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CHRIS SPROWLS
Speaker of the House of Representatives

May 31, 2022

Adam J. Teitzman, Commission Clerk
Florida Public Service Commission
2540 Shumard Oak Boulevard
Tallahassee, Florida 32399-0850

Re: Docket No. 20220050-EI

Dear Mr. Teitzman,

Please find enclosed for filing in the above referenced docket the Direct Testimony and Exhibits of Kevin Mara. This filing is being made via the Florida Public Service Commission's Web Based Electronic Filing portal.

If you have any questions or concerns; please do not hesitate to contact me. Thank you for your assistance in this matter.

Sincerely,

Richard Gentry
Public Counsel

/s/Anastacia Pirrello
Anastacia Pirrello
Associate Public Counsel
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Charles J. Rehwinkel
Deputy Public Counsel

cc: All Parties of Record

CERTIFICATE OF SERVICE
Docket No. 20220050-EI

I HEREBY CERTIFY that a true and correct copy of the foregoing has been furnished by electronic mail on this 31st day of May 2022, to the following:

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BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

In re: Review of Storm Protection Plan pursuant to Rule 25-6.030, F.A.C., Duke Energy Florida, LLC.	DOCKET NO. 20220050-EI FILED: May 31, 2022

DIRECT TESTIMONY

AND EXHIBITS

OF

KEVIN J. MARA, P.E.

ON BEHALF OF THE CITIZENS OF THE STATE OF FLORIDA

Richard Gentry
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DIRECT TESTIMONY

OF

KEVIN J. MARA

On Behalf of the Office of Public Counsel

Before the

Florida Public Service Commission

20220050-EI

I. INTRODUCTION

Q. WHAT IS YOUR NAME, OCCUPATION, AND BUSINESS ADDRESS?

A. My name is Kevin J. Mara. My business address is 1850 Parkway Place, Suite 800, Marietta, Georgia 30067. I am the Executive Vice President of the firm GDS Associates, Inc. ("GDS") and Principal Engineer for a GDS company doing business as Hi-Line Engineering. I am a registered engineer in Florida and 22 additional states.

Q. PLEASE STATE YOUR PROFESSIONAL EXPERIENCE.

A. I received a Bachelor of Science degree in Electrical Engineering from Georgia Institute of Technology in 1982. Between 1983 and 1988, I worked at Savannah Electric and Power as a distribution engineer designing new services to residential, commercial, and industrial customers. From 1989-1998, I was employed by Southern Engineering Company as a planning engineer providing planning, design, and consulting services for electric cooperatives and publicly owned electric utilities. In 1998, I, along with a partner, formed a new firm, Hi-Line Associates, which specialized in the design and planning of electric distribution systems. In 2000, Hi-Line Associates became a wholly owned subsidiary of

GDS Associates, Inc. and the name of the firm was changed to Hi-Line Engineering, LLC. In 2001, we merged our operations with GDS Associates, Inc., and Hi-Line Engineering became a department within GDS. I serve as the Principal Engineer for Hi-Line Engineering and am Executive Vice President of GDS Associates. I have field experience in the operation, maintenance, and design of transmission and distribution systems. I have performed numerous planning studies for electric cooperatives and municipal systems. I have prepared short circuit models and overcurrent protection schemes for numerous electric utilities. I have also provided general consulting, underground distribution design, and territorial assistance.

Q. PLEASE DESCRIBE GDS ASSOCIATES, INC.

A. GDS is an engineering and consulting firm with offices in Marietta, Georgia; Austin, Texas; Auburn, Alabama; Orlando, Florida; Manchester, New Hampshire; Kirkland, Washington; Portland, Oregon; and Madison, Wisconsin. GDS has over 170 employees with backgrounds in engineering, accounting, management, economics, finance, and statistics. GDS provides rate and regulatory consulting services in the electric, natural gas, water, and telephone utility industries. GDS also provides a variety of other services in the electric utility industry including power supply planning, generation support services, financial analysis, load forecasting, and statistical services. Our clients are primarily publicly owned utilities, municipalities, customers of privately owned utilities, groups or associations of customers, and government agencies.

Q. HAVE YOU TESTIFIED BEFORE ANY REGULATORY COMMISSIONS?

A. I have submitted testimony before the following regulatory bodies:

- Vermont Department of Public Service

- Florida Public Service Commission
- Federal Energy Regulatory Commission ("FERC")
- District of Columbia Public Service Commission
- Public Utility Commission of Texas
- Maryland Public Service Commission
- Corporation Commission of Oklahoma

I have also submitted expert opinion reports before United States District Courts in California, South Carolina, and Alabama.

Q. HAVE YOU PREPARED AN EXHIBIT DESCRIBING YOUR QUALIFICATIONS AND EXPERIENCE?

A. Yes. I have attached Exhibit KJM-1, which is a summary of my regulatory experience and qualifications.

Q. ON WHOSE BEHALF ARE YOU APPEARING?

A. GDS Associates, Inc., was retained by the Florida Office of Public Counsel (“OPC”) to review Duke Energy Florida’s ("Duke," “DEF,” or "Company") proposed 2023-2032 Storm Protection Plan (“SPP” or “Plan”) on behalf of the OPC. Accordingly, I am appearing on behalf of the Citizens of the State of Florida.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THIS PROCEEDING?

A. I am presenting my recommendations on behalf of OPC regarding DUKE’s proposed 2023-2032 Storm Protection Plan. My testimony serves to refute the testimony presented by Brian M. Lloyd and Amy H. Home regarding the scope of the SPP projects, and whether the programs and projects could qualify to be included in the SPP.

Q. WHAT INFORMATION DID YOU REVIEW IN PREPARATION OF YOUR TESTIMONY?

A. I reviewed the Company's filing, including the direct testimony and exhibits. I also reviewed the Company's responses to OPC's and Staff's discovery and other materials pertaining to the SPP and its impacts on the Company. In addition, I reviewed Section 366.96, Florida Statutes, which requires the filing of the SPP and authorized the Commission to adopt the relevant rules, including Rule 25-6.030, Florida Administrative Code ("F.A.C."), which addresses the Commission's approval of a Transmission and Distribution SPP that covers a utility's immediate 10-year planning period, and Rule 25-6.031, F.A.C., which addresses the utilities' recovery of costs related to their SPPs.

Q. PLEASE SUMMARIZE YOUR TESTIMONY.

A. I first discuss the purpose of storm hardening and an SPP as informed by Rule 25-6.030, F.A.C., and criteria needed for storm hardening projects. I then discuss principles to be applied when reviewing DEF's proposed SPP. I also address the level of spending by DEF. Finally, I discuss my analysis of the new programs proposed in the SPP, including principles that should be applied when reviewing DEF's proposed SPP. In the discussion of the principles I applied, I include criteria that, in my expert opinion, the Commission must weigh to properly evaluate the sufficiency of the SPP and each SPP program under the statutes and rules governing the SPPs.

II. REVIEW THE PURPOSE OF STORM HARDENING

Q. PLEASE DISCUSS SECTION 366.96, FLORIDA STATUTES.

A. Section 366.96, Fla. Stat., addresses storm protection plan cost recovery for investor-owned utilities. The purpose of storm hardening is to "effectively reduce restoration costs and outage times to customers and improve overall service reliability for customers."[1]

The Florida Legislature has directed the Commission to consider "[t]he estimated costs and benefits to the utility and its customers of making the improvements proposed in the plan."[2] But there is no express ceiling or cap on the magnitude of the upgrades or improvements contained in the SPP or on the rate impact to the customers. Again, while the legislature left the ratemaking impact of both of these considerations to the Commission's discretion it appears that they gave the Commission direction and the tools to limit the utilities' spending in the SPP and SPPCRC approvals. As part of my testimony, I will present some recommended limits to the construction programs.

All of the utilities' SPPs are based on the premise that by investing in storm hardening activities the electric utility infrastructure will be more resilient to the effects of extreme weather events. This resiliency means lower costs for restoration from the storms and reduced outage times experienced by the customers. Some programs have a greater impact on reducing outages times and lowering restoration costs than other programs. Clearly, the goal is to invest in storm hardening activities that benefit the customers of the electric utilities at a cost that is reasonable relative to those benefits.

Q. **PURSUANT TO SECTION 366.96, FLA. STAT., THE COMMISSION ADOPTED RULE 25-6.030, F.A.C. PLEASE DISCUSS RULE 25-6.030, F.A.C., FROM YOUR PERSPECTIVE AS AN ELECTRIC UTILITY DISTRIBUTION ENGINEER.**

A. Rule 25-6.030, F.A.C., mandates a storm protection program, which is a group of storm protection projects to enhance the utility's existing infrastructure for "the purpose of

[1] Section 366.96 (1)(d), Florida Statutes.
[2] Section 366.96 (4)(c), Florida Statutes.

reducing restoration costs and reducing outages times associated with extreme weather conditions ... "[3] Further, a storm protection *project* is defined as a specific activity designed for enhancement of the system "for the purpose of reducing restoration costs and reducing outage times associated with extreme weather conditions ... "[4]

Clearly, this two-prong test to reduce restoration costs and reduce outage times as defined in Rule 25-6.030, F.A.C., must be applied to storm protection programs and projects. A project must accomplish both benefits, reduction in restoration costs, and reduction in outage time to be included in the SPP.

Logically, strengthening the electric utility infrastructure is a storm plan requirement and simply replacing like-for-like equipment with the same strength and functionality does not meet the requirements of Rule 25-6.030, F.A.C. The point of the SPP is to enhance the strength of the grid to withstand extreme weather conditions that result in high winds.

Thus, there are two criteria that must be central in each SPP program and project:

(1) Reduce restoration costs, and

(2) Reduce outage times.

Rule 25-6.030, F.A.C., requires utilities to provide budgets for programs and to provide the estimated reduction in restoration costs.[5] These amounts must be balanced against the benefits to the utilities' customers. Further, the two amounts will allow the Commission and stakeholders to understand the benefits of the capital investments for storm hardening relative to the “reasonableness” of the costs. Any program can claim to reduce outage costs and outage time; however, the program must be cost effective for

[3] Rule 25-6.030 (2)(a), F.A.C.
[4] Rule 25-6.030 (2)(b), F.A.C.
[5] Rule 25-6.030 (3)(d)1., F.A.C.

customers to benefit. To summarize, the rules require a two-prong test for consideration of a program: reduction in outage costs and reduction in outage time.

Q. CAN YOU PROVIDE AN ILLUSTRATIVE EXAMPLE OF HOW A STORM HARDENING PROJECT MEETS THE TWO CRITERIA OF RULE 25-6.030 F.A.C.?

A. Yes. Hardening means to design and build components of the system to a strength that would not normally be required. For instance, distribution poles per the National Electrical Safety Code ("NESC") need only be built based on loading requirement of Rule 250B (60 MPH wind) and Grade C strength. Hardening would specify distribution poles be built based on loading requirements of Rule 250C extreme wind (120-140 MPH) and Grade B strength factors.[6] By installing poles with greater strength needed to meet this new design criteria, these hardened poles will reduce restoration costs because there will be fewer pole failures and will reduce restoration time because there will be fewer failed poles to repair.

Simply replacing a pole using the same loading requirements and same strength factors as the original pole will not harden the system. A like-for-like replacement will result in a stronger pole only because it is new, but the performance of the like-for-like replacement will be the same over time. For instance, in transmission system hardening, many utilities are using non-wood poles (steel or concrete) to replace existing wood poles. The upgrade to non-wood poles is not required by the NESC but these non-wood poles have proven to reduce outages and reduce outage times due to the superior ability of the non-wood pole to survive during extreme windstorms.

Alternately, replacing aging infrastructure with new infrastructure of the same strength or purpose does not harden the system. This is because using the same strength

[6] The loading of NESC Rule 250C and Grade B do not normally apply to distribution lines.

components does not reduce outage times nor outage costs when compared to the original components.

Q. CAN YOU PROVIDE EXAMPLES OF CHANGES TO AN ELECTRIC UTILITY SYSTEM WHICH DO NOT MEET THE CRITERIA SET FORTH IN RULE 25-6.030 F.A.C.?

A. Yes. Adding new sectionalizing equipment such as reclosers, fuses, and disconnect switches does not reduce outages. The outage will still occur and will still need to be repaired; thus, there is no change to the restoration costs. These devices only help to isolate a smaller portion of the system that is affected by the outage. Thus, the devices fail the criteria in Rule 25-6.030 F.A.C. While the devices do reduce outage times, they fail to reduce outage costs. Further, adding sectionalizing equipment does not strengthen or harden the system.

Another example is replacement of a bridge on an access road. The bridge does not reduce outages. It can help with access to the transmission right-of-way. However, the purpose of the bridge originally was, and continues to be, to allow access. Replacing the bridge to allow access does not change its purpose. The utility has a responsibility to maintain its infrastructure and if the bridge is old and in disrepair it needs to be replaced as a normal course of business and would not qualify as a storm protection project.

While not proposed in DEF's filing, the following is an example to illustrate how utilities could expand the SPP programs if the Commission does not adhere to the stringent two-prong test for the program. For example, purchasing a new replacement line truck which is more fuel efficient does not reduce outages. It could be argued that it reduces outage costs by being more fuel efficient. Also, since the truck is new, one could argue that it is more reliable and therefore would reduce outage times. However, this type of

program does not reduce outages. It does not strengthen or harden the system, and in my opinion, would not meet the requirements of the statute.

Q. WHAT OTHER TYPES OF PROGRAMS DO YOU BELIEVE SHOULD BE EXCLUDED FROM THE SPP PROGRAMS?

A. An electric utility has as a core responsibility to maintain a safe operating system. To that end, aging infrastructure and deteriorated equipment needs to be maintained in safe operating condition. Failure to meet this core responsibility puts the public at risk. However, simply replacing old equipment does not constitute storm hardening. The approved storm hardening programs started with replacement of old poles with stronger poles designed for extreme wind experienced during storms above what is necessary to meet the requirements of the National Electric Safety Code. This hardening was characterized by stronger than required components and timed improvements so that as poles failed inspection, the system would be naturally strengthened over a period of time.

In DEF's current 2023 SPP filing there are several programs such as replacement of deteriorated conductors, replacement of antiquated relays and breakers, replacement of rusted switchgear, replacement of live-front transformers, corrosion mitigation to increase service life, and replacement of lattice towers with lattice towers of similar strength, that are **not** storm hardening programs. These are aging infrastructure programs which do not decrease outage costs or reduce outage time when compared to existing system infrastructure. DEF should be implementing the renewals of aging infrastructure through standard base rates primarily because these programs are not related to protecting the system in Florida from damage from storms but could be more accurately classified as ordinary replacements.

Q. CAN ALL COSTS THAT REDUCE OUTAGE COSTS, REDUCE OUTAGE TIMES AND STRENGTHEN THE ELECTRIC UTILITY INFRASTRUCTURE BE INCLUDED IN THE SPP AND SPPCRC?

A. Section 366.96, Florida Statutes, and Rule 25-6.030, F.A.C. provide no overt governance regarding limitations to the costs of SPP programs. Even by DEF's own analysis, some programs provide very minor improvement to cost reductions and reductions in outage times while costing significantly more than these marginal savings projections. It is imperative that the Commission consider implementing guidelines to limit the magnitude of each program's costs compared to its benefits. For this reason, and on behalf of the customers who must bear these costs against the level of projected benefits, elsewhere in my testimony, I will propose my limits to projects for the Commission to consider in the public interest.

Q. DID YOU COMPARE THE 10-YEAR CAPTIAL COSTS OF DEF'S 2020-2029 SPP AND ITS 2023-2031 SPP?

A. Yes, there has been a substantial increase in capital expenditures proposed by DEF. The table below shows an increase of over $682 million in capital spending over the 10-year plan.

Capital	Total 2020-2029 SPP $Millions	Total 2023-2032 SPP $Millions	Difference	Percent increase
Distribution - Feeder Hardening	$ 1,573	$ 2,027	$ 454.00	29%
Distribution - Lateral Hardening	$ 2,266	$ 2,931	$ 665.00	29%
Distribution - Self-Optimizing Grid (SOG)	$ 561	$ 340	$ (221.00)	-39%
Distribution - UG Flood Mitigation	$ 11	$ 14.50	$ 3.50	32%
Distribution - Vegetation Management	$ 497	$ 23	$ (474.30)	-95%
Transmission - Structure Hardening	$ 1,341	$ 1,603	$ 262.00	20%
Transmission - Substation Flood Mitigation	$ 27	$ 38	$ 11.00	41%
Transmission - Loop Radially Fed Substations	$ 52	$ 82	$ 30.40	58%
Transmission - Substation Hardening	$ 109	$ 133	$ 24.00	22%
Transmission - Vegetation Management	$ 198	$ 126	$ (72.00)	-36%
Total Capital	$ 6,635	$ 7,318	$ 682.60	10%

Q. HAVE YOU COMPARED THE CAPITAL COSTS ON A PER RATEPAYER BASIS FOR THE INVESTOR-OWNED UTILITIES WHO HAVE FILED SPP PLANS?

A. Yes. I looked at the ratio of capital spending to number of customers for the 2020-2029 SPP and the budget 2023-2031 SPP for the electric utilities who filed plans. This information is in the following table:

Total 10-year Projected SPP Investment per Customer
Includes only Capital Investment

	Customers Total	2020 SPP 10-Year Capital $Millions	2020 SPP $/Customer	2023 SPP * 10-Year Capital $Millions	2023 SPP $/Customer
FPUC	32,993	N/A		$ 243	$ 7,369
Tampa Electric	824,322	$ 1,589	$ 1,928	$ 1,699	$ 2,061
Duke Energy Florida	1,879,073	$ 6,635	$ 3,531	$ 7,318	$ 3,894
Florida Power & Light	5,700,000	$ 11,244	$ 1,973	$ 13,908	$ 2,440

* FPUC and TECO's plan is dated 2022 for a 10-year period.

DEF's proposed spending per customer has increased more than 10% and the spending on a per customer basis shows DEF spending 150% more than that of some of the other utilities in Florida.

Q. IN YOUR OPINION, WHAT ARE THE CURRENT LIMITS ON THE SPP BUDGETS?

A. DEF and their consultant, Guidehouse, optimized the deployment plans based in part on "available resources." According to DEF, the only limit to the magnitude of the SPP budgets was the limitation of resources in terms of engineers and construction personnel realistically available to complete the annual goals of the program. It is as if DEF is racing to replace and harden as much of the plant as possible regardless of the impact to rate payers. I disagree that the only limitation on expenditures is based on availability of resources. The company should also consider the rate impact to customers and maintain a sharp focus on the ratio of the benefits to the costs. In my opinion the SPP for Tampa Electric and the other utilities is not reasonable and should be constrained to limit the rate impact on customers during a time of higher than average inflation.

III. SUMMARY OF PROPOSED SPP REDUCTIONS

Q. CAN YOU SUMMARIZE YOUR PROPOSED REDUCTION IN DEF'S PROGRAMS?

A. The table below summarizes my recommendations to reduce the 10-year SPP capital budget by $2.0 billion. These recommendations are detailed in the testimony.

Capital	Total 2023-2032 SPP $Millions	Reductions Proposed by Mara	Net 2023-2032 SPP $Millions	Reason for Reduction
Distribution - Feeder Hardening	$ 2,027	$ (500)	$ 1,527	Limit impact to customers
Distribution - Lateral Hardening	$ 2,931	$ (700)	$ 2,231	Limit impact to customers
Distribution - Self-Optimizing Grid (SOG)	$ 340	$ (340)	$ -	Does not comply with 25-6.030
Distribution - UG Flood Mitigation	$ 15	$ (15)	$ -	Does not comply with 25-6.030
Distribution - Vegetation Management	$ 23	$ -	$ 23	
Transmission - Structure Hardening	$ 1,603	$ (200)	$ 1,403	Does not comply with 25-6.030
Transmission - Substation Flood Mitigatio	$ 38	$ (38)	$ -	Does not comply with 25-6.030
Transmission - Loop Radially Fed Substati	$ 82	$ (82)	$ 0	Does not comply with 25-6.030
Transmission - Substation Hardening	$ 133	$ (133)	$ -	Does not comply with 25-6.030
Transmission - Vegetation Management	$ 126	$ -	$ 126	
Total Capital	$ 7,318	$ (2,008)	$ 5,310	

The reductions I am proposing will result in reducing the capital cost per customer to $2,856.

Q. IF LIMITS ARE PLACED ON THESE PROGRAMS, DOES THAT REDUCE BENEFITS OF THE SPP?

A. Yes, it does. However, the reduction in benefits must be balanced against the impact to the ratepayers. Currently, the United States is experiencing its worst inflation in 40 years and consumers have seen steep increases in the price of gas and groceries, as well as escalating electric bills specifically in Florida. Unless the Commission acts to limit the expenditures, the unchecked spending on SPP programs will result in an excessive burden on the rate payers.

DEF stated they did "not believe there are any implementation alternatives that could mitigate the rate impact without negatively impacting the benefits the SPP 2023 is designed to generate."[7] This may be true, but the benefits presented are based on a 30-year implementation duration. In my opinion, prioritizing feeders and laterals, poles, and other equipment that are the most vulnerable to extreme storms provides greater benefit in the early stages of the program.

Q. DO THE BENEFITS OF THESE PROGRAMS SEEM TO BE DEPENDENT ON THE RETURN PERIOD OF THE EXTREME WEATHER EVENTS?

A. Yes, the magnitude of benefits is based on the return period of storms meaning how frequently the electric utility's service area is impacted by a major storm. The goal is to reduce hurricane restoration costs that are imposed on customers. It is important to consider the recent history of weather events impacting Florida. After a catastrophic two-

[7] Direct Testimony of Brian M. Lloyd, p. 9, lines 4-8.

year period in 2004 and 2005, the Commission undertook to require storm hardening measures. As the companies began implementing these measures, Florida embarked on a 10-year period of relative quiet, with no major storms impacting the state until 2016.

In 2016, a five-year period of major storms began. Over this period the five investor-owned electric utilities have reported the following costs from named hurricanes and tropical storms:

Reported Costs from Named Tropical Storms for Each Florida Investor-Owned Utility
2016 Through 2020
$ Millions

	Storm	FPL		Duke		Gulf	TECO	FPUC		Total
2016	Matthew	310.3		40.0			1.0	0.6		351.9
2016	Hermine	21.2		28.6			5.7	0.0		55.5
2016	Colin - TS			3.6			2.5			6.1
2017	Irma	1,378.4		464.1			101.7	2.3		1,946.5
2017	Nate			5.3						5.3
2017	Cindy - TS							0.0		0.0
2018	Michael			316.5		427.7		67.3		811.5
2018	Alberto - TS			1.0						1.0
2019	Dorian	240.6	*	153.0	*			1.2	*	394.7
2019	Nestor - TS			0.6						0.6
2020	Sally					227.5				227.5
2020	Zeta					11.4				11.4
2020	Isaias	68.5		1.1						69.5
2020	Eta - TS	115.9		20.8						136.7
Total All Years		2,134.9		1,034.5		666.6	111.0	71.4		4,018.4

Note: The reported costs included above represent the actual total Company restoration costs included in each petition filed with the FPSC. They do not include reductions for costs capitalized or determined to be non-incremental (ICCA). They also do not include carrying charges or impacts from requested changes to storm reserve balances. Finally, they do not include changes due to later Company modifications, settlements, and/or any other FPSC action.

* Expenses are mostly all preparation costs because the storm did not make landfall in Florida.

DEF's estimate for annual avoided restoration expenses for the 10-year SPP ranges from $56.5 million to $70.6 million.[8] Using these values, over a 5-year period the savings would be $282.5 million to $353 million but to achieve this savings DEF proposes to invest $7.3 billion for storm hardening over the next 10-years. Comparing this savings to actual costs incurred by DEF for 2016 to 2020, the net 5-year savings would be $282.5 million which means rate payers have to shoulder $751.97 million for storm costs plus the total capital cost of $7.3 billion contained in the SPP. In fact, DEF's SPP investment for the 10-year period is 1.82 times the total that all investor-owned utilities spent on storm restoration from 2016 to 2020. Thus, rate payers are paying more for the SPP and "reduced" storm costs than they would if the electric utilities did no storm hardening.

Q. YOU NOTE THAT EXPENSES RELATED TO HURRICANE DORIAN ARE MOSTLY FOR PREPARATION AND STAGING. DOES DUKE CLAIM THAT THEIR SPP WILL RESULT IN LESS PRE-STORM STAGING THEREFORE REDUCING COSTS?

A. No. I am not aware that any of the Florida utilities have committed to reducing the number of contractors that the company pre-stages ahead of a storm due to implementing its SPP programs. The SPP's do not claim to reduce costs in this regard, but if the system is hardened, at some point a company should logically spend less on pre-staging and would be expected to limit the amount of staging they do ahead of a storm in conjunction with the SPP.

IV. THE REVIEW OF SPP PROJECTS

Q. CAN YOU DESCRIBE DEF'S FEEDER HARDENING PROGRAM?

[8] *See* Exhibit BML-2 p. 5 of 41.

A. Yes. The Feeder Hardening Program includes three sub-programs: Feeder Hardening, Pole Replacement, and Inspection. The Feeder Hardening sub-program is designed to upgrade the feeder backbone to the NESC 250C extreme wind load standard.[9] In addition, to structure strengthening, DEF proposes to increase lightning protection, upgrade conductors, relocate difficult to access facilities, address clearance encroachments, and replace oil-filled equipment within this sub-program.[10] The Pole Replacement and Inspection sub-programs are designed for the 8-year inspection cycle of most wood poles and replacement of the poles that fail inspection.

Q. CAN YOU EXPLAIN THE CLEARANCE ENCROACHMENTS?

A. Yes. This is new to DEF's 2023 SPP and is contained in DEF's Feeder Hardening sub-program. This is an additional scope of work for the Feeder Hardening sub-program and states that while upgrading feeders to the extreme wind load standards, the DEF will review clearances with non-company owned structures.[11] The reference to clearances are those clearances contained in the NESC between distribution conductors and buildings, signs, privately owned parking lot lights, antennas, and other non-company owned infrastructure.

Q. DO YOU AGREE WITH THE INCLUSION OF THIS NEW SCOPE OF WORK IN THE SPP?

A. No. When an electric utility builds a power line, the utility has a duty to maintain a safe distance from the buildings and other non-company owned structures. That safe distance is defined in the NESC. It is important to note the safe distances (i.e., clearances) in the

[9] *See* Exhibit BML-1, p. 7 of 56.
[10] *See* Exhibit BML-1, p. 7 of 56 and p. 8 of 56.
[11] *See* Exhibit BML-1, p. 7 of 56.

NESC to distribution lines and buildings, light poles, etc. have remained essentially unchanged since 1990.

If DEF built lines such that they are in violation of the NESC, that construction was imprudent, and DEF should be solely responsible for corrective actions. Alternately, if a customer installed a new sign, building, or non-company owned structure that encroached on the safe NESC clearances, then the individual customer should pay for the corrective action. One of the reasons electric utilities obtain exclusive easements is to protect the space around and below distribution lines such that the utility has legal grounds to compel the customer to pay for corrective actions or remove their facilities from the utility's easement.

For these reasons, it is obvious that DEF is responsible for correcting encroachment problems or otherwise obtaining funding from the customer who caused the encroachment. Thus, the cost for corrective actions to address clearance encroachments should be excluded from the SPP.

Q. WHAT IS THE MAGNITUDE OF THE DISTRIBUTION FEEDER HARDENING SUB-PROGRAM?

A. The ten-year expenditure budget for the feeder hardening sub-program is $1.8 billion in the 2023 SPP.[12] In comparison is same sub-program was budgeted for $1.5 billion in the 2020 SPP.[13]

Q. DO YOU HAVE A RECOMMENDATION FOR THE FEEDER HARDENING SUB-PROGRAM?

[12] *See* Exhibit KJM-2
[13] *See* Exhibit KJM-3p. 8 of 40.

A. Yes. I recommend the Feeder Hardening sub-program be held at the same level as the 2020 SPP for the 10-year period which is $1.5 billion. Below is a table of the annual budgets from the 2020 SPP and 2023 SPP for the Feeder Hardening sub-program.

	2020 SPP*		2023 SPP **			
	2021	2022	2023	2024	2025	2026
Sub-Program	$ Million	$ Million	$ Million	$ Million	$ Million	$ Million
Feeder Hardening	$ 60	$ 90	$ 143	$ 127	$ 151	$ 206

* Source Docket 20200069 Exhibit JWO-2 Page 9 of 40

** DEF response to OPC POD 1, Tab "SPP 2.0 10-year CapEx &OM

Essentially my recommendation caps the annual spending for this program to roughly $150 million per year. The benefits achieved with this budget would be the same level as suggested by DEF in the 2020 SPP which was $22 million to $28 million annually.[14] These benefits exceed the benefits suggested by DEF in the 2023 SPP of only $15 million to $18 million.

The benefits derived from the feeder hardening program are higher for the feeders most vulnerable and least ready for extreme wind conductions. Hardening these feeders first provides the highest benefit. The benefits of hardening will be reduced over time as the hardening sub-program is applied to feeders that are not as vulnerable to extreme wind and may have less tree cover or stronger poles already in place.

My recommendation is to reduce the budget for the Feeder Hardening sub-program by $500 million over 10-years and eliminate the scope of work related to encroachment problems.

Q. CAN YOU DESCRIBE DEF'S LATERAL HARDENING PROGRAM?

[14] *See* Exhibit KJM-3 p. 9 of 40.

A. Yes. This program will upgrade and harden branch line sections fed by the feeder backbone using four sub-programs: undergrounding laterals, lateral hardening overhead, pole replacement, and pole inspection.[15] The lateral undergrounding sub-program will be done on lateral segments that are the most prone to damage resulting in outages during extreme weather events.[16] The lateral hardening overhead sub-program includes structure strengthening, deteriorated conductor replacement, removing open wire secondary, replacing fuses with automated line devices, pole replacement, line relocation, and hazard tree removal.[17] The pole inspection and pole replacement sub-programs are part of DEF's 8-year cycle for inspection of wood poles and replacement of poles that fail inspection.[18]

Q. CAN YOU DESCRIBE WHAT IS MEANT BY THE TERM LATERAL?

A. Yes. The term lateral is critical to understanding the purpose of the Lateral Hardening Program. A distribution circuit can be described as a combination of the mainline feeder with laterals stemming off the mainline. The Feeder Hardening Program increases the strength of the mainline feeder from the substation to some point further along the circuit such as a three-phase tie point with another circuit. Some describe the feeder as the first zone of protection out of the substation, meaning the breaker in the substation will trip for any fault in this zone of protection. Thus, hardening the first zone of protection greatly reduces the chance of a structure failure during an extreme wind event. This is important since failure of the mainline feeder results in all customers on the feeder being without power. Laterals are taps off the mainline and DEF has over 11,800 miles of laterals on its system[19] compared to 6,300 miles of overhead feeders.[20] These laterals can be single-phase

[15] *See* Exhibit BML-1, p. 15 of 56.
[16] *See* Exhibit BML-1, p. 15 of 56
[17] *See* Exhibit BML-1, p. 15 of 56.
[18] *See* Exhibit BML-1, p. 18 of 56.
[19] *See* Exhibit BML-1, p. 18 of 56.
[20] *See* Exhibit BML-1, p. 9 of 56.

taps into residential neighborhoods or three-phase taps to subdivisions or businesses. Many of the laterals are behind the customers' premises. The Lateral Hardening Program focuses on improving the condition of the laterals so they may withstand an extreme wind event.

Q. WHAT IS THE MAGNITUDE OF THE DISTRIBUTION LATERAL HARDENING PROGRAM?

A. The ten-year expenditure budget for the lateral hardening program which includes undergrounding laterals, lateral hardening overhead, pole inspections and pole replacement is $2.9 billion in the 2023 SPP.[21] In comparison this same sub-program was budgeted for $2.2 billion in the 2020 SPP.[22]

Q. DO YOU HAVE A RECOMMENDATION FOR THE LATERAL HARDENING PROGRAM?

A. Yes. I recommended reducing the budgets for both the Lateral Undergrounding sub-program and the Lateral Overhead Hardening sub-program. I recommend the budgets for pole inspection and pole replacement in 2023 SPP not be changed. The 10-year combined budget for the Undergrounding and Lateral Hardening Overhead is $2.5 billion. I recommend a combined budget of roughly $1.8 billion.

	2020 SPP*		2023 SPP **			
	2021	2022	2023	2024	2025	2026
Sub-Program	$ Million	$ Million	$ Million	$ Million	$ Million	$ Million
Undergrounding and Lateral Hardening Overhead		$ 140.0	$ 160.4	$ 194.2	$ 226.2	$ 275.2

* Source Docket 20200069 Exhibit JWO-2 Page 14 of 40

** DEF response to OPC POD 1, Tab "SPP 2.0 10-year CapEx &OM

[21] *See* Exhibit BML-1, p. 18 of 56.
[22] *See* Exhibit KJM-3 p. 14 of 40.

Essentially my recommendation caps the annual spending for this program to roughly $180 million per year. The benefits achieved with this budget would be the same level as suggested by DEF in the 2020-2029 SPP which was $95 million to $119 million annually on a ten-year budget of $2.2 billion.[23] I am not conceding the correctness of or accepting DEF's calculation of the benefits but if we use DEF's own number, ten years of benefits to ten years' budget expenditures, the benefit to cost ratio is 0.50. These benefits exceed the benefit to cost ratio suggested by DEF in the 2023 SPP of $111 million to $139 million on $2.9 billion in spending which is a ratio of 0.44 or a 15% lower benefit to cost ratio.

Q. CAN YOU DESCRIBE DEF'S SELF-OPTIMIZING GRID (SOG) PROGRAM?

A. Yes. This program provides the devices, automation, and intelligence to provide the ability to a distribution feeder to automatically reroute power around damaged sections.[24] The system requires adjacent circuits to allow shifting of load from a faulted circuit to an operational circuit. The load shift helps to isolate a specific section of the faulted circuit. These systems require substation breakers and down-line reclosers or switches to have communication to a distribution system control (Yukon Feeder Automation System) and the devices must be able to operate remotely.

This program has a sub-program referred to as connectivity and capacity. This sub-program increases substation capacity and distribution line capacity to allow the SOG to automatically shift loads.

Q. DOES THIS SOG SYSTEM REDUCE RESTORATION COSTS?

[23] *See* Exhibit KJM-3 p. 14 of 40.
[24] See Exhibit BML-1, p. 27 of 56.

A. No. This system does not reduce the number of outages. Instead, the system is designed to limit the outage to the smallest segment of the system. For example, if a fuse is added to a lateral and a tree falls on that lateral, the fuse opens and isolates the failed portion of the system. Only a few customers are affected by the outage, but the repair costs to remove the tree off the line and perhaps replace a pole are the same whether a fuse is on the lateral or not. The SOG system is more complex but acts in a similar fashion in that it uses automation to switch and isolate outages to the smallest portion of the system. Thus, there is no reduction in restoration costs for the SOG system and the associated connectivity and capacity sub-program. In fact, DEF does NOT provide any costs associated with restoration costs.[25]

Q. DOES THIS SOG SYSTEM WORK DURING EXTREME WEATHER EVENTS?

A. It is my belief that the system is not effective during an extreme weather event. For example, if there is a fault on a feeder, the SOG would automatically transfer unfaulted sections of the feeder to an adjacent feeder. However, during an extreme weather event it is doubtful that adjacent feeders will be available because these adjacent feeders will likely have suffered an outage as well.

On blue sky days, the SOG system should be very effective in reducing outages. But to meet Rule 25-6.030, F.A.C. a program shall have a "purpose of reducing restoration costs and reducing outage times associated with extreme weather conditions therefore improving overall service reliability."[26] DEF noted that the SOG would reduce customer minutes interrupted (CMI) in terms of system reliability and uses this value as a proxy for

[25] See Exhibit BML-1, p. 28 of 56.
[26] Rule 25-6.030 (2)(a), F.A.C.

extreme weather performance.[27] However, DEF has not provided any evidence the system will be a benefit during extreme weather events.

Q. WHAT IS YOUR RECOMMEDNATION REGARDING THE SELF-OPTIMIZING GRID PROGRAM?

A. I recommend this program with a ten-year budget of $340 million be eliminated from DEF's SPP because it fails to meet the purpose set forth in Rule 25-6.030(2)(a), F.A.C. This program, which only improves blue sky reliability, should be funded by means of standard base rate treatment.[28]

Q. CAN YOU DESCRIBE DEF'S UNDERGROUND FLOOD MITIGATION PROGRAM?

A. Yes. The program is designed to harden existing underground equipment prone to storm surge during extreme weather events.[29] For selected locations, DEF plans to utilize a concrete pad with increased weight, stainless steel tie downs and to change all connections to waterproof (submersible) connections. In essence, DEF states that conventional switchgear will be replaced with submersible switchgear that are able to withstand storm surge.[30]

Q. CAN YOU EXPLAIN WHAT ARE SUBMERSIBLE SWITCHGEAR AND TRANSFORMERS?

[27] *See* Exhibit BML-1, p. 28 of 56.
[28] I do not offer an opinion about whether this SOG cost is included in base rate costs already or if it is governed by a separate settlement agreement. To the extent that there has been an established right of recovery for these SOG investments outside of base rates (which I am not conceding), then my proposal would be adjusted accordingly.
[29] *See* Exhibit BML-1, p. 32 of 56.
[30] *Id.* at 6.

A. Yes. Submersible means being able to withstand being underwater. The elbow connectors to connect medium voltage cable (15kV and 25kV cables) to switchgear are rated per IEEE Standard 386 to operate in 6 feet of water and therefore are submersible up to that depth.[31] Some switchgear like S&C PMH gear are air insulated and are not submersible. Many pad-mounted switchgear, even if they use oil insulation, SF6 gas, or solid dielectric insulation are not submersible because the control system (relays and SCADA communication) are typically not rated as submersible.

Submersible transformers are often used in vaults in downtown environments. Most single-phase pad-mounted transformers have exposed secondary bushings which do not make these units rated as submersible. There are some submersible single-phase transformers which are typically installed in vaults, but they are rarely used in the United States.

Q. HOW HAS DEF USED THIS PROGRAM IN 2021?

A. DEF replaced or modified 7 pieces of switchgear in 2021. Most of these were noted to have existing maintenance problems such as rust or oil leaks as shown in the following table.[32] This does not appear to be flood mitigation but rather funding to replace aged switchgear with new switchgear. This type of replacement should more appropriately be recovered through base rates for that switchgear so that these units are not double counted. That is, the cost should not appear in both traditional rate base and in SPPCRC.

[31] IEEE 386-2016, IEEE Standard for Separable Insulated Connector Systems for Power Distribution Systems Rated 2.4 kV through 35 kV, Section 4.1.
[32] *See* Exhibit KJM-3.

Zone	Project	Sub Category	Project Status
South Coastal	GIP_LFSG_PMH-9_J229_J265	Submersible Switchgear	2020
North Coastal	SWITHGEAR RUSTED AND UNSAFE REPLACE IN NEW LOCATION	Submersible Switchgear	2021
North Coastal	Replace VFI switchgear RUSTED NOT SAFE TO WORK REPLACE IN PLACE	Submersible Switchgear	2021
South Coastal	REPLACE ESCO WITH G&W for RA 240	Submersible Switchgear	2020
South Coastal	(HOLD) GSR: SWG PME-9 L for Submersible REPLACEMENT SWG X2964 and X2965	Submersible Switchgear	2021
North Coastal	3/16 GIS*Replace VFI C5944 switchgear leaking oil	Submersible Switchgear	2020
North Coastal	3/8 GIS*Replace VFI C5928 seeping oil.	Submersible Switchgear	2020

DEF also stated they installed 24 submersible transformers in the Dixie Shore subdivision. Homes in this portion of this subdivision with underground electric service were built in the early 1970s.[33] These units may likely be live-front single-phase transformers being replaced with new standard dead-front transformers which are not submersible transformers. These are not upgrades to submersible transformers but rather the standard single-phase transformer used by DEF. Thus, these replacements are just aging infrastructure replacements and therefore should be recovered in base rates.

Q. ARE THE SWITCHGEAR BEING REPLACED BY THIS PROJECT RATED AS SUBMERSIBLE?

A. No. DEF is using VFI switchgear, PME-9 switchgear, and G&W switchgear which are not submersible units. These units use elbow connectors that are rated submersible, but have electronic controls that are not submersible, and PME-9 uses air-insulated bus work which is not rated submersible. Based on the available information, I also believe the transformer

[33] Citrus County Tax Assessor Office.

replacement at Dixie Shores is simply an aging infrastructure replacement from live-front to dead-front single-phase transformers. I note that the 2023 planned project for Floramar is in an area that was built in late the 1960s and early 1970s and is likely to also have live-front transformers.

Q. WHAT IS YOUR RECOMMENDATION FOR THE UNDERGROUND FLOOD MITIGATION PROGRAM?

A. I recommend eliminating this program which is budgeted for $14.5 million for the 10-year period of the 2023 SPP. [34] It is obvious to me that DEF is proposing to use this SPP program to fund replacement of aging infrastructure. It is true that any new equipment will help with reliability. However, replacement of aging equipment is a core function of DEF in providing service to customers. The equipment being installed is presumably DEF's current standard equipment for coastal construction and not an upgrade that reduces storm restoration costs or customer outage times. Without a clear improvement in resiliency, the project does not meet the requirements of Rule 25-6.030(3)(a), F.A.C.[35] Therefore, I recommend this program be excluded from the SPP.

Q. CAN YOU DESCIRBE THE STRUCTURE HARDENING PROGRAM?

A. Yes. The Structure hardening program is part of DEF's functional group of programs related to the transmission system. The Structure Program is then broken down further to seven sub-programs including:

1. Wood Pole Program,
2. Structure Inspections (O&M),

[34] *See* Exhibit KJM-2.
[35] Rule 25-6.030(3)(a), F.A.C.

3. Gang Operated Air Break Switch Automation,

4. Tower upgrade,

5. Tower Drone Inspection (O&M),

6. Tower Cathodic Protection, and

7. Overhead Ground wire (OHGW).

The current 10-year budget for this program is $1.6 billion. [36]

Q. CAN YOU DESCRIBE THE TOWER UPGRADE SUB-PROGRAM?

A. Yes, the Tower Upgrade sub-program contains upgrade activities which will replace tower types that have previously failed during extreme weather events. Seven hundred (700) such towers have been identified. The sub-program also includes replacement of lattice towers identified from visual ground inspections, aerial drone inspections and data gathered during cathodic protection installations.[37]

Q. DO YOU HAVE AN OPINION ON THE NEED TO REPLACE TOWER TYPES THAT HAVE PREVIOUSLY FAILED?

A. Yes. DEF notes that some tower designs have failed in previous extreme wind events.[38] In DEF's 2020-2029 SPP, this sub-program was focused on the replacement of towers identified though enhanced engineering inspections of towers similar in age and vicinity as the towers that failed during Hurricane Irma.[39] First, transmission lines have been required by the NESC to be built for extreme wind events since at least 1977.[40] Failure due to a design flaw should not be a SPP activity. If DEF owns towers that fail to meet strength

[36] *See* Exhibit KJM-2.
[37] *See* Exhibit BML-1, p. 38 of 56.
[38] *See* Exhibit BML-1, p. 38 of 56.
[39] *See* Exhibit KJM-5 p. 30-34.
[40] 2017 NESC Handbook, Fourth Edition, IEEE Standard Press, August 1, 2016 ("NESC").

requirements when constructed, then replacement costs should not be considered an "upgrade" and therefore should not be funded through the SPP. Second, if age is a criterion and the towers are beyond their useful life, then replacement of the towers is an aging infrastructure project and therefore should not be included in the SPP. Replacing towers with new towers that meet the same weather loading condition will not add to resiliency. If the tower design was flawed, it would have been imprudent for DEF to accept the design and construction of the tower in which case the cost should also be excluded from the SPP.

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Q. WHAT ABOUT REPLACEMENT OF OLD LATTICE TOWERS, SHOULD THESE BE INCLUDED IN THE SPP?

A. No. Replacing a tower with another tower of the same strength does not increase resiliency. Rather it simply maintains the status quo in terms of strength. In order to meet Rule 25-6.030, F.A.C., a program shall have a "purpose of reducing restoration costs and reducing outage times associated with extreme weather conditions therefore improving overall service reliability."[41]

Clearly replacing new towers with the same strength and same materials is not a clear improvement in outage costs or times, therefore, the project does not meet the requirements of Rule 25-6.030(3)(a), F.A.C.[42]

I recommend that this sub-program with $175 million 10-year budget[43] be eliminated from the SPP.

Q. CAN YOU DESCRIBE THE CATHODIC PROTECTION SUB-PROGRAM?

[41] Rule 25-6.030 (2)(a), F.A.C.
[42] Rule 25-6.030 (3)(a), F.A.C.
[43] *See* Exhibit KJM-2.

A. Yes, the sub-program is designed to limit corrosion of the lattice tower system.[44] Steel components can be weakened from electrolysis which slowly takes metal away from the structure. A passive corrosion protection method can be used to help reduce or slow this electrolysis.[45]

Q. DOES THIS SUB-PROGRAM INCREASE THE STRENGTH OF TOWERS ON DEF'S SYSTEM?

A. No. The passive corrosion sub-program limits the strength reduction. When the strength of a tower or structure decays below a certain level, per the NESC, the structure must be replaced or rehabilitated.[46] Thus this sub-program does not increase strength or improve resiliency. The purpose of this project, in my opinion, is to increase the service life of the tower which has value but does not meet the requirements in Rule 25-6.030(3)(a), F.A.C., for reducing outage restoration costs and reducing outage times. The tower will have the same required strength throughout its service life and should therefore withstand the extreme wind for which it is designed. The cathodic protection does not add strength, it only extends the life of the asset. Therefore, in my opinion, this sub-program which has a 10-year budget of $25 million[47] should be excluded from the SPP.

Q. CAN YOU DESCRIBE THE OVERHEAD GROUND WIRE (OHGW) SUB-PROGRAM?

A. Yes, the sub-program replaces deteriorated overhead ground wires. DEF proposes installing a new OHGW equipped with a fiber optic cable imbedded in the OHGW.[48]

[44] *See* Exhibit BML-1 page 38 of 56.
[45] *Id.*
[46] *See* NESC, Table 253-1.
[47] *See* Exhibit KJM-2.
[48] *See* Exhibit BML-1 page 40 of 56.

Q. DOES THIS SUB-PROGRAM OF REPLACING OHGW IMPROVE RESILIENCY AND REDUCE RESTORATION COSTS?

A. No. DEF has a duty to maintain its systems within the strength requirements of the NESC. If the OHGW is deteriorated, then it needs to be replaced. The replaced conductor does not add strength or resiliency compared to the original well-maintained structure. Thus, there will be no reduction in outage restoration costs and no reduction in the outage times. This is simply an aging infrastructure replacement sub-program. DEF is adding fiber optic OHGW which adds communication capabilities which may or may not be used. In fact, from my experience, most new transmission lines have fiber optic OHGW installed as standard design. For fiber optic cable to be used and useful it must be integrated into a system of fiber optic cables and have data flowing over the newly installed fiber optic cable. The focus of the sub-program is replacing deteriorated OHGW. Fiber Optic OHGW is a minor side benefit.

Q. WHAT IS YOUR RECOMMENDATION FOR THE OVERHEAD GROUND WIRE SUB-PROGRAM?

A. I recommend eliminating this sub-program which is budgeted for $138.5 million for the 10-year period of the 2023 SPP. [49] The sub-program does not meet the requirements in Rule 25-6.030(3)(a), F.A.C. for reducing outage restoration costs and reducing outage times. The new OHGW will meet the same NESC loading limits for extreme wind so there is no increase in strength and thus no reduction in restoration costs.

[49] *See* Exhibit KJM-2.

Q. CAN YOU DESCRIBE THE GANG OPERATED AIR BREAK (GOAB) AUTOMATION SUB-PROGRAM?

A. Yes, this sub-program is a 20-year initiative to upgrade 160 switch locations with modern switches enabled with SCADA communication and remote-control capabilities. The existing GOAB switches must be manually operated. By automating the switches, DEF will be able to remotely control the transmission system in order to perform equipment maintenance or isolate trouble spots to minimize impacts to customers.[50]

Q. DOES THIS GOAB SUB-PROGRAM REDUCE OUTAGES OR RESTORATION COSTS?

A. No. This system does not reduce the number of outages. Similar to my discussion regarding the SOG program, the GOAB sub-program uses automation to switch and isolate outages to the smallest portion of the system. Thus, there is no reduction in restoration costs with the installation of the GOAB sub-program. In fact, DEF does not provide specific restoration cost reduction associated with this program.[51]

Q. WHAT IS YOUR RECOMMENDATION REGARDING THE GOAB SUB-PROGRAM?

A. I recommend this program with a ten-year budget of $72.5 million[52] be eliminated from DEF's SPP because it fails to meet the purpose set forth in Rule 25-6.030(3)(a), F.A.C. which requires programs to reduce restoration costs and to reduce outage times. This program does not reduce restoration costs and therefore should be funded by means of standard rate base treatment.

[50] *See* Exhibit BML-1, p. 39 of 56.
[51] See Exhibit BML-1, p. 41 of 56.
[52] *See* Exhibit KJM-2.

Q. CAN YOU DESCRIBE DEF'S SUBSTATION FLOOD MITIGATION PROGRAM?

A. Yes, this program is designed to build in protection for substations most vulnerable to flood damage according to flood plain maps and storm surge data.[53]

Q. WHAT IS YOUR UNDERSTANDING OF BUILDING A SUBSTATION IN COASTAL FLOOD ZONES?

A. The acquisition of land for a substation is always a challenge but the land needs to be suitable for safe and reliable electric service. Flood maps were not issued until 1973[54] so substations constructed before 1973 would not have had standards requiring certain elevations. However, stations built after 1973 should have been designed with the knowledge of potential flood waters and designs should have accounted for this predictable occurrence. Specifically, the standard *ASCE-24-14 Flood Resistant Design and Construction* calls for the facilities to be designed for the Basic Flood Elevation (100-year flood level) plus two feet. Details of improvements are not required to be contained in the current SPP. Therefore, no conclusion can be reached regarding the prudence of the original design and the proposed mitigation plans.

Q. ARE THERE OTHER MEANS AVAILABLE TO REDUCE OUTAGE TIME FOR CUSTOMERS DUE TO FLOODING OF SPECIFIC SUBSTATIONS?

A. Yes. It is my belief that most of DEF's distribution system is designed for a single contingency failure which would be consistent with modern distribution systems in suburban and urban areas. Single contingency means designing for the loss of one feeder

[53] *See* Exhibit BML-1, p. 47 of 56.
[54] See Exhibit KJM-6

or one substation transformer. Thus, if a transformer had to be de-energized for flooding it is very likely that the load from this substation can be switched to an adjacent substation that is not flooded. To the extent this is the case, then the Substation Flood Mitigation Program does not reduce outage time nor restoration costs and therefore should be excluded from the SPP in accordance with the statute that contemplates reduction in both outage time and restoration costs.

Q. TO YOUR KNOWLEDGE HAS DEF SUFFERED OUTAGE TIME DUE TO FLOODING OF ITS SUBSTATIONS?

A. My understanding is DEF has not had any outages due to flooding of its substations in recent years. There was one instance where sandbags were deployed at a control house but there were no outages.[55]

Q. WHAT IS YOUR RECOMMENDATION REGARDING THE SUBSTATION FLOOD MITIGATION PROGRAM?

A. I recommend inclusion of this program on a limited basis. The program should exclude any substation where there are alternate feeds to allow the substation to be de-energized due to flooding. The program should also exclude any substation that has not had a history of flooding or which a flooding threat cannot be demonstrated. The excluded cost is likely the entire 10-year budget of $38 million.[56]

Q. CAN YOU DESCRIBE DEF'S LOOP RADIALLY-FED SUBSTATIONS PROGRAM?

[55] *See* Exhibit KJM-7.
[56] *See* Exhibit BML-1, p. 47 of 56.

A. Yes. This program is designed to convert radially fed substations to networked substations and will target 17 sites over 20 years.[57] The program constructs a second feed to substations that DEF determines are more likely to experience long outage durations during extreme weather events. This work may include upgrades to existing substations.

Q. DID DEF INCLUDE ANY COST REDUCTION FOR THIS PROGRAM?

A. No. There is no outage cost reduction for this program and in fact DEF does not provide any estimates for outage cost reduction.[58] Essentially, if the backup transmission line has to be used it is because the primary transmission feed is damaged. Repairs still need to be made to the primary transmission feed. Thus, this program projected to spend $206 million over 20 years does not reduce storm restoration costs, and according to DEF, only results in a 10% reduction in customer outage hours.[59]

Q. DO YOU BELIEVE THIS PROGRAM SHOULD BE INCLUDED IN THE SPP?

A. No. The priority should be to harden transmission lines with non-wood poles designed for extreme wind. With such a design the likelihood of transmission failure is greatly reduced and the need for a loop transmission feed is eliminated. Storm hardened transmission structures have shown to be extremely resilient. For example, FPL reported that zero hardened transmission poles failed in Hurricane Matthew or Hurricane Irma.[60] Thus if DEF puts a higher priority on strengthening the radial taps, the proposed looped transmission lines are not necessary to achieve storm hardening.

[57] *See* Exhibit BML-1, p. 49 of 56.
[58] *See* Exhibit BML-1, p. 49 of 56.
[59] *See* Exhibit BML-1, p. 49 of 56.
[60] Docket No. 20220051-EI, FPL Exhibit MJ-1, Appendix A, p. 7 of 18.

Q. WHAT IS YOUR RECOMMENDATION REGARDING LOOP RADIALLY-FED SUBSTATIONS PROGRAM?

A. I recommend eliminating this program, which has a 10-year budget of $82.4 million,[61] from the SPP. The program fails to meet one criterion of Rule 25-6.030, F.A.C. which is that this program does not reduce restoration costs.

Q. CAN YOU DESCRIBE DEF'S SUBSTATION HARDENING PROGRAM?

A. Yes, this program upgrades oil breakers and electromechanical relays. The program is designed to eliminate 80 oil breakers and 140 electromechanical relay groups with digital relays in the 10-year period of the SPP.[62]

Q. DOES THIS SUB-PROGRAM OF SUBSTATION HARDENING IMPROVE RESILEINCY AND REDUCE RESTORATION COSTS?

A. No. This program is more about replacing aging infrastructure than it is a storm hardening program. The existing oil breakers open and clear faults. The new breakers will open and clear faults. If the existing breakers cannot safely operate and avoid catastrophic failure these devices should, based on prudent utility practice, be replaced. Thus, in terms of performance on the system there would be no significant change other than using modern breakers. These upgraded breakers do not reduce restoration costs and also do not reduce outage times. Existing relays are electromechanical relays which are not readily available in the electric industry because they are considered obsolete. All new substations and relay replacement projects throughout the industry use the modern digital relays. So, while, the digital relays are superior to electro-mechanical relays, DEF realistically has no choice but

[61] *See* Exhibit KJM-2.
[62] *See* Exhibit BML-1, p. 52 of 56.

to replace an electro-mechanical relay with a digital relay, regardless of the threat of extreme weather. Thus, this program is replacing older equipment that is at or near obsolescence with modern equipment. DEF suggests that upgrading to digital relays with advanced system protection functions and communication will enable DEF to respond and restore service more quickly in the aftermath of extreme weather events. However, this does not change the fact that outages will still occur and the cost to restore those outages will not be reduced. Therefore, the program does not meet the criteria set forth in Rule 25-6.030, F.A.C.

Q. WHAT IS YOUR RECOMMENDATION REGARDING THE SUBSTATION HARDENING PROGRAM?

A. I recommend this $133 million[63] program be eliminated from the SPP. The need to replace aging infrastructure does not change but the SPP is specifically designed for those projects that reduce outage times and restoration costs. DEF's estimate for reduction in restoration costs by $90,000 to $120,000 annually is insignificant compared to the program costs. While I may disagree with DEF's assessment of reduction in restoration costs, since the program is actually about replacing old equipment, the benefit to cost ratio for this program (using the company's proposed savings) over a ten-year period in its best light is less than 1%.[64]

Q. DOES THIS COMPLETE YOUR PREFILED TESTIMONY?

A. Yes, it does.

[63] *See* Exhibit KJM-2.
[64] 10 years of benefit at $90,000 per year divided by total program costs of $133 million.

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AREAS OF EXPERTISE

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DESIGN

Mr. Mara has over 30 years of experience as a distribution engineer. He worked six years at Savannah Electric as a Distribution Engineer and ten years with Southern Engineering Company as a Project Manager. At Savannah Electric, Mr. Mara gained invaluable field experience in the operation, maintenance, and design of transmission and distribution systems. While at Southern Engineering, Mr. Mara performed planning studies, general consulting, underground distribution design, territorial assistance, and training services. Presently, Mr. Mara is a Vice President at GDS Associates, Inc. and serves as the Principal Engineer for GDS Associates' engineering services company known as its trade name Hi-Line Engineering.

Overhead Distribution System Design

Mr. Mara is in responsible charge of the design of distribution lines for many different utilities located in a variety of different terrains and loading conditions. Mr. Mara is in responsible charge of the design of over 100 miles of distribution line conversions, upgrades, and line reinsulation each year. Many of these projects include acquisition of right-of-way, obtaining easements, and obtaining permits from various local, state and federal agencies. In addition, Mr. Mara performs inspections at various stages of completion of line construction projects to verify compliance of construction and materials with design specifications and applicable codes and standards.

Underground Distribution System Design

Mr. Mara has developed underground specifications for utilities and was an active participant on the Insulated Conductor Committee for IEEE. He has designed underground service to subdivisions, malls, commercial, and industrial areas in various terrains. These designs include concrete-encased ductlines, direct-burial, bridge attachments, long-bores, submarine, and tunneling projects. He has developed overcurrent and overvoltage protection schemes for underground systems for a variety of clients with different operating parameters.

PLANNING

Mr. Mara has prepared numerous planning studies for electric cooperatives and municipal systems in various parts of the country. The following is a representative list of specific projects:

- Little River Electric Cooperative, SC
  - Long Range Plan
  - Four Construction Work Plans
- Maxwell AFB, AL - Long Range Plan
- Fall River Electric, ID – Long Range Plan
- Chugach Electric, AK - Long Range Plan
- Newberry Electric Cooperative, SC - Construction Work Plan, Long Range Plan
- Lackland AFB, TX - Long Range Plan
- Rio Grande ECI, TX - Construction Work Plan, Long Range Plan
- Northern Virginia Electric Cooperative, VA - Construction Work Plan
- BARC Electric Cooperative - Construction Work Plan
- Dixie Electric Cooperative - Construction Work Plan
- Joe Wheeler Electric Cooperative - Construction Work Plan
- Cullman Electric Cooperative - Long Range Plan, Construction Work Plan

TRAINING SEMINARS

Mr. Mara has developed engineering training courses on the general subject of distribution power line design. These seminars have become extremely popular with more than 25 seminars being presented annually and with more than 4,000 people having attended seminars presented by Mr. Mara. A 3-week certification program is offered by Hi-Line Engineering in eleven states. The following is a list of the training material developed and/or presented:

- Application and Use of the National Electric Safety Code
- How to Design Service to Large Underground Subdivisions
- Cost-Effective Methods for Reducing Losses/Engineering Economics
- Underground System Design
- Joint-Use Contracts – Anatomy of Joint-Use Contract
- Overhead Structure Design
- Easement Acquisition
- Transformer Sizing and Voltage Drop

Construction Specifications for Electric Utilities

Mr. Mara has developed overhead construction specifications including overhead and underground systems for several different utilities. The design included overcurrent protection for padmounted and pole mounted transformers. The following is a representative list of past and present clients:

- Cullman EMC, Alabama
- Blue Ridge EMC, South Carolina
- Buckeye Rural Electric Cooperative, Ohio
- Three Notch EMC, Georgia
- Little River ECI, South Carolina
- Lackland Air Force Base
- Maxwell Air Force Base

System Privatization/Evaluation

- Central Electric Power Cooperative, Columbia, SC
  - 2017 Independent Certification of Transmission Asset Valuation, Silver Bluff to N. Augusts 115kV
  - 2015 Independent Certification of Transmission Asset Valuation, Wadmalaw 115kV
- Choctawhatchee Electric Cooperative, DeFuniak Springs, FL
  - Inventory and valuation of electrical system assets at Eglin AFB prior to 40-year lease to private-sector entity.

Publications

- Co-author of the NRECA "Simplified Overhead Distribution Staking Manual" including editions 2, 3 and 4.
- Author of "Field Staking Information for Overhead Distribution Lines"
- Author of four chapters of "TVPPA Transmission and Distribution Standards and Specifications"

Testimonies & Depositions

Mr. Mara has testified as an expert at trial or by deposition in the following actions.

- Deposition related to condemnation of property
  Newberry ECI v. Fretwell, 2005
  State of South Carolina

- Testimony in Arbitration regarding territory dispute
  Newberry ECI v. City of Newberry, 2003
  State of South Carolina
  Civil Action No. 2003-CP-36-0277

- Expert Report and Deposition, 2005
  United States of America v. Southern California Edison Company
  Case No CIV F-o1-5167 OWW DLB

- Expert Report and Deposition, 2005
  Contesting a transmission condemnation
  Moore v. South Carolina Electric and Gas Company
  United States District Court of South Carolina
  Case No. 1:05-1509-MBS

- Affidavit October 2007
  FERC Docket No. ER04-1421 and ER04-1422
  Intervene in Open Access Transmission Tariff filed by Dominion Virginia Power

- Affidavit February 26, 2008
  FERC Docket No. ER08-573-000 and ER08-574-000
  Service Agreement between Dominion Virginia Power and WM Renewable Energy, LLC

- Direct Filed Testimony date December 15, 2006
  Before the Public Utility Commission of Texas
  SOAH Docket No 473-06-2536
  PUC Docket No. 32766
- Expert Report and Direct Testimony April 2008
  United States Tax Court
  Docket 25132-06
  Entergy Corporation v. Commissioner Internal Revenue
- Direct Testimony September 17, 2009
  Public Service Commission of the District of Columbia
  Formal Case 1076
  Reliability Issues
- Filed Testimony regarding the prudency of hurricane restoration costs on behalf of the City of Houston, TX, 2009
  Cozen O'Connor P.C.
  TX PUC Docket No. 32093 – Hurricane Restoration Costs
- Technical Assistance and Filed Comments regarding line losses and distributive generation interconnection issues, 2011
  Office of the Ohio Consumer's Counsel
  OCC Contract 1107, OBM PO# 938 for Energy Efficiency T & D
- Technical Assistance, Filed Comments, and Recommendations evaluating Pepco's response to Commission Order 15941 concerning worst reliable feeders in the District of Columbia.
  2011, 2012 Office of the People's Counsel of the District of Columbia
  Formal Case No. 766
- Technical Assistance, Filed Comments, and Recommendations on proposed rulemaking by the District of Columbia PSC amending the Electric Quality of Service Standards (EQSS), 2011.
  Office of the People's Counsel of the District of Columbia
  Formal Case No. 766
- Yearly Technical Review, Filed Comments, and Recommendations evaluating Pepco's Annual Consolidated Report for 2011 through 2021.
  Office of the People's Counsel of the District of Columbia
  Formal Case Nos. 766; 766-ACR; PEPACR(YEAR)
- Technical Evaluation, Filed Comments, and Recommendations evaluating Pepco's response to a major service outage occurring May 31, 2011. (2011)
  Office of the People's Counsel of the District of Columbia
  Formal Case Nos. 766 and 1062
- Technical Assistance, Filed Comments, and Recommendations evaluating Pepco's response to Commission Order 164261 concerning worst reliable neighborhoods in the District of Columbia, 2011.
  Office of the People's Counsel of the District of Columbia
  Formal Case No. 766
- Technical Review, Filed Comments, and Recommendations on Pepco's Incident Response Plan (IRP) and Crisis Management Plan (CMP), 2011.
  Office of the People's Counsel of the District of Columbia
  Formal Case No. 766

- Technical Assistance, Filed Comments, and Recommendations assessing Pepco's Vegetation Management Program and trim cycle in response to Oder 16830, 2012.
  Office of the People's Counsel of the District of Columbia
  Formal Case No. 766
- Technical Review, Filed Comments, and Recommendations on Pepco's Secondary Splice Pilot Program in response to Order 16426, 2012.
  Office of the People's Counsel of the District of Columbia
  Formal Case No. 766 and 991
- Technical Review, Filed Comments, and Recommendations on Pepco's Major Storm Outage Plan (MSO), 2012 - active.
  Office of the People's Counsel of the District of Columbia
  Formal Case No. 766
- Technical Assistance and Direct Filed Testimony for fully litigated rate case, 2011-2012.
  Office of the People's Counsel of the District of Columbia
  Formal Case No. 1087 – Pepco 2011 Rate Case. Hearing transcript date: February 12, 2012.
- Evaluation of and Filed Comments on Pepco's Storm Response, 2012.
  Office of the People's Counsel of the District of Columbia
  Storm Dockets SO-02, 03, and 04-E-2012
- Technical Assistance and Direct Filed Testimony for fully litigated rate case, 2013 - 2014.
  Office of the People's Counsel of the District of Columbia
  Formal Case No. 1103 – Pepco 2013 Rate Case. Hearing transcript date: November 6, 2013.
- Evaluation of and Filed Comments on Prudency of 2011 and 2012 Storm Costs, 2013 – 2014.
  State of New Jersey Division of Rate Counsel
  BPU Docket No. AX13030196 and EO13070611
- Technical Assistance and Direct Filed Testimony for DTE Acquisition of Detroit Public Lighting Department, 2013 – 2014.
  Office of the State of Michigan Attorney General
  Docket U-17437
- Evaluation of and Filed Comments on the Siemens Management Audit of Pepco System Reliability and the Liberty Management Audit, 2014.
  Office of the People's Counsel of the District of Columbia
  Formal Case No. 1076
- Expert witness for personal injury case, District of Columbia
  Koontz, McKenney, Johnson, DePaolis & Lightfoot LLP
  Ghafoorian v Pepco 2013 - 2016
  Plaintive expert assistance regarding electric utility design. operation of distribution systems and overcurrent protection systems.
- Technical Assistance and Direct Filed Testimony in the Matter of the Application for approval of the Triennial Underground Infrastructure Improvement Projects Plan, 2014 – 2017.
  Office of the People's Counsel of the District of Columbia
  Formal Case No. 1116
- Technical Assistance and Direct Filed Testimony in the Matter of the Merger of Exelon Corporation, Pepco Holdings, Inc., Potomac Electric Power Company, Exelon Energy Delivery Company, LLC and New Special Purpose Entity, LLC, 2014 – 2016.
  Office of the People's Counsel of the District of Columbia
  Formal Case No. 1119. Hearing transcript date: April 21, 2015.

- Technical Assistance to Inform and advise the OPC in the matter of the investigation into modernizing the energy delivery system for increased sustainability. 2015 - active
  Office of the People's Counsel of the District of Columbia
  Formal Case No 1130.
- Technical Assistance and Direct Filed Testimony in the Matter of the Merger of Exelon Corporation and Pepco Holdings, Inc., 2014 – 2016.
  State of Maryland and the Maryland Energy Administration
  Case No. 9361.
- Technical Assistance and Direct Filed Testimony for fully litigated rate case, 2015 – 2016.
  State of Oklahoma Office of the Attorney General
  Cause No. PUD 201500273 - OG&E 2016 Rate Case. Hearing transcript date: May 17, 2016.
- Technical Assistance and Filed Comments on Notice of Inquiry, The Commission's Investigation into Electricity Quality of Service Standards and Reliability Performance, 2016 - 2018.
  Office of the People's Counsel of the District of Columbia
  Formal Case No. 1076; RM36-2016-01-E.
- Technical Assistance and Direct Filed Testimony for fully litigated rate case, 2016 - 2017.
  Office of the People's Counsel of the District of Columbia
  Formal Case No. 1139 – Pepco 2016 Rate Case. Hearing transcript date: March 21, 2017.
- Technical Assistance in the Matter of the Application for approval of the Biennial Underground Infrastructure Improvement Projects Plan, 2017.- active
  Office of the People's Counsel of the District of Columbia
  Formal Case No. 1145
- Technical Assistance to Inform and advise the OPC Regarding Pepco's Capital Grid Project, 2017 - active.
  Office of the People's Counsel of the District of Columbia
  Formal Case No. 1144. Confidential Comments and Confidential Affidavit filed November 29, 2017.
- Expert witness for personal injury case Mecklenburg County, NC
  Tin, Fulton, Walker & Owen, PLLC
  Norton v Duke, Witness testimony December 1, 2017
- Technical assistance and pre-filed Direct Testimony on behalf of the Joint Municipal Intervenors in a rate case before the Indiana Utility Regulatory Commission.
  Cause No. 44967. Testimony filed November 7, 2017.
- Prefiled Direct Testimony and Prefiled Surrebuttal Testimony on behalf of the Vermont Department of Public Service in a case before the State of Vermont Public Utility Commission, Tariff Filing of Green Mountain Power Corp.
  Case No. 18-0974-TF. Direct Testimony Filed August 10, 2018. Surrebuttal Testimony Filed October 8, 2018.
- Technical assistance and pre-filed Direct Testimony on behalf of McCord Development, Inc. and Generation Park Management District against CenterPoint Energy Houston Electric, LLC in a case before the State Office of Administrative Hearings of Texas.
  TX PUC Docket No. 48583. Direct Testimony filed April 5, 2019.

- Technical Assistance, Direct Filed Testimony, Rebuttal Testimony, Surrebuttal Testimony, and Supplemental Testimony for fully litigated rate case, 2019 – active.
  Office of the People's Counsel of the District of Columbia
  Formal Case No. 1156 – Pepco 2019 Rate Case. Direct Testimony Filed March 6, 2020. Rebuttal Testimony Filed April 8, 2020. Surrebuttal Testimony Filed June 1, 2020. Supplemental Testimony filed July 27, 2020.
- Technical assistance and pre-filed Direct Testimony on behalf of The State of Florida Public Counsel for Review of 2020-2029 Storm Protection Plan pursuant to Rule 25-6.030, F.A.C.
  Docket No. 20200071-EI.
  Gulf Power SPP. Direct Testimony filed May 26, 2020.
  Florida Power& Light Company SPP. Direct Testimony filed May 28, 2020.
- Prefiled Direct Testimony on behalf of the Vermont Department of Public Service in a case before the State of Vermont Public Utility Commission, Petition of Green Mountain Power for approval of its climate Plan pursuant to the Multi-Year Regulation Plan.
  Case No. 20-0276-PET. Direct Testimony Filed May 29, 2020.
- Technical assistance and Filed Comments on behalf of East Texas Electric Cooperative on a Proposal for Publication by the Public Utility Commission of Texas on Project 51841 Review of 16 TAC § 25.53 Relating to Electric Service Emergency Operations Plans.
  Project 51841. Comments filed January 4, 2022.
- Technical assistance, filed affidavit and direct testimony on behalf of Bloomfield, NM in an action concerning Bloomfield's exercise of its right to acquire from Farmington the electric utility system serving Bloomfield.
  Bloomfield v Farmington, NM. State of New Mexico, County of San Juan, Eleventh Judicial District Court Action No. D-1116-CV-1959-07581.
- Technical assistance and pre-filed Direct Testimony on behalf of Sawnee EMC in a territorial dispute with Electrify America.

2023-2032

		2023		2024		2025		20
		Total	Total	Total	Total	Total	Total	Total
Programs	**Sub-Programs**	**Capital $'s**	**O&M $'s**	**Capital $'s**	**O&M $'s**	**Capital $'s**	**O&M $'s**	**Capital $'s**
DISTRIBUTION								
Feeder Hardening	Feeder Hardening	$142,706,530	$2,711,705	$126,786,600	$2,356,065	$150,749,250	$2,801,361	$206,023,975
	Pole Replacement	$16,486,848	$250,416	$16,478,550	$250,800	$16,481,570	$251,160	$16,484,385
	Inspection	$0	$1,120,000	$0	$1,148,000	$0	$1,176,700	$0
		159,193,378	**4,082,121**	**143,265,150**	**3,754,865**	**167,230,820**	**4,229,221**	**222,508,360**
Lateral Hardening	UG	$118,658,391	$1,429,866	$119,369,848	$1,492,156	$136,672,095	$1,708,350	$185,451,017
	OH	$41,652,599	$754,463	$74,801,605	$1,383,830	$89,532,555	$1,656,352	$89,742,783
	Pole Replacement	$42,386,400	$643,800	$42,384,828	$645,088	$42,381,180	$645,840	$42,380,924
	Inspection	$0	$2,880,000	$0	$2,952,000	$0	$3,025,800	$0
		202,697,390	**5,708,129**	**236,556,281**	**6,473,074**	**268,585,830**	**7,036,342**	**317,574,724**
Self Optimizing Grid	Automation	$57,130,194	$1,714,269	$84,500,000	$2,535,148	$84,500,000	$2,535,500	$0
	C&C	$17,869,806	$625,446	$48,000,000	$1,680,006	$48,000,000	$1,679,988	$0
		$75,000,000	**$2,339,715**	**$132,500,000**	**$4,215,154**	**$132,500,000**	**$4,215,488**	**$0**
UG Flood Mitigation		**$1,000,000**	**$0**	**$1,500,000**	**$0**	**$1,500,000**	**$0**	**$1,500,000**
Wood Pole Inspection (O&M) / Replacement	Pole Replacement	$0	$0	$0	$0	$0	$0	$0
	Inspection	$0	$0	$0	$0	$0	$0	$0
		0	**0**	**0**	**0**	**0**	**0**	**0**
	Distribution - SUB TOTAL	**437,890,768**	**12,129,965**	**513,821,431**	**14,443,092**	**569,816,650**	**15,481,051**	**541,583,084**
TRANSMISSION								
Structure Hardening	Wood Pole Program	$119,177,289	$2,565,744	$119,194,566	$2,549,728	$119,210,798	$2,532,992	$119,150,519
	Structure Inspections (O&M)	$0	$500,000	$0	$500,000	$0	$500,000	$0
	GOAB Automation	$5,000,000	$22,608	$7,500,000	$33,914	$7,500,000	$33,923	$7,500,000
	Tower Replacements	$5,000,000	$57,423	$10,000,000	$111,500	$20,000,000	$222,941	$20,000,000
	Tower Drone Inspections (O&M)	$0	$105,000	$0	$105,000	$0	$105,000	$0
	Tower Cathodic Protection	$2,500,000	$55,468	$2,500,000	$55,629	$2,500,000	$55,490	$2,500,000
	OH Ground Wires	$7,500,000	$0	$11,000,000	$0	$15,000,000	$0	$15,000,000
		139,177,289	**3,306,243**	**150,194,566**	**3,355,772**	**164,210,798**	**3,450,346**	**164,150,519**
Substation Flood Mitigation		$3,800,000	$0	$3,800,000	$0	$3,800,000	$0	$3,800,000
Loop Radially Fed Substations		$0	$0	$0	$0	$10,300,000	$0	$10,300,000
Substation Hardening	Breaker Replacements & Electromechanical Relays	$9,500,000	$0	$11,500,000	$0	$14,000,000	$0	$14,000,000
	Transmission - SUB TOTAL	**152,477,289**	**3,306,243**	**165,494,566**	**3,355,772**	**192,310,798**	**3,450,346**	**192,250,519**
VEG MGMT								
VM - Distribution		$1,981,185	$45,129,849	$2,040,620	$46,452,008	$2,101,839	$47,805,621	$2,164,894
VM - Transmission		$10,312,889	$11,528,007	$12,052,127	$12,842,530	$10,940,884	$12,218,273	$12,784,800
	Vegetation Management - SUB TOTAL	**$12,294,074**	**$56,657,856**	**$14,092,747**	**$59,294,538**	**$13,042,723**	**$60,023,894**	**$14,949,694**
	TOTAL	**$602,662,131**	**$72,094,065**	**$693,408,744**	**$77,093,403**	**$775,170,171**	**$78,955,292**	**$748,783,297**

2023-2032

		26	2027		2028		2029	
		Total	Total	Total	Total	Total	Total	Total
Programs	**Sub-Programs**	**O&M $'s**	**Capital $'s**	**O&M $'s**	**Capital $'s**	**O&M $'s**	**Capital $'s**	**O&M $'s**
DISTRIBUTION								
Feeder Hardening	Feeder Hardening	$3,828,527	$206,023,975	$3,828,527	$206,023,975	$3,828,527	$206,023,975	$3,828,527
	Pole Replacement	$251,203	$16,484,385	$251,203	$16,484,385	$251,203	$16,484,385	$251,203
	Inspection	$1,206,118	$0	$1,206,118	$0	$1,206,118	$0	$1,206,118
		5,285,847	**222,508,360**	**5,285,847**	**222,508,360**	**5,285,847**	**222,508,360**	**5,285,847**
Lateral Hardening	UG	$2,318,068	$185,451,017	$2,318,068	$185,451,017	$2,318,068	$185,451,017	$2,318,068
	OH	$1,660,241	$89,742,783	$1,660,241	$89,742,783	$1,660,241	$89,742,783	$1,660,241
	Pole Replacement	$645,836	$42,380,924	$645,836	$42,380,924	$645,836	$42,380,924	$645,836
	Inspection	$3,101,445	$0	$3,101,445	$0	$3,101,445	$0	$3,101,445
		7,725,591	**317,574,724**	**7,725,591**	**317,574,724**	**7,725,591**	**317,574,724**	**7,725,591**
Self Optimizing Grid	Automation	$0	$0	$0	$0	$0	$0	$0
	C&C	$0	$0	$0	$0	$0	$0	$0
		$0	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
UG Flood Mitigation		**$0**	**$1,500,000**	**$0**	**$1,500,000**	**$0**	**$1,500,000**	**$0**
Wood Pole Inspection (O&M) / Replacement	Pole Replacement	$0	$0	$0	$0	$0	$0	$0
	Inspection	$0	$0	$0	$0	$0	$0	$0
		0	**0**	**0**	**0**	**0**	**0**	**0**
	Distribution - SUB TOTAL	**13,011,438**	**541,583,084**	**13,011,438**	**541,583,084**	**13,011,438**	**541,583,084**	**13,011,438**
TRANSMISSION								
Structure Hardening	Wood Pole Program	$2,521,089	$119,150,519	$2,521,089	$119,150,519	$2,521,089	$119,150,519	$2,521,089
	Structure Inspections (O&M)	$500,000	$0	$500,000	$0	$500,000	$0	$500,000
	GOAB Automation	$33,923	$7,500,000	$33,923	$7,500,000	$33,923	$7,500,000	$33,923
	Tower Replacements	$222,941	$20,000,000	$222,941	$20,000,000	$222,941	$20,000,000	$222,941
	Tower Drone Inspections (O&M)	$105,000	$0	$105,000	$0	$105,000	$0	$105,000
	Tower Cathodic Protection	$55,490	$2,500,000	$55,490	$2,500,000	$55,490	$2,500,000	$55,490
	OH Ground Wires	$0	$15,000,000	$0	$15,000,000	$0	$15,000,000	$0
		3,438,443	**164,150,519**	**3,438,443**	**164,150,519**	**3,438,443**	**164,150,519**	**3,438,443**
Substation Flood Mitigation		$0	$3,800,000	$0	$3,800,000	$0	$3,800,000	$0
Loop Radially Fed Substations		$0	$10,300,000	$0	$10,300,000	$0	$10,300,000	$0
Substation Hardening	Breaker Replacements & Electromechanical Relays	$0	$14,000,000	$0	$14,000,000	$0	$14,000,000	$0
	Transmission - SUB TOTAL	**3,438,443**	**192,250,519**	**3,438,443**	**192,250,519**	**3,438,443**	**192,250,519**	**3,438,443**
VEG MGMT								
VM - Distribution		$49,399,115	$2,229,841	$50,871,648	$2,296,736	$52,388,645	$2,365,638	$53,591,462
VM - Transmission		$12,250,800	$11,606,400	$11,663,900	$13,546,000	$12,984,500	$12,312,400	$12,371,900
	Vegetation Management - SUB TOTAL	**$61,649,915**	**$13,836,241**	**$62,535,548**	**$15,842,736**	**$65,373,145**	**$14,678,038**	**$65,963,362**
	TOTAL	**$78,099,796**	**$747,669,844**	**$78,985,429**	**$749,676,339**	**$81,823,026**	**$748,511,641**	**$82,413,243**

2023-2032

		2030		2031		2032		
		Total	Total	Total	Total	Total	Total	On-Going
Programs	**Sub-Programs**	**Capital $'s**	**O&M $'s**	**Capital $'s**	**O&M $'s**	**Capital $'s**	**O&M $'s**	**Capital $'s**
DISTRIBUTION								
Feeder Hardening	Feeder Hardening	$206,023,975	$3,828,527	$206,023,975	$3,828,527	$206,023,975	$3,828,527	$1,862,410,205
	Pole Replacement	$16,484,385	$251,203	$16,484,385	$251,203	$16,484,385	$251,203	$164,837,664
	Inspection	$0	$1,206,118	$0	$1,206,118	$0	$1,206,118	$0
		222,508,360	**5,285,847**	**222,508,360**	**5,285,847**	**222,508,360**	**5,285,847**	**2,027,247,869**
Lateral Hardening	UG	$185,451,017	$2,318,068	$185,451,017	$2,318,068	$185,451,017	$2,318,068	$1,672,857,450
	OH	$89,742,783	$1,660,241	$89,742,783	$1,660,241	$89,742,783	$1,660,241	$834,186,243
	Pole Replacement	$42,380,924	$645,836	$42,380,924	$645,836	$42,380,924	$645,836	$423,818,877
	Inspection	$0	$3,101,445	$0	$3,101,445	$0	$3,101,445	$0
		317,574,724	**7,725,591**	**317,574,724**	**7,725,591**	**317,574,724**	**7,725,591**	**2,930,862,569**
Self Optimizing Grid	Automation	$0	$0	$0	$0	$0	$0	$226,130,194
	C&C	$0	$0	$0	$0	$0	$0	$113,869,806
		$0	**$0**	**$0**	**$0**	**$0**	**$0**	**$340,000,000**
UG Flood Mitigation		**$1,500,000**	**$0**	**$1,500,000**	**$0**	**$1,500,000**	**$0**	**$14,500,000**
Wood Pole Inspection (O&M) / Replacement	Pole Replacement							$0
	Inspection							$0
		0	**0**	**0**	**0**	**0**	**0**	**0**
	Distribution - SUB TOTAL	**541,583,084**	**13,011,438**	**541,583,084**	**13,011,438**	**541,583,084**	**13,011,438**	**5,312,610,438**
TRANSMISSION								
Structure Hardening	Wood Pole Program	$119,150,519	$2,521,089	$119,150,519	$2,521,089	$119,150,519	$2,521,089	$1,191,636,286
	Structure Inspections (O&M)	$0	$500,000	$0	$500,000	$0	$500,000	$0
	GOAB Automation	$7,500,000	$33,923	$7,500,000	$33,923	$7,500,000	$33,923	$72,500,000
	Tower Replacements	$20,000,000	$222,941	$20,000,000	$222,941	$20,000,000	$222,941	$175,000,000
	Tower Drone Inspections (O&M)	$0	$105,000	$0	$105,000	$0	$105,000	$0
	Tower Cathodic Protection	$2,500,000	$55,490	$2,500,000	$55,490	$2,500,000	$55,490	$25,000,000
	OH Ground Wires	$15,000,000	$0	$15,000,000	$0	$15,000,000	$0	$138,500,000
		164,150,519	**3,438,443**	**164,150,519**	**3,438,443**	**164,150,519**	**3,438,443**	**1,602,636,286**
Substation Flood Mitigation		$3,800,000	$0	$3,800,000	$0	$3,800,000	$0	$38,000,000
Loop Radially Fed Substations		$10,300,000	$0	$10,300,000	$0	$10,300,000	$0	$82,400,000
Substation Hardening	Breaker Replacements & Electromechanical Relays	$14,000,000	$0	$14,000,000	$0	$14,000,000	$0	$133,000,000
	Transmission - SUB TOTAL	**192,250,519**	**3,438,443**	**192,250,519**	**3,438,443**	**192,250,519**	**3,438,443**	**1,856,036,286**
VEG MGMT								
VM - Distribution		$2,436,607	$55,561,500	$2,509,706	$57,220,201	$2,584,997	$58,929,055	$22,712,063
VM - Transmission		$14,352,800	$13,762,300	$13,061,400	$13,122,900	$15,207,800	$14,586,700	$126,177,501
	Vegetation Management - SUB TOTAL	**$16,789,407**	**$69,323,800**	**$15,571,106**	**$70,343,101**	**$17,792,797**	**$73,515,755**	**$148,889,564**
	TOTAL	**$750,623,010**	**$85,773,681**	**$749,404,709**	**$86,792,982**	**$751,626,400**	**$89,965,636**	**$7,317,536,288**

2023-2032

		Total 2020 - 2032					
		Incremental	Total	On-Going	Incremental	Total	
Programs	**Sub-Programs**	**Capital $'s**	**Capital $'s**	**O&M $'s**	**O&M $'s**	**O&M $'s**	
DISTRIBUTION							**Capital Inv**
Feeder Hardening	Feeder Hardening		$1,862,410,205	$34,668,821		$34,668,821	$1,862,410,205
	Pole Replacement		$164,837,664	$2,510,796		$2,510,796	$164,837,664
	Inspection		$0	$11,887,523		$11,887,523	$0
		0	**2,027,247,869**	**49,067,140**	**0**	**49,067,140**	**$2,027,247,869**
Lateral Hardening	UG		$1,672,857,450	$20,856,850		$20,856,850	$1,672,857,450
	OH		$834,186,243	$15,416,335		$15,416,335	$834,186,243
	Pole Replacement		$423,818,877	$6,455,581		$6,455,581	$423,818,877
	Inspection		$0	$30,567,915		$30,567,915	$0
		0	**2,930,862,569**	**73,296,681**	**0**	**73,296,681**	**$2,930,862,569**
Self Optimizing Grid	Automation		$226,130,194	$6,784,916		$6,784,916	$226,130,194
	C&C		$113,869,806	$3,985,440		$3,985,440	$113,869,806
		$0	**$340,000,000**	**$10,770,357**	**$0**	**$10,770,357**	**$340,000,000**
UG Flood Mitigation			**$14,500,000**	**$0**		**$0**	$14,500,000
Wood Pole Inspection (O&M) / Replacement	Pole Replacement		$0	$0		$0	$0
	Inspection	$0	$0	$0		$0	$0
		0	**0**	**0**	**0**	**0**	**$0**
	Distribution - SUB TOTAL	**0**	**5,312,610,438**	**133,134,178**	**0**	**133,134,178**	**$5,312,610,438**
TRANSMISSION							**Capital Inv**
Structure Hardening	Wood Pole Program		$1,191,636,286	$25,296,089		$25,296,089	$1,191,636,286
	Structure Inspections (O&M)		$0	$5,000,000		$5,000,000	$0
	GOAB Automation		$72,500,000	$327,909		$327,909	$72,500,000
	Tower Replacements		$175,000,000	$1,952,449		$1,952,449	$175,000,000
	Tower Drone Inspections (O&M)		$0	$1,050,000		$1,050,000	$0
	Tower Cathodic Protection		$25,000,000	$555,016		$555,016	$25,000,000
	OH Ground Wires		$138,500,000	$0		$0	$138,500,000
			1,602,636,286	**34,181,462**	**0**	**34,181,462**	**1,602,636,286**
Substation Flood Mitigation			$38,000,000	$0	$0	$0	$38,000,000
Loop Radially Fed Substations			$82,400,000	$0	$0	$0	$82,400,000
Substation Hardening	Breaker Replacements & Electromechanical Relays		$133,000,000	$0	$0	$0	$133,000,000
	Transmission - SUB TOTAL		**1,856,036,286**	**34,181,462**	**0**	**34,181,462**	**1,856,036,286**
VEG MGMT							
VM - Distribution		$0	$22,712,063	$517,349,104		$517,349,104	$22,712,063
VM - Transmission		$0	$126,177,501	$127,331,811		$127,331,811	$126,177,501
	Vegetation Management - SUB TOTAL	**$0**	**$148,889,564**	**$644,680,915**	**$0**	**$644,680,915**	**$148,889,564**
	TOTAL	**$0**	**$7,317,536,288**	**$811,996,554**	**$0**	**$811,996,554**	**$7,317,536,288**

2023-2032

Programs	Sub-Programs	% Inv	FERC	Dep Rate	Weighted Avg
DISTRIBUTION					
Feeder Hardening	Feeder Hardening	92%	364 POLES AND FIXTURES	4.2%	3.9%
	Pole Replacement	8%	364 POLES AND FIXTURES	4.2%	0.4%
	Inspection	0%		0.0%	0.0%
					4.2%
Lateral Hardening	UG	57%	367 UNDERGROUND CONDUCTOR	3.0%	1.7%
	OH	28%	364 POLES AND FIXTURES	4.2%	1.2%
	Pole Replacement	14%	364 POLES AND FIXTURES	4.2%	0.6%
	Inspection	0%			0.0%
					3.5%
Self Optimizing Grid	Automation	67%	365 OVERHEAD CONDUCTOR	2.7%	1.7%
	C&C	33%	365 OVERHEAD CONDUCTOR	2.7%	1.0%
					2.7%
UG Flood Mitigation		100%	367 UNDERGROUND CONDUCTOR	3.0%	3.0%
Wood Pole Inspection (O&M) / Replacement	Pole Replacement	100%	364 POLES AND FIXTURES	4.2%	4.2%
	Inspection	0%			0.0%
					4.2%
	Distribution - SUB TOTAL	**100%**			
TRANSMISSION		**% Inv**	**FERC**	**Dep Rate**	**Weighted Avg**
Structure Hardening	Wood Pole Program	74%	355 POLES AND FIXTURES	3.3%	2.50%
	Structure Inspections (O&M)	0%			0.00%
	GOAB Automation	5%	356 OVERHEAD CONDUCTOR	1.9%	0.08%
	Tower Replacements	11%	354 TOWERS AND FIXTURES	1.3%	0.13%
	Tower Drone Inspections (O&M)	0%			0.00%
	Tower Cathodic Protection	2%	356 OVERHEAD CONDUCTOR	1.9%	0.03%
	OH Ground Wires	9%	356 OVERHEAD CONDUCTOR	1.9%	0.15%
					2.88%
Substation Flood Mitigation		100%	358 UNDERGROUND CONDUCTOR	2.0%	**1.99%**
Loop Radially Fed Substations		100%	356 OVERHEAD CONDUCTOR	1.9%	**1.88%**
Substation Hardening	Breaker Replacements & Electromechanical Relays	100%	356 OVERHEAD CONDUCTOR	1.9%	**1.88%**
	Transmission - SUB TOTAL	**100%**			
VEG MGMT					
VM - Distribution			365 OVERHEAD CONDUCTOR	2.7%	2.7%
VM - Transmission			356 OVERHEAD CONDUCTOR	1.9%	1.9%
	Vegetation Management - SUB TOTAL				
	TOTAL				

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DUKE ENERGY

Storm Protection Plan

Florida

Program Descriptions

Contents

PROGRAM DESCRIPTIONS

The following sections of this document describe each of the Duke Energy Florida programs that are in the Storm Protection Plan (SPP). This exhibit includes the program vision, description, costs as well as estimated benefits from completion of the program.

Note: Shifts of scope may occur between years to optimize benefits delivery to customers and execution efficiencies.

At the Commission's direction and under its supervision, DEF has engaged in significant storm hardening activities since the 2006 adoption of the Storm Hardening Rule (Rule 25-6.0342, F.A.C., now proposed for repeal due to the adoption of § 366.96, Fla. Stat., and subsequent adoption of Rule 25-6.030, F.A.C.). After the 2016/2017 storm seasons, the Commission initiated its "Review of Florida's Electric Utility Hurricane Preparedness and Restoration Actions 2018"[1] to evaluate the efficacy of the approximately 12 years of hardening efforts. As a result of the analysis performed in that docket, the Commission determined that "Florida's aggressive storm hardening programs are working."[2] This conclusion was borne out by several observations: the length of outages the 2016/2017 storm outages was reduced markedly from the 2004-2005 storm season, hardened overhead distribution facilities performed better than non-hardened facilities, and underground facilities performed much better than overhead facilities.[3]

DEF agrees with the Commission's determination. In recognition of the efficacy of the storm hardening plans implemented since 2006, DEF's Storm Protection Plan ("SPP") carries on the storm hardening work included in the Company's recently approved 2019-2021 Storm Hardening Plan ("SHP"); as such, the programs that are being carried over from the SHP into the SPP are the very programs the Commission has previously acknowledged "are grounded in substantive strengthening and protection of the utility's electric facilities. Programs include tree trimming, pole inspections, hardening of feeders and laterals, and undergrounding."[4] DEF's plan will continue these programs and build upon them, adding incremental investment over the life of the Plan. DEF will also continue researching and investigating additional technologies and programs.

That said, DEF also agrees with the Commission's recognition that "[n]o amount of preparation can eliminate outages in extreme weather events" so while DEF's Plan is designed with an eye toward strengthening the system and reducing outages and outage duration, it must be understood that there is no panacea and individual storms will produce unique challenges.

[1] Docket No. 20170215-EU.
[2] *Id.* at p. 1.
[3] *See id.* at pp. 2-3.
[4] *See id.* at p. 9.

DUKE ENERGY.

Distribution Programs

Florida

Program Summaries

Feeder Hardening Program Description

Vision

Feeder Hardening is a long-term program that will systematically upgrade the feeder backbone to meet the NESC 250C extreme wind load standard. The existing backbone is approximately 6,300 miles on 1,325 feeders.

Description

The Feeder Hardening program will enable the feeder backbone to better withstand extreme weather events. This includes strengthening structures, updating BIL (basic insulation level) to current standards, updating conductor to current standards, relocating difficult to access facilities, replacing oil filled equipment as appropriate, and will incorporate the company's pole inspection and replacement activities.

Structure Strengthening

Structure strengthening includes upgrading existing poles and other facilities as necessary to align with meeting the NESC 250C extreme wind load standard. For example, a stronger pole class reduces the extent of damage incurred on feeder lines during extreme wind events. Other related hardware upgrades will occur simultaneously, such as insulators, crossarms, support brackets, and guys.

BIL

While upgrading feeders to the extreme wind load standard, the company will also upgrade the BIL to further harden the system. Upgrading the BIL involves framing for more space between phases, more wood material between insulator mounting points, application of the larger standard insulator sizes, and moving arresters to the lowest level of the primary space.

Conductor Upgrades

As part of Feeder Hardening, DEF will replace any deteriorated or undersized conductor on the feeder backbone. This conductor is more susceptible to storm damage. It will be replaced with our current standard conductor.

Relocating Difficult to Access Facilities

Where practical, feeder sections that traverse hard to access areas, such as wetlands, will be relocated to truck-accessible routes. These line sections often suffer damage in extreme wind load events and, due to their location, are among the most expensive and longest to restore outages.

Replacing Oil-Filled Equipment

While working to upgrade each feeder, hydraulic (oil-filled) reclosers will be upgraded to electronic reclosers (vacuum interrupters) with communications and remote SCADA control capability, as available. Electronic reclosers enable remote visibility and control. Real-time operational information is remotely available, such as current per phase, voltage per phase, var flow per phase, health condition of the device, on-board battery health, fault information, and interrupter status by phase. This real-time data will help target restoration efforts helping to

reduce outage durations. Additionally, these oil-filled devices can cause negative environmental impacts. Electronic reclosers are vacuum interruption devices and have no internal oil.

Figure 1: SCADA enabled Electronic Recloser

Pole Inspection and Replacement

PER FPSC Order, pole inspection is performed on an 8-year cycle. These inspections determine the extent of pole decay and any associated loss of strength. The information gathered from these inspections is used to determine pole replacements and to effectuate the extension of pole life through treatment and reinforcement.

Cost

It is expected that the 10-year cost will be approximately $1.5B Capital and $73M O&M. This would cover approximately 1,500 miles of feeder hardening and costs of the pole inspection and replacement activities.

	DEF		
Feeder Hardening	**2020**	**2021**	**2022**
Totals	$ -	$ 62,400,005	$ 111,365,448
Feeder Hardening	$ -	$ 62,400,005	$ 93,600,008
Capital	$ -	$ 60,000,000	$ 90,000,000
O&M	$ -	$ 2,400,005	$ 3,600,008
Total Units	0	63	95
Pole Inspection/Replacement*	$ -	$ -	$ 17,765,440
Capital	$ -	$ -	$ 15,629,040
O&M	$ -	$ -	$ 2,136,400
Total Units	0	0	1,680

**Pole Inspection and Replacement details for years 2020 and 2021 are included in Exhibit JWO-1. Beginning in 2022 these activities will be incorporated into the Feeder Hardening Program.*

Cost Benefit Comparison

The Feeder Hardening Program will begin in 2021 and is estimated to take 30 years to complete. Based on today's cost, the program will cost an estimated $6B in Capital and $239M in Project O&M. At completion, approximately 6,300 feeder miles will be hardened.

When the Feeder Hardening Program is complete, DEF estimates it will reduce the cost of extreme weather events on the Distribution system by approximately $22M to $28M annually based on today's costs. This represents a reduction of approximately 11% to 14% when compared to the average of 2016 to 2019 Distribution Major Event Day (MED) costs.

When the Feeder Hardening Program is complete, DEF estimates it will reduce Distribution MED Customer Minutes Interrupted (CMI) by approximately 153 million to 191 million minutes annually. CMI reduction is used as a proxy for reduction in extreme weather event duration for the average customer.

Prioritization Methodology

Work will be prioritized using the following process.

1. Probability of Damage: To prioritize the work in the Florida regions, the Transmission and Distribution systems were modeled, and weather simulations were run to provide probabilistic exposure frequency for all asset locations. The weather modeling uses the FEMA Hazus and Sea, Lake, and Overland Surges from Hurricanes (SLOSH) models, which contain the weather data for storms over the last 200 years. Using the geographical locations of the Florida assets and the historic storm paths embedded in the Hazus model, a spatial correlation of future storm exposure can be derived. To determine probability of damage given that exposure, six years of historical outage data was provided and correlated with the closest weather tower to determine the conditions during historic failures recorded in the outage data. Then, the expected quantities of asset failure for simulated future weather exposure conditions was derived by combining simulated weather patterns with historical asset failure through conditional probability methods.
2. Consequence of Damage: Once the output of probabilistic damage is assessed, the probable impact to customers is considered. This step considers number of customers served by a given asset (e.g., each pole, or segment of conductor on a feeder), observed outage durations, the mix of customers, and critical facilities. This step is performed both for the existing configuration of each feeder and the hardened configuration resulting from the

particular program. The difference between the existing condition and the hardened configuration is the program impact.

3. Distribution subject matter experts then use these outputs to determine the optimum deployment plan considering factors such as current projects in the area, critical customers, operational knowledge, and resource availability.

Lateral Hardening

Vision

Lateral Hardening is a long-term program that will systematically upgrade and harden branch line sections fed by the feeder backbone. There will be two main approaches, undergrounding and overhead hardening. The existing lateral system is approximately 11,800 miles on 1,325 feeders.

Description

The Lateral Hardening program will enable branch lines to better withstand extreme weather events. This will include undergrounding of the laterals most prone to damage during extreme weather events and overhead hardening of those laterals less prone to damage.

Lateral Undergrounding

Lateral segments that are most prone to damage resulting in outages during extreme weather events will be placed underground. Doing so will greatly reduce both damage costs and outage duration for DEF customers. Lateral Undergrounding focuses on branch lines that historically experience the most outage events, contain assets of greater vintage, are susceptible to damage from vegetation, and/or often have facilities that are inaccessible to trucks. These branch lines will be replaced with a modern, updated, and standard underground design of today.

Figure 1: An example of residential customers that would be candidates for Undergrounding due to section of line and service in heavily vegetated areas.

Figure 2: Section of lines that runs through backlot and heavily vegetated areas will be underground.

Lateral Hardening Overhead

The overhead hardening strategy will include structure strengthening, deteriorated conductor replacement, removing open secondary wires, replacing fuses with automated line devices, pole replacement (when needed), line relocation, and/or hazard tree removal.

Figure 3: The teal tap line branches off the main road through an open lot to side streets where it splits again. It serves a few customers with minimal, to no vegetation. The street view is a view of the red line where there are no vegetation concerns.

Structure Strengthening

Structure Strengthening includes upgrading existing poles and other facilities as necessary to align with the NESC 250C extreme wind loading standard. For example, a stronger pole class reduces the extent of damage incurred on lateral lines during extreme wind events. Other related hardware upgrades will occur simultaneously, such as installation of insulators, crossarms, support brackets, and guys.

Conductor Upgrades

As part of Lateral Hardening Overhead, DEF will replace any deteriorated or undersized conductor on the lateral. This conductor is more susceptible to storm damage. It will be replaced with our current standard conductor.

Upgrade Open Wire Secondary

Removing the open secondary wire will mitigate outages during extreme weather conditions. This activity will eliminate an older design standard that is susceptible to wires contacting vegetation and debris. Modern triplex cable will be installed to replace the open wire secondary.

Figure 4: Three examples of open wire secondary that will be addressed

Fusing

DEF will replace current one-time use fuses with automated line devices (ALDs), which are small vacuum reclosers, to improve lateral performance in extreme weather events. ALDs use current fuse holders and do not generally require pole reframing. The reclosing capability inherent in the ALD will reduce outage events for downstream customers. ALDs will also serve as the temporary fault clearing device, thus reducing momentary interruptions for customers upstream on the feeder.

Figure 5: Installed ALD.

Line Relocation

Where practical, lateral line sections that traverse hard to access areas, such as wetlands, will be relocated to truck accessible routes. These line sections often suffer damage in extreme wind load events, and due to their location are among the most expensive to repair and take the longest to restore to service from an outage.

Hazard Tree

During the upgrade process DEF will identify hazard trees in the area surrounding the lateral requiring remediation. A hazard tree is a tree that is dead, structurally unsound, dying, diseased, leaning, or otherwise in a condition that is likely to result in striking electrical lines or other assets. Once identified, hazard trees are assigned to a contractor for remediation. When hazard trees are located in areas where DEF does not have the legal right to mitigate the danger, DEF or its contractor will work with the property owner to gain access and remediate.

Pole Inspection and Replacement

Per FPSC Order, pole inspection is performed on an 8-year cycle. These inspections determine the extent of pole decay and any associated loss of strength. The information gathered from these inspections is used to determine pole replacements and to effectuate the extension of pole life through treatment and reinforcement.

Cost

It is expected that the 10-year cost will be approximately $2.2B Capital and $66M O&M. This would cover approximately 1,500 miles of Lateral Hardening Underground, approximately 1,400 miles of Lateral Hardening Overhead, and costs of the pole inspection and replacement activities.

	DEF		
Lateral Hardening	**2020**	**2021**	**2022**
Totals	$ -	$ -	$ 187,320,107
Lateral Hardening	$ -	$ -	$ 141,637,547
Capital	$ -	$ -	$ 140,000,000
O&M	$ -	$ -	$ 1,637,547
Total Units	0	0	207
Pole Inspection/Replacement*	$ -	$ -	$ 45,682,560
Capital	$ -	$ -	$ 40,188,960
O&M	$ -	$ -	$ 5,493,600
Total Units	0	0	4,320

**Pole Inspection and Replacement details for years 2020 and 2021 are included in Exhibit JWO-1. Beginning in 2022 these activities will be incorporated into the Lateral Hardening Program.*

Cost Benefit Comparison

The Lateral Hardening Program will begin in 2022 and is estimated to take 30 years to complete. Based on today's cost, the program will cost an estimated $7.9B in Capital and $92M in Project O&M. At completion, approximately 11,800 lateral miles will be hardened.

When the Lateral Hardening Program is complete, DEF estimates it will reduce the cost of extreme weather events on the Distribution system by approximately $95M to $119M annually based on today's costs. This represents a reduction of approximately 46% to 58% when compared to the average of 2016 to 2019 Distribution MED costs.

When the Lateral Hardening Program is complete, DEF estimates it will reduce Distribution MED CMI by approximately by 406 million to 508 million minutes annually. CMI reduction is used as a proxy for reduction in extreme weather event duration for the average customer.

Prioritization Methodology

The following steps are used to prioritize the work:

1. Probability of Damage: To prioritize the work in the Florida regions, the Transmission and Distribution systems were modeled, and weather simulations were run to provide probabilistic exposure frequency for all asset locations. The weather modeling uses the FEMA Hazus and SLOSH models, which contain the weather data for storms over the last 200 years. Using the geographical locations of the Florida assets and the historic storm paths embedded in the Hazus model, a spatial correlation of future storm exposure can be derived. To determine probability of damage given that exposure, six years of historical outage data was provided and correlated with the closest weather tower to determine the conditions during historic failures recorded in the outage data. Then, the expected quantities of asset failure for simulated future weather exposure conditions was derived by combining simulated weather patterns with historical asset failure through conditional probability methods.
2. Consequence of Damage: Once the output of probabilistic damage is assessed, the probable impact to customers is considered. This step considers number of customers served by a given asset (e.g. each pole, or segment of conductor on a feeder), observed outage durations, the mix of customers, and critical facilities. This step is performed both for the existing configuration of each feeder, and the hardened configuration resulting from the particular program. The difference between the existing condition and the hardened configuration is the program impact.
3. Distribution subject matter experts then use these outputs to determine the optimum deployment plan considering factors such as current projects in the area, critical customers, operational knowledge, and resource availability.

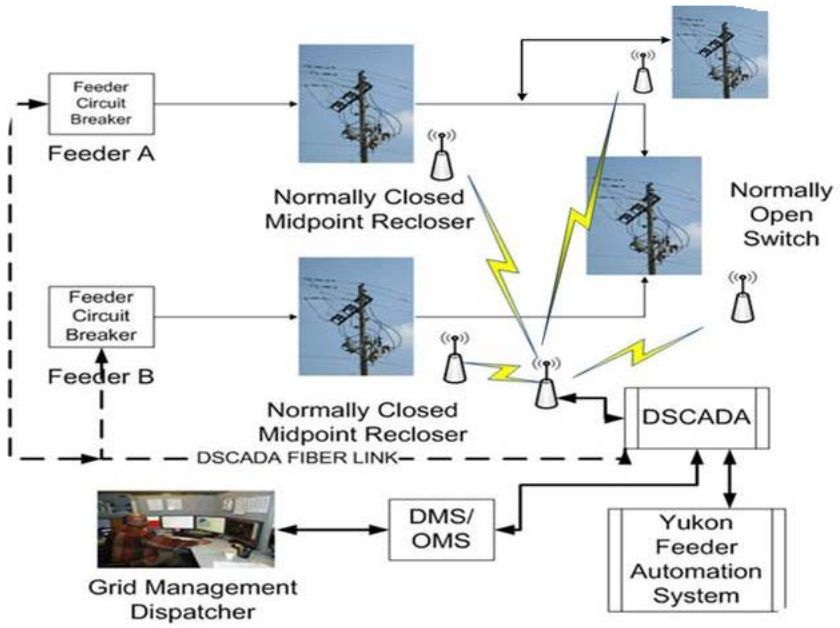
Self-Optimizing Grid – SOG

Vision

The SOG program started as part of DEF's Grid Investment Plan which was partially funded through the 2017 Revised and Restated Settlement Agreement. DEF plans to continue this program through the SPP and at completion in 2027, approximately 80% of the distribution feeders on the DEF system will have the ability to automatically reroute power around damaged line sections. 100% of the distribution feeders will have automated switching capability.

Description

The current grid has limited ability to reroute and rapidly restore power. The SOG program is established to address both of these issues.



The SOG program consists of three (3) major components: capacity, connectivity, and automation and intelligence. The SOG program redesigns key portions of the distribution system and transforms it into a dynamic smart-thinking, self-healing network. The grid will have the ability to automatically reroute power around trouble areas, like a tree on a power line, to quickly restore power to the maximum number of customers and rapidly dispatch line crews directly to the source of the outage. Self-healing technologies can reduce outage impacts by as much as 75 percent on affected feeders.

The **SOG Capacity projects** focus on expanding substation and distribution line capacity to allow for two-way power flow. **SOG Connectivity projects** create tie points between circuits. **SOG Automation projects** provide intelligence and control for the SOG operations; Automation projects enable the grid to dynamically reconfigure around trouble and restore customers not impacted by an outage.

Cost

The SOG program is planned to be complete in 2027. Below are the projected units and costs for 2020-2022:

	DEF		
Self-Optimizing Grid (SOG)	**2020**	**2021**	**2022**
Totals	$ 56,483,391	$ 81,269,879	$ 76,500,000
Automation	$ 35,611,138	$ 56,911,355	$ 45,900,000
Capital	$ 34,860,275	$ 55,795,446	$ 45,000,000
O&M	$ 750,863	$ 1,115,909	$ 900,000
Total ASD's	580	851	686
Connectivity & Capacity	$ 20,872,253	$ 24,358,525	$ 30,600,000
Capital	$ 20,541,619	$ 23,880,906	$ 30,000,000
O&M	$ 330,634	$ 477,618	$ 600,000

Cost Benefit Comparison

Costs from 2020 through 2027 are approximately $550M capital and $11M O&M.

At completion, with more customers automatically restored through automated switching, cost reductions can be achieved through better targeting of restoration efforts and personnel. SOG enables the grid to rapidly reroute power around damaged line sections. Accordingly, the benefit from the completion of this program is a reduction in customers affected by long duration outages as a result of extreme weather events and enhancement of overall reliability via anticipated decrease in CMI.

When the SOG Program is complete, DEF estimates it will reduce Distribution MED CMI by approximately by 227 million to 284 million minutes annually. CMI reduction is used as a proxy for reduction in extreme weather event duration for the average customer.

Prioritization Methodology

The following steps are used to prioritize the work:

1. Probability of Damage: While SOG does not directly reduce damage but rather is intended to reduce the duration of outages, SOG impacts are conservatively assessed after other hardening projects. Since other hardening projects reduce equipment failures and outages, the simulated SOG impacts are evaluated against this new hardened baseline. To prioritize the work in the Florida regions, the Transmission and Distribution systems were modeled, and weather simulations were run to provide probabilistic exposure frequency for all asset locations. The weather modeling uses the FEMA Hazus and SLOSH models, which contain the weather data for storms over the last 200 years. Using the geographical locations of the Florida assets and the historic storm paths embedded in the Hazus model, a spatial correlation of future storm exposure can be derived. To determine probability of damage given that exposure, six years of historical outage data was provided and correlated with the closest weather tower to determine the conditions during historic failures recorded in the outage data. Then, the expected quantities of asset failure for simulated future weather exposure conditions was derived by combining simulated weather patterns with historical asset failure through conditional probability methods.

2. Consequence of Damage: Once the output of probabilistic damage is assessed, the probable impact to customers is considered. This step considers number of customers served by a given asset (e.g., each pole, or segment of conductor on a feeder), observed outage durations, the mix of customers, and critical facilities. For SOG, this step is performed based on the hardened configuration of the feeder after completion of the Feeder Hardening program (see above for a description of the Feeder Hardening program).
3. Consequence of Automation: Because the program benefits are tied to reduction in outage length and customers affected during outages, these values were calculated as a part of the simulation described in steps 1 and 2, with the addition of SOG automation. The outage time reduction varied feeder by feeder, based on number of customers served, historic observed outage durations by asset class on each feeder, the reduction impact of feeder hardening on the feeder, and current level of automation.
4. Distribution subject matter experts then use these outputs to determine the optimum deployment plan considering factors such as current projects in the area, critical customers, operational knowledge, and resource availability.

Underground Flood Mitigation

Vision

The Underground Flood Mitigation program is a targeted program to harden existing underground distribution facilities in locations that are prone to storm surge during extreme weather events. This program will address the areas identified as being at high risk for significant flooding by installing submersible equipment within 20 years.

Description

Underground Flood Mitigation will harden existing underground line and equipment to withstand a storm surge through the use of DEF's current storm surge standards. This involves the installation of specialized stainless-steel equipment and submersible connections. The primary purpose of this hardening activity is to minimize the damage caused by a storm surge to the equipment and thus reduce customer outages and/or expedite restoration after the storm surge has receded.

For selected locations, DEF would raise any pad mount transformer currently in an area that is prone to storm surge onto an elevated pad and change all the connections to waterproof (submersible) connections. Conventional switchgear would be replaced with submersible switchgears that are able to withstand the storm surge.

Cost

It is expected that the 10-year cost will be approximately $11M.

	DEF		
UG Flood Mitigation*	2020	2021	2022
Totals	$ -	$ -	$ 500,000
Capital	$ -	$ -	$ 500,000
O&M	$ -	$ -	$ -

Cost Benefit Comparison

The Underground Flood Mitigation Program is scheduled to start in 2022 and estimated to take 20 years to complete. Based on today's cost, the program will cost an estimated $26M in Capital.

When the Underground Flood Mitigation Program is complete, DEF estimates it will reduce the cost of extreme weather events on the Distribution system by approximately $1M to $1.4M annually based on today's costs. This represents a reduction of approximately 1% when compared to the average of 2016 to 2019 Distribution MED costs.

When the Underground Flood Mitigation Program is complete, DEF estimates it will reduce Distribution MED CMI by approximately 500,000 to 650,000 minutes annually. CMI reduction is used as a proxy for reduction in extreme weather event duration for the average customer.

Prioritization Methodology

Work will be prioritized using the following process.

1. Probability of Damage: To prioritize the work in the Florida regions, the Transmission and Distribution systems were modeled, and weather simulations were run to provide probabilistic exposure frequency for all asset locations. The weather modeling uses the FEMA Hazus and SLOSH models, which contain the weather data for storms over the last 200 years. Using the geographical locations of the Florida assets and the historic storm paths embedded in the Hazus model, a spatial correlation of future storm exposure can be derived. To determine probability of damage given that exposure, six years of historical outage data was provided and correlated with the closest weather tower to determine the conditions during historic failures recorded in the outage data. Then, the expected quantities of asset failure for simulated future weather exposure conditions was derived by combining simulated weather patterns with historical asset failure through conditional probability methods.
2. Consequence of Damage: Once the output of probabilistic damage is assessed, the probable impact to customers is considered. This step considers number of customers served by a given asset (e.g., each pole, or segment of conductor on a feeder), observed outage durations, the mix of customers, and critical facilities. This step is performed both for the existing configuration of each feeder, and the hardened configuration resulting from completion of the program. The difference between the existing condition and the hardened configuration is the program impact.
3. Distribution subject matter experts then use these outputs to determine the optimum deployment plan considering factors such as current projects in the area, critical customers, operational knowledge, and resource availability.

Distribution Vegetation Management

Vision

DEF will continue to utilize a fully Integrated Vegetation Management (IVM) to minimize the impact of vegetation on the distribution assets.

Description

DEF Distribution will continue a fully IVM program focused on trimming feeders and laterals on an average 3 and 5-year cycles respectively. This corresponds to trimming approximately 1,930 miles of feeder backbone and 2,455 miles of laterals annually. The IVM program consists of the following: routine maintenance “trimming”, hazard tree removal, herbicide applications, vine removal, customer requested work, and right-of-way brush “mowing” where applicable. The IVM program incorporates a combination of both cycle-based maintenance and reliability-driven prioritization of work to reduce event possibilities during extreme weather events and enhance overall reliability.

Additionally, a hazard tree patrol is conducted every year on all three-phase circuits. Hazard trees are defined as trees that are dead, dying, structurally unsound, diseased, leaning or otherwise defective. The trees that are located within the right of way are removed prior to hurricane season each year, hazard trees that are located outside the right of way require landowner permission prior to removal. The contact with the landowner is initiated, permission for removal and the removal is also targeted for completion prior to hurricane season. If a feeder circuit is relocated or circuit height changes, an additional hazard tree assessment will be conducted in the line segments that will be impacted.

DEF will optimize the IVM program costs against reliability and storm performance objectives to harden the system for extreme weather events. There are four key objectives for optimization:

- Customer and employee safety;
- Tree-caused outage minimization, with the objective to reduce the number of tree-caused outages, particularly in the “preventable” category;
- Effective cost management; and
- Customer satisfaction.

Cost

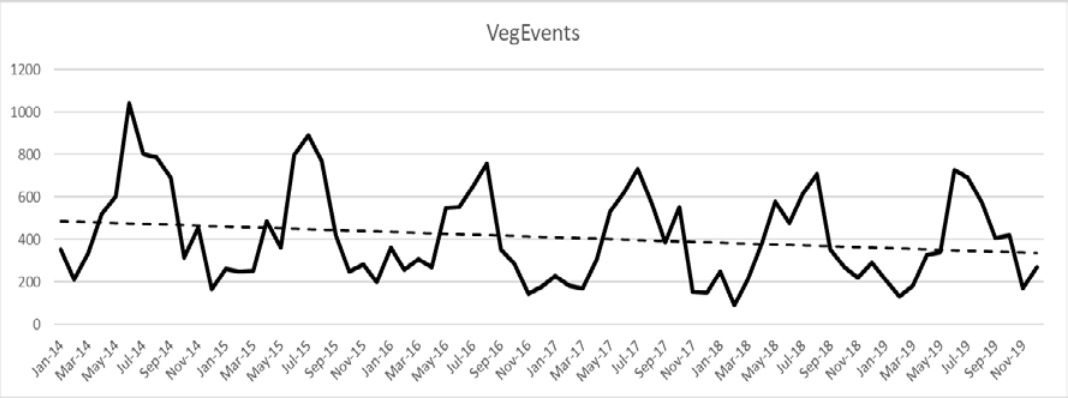
It is expected that the 10-year cost will be approximately $20M Capital and $477M O&M. This would cover the inspection and vegetation remediation activities. The circuit maintenance work performed is predominantly billed under a unit-based contract structure and not differentiated between labor and equipment. The estimated contractor ratio is 95%. The estimated utility personal ratio is 5%.

2020 -2022 Labor / Equipment Breakout		
	Labor	Equipment
Utility Personnel Totals	$ 6,557,823	$ 202,819
Capital	$ 1,132,128	$ 35,014
O&M	$ 5,425,695	$ 167,805
Contract Personnel Totals	$ 97,703,126	$ 32,187,368
Capital	$ 3,092,319	$ 1,030,773
O&M	$ 94,610,807	$ 31,156,595

	DEF		
VM - Distribution*	2020	2021	2022
Totals	$ 46,398,605	$ 44,477,139	$ 45,775,391
Capital	$ 1,499,298	$ 1,867,457	$ 1,923,480
O&M	$ 44,899,307	$ 42,609,682	$ 43,851,911
Approximate Miles	5,209	4,383	4,383

**Costs for 2021 and 2022 are based on an average of 1/3 of feeder mileage and 1/5 of lateral mileage being patrolled and remediated.*

Cost Benefit Comparison



DEF's Distribution IVM program is focused on ensuring the safe and reliable operation of the distribution system by minimizing vegetation-related interruptions and ensuring adequate conductor-to-vegetation clearances, while maintaining compliance with regulatory, environmental and safety requirements/standards. The chart above shows a reduction in vegetation related outage events over the past 5 years and demonstrates the effectiveness of the IVM program. Activities focus on the removal and/or control of incompatible vegetation within and along the right of way to minimize the risk of vegetation-related outages.

Prioritization Methodology

As part of the IVM program, DEF uses a comprehensive circuit prioritization model to minimize tree-caused outages by focusing on the feeders and or laterals that rate high in the model. Prioritization ranking factors are based on past feeder or lateral performance and probable future performance. Examples of the criteria used in prioritization include tree-caused outages in prior years, outages per vegetated mile, and total tree customer minutes of interruption. Utilizing this prioritized process, DEF follows the ANSI 300 standard for pruning and the guide "Pruning Trees Near Electric Utility Lines" by Dr. Alex L. Shigo.

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Transmission Programs

Florida

Program Summaries

Structure Hardening

Vision

The Structure Hardening program focuses on DEF's transmission structures throughout the state. As part of the program, all wood poles on the Florida transmission system will be replaced with non-wood structures within 15 years. In addition, Structure Hardening will upgrade lattice tower structure types that have failed during extreme weather and/or fail inspection.

Description

The Transmission Structure Hardening program addresses existing vulnerabilities on the system. This will enable the transmission system to better withstand extreme weather events. This program includes wood to non-wood upgrades, tower upgrades, adding cathodic protection, automating gang operated air break switches, Overhead Groundwire upgrades, and structure inspections.

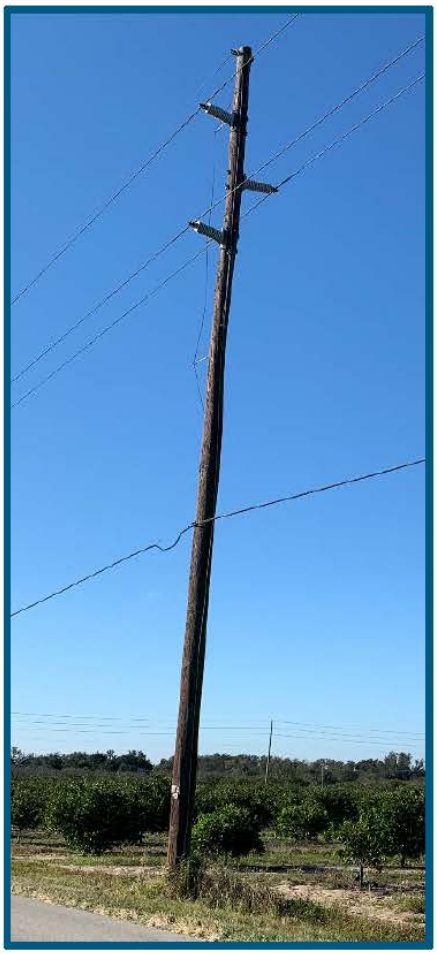

Figure 1: Wood Pole to Non-Wood Upgrade candidate

Wood to Non-Wood Upgrade

This activity will upgrade wood poles to non-wood material such as steel or concrete. Wood pole failure has been the predominate structure damage to the transmission system during extreme weather. This strengthens structures by eliminating damage from woodpeckers and wood rot. The new structures will be more resistant to damage from extreme weather events. Other related hardware upgrades will occur simultaneously, such as insulators, crossarms, switches, and guys. This will upgrade an identified 20,520 wood poles.

Tower Upgrade

Tower Upgrade will prioritize towers based on inspection data and enhanced weather modeling. The upgrade activities will replace tower types that have previously failed during extreme weather events. Over 700 towers have been identified as having this design type.

In addition, the tower upgrade activities will upgrade lattice towers identified by visual ground inspections, aerial drone inspections and data gathered during cathodic protection installations (discussed below). This will improve the ability of the transmission grid to sustain operations during extreme weather events by reducing outages and improving restoration times. Other related hardware upgrades will occur simultaneously such as insulators, cathodic protection, and guys.

Figure 2: Double Circuit Tower

Cathodic Protection

The purpose of the Cathodic Protection (CP) activities will be to mitigate active groundline corrosion on the lattice tower system. This will be done by installing passive CP systems comprised of anodes on each leg of lattice towers. The anodes serve as sacrificial assets that corrode in place of structural steel, preventing loss of structure strength to corrosion. Each CP project will address all towers on a line from beginning point to end point.

The following tangible benefits will be gained related to hardening the lattice system:

- Site Classification - Subsurface investigation and cathodic protection installation on all lattice structures, prioritizing lines based on system criticality, age, and potential storm impact. Galvanization and member thickness measurements will be taken on all legs and diagonals, and structural steel will be classified by corrosion severity. Concrete piers will be classified on concrete health, cracking, and rebar corrosion. This system evaluation will identify any potential weak spots resulting from ground line corrosion on DEF's lattice system.

- Corrosion Mitigation – Each lattice-structure tower leg will have cathodic protection installed on it in order to arrest the corrosion process.

- Corrosion Database – Soil conditions recorded at each tower site will include resistivity, soil pH, redox, and half-cell potentials. These values will be saved into a database which will be used to help classify areas of DEF's system prone to corrosion. This information will be used to aid in condition-based maintenance of system infrastructure.

Gang Operated Air Break (GOAB)

The GOAB line switch automation project is a 20-year initiative that will upgrade 305 switch locations with modern switches enabled with SCADA communication and remote-control capabilities. Automation will add resiliency to the transmission system. Later years will include adding new switch locations to add further resiliency to the transmission system. Transmission line switches are currently manually operated and cannot be remotely monitored or controlled. Switching, a grid operation often used to section off portions of the transmission system in order to perform equipment maintenance or isolate trouble spots to minimize impacts to customers, has historically required a technician to go to the site and manually operate one or more-line switches. The GOAB upgrade increases the number of remote-controlled switches to support faster isolation of trouble spots on the transmission system and more rapid restoration following line faults.

Figure 3: DEF Manually Operated Switch

Overhead Ground Wire (OHGW)

Florida is known for a high concentration of lightning events, which continually stress the existing grid protection. Deteriorated overhead ground wire reduces the protection of the conductor and exposes the line to repeated lightning damage and risk of failure impacting the system. This initiative will also reduce the safety risk due to the required removal of OHGW prior to any restoration work on the system. By targeting deteriorated OHGW on lines with high lightning events, the benefit of this activity will be maximized. An added benefit is upgrading to fiber optic OHGW, facilitating high-speed relaying and enhanced communication and control between stations and centralized control centers.

Structure Inspections and Drone Inspections

The transmission system's inspection activities include all types of structures, line hardware, guying, and anchoring systems. Inspections include:

- Aerial helicopter Transmission Line Inspections
- Wood Pole Line Patrols
- Wood Pole Sound and Bore Line Patrol – 8-year cycle
- Non-wood Structure Line Patrols – 6-year cycle

Further, in 2021 DEF will conduct drone inspections on targeted lattice tower lines. The intent of this additional inspection is to identify otherwise difficult to see structure, hardware, or insulation vulnerabilities through high resolution imagery. DEF is incorporating drone patrols into the inspections because drones have the unique ability to provide a close vantage point with multiple angles on structures that is unattainable through aerial or ground patrols with binoculars.

Cost

DEF estimates the 10-year cost will be approximately $1.3B Capital and $41M O&M, and will entail approximately:

- 12,000 wood to non-wood poles;
- 400 tower replacements;
- CP protection for all towers;
- 100 GOABs;
- 500 miles of OHGW; and
- system inspection cycles, ground and aerial.

	DEF		
Structure Hardening*	2020	2021	2022
Totals	$ -	$ 41,395,564	$ 136,259,137
Capital	$ -	$ 40,000,000	$ 132,250,000
O&M	$ -	$ 1,395,564	$ 4,009,137
Total Units	0	521	1,482

**Pole and tower Inspection and Replacement details for years 2020 and 2021 are included in Exhibit JWO-1. Beginning in 2022 these activities will be incorporated into the Structure Hardening Program.*

Cost Benefit Comparison

The Structure Hardening Program will begin in 2021 and is estimated to take 30 years to complete. Based on today's cost, the program is estimated to cost $2.6B in Capital and $71M in Project O&M. At completion, approximately:

- 20,520 wood to non-wood poles;
- 720 tower replacements;
- CP protection for all towers;
- 305 GOABs;
- 4,300 miles of OHGW; and
- System inspections.

When the Structure Hardening Program is complete, DEF estimates it will reduce the cost of extreme weather events on the Transmission system by approximately $19M to $24M annually based on today's costs. This represents a reduction of approximately 38% to 48% when compared to the average of 2016 to 2019 Transmission MED costs.

When the Structure Hardening Program is complete, DEF estimates it will reduce Transmission MED CMI by approximately 13 million to 16 million minutes annually. CMI reduction is used as a proxy for reduction in extreme weather event duration for the average customer.

Transmission system damage can result in severe consequences in both cost and outage duration. The estimation of benefits represents an annual average expected value based on historical data and does not represent what could happen in individual events or scenarios in which severe damage occurs on critical parts of the Transmission system.

Prioritization Methodology

Work will be prioritized using the following processes:

1. Probability of Damage: To prioritize the work in the Florida regions, the Transmission and Distribution systems were modeled, and weather simulations were run to provide probabilistic exposure frequency for all asset locations. The weather modeling uses the FEMA Hazus and SLOSH models, which contain the weather data for storms over the last 200 years. Using the geographical locations of the Florida assets and the historic storm paths embedded in the Hazus model, a spatial correlation of future storm exposure can be derived. To determine probability of damage given that exposure, six years of historical outage data was provided and correlated with the closest weather tower to determine the conditions during historic failures recorded in the outage data. Then, the expected quantities of asset failure for simulated future weather exposure conditions was derived by combining simulated weather patterns with historical asset failure through conditional probability methods.
2. Consequence of Damage: Once the output of probabilistic damage is assessed, the probable impact to customers is considered. This step considers number of customers served by a given asset (e.g. each pole, or segment of conductor on a line), observed outage durations, the mix of customers, and critical facilities. This step is performed both for the existing configuration of each asset, and the hardened configuration resulting from completion of the Program. The difference between the existing condition and the hardened configuration is the program impact.
3. Transmission subject matter experts then use these outputs to determine the optimum deployment plan considering factors such as current projects in the area, critical customers, operational knowledge, and resource availability.

Substation Flood Mitigation

Vision

Substation Flood Mitigation is a targeted program upgrading 20 sites identified as being at risk for significant flooding during extreme weather events.

Description

The Substation Flood Mitigation program builds in protection for substations most vulnerable to flood damage using flood plain and storm surge data. It includes a systematic review and prioritization of substations at risk of flooding to determine the proper mitigation solution, which may include elevating or modifying equipment, or relocating substations altogether.

Flood mitigation will be a targeted application of mitigation measures for substations. New assets could include control houses, relays, or total station rebuilds to increase elevation, etc.

Cost

It is expected that the 10-year cost will be approximately $27M Capital. This would cover approximately 14 substations on the DEF system.

Cost Benefit Comparison

The Substation Flood Mitigation Program is scheduled to start in 2023 and estimated to take 15 years to complete. Based on today's cost, the program will cost an estimated $38M in Capital. At the completion of the program 20 targeted substations will be hardened with flood mitigation strategies.

When the Substation Flood Mitigation Program is complete, DEF estimates it will reduce the cost of extreme weather events on the Transmission system by approximately $400,000 to $500,000 annually based on today's costs. This represents a reduction of approximately 1% when compared to the average of 2016 to 2019 Transmission MED costs.

When the Substation Flood Mitigation Program is complete, DEF estimates it will reduce Transmission MED CMI by approximately 9 million to 11 million annually. CMI reduction is used as a proxy for reduction in extreme weather event duration for the average customer.

Transmission system damage can result in severe consequences in both cost and outage duration. The estimation of benefits represents an annual average expected value based on historical data and do not represent what could happen in individual events or scenarios in which severe damage occurs on critical parts of the Transmission system.

Prioritization Methodology

Work will be prioritized using the following processes:

1. Probability of Damage: To prioritize the work in the Florida regions, the Transmission and Distribution systems were modeled, and weather simulations were run to provide probabilistic exposure frequency for all asset locations. The weather modeling uses the FEMA Hazus and SLOSH models, which contain the weather data for storms over the last 200 years. Using the geographical locations of the Florida assets and the historic storm paths embedded in the Hazus model, a spatial correlation of future storm exposure can be

derived. To determine probability of damage given that exposure, six years of historical outage data was provided and correlated with the closest weather tower to determine the conditions during historic failures recorded in the outage data. Then, the expected quantities of asset failure for simulated future weather exposure conditions was derived by combining simulated weather patterns with historical asset failure through conditional probability methods.

2. Consequence of Damage: Once the output of probabilistic damage is assessed, the probable impact to customers is considered. This step considers number of customers served by a given asset (e.g. each pole, or segment of conductor on a line), observed outage durations, the mix of customers, and critical facilities. This step is performed both for the existing configuration of each asset, and the hardened configuration resulting from completion of the program. The difference between the existing condition and the hardened configuration is the program impact.
3. Transmission subject matter experts then use these outputs to determine the optimum deployment plan considering factors such as current projects in the area, critical customers, operational knowledge, and resource availability.

Loop Radially-Fed Substations

Vision

The Loop Radially-Fed Substation program will convert radially-fed substations to networked substations. The targeted program will address approximately 20 sites over 20 years.

Description

The Loop Radially-Fed Substations program builds a more resilient and networked transmission system by creating a secondary feed into substations that are more likely to experience long outage durations during extreme weather events. As part of the construction of the additional feed, other assets could include equipment such as breakers, switches, bus work, structures, insulators, potential transformers, lightning arresters, relays, control houses.

Cost

The estimated 10-year cost will be approximately $52M. This would cover approximately 5 substations on the system.

Cost Benefit Comparison

The Loop Radially-Fed Substations Program is scheduled to start in 2025 and estimated to take 20 years to complete. Based on today's cost, the program will cost an estimated $206M in Capital. At the completion of the program 20 targeted substations will be addressed.

When the Loop Radially-Fed Substations Program is complete, it will provide an alternate source of power to limit interruptions experienced by customers.

When the Loop Radially-Fed Substations Program is complete, DEF estimates it will reduce Transmission MED CMI by approximately 450,000 to 600,000 minutes annually. CMI reduction is used as a proxy for reduction in extreme weather event duration for the average customer.

Transmission system damage can result in severe consequences in both cost and outage duration. The estimation of benefits represents an annual average expected value based on historical data and do not represent what could happen in individual events or scenarios in which severe damage occurs on critical parts of the Transmission system.

Prioritization Methodology

Work will be prioritized using the following processes:

1. Probability of Damage: To prioritize the work in the Florida regions, the Transmission and Distribution systems were modeled, and weather simulations were run to provide probabilistic exposure frequency for all asset locations. The weather modeling uses the FEMA Hazus and SLOSH models, which contain the weather data for storms over the last 200 years. Using the geographical locations of the Florida assets and the historic storm paths embedded in the Hazus model, a spatial correlation of future storm exposure can be derived. To determine probability of damage given that exposure, six years of historical outage data was provided and correlated with the closest weather tower to determine the conditions during historic failures recorded in the outage data. Then, the expected quantities of asset failure for simulated future weather exposure conditions was derived by combining

simulated weather patterns with historical asset failure through conditional probability methods.

2. Consequence of Damage: Once the output of probabilistic damage is assessed, the probable impact to customers is considered. This step considers number of customers served by a given asset (e.g. each pole, or segment of conductor on a line), observed outage durations, the mix of customers, and critical facilities. This step is performed both for the existing configuration of each asset, and the hardened configuration resulting from program completion. The difference between the existing condition and the hardened configuration is the program impact.
3. Transmission subject matter experts then use these outputs to determine the optimum deployment plan considering factors such as current projects in the area, critical customers, operational knowledge, and resource availability.

Substation Hardening

Vision

The Substation Hardening Program started as part of DEF's Grid Investment Plan which was partially funded through the 2017 Revised and Restated Settlement Agreement. DEF plans to continue this program through the SPP. The Substation Hardening program will focus on upgrading oil breakers and electromechanical relays. The program will eliminate 443 oil breakers within 10 years. This program will also upgrade approximately 1,237 electromechanical relay groups to electronic relays to properly isolate line faults and reduce storm restoration duration by automating fault identification within 20 years.

Description

Substation Hardening will address two major components.:1) Upgrading oil breakers to state-of-the-art gas or vacuum breakers to mitigate the risk of catastrophic failure and extended outages during extreme weather events; and 2) Upgrading electromechanical relays to digital relays will provide communications and enable DEF to respond and restore service more quickly from extreme weather events.

Breaker Upgrades

Replacing oil circuit breakers with state-of-the-art breakers will result in the transmission system being able to more effectively and consistently isolate faults, reclose after momentary interruptions, and improve the customer experience through fewer interruptions. Oil circuit breakers are more unreliable than gas or vacuum breakers, especially in circumstances where they are operating numerous times over a short period, such as during extreme weather events. When oil circuit breakers are repeatedly called to operate, they can generate arcing gasses within the oil tank that can accumulate and result in catastrophic failure. Existing vintage oil breakers are less reliable when isolating line faults and can contribute to increased and longer customer outages when there is a failure.

Electronic Relays

The Electronic Relay upgrades eliminate noncommunicating electromechanical and solid-state relays with digital relays. Upgrading to modern relay designs with communication capabilities and microprocessor technologies will enable quicker restoration from outage events. Another benefit is increased overall system intelligence, which will improve restoration planning. One digital relay replaces a variety of legacy single-function electromechanical relays. Two-way communications and event recording capabilities allow them to provide device performance information following a system event to support continuous system design and operational improvements.

Grid automation will be implemented to reduce duration and impacts from system issues. Digital relays will be installed to add remote monitoring and operations to key assets, which allows for rapid service response and better protection and monitoring of equipment during extreme weather events. Restoration times will be reduced due to remote monitoring and control which will allow quicker pinpointing and resolution of issues.

Cost

The estimated 10-year cost for Substation Hardening Program is expected be approximately $109M Capital.

This would upgrade all oil filled breakers and approximately 600 relay groups on the DEF system.

	DEF		
Substation Hardening	2020	2021	2022
Totals	$ 5,004,000	$ 5,500,000	$ 7,500,000
Capital	$ 5,004,000	$ 5,500,000	$ 7,500,000
O&M	$ -	$ -	$ -
Total Units	26	29	39

Cost Benefit Comparison

The Substation Hardening Program is estimated to take 20 years to complete. Based on today's cost, the program will cost an estimated $199M in Capital.

When the Substation Hardening Program is complete, DEF estimates it will reduce the cost of extreme weather events on the Distribution system by approximately $70,000 to $90,000 annually based on today's costs.

When the Substation Hardening Program is complete, DEF estimates it will reduce Distribution MED CMI by approximately 15 million to 19 million minutes annually. CMI reduction is used as a proxy for reduction in extreme weather event duration for the average customer.

Transmission system damage can result in severe consequences in both cost and outage duration. The estimation of benefits represents an annual average expected value based on historical data and do not represent what could happen in individual events or scenarios in which severe damage occurs on critical parts of the Transmission system.

Prioritization Methodology

Work will be prioritized using the following processes:

1. Probability of Damage: To prioritize the work in the Florida regions, the Transmission and Distribution systems were modeled, and weather simulations were run to provide probabilistic exposure frequency for all asset locations. The weather modeling uses the FEMA Hazus and SLOSH models, which contain the weather data for storms over the last 200 years. Using the geographical locations of the Florida assets and the historic storm paths embedded in the Hazus model, a spatial correlation of future storm exposure can be derived. To determine probability of damage given that exposure, six years of historical outage data was provided and correlated with the closest weather tower to determine the conditions during historic failures recorded in the outage data. Then, the expected quantities of asset failure for simulated future weather exposure conditions was derived by combining simulated weather patterns with historical asset failure through conditional probability methods.
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3. Transmission subject matter experts then use these outputs to determine the optimum deployment plan considering factors such as current projects in the area, critical customers, operational knowledge, and resource availability.

Transmission Vegetation Management

Vision

DEF will continue to utilize Integrated Vegetation Management (IVM) to minimize the impact of vegetation on the transmission assets.

Description

DEF's Transmission IVM program is focused on ensuring the safe and reliable operation of the transmission system by minimizing vegetation-related interruptions and adequate conductor-to-vegetation clearances, while maintaining compliance with regulatory, environmental, and safety requirements or standards. The program activities focus on the removal and/or control of incompatible vegetation within and along the right of way to minimize the risk of vegetation-related outages and ensure necessary access within all transmission line corridors. The IVM program includes the following activities: planned threat and condition-based maintenance, reactive work that includes hazard tree mitigation, and brush management (herbicide, mowing, and hand cutting operation).

Transmission utilizes LIDAR to generate a threat/condition-based Vegetation Management plan. NERC lines (200kV and above) are flown every year. A fourth of non-NERC lines are currently flown each year. After 4 years all lines will have been flown. Threat triggers target clearing for 6+ years of growth. The LIDAR program targets the entire Transmission system of approximately 5,200 miles.

Cost

The estimated contractor ratio is 91.5%. The estimated utility personnel ratio is 8.5%.

2020 -2022 Labor / Equipment Breakout		
	Labor	Equipment
Utility Personnel Totals	$ 4,010,124	$ 167,089
Capital	$ 1,965,352	$ 66,835
O&M	$ 2,044,773	$ 100,253
Contract Personnel Totals	$ 30,545,624	$ 14,374,411
Capital	$ 15,159,336	$ 7,133,805
O&M	$ 15,386,288	$ 7,240,606

	DEF		
VM - Transmission	2020	2021	2022
Totals	$ 12,522,040	$ 17,228,315	$ 19,346,891
Capital	$ 4,469,073	$ 8,995,999	$ 10,860,255
O&M	$ 8,052,967	$ 8,232,316	$ 8,486,636
Approximate Miles	398	404	404

Cost Benefit Comparison

It is expected that the 10-year cost will be approximately $108M Capital and $90M O&M. This would cover the inspection and vegetation remediation activities.

The IVM program's planned threat and condition-based maintenance include danger tree identification and mitigation, reactive work that includes hazard tree mitigation, and brush management (herbicide, mowing, and hand cutting operation) to reduce event possibilities during extreme weather events and enhance overall system reliability.

Prioritization Methodology

Planned work for DEF is scheduled and prioritized through a manual process using the date of previous work activities as well as threats and conditions identified through patrols, inspections and assessments. As systems and technologies can be developed and implemented, DEF intends to leverage those technologies/systems and analytics to evaluate numerous variables coupled with local knowledge to optimize the risk-based planning and scheduling of work.

Docket No. 20200069-EI
Duke Energy Florida, LLC
Witness: Oliver
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Revenue Requirements and Rate Impacts

Rule 25-6.030(3)(g): An estimate of the annual jurisdictional revenue requirements for each year of the Storm Protection Plan.

Estimated Annual Jurisdictional Revenue Requirements for Each Year of the Storm Protection Plan										
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
($ Millions)	$ -	$ 8.8	$105.6	$169.3	$241.1	$320.4	$404.9	$486.2	$560.9	$632.2

Rule 25-6.030(3)(h): An estimate of rate impacts for each of the first three years of the Storm Protection Plan for the utility's typical residential, commercial, and industrial customers.

Estimated SPP Rate Impacts Residential $/1,000 kWh	2020	2021	2022
(1) Total SPP Estimated Rate	$0.00	$0.27	$3.28
(2) Less: Amounts Historically Recovered in Base Rates	$0.00	$0.00	$2.06
(3) SPP Rate Impact Less Base Reduction	$0.00	$0.27	$1.22
(4) Typical Commercial % Increase from 2020 Bill	0.0%	0.2%	2.0%-2.3%
(5) Typical Industrial % Increase from 2020 Bill	0.0%	0.2%-0.3%	1.6%-4.2%

Notes:

(1) DEF's 2017 Settlement Agreement ends at the end of 2021. In 2022 line (1) shows the total estimated SPP rate. It assumes all spend that has traditionally been recovered in base rates for Storm Hardening activities (vegetation management for example) is now recovered through the SPPCRC. Line (2) shows the offsetting reduction estimated in base rates. Line (3) is the net SPP impact.

(2) Commercial & Industrial % Increase does not consider base rate reduction due to shift of existing spend in base rates to the SPPCRC in 2022.

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Zone	Op Center	County	Project	Sub Category	Project Status	Project #	Costs	Number of Units
North Coastal	Inverness	Citrus	Storm Hardening Dixie Shores Subdivision, Crystal River.	Submersible UG Transformers	Completed 2021	MX0128072	$ 213,294	24
South Coastal	WALSM		GIP_LFSG_PMH-9_J229_J265	Submersible Switchgear	2020	29065515	$ 34,731	1
North Coastal	MONTI		SWITHGEAR RUSTED AND UNSAFE REPLACE IN NEW LOCATION	Submersible Switchgear	2021	29520384	$ 46	1
North Coastal	MONTI		Replace VFI switchgear RUSTED NOT SAFE TO WORK REPLACE IN PLACE	Submersible Switchgear	2021	29522801	$ 33,565	1
South Coastal	CLWTR		REPLACE ESCO WITH G&W for RA 240	Submersible Switchgear	2020	30091770	$ 4,991	1
South Coastal	SPETE		(HOLD) GSR: SWG PME-9 L for Submersible REPLACEMENT SWG X2964 and X2965	Submersible Switchgear	2021	35002887	$ 10,768	1
North Coastal	SEVSP		3/16 GIS*Replace VFI C5944 switchgear leaking oil	Submersible Switchgear	2020	35123111	$ 652	1
North Coastal	SEVSP		3/8 GIS*Replace VFI C5928 seeping oil.	Submersible Switchgear	2020	35123560	$ 15,316	1

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DUKE ENERGY

Storm Protection Plan

Florida

Project-Level Detail

Contents

ACTIVITY DESCRIPTIONS & SCOPE

The following sections of this document describe each of the Duke Energy Florida activities that are in the current Storm Hardening Plan (SHP), have planned scope in 2020, and will have components of work incorporated into the Storm Protection Plan (SPP) moving forward. This exhibit includes the activity description, as well as project-level detail for Year 1 (2020) and scope and cost data for Year 2 (2021).

Note: Shifts of scope may occur between years to optimize benefits delivery to customers and execution efficiencies.

DUKE ENERGY.

Distribution

Florida

Project-Level Detail

I. Targeted Underground (UG)

The Targeted Underground (UG) activity was developed to address difficult to access overhead lines with a history of vegetation-related outages. The locations were selected based on a 10-year outage history of both the fuse and downstream transformers, secondary, and services.

The primary purpose of this activity is to eliminate tree and debris-related outages in the area of exposure by converting heavily vegetated neighborhoods that are prone to power outages from overhead to underground construction. This will decrease outages, reduce momentary interruptions, improve major storm restoration time, improve customer satisfaction, and reduce costs.

Historical Reliability and Prioritization

The Targeted Underground activities use a ten-year historic reliability assessment of protective devices to generate a list of potential targets. These targets are then reviewed and prioritized based on the events/mile ratio, location of assets (for example rear lot distribution), and vegetation coverage.

3-Year Scope

The chart below outlines the 3-Year Scope in Duke Energy Florida:

	DEF		
Targeted Underground (TUG)*	2020	2021	2022
Totals	$ 42,458,678	$ 65,182,532	
Capital	$ 41,934,480	$ 64,398,532	
O&M	$ 524,198	$ 784,000	
Total Miles OH Replaced	45	72	

**Beginning in 2022, these activities will be incorporated into the Lateral Hardening Program*

2020 Planned Duke Energy Florida – Targeted Underground (TUG)

Location	Unit Count	Customer Count	Project Cost - Capital	Project Cost - O&M	Start Date	Finish Date
TROPIC TERRACE - A207	0.71	41	$ 661,584	$ 8,270	6/26/2020	8/14/2020
ZUBER - A203	0.43	10	$ 396,205	$ 4,953	5/19/2020	6/30/2020
REDDICK - A34	0.10	1	$ 89,826	$ 1,123	12/18/2019	1/15/2020
LAND O LAKES - C141	0.25	15	$ 237,425	$ 2,968	3/20/2020	4/13/2020
MAXIMO - X143	0.44	40	$ 408,226	$ 5,103	6/1/2020	7/13/2020
ZUBER - A204	0.08	1	$ 70,445	$ 881	8/3/2020	9/4/2020
ZUBER - A204	0.24	5	$ 225,777	$ 2,822	10/1/2020	11/11/2020
ZUBER - A205	0.14	8	$ 127,006	$ 1,588	10/1/2020	11/11/2020
TARPON SPRINGS - C305	0.81	78	$ 755,324	$ 9,442	7/13/2020	9/4/2020
HIGH SPRINGS - A15	0.31	3	$ 290,165	$ 3,627	7/1/2020	8/12/2020
PORT ST JOE - N52	0.63	57	$ 587,692	$ 7,346	7/1/2020	8/19/2020
PIEDMONT - M473	0.88	70	$ 820,644	$ 10,258	7/13/2020	9/4/2020
SANTOS - A230	0.14	2	$ 132,596	$ 1,658	5/5/2020	6/9/2020
DINNER LAKE - K1685	0.25	53	$ 235,748	$ 2,947	4/24/2020	5/29/2020
EUSTIS - M500	0.04	6	$ 34,291	$ 429	3/9/2020	4/3/2020
COUNTRY OAKS - K1443	0.10	2	$ 90,385	$ 1,130	7/1/2020	7/29/2020
CLERMONT - K601	0.23	9	$ 211,987	$ 2,650	7/1/2020	8/5/2020
LAKE PLACID - K1320	0.10	7	$ 97,467	$ 1,218	5/5/2020	6/2/2020
MAXIMO - X143	0.12	7	$ 115,265	$ 1,441	3/16/2020	4/20/2020
ZUBER - A204	0.28	8	$ 261,745	$ 3,272	8/3/2020	9/14/2020
COUNTRY OAKS - K1446	0.34	42	$ 318,492	$ 3,981	8/3/2020	9/21/2020
CLERMONT - K603	0.41	53	$ 386,514	$ 4,832	8/3/2020	10/5/2020
FORTIETH STREET - X84	0.05	9	$ 44,261	$ 553	2/24/2020	4/1/2020
HAINES CITY - K20	0.31	6	$ 288,954	$ 3,612	5/5/2020	6/9/2020
CARRABELLE - N42	0.51	25	$ 471,961	$ 5,900	8/3/2020	10/5/2020
WOLF LAKE - M564	0.03	1	$ 30,936	$ 387	5/5/2020	6/2/2020
PORT RICHEY WEST - C202	0.28	30	$ 263,981	$ 3,300	3/16/2020	4/27/2020
EASTPOINT - N231	0.03	4	$ 29,259	$ 366	7/1/2020	7/29/2020
JASPER SOUTH - N191	0.23	1	$ 215,714	$ 2,697	3/27/2020	5/1/2020
DENHAM - C153	0.26	5	$ 244,041	$ 3,051	1/27/2020	2/21/2020
PORT RICHEY WEST - C208	0.22	24	$ 204,998	$ 2,563	3/9/2020	4/13/2020
TRI CITY - J5036	0.40	15	$ 373,376	$ 4,667	5/12/2020	6/23/2020
DELTONA EAST - W0130	0.11	25	$ 104,735	$ 1,309	5/12/2020	6/16/2020
BAYVIEW - C652	0.07	26	$ 64,574	$ 807	6/3/2020	6/30/2020
DENHAM - C157	0.21	3	$ 191,114	$ 2,389	2/10/2020	3/13/2020
DENHAM - C155	0.12	2	$ 111,817	$ 1,398	6/3/2020	7/8/2020
PORT RICHEY WEST - C202	0.20	20	$ 186,548	$ 2,332	3/31/2020	5/5/2020
BAYVIEW - C657	0.39	20	$ 361,449	$ 4,518	2/24/2020	4/8/2020
VINELAND - K903	0.11	5	$ 98,958	$ 1,237	11/2/2020	12/11/2020
VINELAND - K903	0.06	4	$ 55,909	$ 699	3/23/2020	4/27/2020
SAFETY HARBOR - C3518	0.15	6	$ 141,728	$ 1,772	5/12/2020	6/16/2020
SAFETY HARBOR - C3527	0.29	16	$ 265,845	$ 3,323	3/9/2020	4/20/2020

PORT RICHEY WEST - C203	0.62	46	$ 575,858	$ 7,198	7/28/2020	9/22/2020
CASSELBERRY - W0027	0.07	15	$ 65,133	$ 814	2/6/2020	3/9/2020
CASSELBERRY - W0022	0.38	16	$ 349,987	$ 4,375	5/12/2020	6/23/2020
ZEPHYRHILLS - C855	0.15	27	$ 144,058	$ 1,801	3/16/2020	4/13/2020
WEST DAVENPORT - K1521	0.16	19	$ 148,158	$ 1,852	3/9/2020	4/13/2020
INTERCESSION CITY - K967	0.07	5	$ 69,420	$ 868	3/23/2020	4/20/2020
HOMOSASSA - A271	0.24	27	$ 224,007	$ 2,800	5/5/2020	6/9/2020
HOMOSASSA - A271	0.34	17	$ 316,256	$ 3,953	7/1/2020	8/12/2020
WINTER GARDEN - K204	0.16	16	$ 145,549	$ 1,819	5/5/2020	6/9/2020
LURAVILLE - A192	0.17	3	$ 161,482	$ 2,019	3/23/2020	4/27/2020
WINDERMERE - K302	0.21	11	$ 195,773	$ 2,447	5/5/2020	6/9/2020
WINDERMERE - K302	0.38	21	$ 351,106	$ 4,389	6/1/2020	7/13/2020
BAY HILL - K76	0.05	2	$ 42,956	$ 537	5/5/2020	6/2/2020
WINTER GARDEN - K204	0.26	35	$ 241,618	$ 3,020	5/15/2020	6/26/2020
REDDICK - A36	0.08	1	$ 75,849	$ 948	7/1/2020	7/29/2020
REDDICK - A36	0.17	1	$ 157,755	$ 1,972	12/19/2019	1/16/2020
REDDICK - A36	0.03	1	$ 27,395	$ 342	3/30/2020	4/27/2020
ZEPHYRHILLS - C853	0.25	25	$ 234,070	$ 2,926	4/6/2020	5/11/2020
LAKEWOOD - K1695	0.20	22	$ 181,703	$ 2,271	4/1/2020	5/6/2020
DINNER LAKE - K1690	0.50	15	$ 465,905	$ 5,824	5/5/2020	6/9/2020
LAKEWOOD - K1695	0.47	18	$ 441,584	$ 5,520	5/5/2020	6/16/2020
HEMPLE - K2246	0.15	12	$ 141,821	$ 1,773	6/1/2020	7/13/2020
HEMPLE - K2246	0.16	4	$ 146,387	$ 1,830	3/9/2020	4/13/2020
HEMPLE - K2253	0.46	25	$ 425,744	$ 5,322	6/1/2020	7/13/2020
SILVER SPRINGS - A154	0.17	5	$ 158,967	$ 1,987	5/19/2020	6/23/2020
SILVER SPRINGS - A154	0.08	2	$ 72,867	$ 911	12/17/2019	1/14/2020
SILVER SPRINGS - A154	0.11	2	$ 105,667	$ 1,321	5/1/2020	6/5/2020
CASSELBERRY - W0025	0.23	13	$ 213,664	$ 2,671	5/12/2020	6/16/2020
ALTAMONTE - M572	0.10	9	$ 93,181	$ 1,165	5/27/2020	6/23/2020
ALTAMONTE - M573	0.22	17	$ 205,464	$ 2,568	5/27/2020	6/30/2020
ALTAMONTE - M573	0.07	14	$ 63,643	$ 796	3/9/2020	4/3/2020
ZEPHYRHILLS - C851	0.08	13	$ 77,433	$ 968	12/9/2019	1/30/2020
ARCHER - A195	0.42	15	$ 391,173	$ 4,890	4/1/2020	5/13/2020
ZEPHYRHILLS NORTH - C340	0.17	6	$ 158,408	$ 1,980	2/10/2020	3/18/2020
ALDERMAN - C5010	0.13	23	$ 122,440	$ 1,531	1/13/2020	2/14/2020
HOMOSASSA - A272	0.20	4	$ 186,362	$ 2,330	5/13/2020	6/17/2020
ZEPHYRHILLS NORTH - C344	0.37	18	$ 346,260	$ 4,328	3/17/2020	4/21/2020
LURAVILLE - A192	0.19	10	$ 175,739	$ 2,197	5/5/2020	6/9/2020
WELCH ROAD - M552	0.40	11	$ 375,799	$ 4,698	4/16/2020	5/20/2020
WELCH ROAD - M552	0.22	6	$ 203,787	$ 2,547	3/30/2020	5/4/2020
CURLEW (HD) - C4988	0.47	3	$ 438,230	$ 5,478	4/1/2020	5/13/2020
NORTHEAST - X286	0.05	8	$ 44,354	$ 554	3/9/2020	4/13/2020

PERRY - N7	0.24	15	$ 219,441	$ 2,743	1/13/2020	1/28/2020
WILLISTON - A124	0.37	6	$ 348,497	$ 4,356	5/1/2020	6/12/2020
FORTIETH STREET - X82	0.11	21	$ 101,008	$ 1,263	5/5/2020	6/9/2020
ALTAMONTE - M578	0.21	16	$ 199,593	$ 2,495	8/3/2020	9/14/2020
ALTAMONTE - M576	0.78	59	$ 727,463	$ 9,094	7/1/2020	8/5/2020
LONGWOOD - M143	0.10	8	$ 92,715	$ 1,159	3/9/2020	4/13/2020
NORTH LONGWOOD - M1755	0.13	16	$ 121,974	$ 1,525	4/14/2020	5/11/2020
LONGWOOD - M144	0.07	10	$ 68,861	$ 861	5/12/2020	6/9/2020
ALTAMONTE - M578	0.15	7	$ 137,069	$ 1,713	3/9/2020	4/13/2020
APOPKA SOUTH - M727	0.09	2	$ 79,483	$ 994	1/21/2020	2/4/2020
APOPKA SOUTH - M727	0.10	3	$ 91,876	$ 1,148	5/1/2020	6/5/2020
APOPKA SOUTH - M727	0.04	2	$ 37,645	$ 471	2/3/2020	3/4/2020
PERRY - N9	0.13	6	$ 124,862	$ 1,561	2/18/2020	3/26/2020
PERRY NORTH - N14	0.15	14	$ 140,051	$ 1,751	5/5/2020	6/9/2020
LAKE WEIR - A64	0.29	11	$ 274,790	$ 3,435	7/1/2020	8/12/2020
DISSTON - X62	0.21	20	$ 196,053	$ 2,451	2/10/2020	4/7/2020
DISSTON - X65	0.31	30	$ 288,861	$ 3,611	4/1/2020	5/13/2020
LAKE WEIR - A64	0.11	5	$ 104,922	$ 1,312	2/10/2020	3/18/2020
MINNEOLA - K948	0.31	25	$ 288,861	$ 3,611	6/11/2020	7/16/2020
MINNEOLA - K948	0.23	17	$ 218,882	$ 2,736	10/1/2020	11/4/2020
LURAVILLE - A192	0.45	22	$ 418,382	$ 5,230	4/1/2020	5/13/2020
PERRY - N7	0.44	11	$ 412,885	$ 5,161	4/1/2020	5/13/2020
HOLDER - A48	0.07	1	$ 68,674	$ 858	2/10/2020	3/11/2020
WEKIVA - M103	0.08	4	$ 76,781	$ 960	5/27/2020	6/23/2020
WALSINGHAM - J553	0.11	55	$ 100,635	$ 1,258	3/16/2020	4/20/2020
BROOKSVILLE - A97	0.11	6	$ 100,915	$ 1,261	3/2/2020	3/27/2020
WALSINGHAM - J553	0.20	6	$ 186,362	$ 2,330	3/9/2020	4/13/2020
PINECASTLE - W0392	0.58	30	$ 545,015	$ 6,813	7/1/2020	8/19/2020
LAKE PLACID NORTH - K24	0.22	10	$ 201,178	$ 2,515	3/9/2020	4/13/2020
KENNETH CITY - X55	0.22	30	$ 206,675	$ 2,584	4/1/2020	5/6/2020
CLEARWATER - C16	0.37	44	$ 343,651	$ 4,296	4/1/2020	5/6/2020
WEKIVA - M103	0.12	3	$ 113,681	$ 1,421	1/27/2020	2/25/2020
PIEDMONT - M471	0.21	19	$ 191,766	$ 2,397	5/19/2020	6/23/2020
PERRY NORTH - N14	0.28	26	$ 260,534	$ 3,257	5/5/2020	6/16/2020
PERRY - N7	0.18	3	$ 168,192	$ 2,102	2/18/2020	3/26/2020
JASPER SOUTH - N191	0.15	5	$ 138,001	$ 1,725	5/5/2020	6/9/2020
COLEMAN - A105	0.11	8	$ 99,890	$ 1,249	6/1/2020	7/6/2020
WILDWOOD - A396	0.26	6	$ 245,159	$ 3,065	7/1/2020	8/12/2020
WILDWOOD - A396	0.12	2	$ 110,513	$ 1,381	6/1/2020	7/6/2020
EUSTIS - M503	0.07	3	$ 62,711	$ 784	7/1/2020	7/29/2020
EUSTIS - M499	0.27	14	$ 249,166	$ 3,115	5/5/2020	6/9/2020
FLORA MAR - C4008	0.78	62	$ 725,227	$ 9,066	7/1/2020	8/19/2020

WALSINGHAM - J555	0.23	28	$ 217,111	$ 2,714	4/1/2020	5/6/2020
JENNINGS - N195	0.08	1	$ 75,477	$ 943	12/19/2019	1/14/2020
EAST CLEARWATER - C903	0.33	43	$ 303,117	$ 3,789	5/5/2020	6/9/2020
UMATILLA - M4407	0.08	7	$ 76,129	$ 952	7/1/2020	7/29/2020
UMATILLA - M4405	0.13	4	$ 123,837	$ 1,548	8/3/2020	9/4/2020
LISBON - M1519	0.06	2	$ 53,579	$ 670	7/1/2020	7/29/2020
LISBON - M1517	0.51	22	$ 478,018	$ 5,975	7/1/2020	8/19/2020
JASPER SOUTH - N191	0.18	8	$ 167,726	$ 2,097	3/30/2020	5/4/2020
JASPER SOUTH - N192	0.13	12	$ 116,569	$ 1,457	5/5/2020	6/9/2020
ZUBER - A202	0.27	2	$ 255,968	$ 3,200	7/1/2020	8/12/2020
HIGH SPRINGS - A15	0.08	3	$ 70,724	$ 884	12/18/2019	1/20/2020
LAKE OF THE HILLS - K1885	0.22	8	$ 203,134	$ 2,539	8/3/2020	9/4/2020
HIGH SPRINGS - A15	0.09	5	$ 79,856	$ 998	3/31/2020	4/28/2020
HIGH SPRINGS - A15	0.11	3	$ 105,854	$ 1,323	6/1/2020	7/6/2020
TRENTON - A90	0.12	1	$ 113,215	$ 1,415	2/10/2020	3/18/2020
TRENTON - A90	0.05	5	$ 49,665	$ 621	7/1/2020	7/29/2020
OVIEDO - W0175	0.06	2	$ 53,579	$ 670	9/1/2020	10/6/2020
OVIEDO - W0174	0.04	2	$ 37,459	$ 468	7/1/2020	7/29/2020
WINTER SPRINGS - W0192	0.18	6	$ 170,987	$ 2,137	6/1/2020	7/6/2020
ALAFAYA - W0298	0.18	6	$ 168,937	$ 2,112	7/1/2020	7/29/2020
CLERMONT - K603	0.42	59	$ 389,962	$ 4,875	10/1/2020	11/18/2020
TRENTON - A90	0.05	1	$ 45,472	$ 568	7/1/2020	7/29/2020
GEORGIA PACIFIC - A45	0.18	8	$ 167,726	$ 2,097	6/1/2020	7/6/2020
CONWAY - W0407	0.32	27	$ 299,763	$ 3,747	10/1/2020	11/18/2020
CONWAY - W0408	0.24	37	$ 219,907	$ 2,749	10/1/2020	11/4/2020
CONWAY - W0408	0.37	25	$ 341,694	$ 4,271	11/2/2020	12/4/2020
NORTH LONGWOOD - M1751	0.15	3	$ 141,355	$ 1,767	8/3/2020	9/14/2020
NORTH LONGWOOD - M1758	0.09	3	$ 82,279	$ 1,029	10/1/2020	11/4/2020
NORTH LONGWOOD - M1751	0.12	12	$ 109,860	$ 1,373	9/1/2020	10/13/2020
LAKE EMMA - M426	0.05	7	$ 46,497	$ 581	8/3/2020	9/4/2020
EASTPOINT - N231	0.15	38	$ 135,951	$ 1,699	7/1/2020	7/29/2020
TAVARES EAST - M581	0.05	7	$ 46,404	$ 580	8/3/2020	9/4/2020
SKY LAKE - W0363	0.11	15	$ 101,101	$ 1,264	9/1/2020	10/6/2020
MAXIMO - X150	1.08	119	$ 1,006,913	$ 12,587	7/13/2020	9/4/2020
PIEDMONT - M473	0.30	25	$ 275,350	$ 3,442	6/1/2020	7/6/2020
MAITLAND - W0087	0.16	12	$ 151,885	$ 1,899	11/2/2020	12/4/2020
ALTAMONTE - M579	0.04	5	$ 36,713	$ 459	11/2/2020	12/4/2020
ALTAMONTE - M579	0.03	3	$ 25,252	$ 316	11/2/2020	12/4/2020
MAITLAND - W0087	0.05	7	$ 46,963	$ 587	11/2/2020	12/4/2020
MAITLAND - W0079	0.05	4	$ 43,515	$ 544	10/2/2020	11/5/2020
PORT ST JOE - N52	0.38	39	$ 355,392	$ 4,443	7/1/2020	8/12/2020
BOGGY MARSH - K957	0.22	1	$ 205,557	$ 2,570	8/3/2020	9/14/2020

BAY RIDGE - M447	0.10	2	$ 90,013	$ 1,125	9/1/2020	10/6/2020
BAY RIDGE - M451	0.14	5	$ 129,428	$ 1,618	11/2/2020	12/4/2020
TAYLOR AVENUE - J2904	0.09	11	$ 85,167	$ 1,065	11/2/2020	12/4/2020
MAITLAND - M82	0.07	11	$ 62,990	$ 787	11/2/2020	12/4/2020
EATONVILLE - M1135	0.16	7	$ 148,437	$ 1,856	10/1/2020	11/11/2020
MYRTLE LAKE - M651	0.27	22	$ 249,911	$ 3,124	10/1/2020	11/18/2020
TROPIC TERRACE - A207	0.05	2	$ 48,361	$ 605	6/11/2020	7/9/2020
BEVERLY HILLS - A73	0.08	13	$ 78,458	$ 981	5/12/2020	6/9/2020
GE ALACHUA - A186	0.14	3	$ 131,478	$ 1,644	8/3/2020	9/14/2020
WALSINGHAM - J558	0.11	5	$ 104,269	$ 1,303	12/16/2019	2/10/2020
CLEARWATER - C5	0.09	18	$ 83,863	$ 1,048	3/31/2020	5/5/2020
LAKE WEIR - A61	0.18	9	$ 165,117	$ 2,064	3/9/2020	4/13/2020
GEORGIA PACIFIC - A45	0.07	5	$ 61,499	$ 769	3/9/2020	4/3/2020
DELAND - W0804	0.13	132	$ 118,433	$ 1,480	3/9/2020	4/13/2020
ST MARKS WEST - N336	0.11	9	$ 103,524	$ 1,294	3/31/2020	5/5/2020
BELLEAIR - C656	0.10	8	$ 88,895	$ 1,111	2/10/2020	3/13/2020
WAUKEENAH - N64	0.07	2	$ 64,854	$ 811	5/5/2020	6/2/2020
PERRY NORTH - N14	0.07	1	$ 61,313	$ 766	5/13/2020	6/10/2020
ST MARKS WEST - N336	0.08	1	$ 77,620	$ 970	7/1/2020	7/29/2020
SUN N' LAKE - K1296	0.12	4	$ 108,835	$ 1,360	2/24/2020	4/1/2020
LAKEWOOD - K1693	0.05	2	$ 47,429	$ 593	5/1/2020	5/29/2020
CLERMONT - K606	0.07	5	$ 64,761	$ 810	1/13/2020	2/4/2020
ANCLOTE - C4203	0.08	8	$ 71,190	$ 890	3/9/2020	4/3/2020
CLERMONT - K602	0.10	15	$ 97,374	$ 1,217	3/18/2020	4/22/2020
CLERMONT - K606	0.08	11	$ 72,122	$ 902	5/27/2020	6/23/2020
ZUBER - A203	0.22	8	$ 200,339	$ 2,504	3/9/2020	4/13/2020
LAKE WALES - K53	0.17	10	$ 154,587	$ 1,932	3/16/2020	4/13/2020
LAKE WALES - K58	0.34	35	$ 321,101	$ 4,014	5/5/2020	6/16/2020
REDDICK - A34	0.29	5	$ 271,250	$ 3,391	4/21/2020	6/2/2020
REDDICK - A34	0.08	2	$ 74,545	$ 932	3/16/2020	4/13/2020
SILVER SPRINGS SHORES - A131	0.28	20	$ 261,279	$ 3,266	5/5/2020	6/16/2020
ZUBER - A202	0.05	6	$ 48,920	$ 612	5/5/2020	6/9/2020
ZUBER - A202	0.11	2	$ 103,058	$ 1,288	2/24/2020	4/1/2020
SANTOS - A230	0.20	15	$ 185,989	$ 2,325	5/5/2020	6/9/2020
SANTOS - A230	0.11	2	$ 101,101	$ 1,264	1/13/2020	1/22/2020
DESOTO CITY - K3222	0.14	1	$ 129,801	$ 1,623	1/27/2020	3/17/2020
DESOTO CITY - K3222	0.06	1	$ 59,729	$ 747	3/2/2020	3/27/2020
DINNER LAKE - K1691	0.23	7	$ 217,205	$ 2,715	6/17/2020	7/22/2020
CYPRESSWOOD - K562	0.25	7	$ 229,318	$ 2,867	5/5/2020	6/9/2020
HAINES CITY - K21	0.13	2	$ 124,024	$ 1,550	5/13/2020	6/17/2020
HAINES CITY - K21	0.05	7	$ 47,988	$ 600	2/10/2020	3/13/2020
CYPRESSWOOD - K563	0.06	3	$ 57,027	$ 713	2/17/2020	3/20/2020
SKY LAKE - W0368	0.34	49	$ 313,367	$ 3,917	9/9/2020	10/20/2020
FERN PARK - M907	0.44	47	$ 406,921	$ 5,087	9/9/2020	10/13/2020
EATONVILLE - M1135	0.11	24	$ 104,363	$ 1,305	6/3/2020	6/30/2020
OBRIEN - A379	1.02	6	$ 953,893	$ 11,924	6/10/2020	7/22/2020

II. Deteriorated Conductor

The primary purpose of this activity is to replace over-dutied overhead conductor on the system that is prone to outages due to its brittle composition, small load capacity and reduced connection quality.

Historical Reliability and Prioritization

Deteriorated Conductor activities utilize a four-year historical reliability assessment of protective devices upstream of small copper overhead conductor, including a weighted scoring that included CMI performance (55%), count of devices involved in CEMI4 indicator (30%) and whether the feeder had been showing up on the 3% Worst Performing Feeder list (15%). The historical reliability assessment is then coupled with local operational knowledge from Operations and Engineering, as well as physical condition of the conductor (splices) to select the specific devices to address.

Once a target is selected, all of the copper conductor (typically #4 & #6) and smaller aluminum (typically #4) is brought up to the current aluminum equivalent (1/0); poles are replaced and brought up to the current specifications with increased spacing; transformers and other primary equipment are either replaced with newer units or retrofitted to new specifications; open wire secondary is replaced with insulated conductor; and vegetation is cleared to the standard. All of these efforts result in a lateral that is more resilient to weather and vegetation events.

3-Year Scope

The chart below outlines the 3-Year Scope in Duke Energy Florida:

	DEF		
Deteriorated Conductor*	2020	2021	2022
Totals	$ 14,597,739	$ 19,661,130	
Capital	$ 14,453,207	$ 19,427,994	
O&M	$ 144,532	$ 233,136	
Total Miles OH Replaced	58	76	

**Beginning in 2022, these activities will be incorporated into the Lateral Hardening Program.*

2020 Planned Duke Energy Florida – Deteriorated Conductor

Location	Unit Count	Customer Count	Project Cost - Capital	Project Cost - O&M	Start Date	Finish Date
APALACHACOLA' - N58 Total	15629	1000	$ 743,784.11	$ 7,437.84	07/06/20	11/27/20
APOPKA SOUTH' - M723 Total	8237	2209	$ 391,998.83	$ 3,919.99	11/04/19	04/10/20
ARCHER' - A196 Total	6178	492	$ 294,011.02	$ 2,940.11	06/29/20	10/09/20
BARBERVILLE' - W0902 Total	6864	1517	$ 326,657.76	$ 3,266.58	01/06/20	04/17/20
BOGGY MARSH' - K959 Total	3802	598	$ 180,937.18	$ 1,809.37	08/12/19	03/27/20
CLARCONA' - M342 Total	6125	1838	$ 291,488.75	$ 2,914.89	01/13/20	03/06/20
DELAND EAST' - W1110 Total	9293	1810	$ 442,253.87	$ 4,422.54	09/30/19	03/27/20
DUNDEE' - K3245 Total	3802	1812	$ 180,937.18	$ 1,809.37	01/06/20	01/31/20
DUNEDIN' - C104 Total	11349	2127	$ 540,098.91	$ 5,400.99	09/02/19	02/14/20
EAST ORANGE' - W0250 Total	4118	1886	$ 195,975.62	$ 1,959.76	09/23/19	02/28/20
LISBON' - M1517 Total	2745.6	2159	$ 130,663.10	$ 1,306.63	09/30/19	02/21/20
LISBON - M1518 Total	9768	1704	$ 464,859.12	$ 4,648.59	10/28/19	02/28/20
LOCKHART' - M402 Total	3115	619	$ 148,242.85	$ 1,482.43	09/23/19	02/14/20
MCINTOSH' - A51 Total	33474	1315	$ 1,593,027.66	$ 15,930.28	10/28/19	05/08/20
ORANGE CITY' - W0382 Total	12619	1563	$ 600,538.21	$ 6,005.38	01/13/20	08/07/20
PINECASTLE' - W0392 Total	3062	1538	$ 145,720.58	$ 1,457.21	05/01/19	02/14/20
SOPCHOPPY' - N327 Total	35271	1463	$ 1,678,546.89	$ 16,785.47	12/02/19	06/01/20
ST MARKS WEST' - N332 Total	16210	1105	$ 771,433.90	$ 7,714.34	04/01/20	10/30/20
TARPON SPRINGS' - C303 Total	17318	1985	$ 824,163.62	$ 8,241.64	09/09/19	04/24/20
WAUKEENAH' - N64 Total	19483	649	$ 927,195.97	$ 9,271.96	06/01/20	11/13/20
WEST LAKE WALES' - K866 Total	23707	1073	$ 1,128,216.13	$ 11,282.16	12/16/19	06/01/20
ZELLWOOD' - M33 Total	45672	1226	$ 2,173,530.48	$ 21,735.30	10/14/19	06/12/20
ZEPHYRHILLS' - C855 Total	5861	3133	$ 278,924.99	$ 2,789.25	10/12/20	11/27/20

III. Self-Optimizing Grid (SOG)

This program enables the automatic reconfiguration of the system to minimize the number of customers that experience sustained power outages. The Self-Optimizing Grid (SOG) Program transforms the radial distribution system into an automated distribution network that provides:

1. connectivity with automated switching,
2. capacity on the circuits to allow most circuits to be restored from alternate sources,
3. automated control with SCADA-enabled Automated Switching Devices (ASDs) to isolate faults and reconfigure the system,
4. segmentation such that the distribution circuits have much smaller line segments, thus reducing the number of customers that are affected by outages, and
5. feeders are segmented into blocks of approximately 400 customers.

Historical Reliability and Prioritization

The target selection and prioritization model for the Self-Optimizing Grid Program primarily include circuit customer count and 4 years of circuit backbone customer interruption (CI) data. Circuit backbone CI (breaker and electronic recloser) is included to ensure historically poor performing circuits are prioritized appropriately. Once a circuit is selected and prioritized, a "Team" (SOG Team) is developed around this circuit by reviewing available/ alternate circuit ties (requiring a review of grid topology). Annual work prioritization of the SOG Teams is generally based on customer count and circuit backbone CI; but it may also include such factors as total cost per SOG Team, load-growth considerations, and societal impacts (i.e., circuits with schools, hospitals, or airports).

3-Year Scope

The chart below outlines the 3-Year Scope in Duke Energy Florida:

	DEF		
Self-Optimizing Grid (SOG)	2020	2021	2022
Totals	$ 56,483,391	$ 81,269,879	$ 76,500,000
Automation	$ 35,611,138	$ 56,911,355	$ 45,900,000
Capital	$ 34,860,275	$ 55,795,446	$ 45,000,000
O&M	$ 750,863	$ 1,115,909	$ 900,000
Total ASD's	580	851	686
Connectivity & Capacity	$ 20,872,253	$ 24,358,525	$ 30,600,000
Capital	$ 20,541,619	$ 23,880,906	$ 30,000,000
O&M	$ 330,634	$ 477,618	$ 600,000

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2020 Planned Duke Energy Florida – Self-Optimizing Grid

Location	Unit Count	Customer Count	Project Cost - Capital	Project Cost - O&M	Start Date	Finish Date
WEST DAVENPORT - K1526 Total	1	3797	$ 64,619	$ 1,400	04/20/20	04/24/20
EAST ORANGE - W0252 Total	2	1571	$ 129,238	$ 2,800	02/13/20	04/03/20
EAST ORANGE - W0253 Total	1	1231	$ 40,000	$ 814	11/18/19	02/17/20
EAST ORANGE - W0274 Total	1	2399	$ 64,619	$ 1,400	10/15/19	04/09/20
SUNFLOWER - W0471 Total	2	1340	$ 104,619	$ 2,214	11/15/19	04/24/20
POINCIANA - K1236 Total	1	2461	$ 64,619	$ 1,400	11/14/19	03/11/20
POINCIANA - K1508 Total	1	2288	$ 64,619	$ 1,400	12/10/19	02/06/20
LONGWOOD - M142 Total	8	2406	$ 516,952	$ 11,200	01/20/20	02/28/20
LONGWOOD - M143 Total	3	852	$ 193,857	$ 4,200	01/21/20	01/29/20
CASSELBERRY - W0019 Total	3	1816	$ 193,857	$ 4,200	01/22/20	03/05/20
WINTER SPRINGS - W0187 Total	1	1302	$ 64,619	$ 1,400	05/06/20	05/06/20
WINTER SPRINGS - W0188 Total	3	2348	$ 169,238	$ 3,614	02/04/20	04/24/20
DELTONA EAST - W0121 Total	4	1492	$ 258,476	$ 5,600	04/30/20	05/21/20
DELTONA EAST - W0130 Total	5	1910	$ 323,095	$ 7,000	05/12/20	06/11/20
TURNER PLANT - W0762 Total	2	1414	$ 129,238	$ 2,800	05/26/20	05/28/20
TURNER PLANT - W0763 Total	3	1682	$ 193,857	$ 4,200	05/07/20	05/19/20
LAKE BRYAN - K231 Total	2	852	$ 80,000	$ 1,628	05/07/20	05/20/20
LAKE BRYAN - K238 Total	2	693	$ 80,000	$ 1,628	11/11/19	04/13/20
ISLESWORTH - K781 Total	2	3202	$ 104,619	$ 2,214	11/11/19	04/20/20
ISLESWORTH - K782 Total	4	870	$ 160,000	$ 3,256	11/04/19	05/28/20
VINELAND - K901 Total	1	406	$ 64,619	$ 1,400	04/14/20	04/20/20
VINELAND - K912 Total	2	2697	$ 80,000	$ 1,628	04/30/20	06/04/20
VINELAND - K915 Total	2	366	$ 80,000	$ 1,628	11/14/19	04/29/20
VINELAND - K917 Total	1	2755	$ 40,000	$ 814	04/20/20	04/24/20
OVIEDO - W0171 Total	3	1561	$ 169,238	$ 3,614	06/03/20	08/06/20
OVIEDO - W0172 Total	5	1398	$ 273,857	$ 5,828	03/12/20	08/13/20
OVIEDO - W0174 Total	6	1768	$ 387,714	$ 8,400	03/05/20	06/24/20
WINTER SPRINGS - W0193 Total	1	1610	$ 64,619	$ 1,400	05/06/20	05/06/20
WINTER SPRINGS - W0194 Total	5	1205	$ 298,476	$ 6,414	04/08/20	06/24/20
WINTER SPRINGS - W0195 Total	5	2686	$ 249,238	$ 5,242	05/06/20	09/03/20
LOCKWOOD - W0480 Total	5	1680	$ 249,238	$ 5,242	04/29/20	08/20/20
LOCKWOOD - W0481 Total	4	1430	$ 258,476	$ 5,600	03/17/20	05/27/20
LOCKWOOD - W0483 Total	1	1310	$ 64,619	$ 1,400	05/13/20	05/13/20
LAKE MARION - K1286 Total	2	2586	$ 129,238	$ 2,800	06/17/20	07/15/20
LAKE MARION - K1287 Total	6	2751	$ 387,714	$ 8,400	06/24/20	08/05/20
HEMPLE - K2255 Total	4	2076	$ 160,000	$ 3,256	11/19/19	04/30/20
WINTER GARDEN - K3285 Total	3	1124	$ 120,000	$ 2,442	11/11/19	04/28/20
LAKE MARION - K1288 Total	2	1585	$ 129,238	$ 2,800	03/23/20	04/15/20
DUNDEE - K3244 Total	3	2218	$ 193,857	$ 4,200	03/03/20	04/08/20

DELAND EAST - W1107 Total	1	331	$ 64,619	$ 1,400	12/30/19	01/06/20
RIO PINAR - W0972 Total	1	1732	$ 64,619	$ 1,400	07/22/20	07/22/20
NARCOOSSEE - W0214 Total	4	1525	$ 258,476	$ 5,600	07/08/20	08/19/20
NARCOOSSEE - W0217 Total	5	2533	$ 323,095	$ 7,000	07/29/20	09/09/20
NARCOOSSEE - W0220 Total	4	1537	$ 258,476	$ 5,600	07/22/20	08/19/20
RIO PINAR - W0972 Total	5	1732	$ 323,095	$ 7,000	05/27/20	06/17/20
RIO PINAR - W0973 Total	4	1532	$ 258,476	$ 5,600	06/24/20	09/16/20
RIO PINAR - W0975 Total	5	2306	$ 323,095	$ 7,000	06/17/20	08/24/20
BARNUM CITY - K1503 Total	2	2063	$ 80,000	$ 1,628	11/04/19	04/13/20
CHAMPIONS GATE - K1762 Total	1	2346	$ 64,619	$ 1,400	12/27/19	01/08/20
BARNUM CITY - K1763 Total	3	1677	$ 120,000	$ 2,442	11/11/19	04/24/20
BARNUM CITY - K3360 Total	1	2465	$ 64,619	$ 1,400	12/02/19	04/13/20
BARNUM CITY - K3362 Total	4	2338	$ 160,000	$ 3,256	04/13/20	05/15/20
INTERCESSION CITY - K967 Total	1	1398	$ 64,619	$ 1,400	12/30/19	04/09/20
ZELLWOOD - M33 Total	5	1226	$ 323,095	$ 7,000	06/09/20	06/23/20
KELLY PARK - M34 Total	3	1567	$ 169,238	$ 3,614	06/25/20	07/21/20
KELLY PARK - M821 Total	3	1338	$ 144,619	$ 3,028	06/30/20	07/14/20
LAKE PLACID - K1066 Total	5	1411	$ 323,095	$ 7,000	05/19/20	06/04/20
LAKE PLACID - K1320 Total	4	2243	$ 258,476	$ 5,600	05/05/20	07/16/20
FISHEATING CREEK - K1560 Total	8	2473	$ 516,952	$ 11,200	05/01/20	07/21/20
LAKE PLACID NORTH - K27 Total	4	563	$ 258,476	$ 5,600	04/30/20	07/02/20
LAKE PLACID - K757 Total	5	920	$ 323,095	$ 7,000	04/16/20	05/07/20
LAKE PLACID - K758 Total	3	1362	$ 193,857	$ 4,200	06/09/20	07/07/20
SUNFLOWER - W0470 Total	6	2096	$ 264,619	$ 5,470	10/01/20	11/04/20
SUNFLOWER - W0473 Total	5	1653	$ 200,000	$ 4,070	10/22/20	11/13/20
SUNFLOWER - W0474 Total	6	2126	$ 264,619	$ 5,470	10/06/20	12/02/20
BITHLO - W0953 Total	6	2354	$ 338,476	$ 7,228	10/08/20	12/09/20
BITHLO - W0954 Total	5	1805	$ 224,619	$ 4,656	10/22/20	12/18/20
ALAFAYA - W0298 Total	1	1667	$ 64,619	$ 1,400	10/08/20	10/14/20
EAST ORANGE - W0250 Total	1	1886	$ 64,619	$ 1,400	04/13/20	04/17/20
EAST ORANGE - W0255 Total	2	974	$ 104,619	$ 2,214	11/11/19	04/06/20
MEADOW WOODS SOUTH - K1775 Total	4	1325	$ 258,476	$ 5,600	07/02/20	07/21/20
MEADOW WOODS SOUTH - K1789 Total	1	336	$ 40,000	$ 814	07/23/20	07/29/20
HUNTERS CREEK - K42 Total	8	2131	$ 467,714	$ 10,028	06/11/20	09/02/20
HUNTERS CREEK - K45 Total	8	2501	$ 320,000	$ 6,512	07/09/20	10/15/20
HUNTERS CREEK - K51 Total	5	2035	$ 224,619	$ 4,656	07/06/20	10/01/20
SHINGLE CREEK - K861 Total	4	1383	$ 233,857	$ 5,014	06/25/20	08/06/20
WINDERMERE - K302 Total	1	1187	$ 64,619	$ 1,400	06/18/20	06/18/20
WINDERMERE - K303 Total	6	1938	$ 387,714	$ 8,400	06/23/20	07/30/20

BAY HILL - K68 Total	8	1826	$	516,952	$ 11,200	06/02/20	07/23/20
OCOEE - M1090 Total	5	2276	$	323,095	$ 7,000	05/26/20	08/11/20
WOODSMERE - M255 Total	4	1147	$	258,476	$ 5,600	05/28/20	08/13/20
OKAHUMPKA - K285 Total	4	1686	$	258,476	$ 5,600	03/25/20	05/13/20
OKAHUMPKA - K565 Total	2	1300	$	129,238	$ 2,800	03/04/20	04/08/20
Frostproof - K101 Total	1	2647	$	64,619	$ 1,400	09/16/20	09/16/20
FROSTPROOF - K102 Total	6	1966	$	387,714	$ 8,400	08/05/20	09/09/20
FROSTPROOF - K104 Total	2	1440	$	129,238	$ 2,800	07/22/20	07/29/20
TAUNTON ROAD - K1081 Total	2	1395	$	129,238	$ 2,800	06/03/20	06/10/20
AVON PARK NORTH - K891 Total	4	1921	$	258,476	$ 5,600	06/17/20	07/15/20
AVON PARK NORTH - K892 Total	1	356	$	64,619	$ 1,400	06/24/20	06/24/20
ORANGEWOOD - K226 Total	5	1922	$	323,095	$ 7,000	10/07/20	12/02/20
SHINGLE CREEK - K858 Total	5	1809	$	298,476	$ 6,414	12/10/20	12/16/20
SOPCHOPPY - N327 Total	1	1463	$	64,619	$ 1,400	07/07/20	07/07/20
CRYSTAL RIVER SOUTH - A158 Total	1	1401	$	64,619	$ 1,400	01/01/20	01/16/20
TROPIC TERRACE - A207 Total	1	1414	$	64,619	$ 1,400	04/14/20	04/14/20
HOMOSASSA - A272 Total	2	1545	$	129,238	$ 2,800	01/16/20	01/22/20
CRAWFORDVILLE - N35 Total	6	1190	$	387,714	$ 8,400	06/15/20	07/02/20
CRAWFORDVILLE - N36 Total	3	1182	$	193,857	$ 4,200	06/17/20	06/22/20
REDDICK - A35 Total	4	569	$	258,476	$ 5,600	04/09/20	05/12/20
REDDICK - A36 Total	3	1166	$	193,857	$ 4,200	04/14/20	05/07/20
MCINTOSH - A50 Total	2	836	$	129,238	$ 2,800	04/23/20	05/05/20
MCINTOSH - A51 Total	3	1315	$	193,857	$ 4,200	04/28/20	05/14/20
PORT RICHEY WEST - C208 Total	6	2163	$	387,714	$ 8,400	10/08/20	11/03/20
PORT RICHEY WEST - C210 Total	5	2355	$	323,095	$ 7,000	08/20/20	12/08/20
FLORA MAR - C4001 Total	8	2268	$	516,952	$ 11,200	08/18/20	12/17/20
FLORA MAR - C4002 Total	6	2310	$	387,714	$ 8,400	09/08/20	11/12/20
FLORA MAR - C4003 Total	6	2380	$	387,714	$ 8,400	09/01/20	10/01/20
FLORA MAR - C4006 Total	5	2932	$	323,095	$ 7,000	08/13/20	09/10/20
ELFERS - C952 Total	2	2187	$	129,238	$ 2,800	08/24/20	10/06/20
BAYBORO - X16 Total	6	2782	$	387,714	$ 8,400	04/07/20	05/06/20
BAYBORO - X21 Total	8	2565	$	516,952	$ 11,200	03/03/20	04/29/20
SIXTEENTH STREET - X43 Total	3	1253	$	193,857	$ 4,200	02/20/20	04/07/20
SIXTEENTH STREET - X46 Total	3	2389	$	193,857	$ 4,200	03/10/20	04/30/20
BAYBORO - X9 Total	5	2257	$	323,095	$ 7,000	04/02/20	04/23/20
DUNEDIN - C103 Total	4	3052	$	258,476	$ 5,600	01/30/20	06/11/20
DUNEDIN - C104 Total	5	2127	$	323,095	$ 7,000	01/29/20	07/16/20
DUNEDIN - C108 Total	4	2279	$	258,476	$ 5,600	01/22/20	06/09/20
CURLEW (HD) - C4988 Total	4	1708	$	258,476	$ 5,600	01/29/20	06/16/20

PALM HARBOR - C753 Total	5	2129	$	323,095	$ 7,000	06/04/20	06/30/20
PALM HARBOR - C755 Total	7	2597	$	452,333	$ 9,800	06/09/20	07/14/20
EAST CLEARWATER - C907 Total	4	2824	$	258,476	$ 5,600	06/04/20	07/09/20
HIGHLANDS - C2802 Total	3	2209	$	193,857	$ 4,200	05/12/20	07/30/20
HIGHLANDS - C2803 Total	4	2595	$	258,476	$ 5,600	06/04/20	07/23/20
HIGHLANDS - C2804 Total	4	2011	$	258,476	$ 5,600	05/05/20	05/28/20
HIGHLANDS - C2805 Total	5	2835	$	323,095	$ 7,000	06/09/20	07/28/20
HIGHLANDS - C2807 Total	4	1953	$	258,476	$ 5,600	05/07/20	07/02/20
HIGHLANDS - C2808 Total	1	549	$	64,619	$ 1,400	05/14/20	05/14/20
EAST CLEARWATER - C908 Total	6	2984	$	387,714	$ 8,400	06/02/20	08/04/20
FLORA MAR - C4000 Total	5	2095	$	323,095	$ 7,000	05/20/20	08/20/20
FLORA MAR - C4007 Total	3	1886	$	193,857	$ 4,200	05/13/20	07/28/20
FLORA MAR - C4009 Total	4	1913	$	258,476	$ 5,600	05/18/20	07/21/20
SEVEN SPRINGS - C4501 Total	5	2402	$	323,095	$ 7,000	05/19/20	08/13/20
SEVEN SPRINGS - C4508 Total	5	3479	$	323,095	$ 7,000	07/16/20	08/18/20
ELFERS - C950 Total	2	1961	$	129,238	$ 2,800	05/15/20	05/21/20
PASADENA - X211 Total	9	3359	$	556,952	$ 12,014	09/03/20	10/01/20
PASADENA - X213 Total	5	1926	$	298,476	$ 6,414	07/09/20	10/08/20
Pasadena - X214 Total	8	2987	$	467,714	$ 10,028	07/21/20	09/17/20
Pasadena - X217 Total	4	891	$	258,476	$ 5,600	10/13/20	11/10/20
PASADENA - X219 Total	4	2104	$	258,476	$ 5,600	07/16/20	09/01/20
Pasadena - X220 Total	2	2146	$	129,238	$ 2,800	10/22/20	11/05/20
THIRTY SECOND STREET - X30 Total	1	3019	$	64,619	$ 1,400	05/12/20	05/18/20
BELLVIEW - A12 Total	1	579	$	64,619	$ 1,400	07/09/20	07/09/20
ORANGE BLOSSOM - A392 Total	1	1668	$	64,619	$ 1,400	10/07/19	01/29/20
EAGLES NEST - A224 Total	4	1589	$	258,476	$ 5,600	04/14/20	05/07/20
LADY LAKE - A244 Total	5	2466	$	323,095	$ 7,000	04/21/20	05/21/20
CURRY FORD - W0596 Total	5	1605	$	298,476	$ 6,414	10/08/20	12/15/20
RIO PINAR - W0974 Total	7	2504	$	378,476	$ 8,042	10/13/20	12/08/20
ARBUCKLE CREEK - K1361 Total	2	1161	$	129,238	$ 2,800	11/05/20	11/17/20
DESOTO CITY - K3220 Total	5	1370	$	323,095	$ 7,000	10/01/20	11/19/20
DESOTO CITY - K3222 Total	1	482	$	64,619	$ 1,400	10/06/20	10/06/20
SEBRING EAST - K541 Total	5	589	$	323,095	$ 7,000	10/13/20	11/12/20
SEBRING EAST - K542 Total	3	104	$	193,857	$ 4,200	10/20/20	11/12/20
BOGGY MARSH - K958 Total	6	2799	$	313,857	$ 6,642	09/15/20	10/20/20
BOGGY MARSH - K961 Total	6	1994	$	313,857	$ 6,642	09/22/20	10/22/20
UCF NORTH - W0994 Total	3	1368	$	193,857	$ 4,200	10/15/20	11/04/20
ALAFAYA - W0289 Total	3	1898	$	144,619	$ 3,028	10/22/20	10/08/20
ALAFAYA - W0298 Total	6	1667	$	255,488	$ 6,449	11/05/20	12/02/20

IV. Submersible Underground

The Submersible Underground activity targets underground facilities that are prone to storm surge and use the current Duke Energy Florida storm surge standards. These standards include the use of specialized stainless-steel equipment and submersible connections.

These activities reduce outage frequencies for lines exposed to flooding or storm surge and includes conversion of existing underground lines to submersible lines to reduce susceptibility to flooding and storm surge.

The scope of work includes replacing any live-front equipment (e.g. switchgear, transformers) with dead-front equipment, including sealed connections on the secondary and services (no exposed bus bars). In some instances, the pad mounted equipment is placed on elevated structures – raising the equipment 2-4 feet above grade – to mitigate potential flood impacts.

Historical Reliability and Prioritization

This project was selected based on historical storm surge events, and the likelihood of future similar conditions.

3-Year Scope

The chart below outlines the 3-Year Scope in Duke Energy Florida:

	DEF		
Submersible Underground*	**2020**	**2021**	**2022**
Totals	$ 265,000	$ -	
Capital	$ 265,000	$ -	
O&M	$ -	$ -	
Total Units	24	0	

**Beginning in 2022, these activities will be incorporated into the Underground Flood Mitigation Program*

2020 Planned Duke Energy Florida – Submersible Underground

Location	Unit Count	Customer Count	Project Cost - Capital	Project Cost - O&M	Start Date	Finish Date
Tropic Terrace A207	24	183	$ 265,000	0	2/1/2020	3/31/2020

V. Pole Replacement and Inspection

In accordance with FPSC Order No. PSC-06-0144-PAA-EI, Duke Energy Florida's distribution department inspects company-owned wood poles on an average 8-year cycle. These inspections determine the extent of pole decay and any associated loss of strength.

The information gathered from these inspections is used to determine pole replacements and to effectuate the extension of pole life through treatment and reinforcement. Additionally, groundline reject information collected from the wood pole inspections is used to populate regulatory reporting requirements, provide data for loading analyses, identify other equipment maintenance issues, and track the results of the inspection activities over time.

If the pole is found to be sound (top and bottom) then it is treated at the ground level to discourage future rot. If it is deemed solid at the top but below acceptable limits at the ground level, then a steel brace is attached to the pole to provide structural stability.

If the pole fails both top and bottom criteria or beyond what a brace can support, then it is reported for replacement. The new poles meet or exceed the strength requirements of the NESC.

Historical Reliability and Prioritization

Pole inspections and replacement benefit the entire distribution system. The Wood Pole Inspection activities check the integrity of the wood poles in the distribution system, and the replacements are prioritized to ensure that the poles that do not pass the inspection are replaced.

3-Year Scope

The chart below outlines the 3-Year Scope in Duke Energy Florida:

	DEF		
Pole Replacement*	**2020**	**2021**	**2022**
Totals	$ 23,618,098	$ 22,608,270	
Capital	$ 22,072,989	$ 21,063,160	
O&M	$ 1,545,109	$ 1,545,110	
Total Units	2,668	2,650	

	DEF		
Pole Inspection*	**2020**	**2021**	**2022**
Totals	$ 4,000,000	$ 4,000,000	
Capital	$ -	$ -	
O&M	$ 4,000,000	$ 4,000,000	
Total Units	100,772	100,000	

**Beginning in 2022 these activities will be incorporated into the Feeder and Lateral Hardening Programs*

2020 Planned Duke Energy Florida – Pole Replacement

Location	Unit Count	Customer Count	Project Cost - Capital	Project Cost - O&M	Start Date	Finish Date
Apopka	5	105668	$40,677.95	$2,847.46	1/1/2020	5/31/2020
Deland	15	85601	$122,033.85	$8,542.37	1/1/2020	12/31/2020
Jamestown	14	138613	$113,898.26	$7,972.88	1/1/2020	12/31/2020
Longwood	25	92030	$203,389.75	$14,237.28	1/1/2020	12/31/2020
Inverness	85	79397	$691,525.15	$48,406.76	1/1/2020	12/31/2020
Monticello	7	58417	$56,949.13	$3,986.44	1/1/2020	7/31/2020
Ocala	40	80509	$325,423.60	$22,779.65	1/1/2020	12/31/2020
Clearwater	122	161275	$992,541.98	$69,477.94	1/1/2020	12/31/2020
Seven Springs	74	187524	$602,033.66	$42,142.36	1/1/2020	12/31/2020
St Pete	98	176058	$797,287.82	$55,810.15	1/1/2020	12/31/2020
Walsingham	86	156443	$699,660.74	$48,976.25	1/1/2020	12/31/2020
Zephyrhills	12	27764	$97,627.08	$6,833.90	1/1/2020	12/31/2020
Buena Vista	11	135224	$89,491.49	$6,264.40	1/1/2020	11/30/2020
Clermont	9	37129	$73,220.31	$5,125.42	1/1/2020	9/30/2020
Highlands	19	57450	$154,576.21	$10,820.33	1/1/2020	12/31/2020
Lake Wales	30	114912	$244,067.70	$17,084.74	1/1/2020	12/31/2020
SE Orlando	71	94574	$577,626.89	$40,433.88	1/1/2020	12/31/2020
Winter Garden	44	85734	$357,965.96	$25,057.62	1/1/2020	12/31/2020
Apopka	4	105668	$33,315.08	$2,332.06	1/1/2020	12/31/2020
Deland	219	85601	$1,824,000.63	$127,680.04	1/1/2020	12/31/2020
Jamestown	161	138613	$1,340,931.97	$93,865.24	1/1/2020	12/31/2020
Longwood	105	92030	$874,520.85	$61,216.46	1/1/2020	12/31/2020
Inverness	194	79397	$1,615,781.38	$113,104.70	1/1/2020	12/31/2020
Monticello	38	58417	$316,493.26	$22,154.53	1/1/2020	12/31/2020
Ocala	98	80509	$816,219.46	$57,135.36	1/1/2020	12/31/2020
Clearwater	104	161275	$866,192.08	$60,633.45	1/1/2020	12/31/2020
Seven Springs	87	187524	$724,602.99	$50,722.21	1/1/2020	12/31/2020
St Pete	384	176058	$3,198,247.68	$223,877.34	1/1/2020	12/31/2020
Walsingham	91	156443	$757,918.07	$53,054.26	1/1/2020	12/31/2020
Zephyrhills	0	27764	$0.00	$0.00	1/1/2020	12/31/2020
Buena Vista	33	135224	$274,849.41	$19,239.46	1/1/2020	12/31/2020
Clermont	11	37129	$91,616.47	$6,413.15	1/1/2020	12/31/2020
Highlands	60	57450	$499,726.20	$34,980.83	1/1/2020	12/31/2020
Lake Wales	124	114912	$1,032,767.48	$72,293.72	1/1/2020	12/31/2020
SE Orlando	141	94574	$1,174,356.57	$82,204.96	1/1/2020	12/31/2020
Winter Garden	47	85734	$391,452.19	$27,401.65	1/1/2020	12/31/2020

2020 Planned Duke Energy Florida –Pole Inspection

Location	Unit Count	Customer Count	Start Date	Finish Date
Jamestown	29,224	138,613	2/10/2020	12/31/2020
Longwood	13,100	92,030	2/10/2020	12/31/2020
Inverness	15,116	79,397	2/10/2020	12/31/2020
Ocala	504	80,509	2/10/2020	12/31/2020
Clearwater	8,062	161,275	2/10/2020	12/31/2020
Seven Springs	15,116	187,524	2/10/2020	12/31/2020
SE Orlando	19,650	94,574	2/10/2020	12/31/2020

**Note - The total inspection cost for 2020 is $4M O&M*

VI. Vegetation Management – Distribution

The Duke Energy Florida distribution Integrated Vegetation Management (IVM) Program ensures the safe and reliable operation of the distribution system by minimizing vegetation-related interruptions and ensuring adequate conductor-to-vegetation clearances, while maintaining compliance with regulatory, environmental, and safety requirements or standards.

The program activities focus on the removal and/or control of incompatible vegetation within and along the right of way to minimize the risk of vegetation-related outages. The IVM program consists of the following: routine maintenance "trimming", hazard tree removal, herbicide applications, vine removal, customer requested work, and right-of-way brush "mowing" where applicable. The IVM program incorporates a combination of both cycle-based maintenance and reliability-driven prioritization of work to reduce event possibilities during extreme weather events.

Duke Energy's distribution organization has proudly been recognized as a Tree Line USA utility for the past 14 years. There are no expected changes to the distribution vegetation program, and the program remains the same as previous storm hardening filings.

Duke Energy Florida Distribution will continue a fully IVM program focused on trimming feeders and laterals on an average 3- and 5-year cycles respectively. This corresponds to approximately 1,930 miles of feeder backbone and 2,455 miles of laterals to be trimmed annually. The circuit maintenance work performed in Florida is predominantly billed under a unit-based contract structure and not differentiated between Labor and Equipment. The estimated contractor ratio is 95%. The estimated utility personnel ratio is 5%.

2020 -2022 Labor / Equipment Breakout		
	Labor	Equipment
Utility Personnel Totals	$ 6,557,823	$ 202,819
Capital	$ 1,132,128	$ 35,014
O&M	$ 5,425,695	$ 167,805
Contract Personnel Totals	$ 97,703,126	$ 32,187,368
Capital	$ 3,092,319	$ 1,030,773
O&M	$ 94,610,807	$ 31,156,595

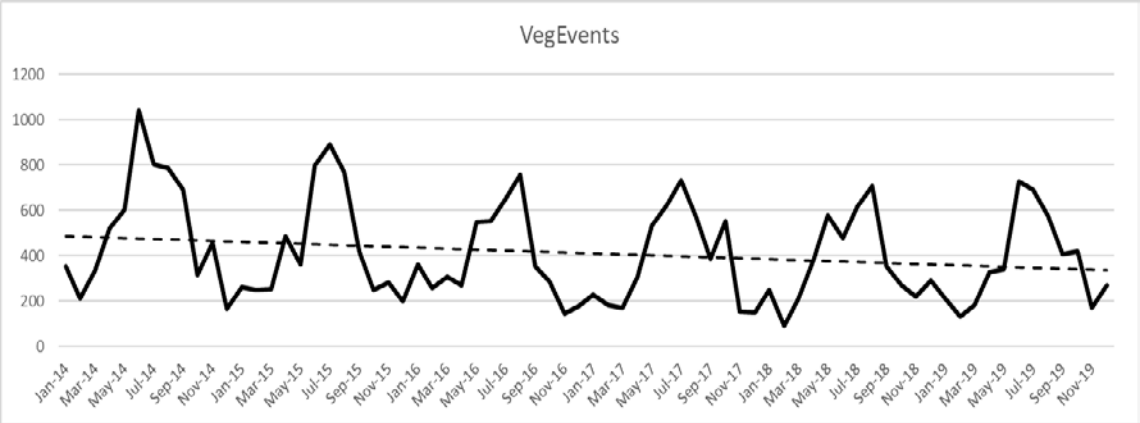
Historical Reliability and Prioritization

The chart below depicts the historical reliability activity for the vegetation management program. It demonstrates the value of consistent vegetation management in reducing outage events.

As part of the IVM program, Duke Energy uses a comprehensive circuit prioritization model to ensure that tree-caused outages are minimized by focusing on the feeders and or laterals that rate high in the model. Prioritization ranking factors are based on past feeder or lateral performance and probable future performance.

Criteria used to prioritize include tree-caused outages in prior years, outages per vegetated mile, and total tree customer minutes of interruption. Utilizing this prioritized process, Duke Energy Florida follows the ANSI 300 standard for pruning and the guide "Pruning Trees Near Electric Utility Lines" by Dr. Alex L. Shigo.

Vegetation Events 2014-2019



3-Year Scope

The chart below outlines the 3-Year Scope in Duke Energy Florida:

	DEF		
VM - Distribution*	**2020**	**2021**	**2022**
Totals	$ 46,398,605	$ 44,477,139	$ 45,775,391
Capital	$ 1,499,298	$ 1,867,457	$ 1,923,480
O&M	$ 44,899,307	$ 42,609,682	$ 43,851,911
Approximate Miles	5,209	4,383	4,383

**Costs for 2021 and 2022 are based on an average of 1/3 of feeder mileage and 1/5 of lateral mileage being patrolled and remediated.*

Transmission

Florida

Project-Level Detail

VII. Pole Replacement

The Pole Replacement activities are based on field inspections of the poles on a regular schedule. The transmission department inspects company-owned wood poles on an average 4-year cycle and non-wood poles such as steel, towers, and concrete are visually inspected on an average 6-year cycle. In addition to the 4-year inspection, there is an average 8-year cycle of sound and bore inspection performed on the wood poles. These inspections determine the extent of pole decay and any associated loss of strength.

The information gathered from these inspections is used to determine pole replacements and to effectuate the extension of pole life through treatment. Additionally, information collected from the wood pole inspections is used to populate regulatory reporting requirements and identify other equipment maintenance issues.

Historical Reliability and Prioritization

These activities strengthen structures by eliminating damage from woodpeckers and wood rot. Wood pole failure has been the predominate structure damage to the transmission system during extreme weather. The new structures will be more resistant to damage from extreme weather events. Other related hardware upgrades will occur simultaneously, such as insulators, crossarms, switches, and guys. In 2020, Duke Energy Florida will continue to replace prioritized poles from inspections across its service territory. DEF Transmission prioritizes poles that need to be corrected based upon the inspection results and their status.

3-Year Scope

The chart below outlines the 3-Year Scope in Duke Energy Florida:

	DEF		
Pole Replacement*	**2020**	**2021**	**2022**
Totals	$ 34,285,154	$ 33,838,208	
Capital	$ 33,000,000	$ 33,000,000	
O&M	$ 1,285,154	$ 838,208	
Total Units	642	339	

**Beginning in 2021, the Structure Hardening Program will include a portion of the Pole Replacement activities. Beginning in 2022, these activities will be fully incorporated into the Structure Hardening Program.*

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Duke Energy Florida, LLC
Witness: Oliver
Exhibit No. ___(JWO-1)
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2020 Planned Duke Energy Florida – Pole Replacement

Location	Unit Count	Customer Count	Project Cost - Capital	Project Cost - O&M	Start Date	Finish Date
(AL-1) - Avon Park North - Frostproof	1	7189	$ 29,419	$ 556	4/29/2020	5/27/2020
(ASL-2) Douglas Ave. - Spring Lake	1	4618	$ 136,786	$ 2,377	1/28/2020	2/28/2020
(AUCF-1) - Alafaya - UCF	45	6033	$ 2,212,210	$ 113,566	5/4/2020	7/3/2020
(AW-1) - Archer - Williston	23	1473	$ 733,092	$ 16,091	2/8/2020	4/10/2020
(BBW-1) - Brookridge - Brooksville West CKT # 1	12	26226	$ 389,707	$ 19,686	2/10/2020	3/6/2020
(BCF-3) - Brooksville - Bushnell East	3	2356	$ 197,392	$ 10,424	5/11/2020	5/15/2020
(BF-1) Barcola - Ft Meade	4	70	$ 111,948	$ 2,226	10/5/2020	10/9/2020
(BHV-1)Bay Hill-Vineland	13	11268	$ 621,159	$ 31,235	6/1/2020	6/30/2020
(BWR-1) - Brooksville West - Hudson	19	0	$ 654,092	$ 30,985	3/2/2020	3/27/2020
(BZ-1) - Brooksville - Union Hall	15	0	$ 749,449	$ 38,952	4/6/2020	5/4/2020
(CEB-2) - Boggy Marsh - Lake Louisa (SEC)	60	10293	$ 3,633,459	$ 212,905	3/16/2020	7/31/2020
(CEB-3)Lake Louisa SEC - Clermont East	21	10293	$ 726,386	$ 50,112	2/3/2020	3/13/2020
(CP-2) Florida Gas Transmission - Perry	12	3562	$ 389,004	$ 9,969	1/27/2020	3/21/2020
(CPS-1) - Crawfordville - Port St Joe	7	2560	$ 308,447	$ 7,187	8/24/2020	9/18/2020
(DB-2) - Monticello - Boston (Ga Pwr)	1	0	$ 140,814	$ 3,848	6/15/2020	6/20/2020
(DLW-1) Disston - Starkey Road	3	13637	$ 227,967	$ 15,789	1/27/2020	1/30/2020
(DLW-3) Oakhurst-Walsingham	4	20746	$ 189,532	$ 9,510	5/18/2020	5/22/2020
(DLW-4) SeminoleOakhurst	7	16520	$ 336,821	$ 16,971	5/22/2020	6/5/2020
(DLW-6) - Ulmerton West - Walsingham	2	20746	$ 159,707	$ 7,886	2/17/2020	2/21/2020
(DWB-1) - Barberville - Deland West	9	3180	$ 474,829	$ 11,591	3/16/2020	4/4/2020
(FH-1) - Ft White - High Springs	19	2866	$ 670,636	$ 13,865	9/7/2020	10/22/2020
(FTO-3) De-energized Line	1	0	$ 47,379	$ 2,377	6/1/2020	6/30/2020
(GH-1) - High Springs - Hull Road	1	0	$ 21,664	$ 556	2/2/2020	2/3/2020
(HB-3) - Holder - Inverness	19	7302	$ 559,241	$ 10,573	6/15/2020	7/13/2020
(HBH-1) - Beverly Hills - Holder	9	6996	$ 264,911	$ 5,008	7/27/2020	8/20/2020
(HCL-1) Clearwater-Highlands	1	15408	$ 25,808	$ 1,068	1/28/2020	1/30/2020
(IS-1) - Chiefland - Inglis	20	1346	$ 697,100	$ 14,421	7/13/2020	8/6/2020
(JQ-2) - Bradfordville West - Drifton	24	10378	$ 757,665	$ 16,647	3/23/2020	5/9/2020
(JQ-4) - Drifton - Hanson	8	5409	$ 346,795	$ 7,743	5/18/2020	6/5/2020
(JW2) - Jasper -homerville (Ga Pwr)	2	0	$ 172,494	$ 4,404	5/11/2020	5/16/2020
(KZN) Kathleen-Zephyrhills North 230kV	5	11885	$ 329,957	$ 19,142	3/2/2020	3/13/2020
(LWC-1) - Lake Wales - Citrusville	1	4	$ 140,814	$ 3,848	8/3/2020	8/6/2020
(NT-1) - Newberry - Trenton	75	1328	$ 3,539,155	$ 181,596	4/1/2020	10/1/2020
(OCF-1) - Silver Springs - Silver Springs Shores	26	5399	$ 702,328	$ 15,025	1/22/2020	3/2/2020
(PF-1) Pasadena - 51st St	1	16213	$ 99,095	$ 5,669	9/7/2020	9/10/2020
(QX-1) - Atwater - Quincy	9	0	$ 376,306	$ 8,300	7/20/2020	8/13/2020
(SES-1) - Eustis South - Sorrento	26	8514	$ 876,458	$ 17,760	4/13/2020	6/5/2020
(SF-2) Suwannee River Pl - Ft White	9	5409	$ 376,306	$ 8,300	5/25/2020	6/13/2020
(WO-6) North Longwood-Winter Springs	2	14246	$ 96,481	$ 4,865	6/1/2020	6/30/2020
(WP-2) Apopka South-Woodsmere	5	11300	$ 238,628	$ 11,997	6/1/2020	6/30/2020
(WR-4) Conway-Pinecastle	1	5722	$ 49,108	$ 2,487	6/1/2020	6/30/2020
(JH-3) Liberty - Hosford (TEC) Radial	2	1203	$ 170,211	$ 4,404	7/6/2020	7/11/2020
(DWD-1) Davenport - West Davenport Radial	10	9677	$ 294,297	$ 5,565	6/15/2020	7/10/2020
(FSD-1) - Ft Green Springs - Duette (PREC) Radial	18	880	$ 637,923	$ 13,308	4/13/2020	5/22/2020
(FSM-1) - Ft Meade - Sand Mountain Radial	7	178	$ 215,921	$ 3,895	5/25/2020	6/12/2020
Arbuckle Creek Tap	5	1066	$ 683,490	$ 18,628	8/3/2020	8/21/2020
Crooked Lake Tap	11	1943	$ 1,487,556	$ 40,982	8/24/2020	10/2/2020
Desoto City Tap	17	2907	$ 2,300,229	$ 63,335	3/1/2020	4/3/2020
Leisure Lakes Tap	5	1955	$ 683,490	$ 18,628	7/13/2020	7/21/2020
Pembroke Tap	1	20	$ 136,604	$ 3,339	3/2/2020	3/5/2020
(HC-1) - Hanson - Cherry Lake (TREC) Radial	6	1591	$ 176,584	$ 11,638	6/22/2020	6/27/2020
Blair Tap (SVEC)	11	1502	$ 1,598,936	$ 44,273	4/13/2020	5/8/2020
Miccosukee Tap (TEC)	1	3684	$ 248,042	$ 7,017	10/4/2020	10/9/2020
Blichton Tap (SEC)	22	2586	$ 1,556,170	$ 82,621	8/3/2020	8/28/2020

VIII. Pole/Tower Inspections

The Pole/Tower Inspection activities are for transmission system poles and towers. The Tower and Pole Inspection activities in Duke Energy Florida's Storm Hardening Program included ground-line inspection and treatment activities. The wood and non-wood pole inspections are reported in our Annual Reliability Report as well as in the Storm Hardening Plan filing.

Historical Reliability and Prioritization

These inspections determine the extent of pole decay and any associated loss of strength. The information gathered from these inspections is used to determine pole replacements and extend pole life through treatment. In 2020, Duke Energy Florida will continue to inspect company-owned wood poles on an average 4-year cycle and non-wood poles on an average 6-year cycle.

3-Year Scope

The chart below outlines the 3-Year Scope in Duke Energy Florida:

	DEF		
Pole/Tower Inspections*	2020	2021	2022
Totals	$ 400,000	$ 400,000	
Capital	$ -	$ -	
O&M	$ 400,000	$ 400,000	
Total Units	10,959	12,000	

**Beginning in 2022, these activities will be incorporated into the Structure Hardening Program.*

2020 Planned Duke Energy Florida – Pole/Tower Inspections

Location	Unit Count	Customer Count	Start Date	Finish Date
Bell Tap (CFEC)	105	3034	3/16/2020	6/30/2020
New River Tap (WREC)	1	5041	3/16/2020	6/30/2020
(DLM-LMP-1-2) - Dundee - Lake Marion	1	7307	3/16/2020	6/30/2020
(BCF-3) - Brooksville - Bushnell East	1	136	3/16/2020	6/30/2020
Alachua Tap (CEC)	5	4135	3/16/2020	6/30/2020
Archer Tap (CEC)	4	3736	3/16/2020	6/30/2020
Brooksville Rock Tap	1	1	3/16/2020	6/30/2020
Camps Section Seven Tap	1	1	3/16/2020	6/30/2020
Croom Tap (WREC)	1	136	3/16/2020	6/30/2020
Foley Tap	1	2	3/16/2020	6/30/2020
Havana Tap (TEC)	1	2535	3/16/2020	6/30/2020
Lakewood Tap	29	6880	3/16/2020	6/30/2020
Leisure Lakes Tap	1	2503	3/16/2020	6/30/2020
Mcintosh Tap	45	2800	3/16/2020	6/30/2020
Otter Creek Tap (CFEC)	1	558	3/16/2020	6/30/2020
Point Milligan Tap (TEC)	7	2064	3/16/2020	6/30/2020
Webster Tap (SEC)	118	2621	3/16/2020	6/30/2020
Weeki Wachee Tap (WREC)	1	10184	3/16/2020	6/30/2020
White Springs Tap	1	1006	3/16/2020	6/30/2020
Winter Garden Citrus Tap	1	1	3/16/2020	6/30/2020
(BWR-HPNR-2) Hudson-New Port Richey	65	6226	3/16/2020	6/30/2020
(CFO-4) - Dallas - Silver Springs	63	3341	3/16/2020	6/30/2020
(FO-4) - Dearmin - Silver Springs	1	4413	3/16/2020	6/30/2020
(ICBL-1) - Intercession City PI - Bonnet Creek	21	3230	3/16/2020	6/30/2020
(IS-3) - Ginnie - High Springs	41	2866	3/16/2020	6/30/2020
(RW-5) - Florida Gas Transmission East - Magnolia Ranch	43	6293	3/16/2020	6/30/2020
(AD-1) - Avon Park PI - Desoto City	260	2202	3/16/2020	6/30/2020
(ALP-2) - Fisheating Creek - Lake Placid	80	6018	3/16/2020	6/30/2020
(AOGX-1) - Atwater - Oak Grove (TEC)	6	938	3/16/2020	6/30/2020
(APW-1) - Avon Park PI - Wauchula	296	10,704	3/16/2020	6/30/2020
(BCF-2) - Central Fla - Coleman	107	2356	3/16/2020	6/30/2020
(BFE-1) - Bayboro - 16th St	54	14490	3/16/2020	6/30/2020
(BFR-1) - Brooksville - Florida Rock Radial	185	3	3/16/2020	6/30/2020
(BL-1) - Central Fla - Leesburg (BL)	87	4104	3/16/2020	6/30/2020
(BWKX-1) - Bradfordville West - Killearn (TEC) Radial	14	5844	3/16/2020	6/30/2020
(CET-1) - Avalon - Clermont East	112	33136	3/16/2020	6/30/2020
(CF-1) - Crystal River PI - Bronson - Crew88	470	2678	3/16/2020	6/30/2020
(CFLE-1) - Central Fla - Leesburg (CFLE)	122	4104	3/16/2020	6/30/2020
(CLC-1) - Camp Lake - Clermont	135	10470	3/16/2020	6/30/2020
(CLC-2) - Clermont - Clermont East	59	10470	3/16/2020	6/30/2020
(CLL-2) - Leesburg - Okahumpka	103	4104	3/16/2020	6/30/2020

(CLL-3) - Howey SEC - Okahumpka	182	4104	3/16/2020	6/30/2020
(CRB-4) - Crystal River South - Twin County Ranch	32	4578	3/16/2020	6/30/2020
(CS-1) - Crawfordville - St Marks	159	1942	3/16/2020	6/30/2020
(DA-1) - Altamonte - Sanford	65	11644	3/16/2020	6/30/2020
(DA-2) - Debary PI - Sanford (FPL)	39	1	3/16/2020	6/30/2020
(DB-3) - Monticello - Monticello (TREC) Radial	5	933	3/16/2020	6/30/2020
(DDW-2) - Deland West - Orange City	79	7746	3/16/2020	6/30/2020
(DLL-1) - Dallas - Orange Blossom	46	9300	3/16/2020	6/30/2020
(DLP-1) - Desoto City - Lake Placid North	166	1543	3/16/2020	6/30/2020
(DLW-1) - Disston - Starkey Road	74	13637	3/16/2020	6/30/2020
(DLW-4) - Oakhurst - Walsingham	50	16520	3/16/2020	6/30/2020
(DLW-6) - Umerton West - Walsingham	76	20746	3/16/2020	6/30/2020
(DR-1) - Dunnellon Town - Rainbow Lk Est (SEC) Radial	142	3555	3/16/2020	6/30/2020
(DWS-1) - Debary PI - Lake Emma	117	6844	3/16/2020	6/30/2020
(ELCX-1) - Enola - Lake Cogen	1	1	3/16/2020	6/30/2020
(EU-1) - Eustis - Umatilla	104	4336	3/16/2020	6/30/2020
(FFG-1) - Ft Green Springs - Ft Meade	336	880	3/16/2020	6/30/2020
(FTR-2) - Bithlo - UCF	61	6033	3/16/2020	6/30/2020
(FTR-3) - Rio Pinar PI - East Orange	111	13770	3/16/2020	6/30/2020
(FV-1) - Ft Meade - Vandolah	312	3559	3/16/2020	6/30/2020
(FWL-1) - Ft Meade - West Lake Wales	256	1063	3/16/2020	6/30/2020
(GBC-1) - Carrabelle - Gumbay	217	2394	3/16/2020	6/30/2020
(GH-1) - High Springs - Hull Road	315	5134	3/16/2020	6/30/2020
(HB-2) - Brooksville - Inverness - Crew74	97	7302	3/16/2020	6/30/2020
(HCR-HT-1) - Crystal River South - Homosassa Radial (Tropic Terrace No)	193	2767	3/16/2020	6/30/2020
(HDU-1) - Dunnellon Town - Holder	142	5372	3/16/2020	6/30/2020
(ICB-1) - Barnum City - Westridge	97	9347	3/16/2020	6/30/2020
(ICB-2) - Boggy Marsh - Westridge	64	9347	3/16/2020	6/30/2020
(ICLB-1) - Celebration - World Gateway	25	696	3/16/2020	6/30/2020
(ICLW-6) - Davenport - Haines City	197	12139	3/16/2020	6/30/2020
(IS-4) - Ginnie - Trenton	240	1328	3/16/2020	6/30/2020
(IT-CKT1) - Crystal River East - Inglis CKT #1	50	1346	3/16/2020	6/30/2020
(JW2) - Jasper -homerville (Ga Pwr)	96	1	3/16/2020	6/30/2020
(KWX-1) - Kathleen - West Sub (City Of Lakeland)	254	1	3/16/2020	6/30/2020
(LBV-1) - Lake Bryan - Disney World Lake Buena Vista	84	1	3/16/2020	6/30/2020
(LECW-3) - Clearwater - East Clearwater	81	19962	3/16/2020	6/30/2020
(LV-1) - Lake Bryan - Vineland	87	11268	3/16/2020	6/30/2020
(MSH-1) - Meadow Woods South - Hunters Creek	59	13410	3/16/2020	6/30/2020
(NR-2) - North Longwood - Winter Springs	7	14246	3/16/2020	6/30/2020
(OCC-1) - Clarcona - Ocoee	105	13138	3/16/2020	6/30/2020
(OD-1) - Deland East - Orange City	175	9628	3/16/2020	6/30/2020
(OLR-1) - Okahumpka - Lake County RR	35	1	3/16/2020	6/30/2020

(OSC-1) - Orangewood - Shingle Creek	55	8071	3/16/2020	6/30/2020
(PAX-1) - Parkway - Orlando Cogen Ltd	8	1	3/16/2020	6/30/2020
(PDL-1) - Dinner Lake - Phillips	162	11451	3/16/2020	6/30/2020
(PP-1) - Piedmont - Plymouth	185	3807	3/16/2020	6/30/2020
(PSJF-1) - Port St Joe - Fla Coast Paper Co Radial	39	0	3/16/2020	6/30/2020
(RW-4) - Rio Pinar PI - Florida Gas Transmission East	138	1	3/16/2020	6/30/2020
(SLE-1) - Eatonville - Spring Lake	78	12607	3/16/2020	6/30/2020
(SLX-1) - Sky Lake - Southwood (OUC)	63	1	3/16/2020	6/30/2020
(SSC-1) - Occ Swift Creek #1 - Suwannee River	432	1	3/16/2020	6/30/2020
(TMS-2) - Meadwds South - Taft	105	1983	3/16/2020	6/30/2020
(TZ-2) - Odessa - Tarpon Springs	188	11861	3/16/2020	6/30/2020
(TZ-6) - Denham - Odessa	83	11861	3/16/2020	6/30/2020
(VFG-1) - Ft Green Springs - Vandolah CKT #1	113	1	3/16/2020	6/30/2020
(VHC-1) - Vandolah - Murphy Road (PREC) Radial	91	2679	3/16/2020	6/30/2020
(VW-1) - Vandolah - Wauchula	155	6940	3/16/2020	6/30/2020
(WCC-1) - Cross City - Wilcox	162	973	3/16/2020	6/30/2020
(WCE-1) - Montverde - Winter Garden	116	12825	3/16/2020	6/30/2020
(WCE-3) - Ocoee - Woodsmere	90	13138	3/16/2020	6/30/2020
(WEWC-1) - West Chapman Radial - Winter Park East	98	5801	3/16/2020	6/30/2020
(WF-1) - UCF - Winter Park East	167	6033	3/16/2020	6/30/2020
(WIW-1) - Windermere - Woodsmere	76	6854	3/16/2020	6/30/2020
(WLLW-1) - Lake Wales - West Lake Wales CKT #1	78	7851	3/16/2020	6/30/2020
(WP-1) - Apopka South - Plymouth	33	3807	3/16/2020	6/30/2020
(WP-2) - Apopka South - Woodsmere	155	11300	3/16/2020	6/30/2020
(LSP-UL-1) - Largo - Seminole	66	19045	3/16/2020	6/30/2020
(SSB-2) - Maricamp - Silver Springs	37	8556	3/16/2020	6/30/2020
(UL-1) - Largo - Ulmerton	28	5132	3/16/2020	6/30/2020
(CLT-1) - Brookridge - Lake Tarpon	150	93312	3/16/2020	6/30/2020
(CC-LTL-1) - Lake Tarpon - Palm Harbor	58	9629	3/16/2020	6/30/2020
(CC-NC-1) - Lake Tarpon - Ulmerton	67	5132	3/16/2020	6/30/2020

**Note – the total inspection cost for 2020 is $400K O&M.*

IX. Tower Replacements

This activity focuses on the replacement of towers identified through enhanced engineering inspections of similar towers in age and vicinity as the towers that failed during Hurricane Irma. Beginning in 2021, the Tower Replacements activities will replace lattice towers as identified by ground and drone inspections as well as data from the cathodic protection installations.

Historical Reliability and Prioritization

These activities strengthen towers by eliminating damage from corrosion. The focus is on the replacement of towers identified through enhanced engineering inspections of similar towers in age and vicinity as the towers that failed during Hurricane Irma. The new towers will be more resistant to damage from extreme weather events. In 2020, Duke Energy Florida will continue to prioritize the replacement of towers of similar age and vicinity as the tower failure during Hurricane Irma.

3-Year Scope

The chart below outlines the 3-Year Scope in Duke Energy Florida:

	DEF		
Tower Replacements*	2020	2021	2022
Totals	$ 806,721	$ 1,008,250	
Capital	$ 802,221	$ 1,000,000	
O&M	$ 4,500	$ 8,250	
Total Units	2	3	

**Beginning in 2021, the Structure Hardening Program will include a portion of Tower Replacement activities. Beginning in 2022, these activities will be fully incorporated into the Structure Hardening Program.*

2020 Planned Duke Energy Florida – Tower Replacements

Location	Unit Count	Customer Count	Project Cost - Capital	Project Cost - O&M	Start Date	Finish Date
LINE HIGGINS PL - BROOKER CREEK115KV, HTE-2,LINE 115.0 KV	2	9,189	$ 802,221	$ 4,500	4/6/2020	5/1/2020

X. Overhead Ground Wires (OHGW)

The Overhead Ground Wires (OHGW) activities target lines to improve the lightning protection and address standards gaps.

The OHGW replacements are reported on our Annual Reliability Report.

Historical Reliability and Prioritization

Florida is known for a high concentration of lightning events, which continually stress the existing grid protection. Deteriorated OHGW reduces the protection of the conductor and exposes the line to repeated lightning damage and risk of failure impacting both the transmission system and associated distribution underbuilds. In 2020 and 2021, Duke Energy Florida will continue to prioritize by targeting the replacement of deteriorated OHGW on known lines with frequency and density of lightning events, outage history, structure design types, OHGW material, and inspection results of each line.

3-Year Scope

The chart below outlines the 3-Year Scope in Duke Energy Florida:

	DEF		
Overhead Ground Wires (OHGW)*	2020	2021	2022
Totals	$ 1,817,267	$ 1,534,884	
Capital	$ 1,817,267	$ 1,500,000	
O&M	$ -	$ 34,884	
Total Units	3	14	

**Beginning in 2022, these activities will be incorporated into the Structure Hardening Program*

2020 Planned Duke Energy Florida – Overhead Ground Wires (OHGW)

Location	Unit Count	Customer Count	Project Cost - Capital	Project Cost - O&M	Start Date	Finish Date
AL-165 to AL-188 (1.25Mi)	1.35	7851	$ 744,502	0	5/4/2020	5/29/2020
VHC-40-68 to 40-84 (1.7Mi)	1.7	2679	$ 213,560	0	7/6/2020	7/24/2020
VHC-83 to 88 (.25Mi)	0.25	2679	$ 859,205	0	7/27/2020	8/21/2020

XI. Substation Hardening

The Substation Hardening Program is a combination of the replacement of breakers and electro-mechanical relays. The breaker activity replaces oil circuit breakers with state-of-the-art gas and vacuum breakers. Existing vintage oil breakers are unreliable when isolating line faults and are contributing to increased customer outages.

The replacement of electro-mechanical relays with electronic relays is designed to support rapid restoration. Modern relay design with communications capabilities and microprocessor technology enables quicker recovery from events than the design of the existing electromechanical relays.

Historical Reliability and Prioritization

Oil circuit breakers are more unreliable than gas or vacuum breakers, especially in circumstances where they are operating numerous times over a short period, such as during extreme weather events. When oil circuit breakers are repeatedly called to operate, they generate arcing gasses within the oil tank that can accumulate and result in catastrophic failure. Existing vintage oil breakers are less reliable when isolating line faults and are contributing to increased and longer customer outages when there is a failure.

The Electronic Relay upgrades eliminate noncommunicating electromechanical and solid-state relays with digital relays. Upgrading to modern relay designs with communication capabilities and microprocessor technologies will enable quicker restoration from outage events. Another benefit is increased overall system intelligence, which will improve restoration planning. One digital relay replaces a variety of legacy single-function electromechanical relays. Two-way communications and event recording capabilities allow them to provide device performance information following a system event to support continuous system design and operational improvements.

In 2020 and 2021, Duke Energy Florida will prioritize substation hardening with the recommendations from SME analysis of breaker health, customer impacts, outage data and field expertise to set priorities for replacement of both oil Transmission and Distribution breakers. Relay upgrades will be matched with the breaker replacements when feasible. Recommendations for relay replacements will also include SME analysis of relay outages, customer impacts, operational impacts and field expertise.

3-Year Scope

The chart below outlines the 3-Year Scope in Duke Energy Florida:

	DEF		
Substation Hardening	**2020**	**2021**	**2022**
Totals	$ 5,004,000	$ 5,500,000	$ 7,500,000
Capital	$ 5,004,000	$ 5,500,000	$ 7,500,000
O&M	$ -	$ -	$ -
Total Units	26	29	39

2020 Planned Duke Energy Florida– Substation Hardening

Location	Unit Count	Customer Count	Project Cost - Capital	Project Cost - O&M	Start Date	Finish Date
Fortieth Street	2	8467	$ 468,000	$ -	7/5/2018	1/22/2020
Idylwild	10	12589	$ 1,980,000	$ -	3/1/2018	4/9/2020
UCF	4	6003	$ 936,000	$ -	9/11/2018	5/8/2020
Casselberry	8	19139	$ 1,512,000	$ -	9/4/2018	7/9/2020
Welch Road	2	10171	$ 108,000	$ -	7/27/2018	12/21/2020

XII. Vegetation Management – Transmission

Duke Energy Florida's transmission Integrated Vegetation Management (IVM) program is focused on safe and reliable operation of the transmission system by minimizing vegetation-related interruptions and ensuring adequate conductor-to-vegetation clearances, while maintaining compliance with regulatory, environmental, and safety requirements or standards. The program activities focus on the removal and/or control of incompatible vegetation within and along the right of way to minimize the risk of vegetation-related outages and ensure necessary access within all transmission line corridors. The IVM program consists of the following programs: planned threat and condition-based maintenance, including danger tree identification and mitigation; reactive work that includes hazard tree mitigation; and brush management (herbicide, mowing, and hand cutting operation).

Historical Reliability and Prioritization

Transmission utilizes LIDAR to generate a threat/condition-based Vegetation Management plan. NERC lines (200kV and above) are flown every year. A fourth of Non-NERC lines are currently flown each year. After 4 years all will be flown. Threat triggers target clearing for 6+ years of growth. The LIDAR program targets the entire Transmission system of approximately 5200 miles. The data is utilized to calculate and model risks which allows the focus of work performed to produce sustainable, reliable results for the transmission grid from vegetation. The estimated contractor ratio is 91.5%. The estimated utility personnel ratio is 8.5%.

2020 -2022 Labor / Equipment Breakout		
	Labor	Equipment
Utility Personnel Totals	$ 4,010,124	$ 167,089
Capital	$ 1,965,352	$ 66,835
O&M	$ 2,044,773	$ 100,253
Contract Personnel Totals	$ 30,545,624	$ 14,374,411
Capital	$ 15,159,336	$ 7,133,805
O&M	$ 15,386,288	$ 7,240,606

3-Year Scope

The chart below outlines the 3-Year Scope in Duke Energy Florida:

	DEF		
VM - Transmission	2020	2021	2022
Totals	$ 12,522,040	$ 17,228,315	$ 19,346,891
Capital	$ 4,469,073	$ 8,995,999	$ 10,860,255
O&M	$ 8,052,967	$ 8,232,316	$ 8,486,636
Approximate Miles	398	404	404

A Chronology of Major Events Affecting the National Flood Insurance Program

December 2005

Completed for the Federal Emergency Management Agency Under Contract Number 282-98-0029

The American Institutes for Research
The Pacific Institute for Research and Evaluation
Deloitte & Touche LLP

Acronyms
CRS
FEMA
FHBM
FIA
FIMA
FIRM
FY
GAO
NFIP
PL
SFHA
TVA
USGS
WYO

Community Rating System
Federal Emergency Management Agency
Flood Hazard Boundary Map
Federal Insurance Administration
Flood Insurance and Mitigation Administration
Flood Insurance Rate Map
Fiscal year
General Accounting Office
National Flood Insurance Program
Public Law
Special Flood Hazard Area
Tennessee Valley Authority
United States Geological Survey
Write Your Own

Please inform Marion Chastain (mchastain@air.org) of all errors and significant omissions.

Date

1824

In Gibbons v. Ogden, the U.S. Supreme Court construes the Constitution's commerce clause (Article I, Section 8) to permit the federal government to finance and construct river improvements. Within two months, Congress appropriates funds and authorizes the Corps of Engineers to remove certain navigation obstructions from the Ohio and Mississippi Rivers.

1849-50

The Swamp Land Acts of 1849 and 1850 transfer swamp and overflow land from federal control to most state governments along the lower Mississippi River on the condition that the states use revenue from the land sales to build levees and drainage channels. The Acts require no federal funds.

1853

Charles S. Ellet, Jr., a leading civil engineer, produces a congressionally man-

dated report on the Ohio and Mississippi Rivers, insisting that the flood problem is growing as cultivation increases. He suggests enlarging natural river outlets, constructing higher and stronger levees, and building a system of headwaters reservoirs on the Mississippi River and its tributaries. Most engineers of the period disagree.

1861

In a Report upon the Physics and Hydraulics of the Mississippi River, Captain Andrew A. Humphreys, Corps of Topographical Engineers, and Lieutenant Henry L. Abbott support the completion of the existing levee system and exclude alternative flood controls, partly for economic reasons. The emphasis on levees represents the primary focus of U.S. policy on flood control well into the 20th century.

1866

Captain Humphreys becomes Chief of Engineers of the U.S. Army and labors to quash opposition to the “levees-only” policy he advocates.

1879

Congress creates the Mississippi River Commission and gives it authority to survey the Mississippi and its tributaries, formulate plans for navigation and flood control, and report on the practicability and costs of the various alternative courses of action.

By 1890

The entire 700-mile, lower Mississippi Valley, from St. Louis to the Gulf of Mexico, is divided into state and locally organized levee districts.

1891

W. J. McGee, in “The Floodplains of Rivers,” published in Forum, XI, states that “as population has increased, men have not only failed to devise means for suppressing or for escaping this evil [flood], but have a singular shortsightedness, rushed into its chosen paths.”

1913

A flood in the Ohio River Valley kills 415 people and causes about $200 million in property loss. The flood spurs public interest in flood control, leading to the creation of basin-wide levee associations and other lobbying groups.

1916

The U.S. House of Representatives’ Committee on Flood Control is created. The committee becomes a forum for congressional proponents of flood control.

1917

A Flood Control Act (PL 64-367) is approved. Congress appropriates $45 million for a long-range and comprehensive program of flood control for the lower Mississippi and Sacramento Rivers. In doing so, Congress accepts federal responsibility for flood control. The Act includes a requirement for local financial contributions in flood-control legislation and authorizes the Corps of Engineers to undertake examinations and surveys for flood-control improvements and to provide information regarding the relation of flood control to navigation, waterpower, and other uses. The Act establishes important precedents and frameworks for the Flood Control Act of 1936 (see 7/1936).

1927

The Great Mississippi River Flood shows the limits of Humphreys’ “levees-

only" policy. The death toll is 246 but may have reached 500, more than 700,000 people are homeless, 150 Red Cross camps care for more than 325,000 refugees, and property damage exceeds $236 million. Nearly 13 million acres of land are flooded.

5/1928

Through a new Flood Control Act (PL 70-391), Congress adopts a flood-control plan that abandons the levees-only approach. The Act commits the federal government to pay for the construction of protective measures. The non-federal contribution is to provide rights-of-ways for the levees along the main stem. Levee districts and state governments will maintain the levees. Expenditures of $325 million are authorized.

1929

The private insurance industry abandons the coverage of flood losses.

5/1933

Congress creates the Tennessee Valley Authority (TVA)through PL 73-17 as a government corporation armed with the power to plan, build, and operate multipurpose development projects for water resources within the 40,000 square miles of the Tennessee River basin.

1933

In response to a major earthquake in California, and contrary to past traditions, Congress enacts legislation to provide direct assistance to private citizens suffering disaster damage by issuing federal loans through the Reconstruction Finance Corporation.

4/1934

In response to several disasters that befell communities in disparate parts of the country, Congress enacts PL 73-160, which makes $5 million in loans available to victims of all natural disasters, including floods.

7/1936

The Flood Control Act of 1936 (PL 74-738) provides for the construction of approximately 250 projects using funds for work relief. Congress appropriates $310 million to initiate construction and $10 million to complete examinations and surveys. The Act establishes a two-pronged attack on the problem of reducing flood damages: the Department of Agriculture will develop plans to reduce runoff and retain more rainfall and the Corps of Engineers will develop engineering plans for downstream projects. The Act represents the initial development of a national flood-control program.

1938

Harlan H. Barrows, one of 12 members on the Water Resources Committee (WRC), submits a report to the WRC President, expressing his views that good planning requires linking land and water use. A report submitted by the Ohio-Lower Mississippi Regulation Subcommittee, which Barrows chairs, states that, "if it would cost more to build reservoir storage than to prevent floodplain encroachment, all relevant factors considered, the latter procedure would appear to be the best solution."

1938

President Franklin Roosevelt forwards to the Water Resources Committee a Corps of Engineers' document calling for the construction of 81 reservoirs in the Ohio and Mississippi River basins. Barrows expresses concern that further studies are needed. The need for more studies temporarily ends further con-

struction proposals.

1942

Gilbert White finishes Human Adjustment to Floods: A Geographic Approach to the Flood Problem in the United States. He advocates, “adjusting human occupancy to the floodplain, and at the same time, of applying feasible and practicable measures for minimizing the detrimental impacts of floods.” He characterizes the prevailing national policy as “essentially one of protecting the occupants of floodplains against floods, of aiding them when they suffer flood losses, and of encouraging more intensive use of floodplains.”

9/1950

The Disaster Relief Act of 1950 (PL 81-875) provides “an orderly and continuing means of assistance by the Federal Government to States and local governments in carrying out their responsibilities to alleviate suffering and damage resulting from major disasters,” including floods. State governments must formally request the president to declare a major disaster. If granted, the federal government will then provide disaster assistance “to supplement the efforts and available resources of states and local governments in alleviating the disaster.” The law creates the first permanent system for disaster relief without the need for congressional action.

1950

An internal report from the TVA, Major Flood Problems in the Tennessee River Basin, notes that many communities have flood problems but because of insufficient development in flood-prone areas, flood-control projects cannot be justified. Gordon Clapp, Chairman of the TVA’s Board, responds, “What should TVA do, wait for development of the floodplains so that a flood control project could be justified?” He recommends circulating the report to solicit other reactions, particularly from the Division of Regional Studies.

After reviewing the report, Aldred J. Gray, director of the Division of Regional Studies, and a proponent of White’s concepts, proposes a different approach to the problem. TVA and state representatives will join in a technical appraisal of the possible application of flood data to planning programs. The joint appraisal will include research into the types and forms of flood information needed by state and local planning programs and how such data can be applied to community planning, land-use controls, and capital improvement programs. During its early work in this area, TVA coins the term “floodplain management.”

8/1951

Following massive flooding in Kansas and Missouri that causes more than $870 million in damage, President Harry Truman recommends the creation of a “national system of flood disaster insurance, similar to the war damage insurance of World War II.” In Truman’s words: “The lack of a national system of flood disaster insurance is now a major gap in the means by which a man can make his home, his farm, or his business secure against events beyond his control.” Truman proposes a system of flood insurance based on private insurance with re-insurance by the federal government.

1/1952

President Truman calls for the enactment of legislation to establish a federal flood insurance program and recommends that $50 million be appropriated to create a flood insurance fund.

5/1952

President Truman submits proposed legislation to Congress to establish a national system of flood-disaster insurance. The proposed legislation would establish a maximum amount of insurance of $25,000; establish rates to cover all

expenses, including a proper reserve for losses; and authorize federal agencies that make or guarantee loans to require borrowers to purchase flood insurance where it is available.

1953

The TVA embarks on a pioneering cooperative program to tackle local flood problems. In cooperation with each of the states in the Tennessee River's watershed, they prepare an initial list of 150 communities with significant flood problems and agree on an order for undertaking studies to identify flood hazards. Communities having the most urgent need can request a study of their flood problems from the TVA, which will fund the process. This offer, however, does not meet universal acceptance.

Circumstances surrounding these studies significantly retard the early progress of TVA's assistance program for floodplain management. To solve this impasse, two hypothetical floods are computed: the "maximum probable" and the "regional." The TVA uses the maximum probable flood to design flood-control works. This leads to development of a model by the TVA's engineers that is large enough to use in planning and that state planners believe to be fair and reasonable. The model is based on actual flood occurrences near the studied streams. The TVA's flood-hazard information reports developed during this period do not change substantially until the mid-1970s.

8/1954

The Watershed Protection and Flood Prevention Act (PL 83-566) authorizes flood-protection structures in upstream watersheds (defined as smaller than 250,000 acres). The Act also authorizes the U.S. Department of Agriculture's Soil Conservation Service (now the Natural Resources Conservation Service) to participate in comprehensive watershed management projects in cooperation with states and their subdivisions.

1954

Walter B. Langbein, an employee of the U.S. Geological Survey (USGS), designs a report format consisting of a map with pertinent text in the margins. This report becomes the Hydrologic Investigations Atlas No. 1 (HA-1). This successful format is often repeated in following years.

6/1955

PL 84-71, the Coastal and Tidal Areas – Survey – Damages Act, requires the Corps of Engineers to conduct a study of the behavior and frequency of hurricanes on the eastern and southern coasts and to assess "possible means of preventing loss of human lives and damages to property…."

1955

William G. Hoyt and Walter B. Langbein, two noted hydrologists, endorse White's concepts in their book, Floods, which traces the evolution of public flood-control policies, describes current problems, and suggests desirable changes. White characterizes their work as the first to synthesize the scientific information about floods.

1/1956

In a budget message to Congress, President Dwight Eisenhower recommends legislation to establish, on an experimental basis, an "indemnity and reinsurance program, under which the financial burden resulting from flood damage would be carried jointly by the individuals protected, the States, and the Federal Government." He requests $100 million to start the program.

8/1956

The Federal Flood Insurance Act of 1956 (PL 84-1016) directs the Housing and Home Finance Agency to establish a program of federal insurance and re-insurance against the risks of losses resulting from floods and tidal disasters. The program is intended to provide up to $10,000 in insurance per dwelling and to encourage private companies to provide coverage for risks above that amount. The cost of coverage for policyholders will be the same regardless of their location.

9/1956

The Housing and Home Finance Agency creates the Federal Flood Indemnity Administration to carry out tasks set forth in the Federal Flood Insurance Act of 1956.

1956

A study for the American Insurance Association on floods and flood losses strengthens insurers' conviction that flood insurance is not commercially fea-sible.

6/1957

In the absence of technical studies to determine the costs of starting a federal program for flood insurance, Congress does not appropriate any funds for the Federal Flood Indemnity Administration. As a consequence, the administration ceases to exist.

11/1958

A study by Gilbert White and his colleagues, Changes in Urban Occupancy of Flood Plains in the United States, reveals what had happened during the previ-ous two decades. With land-use pressures and few incentives to stay out of po-tential flood zones, occupancy in these zones is increasing, even in urban areas where population is declining. Federal incentives are creating a new perception that if a serious flood hazard develops, the federal government will deal with it.

11/1958

In Regulating Flood Plain Development, Francis C. Murphy notes that no more than eight communities had enacted floodplain zoning before 1955. By 1958, 49 communities had ordinances. To convince others of the need for more regulations, he argues that regulating development on the floodplain is a nec-essary and practicable way to reduce the drain of both floods and protective measures on the national economy. He observes that governments are reluctant to enact land-use management practices because they have no flood maps or other data that indicate the extent and character of local flooding.

12/1958

The growing loss of property and the cost of flood damage from several major hurricanes and floods convinces the Council of State Governments to recom-mend that one federal agency be directed by Congress to cooperate with other federal agencies and state governments to prepare reports providing data on the magnitude and frequency of floods in flood-prone areas.

1958

By this time, only seven states have enacted and are enforcing floodplain man-agement regulations, principally for narrow-channel encroachment areas.

1958

The Corps of Engineers prepares draft legislation providing for the systematic collection and dissemination of flood data as a new Corps' mission.

8/1959

The TVA submits a report to Congress proposing a program to reduce damages associated with floods (A Program for Reducing the National Flood Damage Potential: Memorandum of the Chairman to Members of the Committee on Public Works, U.S. Senate, 86th Cong., 1st Sess., 31 Aug. 1959). In its letter of transmittal, the TVA states that it "believes that local communities have the responsibility to guide their growth so that their future development will be kept out of the path of floodwaters. With the States and communities of the Tennessee Valley, TVA has developed a means of putting this proposition into action." Floodplain management formally enters the federal agenda with the report's submission.

1959

Floods at Topeka, Kansas (HA-14) is published, the first in a series flood atlases.

1959

The USGS adopts flood-inundation maps as a means to depict information about floods. Publishing such maps, which delineate boundaries of inundated areas, provide profiles of water surfaces, and show flood-frequency relations, becomes a standard means of reporting about floods.

7/1960

Amendments to the Flood Control Act contained in PL 86-645 authorize the Corps of Engineers to compile and disseminate information on floods and flood damages at the request of a state or responsible local agency. As a result of the Act, the Corps of Engineers establishes a Flood Plain Management Service and thus promotes the use of nonstructural measures for dealing with floods.

1960

John R. Sheaffer publishes the first comprehensive study on floodproofing, Flood Proofing: An Element in a Flood Damage Reduction Program.

1/1961

The U.S. Senate's Select Committee on National Water Resources issues a report on floodplain management. The report becomes the means through which the concepts of floodplain management are officially recommended. The report calls for major efforts in five categories. Among these are recommendations that the federal government delineate flood-hazard areas and encourage enactment of land-use regulations for floodplains.

1961

A flood atlas, Floods at Boulder, Colorado (HA-41), summarizes the results of a study of Boulder Creek in which areas inundated by floods of several frequencies were constructed synthetically from past records and physical surveys of the floodplain.

1962

The State of Washington enacts a law that provides for the establishment of flood-control zones when data are available.

8/1964

Following the "Good Friday" earthquake and subsequent seismic waves in Alaska in March, Congress ushers in the direct subsidy, or grant, as a federal

disaster relief policy through PL 88-451 (the 1964 Amendments to the Alaska Omnibus Act).

1964

Gilbert White's Choice of Adjustment to Floods, based on a field study in La-Follette, Tennessee, analyzes existing methods and practices and addresses alternative means of dealing with flood problems by occupants, communities, and federal agencies. His study aids the ongoing discussions and debates concerning the paths that should be taken and the ways of canvassing the whole range of alternatives for achieving desirable land use.

7/1965

The Water Resources Planning Act of 1965 (PL 89-90) creates the Water Resources Council (WRC), an independent agency composed of the secretaries of federal agencies with responsibilities for water resource management. Its purpose will be to study, coordinate, and review water and related land resource requirements, policies, and plans.

11/1965

The Southeast Hurricane Disaster Relief Act (PL 89-339) is passed in response to Hurricane Betsy and other hurricanes, which devastated the south in 1963 and 1964. The Act mandates the Secretary of the Department of Housing and Urban Development to "undertake an immediate study of alternative programs which could be established to help provide financial assistance to those suffering property losses in floods and other natural disasters, including alternative methods of Federal disaster insurance…."

1965

The TVA has prepared 92 reports on floodplains covering 112 communities. Forty-three of these communities have officially adopted floodplain regulations in their zoning ordinances, subdivision regulations, or both.

1965

California encourages "local levels of government to plan land use regulations to accomplish floodplain management and to provide state assistance and guidance as appropriate."

1965

The Bureau of the Budget's Task Force on Federal Flood Control Policy is established. It represents a significant step toward a unified federal policy for managing the nation's floodplains.

1965

The National Association of Insurance Commissioners' Flood and Hurricane Committee and National All-Industry Flood Insurance Committee are created.

8/1966

The Task Force on Federal Flood Control Policy, with Gilbert White as chair, issues A Unified National Program for Managing Flood Losses (U.S. House of Representatives, House Document 465, 89th Cong., 2nd Sess.). The report examines ways in which the federal government can decrease flood losses without large expenditures for flood control. It is supportive of state and local regulation of the use of lands exposed to flood hazard.

Concluding that federally subsidized insurance will provide an important incentive to local communities to participate in a flood insurance program, the report recommends a system of structural and nonstructural approaches to

flood control. In addition, the report recommends that a practicable national program of flood insurance be established and calls for an integrated program to manage losses from floods that would involve federal, state, and local governments and the private sector. The report also recommends a limited, experimental test of a national flood insurance program before nationwide implementation. The report warns, however, that "if misapplied an insurance program could aggravate rather than ameliorate the flood program." The report estimates that subsidies for existing high-risk properties will be required for approximately 25 years.

8/1966

Executive Order No. 11296, Evaluation of Flood Hazard in Locating Federally Owned or Financed Buildings, Roads, and Other Facilities, and in Disposing of Federal Lands and Properties, is issued. It directs federal agencies to provide leadership in encouraging an effort to prevent unnecessary use of the country's floodplains and to lessen the risk of flood losses; evaluate flood hazards; and develop procedures to ensure that flood-hazard evaluations are conducted before initiating federally financed or supported actions in floodplains.

8/1966

President Lyndon Johnson submits to Congress a feasibility study of a flood insurance program conducted by the Secretary of the Department of Housing and Urban Development and mandated by the Southeast Hurricane Disaster Relief Act (see 11/1965). The study, Insurance and Other Programs for Financial Assistance to Flood Victims, concludes that flood insurance is feasible and will promote the public interest. Flood insurance is viewed both as a means to help individuals bear the risks of flood damage and, equally, as a means to discourage unwise occupancy of floodplains. The report envisions a program of essentially private character but with continued large-scale participation of the federal government. The approach recommended would include subsidies of premiums for existing properties in high-risk areas. To encourage widespread purchase of flood insurance, the report further recommends that all "lending institutions entrusted with savings or deposits and under any form of Federal supervision…shall require in high-risk areas flood insurance at unsubsidized rates on all new mortgages based on new residences…."

1966

New Jersey authorizes a state agency to delineate and mark flood-hazard areas to identify reasonable and proper use of these areas according to their relative flood risk and to develop and disseminate other information on floodplains.

1966

Wisconsin enacts a comprehensive act providing for the adoption of a reasonable and effective zoning ordinance for floodplains by every county, city, and village before January 1, 1968.

5/1967

The Corps of Engineers publishes Guidelines for Reducing Flood Damages.

6/1967

The USGS publishes a 19-volume study of the magnitude and frequency of floods in the United States.

7/1967

Representatives of 26 federal agencies adopt a draft of Proposed Flood Hazard Evaluation Guidelines for Federal Executive Agencies. These guidelines deal with methodologies and standards to be used in developing information about flood hazards, including delineation of the floodplain, elevations that floods of

various magnitudes would reach, flood velocities, and the probability of floods of various magnitudes. Use of the 100-year flood as the base standard is first advocated. After receiving these guidelines, the Bureau of Budget asks the Water Resources Council to conduct a more detailed review, revise where appropriate, and issue the Guidelines (see 9/1969).

12/1967

The Water Resources Council (WRC) publishes Bulletin No. 15, A Uniform Technique for Determining Flood Flow Frequencies, a study prepared by its Hydrology Committee to determine the best methods to analyze the frequency of floods. The WRC adopts the techniques presented in the bulletin for use in all federal planning involving water and related land resources and recommends their use by state and local governments and private organizations.

8/1968

The Corps of Engineers, which has been mapping and identifying flood-prone areas since 1962, estimates that there are about 5,000 flood-prone communities in the United States.

8/1968

The National Flood Insurance Act of 1968 (Title XII of the Housing and Urban Development Act of 1968 [PL 90-448]) creates the National Flood Insurance Program (NFIP) and the Federal Insurance Administration (FIA) within the Department of Housing and Urban Development to provide flood insurance in communities that voluntarily adopt and enforce floodplain management ordinances by June 30, 1970, that meet minimum NFIP requirements.

Residents will be eligible for flood insurance after the NFIP identifies local flood-hazard areas and establishes actuarial rates. Occupants of structures in floodplains will have their premiums subsidized. Structures built in floodplains after the Act’s passage will pay actuarially based premiums.

Section 1360 of the 1968 Act authorizes the Secretary of the Department of Housing and Urban Development to consult with, receive information from, and enter into any agreements or other arrangements with heads of other federal departments or enter into contracts with any persons or private firms in order that he may identify and publish information with respect to all floodplain areas, including coastal areas located in the United States that have special flood hazards, within five years following the date of the Act’s approval.

Section 1361 authorizes the NFIP to develop criteria that states and communities can apply to deter development in flood-prone areas.

The Act also requires that flood-risk zones be established in all flood-prone areas and that rates of probable flood-caused losses be estimated for the various flood-risk zones for each of these areas within 15 years (i.e., by August 1,1983) following enactment.

Section 1302 (c) requires that “the objectives of a flood insurance program should be integrally related to a unified national program for floodplain management,” and directs that “… the President should transmit to Congress for its consideration any further proposals for such a unified program.” The Bureau of the Budget assigns responsibility to prepare such a proposal to the Water Resources Council.

Section 1314 denies disaster relief to persons who could have purchased flood insurance for a year or more and did not do so.

The Act creates the National Flood Insurance Fund in the Department of the Treasury. Premiums from the sales of flood insurance will be deposited into the fund, and losses, operating costs, and administrative expenses are paid out of the fund, which will operate without fiscal-year limitations. The NFIP is

authorized to borrow up to $1 billion from the Department of the Treasury to cover losses that exceeds the program's revenues. Presidential approval is required for loans exceeding $500 million.

8/1968

PL 90-448, the Urban Property Protection and Reinsurance Act of 1968 (part of the Housing and Urban Development Act of 1968), establishes the position of Federal Insurance Administrator within the Department of Housing and Urban Development.

12/1968

The Secretary of the Department of Housing and Urban Development delegates authority for administering the NFIP to FIA.

12/1968

The industry's flood insurance pool, the National Flood Insurers Association (NFIA), authorized in accordance with sections 1331 and 1332 of the National Flood Insurance Act, is created. Administered by the Insurance Services Office, membership in the NFIA is open to all qualified companies licensed to write property insurance under the laws of any state. The companies will sell and service policies written as part of the NFIP.

1968

The USGS begins to outline approximate floodplain boundaries on topographic maps. The USGS agrees to assist FIA in its mapping efforts by preparing detailed flood insurance studies, restudies, and limited detailed studies (completed when comprehensive studies cannot be justified).

1968

The Corps of Engineers creates a Floodplain Management Services Branch in the Planning Division of the Office of Chief of Engineers.

1/1969

The National Flood Insurance Program begins its operations.

2/1969

HUD's Federal Insurance Administration (FIA) publishes a proposed rule containing the first floodplain management criteria for the NFIP. The proposed rule does not mention the 100-year flood standard or any other flood standard.

5/1969

George K. Bernstein becomes the first Federal Insurance Administrator.

6/1969

The Final Rule regarding floodplain management criteria defines special flood hazard areas as the 100-year floodplain for mapping purposes. Communities are required to "take into account the relation between first floor elevations and the anticipated level of the 100-year flood" in developing floodplain management measures.

6/1969

The Department of Housing and Urban Development and the National Flood Insurers Association (NFIA) sign an agreement for the marketing of flood insurance policies and the adjustment of claims. Under the agreement, the NFIA will appoint a servicing company, generally on a statewide basis, to dissemi-

nate information on the insurance aspects of the program both to the public and to insurance agents, to process all insurance policies, and to handle the adjustment of claims for loss payments.

The first flood insurance policies are sold.

6-8/1969

The first communities joining the NFIP become eligible for participation using data from the USGS and Corps of Engineers. Metairie, Louisiana, and Fairbanks, Alaska, enter the NFIP on June 25. Alexandria, Virginia, enters on August 22 with Flood Insurance Rate Maps (FIRMs) based on Corps of Engineers' Floodplain Information Reports. Biloxi, Mississippi, and other communities along the Mississippi River become eligible for program participation at the end of 1969 with studies using data from the USGS. A FIRM is an official map of a community on which both the special hazard areas and the risk premium zones applicable to the community are delineated.

8/1969

Hurricane Camille strikes the Gulf Coast. In parts of Mississippi, water is 24 feet above the normal high tide. More than 250 people die because of the storm, which one retrospective analysis suggests may be "the most significant economic weather event in the world's history." No communities that suffer from flooding are covered by the NFIP.

8/1969

Congress approves the National Environmental Policy Act (NEPA) (PL 91-190), which declares environmental quality as a national goal and establishes a procedure to assess the environmental impacts of proposed federal projects and programs that could significantly affect the environment. NEPA lays the legislative and administrative foundation for evaluating environmental resources associated with river corridors and coastal zones.

9/1969

The Water Resources Council publishes a revised version of Flood Hazard Evaluation Guidelines for Federal Executive Agencies for federal agencies, states, and consultants to review through experimental use. The revised guidelines define the floodway as that portion of the floodplain needed to accommodate passage of the 1-percent annual chance flood without increasing the level of the flood by more than one foot.

12/1969

Section 408 of the Housing and Urban Development Act of 1969 (PL 91-152) provides for an "emergency program" (in contrast to the original or "regular" program) whereby limited amounts of subsidized insurance can be made available in participating communities before completion of detailed flood insurance studies and FIRMs (see 6-8/1969).

FIA will provide communities in the emergency program with Flood Hazard Boundary Maps (FHBMs). Such maps, which are based on available information, outline the areas estimated to be within the 100-year floodplain. FHBMs are less detailed than FIRMs, which are based on comprehensive flood insurance studies. A community will be eligible for the regular program when a FIRM is completed for that community.

The emergency program does not affect the requirement that such communities must adopt adequate floodplain management regulations. The law also postpones until December 31, 1971, the deadline for communities to enact measures for floodplain management that are necessary for continued participation in the NFIP and revises the definition of a flood to include inundation from mudslides. The deadline is subsequently extended several times.

12/1969

In an interpretation of congressional intent, FIA decides to use data provided by a local community to identify and map flood-prone areas so the community can participate in the emergency program. Thus, it becomes an accepted practice for FIA to issue a map delineating flood-hazard areas of a community if sufficient flood data exist. If sufficient flood data do not exist and there is adequate information to indicate a potential for destructive floods in a community, a map is issued that shows the entire community to be flood prone.

12/1969

Only four communities have joined the NFIP, and only 16 policies have been sold.

1/1970

Four communities are in the “regular program,” 16 flood insurance policies have been sold, and $392,000 of coverage is in force.

3/1970

NFIP regulations are published in the Federal Register. The regulations contain the first criteria for floodplain management. These criteria are general in nature and do not contain specific standards, as do current criteria. To maintain eligibility, participating communities must adopt measures for floodplain management compliant with these regulations no later than December 31, 1971.

12/1971

Almost 920 communities are eligible for coverage under the NFIP. More than 87,000 flood insurance policies are in effect with coverage totaling $1.4 billion.

1971

The Water Resources Council publishes the first volume of Regulation of Flood Hazard Areas to Reduce Flood Losses, which reports on a study that used regulations to guide adjustment of individual land uses to meet flood threats and avoid flood damages. The Council concludes that “the precise manner in which Federal flood insurance and land use controls will be integrated is unclear” and further notes that flood insurance “will not be an adequate substitute for guiding new development or regulating existing development in flood hazard areas.” The report includes draft statutes and local ordinances for regulation of land uses in riverine and coastal flood hazard areas.

5/1972

The Water Resources Council, after receiving comments on their use (see 7/1967), further revises and publishes Flood Hazard Evaluation Guidelines for Federal Executive Agencies.

6/1972

The Corps of Engineers publishes Flood-Proofing Regulations. State and local officials have subsequently requested more than 100,000 copies of this document.

6/1972

When Tropical Storm Agnes strikes the East coast, fewer than 1,200 communities participate in the NFIP, with only 95,000 policies and $1.5 billion of coverage in force. Consequently, less than 1 percent of insurable damages are covered. Agnes causes $400 million in structural damage, but only $5 million is

paid in flood insurance claims.

7/1972

The NFIP's subsidized rates for flood insurance are lowered by 37.5 percent to encourage increased participation in the program.

10/1972

Congress approves the Water Pollution Control Act Amendments of 1972 (PL 92-500). Section 404 provides protection for wetlands and supplements the Corps of Engineers' existing permitting program for activities in navigable waters, pursuant to Section 10 of the Rivers and Harbors Act of 1899. That Act required permits for the discharge of dredged or fill materials into all "waters of the United States." Later court decisions interpret this provision to include most of the nation's wetlands.

10/1972

Congress passes the Coastal Zone Management Act (PL 92-583), one of several acts that emphasize protection and enhancement of environmental quality.

1972

The Water Resources Council publishes the second volume of Regulation of Flood Hazard Areas to Reduce Flood Losses. The volume explores in more detail techniques to regulate subdivision of lands in flood-hazard areas. Like the initial volume, the second volume contains draft regulations dealing with subdivision regulations and regulations of coastal flood hazard areas.

1972

The NFIP develops new insurance rate tables based on nationwide risk zones, which replace the former community risk zones.

4/1973

Comprehensive revisions to NFIP regulations become effective on April 1. The revisions include detailed criteria for floodplain management for communities and specific performance standards requiring the elevation or flood proofing of structures to the elevation of the 100-year flood.

5/1973

The Federal Insurance Administrator estimates that there are approximately 10,000 flood-prone communities in the United States, or about twice as many as had been estimated in 1968 (see 8/1968).

6/1973

In Water Policies for the Future, the National Water Commission raises concerns about the NFIP's high degree of subsidization as well as the practicality of withholding emergency relief from people who could have covered their losses by insurance but chose not to do so. The Commission further declares that the "role that flood insurance should play in a unified national program for reducing flood losses is not yet clear and there is a need for an independent study of present flood insurance legislation and activities." The report recommends increased funding for the Corps' Floodplain Management Services Program. Subsequently, the Office of Management and Budget approves more than $10 million for FY 1974 and comparable sums in the following years to fund the Corps' work on floodplain management.

6/1973

FIA initially relied on its small in-house staff to utilize base maps provided by

communities desiring to participate in the NFIP, augmented by flood data generated by the Corps of Engineers, the USGS, and others to map flood hazards. As more communities are identified as being prone to floods, and as the number of participating communities increases, the scope of the mapping task exceeds FIA's internal capabilities. Therefore, FIA hires three engineering firms to identify communities for which flood data exist and to prepare Flood Hazard Boundary Maps (FHBMs). These firms are asked to identify communities for which flood data do not exist so that these communities can be referred to another federal agency for study and the generation of the flood data.

Before 1973, flood-prone areas shown on early FHBMs are shaded, delineated in a rectilinear or "blocked out" method (i.e., straight lines following easily identifiable land features such as streets and railroads). This practice makes the maps easy for lenders, insurance agents, and other laypersons to interpret but results in an artificial representation of the true flood boundaries, which are curvilinear and reflect the topography of the land. The use of blocked out flood boundaries is standard for all NFIP mapping until the passage of the Flood Disaster Protection Act (PL 93-234) in December 1973, which makes artificial rectilinear flood boundaries unacceptable, especially for large, undeveloped tracts of land.

7/1973

In Actions Needed to Provide Greater Insurance Protection to Flood-Prone Communities, the General Accounting Office (GAO) reports that FIA has no monitoring system to determine whether communities are effectively enforcing the floodplain management regulations they have adopted.

12/1973

The NFIP estimates that there are approximately 13,600 flood-prone communities in the United States (see 8/1968 and 5/1973).

12/1973

The Flood Disaster Protection Act of 1973 (PL 93-234) amends the National Flood Insurance Act of 1968. The new Act, effective in March 1974:

.. Increases the amounts of flood insurance available to property owners.

.. Requires property owners in participating communities to purchase flood insurance as a condition of receipt of federal or federally related financial assistance on or after March 2, 1974, for acquisition, construction, or improvement of structures in special flood hazard areas (SFHAs). In addition, purchase of flood insurance is required before property owners will be eligible to obtain federal disaster assistance for construction or reconstruction purposes.

12/1973

continued

.. Requires the NFIP to identify, by June 30, 1974, all communities that contain areas at risk for serious flood hazard and to notify these communities that they can apply for participation in the NFIP or they will be ineligible for certain types of federal assistance in their floodplains.

.. As a condition of future federal financial assistance, requires states and communities "to participate in the flood insurance program and to adopt adequate floodplain ordinances with effective enforcement provisions consistent with federal standards to reduce or avoid future flood losses." Participation must begin by July 1, 1975, or one year after notification that a community has flood-prone areas.

.. Requires FIA to consult with local officials to implement its flood-prone notification and identification procedures; to establish explicit procedures whereby communities can appeal their flood-prone identification; and to accelerate the insurance ratemaking studies.

.. Allows the Department of Housing and Urban Development to implement the NFIP on an emergency basis until December 31, 1975, while it completes determinations of flood-prone areas (see 12/1969).

.. Provides for grandfathering, for purposes of determining insurance rates, for structures built in flood-hazard areas before the areas are identified as such. These pre-FIRM structures are not required to comply with existing construction requirements.

.. Mandates that federally regulated lending institutions cannot make, increase, extend, or renew any loan on a property located in a SFHA in a participating community without requiring flood insurance.

.. Expands the definition of “flood” to include “flood-related erosion.”

.. Repeals Section 1314 (denying disaster relief to persons who could have purchased flood insurance for a year or more and did not do so) because it is a disincentive to community participation.

In approving PL 93-234, Congress reaffirms the use of the 100-year flood as the standard for identifying SFHAs and establishing land-use requirements. SFHA have a 1-percent chance of being flooded in any given year (100-year floodplain).

12/1973

Over 2,850 communities are participating in the NFIP.

1973

The Nixon Administration issues New Approaches to Federal Disaster Preparedness and Assistance. The report concludes that federal assistance typically replaces rather than supplements nonfederal efforts. In addition, the report notes that federal assistance for disasters is often perceived to be sufficiently generous that “individuals, business, and communities had little incentives to take initiatives to reduce personal and local hazards” (House Document 93-100, 93rd Congress, First Session).

1973

The USGS expands aerial coverage of flood-prone area maps and pamphlets to include areas subject to future development. To guide this phase, the USGS publishes a National Program for Managing Flood Losses: Guidelines for Preparation, Transmittal, and Distribution of Flood-Prone Area Maps and Pamphlets to assist the Water Resources Division to prepare the maps.

1/1974

Effective January 1, 1974, rates for flood insurance are lowered to encourage wide acceptance of the new mandatory purchase requirement and to encourage increased sales of the insurance. This is the second such decrease (see 7/1972).

More than 2,850 communities (including 2,264 in the emergency program) are participating in the NFIP. About 312,000 policyholders have about $5.5 billion of coverage.

3/1974

The Water Resources Development Act (PL 93-251) authorizes federal projects containing major "nonstructural" features. Section 73 directs all federal agencies to consider nonstructural alternatives when reviewing any project involving flood protection and to pay at least 80 percent of the cost of nonstructural flood control measures.

5/1974

The Disaster Relief Act Amendments of 1974 (PL 93-288) authorize the president to make contributions to state and local governments to help repair, restore, reconstruct, or replace public facilities damaged or destroyed by a major disaster. Section 314 requires that applicants for such assistance must comply with regulations (to be developed) to assure that "such types and extent of insurance will be obtained and maintained as may be reasonably available, adequate, and necessary to protect against future loss to such property." The law prohibits the federal government from requiring "greater types and extent of insurance than are certified…as reasonable by the appropriate State insurance commissioner…."

States and communities receiving federal disaster assistance will be required to "agree that the natural hazards in the area in which the proceeds of the grants or loans are to be used shall be evaluated and appropriate action shall be taken to mitigate such hazards…."

The amendments represent the first congressional mandate for hazard mitigation as a precondition for federal disaster assistance.

6/1974

The Flood Disaster Protection Act of 1973 (see 12/1973) required that the Department of Housing and Urban Development identify all flood-prone communities and notify them of their special flood hazard areas by June 30. Of the 13,600 such communities so identified by December 1973, FIA had provided FIRMs or FHBMs to less than two-thirds. By June 1974, an additional 2,700 communities are identified as flood-prone. Once a community is informed that it is prone to floods, it has one year to qualify for the emergency program (see 12/1969) or six months to appeal its designation as a flood-prone community.

7/1974

FIA further reduces rates for flood insurance and introduces the direct bill system for renewal of flood insurance policies.

7/1974

The U.S. District Court for the Middle District of Pennsylvania grants a motion to dismiss a civil action filed by the Commonwealth of Pennsylvania, et al., against the United States, the Secretary of the Department of Housing and Urban Development, and the National Flood Insurers Association, alleging that the defendants negligently failed to make known the availability of flood insurance to Pennsylvanians who, as a result, suffered uninsured losses as a consequence of the June 1972 and 1973 floods in Pennsylvania. The aggregate damages suffered were alleged to be $1 billion. The U.S. Court of Appeals affirms the decision in June 1975.

8/1974

The Housing and Community Development Act of 1974 (PL 93-383) amends the National Flood Insurance Act of 1968 by adding Section 1364 (commonly known as the Jones' amendment), which requires federally regulated lenders to notify prospective borrowers of a property's location in a SFHA, and subsection (e) to Section 1307 (commonly known as the Brooks' amendment). In communities where adequate progress has been made on the construction of a federal flood-protection system that will afford protection against the 1-percent annual chance flood, the Brooks' amendment provides for the availability of

flood insurance at risk premium rates that will not exceed those that would apply if such a flood-protection system had been completed.

10/1974

Due to the requirements of the Flood Disaster Protection Act of 1973 (see bullet 4 at 12/1973), the first Letter of Map Amendment (LOMA), which excludes a property from inadvertent inclusion in a SFHA, is issued. A LOMA amends an effective FIRM. The role of the three mapping contractors is expanded to process these map amendments.

The first community determined not to require a detailed study (i.e., minimal conversion) is converted to the regular program. Similarly, the first community determined not to be subject to inundation by the 100-year flood (i.e., non-flood-prone conversion) joins the regular program in 1974.

11/1974

FIA hires a contractor to develop and maintain a computerized management information system.

1974

Due to the accuracy required by the mandatory purchase requirement of the Flood Disaster Protection Act of 1973 (see 12/1973), 10,000 FHBMs must be revised to change the rectilinear boundaries of flood-prone areas to curvilinear boundaries.

1974

The first private company begins providing flood-zone determination services to lending institutions to assist them in complying with the mandatory purchase requirements contained in the 1973 Act.

2/1975

Given the large number of flood insurance studies in progress and FIA's limited staff, two engineering firms, referred to as technical evaluation contractors (TECs), are contracted to review the study products that federal agencies create and to put the NFIP's maps in standard format.

3/1975

In National Attempts to Reduce Losses from Floods by Planning for and Controlling Uses of Flood-Prone Lands, the GAO reports that federal agencies do not adequately evaluate flood hazards in their programs. Many of the agencies, the report notes, do not have or properly implement their flood-related procedures. In addition, the report observes, Executive Order 11296 (see 8/1966) has had limited effect in reducing flood losses due lack of implementing procedures and, among agencies that do have procedures, limited compliance.

3/1975

Proposed revisions to NFIP regulations are published in the Federal Register. The proposed revisions will allow minimum requirements for floodplain management to differ depending on the amount of technical data available to communities. Other proposed revisions will: allow the use, in establishing regulations, of data from other federal or state agencies or consulting services in communities where a FHBM has not yet been completed; require building permits for construction in SFHA when FHBM have been issued; require that all new construction must have the lowest floor above the 100-year flood level in communities with FHBMs and in which 100-year flood-surface elevations have been issued; and require new construction in coastal high hazard areas to keep the space below the lowest floor free from obstructions or use "breakaway walls" when 100-year flood levels have been identified.

6/1975

Of the 21,411 communities that FIA has designated as flood-prone, 9,977 participate in the NFIP, but only 549 have FIRMs and are in the regular program.

Summer 1975

The National Flood Insurers Association hires its own staff and relocates its headquarters to suburban Washington, DC. The association assumes the functions that the Insurance Services Office previously handled and retains the servicing carrier concept.

7/1975

Flood insurance studies are produced under interagency agreement with other federal agencies through June, when FIA enters into contracts with engineering firms to produce data for flood insurance studies.

8/1975

Over 350 communities have appealed their designation as flood-prone. Based on the appeals, 136 were found not to be flood-prone. An additional 2,445 appeals have been received but not yet processed. Further appeals are possible because not all communities have been notified of their flood-prone status.

9/1975

The GAO reports in Tulsa, Oklahoma’s Participation in the National Flood Insurance Program, that FIA “does not formally monitor the flood insurance program to insure that communities enforce approved flood plain management regulations” or those of FIA (see 7/1973). The report also notes that the GAO does “not question the validity of the 100-year flood level as the acceptable standard for flood plain management” (see 12/1973).

1975

Gilbert White founds the Natural Hazards Center at the University of Colorado, Boulder. The Center’s primary goal is to strengthen communication among the researchers, individuals, organizations, and agencies that are concerned with individual and public actions to reduce damages from disasters.

1975

The Interagency Task Force on Floodplain Management is created (see Water Resources Council reorganizes, 1976).

3/1976

The Water Resources Council publishes Guidelines for Determining Flood Flow Frequency (Bulletin No. 17), an updated and revised Bulletin No. 15, A Uniform Technique for Determining Flood Flow Frequencies.

4/1976

The GAO, in Formidable Administrative Problems Challenge Achieving National Flood Insurance Objectives, concludes that FIA has made considerable progress in identifying flood-prone communities and in providing them with FHBMs (see 12/1969). In contrast, FIA has made limited progress in completing the necessary studies to move communities into the regular program. Delays have occurred, according to the GAO, because of: a) ineffective planning and scheduling of studies; b) delays in reviewing completed studies; and, c) ineffective coordination and use of federal resources. FIA faces a deadline of August 1, 1983, to complete its studies on all flood-prone communities (see 8/1968). To meet this deadline, FIA will have to increase its completion rate

from about 91 studies per year to about 2,600 per year.

The report also notes that FIA still has "not established an effective system for monitoring community efforts to adopt and enforce required flood plain management regulations." Consequently, in the words of the GAO, the federal government, "though heavily subsidizing the flood insurance program…had no assurance that the communities' flood-prone lands were being developed wisely to prevent or minimize future flood losses" (see 7/1973 and 9/1975).

6/1976

The federal government shifts its fiscal year (FY), so that it will now end on September 30 instead of June 30, as had previously been the case. Thus, FY 1976 was 15 months long. Flood studies and surveys receive their greatest single-year appropriations, about $94 million. As a result, 2,300 flood insurance studies are initiated. This amount equaled the total number initiated in the previous five years.

7/1976

The Water Resources Council publishes A Unified National Program for Floodplain Management, which updates and revises House Document 465 (see 8/1966) in response to Section 1302 (c) of the National Flood Insurance Act of 1968. The report establishes the conceptual framework for floodplain management and recommends actions for improving such management and recommends "appropriate floodplain management programs and regulations or control measures as a prerequisite to federal expenditures for the modification of flooding on the impact of flooding."

The report states that: "Delay in completion of flood insurance studies and the resultant delay of community participation in the Regular program may permit continued development and building at flood-prone locations and the subsequent grandfathering of these high risk developments under subsidized insurance rates."

10/1976

HUD's Federal Insurance Administration issues a Final Rule that introduces the terms "base flood" and "base flood elevation" and begins to phase out the use of the term "100-year flood."

12/1976

Comprehensive revisions to the NFIP's requirements for floodplain management become effective on December 31. These revisions remain the basis of the NFIP's current requirements for floodplain management.

1976

The Water Resources Council reorganizes, abolishing all of its technical committees. The Federal Interagency Floodplain Management Task Force succeeds the Floodplain Management Technical Committee. The task force consists of representatives from the TVA; the Departments of Agriculture, Army, Commerce, Energy, Housing and Urban Development, Interior, and Transportation; the Environmental Protection Agency; and, eventually, the Federal Emergency Management Agency (FEMA), which was created in 1979 (see 6/1978 and 4/1979). State representatives, through the Association of State Floodplain Managers, attend the meetings as observers. The task force provides continuity of communication between member agencies on issues related to floodplain management.

1976

The NFIP adopts regulations that treat states as communities and accordingly makes flood insurance available for state-owned properties in SFHAs only if

the state has adopted adequate regulations for the management of its floodplains. The state may also elect to self-insure its properties if suitable regulations are in place.

1976

Robert J. Hunter is appointed Federal Insurance Administrator.

5/1977

Executive Order 11988, Floodplain Management, revokes and supersedes Executive Order 11296 (see 8/1966), which had limited success in reducing flood losses. The new executive order directs federal agencies to assert a leadership role in reducing flood losses and losses to environmental values that floodplains serve. Federal agencies are to avoid actions in or affecting floodplains unless there are no practicable alternatives and to use the 100-year flood as the base flood standard for the NFIP. The executive order is intended, in part, to ensure that federal agencies do not undermine communities' implementation of regulations adopted to participate in the NFIP. The order directly references NFIP's criteria for floodplain management.

5/1977

Executive Order 11990, Protection of Wetlands, directs all Federal agencies to avoid, if possible, adverse impacts to wetlands and to preserve and enhance the natural and beneficial values of wetlands. Each agency is directed to avoid undertaking or assisting in wetland construction projects unless the head of the agency determines that there is no practicable alternative to such construction and that the proposed action includes measures to minimize harm.

8/1977

Concerned with delays in issuing flood insurance studies, FIA decides to circumvent the state review and approval process. The states in Region V object. FIA subsequently revises the study policy. The states' success in altering the policy change solidifies their cause and pushes them to form an association that eventually becomes the Association of State Floodplain Managers.

8/1977

The National Flood Insurers Association issues a termination notice to the arrangement with the Department of Housing and Urban Development in an attempt to bring to its attention, and that of Congress, the serious nature of the disagreements between the insurance pool and the government on issues of authority, financial control, and other operating matters.

10/1977

FIA hires two additional engineering firms to perform technical evaluation services because of the growing backlog of flood insurance studies in progress.

10/1977

Title VII of the Housing and Community Development Act of 1977 (PL 95-128) further amends the National Flood Insurance Act of 1968 through the "Eagleton Amendment." This amendment permits federally regulated or insured lenders to make conventional loans in flood-prone areas of nonparticipating communities and to require that notification be given as to whether federal disaster assistance would be available in the event of a flood disaster.

10/1977

continued

PL 95-128 also removes the prohibition against all forms of disaster assistance

within the SFHA of “sanctioned” communities and imposes the ban only on federal disaster assistance related to a declared flood disaster; increases the additional limits of insurance coverage available at risk premium rates; provides additional criteria under which flood-damaged property can be eligible for purchase; and provides authority for low-interest loans for elevating structures located in floodways.

12/1977

Approximately 1.2 million flood insurance policies are in force, an increase of almost 900,000 over the number in December 1973. Community participation increases to approximately 15,000 in 1977 from approximately 3,000 in 1973.

12/1977

The Secretary of the Department of Housing and Urban Development and the National Flood Insurers Association sign an Assumption Agreement terminating the involvement of the National Flood Insurers Association in the NFIP, effective December 31, 1977.

1977

Following record floods in southwest Virginia, the TVA provides technical and financial assistance to four communities in floodplain evacuation and relocation. Local officials acquire several hundred properties, often as linear parks next to streams.

1977

Gloria Jimenez is appointed Federal Insurance Administrator.

1/1978

The federal government assumes the direct insurance writing and claims handling operation of the NFIP using an NFIP Servicing Agent to handle the sales and servicing responsibilities. Prospective policyholders continue to go through local agents and brokers to obtain their policies (see 6/1969 and 8/1977).

2/1978

The Water Resources Council publishes Guidelines for Implementing Executive Order 11988 – Floodplain Management. The report is designed to assist federal agencies in preparing regulations and procedures for implementing the order (see 5/1977). The document describes ways government agencies are to avoid supporting development in floodplains when a practicable alternative exists. As the Guidelines note, however, they “do not intend to prohibit floodplain development in all cases, but rather to create a consistent government policy against such development under most circumstances.”

5/1978

In Texas Landowners Rights Association v. Harris, 453 F.Supp. 1025 (D.D.C. 1978), the State of Missouri, 40 political subdivisions in 12 states, and 30 individual landowners within federally designated flood zones bring suit against federal officials administering the NFIP. The plaintiffs contend that requiring local governments to adopt regulations for building in floodplains under their police powers, on pain of losing federal financial assistance for acquisition or construction purposes within nonparticipating communities, violates the Constitution’s Tenth Amendment. This sanction includes denial of FHA and VA home mortgages in affected communities. The plaintiffs further argue that the severity of the sanctions is such that the “choice” represents no choice at all, but only coercion.

The court rejects the plaintiffs’ contention, holding that coercion is to be found

only where the federal government gives the states no choice, but mandates compliance. In addition, the court rules that the NFIP's implementation is not a constitutionally prohibited taking of property without payment of just compensation.

The U.S. Circuit Court for the District of Columbia (598 F.2d 311, 1979) and the U.S. Supreme Court (cert. denied, 444 U.S. 927, 100 S.Ct. 267, 1979) subsequently upholds the lower court's judgment.

6/1978

President Carter forwards Reorganization Plan No. 3 of 1978 (House Document 95-356, 95th Cong., 2nd Sess.) to Congress. The plan calls for FEMA's establishment as an independent agency within the executive branch. The new agency will coordinate federal disaster response-and-recovery efforts and consolidate the programs of five related agencies (FIA, the Federal Disaster Assistance Administration, the Defense Civil Preparedness Agency, the Federal Preparedness Agency, and the National Fire Prevention and Control Administration). The new agency will begin to operate on April 1, 1979.

6/1978

The initial identification of flood-prone communities is essentially completed. More than 19,000 FHBMs have been produced.

6/1978

President Jimmy Carter's Water Policy Initiatives include proposals to fund the National Flood Insurance Act's Section 1362. The section allows FEMA to purchase certain insured properties that have either been substantially or repeatedly damaged and then to transfer the properties to a public agency to improve floodplain management.

10/1978

Only 2,818 of 16,116 participating communities are in the regular program; the rest remain in the emergency program (see 12/1969).

12/1978

The Corps of Engineers has completed 1,800 Floodplain Information Reports covering 3,500 communities.

3/1979

The GAO reports to the secretary of the Department of Housing and Urban Development that use of the 100-year flood "as the single national standard of regional flooding conditions has caused considerable controversy over the years." Noting that there were 127 floods between 1968 and 1978 that equaled or exceeded the 100-year flood level in 62 counties, the GAO recommends an evaluation of the 100-year flood as a national standard. This recommendation contradicts GAO's earlier conclusion (see 9/1975) that the 100-year flood standard is suitable.

The same report notes continuing deficiencies in FIA's monitoring of communities' compliance with the NFIP's requirements (see 7/1973, 9/1975, and 4/1976). The GAO observed that FIA makes relatively few visits to communities and "major differences in the approach, scope, and duration of the visits conducted by personnel from two different [FIA] regional offices."

4/1979

On April 1, FIA and the NFIP are transferred from the Department of Housing and Urban Development to the newly created FEMA.

8/1979

FEMA publishes a proposed rule in the Federal Register that will allow flood-proofed residential basements in all communities. This rule is in response to demand for basements in some areas of the nation. The proposed rule is withdrawn in March 1981 after it is determined that flood-proofed basements can pose an unacceptable threat to public safety under some flooding conditions.

8/1979

John Macy is appointed FEMA Director.

9/1979

An initiative to decentralize the production of maps to individual contractors is implemented. It is subsequently determined that this is not a cost-effective approach. The previous system of having the technical evaluation contractors produce the maps through printing by the Government Printing Office is reinstituted.

The acquisition program for flood-damaged properties provided for in Section 1362 of the National Flood Insurance Act of 1968 is funded for the first time (see 6/1978). Just over 100 properties are acquired in FY 1980. Over the next 14 years, approximately 1,400 properties are purchased at a cost of nearly $52 million. In addition to funding for Section 1362, Congress also provides funds for the State Assistance Program to develop floodplain management capabilities.

9/1979

Hurricane Frederic strikes Gulf Shores, Alabama, and nearby coastal communities causing severe damage to structures. This results in considerable controversy about the adequacy of the NFIP's V-zone construction standards; criteria used to designate V-zones and V-zone flood insurance rates; and whether wave heights should be added to coastal base flood elevations.

9/1979 continued

Note: V-zones or coastal high hazard areas are the most hazardous coastal flood zones because they are subject to high velocity wave action. V-zone designation is applied only to those areas along the coast where water depth and other conditions support at least a three-foot wave height.

9/1979

A revised version of A Unified National Floodplain Management Program is published and concludes that the NFIP "provides persuasive strength and beneficial emphasis to floodplain management."

9/1979

By the end of Fiscal Year 1979, nearly 16,600 communities are participating in the NFIP, with 3,381 in the program's "regular phase." There are more than 1.6 million policies in force, covering about $60 billion in property. Throughout the program's life, total claims have exceeded 146,000, and total payments to victims have exceeded $572 million.

12/1979

Approximately 1.85 million flood insurance policies are in effect, representing $74.5 billion in coverage. More claims (86,360) are filed in 1979 than in any subsequent year through 1999.

3/1980

A proposed rule is published in the Federal Register that would prohibit the use of solid breakaway walls to enclose areas below the base flood elevation in V-zones. In 1981, after a change in presidential administrations, the proposed rule is withdrawn after the Office of Management and Budget raises concerns that the rule revision is an unnecessary intrusion into the management of local affairs.

4/1980

Damages from Hurricane Frederic result in a decision to incorporate wave heights into base flood elevations in coastal areas. The impact of wave heights on coastal flood levels is first added to FIRM for seven communities in Alabama.

5/1980

FEMA adopts a policy that requires state and local governments to agree to pay 25 percent of the eligible costs of public assistance programs (other than individual and family grants). Prior to this time, the required nonfederal contribution was subject to negotiation between FEMA and the affected state and local governments.

6/1980

The Office of Management and Budget's memorandum, "Nonstructural Flood Protection Measures and Flood Disaster Recovery," directs that "all Federal programs that provide construction funds and long-term recovery assistance must use common flood disaster planning and post-flood recovery procedures." In response, 12 federal agencies approve an interagency agreement to provide technical assistance to states and communities for nonstructural measures to reduce flood damage in flood-recovery efforts. The agencies form an Interagency Flood Hazard Mitigation Task Force with responsibility for implementing agreement.

In subsequent disasters interagency teams are sent to investigate opportunities to employ nonstructural mitigation measures and to issue recommendations before recovery and reconstruction advance to the point where such measures could not be considered.

6/1980

FIA's management explores ways in which the private insurance industry's state windpools can be used to assure prompt claims service in a major post-flood hurricane disaster. The Single Adjuster Program is established. In this voluntary program, individual windpools, or coastal plans, and the NFIP agree in advance on the use of single adjusters to adjust both the wind and water damage from hurricanes and to recommend the claim payments by each insurer for risks that both a coastal plan and the NFIP insure.

9/1980

FEMA's regulations implementing Executive Order 11988, Floodplain Management, and Executive Order 11990, Protection of Wetlands, are effective on September 9. Although the primary focus of these regulations is on disaster assistance, provisions are included to limit flood insurance coverage for certain structures in floodways and for new structures in V-zones where wave heights are not included in base flood elevations. On November 28, FEMA publishes a notice of intent not to enforce these provisions. Instead, an interim rating system is developed that includes a calculation of wave height on a case-by-case basis.

10/1980

The Engineering Scientific Data Package (ESDP) system is established to archive and retrieve selected documentation necessary to recreate the elevation

information presented in a flood insurance study.

12/1980

FIA promulgates a methodology for assessing the flood hazards unique to alluvial fans in the arid West.

1980

Regulation of Flood Hazard Areas to Reduce Flood Losses is revised to emphasize the lessons drawn from experiences with floodplain management in the 1970s. The Regulation focuses on state and local programs, including innovations that can exemplify effective reductions in flood losses in the future.

1980

FIA pilots a centralized map information facility, which uses state-of-the-art technology to develop a centralized database of the flood zone for individual structures that could be accessed by calling a toll free number. The pilot was discontinued in 1981 because available technology was inadequate, the system was not cost-effective, and the private sector was beginning to provide this service.

1/1981

In Requests for Federal Disaster Assistance Need Better Evaluation, the GAO recommends that FEMA “reevaluate and improve its assessment criteria” for disaster and emergency declarations. The GAO had found a “lack of consistency in the quality and methods” of assessing requests from governors for declarations.

1/1981

Rates for flood insurance are increased by 19 percent for pre-FIRM structures (i.e., structures for which construction or substantial improvement started on or before December 31, 1974, or before the effective date of a community’s initial FIRM, whichever is later). The rate increase is the first in the NFIP’s history.

The initial legislation creating the NFIP allowed these rates to be substantially lower than actuarial rates in an effort to promote communities participation in the program. The rate increase in 1981, the first since the NFIP’s creation, begins an effort to increase rates gradually to reduce, but not eliminate, the amount of subsidy and to make the NFIP self-supporting for the average historical loss year by 1988.

5/1981

Louis O. Giuffrida is appointed FEMA Director.

6/1981

An interim policy for accreditation of levees as providing 100-year protection on NFIP maps is promulgated. This policy is finalized in 1986 with its publication in the Code of Federal Regulation, Title 44, Chapter 1, Section 65.10 (see 10/1986).

8/1981

Section 341 of the Omnibus Budget Reconciliation Act of 1981 (PL 97-35) terminates, effective October 1, 1983, flood insurance coverage for new construction and substantial improvements of structures on undeveloped coastal barriers designated by the Secretary of the Department of Interior. FEMA participates in the Coastal Barriers Task Force the Secretary establishes to designate the undeveloped coastal barriers. The Coastal Barrier Resources Act of

1982 (PL 97-348) later overtakes and supersedes this process (see 10/1982).

8/1981

Section 1345 of the 1968 Act, governing services by the insurance industry, is amended to include subsection (c), which holds harmless insurance agents or brokers for the errors and omissions of FEMA.

8/1981

In Till v. Unifirst Federal Savings and Loan Association (653 F.2d 152), the U.S. Court of Appeals for the Fifth Circuit concludes that the National Flood Insurance Act does not provide an express or implied federal statutory cause of action against a federally regulated lending institution for failing to require flood insurance or to notify a prospective borrower that a dwelling is in a floodplain. In subsequent years, U.S. Courts of Appeals for the Fourth Circuit (Arvai v. First Federal Savings and Loan Association, 698 F.2d 683, 1983), the Seventh Circuit (Mid-America National Bank of Chicago v. First Savings and Loan Association of South Holland, 737 F.2d 638, 1984), and the Eighth Circuit (Hofbauer v. Northwestern National Bank of Rochester, 700 F.2d 1197, 1983) reach similar conclusions.

9/1981

The NFIP establishes a methodology to assess the contribution of wave run-up to flood elevations for communities along the open coast. This methodology is applied in several communities in Maine that had initiated flood insurance studies during FY 1981.

9/1981

FIA establishes a goal for the NFIP to achieve self-supporting status for an average historical loss year by 1988. Achieving this goal would mean the elimination of subsidies for pre-FIRM properties.

9/1981

FIA opens discussions with representatives of the insurance industry concerning re-involvement in the NFIP that ultimately develops into the Write Your Own (WYO) Program (see 10/1983).

10/1981

FEMA begins to use information on floods developed for purposes other than the NFIP (e.g., flood-flow estimates developed to size road crossings and bridges by state highway departments) as a cost-savings measure.

A new rating system for post-FIRM V-zone buildings is implemented to reflect the additional risk of surge and wave height and to offer an individual risk-rating option. Post-FIRM properties are those for which construction or substantial improvement started on or after the effective date of a community's initial FIRM or after December 31, 1974, whichever is later.

1981

The Water Resources Council updates Bulletin No. 17, Guidelines for Determining Flood Flow Frequency (Bulletin 17B of the Hydrology Committee, U.S. Water Resources Council). This document, first published in 1967 (Bulletin No. 15), is the guide most government agencies use when conducting flood-frequency studies.

1981

The NFIP's premium rates are increased by 45 percent for pre-FIRM structures, as part of FEMA's effort to reduce subsidies and to make the NFIP self-

supporting for an average historical loss year. Over the next seven years rates will increase by 120 percent.

1981

Jeffrey S. Bragg is appointed Federal Insurance Administrator.

4/1982

Approximately 62 percent of premiums paid for flood insurance are subsidized.

8/1982

As part of President Ronald Reagan's Task Force on Regulatory Relief, created in January 1981, the Office of Management and Budget directs FEMA to investigate whether federal agencies are complying with the requirements of Executive Order 11988, issued in May 1977. In addition, FEMA is to: a) determine what impact, if any, the executive order is having on the level of federal support in designated flood-hazard areas and b) review the base, or "100-year" flood standard used in implementing the executive order.

8/1982

The GAO, in National Flood Insurance: Marginal Impact on Flood Plain Development, Administrative Improvements Needed, concludes that FEMA needs a better monitoring program to assure that local communities are enforcing floodplain regulations. According to the report, many premiums for flood insurance are based on erroneously designated (misrated) flood zones. In addition, the report concludes that this insurance creates a "marginal added incentive for development in coastal and barrier island communities."

9/1982

Funding for the Water Resources Council ceases, although the Council is never officially dissolved.

10/1982

The Coastal Barrier Resources Act (PL 97-348) creates the Coastal Barrier Resources System (CBRS). The Act prohibits new federal expenditures (including the issuance of new federal flood insurance and most disaster assistance for new construction and substantial improvements) in designated units of the CBRS on the Atlantic and Gulf Coasts on and after October 1, 1983. Existing flood insurance policies can remain in force.

1982

The third volume of Regulation of Flood Hazard Areas to Reduce Flood Losses, started at the time of the Water Resource Center's demise, is subsequently completed and published by the TVA. The three volumes advance the understanding and application of land-use regulations in flood- hazard areas as a principal tool in reducing vulnerability to flood risk.

1/1983

Due to what the GAO labels as data and methodological weaknesses in the determination of rate structures, the GAO finds that the NFIP has not collected sufficient premiums to cover the cost of providing insurance to almost two million policyholders. As a result, National Flood Insurance Program: Major Changes Needed if it is to Operate without a Federal Subsidy points out that FIA had to borrow $854 million from the Department of the Treasury between 1970 and 1980.

2/1983

A system to maintain an inventory of levees, by community name, accredited as providing 100-year protection on NFIP maps begins.

2/1983

In The Effect of Premium Increases on Achieving the National Flood Insurance Program's Objectives, the GAO finds that FEMA's decision in January 1981 to raise rates for flood insurance policies has led to a decline in the total number of policies, from 2.01 million policies in the month before the rate increase to 1.86 million in November 1982. The GAO identifies several additional factors, such as a decline in the housing market and a smaller number of recent floods that might explain the decrease in the number of policyholders.

4/1983

Responsibility for flood insurance studies and for the issuance of single-lot, single-structure, Letters of Map Amendment and Letters of Map Revision is decentralized to FEMA's regional offices.

4/1983

In Approaches for Converting National Flood Insurance Program Communities from the Emergency Phase to the Regular Phase, the GAO concludes that FEMA will not meet the August 1983 deadline contained in the National Flood Insurance Act of 1968 for providing FIRMs for all flood-prone communities. The GAO explains that the missed deadline is due both to the complexity of the task and that FEMA has not used less costly and time-consuming techniques to produce the maps. The GAO also notes FEMA's estimate that approximately $153 million will be required to complete the mapping effort.

The GAO further observes that the imminent expiration of the emergency program in May 1983 (see 12/1969) will mean that over 290,000 policyholders will lose coverage unless Congress acts to extend the program.

9/1983

FEMA completes The 100-year Base Flood Standard and the Floodplain Management Executive Order, which the Office of Management and Budget had requested in August 1982 (see 8/1982). The President's Task Force on Regulatory Relief had selected Executive Order 11988 on Floodplain Management and the 100-year standard for review. The report concludes that both the 100-year standard and the executive order should be retained. For example, the report concludes that the 100-year base flood "is strongly supported and being applied successfully by all levels of government…and no alternatives have been identified that are superior to it…." In addition, however, the report concludes that some federal agencies have not adopted procedures to implement the executive order. Other agencies have adopted procedures, but they are not consistent with the executive order.

10/1983

In recognition of the 1968 Act's purpose that FIA arrange for appropriate participation in the NFIP by private-sector property insurers, flood insurance becomes available from insurance companies that had entered into an arrangement with the Federal Insurance Administrator to sell and service flood insurance under the Write Your Own (WYO) Program. At the time, there were 1,897,176 policies and slightly over $111 billion of coverage in force. During the first year, 48 companies agreed to become WYO participants in FY 1984. The first WYO policies are sold in November 1983.

10/1983

The map revision and technical evaluation contractor services are consolidated and the number of technical evaluation contractors is reduced from seven to

three as the requirements for the flood insurance study program are changed.

10/1983

Effective October 1, the NFIP revises the rate schedules for flood insurance premiums and makes significant amendments to flood policies. To simplify insurance ratings, the NFIP groups Zones A1 to A30 under a single set of schedules and makes a similar reduction for Zones V1 to V30. Optional, higher deductibles become available so policyholders concerned with catastrophic protection can reduce their flood insurance premiums. In addition, flood insurance policies no longer cover:

.. Finished walls, floors, ceilings, and other similar improvements to basement areas;

.. Enclosures and building components located below the lowest elevated floor of an elevated building except for the required utility connections and the footing, foundation, anchorage system, etc. required to support the elevated building; and

.. Contents building machinery and equipment located in a basement area or below the lowest elevated floor of an elevated building, except stairways not separated from the building. For buildings where construction started before this date, coverage continues for sump pumps, water tanks, oil tanks, furnaces, hot water heaters, washers, dryers, freezers, air conditioners, heat pumps, and electrical boxes.

10/1983

FIA limits flood insurance coverage for basements to reduce future flood-claim payments. This action is based on FIA's findings that, between 1978 and 1982, the claim-loss frequency of buildings with basements was almost four times higher than the claim-loss frequency for buildings without basements. As a result of the change, the NFIP will no longer provide unlimited coverage of the contents of basements or finished walls, floors, ceilings. Coverage will continue for such items as oil tanks, furnaces, hot water heaters, heat pumps, and air conditioners.

10/1983

Continued

The controversial nature of the change in coverage leads to several lawsuits, which are decided in favor of FIA, as well as a report by the GAO (see Federal Emergency Agency's Basement Coverage Limitations, completed in 1/1986).

11/1983

The Housing and Urban-Rural Recovery Act of 1983 (PL 98-181) extends until September 30, 1985, the deadline for the establishment of flood-risk zones in floodplain areas and requires FEMA to submit to Congress a plan for bringing all communities containing flood-risk zones into full program status by September 30, 1987. The Act also prohibits any increase in premiums charged for flood insurance before September 30, 1984, and directs FEMA to submit a report to Congress explaining the rate structure and any rate increase anticipated before October 1, 1985.

FEMA subsequently notifies Congress that all remaining flood studies can be completed by 1991.

1983

The TVA publishes Floodplain Management: The TVA Experience to provide information about the authority's approach to working with state and local officials in floodplain management.

1983

The TVA joins with the Natural Hazards Research and Applications Information Center at the University of Colorado to evaluate the effectiveness of efforts to prevent flood damage. The Center forms an advisory group of national experts in floodplain management, develops the initial evaluation procedures, and conducts a pilot test in several area communities. The results are published in Determining the Effectiveness of Efforts to Reduce Flood Losses: The TVA Experience.

1/1984

In response to FEMA's review of the 100-year base flood standard (see 9/1983) the Office of Management and Budget (OMB) agrees that "the 100-year base flood standard appears to be working well and, given its widespread use, it does not appear to be in the public interest to adopt another methodology."

5/1984

The first countywide FIRM, for Marion County, Indiana, becomes effective. The FIRM shows the flood risks for all incorporated communities within the county as well as its unincorporated portions.

6/1984

A demographic survey of communities participating in the NFIP's Emergency Program identifies those communities where expected development in the floodplain would justify incurring the costs of a detailed study.

9/1984

A Risk Studies Completion and Full Program Status Plan is submitted to Congress by FEMA (see 11/1983). The plan identifies how cost-containment measures will be implemented to achieve the most economical conversion of about 7,000 communities to the Regular Program on or before September 30, 1991. A benefit-cost strategy is promulgated to standardize decision-making as to which communities will be converted by other means.

9/1984 continued

Largely because of the results of the demographic survey completed in June and the application of benefit-cost considerations, emphasis is given to converting low-growth communities to the Regular Program through the minimal conversion process. As a result, 1,871 conversions to the Regular Program occur in FY 1984. This is the largest number of conversions in any year of the NFIP's history.

1/1985

The Map Initiatives Project is completed after more than two years of review and discussion by a task force comprised of representatives from the major user groups. Consequently, a new format is specified for NFIP maps to make them more "user-friendly." Changes include a reduction in the number of risk zones from 68 to 9; the elimination of flood-hazard identification dates; and the consolidation of essential information on flood insurance and floodplain management on one map, thus eliminating the need for separate FIRM and FHBM.

9/1985

FIA publishes Appeals, Revisions and Amendments to Flood Insurance Maps – A Guide for Community Officials, a document written in lay language to explain the mechanisms for revising or amending NFIP maps. More than 12,000

copies of this manual are distributed before it is revised in January 1990.

10/1985

The first of more than 500 Limited Detail Studies (LDS) is initiated as a cost-containment measure to provide flood-risk zones and base flood-elevation information to communities that would experience low-to-moderate development pressure in their SFHA during the 15-year period beginning in 1985.

10/1985

The Community Assistance Program (CAP) is established to provide assistance on floodplain management to communities by drawing on resources in addition to FEMA's regional offices. The State Support Services Element, which replaces the State Assistance Program, uses states to provide this assistance. Similarly, the Federal Support Services Element makes use of federal agencies such as the TVA, USGS, the Corps of Engineers, and the Soil Conservation Service.

10/1985

The NFIP's Community Compliance Program (CCP) is established to provide a credible means to ensure that communities adequately enforce regulations on floodplain management adopted as a condition of participation in the NFIP. The program provides procedures for the probation and suspension of communities and the denial of flood insurance for individual structures under Section 1316 of the National Flood Insurance Act and builds on the mutually supportive relationship between flood insurance ratings and floodplain management.

10/1985

The Corps of Engineers' National Flood Proofing Committee is formed to advance the application of flood-proofing techniques.

11/1985

Julius W. Becton, Jr. is appointed FEMA Director.

1985

The TVA publishes A Guide to Evaluate a Community's Floodplain Management Program to document how others could use the TVA's evaluation procedures to judge community floodplain management programs.

1985

The first Annual Report of the Association of State Floodplain Managers summarizes activities of state initiatives and resources independent of the NFIP. The annual report represents slightly more than half the states and is not compiled through a formal survey.

1/1986

The NFIP's regulations are revised on January 1 to provide a probation procedure for participating communities that fail to adequately enforce floodplain-management measures adopted to meet NFIP criteria. As part of probation procedures, a $25 surcharge applies for any flood insurance policy newly issued or renewed on and after October 1, 1986, for any property that is located within a community that is on probation. This is intended to be an interim process, short of community suspension, to increase public awareness of the situation and to encourage community officials to take the actions necessary to comply with the NFIP's requirements for floodplain management. Revisions are also made to V-zone construction requirements and other criteria for floodplain management.

1/1986

FIA publishes A Standardized System for Flood Insurance Restudy Identification and Prioritization to systemize decision making about communities that are candidates for restudy and to assure that only cost-effective restudies are initiated.

1/1986

FIA implements a fee-charge system for certain categories of conditional letters of map correction to recover the cost of providing engineering services to review and comment on proposed developments in participating communities' floodplains.

3/1986

A revised Unified National Program for Floodplain Management notes that the previous report has again become dated by the relative success and changes in federal programs and by the strengthening of floodplain management at the state and local levels. The report, building on earlier reports and subsequent legislation, directives, and activities, establishes two broad goals for floodplain management: to reduce loss of life and property from flooding and to reduce loss of natural and beneficial resources from unwise land use.

The report urges that development in high hazard areas be avoided, except in instances of public interest or in the absence of a suitable alternative.

4/1986

FEMA proposes to change the process of declaring disasters; the criteria for eligibility for federal assistance; and the nonfederal responsibility for major disasters. The proposed regulations would also decrease the federal share of disaster costs to 50 percent from 75 percent. Furthermore, states would be required to meet certain economic criteria before they would be eligible to receive federal assistance and to increase their cost-sharing responsibilities, along with that of local governments, for disaster assistance.

Due to strong opposition in Congress, FEMA subsequently withdraws the proposed rules.

9/1986

Harold T. Duryee is appointed Federal Insurance Administrator. He remains in this position until August 1990.

9/1986

FIA produces the first digital FIRM, for Tulsa, Oklahoma. A five-year, $20 million program to digitize 25,000 FIRM panels for about 340 counties that account for about 75 percent of all property-at-risk begins.

10/1986

The NFIP's regulations on floodplain management are revised. Major changes affect placement of manufactured homes, mechanical and utility equipment, openings for enclosures, use of available flood data, and functionally dependent uses. The revisions also formally terminate the State Assistance Program and establish procedures for denial of insurance under Section 1316, obtaining basement exceptions, revision of flood maps, and the recognition of levees. The revisions result in the first required update of all NFIP community ordinances since the 1976 rule revisions.

10/1986

On October 1, the NFIP makes the following amendments to the standard

flood insurance policy:

.. Buildings in the course of construction that are not walled or roofed are eligible for coverage. The standard deductible for these buildings is double the post-construction amount and buildings in selected zones with the lowest floor below the base flood elevation are not eligible.

.. When an insured building has been inundated by rising lake waters continuously for 90 or more days, and it appears reasonably certain that a continuation of this flooding will result in damage reimbursable under the flood policy, the insurer can pay the insured without waiting for further damage to occur. To receive payment, the insured must sign a release agreeing not to make further claims under the policy, not to renew the policy, and not to apply for NFIP insurance for a new property at the same location.

.. For mobile homes in mobile home parks or subdivisions, the date of construction to determine pre- or post-FIRM status is the date a mobile home is placed on its foundation.

1/1987

Effective January 1, the standard policy covers reasonable expenses incurred for the temporary removal and storage of insured property because of the imminent danger of flooding up to the amount of the minimum building deductible. The policy no longer provides coverage for the cost of repairs to protect insured property damaged by flood from further damage.

1/1987

President Ronald Reagan’s proposed budget for the next fiscal year recommends that all subsidies for flood insurance be eliminated and that rates be increased in order to recover “the clearly allocable costs of flood insurance from beneficiaries.” The Reagan Administration also states that flood insurance can be provided at affordable rates for homeowners by the private sector.

Spring 1987

A task force is created to investigate the feasibility of using the insurance industry’s services and facilities and, if feasible, to develop procedures for implementing a Community Rating System (CRS). CRS would recognize a community’s efforts to undertake floodplain management activities beyond those required for participation in the NFIP; increase the public’s awareness of flood insurance; and assist property owners, insurance agents, and lenders seeking individual property flood-risk information.

7/1987

FIA inaugurates a Limited Map Maintenance Program (LMMP) as a cost-containment measure to process, in an expedient manner, revisions to NFIP maps that are limited in scope. Authority to task federal agencies to perform LMMP projects under interagency agreements is decentralized to FEMA’s regional offices.

7/1987

The Supplemental Appropriations Act of 1987 (PL 100-71) suspends through September 30, 1988, those portions of the rule revision (of October 1, 1986) applicable to existing manufactured home parks and subdivisions. The Act also requires FEMA to prepare a report on the impact of the regulations. The report is submitted to Congress in September 1988.

10/1987

For the first time, the NFIP becomes self-supporting for the historical average loss year. For the NFIP, the intent is to generate premiums at least sufficient to cover expenses and losses relative to what is called the historical average loss year, which differs from the traditional insurance definition of solvency. During FY 1986, no taxpayer funds are required to meet the NFIP's flood insurance expenses. In addition, at the beginning of the fiscal year, the NFIP is required for the first time to pay all program and administrative expenses with funds derived from insurance premiums. Prior to this time, program costs for administrative expenses, surveys, and studies, are financed through congressional appropriations.

12/1987

Approximately 2.1 million flood insurance policies are in force, representing $165 billion in coverage. The program's net operating deficit is about $652 million.

1987

Minnesota establishes a Flood Hazard Mitigation Grant Assistance Program, which will provide a 50-percent state/50-percent local, cost-share grant program for activities to reduce damages from floods.

1987

The Unified National Program for Floodplain Management recommends the evaluation of "floodplain management activities with periodic reporting to the public and to Congress on progress toward implementation of a unified national program for floodplain management." To implement this recommendation, the Federal Interagency Floodplain Management Task Force initiates an assessment of the nation's program for floodplain management. The national assessment provides a comparative basis for justifying program budgets and evaluating, over time, the effectiveness of various tools, policies, and planning efforts for floodplain management.

4/1988

FIA inaugurates a fee-charge system to require certain requestors of NFIP maps to reimburse the National Flood Insurance Fund for the costs of map-ordering services. Entities required to use the NFIP maps as part of the program's implementation are exempt from these fees (i.e., local, state, and federal agencies, insurance agents, and lenders).

A pilot marketing analysis is conducted to determine if map users are interested in purchasing microfilm copies of NFIP maps as opposed to purchasing these maps in hard-copy paper format. The results of this analysis identify a small market and limited interest in microfilm.

4/1988

In Statistics on the National Flood Insurance Program, the GAO summarizes data on the program's operations through the end of FY 1987.

5/1988

To reduce the NFIP's subsidy levels without using a rate increase, NFIP regulations are amended to increase the standard building and contents deductible for pre-FIRM properties to $1,000 from $750. Policyholders who wish to have lower deductibles are given the option to "buy back" a $500 deductible separately for building and contents coverage.

5/1988

Due to record high-water levels in the Great Lakes, the Housing and Community Development Act of 1987 (PL 100-242) amends the National Flood Insur-

ance Act of 1968 (through what is called the “Upton-Jones Amendment”) to provide insurance benefits to structures in imminent danger of collapse due to coastal erosion or undermining caused by waves or water levels exceeding cyclical levels. Following a local government’s condemnation of a structure, the payment from flood insurance would be 40 percent of the structure’s value prior to collapse and, following demolition, 60 percent of the structure’s value. The approach represents the first federal use of erosion setbacks as a tool for preventive management as part of an insurance program.

The Act also authorizes the president to contribute to states and local communities up to 50 percent of the cost of measures to mitigate hazards that substantially reduce the risk of future damage or loss in any area affected by a major disaster. Contributions cannot exceed 10 percent of the Public Assistance grants made with respect to the disaster or $1 million, whichever is greater.

6/1988

The Claims Coordinating Office (CCO) is developed to facilitate the entrance of multiple WYO companies into the Single Adjuster Program. When major storm events occur, a CCO will be established within Integrated Flood Insurance Claim Offices (IFICO) to provide a central clearinghouse for loss adjuster assignments and data sharing, for the use of WYO companies, coastal plans, and certain other property insurers willing to participate in coordinating a claims-oriented response to the catastrophe. Subsequent experience indicates that IFICO handle losses efficiently while coordinating activities with private sector windpool associations, WYO companies, and FEMA’s Disaster Field Office and Disaster Assistance Centers.

10/1988

FIA restructures commissions to encourage the sale of flood insurance. The commission provisions for the WYO Program are also restructured under a program to be re-evaluated in 1990. The provisions allow for commissions equal to 14 percent of premiums with the opportunity to earn an additional commission of one-tenth of 1 percent for each 1-percent increase in a company’s total policies in force up to a total commission of 17 percent of premium.

10/1988

The coverage limitation for enclosures (and contents) below an elevated structure is revised effective October 1 to apply only to elevated post-FIRM buildings (i.e., buildings for which the start of construction or substantial improvement occurred on or after the effective date of the FIRM or after December 31, 1974, whichever is later).

11/1988

The Robert T. Stafford Disaster Relief and Emergency Assistance Act (PL 100-707) emphasizes hazard mitigation including funds to acquire or “buyout” destroyed or damaged properties and to not rebuild in SFHAs; to rebuild in nonhazardous areas; and to reduce exposure to flood risk in reconstruction.

The Act authorizes the allocation of up to 10 percent of FEMA’s Public Assistance grants for hazard-mitigation projects, that are cost effective and that substantially reduce the risk of future damage, hardship, loss, or suffering. Benefit-cost analysis is the recommended approach for determining cost-effectiveness. Buyouts are also approved. When buyouts are authorized, they are available to all affected residents of a flood-damaged area.

Section 404 establishes a Hazard Mitigation Grant Program. Grants are available to state and local governments and certain nonprofit organizations to implement long-term hazard mitigation measures following a presidential declaration of disaster. These measures can include projects to reduce the risk of future damage, hardship, or loss or suffering from damages. Buyouts are one

type of eligible mitigation measure. Potential recipients of the grants, which can cover up to 50 percent of the costs of these activities, must maintain insurance as a condition of receipt.

1988

South Carolina acts to restrict new development along erosion-prone beachfronts.

1988

The Casualty Actuarial Society releases a Statement of Principles Regarding Property and Casualty Insurance Ratemaking. The statement identifies and describes principles applicable to the determination and review of rates for property and casualty insurance. The principles provide the foundation for the development of actuarial procedures and standards that seek to protect the insurance system's financial soundness and to promote equity and availability for insurance consumers.

1988

The Department of the Interior estimates that not developing 39,000 acres of developable coastal barrier land proposed to be added to the Coastal Barrier Resources System (see 10/1982) will save the federal government approximately $3 billion, which includes subsidies for flood insurance.

1/1989

Two new products, the Condominium Master Policy (CMP) and the Preferred Risk Policy (PRP), become available for the first time. The CMP provides insurance coverage at a significantly reduced cost under a single policy for residential condominiums with five or more units and three or more stories located in Regular Program communities. The PRP is available to the owners of one- to four-family residential buildings located in Regular Program communities provided the buildings are located outside of SFHA and have favorable flood-loss histories. The PRP has a new, simplified application form tailored to several fixed, limited-coverage combinations.

2/1989

FIA completes its assessment of future resource requirements, including both staffing and funding levels, needed to maintain the currency and accuracy of published NFIP maps. These resource requirements, identified in A Cost Effective Plan for Flood Studies Maintenance, describe how FIA will move from an "initial studies" phase to a "maintenance" phase for flood studies and surveys.

5/1989

Through the use of an interim rule, FEMA decides that federal disaster assistance to restore insurable structures in SFHAs will be reduced by the maximum amount of insurance proceeds that would have been received had a building and its contents been fully covered by a flood insurance policy. The interim rule is revoked in December 1991.

5/1989

Under the auspices of the Domestic Policy Council's Working Group on the Environment, Energy, and Natural Resources, the White House establishes an Inter-Agency Task Force on Wetlands. One of the group's primary objectives is to recommend revisions to existing presidential executive orders on wetlands protection and floodplain management (see 5/1977).

6/1989

The Enhanced Actuarial Information System is completed and used for the

first time in conducting the annual review of NFIP rates.

9/1989

Hurricane Hugo strikes, wreaking havoc in the Carolinas, Puerto Rico, and the Virgin Islands. Buildings that had been built to meet the NFIP's requirements for floodplain management performed well, demonstrating the effectiveness of the requirements in reducing flood damages.

9/1989

The first major test of the Claims Coordinating Office (CCO) system occurs when a CCO is established to coordinate the assignment of a single adjuster to handle the wind and flood claims in North and South Carolina. The system works well and proves that cooperation between windpool and WYO companies through the CCO benefits insured individuals by simplifying the claims process with the use of a single adjuster.

10/1989

FIA implements a fee-charge system for certain categories of requestors of the archival backup for flood insurance studies and restudies. The fee-charge system is needed to limit the increasing costs associated with the servicing of these requests.

10/1989

Effective October 1, new rules revise the definition of substantial improvement and, for the first time, define substantial damage. "Substantial improvement" represents any reconstruction, rehabilitation, addition, or other improvement of a building, the cost of which equals or exceeds 50 percent of the market value of the building before the "start of construction" of the improvement. Substantial improvement includes buildings that have incurred "substantial damage," regardless of the actual repair work performed. Substantial damage reflects damage of any origin sustained by a building whereby the cost of restoring the building to its before-damaged condition would equal or exceed 50 percent of the market value of the building before the damage occurred.

11/1989

Effective November 1, new rules, which supersede those first implemented in October 1986, address provisions on the placement of manufactured homes in existing parks and subdivisions for manufactured homes. The revised rule is developed after consideration of recommendations by a task force including representatives of the manufactured home community and of state and local governments.

11/1989

The National Academy of Sciences completes Managing Coastal Erosion through the National Flood Insurance Program, a study requested by FIA, to provide advice on strategies for erosion management, supporting data needs, and applicable methodologies to administer these strategies through the NFIP. The study is necessary to determine whether the federal government should be involved in erosion insurance and, if so, how such a program should be administered. The question is triggered by the Upton-Jones Amendment (Section 544 of PL 100-242) to the National Flood Insurance Act of 1968 (see 5/1988).

11/1989

The Defense Production Act Amendment of 1989 (PL 101-137), which reauthorizes the NFIP, extends the Upton-Jones Amendment (see 5/1988) from September 30, 1989, through September 30, 1991, and requires FEMA to conduct a study to determine the impact of relative sea-level rise on FIRMs. The study will also project the economic losses associated with estimates of sea-

level rise.

12/1989

FIA produces its first community Flood Risk Insurance Directory (FRID) as a prototype in conjunction with its program to digitize FIRMs. The FRID was never adopted because the information is available in the private sector.

Before 1989, FIA had maintained an archive of all effective and all previously effective NFIP maps in hard-copy paper format. To improve on the archival system, to reduce the storage required, and to make copies of the archived maps available to requestors, FIA begins microfilming all NFIP maps.

1989

The Association of State Floodplain Managers' first formal survey of state and local programs is completed. Using a standardized reporting form makes it possible to summarize state floodplain management activities at the end of the 1980s.

3/1990

FIA initiates the first two pilot erosion studies to develop the applicable methodologies and study processes to determine rates of erosion.

FIA institutes a map panel subscription service. This system allows subscribers to obtain current information on the status of NFIP maps, on a map panel-by-panel basis.

4/1990

The National Wildlife Federation sues FEMA, claiming that the NFIP facilitates development that may result in destruction or adverse modification of habitat of the key deer, an endangered species found only in the Florida Keys. The Endangered Species Act requires that all federal agencies ensure that the actions they authorize, fund, or implement do not jeopardize the continued existence of endangered species. To ensure compliance with this requirement, federal agencies must consult with the Secretary of the Interior about how such actions might affect endangered and threatened species or their critical habitats.

6/1990

C. M. "Bud" Schauerte is nominated to be Federal Insurance Administrator.

8/1990

The GAO reports on compliance with the mandatory flood insurance provision of the Flood Disaster Protection Act of 1973 (see 12/1973) in Information on the Mandatory Purchase Requirement. The GAO notes FEMA's belief that the level of compliance with the provision is low. In contrast, according to the GAO, several agencies with responsibility for enforcing the requirement state that noncompliance is not a major problem. GAO's own assessment identifies high levels of noncompliance in parts of the two states it examined, Maine (22 percent) and Texas (79 percent).

8/1990

Wallace E. Stickney is appointed FEMA Director.

9/1990

As of September 30, there are 2.3 million policies and more than $202 billion of coverage in force.

10/1990

The first financial statement audit of the NFIP that includes the WYO Program (covering 1986-89) results in an unqualified opinion.

10/1990

The Community Rating System (CRS) begins. Under CRS, discounts on flood insurance premiums are available in communities that voluntarily initiate activities that reduce flood losses or that increase the number of flood insurance policies.

10/1990 continued

CRS is the product of three years of development by the Community Rating Task Force, which had representatives from FIA, the insurance industry, and state and local floodplain managers. Extensive field testing, critiques, and reviews with communities, public interest organizations, and the Association of State Floodplain Management's technical advisors were conducted by the Insurance Services Office's Commercial Risk Services Organization under the technical directions of the Community Rating Task Force. Four hundred professional floodplain managers, 50 public interest organizations, and representatives of over 100 communities reviewed the proposal. CRS is also the subject of a congressional hearing.

10/1990

Effective October 1, the NFIP introduces new elevation and floodproofing for nonresidential structures certificates forms. In addition, the NFIP broadens the definition of a small business so that more businesses can qualify as small businesses under the program.

11/1990

The Omnibus Budget Reconciliation Act of 1990 (PL 101-508) requires FEMA to establish a policy fee to cover the administrative expenses, including salaries, and mapping expenses incurred in implementing the flood insurance and floodplain management program. The $25 fee (later increased to $30) applies to all new and renewal flood insurance policies sold after May 31, 1991. From 1987 to 1991, Congress required all program and administrative costs to be paid from the National Flood Insurance Fund (see 8/1968) without a commensurate increase in rates. FIA estimates that, as of September 2000, program assets were reduced by about $485 million because costs were not collected during these years.

11/1990

The Coastal Barrier Improvement Act of 1990 (PL 101-591) expands the Coastal Barrier Resources System (established by the Coastal Barrier Resources Act of 1982, see 10/1982) to include units along the Great Lakes, Puerto Rico, the Florida Keys, the Virgin Islands, and secondary barriers within large embayments. After a one-year grace period, federal flood insurance will be prohibited in these units as well as in "otherwise protected lands." Such public or private lands are held for conservation purposes.

After the law's passage, the Coastal Barrier Resources System includes approximately 1,200 miles of coastline and approximately 1,272,000 acres of undeveloped coastal barriers and associated aquatic habitats.

The Act directs the Secretary of the Interior to establish a Coastal Barriers Task Force, which would include a representative from FEMA. The task force is supposed to complete a report by November 1992 that, among other topics, identifies the number of structures for which flood insurance has not been available because of the Act. The report is never completed.

12/1990

Over 18,000 communities now participate in the NFIP. The Engineering Scientific Data Package System has archived almost 10,000 flood insurance studies. Since 1981, nearly 1,300 existing data studies or existing data restudies were produced using flooding information generated for other purposes. Since 1983, FIA has accredited more than 12,000 linear miles of levees that protect against 100-year floods.

1990

FEMA identifies seven states (Colorado, Illinois, Kansas, Missouri, North Dakota, Ohio, and Oklahoma) that had zoning exemptions in enabling legislation for agricultural buildings. Due to these exemptions communities could not enact ordinances in compliance with the NFIP. FIA worked with these states to pass legislation or obtain legal opinions that the communities had the authority to enact ordinances on floodplain management.

1/1991

The Mortgage Portfolio Protection Program (MPPP) begins. This voluntary program allows lenders to bring their portfolios into compliance with the requirements for the purchase of flood insurance. Any insurance purchased through this program would occur only if the mortgagor property owner does not respond to all the notices the program requires. Lenders participating in the MPPP can purchase policies (or “force place” required insurance coverage) at special high rates, reflecting the uncertainty as to the degree of risk due to the limited underwriting data required. Policies under the MPPP can be purchased only from WYO companies participating in the MPPP. Further, these policies can be purchased only as a last resort for properties that are part of a lending institution’s mortgage portfolio. The property must be located within a SFHA of a community participating in the NFIP and not be covered by a policy even after required notices have been given to the mortgagor property owner by the lending institution of the requirement for obtaining and maintaining such coverage.

3/1992

The Corps of Engineers publishes a revised Flood-Proofing Regulations.

7/1992

In Coastal Barriers: Development Occurring Despite Prohibitions against Federal Assistance, the GAO concludes that development continues on previously undeveloped barrier islands despite restrictions in the Coastal Barrier Resources Act (PL 97-348) on the issuance of flood insurance for structures on such islands. Equally important, the study finds that nearly 10 percent of residences in these areas have flood insurance coverage even though coverage is not supposed to be provided in these areas.

9/1992

In reviewing FEMA’s adherence to its policies for updating flood maps, the agency’s Office of Inspector General finds that FEMA does not consistently adhere to policies to ensure that restudies yielding the most benefits are performed first or use a standard set of criteria to choose maps to digitize. In addition, the Inspector General notes that FEMA provides information on communities to map users in five ways, with the result that the information from the different sources may conflict and lead to incorrect or unneeded flood insurance policies. FEMA generally agrees to implement the recommendations associated with the audit’s findings.

10/1992

Section 928 of the Housing and Community Development Act of 1992 (PL

102-550) legislates a flood-control restoration zone (AR) as a result of the de-certification of the levee systems of Los Angeles and Sacramento, California. The Act makes certain insurance and development benefits available in areas where a federal flood-control system will be restored.

1992

A survey of state NFIP coordinators by the Association of State Floodplain Managers identifies an increase in state activities and state participants. The survey notes that many states participate in activities to restore and preserve the natural and cultural resources of floodplains and that many identify the environmental benefits of floodplain management as the key to obtaining wide public support. The survey reports that 39 states have more than 175 full-time equivalent personnel.

1992

The Federal Interagency Floodplain Management Task Force publishes its two-volume Floodplain Management in the United States: An Assessment Report. Key topics include individual risk awareness; migration to water; floodplain losses; short-term economic returns; enhanced knowledge and technology; national standards for flood protection; limited governmental capabilities; the need for interdisciplinary approaches; application of mitigation measures; the effectiveness of mitigation measures; the role of disaster relief; and national goals and resources. The report concludes that it is difficult to assess the effectiveness of floodplain management, observing that “there are few clearly stated, measurable goals,” and that “there is not enough consistent reliable data about program activities and their impacts to tell how much progress is being made in a given direction.”

2/1993

In Coping with Catastrophe: Building an Emergency Management System to Meet People’s Needs in Natural and Manmade Disasters, the National Academy of Public Administration concludes that, in light of the devastation caused by Hurricane Andrew in south Florida in 1992, FEMA has not successfully integrated its many missions. In the report’s words, “FEMA has been ill-served by congressional and White House neglect, a fragmented statutory charter, irregular funding, and the uneven quality of its political executives appointed by past presidents.”

4/1993

A U.S. District Court in Key West, Florida, hears the National Wildlife Federation’s complaint (see 4/1990) that the NFIP facilitates development in the Florida Keys that may jeopardize the continued existence of the key deer, an endangered species. In response, FEMA states that implementation of the NFIP is not an action subject to the consultation requirements of the Endangered Species Act.

6/1993

The Great Midwest Flood of the upper Mississippi and lower Missouri River basins from mid-June through early August provide evidence that the nation has not yet reached an accommodation between nature’s periodic need to occupy her floodplains and the present human occupancy and use. The floods generated the highest flood crests ever recorded at 95 measuring stations. President Clinton declares 505 counties in nine states to be federal disaster areas. Estimates of the total damage are as high as $16 billion. Only about one in ten of affected structures have flood insurance.

Various sources attempt to assign recurrence intervals (e.g., a “500-year” flood) to the flood, but they are subject to considerable error due to the flood’s complex and widespread nature, the short historic data record on which to base an analysis, changing observation methods, and the difficulty in assigning flow

rates and elevations to past historic events. Stanley Changnon edits a comprehensive evaluation of this flood, The Great Flood of 1993: Causes, Impacts and Responses, which is published in 1996.

Four broad issues are examined as a result of this flood: a) whether to repair or reconstruct the hundreds of damaged flood-control levees (or other structural/protective measures in future floods) and who would pay for permitted repairs; b) whether to permit repair or rebuilding of thousands of substantially damaged structures so they could again be inhibited; c) whether to commit community planning and financial assistance to develop alternative mitigation strategies to the typical repair/rebuild scenario; and, d) whether to use the experience of risk insurance as a mitigation tool.

8/1993

To study the “levee issue” resulting from damage caused by the 1993 floods and to facilitate the search for appropriate alternatives, the Office of Management and Budget issues guidance to assess strategies for levee reconstruction. Representatives from five federal agencies, state and local governments, and other interested organizations consider alternatives to levee repair that would provide the benefits of flood control and protect natural resources. The committee affects decisions not to rebuild a few levees, but its overall impact is not felt until other post-flood recovery situations such as in California in 1995.

9/1993

The National Performance Review finds that the provision of federal disaster assistance is too generous and too frequent, with the possible result that the federal government may be perceived as the states’ “first-line resource in every emergency.” Echoing past recommendations (see 1/1981, for example), the Review urges the development of objective criteria to replace “political factors” in decisions about disaster declarations.

11/1993

In response to the criticisms contained in Coping with Catastrophe, FEMA reorganizes its 2,500 employees into five directorates, two administrations (the Federal Insurance Administration and the U.S. Fire Administration), and 10 regional offices.

12/1993

Due to extensive flooding during the previous fiscal year, the NFIP experiences losses that are more than twice its historic loss level and must borrow $100 million from the Department of Treasury to meets its needs for cash. This is the first time such borrowing has been necessary since 1984. The borrowed funds are repaid in FY 1994.

12/1993

The “Volkmer Amendment” in the Hazard Mitigation and Relocation Assistance Act of 1993 (PL 103-181) amends the 1988 Stafford Act (see 11/1988) to increase federal support for relocating flood-prone properties and to increase the amount of hazard-mitigation funds available after a disaster to 15 percent of all of FEMA’s appropriated federal disaster funds, up from 10 percent of a portion of FEMA’s funds dedicated to community assistance disaster funding for relocation or hazard-mitigation activities. The Act also increases to 75 percent from 50 percent, effective June 10, 1993, the share of the costs of mitigation activities the federal government will cover; clarifies acceptable conditions for the purchase of damaged homes and businesses; requires the complete removal of such structures; and dictates that the purchased land be dedicated “in perpetuity for a use that is compatible with open space, recreational, or wetlands management practices.”

1/1994

The Executive Office of the President, through the Administration Floodplain Management Task Force, assigns a broad mandate to the Federal Interagency Floodplain Management Review Committee to delineate the causes and consequences of the 1993 Midwest flooding and evaluate the performance of existing programs for floodplain and related watershed management.

The committee observes that “in the Midwest, the NFIP tends to discourage floodplain development through the increased costs in meeting floodplain management requirements and the cost of an annual flood insurance premium, although this may not be the case elsewhere in the nation.”

1/1994 continued

The committee’s report provides an opportunity for “a blueprint for change” in the nation’s programs and policies affecting its coastal and riverine floodplains. The committee makes several recommendations including changes in federal policies, programs, and activities that will most effectively achieve risk reduction, economic efficiency, and governmental enhancement in the floodplain and related watersheds. In all, there are 93 recommendations to be used as “a blueprint for the future.”

3/1994

The GAO issues Flood Insurance: Financial Resources May Not Be Sufficient to Meet Future Expected Losses. The report notes that income from insurance premiums is not sufficient to build reserves to meet expected flood losses. Consequently, the GAO concludes that losses from claims and the program’s expenses will exceed the funds available to the program in some years.

4/1994

FEMA issues a proposed rule in response to the Housing and Community Development Act of 1992, which created a flood-control restoration zone (AR) designed to meet communities’ concerns. The AR designation recognizes that a system for flood protection is being restored to provide protection during the base flood event and during the restoration period and reduces the costs of flood insurance and elevation requirements while still providing some level of protection for properties that will be exposed to the increased risks of flooding during the restoration period.

6/1994

The Interagency Floodplain Management Review Committee, given the responsibility for conducting a comprehensive review of floodplain management after the Midwest floods of the previous year, publishes Sharing the Challenge: Floodplain Management Into the 21st Century (sometimes referred to as the “Galloway Report,” after the committee’s chair, Gerald E. Galloway, Jr.). The report recommends a sharing of responsibility for floodplain management among federal, state, and local officials and for restrictions on development in floodplains.

With respect to flood insurance, the Committee criticized the limited penetration of the program in communities affected by the Great Midwest Flood of 1993 (see 6/1993). Repeating the warning of the National Performance Review (see 9/1993), the Galloway report notes that overly generous federal disaster assistance has the potential to reduce individuals’ responsibility to protect themselves against disasters.

6/1994 continued

In addition, the report notes that the five-day waiting period between the time of purchase of a flood insurance policy and when coverage is effective allowed many people to purchase insurance with the knowledge that they would be flooded in the summer of 1993. If the waiting period had been 30 days, nearly

4,000 fewer insurance claims would have qualified, and payments would have been $82 million less. The committee thus recommended that the waiting period be increased to 15 days.

9/1994

The Community Development and Regulatory Improvement Act (PL 103-325), the National Flood Insurance Reform Act of 1994, includes the most comprehensive changes to the NFIP since the Flood Disaster Protection Act's approval in 1973.

Subtitle B provisions include a nonwaiver of the requirement that flood insurance be purchased by recipients of federal disaster assistance; expand requirements for lenders when making loans and requiring that coverage be maintained over the life of the loan; require escrow of flood insurance payments if escrows are already required; require placement of flood insurance by lenders if a borrower fails to obtain the necessary coverage; impose penalties for failure to require flood insurance or notify borrowers; impose fees for determining the applicability of flood insurance purchase requirement; establish notice requirements for properties located in a SFHA and a change in loan servicer; and require standard hazard determination forms.

Subtitle C codifies the Community Rating System and directs that credits may be given to communities that implement measures to protect natural and beneficial floodplain functions and manage erosion.

Subtitle D includes provisions to repeal the flood-property purchase and loan program (Section 1362); terminate the erosion-threatened structures program (Upton-Jones Amendment; see 5/1988 and 11/1989); establishes a Mitigation Assistance Program, which replaces the Upton-Jones acquisition/demolition program, to provide grants to states and communities based on a 75/25-percent cost share for mitigation plans and projects; creates the National Mitigation Fund; and provides additional coverage for compliance with land-use and control measures.

Subtitle E establishes the Flood Insurance Interagency Task Force (Section 561(a)) and the Task Force on Natural and Beneficial Functions of the Floodplain. The Flood Insurance Interagency Task Force is directed to conduct a number of studies addressing the programs and procedures of Federal agencies and corporations for compliance with NFIP regulations, and to submit a report of findings and conclusions to Congress.

9/1994 continued

Subtitle F increases the maximum coverage amounts available and includes a requirement to review and assess the need to update and revise FIRMs every five years; establishes a Technical Mapping Advisory Council; requires a study of the economic impacts of erosion-hazard areas; requires an economic impact study of the effect of charging actuarial rates for pre-FIRM properties; increases the waiting period for flood insurance policies to 30 days (see 6/1994); adds provisions regarding agricultural structures; and prohibits disaster assistance to individuals in a SFHA who received disaster assistance and did not maintain flood insurance.

9/1994

In an Audit of FEMA's Mitigation Programs, FEMA's Inspector General concludes that a lengthy application process, due primarily to the significant delays in the process for determining project eligibility, hampers the agency's implementation of the Hazard Mitigation Grant Program (see 11/1988). In the audit's words, "The criteria for determining environmental impact, cost effectiveness and whether projects represent a long-term solution are especially confusing." In addition, the audit concludes that "there are no mechanisms to measure the effectiveness of mitigation in any of FEMA's programs, and managers have neither the qualitative tools nor resources."

10/1994

FIA issues a newly revised Agent Flood Insurance Manual.

11/1994

Given the gravity of the 1993 Midwest flood and because less than 15 percent of the nonfederal levees that were damaged qualified for repair consideration under the Corps of Engineer's emergency flood-control repair program, Congress provides supplemental funding for repair of levees. Under the authority of PL 84-99, the Corps of Engineers rehabilitate the 115 levees already eligible under its program and another 241 nonfederal levees using supplemental funding. In total, repairs cost $230 million.

12/1994

The number of flood insurance policies in force exceeds three million for the first time.

12/1994

A report issued by the U.S. House of Representatives Bipartisan Natural Disasters Task Force concludes that the federal government's generosity with disaster assistance diminishes the incentives for state and local governments "to spend scare state and local resources on disaster preparedness, mitigation, response, and recovery. This not only raises the costs of disasters to federal taxpayers, but also to our society…as people are encouraged to take risks they think they will not have to pay for."

The Task Force recommends the creation of a "private, naturally based all-hazard insurance program, in consultation with the insurance industry…for residential and commercial property."

1994

A revised Unified National Program for Floodplain Management is published. In the report, the Federal Interagency Floodplain Management Task Force recommends four broad goals for a Unified National Program. These are to: formalize a national goal-setting and monitoring system; reduce by at least half the risks to life and property and the risks to natural resources of the nation's floodplains; develop and implement a process to "encourage positive attitudes toward floodplain management;" and establish a nationwide, in-house capability for floodplain management.

The report, submitted to Congress on March 6, 1995, also identifies objectives necessary to achieve each goal and establishes target dates for completing them.

1994

The Federal Interagency Floodplain Management Task Force, with funding from the Environmental Protection Agency and the Corps of Engineers, publishes a guidebook for community officials and other interested parties to aid in developing local programs to protect and restore important floodplain resources and functions. Protecting Floodplain Resources: A Guide for Communities provides information on methods to mitigate flood hazards to preserve the integrity of natural systems.

1994

The Association of State Floodplain Managers produces National Flood Programs in Review, 1994, the Association's first comprehensive effort to assess national programs and policies related to floodplain management.

1994

Elaine A. McReynolds is appointed Federal Insurance Administrator.

1994

In Florida Key Deer v. Stickney, 864 F. Supp. 1222 (S.D. Fla. 1994), a U.S. District Court rules that FEMA must comply with the requirements of the Endangered Species Act and consult with the Department of the Interior regarding the possible impacts of development by flood insurance on the key deer, and endangered species (see 4/1990 and 4/1993).

1/1995

As a result of an Audit of the Accuracy of Flood Zone Ratings, FEMA's Inspector General finds that zone misreadings occurred in more than one-quarter of all flood insurance policies and that premiums were incorrect for 10 percent of the policies sampled. The audit also notes that FEMA's flood maps are difficult to read, that the rules for writing policies are more complex than for most other forms of insurance, and that FEMA does not have a program for quality control to verify that insurance agents use the correct rating factors (such as flood zone, elevation, or pre- or post-FIRM status) to calculate premiums.

FEMA accepts the findings, but does not act to implement the report's recommendations, at least through the end of 1999.

2/1995

Retroactive to September 23, 1994, (the date President Clinton signed PL 103-325, the National Flood Insurance Reform Act), all applicants for Individual and Family Grants (IFG) who receive federal disaster assistance are required to purchase and maintain flood insurance on the flooded property until they move to another address. Failure to maintain the insurance will preclude receipt of any subsequent disaster assistance through the IFG program.

2/1995

FEMA publishes in the Federal Register the first compendium that lists all revisions and amendments made to flood maps between October 1, 1994, and December 31, 1994. Subsequent compendia are published in the Federal Register every six months.

3/1995

Federal Disaster Assistance, Report of the Senate Bipartisan Task Force on Funding Disaster Relief (U.S. Senate Doc. No 104-4) concludes that Congress should improve financial preparedness for catastrophic events. The report notes that between FY 1977 and 1993, the federal government spent $64 billion in direct disaster relief and $55 billion indirectly through low-cost loans.

Congress does not act on the recommendations. The Task Force recommends: a) clarification of criteria for declarations of disasters; b) improved incentives for mitigation; and c) greater dependence on insurance. The Senate Task Force does not support the recommendations of the House Bipartisan Natural Disasters Task Force (see 12/1994) regarding all-hazard insurance.

3/1995

FIA proposes the creation of Group Flood Insurance Policies (GFIP). Such policies, intended for low-income recipients of flood-related disaster assistance through the NFIP's Individual and Family Grant Program (see 2/1995), will provide three years of flood insurance, with the federal (75 percent) and state governments (25 percent) sharing the cost of the premiums. At the end of the three-year period, each GFIP recipient will be required to purchase and maintain a standard flood insurance policy. Coverage on that property must be con-

tinued as long as the property exists.

3/1995

In response to the National Flood Insurance Reform Act of 1994, FEMA increases the waiting period to 30 days from 5 days before flood insurance coverage becomes effective. Two exceptions are possible: when the initial purchase of flood insurance is in connection with the making, increasing, extension, or renewal of a loan and when the initial purchase of flood insurance occurs during the one-year period following notice of the issuance of a revised FIRM for a community.

7/1995

Effective July 1, the NFIP introduces provisional ratings for policies that require an elevation certificate when it is not yet available. The NFIP begins accepting credit cards as a means of paying insurance premiums.

7/1995

The Corps of Engineers publishes Floodplain Management Assessment of the Upper Mississippi River and Lower Missouri Rivers and Tributaries. Among its findings, the Corps determines that structural flood protection prevents significant damage, that restoration of floodplain wetlands would have had little impact on floods the size of those in 1993, and increased reliance on flood insurance better ensures appropriate responsibility for flood damage.

7/1995

FEMA’s Inspector General issues an Audit of the Enforcement of Flood Insurance Purchase Requirements for Disaster Aid Recipients. The audit finds that individual recipients of flood-related disaster assistance, who are required to purchase and maintain flood insurance if their flood-damaged property is insurable and within a SFHA, often do not do so (see 9/1994). Low levels of compliance are found even though grants through the Individual and Family Grant Program include funds for the first year’s premium.

Similarly, the audit notes “very low” levels of compliance with the mandatory-purchase requirement among recipients of grants from FEMA’s Public Assistance Program. Such grants provide funds for the repair of state and local governments’ facilities. Recipients of Public Assistance funds must purchase flood insurance if their flood-damaged property is insurable and if their grant is over $5,000, regardless of whether the property is in a SFHA if insurance is reasonably available, adequate, and necessary.

9/1995

Due to extensive flooding during the previous 12 months, the NFIP experiences losses that are much higher than the historic loss level and must borrow $265 million from the Department of Treasury to meets its needs for cash.

10/1995

The NFIP’s “Cover America” campaign begins. The campaign represents a nationwide effort to increase public awareness of the perils of flooding and the desirability of purchasing flood insurance.

12/1995

FEMA issues The National Mitigation Strategy: Partnerships for Building Safer Communities. The document emphasizes two key goals, increasing public awareness of the risks associated with natural hazards and significantly reducing the loss of life, injuries, economic costs, and disruption of families and communities due to natural hazards.

1995

A survey of states by the Association of State Floodplain Managers describes trends since 1992 that have reversed some of the continuous advances made since the late 1960s. According to the survey, state programs face challenges in budget, organization, and authority that threaten their ability to be full, active partners with the federal government and local communities in reducing flood losses. The report concludes that states' capabilities have eroded because of legislative dilution, budgetary restrictions, and organizational dissection.

1/1996

Federally regulated lenders, federal agency lenders, and government-sponsored enterprises are henceforth required to use the Standard Flood Hazard Determination Form. This form is used to determine whether real property offered as collateral for a loan is located in a SFHA.

2/1996

President Clinton promotes FEMA's director to cabinet status.

4/1996

Effective April 30, the NFIP revises the standard flood insurance application and endorsement forms and makes them available through ACORD, a non-profit association that develops and maintains communication standards for the insurance industry.

5/1996

FEMA initiates the use of Group Flood Insurance Policies (see 3/1995). Such policies help disaster victims located in a SFHA who do not qualify for loans from the Small Business Administration comply with flood insurance purchase requirements. The first such policies are issued in August 1996.

8/1996

Federal regulators of financial institutions issue a joint rule on August 29 to implement the provisions of the National Flood Insurance Reform Act of 1994. The rule is intended to achieve uniformity among these regulators on the substantive and procedural requirements of the act. These regulations become effective on October 1, 1996.

9/1996

FEMA exempts several categories of projects funded through the Stafford Act's Hazard Mitigation Grant Program (see 11/1988) from the use of a benefit-cost analysis due to the difficulty in quantifying known project costs and the time involved in gathering data. Exempted activities include those in which the cost of restoring damaged structures equals or exceeds 50 percent of the structures' market value and the structures are located in a 100-year floodplain.

9/1996

In response to Section 541 of the National Flood Insurance Reform Act of 1994, FEMA submits The Community Rating System of the National Flood Insurance Program to Congress. The section requires FEMA to submit a report on the rating system to Congress every two years. Such reports are required to analyze the program's cost effectiveness, accomplishments, or shortcomings, and to provide recommendations for legislation.

9/1996

Due to extensive flooding during the past 12 months, the NFIP experiences losses that are much higher than its historic loss levels and must borrow funds

from the Department of Treasury to meets its needs for cash. The total amount borrowed reaches $626 million. The NFIP borrows an additional $192 million over the next six months.

10/1996

Congress approves a supplemental request (reflected in PL 104-208) to increase the NFIP's borrowing authority (see 9/1996) for FY 1997 to $1.5 billion from $1 billion.

10/1996

Federally regulated lending institutions and government-sponsored enterprises (GSE) that purchase mortgages are required, effective October 1, to escrow premiums for flood insurance for properties located in floodplains. If a federally regulated lender or GSE determines that a property in a SFHA does not need flood insurance, such insurance can be "force placed" at the borrower's expense.

10/1996

The Federal Financial Institutions Examination Council (FFIEC) implements revised examination procedures for flood insurance in response to the new mandatory purchase requirements of the National Flood Insurance Reform Act of 1994 (see 9/1994).

12/1996

FEMA issues interim guidance for determining the cost-effectiveness of hazard-mitigation projects entitled How to Determine Cost-Effectiveness of Hazard Mitigation Projects: A New Process for Expediting Application Reviews. The new guidelines declare that benefit-cost analysis should be used for all cost-effectiveness determinations.

12/1996

Through its Innovations in American Government program, Harvard University's School of Government recognizes FEMA for its Consequent Assessment Tool Set (CATS), which enables the agency to predict the likely consequences of an impending disaster and then to rapidly mobilize an appropriate response.

12/1996

FEMA creates an Insurance Task Force to develop recommendations for the reform of its Public Assistance program (see 11/1988 and 7/1995). The Flood Disaster Protection Act of 1973 required the NFIP to identify, by June 30, 1974, all communities that contain areas at risk for serious flood hazard and to notify these communities that they can apply for participation in the NFIP or forego their eligibility for certain types of federal assistance in their floodplains (see 12/1973).

1996

The Association of State Floodplain Managers establishes an executive office in Madison, Wisconsin. The Association has catalogued more than 700 publications, which are housed at the National Floodplain Management Resource Center at the University of Colorado.

1996

Gerald Galloway declares "the flood [the 1993 upper Mississippi and lower Missouri River basins flood] is over. No one now cares," in his remarks to the Association of State Floodplain Managers Annual Conference and printed in National Flood Policy: Progress Since the 1993 Floods.

1/1997

FEMA's Insurance Task Force issues Insurance Regulations, Review, Analysis, and Recommendations. The report focuses attention on FEMA's Public Assistance program and recommends that: a) insurance deductibles not be eligible for FEMA funding; b) FEMA establish a policy requiring actual proof of insurance rather than an insurance commitment, before funding is provided; c) FEMA should develop clear regulations to minimize opportunities for misinterpretation of these regulations among FEMA's regional offices; and d) the authority of state insurance commissioners to waive insurance requirements for public facilities be revoked. In lieu of these commissioners being allowed to grant waivers, the report encourages input from them as to the availability, adequacy, and necessity of insurance. Under no circumstances, however, should the requirement be waived because of affordability, at least according to the report.

3/1997

FEMA issues a Report on Costs and Benefits of Natural Hazard Mitigation, which reviews the benefits of mitigation measures. Among the report's 16 case studies are three related to floods: a) the acquisition and relocation of floodplain structures in Missouri; b) land-use and building regulations along Florida's coasts; and c) land-use and building requirements in floodplains.

3/1997

The Flood Insurance Interagency Task Force submits an interim report to Congress providing details on surveys, studies, and research underway to complete the tasks directed by Title V of the National Flood Insurance Reform Act of 1994 (see 9/1994).

5/1997

To consider and implement the recommendations in the 1994 report, A Unified National Program for Floodplain Management, FEMA convenes a group of about 40 experts at the annual conference of the Association of State Floodplain Managers in Little Rock, Arkansas and prepares a report on the forum.

6/1997

Mandated by the National Flood Insurance Reform Act of 1994, Increased Cost of Compliance (ICC) coverage is included in all new and renewed flood insurance policies effective on or after June 1, 1997. This coverage helps to cover the costs of bringing flood-damaged homes and businesses into compliance with community floodplain ordinances. The coverage limit of $15,000 helps to pay for elevating, flood proofing, demolishing, or relocating a structure that has been substantially or repetitively damaged by flooding. ICC coverage is available only in communities that adopt and enforce substantial-damage or repetitive-loss provisions in their floodplain management ordinances and require action by property owners.

9/1997

In accordance with the Government Performance and Results Act (PL 103-62), FEMA issues its first strategic plan, Partnership for a Safer Future. The plan delineates FEMA's mission statement, which is to reduce future loss of life and property through timely delivery of assistance intended to help communities restore damaged services and rebuild facilities. According to the plan, FEMA seeks to reduce, by FY 2007, the risk of loss of life and injury from natural hazards by 10 percent and the risk of property loss and economic disruption from such hazards by 15 percent.

9/1997

Due to continuing flood-related losses that exceed historical averages, the

value of the Department of the Treasury's loans to the NFIP reach $917 million (see 9/1995 and 9/1996).

10/1997

FEMA publishes a final rule on AR Zones. The rule establishes an AR zone or area of special flood hazard that results from the decertification of a previously accredited flood protection system that is determined to be in process of being restored to provide base flood protection.

10/1997

FEMA begins "Project Impact," an effort to protect against the impact of natural disasters before they happen. The project seeks to build disaster-resistant communities through public-private partnerships and includes a national public-awareness campaign; the designation of pilot communities; and an outreach effort to community and business leaders. FEMA will encourage communities to assess the risks they face, to identify their vulnerabilities, and to take steps to prevent disasters.

The first three pilot communities include Deerfield Beach, Florida; Pascagoula, Mississippi; and Wilmington, North Carolina. Others are in California, Maryland, Washington, and West Virginia. FEMA's goal is to have at least one Project Impact community in every state by September 30, 1998.

Congress appropriates $30 million for Project Impact for FY 1998 and $25 million for the following fiscal year.

10/1997

FEMA announces that benefit-cost analyses will not be required for hazard mitigation planning projects associated with disasters that occurred before June 10, 1993.

11/1997

In Modernizing FEMA's Flood Hazard Mapping Program, FEMA describes its plans to modernize its flood-hazard maps, of which there are about 100,000 map panels. The program's purpose is to increase public awareness and the maps' accuracy, utility, and production. Approximately 45 percent of the current maps are at least 10 years old, and 70 percent are five years or older. Consequently, many of the maps are inaccurate and portray analyses that are outdated.

11/1997 continued

FEMA estimates the cost of implementing its new program at $901 million (in addition to the $46 million spent in 1997) over seven years. FEMA believes that the plan will avoid approximately $26 billion in flood damages to new buildings over a 50-year period.

12/1997

In response to Section 577 of the National Flood Insurance Reform Act of 1994, FEMA completes a process of mapping erosion hazards in 27 coastal counties in 18 states.

1997

The Association of State Floodplain Managers establishes a foundation to "attract funds that support, through education, training and public awareness, projects and programs that will lead to the wise management of our nation's floodplains."

1997

The Presidential Long Term Recovery Task Forces (for the 1997 Red River floods) are established. These task forces operate at a higher administrative level and are more visible than FEMA's mitigation process. Recovery and mitigation become increasingly integrated.

1997

FEMA awards a contract to evaluate the NFIP's underwriting and loss adjustment process. This subsequent report provides recommendations to improve the operation of the NFIP by identifying practical changes to the underwriting/rating and claims processes. The NFIP's requirements and controls (and compliance with them) are found to be adequate to ensure effective management of the program. The report also notes areas for improvement.

1997

FEMA awards a contract to investigate alternative financing arrangements for the NFIP. A stochastic model is developed to estimate the NFIP's financing costs over a ten-year period using eight alternative financing scenarios. Four commercial and four governmental financing scenarios are simulated, and the total cost of each is projected.

1/1998

FEMA initiates the Repetitive Loss Task Force to develop a strategy to address the NFIP's repetitive loss problem.

3/1998

The American Society of Civil Engineers releases its 1998 Report Card for America's Infrastructure and declares that "an alarming number of dams across the country are showing signs of age and lack of proper maintenance….Dam safety officials estimate that thousands of dams are at risk of failing or are disasters waiting to happen."

3/1998

FEMA's Office of Inspector General issues Review of FEMA's Implementation of Insurance Requirements in the Public Assistance Program. The report recommends that FEMA clarify its regulations governing the conditions under which state insurance commissioners issue waivers of insurance requirements for recipients of Public Assistance grants.

As a condition of receiving a Public Assistance grant, FEMA requires that applicants purchase and maintain insurance on property damaged in a disaster (see 11/1988, 1/1997, and 7/1995). The amount of insurance applicants must purchase is equal to the cost of repairs to the property. In addition, insurable structures located in a SFHA must be insured if they have been damaged in previous disasters. These requirements are designed to reduce the need for future disaster assistance. In lieu of a commitment to purchase insurance, an applicant can obtain a waiver from a state insurance commissioner. The commissioner can waive the requirement if it is determined that the required insurance is not reasonably available, adequate, and necessary.

The Inspector General's report notes that FEMA has not provided an interpretation of what is reasonable, with the consequence that many waivers are granted because insurance commissioners decide that suitable coverage is not affordable. In such instances, FEMA has a substantial uninsured investment since it is the primary insurer.

3/1998

In a separate report, Improvements Are Needed in the Hazard Mitigation Buyout Program, the Office of Inspector General questions FEMA's decision to

exempt certain categories of activities from the requirement that mitigation activities be cost-effective, as determined through the use of cost-benefit analysis. The report also notes that FEMA lacks an analytical basis for exempting such projects.

5/1998

On May 1, the NFIP increases the standard deductibles for building and contents coverages for subsidized policies to reduce the subsidy levels through means other than rate increases. Other program changes include: new eligibility requirements for Preferred Risk Policies based on the flood history of the property regardless of ownership, implementation of new AR zones, and detailed procedures for detailed procedures for determining eligibility for NFIP insurance in areas of the Coastal Barrier Resources Systems.

6/1998

The National Flood Determination Association (NFDA) incorporates itself. The NFDA, a national non-profit organization, promotes the interest and success of companies involved in making, distributing, and reselling flood zone determinations.

9/1998

FEMA initiates a nationwide Call for Issues. Through this activity FEMA requests comments on all facets of the NFIP from its partners and customers in an effort to improve the program's effectiveness.

9/1998

The Flood Insurance Interagency Task Force submits its final report to Congress on Enforcement and Compliance Procedures Necessary to Carry Out the Provisions of the National Flood Insurance Reform Act. The Task Force reports on its development of a compliance model checklist, a catalog of compliance assistance materials, and a list of "best practices" for federal agencies and Government Sponsored Enterprises (GSEs). The report finds that a reasonable degree of standardization of enforcement exists within the federal agencies and GSEs.

9/1998

Five cities in southern California file a lawsuit in U.S. District Court in which they claim that FEMA's delineation of a flood control restoration zone (Zone AR) violates the National Environmental Policy Act and Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations." The cities allege that the zone's designation and the requirements it imposes will have a substantial negative impact of their residents' ability to use their land, on the environment, and on minority and low-income populations.

10/1998

The Partnership for Response and Recovery, under a FEMA contract, issues Analysis of Public Assistance Proposed Insurance Regulation Changes, which estimates the potential cost reductions of proposed changes in insurance regulations and the Stafford Act's Public Assistance grants (see 11/1988, 7/1995, 1/1997, and 3/1998).

10/1998

In response to Section 541 of the National Flood Insurance Reform Act of 1994, FEMA completes and submits to Congress An Evaluation of the National Flood Insurance Program's Community Rating System. The report notes that 894 communities, representing 66 percent of all policyholders, participate in CRS (see 10/1990 and 9/1994). Tulsa, Oklahoma, and Sanibel Island, Flor-

ida, are the two-best rated CRS communities.

11/1998

FEMA's director, James Lee Witt, announces a series of proposals to reduce disaster losses by half in three years and to save nearly $1 billion over 10 years. If adopted, the first proposal would prohibit the purchase of flood insurance by homeowners who have filed two or more claims that total more than the value of their home and who refuse to elevate their home or to accept a buyout. At present, there is no limit to the number of claims made by property owners who suffer repetitive damage from floods.

11/1998 continued

The second proposal would require that public buildings be insured to 80 percent of their replacement value within two years. Although the 1988 Stafford Act requires states and local communities to insure public buildings, FEMA's regulations require only that the amount of insurance to be purchased must be at least up to the amount of eligible damage under the Public Assistance program (see 11/1988, 7/1995, 1/1997, and 3/1998). If the eligible damage is less than the building's replacement value, and if the corresponding minimal levels of insurance can be purchased, this can result in vastly underinsured buildings.

Existing regulations do not indicate whether the insurance must provide coverage for a building's actual cash value or its replacement cost and do not address deductibles. Consequently, the current regulations do not include any incentive to encourage insurance on public buildings that have benefited from disaster assistance.

1998

FIA estimates that approximately 1.7 million homeowners (or 38 percent) with a mortgage in a SFHA do not have flood insurance.

1998

The National Wildlife Federation publishes Higher Ground: A Report on Voluntary Property Buyouts in the Nation's Floodplains describing efforts to restore floodplains through voluntary buyouts of property in high-risk areas. The report analyzes repetitively flooded properties and discusses the history of buyout programs in the United States and the 1993 Midwest flood. Most important, the report concludes that the NFIP is not actuarially sound and that its premiums are insufficient to generate the funds needed to cover flood insurance payments.

1998

JoAnn Howard is appointed Federal Insurance Administrator.

1/1999

The Association of State Floodplain Managers supports the creation of state floodplain management associations and encourages their chapter membership. As of 1999, 12 states enjoyed chapter membership. Several other states formed associations, with many working toward chapter status.

1/1999

FIA uses findings from an evaluation of the "Cover America" campaign to develop the "Cover America II" campaign.

1/1999

FEMA, working with the Public Risk Management Association, conducts a series of regional meetings of public risk managers to discuss and hear reac-

tions to FEMA's first draft of its insurance proposal relative to Public Assistance grants under the Stafford Act (see 11/1988, 7/1995, 1/1997, 3/1998, and 11/1998). FEMA's goal is to limit funding under the Act's Public Assistance program to the state and local agencies that maintain specified minimum levels of insurance coverage. FEMA believes that existing rules create a disincentive to both carry insurance and to manage the risk of disasters and are inequitable in that they penalize state and local governments that purchase appropriate insurance coverage.

1/1999

National Flood Insurance Program: Issues Assessment, A Report to the Federal Insurance Administration is published. This report, funded by FEMA, is based on a literature review to answer questions about the program's effectiveness by assessing two central concerns: the relation between floodplain development and insurance availability and enforcement of floodplain management requirements at the local level. The report notes that "none of the studies offered irrefutable evidence that the availability of flood insurance is a primary factor in floodplain development today. Neither does the empirical evidence lend itself to the opposite conclusion." Noting that "it is there, in the day-to-day decisions by location officials, that the [NFIP] either succeeds or fails to accomplish its statutory mandate" and that "a number of tools and oversight systems have been devised to monitor, support and evaluate the quality of community enforcement." The report offers no conclusions regarding the second concern.

1/1999

FEMA requests that Congress authorize a transaction fee of $15 for each federally insured mortgage issued. The money collected will be used to fund FEMA's modernization of its maps. Congress eventually declines the request but does provide $5 million to begin updating the maps.

The U.S. Senate Committee on Appropriations instructs FEMA to evaluate alternative funding options. FEMA's response is contained in Flood Map Modernization Plan: Funding Options Report. Four options are identified: a map-use fee; an increase in the fee charged for each flood insurance policy; supplemental appropriations; and use of the NFIP's borrowing authority.

2/1999

The U.S. House of Representatives' Committee on Financial Services indicates that its oversight plan for the 106th Congress includes attention to repetitive losses and the implementation of the Community Development and Regulatory Improvement Act of 1994 (see 9/1994).

3/1999

To recognize the inherently greater flood risk of pre-FIRM, V-zone properties, FIA announces increases in the amount of premiums that flood insurance policyholders must pay for flood insurance coverage for pre-FIRM buildings in coastal areas subject to high velocity waters, such as storm surges and wind-driven waves.

4/1999

FIA hires an advertising agency to plan, implement, and evaluate the five-year "Cover America II" campaign. A new logo is developed for the campaign.

5/1999

On May 1, the NFIP eliminates the three-year policy.

5/1999

At FEMA's request, a Study of the Economic Effects of Charging Actuarially Based Premium Rates for pre-FIRM Structures is completed. The study examines: the number and types of properties that would be affected by an increase in premium rates; the number of policyholders that might cancel their policies if rates are increased; and the effects of increased premiums on property taxes and the value of land. The report estimates that there are about seven million structures in a SFHA. The study concludes that an immediate elimination of subsidized flood insurance would lead to a significant drop in the number of people retaining insurance. In the report's words, "…if [the] subsidy was eliminated…average premiums for residential properties subject to substantial flood risk would likely increase from $585 to about $2,000 annually."

5/1999

The Association of State Floodplain Managers initiates a Certified Floodplain Manager (CFM) Program. The program is intended to advance the knowledge of floodplain managers, enhance the profession of floodplain management, and provide a common basis for understanding floods and flood losses.

5/1999

A. U.S. District judge in the Central District of California rules that FEMA did not violate the National Environmental Policy Act by requiring flood insurance of property owners in five southern California cities without first preparing an environmental impact statement (see 9/1998).

6/1999

The Board of Governors of the Federal Reserve System imposes the first penalty on a federally regulated lending institution, in Puerto Rico, for a pattern of noncompliance with the mandatory-purchase requirement of the Flood Disaster Protection Act of 1973. The Federal Deposit Insurance Corporation subsequently imposes a fine on a lending institution for the same reason.

7/1999

FEMA submits a draft, revised regulation on Public Assistance grants and insurance requirements to the Office of Management and Budget for review and approval (see 11/1988, 7/1995, 1/1997, 3/1998, 11/1998, and 1/1999). FEMA designates the draft proposed rule as being economically significant under Executive Order 12866, Regulatory Planning and Review, but has not yet completed analyses of the economic impact the proposed regulations would have on small entities.

7/1999

With the imminent expiration of the first Group Flood Insurance Policies (see 5/1996 and 8/1996), FEMA extends the coverage of such policies from 36 to 37 months. As of September 30, 2002, FEMA reinstates the 36-month term for Group Flood Insurance Policies.

8/1999

FEMA proposes to apply full-risk premium rates on new or renewed policies for structures that have suffered multiple flood losses whose owners have declined an offer of funding to elevate, relocate, or flood proof the structure. Labeled as "target repetitive loss buildings," these structures have had two or more flood-related losses, each resulting in a claim of $1,000 or more, within the past 10 years. In addition, such structures have suffered four or more insured flood losses or two insured flood losses cumulatively greater than their value.

FEMA indicates that approximately 8,000 insured structures have suffered four or more losses; another 1,300 insured buildings have had two or three losses that cumulatively exceed their value.

8/1999

The GAO releases Disaster Assistance: Opportunities to Improve Cost-Effectiveness Determinations for Mitigation Grants. The 1988 Stafford Act requires that such grants be cost effective, but the report notes that 15 percent of funds distributed by FEMA's Hazard Grant Mitigation Program have been exempted from benefit-cost analysis or had a benefit-cost ratio of less than 1.0. In addition, 39 percent of projects had a benefit-cost ratio of between 1.0 and 1.5, and were thus "marginally effective," at least according to a subcommittee of the U.S. House of Representatives' Committee on Transportation and Infrastructure.

FEMA states that it will comply with all of the recommendations included in the GAO report.

8/1999

FEMA issues Cost Estimate for the Flood Map Modernization Plan. The report estimates it will cost $750 million to implement the plan over the seven-year period from FY 2001-07. The upgrade of the map inventory will involve updating and producing digital maps for at least 17,500 panels requiring updates, digital conversion and maintenance for 74,500 panels, and development of flood data and digital flood maps for 13,700 panels for flood-prone communities without flood maps.

9/1999

In an Audit of the Effectiveness of the Substantial Damage Rule, FEMA's Inspector General notes that many communities participating in the NFIP fail to enforce the substantial damage rule. As a result, subsidized rates are provided to structures that should be rated on an actuarial basis.

9/1999

FEMA publishes an Economic Evaluation of Substantially Damaged Structures Funded through the Hazard Mitigation Grant Program. The report retrospectively calculates the costs and benefits of approximately 10 percent of acquisition and relocation projects for substantially damaged structures in floodplains.

9/1999

Hurricane Floyd strikes North Carolina and causes the worst flooding in the state's history. Over $100 million in disaster assistance is provided to more than 72,000 residents.

Throughout the state, nearly 150,000 structures are located in SFHAs, but only one-third are covered by flood insurance.

10/1999

FEMA's director hosts a meeting with insurance executives. According to FEMA, the participants agree that FEMA's proposal on Public Assistance grants has strong merit and the amount of insurance coverage appears reasonable (see 11/1988, 7/1995, 1/1997, 3/1998, 11/1998, and 1/1999). FEMA also observes that doubt is expressed about the market's ability to provide earthquake coverage immediately and that several meeting participants suggested separating earthquake insurance from the proposal.

10/1999

FIA begins operating the Special Direct Facility (SDF) to centralize policies with repetitive losses for control purposes and mitigation actions. Two subsets of currently insured repetitive-loss properties are moved to the SDF – those

with two or three paid losses where the cumulative payments for flood insurance claims are equal to or greater than the building value and those with four or more paid losses.

10/1999

FEMA director James Lee Witt informs a congressional committee that 84 percent of the agency's flood-hazard maps are more than five years old, 66 percent are greater than 10 years old, and 33 percent are greater than 15 years old. Some maps, produced in the 1970s, have never been updated.

10/1999

At a hearing before the U.S. House of Representatives' Subcommittee on Housing and Community Development Opportunity of the Committee on Banking and Financial Services, Director Witt notes that FEMA has identified approximately 10,000 properties that have had four or more flood losses or two or three flood losses that cumulatively exceed the value of the building. The NFIP has provided over $800 million in claims for these properties over the past 21 years. The total cost for mitigation or buyout for these structures would be about $450 million.

10/1999

Through October 1999, FEMA has issued 98 Group Flood Insurance Policies (see 3/1995, 5/1996, 8/1996, and 7/1999) covering nearly 29,000 households.

11/1999

The H. John Heinz III Center for Science, Economics and the Environment publishes The Hidden Costs of Coastal Hazards. The result of a two-year study by an expert panel, the report suggests new strategies to identify and reduce weather-related hazards and the costs associated with rapidly increasing coastal development. The report offers the first in-depth estimates of the costs of coastal hazards to natural resources, social institutions, business, and the built environment.

11/1999

"Cover America II" begins to increase awareness of the NFIP and flood insurance.

11/1999

The Consolidated Appropriations Act (PL 106-113) directs FEMA to study the feasibility and justification for reducing buyout assistance to property owners who fail to purchase and maintain flood insurance. The Act also authorizes up to $215 million for the buyout or relocation of owner-occupied principal residences located in a 100-year floodplain that were made uninhabitable by flooding caused by Hurricane Floyd and "surrounding events" in October 1999. Before such funds can be allocated, FEMA will be required to establish procedures for establishing priorities and for benefit-cost analyses.

12/1999

By the end of 1999, there are more than 4.2 million flood insurance policies in effect, with total insurance coverage of more than $534 billion, an increase of more than 250 percent since December 1990.

1999

Approximately 20 years after publication of the first Assessment of Research on Natural Hazards, researchers complete a follow-up study to reassess the state of knowledge of natural hazards in the United States. Begun in 1992, the study involves more than 120 experts and culminates in Disasters by Design:

A Reassessment of the Natural Hazards in the United States. The report concludes that: a) one of the central problems in coping with disasters is the belief that technology can be used to control nature; b) most strategies for coping with hazards fail to consider the complexity and changing nature of hazards; and c) losses from hazards result from shortsighted and narrow concepts of the relation of humans to the natural environment. To redress these shortcomings, the researchers recommend that the United States shift to a policy of "sustainable hazard mitigation." This concept links wise management of natural resources with local economic and social resiliency.

1999

In Disasters and Democracy: The Politics of Extreme Natural Events, Rutherford Platt and his colleagues trace the historical evolution of the federal role in disaster assistance and analyze disaster declarations and federal assistance provided under the Robert T. Stafford Relief and Emergency Assistance Act since 1988.

End 1990s

FEMA has mapped more than 100 million acres of SFHAs and had designated about six million acres of floodways along 40,000 stream and river miles. The total cost for these studies is approximately $1.3 billion.

1/2000

The International Building Code and the International Residential Code are published. For the first time there is a national model building code that includes the construction provisions of the NFIP. The codes are substantially equivalent to the requirements of the National Earthquake Hazard Reduction Program Recommended Provisions (1977) and the state-of-the-art wind-load provisions of the American Society of Civil Engineers (1998), Minimum Design Loads for Buildings and Other Structures. The International Residential Code represents the first time that wind, flood, and seismic loads are comprehensively addressed in a model for one- and two-family dwellings.

2/2000

In Disaster Assistance: Issues Related to the Development of FEMA's Insurance Requirements, the GAO concludes that FEMA had conscientiously sought to obtain and incorporate comments from stakeholders on its proposal to revise the Public Assistance program (see 11/1988, 7/1995, 1/1997, 3/1998, 11/1998, 1/1999, and 10/1999). In contrast, the GAO also finds that FEMA had not completed the analysis required for economically significant regulations.

2/2000

Seeking public comment and advice, FEMA publishes an Advance Notice of Proposed Rulemaking, which indicates FEMA's belief that its regulations covering Public Assistance insurance requirements are inadequate with respect to public buildings (see 11/1988, 7/1995, 1/1997, 3/1998, 11/1998, 1/1999, and 10/1999). The notice identifies three options; FEMA favors the option that would provide funds for the repair of public buildings, through federal disaster assistance, only if they are insured at the time of the disaster. States and local governments would have 36 months after the publication date of the final rule to purchase the required insurance.

4/2000

The Association of State Floodplain Managers publishes The Nation's Response to Flood Disasters: A Historical Account, which summarizes the forces and events that have affected floodplain management in the United States since the 1850s.

5/2000

The NFIP revises its fee schedule for processing certain types of requests for changes to NFIP maps and for processing requests for particular NFIP map and insurance products. The changes in the fee schedules are intended to further reduce the NFIP's expenses by recovering more fully the costs associated with processing conditional and final requests for map changes; retrieving, reproducing, and distributing technical and administrative data related to analyses and mapping; and producing, retrieving, and distributing map and insurance products.

6/2000

In collaboration with the H. John Heinz III Center for Science, Economics and the Environment, FEMA releases Evaluation of Erosion Hazards. The report responds to a congressional mandate included in Section 577 of the National Flood Insurance Reform Act of 1994. Noting that coastal erosion potentially jeopardizes nearly 87,000 homes, the report recommends that Congress should require FEMA to include the anticipated cost of erosion when setting flood insurance rates. The NFIP is not permitted to take into account expected losses from coastal erosion when establishing premiums for flood insurance.

6/2000

FEMA issues Call for Issues: Status Report, which summarizes the NFIP-related comments and suggestions of more than 170 stakeholders (see 9/1998).

6/2000

The NFIP issues rules that establish procedures for inspections to help verify that structures comply with a community's floodplain ordinances and to ensure that property owners pay flood insurance premiums commensurate with their flood risks. The procedures, to be used initially in a pilot study in Monroe County, Florida, will require owners of insured buildings to obtain an inspection from local floodplain officials as a condition of receiving insurance. Results of the pilot study will be evaluated before further implementation of the new procedures.

6/2000

FEMA sponsors a Floodplain Management Forum in Washington, DC, which gathers a group of experts on floodplain management together to discuss the future of floodplain management in the United States.

7/2000

PL 106-246 provides $50 million for the buyout and elevation of structures in states that received presidential disaster declarations in FY 1999 or 2000.

8/2000

At the request of the U.S. Senate's Committee on Banking, Housing, and Urban Affairs, the GAO initiates a study of the compliance of federally regulated lending institutions with the NFIP's mandatory-purchase provisions (see 12/1973, 1/1974, 8/1990, and 6/1999). The Flood Disaster Protection Act of 1973 prohibits such institutions from making, increasing, extending, or renewing any loan on a property without requiring flood insurance if that property is located in a SFHA within a community participating in the NFIP. As a result of the GAO study, FIA delays its own study on the subject.

8/2000

In response to the Consolidated Appropriations Act (PL 106-113) (see 11/1999), FEMA reports to Congress that there is no justification for reducing buyout assistance to property owners who fail to purchase and maintain flood

insurance. In the report's words, "Doing so will not result in any significant increase in the purchase of flood insurance, but will have the unintended consequence of effectively penalizing the low income populations most in need of federal assistance to move out of harm's way…."

8/2000

In Opportunities to Enhance Compliance with Homeowner Flood Insurance Purchase Requirements, FEMA's Inspector General examines compliance with the requirement for mandatory purchase of flood insurance by property owners with mortgages from federally regulated lending institutions. In its sample of structures, the Inspector General finds that 10 percent did not have flood insurance even though they met the requirements for mandatory purchase. The examination also notes that there is "no process to ensure that structures remapped into SFHAs are covered by or will be required to purchase a flood insurance policy."

The report also observes that Group Flood Insurance Policies (see 3/1995 and 8/1996) appear to have lessened the costs of some disasters and appear to be cost-effective. In contrast, once the federal and state subsidies end for such policies, the low-income recipients of these subsidies rarely continue their coverage, although they are required to do so under the terms of their receipt of previously subsidized coverage.

9/2000

In an Audit of FEMA's Cost Estimates for Implementing the Flood Map Modernization Plan, FEMA's Inspector General concludes that the agency's methodology for estimating the plan's costs are generally sound but that FEMA "has not made significant progress in implementing the plan's primary objectives" due to a lack of funds and the accuracy of the estimated costs of implementation should be improved.

9/2000

FEMA initiates the first comprehensive evaluation of the NFIP. A consulting firm is hired to design the evaluation and to assess the feasibility of evaluating questions in six areas of inquiry.

10/2000

FIA issues final regulations in the Federal Register that render the standard flood insurance policy in plain English and restructures its format to resemble a homeowner's policy. In addition, use of FEMA's new elevation certificate becomes mandatory.

10/2000

FEMA summarizes comments in the Federal Register from nearly 300 stakeholders who expressed their opinions about the agency's proposed revisions to the Public Assistance program (see 11/1988, 7/1995, 1/1997, 3/1998, 11/1998, 1/1999, 10/1999, and 2/2000). Opponents claim that states and communities cannot afford to insure public buildings and that coverage would be difficult to obtain. FEMA notes that it will initiate a study on insurance coverage of publicly owned buildings and facilities.

10/2000

FEMA issues its Biennial Report to Congress on the Community Rating System. As of October 1, 926 communities are participating in CRS. Tulsa, Oklahoma continues to be the best rated community (see 10/1998), followed by Juno Beach and Sanibel, Florida; Kemah, Texas; and Pierce and Thurston Counties, Washington.

10/2000

The Disaster Mitigation and Cost Recovery Act (PL 106-390) amends the 1988 Stafford Act and provides authority to establish a program to provide technical and financial assistance to states and local governments to assist in the implementation of predisaster hazard-mitigation measures that are cost-effective and that are designed to reduce injuries, loss of life, and damage and destruction of property, including damage to critical services and facilities under the jurisdiction of the states or local governments.

The law also requires states to prepare a comprehensive state program for emergency and disaster mitigation prior to receiving funds from FEMA and directs the GAO to conduct a study to determine the current and future expected availability of disaster insurance for public infrastructure eligible for assistance under the Stafford Act.

The law further requires that FEMA discontinue its Individual and Family Grant Program as of May 2002 and replace it with a new program entitled "Financial Assistance to Address Other Needs" (see 2/1995).

11/2000

President William J. Clinton signs into law the Coastal Barrier Resources Reauthorization Act of 2000 (PL 106-514), which reauthorizes and amends the Coastal Barrier Resources Act (CBRA) (see 10/1982 and 11/1990). One provision of the Act allows for the voluntary addition of lands to the Coastal Barrier Resources System (CBRS) and could increase the amount of coastal barriers protected by CBRA. The Act also codifies a set of mapping criteria, which will help the public understand the technical basis behind delineating parts of the CBRS. Finally, the Act authorizes a pilot program to digitally map coastal areas and to improve the coordination of mapping efforts at the federal, state, and local levels.

12/2000

More than 200 communities are participating in Project Impact, FEMA's predisaster mitigation program.

2000

FIA's business process improvement initiative results in a "Blueprint for the Future" for the NFIP. Developed with the NFIP's strategic partners, this blueprint will be the foundation for strategic and performance planning. When completed, Phase II will focus on FIA's information technology requirements and capabilities. Strategies for information technology, which lead to optimum future operations, will be developed and assessed.

1/2001

In Compliance with Public Assistance Program's Insurance Purchase Requirements, FEMA's Inspector General notes that neither FEMA nor the states consistently maintain sufficient information to support their decisions on applicants' insurance status (see 11/1988, 7/1995, 1/1997, 3/1998, 11/1998, 1/1999, 10/1999, 2/2000, and 10/2000). As a condition of receiving public assistance, recipients are required to protect insurable facilities by obtaining and maintaining insurance for the hazard that caused the damage. If the applicant does not maintain insurance, FEMA will not provide any assistance to that applicant in future disasters of the same type. In about one-third of cases examined, states, or communities did not maintain required insurance. In other instances, although proof of insurance was provided, some applicants for federal assistance purchased less insurance than required. FEMA generally agreed to implement the recommendations associated with the audit's findings.

1/2001

Several environmental groups, including the Forest Guardians of Santa Fe, file

suit in U.S. District Court in New Mexico alleging that the NFIP promotes inappropriate development in floodplains of the Rio Grande and San Juan Rivers and adversely affects the habitats of several endangered species.

2/2001

President George W. Bush submits to Congress his budget for 2002. This "Blueprint for New Beginnings" includes reforms to the National Flood Insurance Program aimed at saving $12 million dollars. The budget seeks to eliminate the availability of flood insurance coverage to several thousand "repetitive loss" properties and phase out the subsidization of premium rates for vacation homes, rental properties, and other nonprimary residences and businesses. The proposed budget would also eliminate funding for Project Impact (see 10/1997) because it "has not been proven effective."

2/2001

The U.S. House of Representatives' Committee on Financial Services indicates that its oversight plan for the 107th Congress includes attention to the implementation of the Community Development and Regulatory Improvement Act of 1994 (see 9/1994) and recent FEMA reports that address reductions in subsidies and repetitive losses (see also 2/1999).

2/2001

In Buyouts: Hurricane Floyd and Other Issues Related to FEMA's Hazard Mitigation Grant Program, FEMA's Inspector General notes that ambiguity in the legislation authorizing buyouts of properties damaged by Hurricane Floyd "caused significant delays in the commencement of the buyout process, contributed to much confusion and frustration over the funding requirement to execute such projects, and may have caused potential inequities in the type of structures targeted for buyout…" (see 11/1999 and 7/2000).

5/2001

The GAO provides testimony and submits a statement to the U.S. Senate's Committee on Appropriations, Subcommittee on Veterans, Housing, and Independent Agencies, on Emerging Opportunities to Better Measure Certain Results of the National Flood Insurance Program. The GAO finds that FEMA's performance goals do not assess the degree to which residents in flood-prone areas participate in the program. Noting that better data are needed on the number of structures in flood-prone areas, the GAO concludes that "Capturing data on the numbers of uninsured and insured structures in flood-prone areas can provide FEMA with another indication of how effectively the program is penetrating those areas most at risk of flooding, whether the financial consequences of floods in these areas are increasing or decreasing, and where marketing efforts can better be targeted."

6/2001

FEMA combines FIA and the Mitigation Directorate to form the Federal Insurance Administration and Mitigation Administration (FIMA).

6/2001

The NFIP eliminates its outstanding debt to the Department of the Treasury. This debt, which the NFIP had accumulated to pay for flood claims since the 1970s, had reached as much as $922 million in February 1999.

7/2001

In testimony before the U.S. House of Representatives' Committee on Financial Services, Subcommittee on Housing and Community Opportunity, FIMA's acting director notes that pre-FIRM, subsidized policies represent approximately 27 percent of all of its policies. Among all policies, approximately

15 percent of properties have accounted for 38 percent of all of the NFIP's losses.

8/2001

Robert F. Shea is appointed Acting Federal Insurance and Mitigation Administrator.

9/2001

The Office of Federal Housing Enterprise Oversight proposes (and subsequently adopts in December 2001) a regulation to codify the office's authority to oversee and enforce certain statutory requirements affecting the operations of government-sponsored enterprises regarding the NFIP.

10/2001

More than 4.37 million policies are in force, with a total coverage of approximately $594/5 billion. These policies are distributed among 19,713 communities, including 19,071 in the regular program and 642 in the emergency program (see 12/1969); 938 communities (with 66 percent of all policyholders) participate in the Community Rating System (see 10/1990).

12/2001

FEMA proposes to increase the amount of premium that policyholders must pay for flood insurance for pre-FIRM buildings in coastal areas subject to high-velocity waters, such as storm surges and wind-driven waves. If finalized, the increase will represent the fifth such increase in rates for such policyholders (see 3/1999). The purpose of the proposed increase is to reflect the insurance associated with their greater exposure to flood losses.

1/2002

In response to the Disaster Mitigation Act of 2000 (PL 106-390) (see 10/2000), FEMA proposes the consolidation of two disaster-relief programs, "Temporary Housing Assistance" and "Individual and Family Grant Program," into a single program called "Federal Assistance to Individuals and Households." In addition, FEMA proposes the elimination of Group Flood Insurance Policies (see 3/1995, 5/1996, 7/1999, 10/1999, and 8/2000), thus indicating its desire to "restore the responsibility for the flood insurance purchase requirement back to the individual or household receiving federal assistance."

1/2002

FEMA notifies officials in Monroe County, Florida, that its unincorporated areas may be placed on probationary status with the NFIP due to ongoing deficiencies in the local floodplain management program (see 6/2000).

3/2002

The NFIP amends its regulations to require that areas of Monroe County, Florida, that incorporate on or after January 1, 1999, and become eligible for the sale of flood insurance must participate in the inspection program as a condition of joining the NFIP (see 6/2000 and 1/2002).

3/2002

The NFIP initiates a three-year pilot project that will permit governmental risk-sharing pools to sell flood insurance to public entities under the NFIP's WYO effort. The NFIP limits participants in this pilot effort to a maximum of six such insurers that are able to provide flood insurance for their public buildings.

3/2002

Anthony Lowe is appointed Federal Insurance and Mitigation Administrator.

5/2002

FEMA's Inspector General publishes Extent that Mitigation Funds are Used to Address Repetitive Flood Loss and Other Related Issues. This report assesses the extent to which funds from the Hazard Mitigation Grant Program and the Flood Mitigation Assistance Program are used to acquire repetitive-loss properties. The report concludes that such funds could be used more effectively, especially with regard to the targeting of the most egregious repetitive-loss properties (see 11/1988, 9/1994, 9/1996, 9/1999, and 2/2001).

6/2002

The GAO completes Extent of Noncompliance with Purchase Requirements is Unknown. This report notes that flood insurance is required for properties located in flood-prone areas of participating communities for the life of mortgage loans made or held by federally regulated lending institutions or guaranteed by federal agencies. Mortgages purchased by Government Sponsored Enterprises (GSEs) are also included in this requirement as a result of the National Flood Insurance Reform Act of 1994 (see 9/1994). Despite the requirement, the GAO notes that no definitive analysis has been conducted that measures the extent to which property owners who are required to purchase insurance actually do so.

6/2002 continued

On the basis of examinations and compliance reviews, bank regulators and GSE officials believe that rates of noncompliance are low. In contrast, FEMA officials disagree with bank regulators and these officials, contending that rates of noncompliance are still significant. According to the GAO, these contrasting views are due to the fact that the regulators and FEMA use different measures to assess compliance. Nonetheless, the GAO concludes that analysis of the available data suggests that noncompliance could be low at loan origination.

6/2002

In Duplication of Benefits: National Flood Insurance Program and the Disaster Housing Program's Minimal Repair Grants, FEMA's Inspector General concludes that FEMA's internal controls are inadequate to detect and prevent duplication of benefits, which occurs when victims of floods receive benefits or assistance from more than one source for the same damaged property.

6/2002

The Task Force on The Natural and Beneficial Functions of the Floodplain, created by the National Flood Insurance Reform Act of 1994, concludes that the benefits provided by natural floodplains in flood loss reduction have been overlooked and that the protection and restoration of floodplains must be further integrated into government programs.

9/2002

With the issuance of an interim final rule in the Federal Register, FEMA consolidates the Temporary Housing Assistance and Individual and Family Grant Programs into a single program called Federal Assistance to Individuals and Households (IHP) (see 1/2002). FEMA indicates that states will have the option to be active partners in the administration of this new program, which provides a maximum of $25,000. Recipients of assistance from the IHP will be required to maintain flood insurance at least in the amount of the assistance, if they own the affected structure, for as long as the structure exists. The flood insurance requirement is reassigned to all subsequent owners of the flood-damaged address.

9/2002

In conjunction with the creation of the IHP (see previous entry), FEMA reverses its earlier proposal to eliminate Group Flood Insurance Policies (see 1/2002). FEMA increases the coverage to $25,000 from $14,800, reduces the term from 37 to 36 months, and retains a $200 deductible. The cost of the three-year policy increases to $600 from $200. The cost-sharing arrangements remain unchanged, with the states responsible for 25 percent of the cost and the federal government for 75 percent (funded as part of the IHP grant).

9/2002

In Invalid Preferred Risk Policies Based on Loss History, FEMA's Inspector General reviews policies with a repetitive loss history in Florida, Louisiana, Mississippi, Missouri, North Carolina, and Texas to determine which received a preferred risk rating. The audit finds that FEMA failed to invalidate 76 percent of the preferred risk policies (PRPs) included in the sample. To correct such problems, the Inspector General recommends FIMA review monitoring procedures to ensure WYO companies resolve rating errors in a timely manner.

10/2002

The NFIP pays the final $10 million installment on the $650 million it borrowed to pay claims arising from Tropical Storm Allison. The storm resulted in over 30,000 claims and approximately one billion dollars in claim payments.

10/2002

In Community Rating System: Effectiveness and Other Issues, FEMA's Inspector General determines the effectiveness of CRS as a tool to improve local policies and practices related to floodplain management. Overall, the report finds that CRS is a disciplined and well-defined program in terms of its guidelines, requirements, and rating processes and procedures. However, FIMA could enhance the effectiveness of CRS by: (1) performing Community Assistance Visits in all CRS communities, (2) marketing CRS to communities having greater exposure to the NFIP, (3) providing credit for increasing flood insurance coverage in a community, and (4) providing CRS coordinators with access to claims data.

2/2003

FEMA's Inspector General addresses the work done by three Flood Map Production Coordination Contractors (mapping contractors) in Audit of FEMA's Use and Management of Flood Mapping Contractors. The audit reveals that FEMA's management of mapping contracts needs strengthening especially in administration and support. According to the Inspector General, FEMA may have the ability to update more maps if it (1) reduces spending on processing Letters of Map Change, which accounted for 32 percent of contract spending over fiscal years 2000 and 2001, and (2) revises contracting strategies to increase competition and give contractors incentives to control costs.

3/2003

FEMA becomes part of the U.S. Department of Homeland Security and the Emergency Preparedness and Response Directorate.

5/2003

FEMA increases the maximum claim payout for Increased Cost of Compliance (ICC) coverage from $20,000 to $30,000 (see 6/1997).

8/2003

The NFIP has cash reserves of $580 million, which are available to pay future claims.

9/2003

FEMA recognizes Tulsa, Oklahoma, for outstanding achievements in reducing flood risks with a rating of Class 2 in CRS. Beginning in October 2003, property owners in the city will receive a 40 percent discount on their flood insurance premiums. Tulsa represents the first community in the nation to achieve a rating of Class 2.

9/2003

Hurricane Isabel, the only hurricane of the 2003 hurricane season to reach Category 5 status, makes landfall in North Carolina. Isabel results in extensive flooding in Baltimore and in other mid-Atlantic communities.

10/2003

FEMA offers states funds to upgrade their Map Modernization Implementation Plans (MMIP), developed in 2002, and develop the Flood Map Modernization State Business Plan. Using the Fiscal Year 2002 state plans as a starting point, states are asked to identify the projects to be completed each year, the role they play in managing the projects, and the support needed from FEMA. FEMA's Cooperating Technical Partner (CTP) initiative continues to be the funding mechanism for flood hazard mapping projects. A separate, distinct funding mechanism provides for the management activities identified in this plan.

03/2004

FEMA hosts the Mid-Atlantic Flood Insurance Summit to address concerns of Hurricane Isabel victims in settling flood insurance claims. Insurance companies, agents and adjustors, policyholders, insurance commissioners and Congressional staff meet in Falls Church , VA, to discuss solutions. As a result of the summit, FEMA begins to offer Isabel victims three ways to request flood insurance settlement review: by attending NFIP community outreach team visits, by using a toll-free number to initiate flood insurance settlement review, or by sending settlement review request form by mail. In April and May, community outreach teams visit hard-hit North Carolina, Virginia and Maryland communities to offer policyholders face-to-face discussions with claims specialists.

3/2004

The General Accounting Office (GAO) releases Actions to Address Repetitive Loss Properties on recent federal actions to target and reduce the number of repetitive loss properties, defined as properties for which policyholders have made two or more claims of $1,000 or more. About 1 percent of the 4.4 million properties currently insured by the program fit this definition. About 38 percent of all program claim costs have been the result of repetitive loss properties, at a cost of about $4.6 billion since 1978. The report concludes that FEMA’s strategy of targeting repetitive loss properties for mitigation and congressional proposals to raise premiums have the potential to reduce the number and vulnerability of repetitive loss properties.

3/2004

The General Accounting Office (GAO) releases the report Flood Map Modernization: Program Strategy Shows Promise, But Challenges Remain. The report finds several deficiencies in FEMA’s plan to implement updated maps of flood zones. In developing digital flood maps, FEMA plans to incorporate data that are of a level of specificity and accuracy commensurate with communities’ relative flood risk. FEMA has not yet established data standards that describe the appropriate level of detail, accuracy, and analysis required to develop digital maps based on risk level. Without such standards, FEMA cannot ensure that it uses the same level of data collection and analysis for all com-

munities in the same risk category. FEMA has developed partnerships with states and local entities that have begun mapping activities and has a strategy on how to best work with these entities. However, the overall effectiveness of FEMA's future partnering efforts is uncertain because FEMA has not yet developed a clear strategy for partnering with communities with few resources and little or no experience in flood mapping. GAO recommends that FEMA should address differences among the communities for which flood maps are being developed.

3/2004

FEMA revises the Disaster Mitigation Act planning guidance and checklists for state and local hazard mitigation plans. Previously called the Interim Criteria for Mitigation (issued in July 2002), the guidance and checklists are been finalized as the Multi-Hazard Mitigation Planning Guidance. The new guidance includes references to specific language in the rule, descriptions of the relevant requirements, and sample plan text to illustrate distinctions between plan approaches that would and would not meet Disaster Mitigation Act 2000 requirements. In addition, this document provides references to planning tools that FEMA has made available to assist states, tribes, and localities in developing a comprehensive, multi-hazard approach to mitigation planning, and in preparing plans that will meet the DMA 2000 requirements.

4/2004

FEMA updates Increased Cost of Compliance—Guidance for State and Local Officials, a manual that helps officials understand the Increased Cost of Compliance (ICC) coverage provisions. The manual covers how the owners of buildings insured under the NFIP can benefit from ICC coverage, and how the coverage relates to community administration of the local floodplain management regulations and ordinances. The guidance highlights the new, increased maximum benefit level of $30,000 available to eligible policyholders (see 5/2003 and 6/1997).

5/2004

Connecticut's Governor Rowland signs into law House Bill 5045, An Act Concerning Floodplain Management and Hazard Mitigation, based in part on No Adverse Impact legislation. The new legislation requires municipalities to revise their current floodplain zoning regulations or ordinances to include new standards for compensatory storage and equal conveyance of floodwater. The Connecticut Department of Environmental Protection will develop model regulation language. The legislation requires the state to incorporate a natural hazards element into the next revision of its plan of conservation and development and enables municipalities to use local capital improvement funds from the state to conduct floodplain management and hazard mitigation activities.

6/2004

David Maurstad is appointed Acting Director of the Mitigation Division and Federal Insurance Administrator, replacing Anthony Lowe. His areas of oversight include the NFIP, the National Earthquake Hazards Reduction Program, the National Dam Safety Program and the National Hurricane Program. Mr. Maurstad previously served as Regional Director of FEMA's Region VIII since October 2001.

6/2004

President George W. Bush signs into law the Bunning-Bereuter-Blumenauer Flood Insurance Reform Act of 2004 (H.R. 253). The Act includes reforms to address repetitive loss properties and a reauthorization of the NFIP until September 30, 2008. Additional funding mechanisms focus mitigation efforts on "severe" repetitive loss structures that result in a disproportionate amount of claims to the National Flood Insurance Fund. The goals of the Act are to help

people who have experienced serious and repetitive flood damage to solve their problems with financial assistance from the NFIP, communities, and states; to end the abuses by those who misuse the program; and to improve consumer understanding and rights of NFIP policyholders.

7/2004

FEMA issues an interim final rule in the Federal Register to amend the Federal Insurance Administration, Financial Assistance/Subsidy Arrangement and related regulations regarding issues of federal jurisdiction and applicability of federal law for lawsuits involving Write-Your-Own (WYO) Companies and of reimbursement to WYO Companies for the cost of litigation. Additionally, FEMA amends procedures for companies seeking to become, and ceasing to be, WYO Companies.

8/2004 to 9/2004

Florida experiences Tropical Storm Bonnie and Hurricanes Charley, Frances, Ivan and Jeanne. Hurricane and tropical storm related disasters are also declared in Alabama, Delaware, Georgia, Louisiana, Mississippi, New Jersey, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, Virginia and West Virginia.

12/2004

NFIP paid losses for 2004 number 52,785, about 45 percent more than the number of 2003 paid losses. FEMA pays out $1.9 billion in claims for 2004, or about 2 ½ times the amount paid out in 2003. FEMA uses $225 million in NFIP borrowing authority to pay 2004 flood loss claims.

4/2005

The President signs H.R. 1134, a measure to overturn a 2004 IRS ruling that made disaster mitigation funds taxable as income.

4/2005

In testimony before the Subcommittee on Housing and Community Opportunity, Committee on Financial Services, US House of Representatives, GAO reports that many private company insurance agents, who are the main points of NFIP contact for policyholders, have varying levels of NFIP knowledge. GAO also reports that FEMA has not met the six-month timeframe given for complying with the mandates of the Flood Insurance Reform Act of 2004, which require FEMA to establish agent training standards, but that FEMA has drafted the policyholder informational materials required by the Act.

7/2005

The Subcommittee on Housing and Community Opportunity, Committee on Financial Services, US House of Representatives, holds hearing on a GAO report, titled Flood Map Modernization: FEMA’s Implementation of a National Strategy. GAO reports it found that the flood map modernization program lacked performance measures that would measure adequately the effectiveness of the map modernization program in meeting FEMA’s goals. GAO notes, however, that FEMA had set target percentages in its Multi-Year Flood Hazard Identification Plan in response to the recommendations.

7/2005

Dennis becomes the first major hurricane to strike the US in the 2005 hurricane season. It reaches Category 4 status earlier in the hurricane season than any Atlantic storm since 1957. It strikes the Florida Panhandle in the same area affected by Hurricane Ivan the previous year, causing an approximate $4 to $6 billion in damage.

9/2005

Complying with Section 207 of the Flood Insurance Reform Act of 2004, FEMA issues a notice in the Federal Register that establishes minimum training and education requirements for all insurance agents who sell Standard Flood Insurance Policies issued through the NFIP.

8/2005 to 9/2005

Hurricane Katrina strikes Louisiana and Mississippi, resulting in flood wall and levee failures that cause up to 80 percent of the city of New Orleans to flood, leaving homes in some city neighborhoods with flood water levels up to the eaves for several weeks. Hurricane Rita strikes the Gulf Coast along the western Louisiana and eastern Texas shores, and New Orleans experiences new levee breaches and additional flooding.

9/2005

Michael Brown, FEMA director since 2003, offers his resignation. R. David Paulison, the director of FEMA's preparedness division, becomes interim FEMA director.

9/2005

After Hurricane Katrina, R. David Paulison, Acting Under Secretary of Homeland Security for Emergency Preparedness and Response, announces FEMA will modify the NFIP claim settlement process to expedite the response to policy-holders in storm-stricken areas.

9/2005

In response to Hurricanes Katrina and Rita, the President signs H.R. 3669, “The National Flood Insurance Enhanced Borrowing Authority Act of 2005” to increase the NFIP’s borrowing authority from $1.5 billion to $3.5 billion. The CBO estimates that FEMA probably will not be able to repay the funds borrowed under H.R. 3669 within the “next 10 years” and that Katrina-related claims will “exceed the total resources that will be available to FEMA under H.R. 3669” and that “repayments of borrowed funds would not occur until after 2015.”

10/2005

FEMA publishes a “Summary of Coverage” and a “Claims Handbook” for flood insurance policyholders, as required by the Flood Insurance Reform Act of 2004. The handbook is made available on the Internet. WYO companies and the NFIP Direct program begin distributing materials to policyholders as required by the 2004 Act.

10/2005

GAO testifies before the Subcommittee on Housing and Community Opportunity, Committee on Financial Services, US House of Representatives on Oversight and Management of the National Flood Insurance Program. GAO reports that FEMA has not yet fully implemented some of the provisions of the Flood Insurance Reform Act of 2004.

10/2005

David Maurstad, Acting Director of the FEMA Mitigation Division and Federal Insurance Administrator, testifies before the US Senate Committee on Banking, Housing and Urban Affairs on “The Future of the National Flood Insurance Program.” Mr. Maurstad reports to the Committee that magnitude and severity of flood losses caused by Hurricanes Katrina and Rita are “unprecedented in the history of the NFIP.” He states that Katrina and Rita-related flood claims would “result in flood insurance claims that significantly

exceed the highest number of claims filed from any single event in the NFIP's history, and well more than triple the total number of claims filed in 2004." He states that Katrina and Rita-related NFIP claims could exceed $22 billion and that the NFIP in its entire history has paid out only $15 billion total.

10/2005

The National Science Foundation, the American Society of Civil Engineers, and the state of Louisiana begin to investigate the New Orleans floodwall breaches that led to massive flooding of the city after Hurricane Katrina. Defense Secretary Donald Rumsfeld announces that the National Academies of Science and Engineering will begin a separate probe into the New Orleans floodwall and levee failures.

10/2005

Eight tropical storm systems have struck southeastern US coasts during the 2005 season: Arlene, Cindy, Dennis, Katrina, Ophelia, Rita, Tammy and Wilma. Four of the eight—Dennis (July), Katrina (August), Rita (September) and Wilma (October)—are very destructive storms, and one—Katrina—becomes perhaps the most costly natural disaster in US history. The 2005 hurricane season becomes the most active on record, surpassing all previous hurricane seasons in number of named storms.

10/2005

The Subcommittee on Water Resources and Environment, Committee on Transportation and Infrastructure, US House of Representatives, holds two hearings inquiring into the causes of the New Orleans levee failures, and about ways in which New Orleans and other US cities at risk can be protected.

11/2005

The 2005 Atlantic hurricane season officially ends with a record 29 storms. Twenty-six were named storms, including 5 storms relying on Greek letters for their names. NOTE: on 12/30/05, the 2005 season continued with a 27th named storm, Zeta.

11/2005

President Bush signs legislation authorizing the NFIP to borrow up to an additional $18.5 billion to settle flood insurance claims for the 2005 claims year. David Maurstad states that further borrowing authority will be needed. Long-term NFIP reforms are also being considered along with the increases in borrowing authority.

11/2005

FEMA begins to release "advisory BFEs" and recovery maps that reflect post-hurricane data on flood risks for Katrina-affected Gulf Coast areas, so rebuilding can proceed based upon current understandings of base flood elevations. Localities are encouraged to adopt the advisory BFEs into their local ordinances. FEMA plans to issued revised FIRMs in the next year or two that are expected to closely resemble today's advisory BFE maps.

11/2005

The causes of the New Orleans flooding and levee breaches are explored in a hearing before the full US Senate Committee on Environment and Public Works. The US Army Corps of Engineers and members of engineering teams that are investigating the levee failures testify.

11/2005

Proposals for flood insurance reform are considered by the US House Finan-

cial services Committee in H.R. 4320. A number of changes to the NFIP are being considered, including increasing flood insurance coverage caps on structures and contents, and increasing fines imposed on lenders who fail to enforce mandatory flood insurance purchase requirements.

12/2005

Although it officially ended on November 30, the 2005 hurricane season continues with another named tropical system, Zeta. Zeta brings the total number of 2005 tropical systems to 30, including 27 named storms.

01/2006

With Zeta still active, the Atlantic hurricane season extends into January for only the second time since records have been kept.

- Lateral Hardening Underground
  - LHU benefits are measured by comparing the historical performance of the previously overhead line to the performance of the new underground line.

The following questions relate to the topic area underlined below.

Overhead Construction Standards and Policies

5. State the BIL level used as a goal for new construction.

Response:
IEEE 1410 defines BIL as the crest value of a standard lightning impulse for which the insulation exhibits a 90% probability to withstand (or a 10% probability of failure) under specified conditions. Equipment manufacturers rate and test their equipment. Most of our Florida system is 12.47kV. The industry standard BIL rating for equipment of that voltage is 95kV – 110kV. In our costal zones we usually select equipment with a BIL rating of 120kV or more to help with the salty environment.

6. Explain what Critical Flashover (CFO) is not used in the determining the spacing of constructions and insulators instead of BIL.

Response:
DEF uses both BIL and CFO as they are closely related. BIL is generally an equipment rating and CFO is generally an overall rating given to a structure. DEF uses the guidelines in IEEE 1410 to calculate the CFO for our structures. Basically, DEF aims at a CFO for structures of 450kV or more which influence the spacing and insulation levels used in our design. This is achievable on distribution structures without equipment. For structures with equipment, we utilize lightning arresters to mitigate flashover issues.

7. State whether DEF uses Grade C for most distribution lines with loading from NESC Rule 250B (except for NESC specified situations as defined in NESC Table 242-1).

Response:

For SPP work, DEF uses Grade B and meets loading from both NESC 250B and 250C (without 60 ft exception). DEF is also transitioning all new construction to these standards.

Substations in Flood Zones

8. For 2020, 2021, 2022 identify each substation where DEF has deployed

a. Sand bagging

b. Dam systems, and

c. Other flood protection systems.

Response:

DEF has deployed temporary sandbags added to block water entry on the control house door at the Occidental #3 Substation on June 7, 2020. DEF has not utilized dam systems or any "other flood protection systems" at any substations during the identified period.

9. Provide the annual cost for substation flood mitigation.

Response:

The DEF Storm Protection Plan 2023 – 2032 filing includes the annual cost for Flood Mitigation in Exhibit BML-1.

10. Provide a list of each substation where flood mitigation has occurred and state whether the mitigation measure is permanent or a temporary measure (Ex: sand bagging).

Response:

Please see DEF's response to OPC Interrogatory 1.8.

Grid Investment Plan

11. Explain how DEF prioritizes which group of feeders are to be upgraded with the ASD system and the order in which the upgrades occur.

Response:

DEF prioritizes feeders for the SOG Program based on customer count and a 4-year average of feeder backbone customer interruption (CI) data. Feeders with the highest customer count and CI are ranked higher as those are the circuits with the largest opportunity for improvement. Once a feeder is selected and prioritized based on customer count and CI, DEF then develops a 'Team' (SOG Team) around each prioritized feeder by reviewing available relief feeder ties (requires a review of grid topology). Other aspects that influence priority are societal impacts (i.e., feeders with schools, hospitals, emergency operations centers, or airports), resource efficiency, and load-growth considerations.

12. Provide the average number of automated switches that are required for each feeder in order to automate that feeder.