FILED MAR 10, 2014
DOCUMENT NO. 01101-14
FPSC - COMMISSION CLERK

DUKE
ENERGY
FLORIDA

Matthew R. Bernier
Sr. Counsel
Duke Energy Florida, Inc.

March 10, 2014

Ms. Carlotta Stauffer, Commission Clerk
Florida Public Service Commission
2540 Shumard Oak Boulevard
Tallahassee, Florida 32399-0850

Re: *Rule 25-6.0143(1)(l), Florida Administrative Code; Storm Damage Self-Insurance Reserve Study; Undocketed*

Dear Ms. Stauffer:

Pursuant to Rule 25-6.0143(1)(l), F.A.C., please find attached for electronic filing on behalf of Duke Energy Florida, Inc. ("DEF"), DEF's Storm Damage Self-Insurance Reserve Study.

Thank you for your assistance in this matter. Please feel free to call me at (850) 521-1428 should you have any questions concerning this filing.

Respectfully,

s/Matthew R. Bernier
Matthew R. Bernier
Sr. Counsel
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MRB/mw
Enclosures

Storm Loss and Reserve Performance Analyses

Duke Energy Florida, Inc.

March, 2014

EQECAT is dedicated to being a trusted advisor to our insurance, reinsurance and financial clients, enabling them to successfully manage their business risk due to catastrophic events. We are committed to providing our clients with practical, state-of-the-art catastrophe risk modeling products and services, and advancing the science and analytics of catastrophe risk modeling

Risk Profile

The following is a summary description of analyses performed by EQECAT, Inc. of Duke Energy Florida's ("DEF") storm loss exposure and reserve performance. This report is intended to be used solely by DEF and the Florida Public Service Commission for estimation of potential future DEF losses to the reserve and the estimation of the performance of the reserve.

OWNER	**Duke Energy Florida**	
ASSETS	Transmission and Distribution (T & D) System: Transmission towers, and conductors; Distribution poles, transformers, conductors, lighting and other miscellaneous assets; Non-recovered property insurance policy deductibles.	
LOCATION	All T & D assets located within the State of Florida,	
ASSET VALUE	Normal replacement value is approximately $ 12.5 billion, of which approximately 43% is transmission and 57% is distribution	
LOSS PERILS	Hurricane Windstorm (SSI 1 to 5)	
	Hurricane Hazard (one year)	
EXPECTED ANNUAL LOSS (T&D and deductibles)	$28.4 million	
1% AGGREGATE DAMAGE EXCEEDANCE VALUE	$411 million	
Reserve Analysis Cases $124.9 m initial balance 5 Year recovery of negative balances	**Expected balance at 5 years**	**Probability of negative balance within 5 years**
$0 million Annual Accrual	$18.4 million	30.3%
$6 million Annual Accrual	$46.3 million	25.2%
$23 million Annual Accrual	$128 million	15.8%

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Tables

Figures

1. Storm Loss Analysis

Duke Energy Florida, Inc. ("DEF") transmission and distribution (T & D) systems and general property are exposed to and in the past have sustained damage from hurricanes. The exposure of these assets to storm damage is described and potential losses are quantified. Loss analyses were performed by EQECAT, using a computer model simulation program *Risk Quantification and Engineering* (RQE$^{®}$) developed by EQECAT, Inc. The EQECAT proprietary computer software RQE is one of only five models evaluated and determined acceptable by the Florida Commission on Hurricane Loss Projection Methodology (FCHLPM) for projecting hurricane loss costs (Reference 1).

All results which are presented here have been calculated using RQE, and the DEF provided T & D asset portfolio data. Factors considered in the analysis include the location of DEF's T & D assets, the probability of storms of different intensities and/or landfall points impacting those assets, the vulnerability of those assets to storm damage, and the costs to repair assets and restore electrical service.

RQE Modeling Methodology

Natural Catastrophe (NatCAT) modeling is the process of using computer-assisted calculations to estimate losses that could be sustained due to hurricanes, ice storms, earthquakes, floods and other similar events. NatCAT modeling has developed over the past few decades to be the standard methodology utilized in the insurance industry to analyze potential losses and is at the confluence of many disciplines including actuarial science, engineering, meteorology, seismology and computer science. NatCAT models utilize a class of computer programs called geographic information systems (GIS). GIS allow the storage, manipulation, analysis, and management, of the very large quantities of geographical and other data required by NatCAT simulation models.

Natural catastrophic events have low probabilities of occurrence and high consequences, and there have not been the large numbers of actual loss events affecting the built infrastructure that would be required for actuarial analysis of these perils. Therefore simulation modeling has been developed, using known science of meteorology, to allow modeling of the many more storm events that are possible, but have not yet been observed.

Model Components

Hurricane simulation models are developed using four model components: hazard, assets at risk, vulnerability, and damage which are described here.

Hurricane Hazard Model

First, the hazard component of the hurricane model describes three basic attributes of the hazard. These are the location of events, their frequency of occurrence, and their severity. Hazard models are developed using available historical hurricane information from inventories and catalogs of actual historical events. The historical record for hurricanes is only about a century long in the United States, with the most modern scientific observations and measurements having been made in the last half of the twentieth century.

Synthetic hurricanes are generated using scientific parameters observed in past historical events. For hurricanes, central pressure, wind speed, radius to maximum winds, hurricane track, are among the important modeled parameters. For each hurricane variable, the model uses probability distributions that describe the range of values each variable may have to construct synthetic events. These probability distributions are used to produce thousands of scientifically possible simulated events with varying severities and frequencies called a stochastic event set. These large stochastic event sets provide a more realistic representation of the full range of potential hurricanes that could happen, but have not yet been observed in our limited historical observation period.

Portfolio Model – Assets at Risk

Second, assets at risk are an essential component of catastrophe models. The risk model requires defining of the portfolio of properties at risk. It is basically putting together all the relevant information of the transmission and distribution asset portfolio including location, values at risk, structural types.

The inventory of assets at risk are managed in GIS data bases and describe the basic asset attributes of location, value, structure type to allow the estimation of potential damage to structures and associated assets. The estimation of damage from hurricane events requires estimation of hazard parameters at the location of each asset at risk. Model computations are performed in the hazard module to estimate how the local hazard intensity (peak gust wind speed) varies over the areas where assets are at risk for each simulated event. Transmission and Distribution asset data are provided in the Tables 1-1 and 1-2 below. Distribution and transmission asset values by zip code are shown in Figure 1-1 and Figure 1-2 respectively.

Vulnerability Model

Third, is the model vulnerability component. Damage to structures varies with the intensity of the forces from hurricane winds. Damage also varies with other asset characteristics such as type of structure. Vulnerability functions account for variability by assigning a probability distribution bounded by 0% and 100% with a prescribed mean value and standard deviation.

The DEF loss history from the 2004 Hurricanes Charley, Frances, and Jeanne were considered in the calibration of the vulnerability model. These hurricanes provide data on recent storm recovery costs from low intensity winds. The 2004 storm loss experience includes the effects of many factors including the post hurricane costs of labor and other factors associated with the storm restoration process utilized by DEF. The 2004 loss history is believed to be most reflective of the current DEF storm restoration practices and cost experience.

Damage Model

Lastly, the model damage component estimates the damage to the assets at risk that are sustained as a result of the local hazard intensity of each simulated event. Damage is estimated by the relationship between the local hazard intensity at the each asset location and the vulnerability of the asset.

Damage to each asset for each of the stochastic events is estimated and aggregated along with the frequency of each event. The damages at the site are combined probabilistically to develop the damage distribution. In this way, a large database of damage is developed for all events that can cause damage to the asset portfolio.

These databases of damage and frequency are used to develop probability distributions of event driven losses. The individual damage estimates for each possible event are probabilistically aggregated to estimate overall expected (annual) damage and damage non-exceedance values. The expected annual damage represents the aggregate of the annualized damages from all relevant probabilistic events. It is a common measure of the hazard severity in the region of interest.

Damage is defined as the cost associated with repair and/or replacement of T & D assets necessary to promptly restore service in a post-storm environment. This cost is typically larger than the costs associated with scheduled repair and replacement programs. This study includes costs associated with storm damage, service restoration and insured property deductibles.

Table 1-1

DISTRIBUTION ASSETS
REPLACEMENT VALUES BY COUNTY

County	Replacement Values ($1000)
Alachua	32,278
Bay	5,935
Brevard	520
Citrus	221,884
Columbia	4,018
Dixie	13,386
Flagler	1,502
Franklin	63,172
Gilchrist	12,274
Gulf	34,924
Hamilton	19,342
Hardee	11,446
Hernando	68,987
Highland	219,956
Hillsborough	677
Jefferson	39,926
Lafayette	7,105
Lake	355,705
Leon	754
Levy	33,985
Liberty	155
Madison	24,313
Marion	316,411
Orange	1,635,303
Osceloa	224,577
Pasco	502,508
Pinellas	1,727,941
Polk	464,140
Seminole	615,877
Sumter	52,377
Suwannee	8,780
Taylor	37,419
Volusia	304,861
Wakulla	49,360
Total	**7,111,797**

Table 1-2

TRANSMISSION ASSET
REPLACEMENT VALUES BY COUNTY

County	**Replacement Values ($1,000)**
Alachua	95,444
Bay	10,292
Citrus	455,869
Columbia	50,972
De Soto	198
Dixie	19,823
Franklin	55,301
Gadsden	77,761
Gilchrist	76,281
Gulf	61,538
Hamilton	148,087
Hardee	139,987
Hernando	215,220
Highlands	159,982
Hillsborough	26,120
Jackson	194
Jefferson	60,347
Lafayette	7,301
Lake	340,979
Leon	47,006
Levy	113,916
Liberty	42,969
Lowndes	291
Madison	69,103
Manatee	1,307
Marion	282,533
Orange	431,474
Osceola	74,525
Pasco	295,190
Pinellas	456,865
Polk	604,054
Seminole	146,311
Sumter	379,347
Suwannee	160,224
Taylor	62,415
Volusia	182,069
Wakulla	72,218
Other	4,735
Total	**5,428,250**

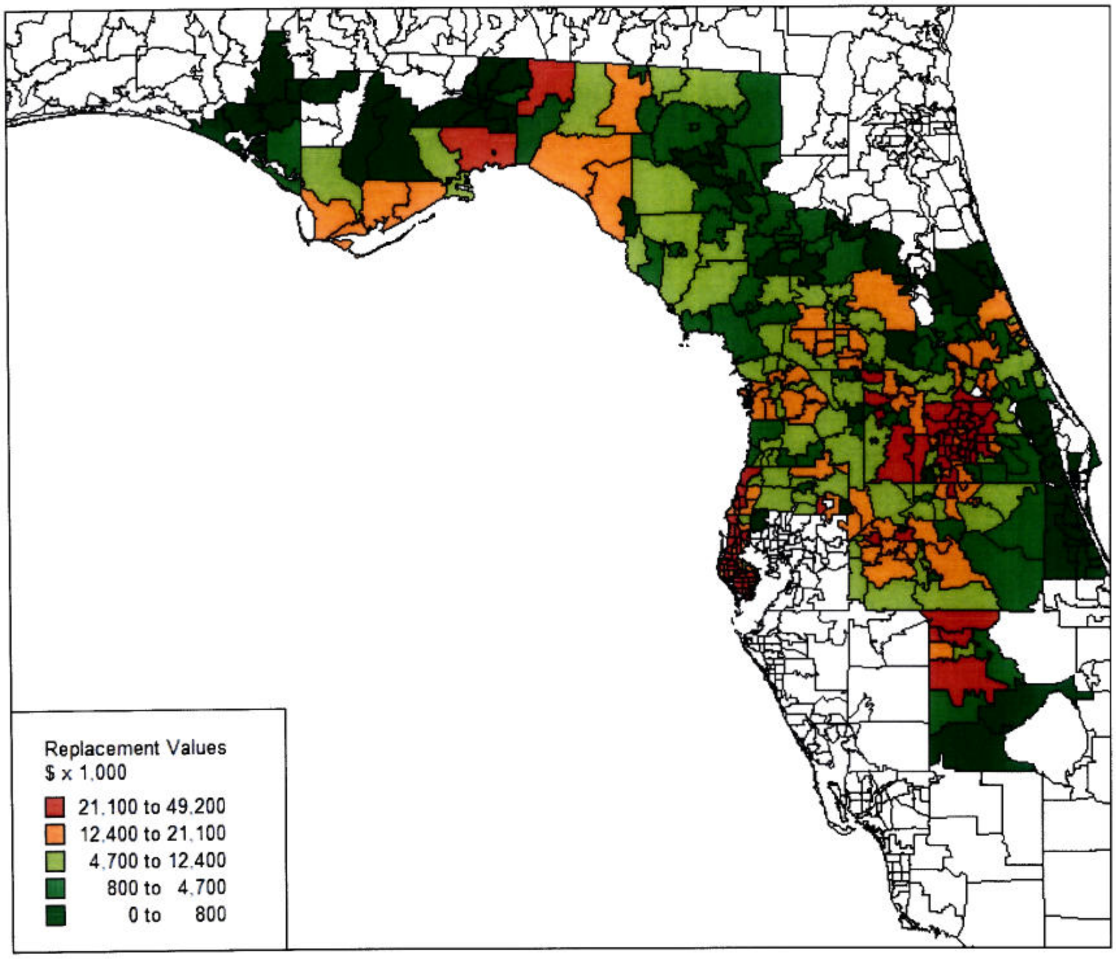

Figure 1-1: Overhead Distribution Asset Values by Zip Code

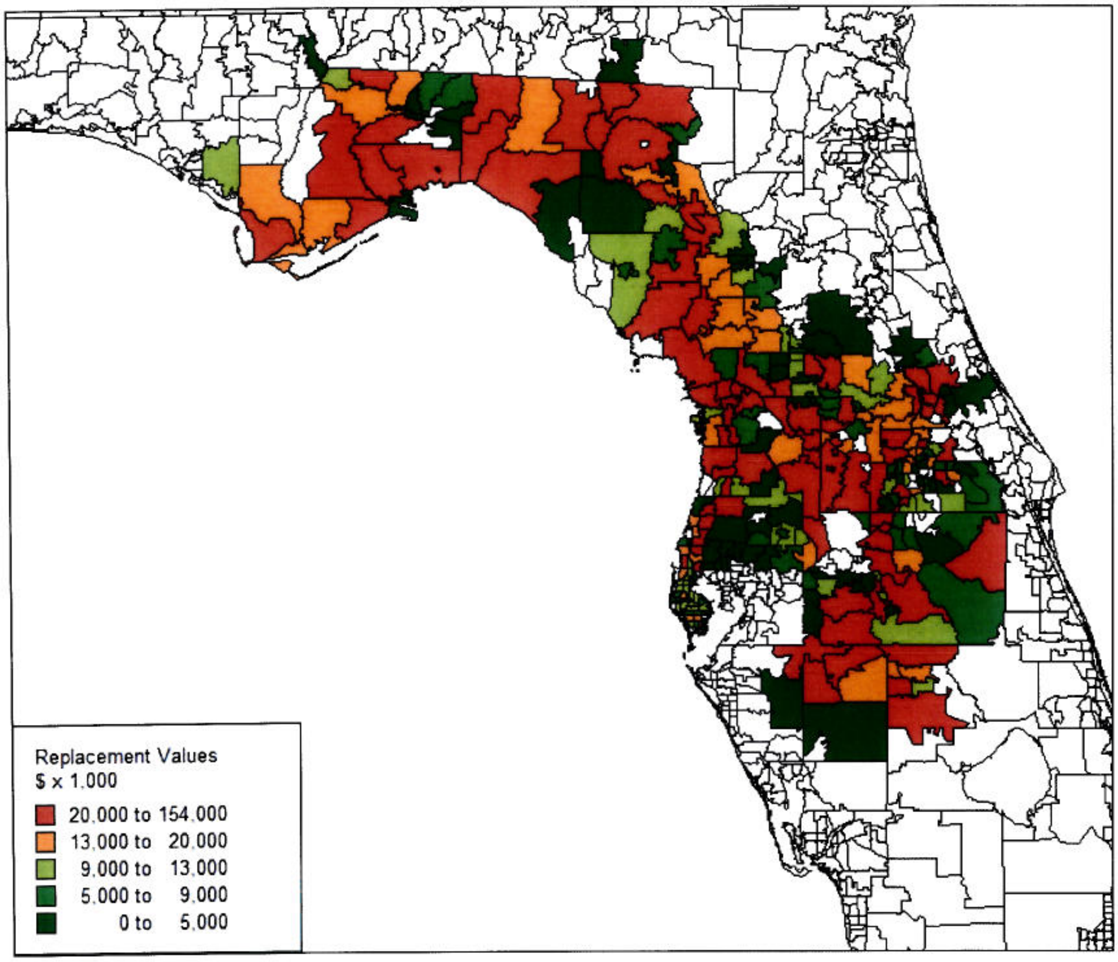

Figure 1-2: Overhead Transmission Asset Values by Zip Code

2. Hurricane Hazard

Hurricane Exposure

The hurricane exposure is analyzed from a probabilistic approach, which considers the full range of potential hurricane characteristics and corresponding losses. Probabilistic analyses identify the probability of damage exceeding a specific dollar amount. RQE is a probabilistic model designed to estimate damage and losses due to the occurrence of hurricanes. EQECAT, Inc. proprietary computer software RQE is one of only five models evaluated and determined acceptable by the Florida Commission on Hurricane Loss Projection Methodology for projecting hurricane loss costs.

The historical annual frequency of hurricanes has varied significantly over time. There are many causes for the temporal variability in hurricane formation. While stochastic variability is a significant factor, many scientists believe that the formation of hurricanes is also related to climate variability.

One of the primary climate cycles having a significant correlation with Hurricane activity is the Atlantic Multidecadal Oscillation (AMO). It has been suggested that the formation of hurricanes in the Atlantic Ocean off the coast of Africa is related to the amount of rainfall in the Western African Sahel region. Years in which rainfall is heavy have been associated with the formation of a greater number of hurricanes. The AMO cycle consists of a warm phase, during which the tropical and sub-tropical North Atlantic have warmer than average temperatures at the surface and in the upper portion relevant to hurricane activity, and a cool phase, during which these regions of the ocean have cooler than average temperatures. In the period 1900 through 2012, the AMO has gone through the following phases:

1900 through 1925	Cool	(Decreased Hurricane Activity)
1926 through 1969	Warm	(Increased Hurricane Activity)
1970 through 1994	Cool	(Decreased Hurricane Activity)
1995 through 2012	Warm	(Increased Hurricane Activity)

The National Oceanic and Atmospheric Administration (NOAA) believes that we entered a warm phase of AMO around 1995 which can be expected to continue for at least several years; historically, each phase of AMO has lasted approximately 25 to 40 years..

Probabilistic Annual Damage & Loss is computed using the results of thousands of random variable hurricanes considering the long term 112 year hurricane hazard. Annual damage estimates are developed for each individual site and aggregated to overall portfolio damage amounts. Damage is defined as the total cost including the operations and maintenance (O&M) and capital components associated with repair and/or replacement of T & D assets necessary to promptly restore service in a post storm environment. This cost is typically larger than the costs associated with scheduled repair and replacement programs.

Factors considered in the analysis include the location of DEF's T & D assets, the probability of hurricanes of different intensities and/or landfall points impacting those assets, the vulnerability of those assets to hurricane damage, and the costs to repair assets and restore electrical service.

3. Storm Loss Analysis Results

Aggregate Loss Exceedance and Expected Annual Loss

A probabilistic database of T&D is developed using the storm hazard, assets at risk and their vulnerabilities. The analysis utilizes the long term 112 year hurricane hazard. For each hurricane, the center, shape, geographical orientation, track and wind speeds were defined. The wind field for each storm is integrated with the asset vulnerability and the asset locations to compute the damage. The annual frequency and the portfolio damage for each are simulated. By using this database of thousands of hurricane losses, various loss exceedance or non-exceedance distributions are generated.

The frequencies and computed damage for all hurricanes are combined to calculate the expected annual loss and the annual aggregate exceedance relations.

Aggregate damage exceedance calculations are developed by keeping a running total of damage from ***all possible events*** in a year. At the end of each time period, the aggregate damage for all events is then determined by probabilistically summing the damage distribution from each event, taking into account the event frequency. The process considers the probability of having zero events, one event, two events, etc. during a year.

A series of probabilistic analyses were performed, using the vulnerability curves derived for DEF assets and the computer program RQE. A summary of the analysis is presented in Table 3-1, which shows the aggregate damage exceedance probability for damage layers between zero and over $500 million dollars.

The analysis calculates the probability of damage from all storms and aggregates the total.

Table 3-1 provides the aggregate damage exceedance probabilities for the DEF T&D assets analyzed for a series of layers. Each layer has a layer amount of $25 million, except for the final layer which represents all damage $500 million and greater. For each damage layer shown, the probability of damage exceeding a specified value is shown. The value in the first column, labeled Damage Layer, is the attachment point for each layer, with the exception of the last layer, for which the attachment point is $500 million.

The second column of the table, labeled 1 year Exceedance Probability, provides the annual modeled probability of penetrating each layer, i.e. the probability that the total damage from all events in a 1 year period will exceed the attachment point of the layer. For example, the probability of damage exceeding $100 million in one year is 6.94%.

The expected annual loss (EAL) and exposure to DEF's reserve from hurricane damage to T&D is $28.4 million. This value represents the average loss from all simulated storms. The EAL is not expected to occur each and every year. Some years will have no damage from storms, some years will have small amounts of damage and a few years will have large amounts of damage. The EAL represents the average of all storm years over a long period of time.

It should be noted that the National Oceanographic and Atmospheric Administration (NOAA) believes that in 1995 we entered a period of heightened hurricane formation in the Atlantic Basin and near term frequencies of hurricanes over the coming decade should be expected to be significantly higher than those over the long term. This could result in significantly greater annual hurricane losses than those determined from the long term hurricane hazard frequency.

Table 3-1

T & D ASSETS
AGGREGATE DAMAGE EXCEEDANCE PROBABILITIES

Damage Layer ($millions)	1 Year Exceedance Probability
(≥ 0.5)	42.5%
25	23.0%
50	15.3%
75	10.20%
100	6.94%
125	4.99%
150	3.80%
175	3.06%
200	2.56%
225	2.20%
250	1.92%
275	1.70%
300	1.53%
325	1.38%
350	1.25%
375	1.14%
400	1.04%
425	0.95%
450	0.80%
475	0.73%
>500	0.66%

4. Reserve Performance Analysis

A probabilistic analysis of losses from hurricanes was performed for Duke Energy Florida to determine their potential impact on the reserve. The analysis included transmission and distribution (T&D) damage as well as estimates of insurance deductibles paid on insured property assets.

Analysis

The reserve performance analysis consisted of performing 10,000 iterations of hurricane loss simulations within the Duke Energy Florida service territory, each covering a 5-year period, to determine the effect of the charges for damage on the DEF reserve. Monte Carlo simulations were used to generate damage samples for the analysis. The analysis provides an estimate of the reserve assets in each year of the simulation, accounting for the annual accrual and storm damage using a dynamic financial model.

The performance analyses consider three funding cases, each with an initial $124.9 million reserve balance. The funding cases have annual accruals of $0, $6 million, and $23 million over the five year period.

Assumptions

The analysis performed included the following assumptions:

- An initial reserve balance of $124.866 million.
- Hurricane losses are assumed to increase by 3% per year as replacement values of T&D increase due to system growth and inflation.
- In years when the reserve has a negative balance, the deficit is assumed to be recovered over the following five year period in equal increments.
- $23.1 million of the $28.4 million Expected Annual Loss, determined in the Loss Analysis, is assumed to be an obligation of the reserve.
- Hurricane losses include estimates of property insurance policy deductibles up to the policy limit of $10 million per occurrence.

The analysis results for the cases analyzed are shown in Tables 4-1a and b below. The results show the annual reserve accrual amount, the mean (expected) reserve balance as well as the probability that the reserve balance will be negative in any one or more of the five years of the simulated time horizon.

Table 4-1a

DEF T & D
RESERVE ACCRUALS AND
RESERVE BALANCES FOR
ANNUAL ACCRUAL CASES
($ Millions)

Expected Annual Loss Obligation of Reserve	**$23.1**		
Reserve Balance at the end of 5 years			
Accrual	**5%ile**	**Mean**	**95%ile**
$0	($214)	$18.4	$125
$6	($183)	$46.3	$155
$23	($112)	$128	$240

Table 4-1b

DEF T & D
RESERVE ACCRUALS AND
PROBABILITY OF RESERVE BALANCES
($ Millions)

Accrual	**Mean Reserve Balance at the end of 5 years**	**Probability of Balance <$0 in 5 years**	**Probability of Balance >$120m in 5 years**
$0	$18.4	30.3%	67.9%
$6	$46.3	25.2%	77.3%
$23	$128	15.8%	91.0%

Figures 4-1 through 4-3 show the results of the $124.9 million initial balance, and $0, $6 million, and $23 million annual accrual cases. These results show the mean (expected) reserve balance as well as the 5th and 95th percentiles reserve balances for each of the five years in the simulations.

For example, given an initial reserve balance of $124.9 million and no accrual, Figure 4-1 illustrates the expected performance of the reserve. The reserve has a mean (expected) balance of $18.4 million at the end of the five year simulation. The 5th percentile and 95th percentile 5 year ending reserve balances are negative ($214 million) and $125 million respectively. The reserve has a 30.3% chance of a negative balance in one or more years of the five-year simulation. The reserve has a 67.9% chance of a balance greater than $120 million in one or more years of the five-year simulation.

The cases with no annual accrual and a $6 million annual accrual have accruals less than the Expected Annual Loss to the reserve from storms of $23.1 million. Therefore with each passing year, the reserve ending balance has a decreasing likelihood of accumulating surpluses and an increasing likelihood of insufficient funds. The expected (mean) reserve balance for these cases decline gradually over the five-year simulation.

The annual accrual of $23 million is close to the expected annual loss obligation to the reserve of $23.1 million. Therefore with each passing year, the reserve ending balance remains stable and has an expected ending balance of $128 million, close to the initial balance of $124.9 million.

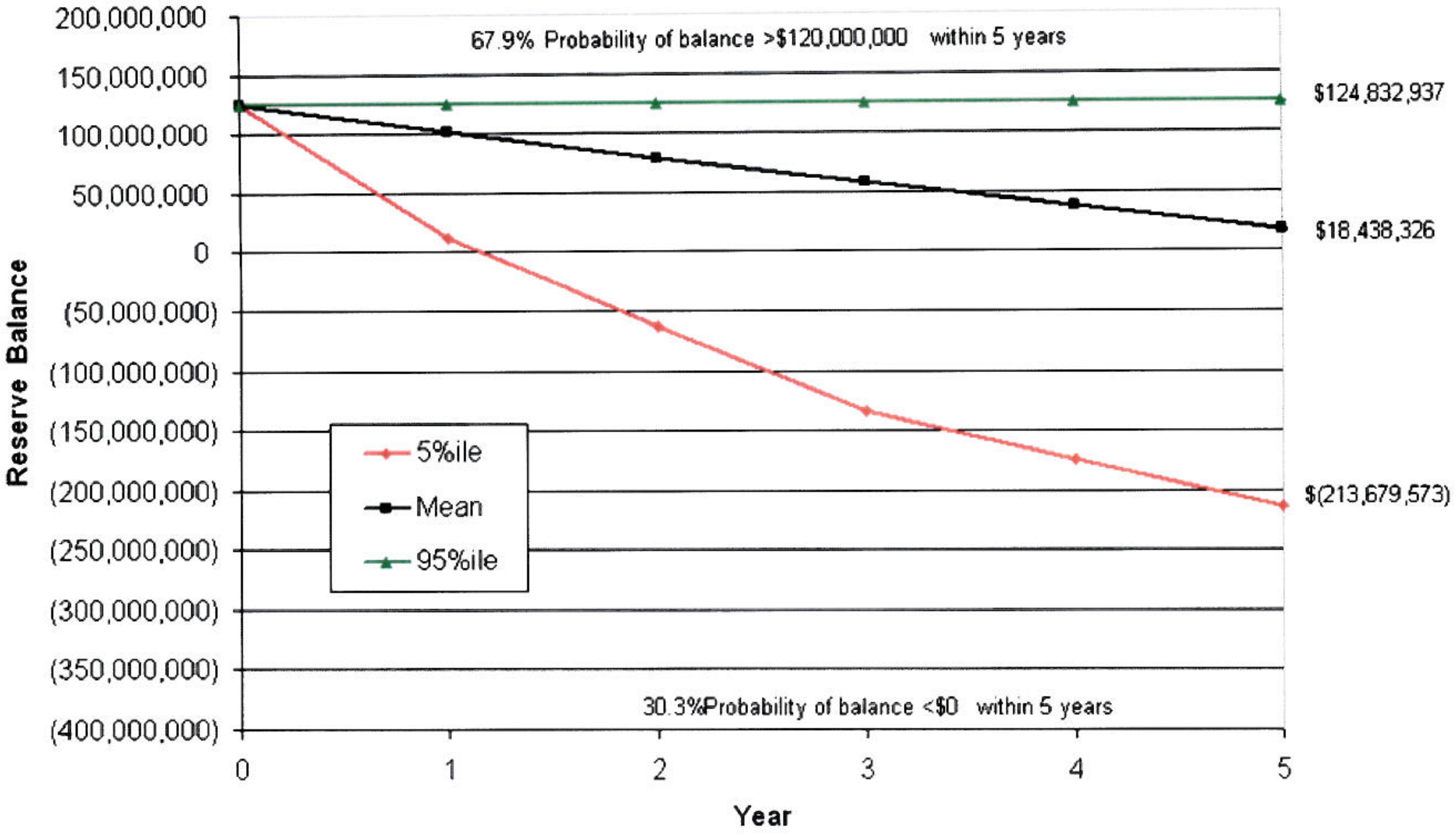

Figure 4-1: Reserve Performance Analyses: $124.9 million initial balance, no accrual and five year recovery of negative balances

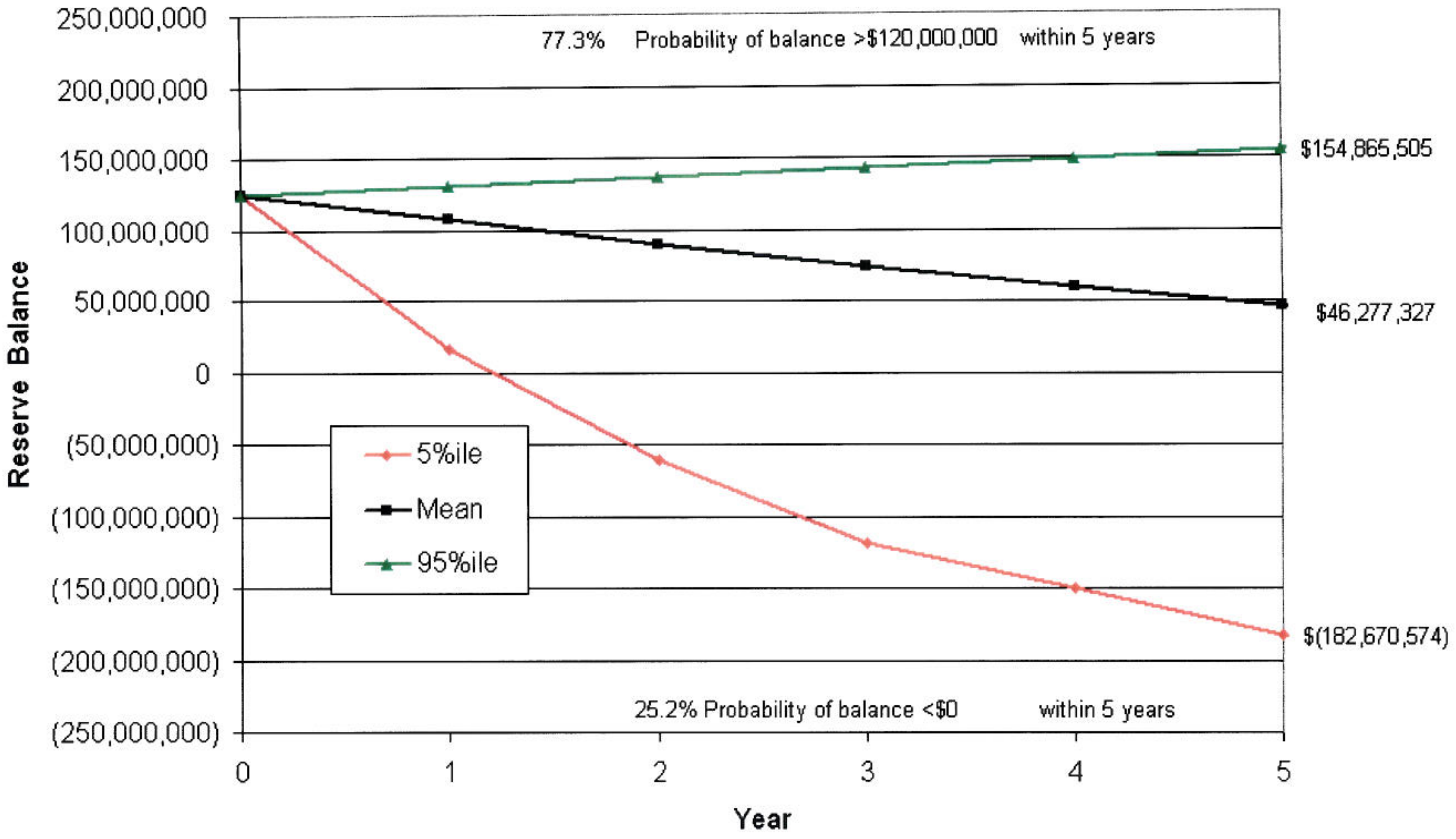

Figure 4-2: Reserve Performance Analyses: $124.9 million initial balance, $6 million annual accrual and five year recovery of negative balances

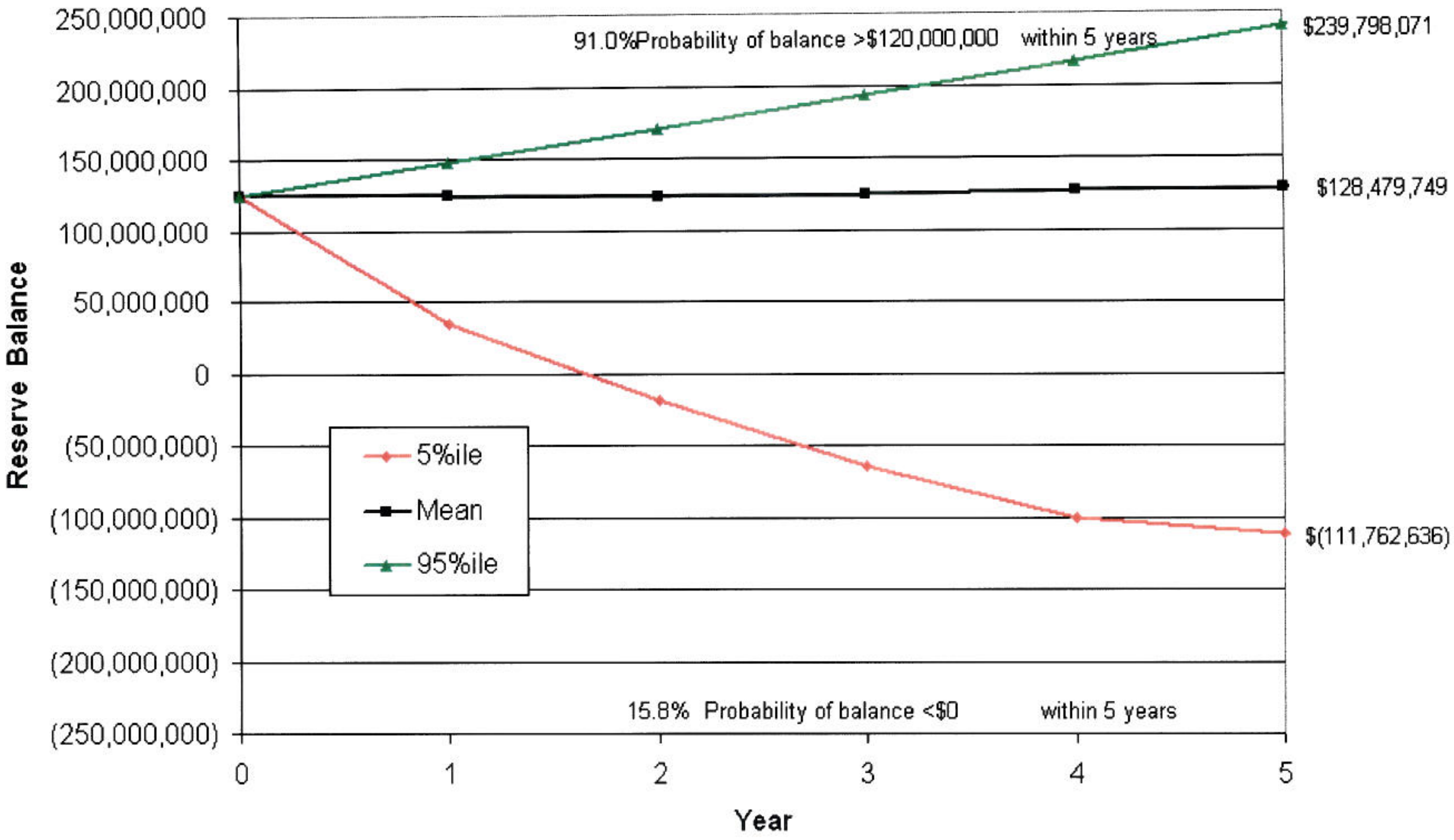

Figure 4-3: Reserve Performance Analyses: $124.9 million initial balance, $23 million annual accrual and five year recovery of negative balances

5. References

1. "Florida Commission on Hurricane Loss Projection Methodology", EQECAT, Inc., May 13, 2013. Submission.

EQECAT

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