

Substation

Field Trip Notes

Station Name	JUPITER			
Location/Address				
Date Constructed	1925 ; ZEDVILLE 1950s - 1960s			
GF Attendees				
Company Attendees, Title	KON, VERONIEE			
Date/Time	6/13/2012			
Type	<input type="checkbox"/> Transmission <input checked="" type="checkbox"/> Distribution <input type="checkbox"/> Both			
Line(s) in				
No.	From	Voltage	Notes	
1	PLEMOUS - UOBE	138 kV	12/10/05	
2		138		
3				
4				
5				
Line(s) out				
No.	To	Voltage	Notes	
1	LOCAL (8 LINES)	138		
2				
3				
4				
5				
Transformers				
No.	Manufacturer	Voltage (in/out)	Vintage	Notes
1	WAGNER	138 -> 13	~1970s	
'	"	"		
'	"	"		
Breakers				
No.	Type	Vintage	Notes	
2	MCCORM		OLAN 1960s - 1970s SUE ROLAND	
Structures				
No.	Type	Vintage	Notes	

CAPLITOR BANK (138kV) - RAISE VOLTAGE DURING DAY

Substation

Field Trip Notes

Station Name	Plumosis			
Location/Address				
Date Constructed	1965, REBUILT 1992, DIST. 1997			
GF Attendees				
Company Attendees, Title	Karl VERONISE			
Date/Time	6/13/2012			
Type	<input type="checkbox"/> Transmission <input type="checkbox"/> Distribution <input checked="" type="checkbox"/> Both			
Line(s) in				
No.	From	Voltage	Notes	
1	MARTIN PLANT	230 kV		
2				
3				
4				
5				
Line(s) out				
No.	To	Voltage	Notes	
1	LOCAL DIST. SUBSTATIONS (4)	138 kV	4 LINES	
2	LOCAL CUSTOMERS	23 kV		
3			RIVIERA	
4			HOUC	
5			HOUC 2 LANDINGS	
Transformers				
No.	Manufacturer	Voltage (in/out)	Vintage	Notes
1	ABB	230 kV / 138	1991	
1	PTT	230 kV / 23 kV	2006	
Breakers				
No.	Type	Vintage	Notes	
3	230 kV	~ 1992	SIEMENS + MITSUBISHI / SF6	
6	138 kV	~ 1992	ABB / AEG / SIEMENS SF6	
3	23 kV		VACUUM / ABB	
Structures				
No.	Type	Vintage	Notes	
1	BRICK		RELAY HOUSE (A/C FOR RELAYS)	
1	CONCRETE		DISTRIBUTION RAILS	

PLUMOSUS

- RELAYS

REQUIRE PRIMARY & SECONDARY RELAYS
BY TERC

BATTERIES

- 10 YEAR LIFE

OLD RELAYS - 30 YEARS

NEW RELAYS - 15-20 YEARS

BUS PILES → ARE CONCRETE

BREAKERS → PRIMARILY USE GAS

USED TO USE VACUUM, BUT
PREFER GAS

NOTE: EPA SAYS SF6 IS GREENHOUSE GAS (~ 15 HAS 100)
- MEASURE LEAKAGE EACH YEAR

- GAS REUSED WHEN BREAKERS RETIRED

TRANSFORMERS DESIGN LIFE 30-35 YEARS

REMARKS - MANY SOL IN S AMERICAN COUNTRIES

FAILURE → REMOVE OIL
CUT UP BY CONTRACTOR

GAS MONITORING

6% SIMILAR

- FEDERAL (AARA) FINDING

- CAN MONITOR GAS/OIL IN TRANSFORMERS
FOR SAFETY/FAILURE

DISTRIBUTION

VOLTAGE REGULATOR (SEPARATE FROM TRANSFORMER)

- SIEMENS, 2011 (REPLACED)

- REPLACED AFTER ~ 10 YEARS

- 3 BANKS OF REGULATORS (3-PHASE
9 REGULATORS)

FIL -> USES REGULATORS SEPARATE FROM
TRANSFORMERS

LOAD

Now SUMMER PEAK
(LTS) SEASONAL POPULATION

- LOAD MANAGEMENT EQUIPMENT
(TURN OFF CONSUMER A/C, ETC.)

Generating Station

Field Trip Notes

Station Name	ST LUCIE NUCLEAR
Location/Address	JANSON Bldg, FL
Date Constructed	1976
GF Attendees	MRS. CLARK
Company Attendees, Title	TONY BLAKE NANCY SOLANSON, THOMAS BOBBY, JOHN PENSON
Date/Time	3/17/2012 9:30 AM
License Date(s)	3/2036 4/2043

Generating Units							
Unit	Date in Service	MW (gross/net)	Fuel	Fuel Delivery	Fuel Disposal	Base/Int/Peak	Number of Starts
1	1976	839	NUCLEAR			BASE	—
2	1983	839	NUCLEAR			BASE	—

Comments
 LICENSES EXPIRED 2013
 UPDATE WITH INCREASE MW

Major Equipment (including year installed)					
Unit	Scrubber	SCR	Baghouse	Cooling Tower	Stacks
1	—	—	—	NO - OPEN WATER	
2	—	—	—		

Comments
 VIBRATES
 - MSR
 - STEAM TURBINE
 - FEED PUMPS

St Lucie Nuclear Plant

UPDATES

- Run Cans at Higher Temperature
- Molten Selenate Refractories
- Steam Turbine Upgrade
- Feed Pumps

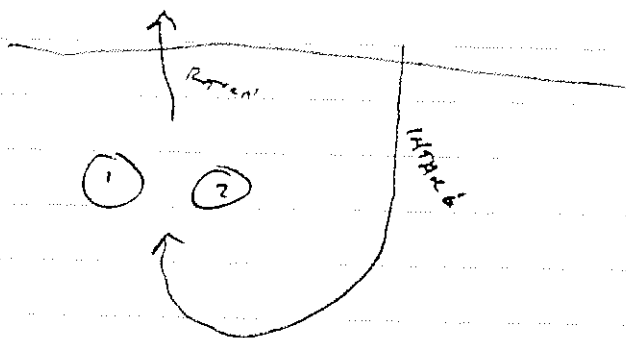
V1 (COMPLETED) APRIL 2012

V2 OUTAGE - AUG-DEC 2012

V1 & V2 - PWIR

SPENT FUEL - DRY CASK STORAGE ON SITE

COOLING → No COOLING TOWER, WATER PUMPED TO OCEAN



MSIC

4 per VNT

VI → Alund

ABANDON CONTROLS, SIZE (CARRON), etc

TURBINE

ENTIRE TURBINE REPLAZED

Generating Station

Field Trip Notes

Station Name	West County
Location/Address	
Date Constructed	2009
GF Attendees	
Company Attendees, Title	Charles Rite Eric Holzner Kathy Zinks Lisa Eiland
Date/Time	6/15/2012
License Date(s)	

Generating Units								
Unit	Date in Service	MW (gross/net)	Fuel	Fuel Delivery	Fuel Disposal	Base/Int/Peak	Number of Starts	
1	2009	~1220	GAS	PIPELINE	✓	Base/Int		
2	2009	1220	↓	↓	?	↓		
3	2011	1220	↓	↓	?	↓		
			GULFSTREAM	GAS				

Comments

All 3x1 CCs

GAS - GULFSTREAM (GULF OF MEXICO GAS)

9 MITSUBISHI MS01G GAS TURBINES (~240 MW)

3 TOSHIBA STEAM TURBINES (~423 MW)
- 517 MW w/ DUAL BURNERS

- CYCLE 2-3 UNITS
- 100% NUCLEAR

Major Equipment (including year installed)						
Unit	Scrubber	SCR	Baghouse	Cooling Tower	Stacks	
1	—	2009	—	2009	—	
2		2009		2009		
3		2011		2011		

Comments

RECLAIMED WATER FROM PEAR BAY COUNTY SYSTEM

SCR ON EACH GT FOR NO_x (AMMONIA)

WEST COUNTY

- Newest Plant in FPL Fleet

RIVERA & CAPE CANAVIAL - 321 CC
MAY 2013 & MAY 2014

- WCC is largest CC in US

- WATER IS RECLAIMED WATER FROM PALM BEACH COUNTY
- 30 YEAR CONTRACT W/ COUNTY
- USED WATER FOR FIRST TWO YEARS OF OPERATION

SCA → NO_x 25 ppm → 4 ppm
AIRWAYS AMMONIA

- DUCT FRINGE ON HANI GT UNITS

EMERSON Ovation Digital Controls - HASC
MITSUBISHI DIASYS CONTROLS FOR GT
TOSHIBA D-FAC CONTROLS - SEVERAL TRIBUNES

CONTROLS UPGRADED / REPLACED REVENUE (SHORTEN LIFE)
CAN BE > \$1 MILLION FOR UNIT 5-10 YEARS

LONG TERM
PARTS AGREEMENT MITSUBISHI FA GTs

- MATRS 10-20 YEAR TERM

- CAN SEND SUMMARY

COMBUSTION TURBINE }
STEAM TURBINE } LARGEST COMPONENTS
GENERATORS }
HSCG }

Cycle 2-3 units at 1100F
RIVER/CANAL/WATER WITH LOAD + MORE CYCLING

See AIR

→ FILTER BEFORE COMBUSTION PROCESS

COMPARISONS TO OTHER TYPES

- FREQUENTLY SAW PARTICLES NOT PAPER
- PITTING, FATIGUE METAL, CORROSION

- STORMS

- LIGHTNING

SUBSTATIONS

6/13/2012
KEN VERONEE

~ 620 SUBSTATIONS
~ 2 ADD'D PER YEAR

500 }
230 } TRANSMISSION
138 }
115 }
69 }
23 }
13 } DISTRIBUTION

AT SUBSTATION, TRANSFORMER
IS DEMARCATION FOR TRANS/DIST.
→ 230 → 13 TRANSFORMER
IS DISTRIBUTION

RELIABILITY PROGRAMS (= 90% OF CAPITAL BUDGET CUMULATIVE)

- BREAKERS - REPAIRING OR BREAKERS
- ALL GAS SINCE 1982
- REPLACING SOME GAS BREAKERS

RELAY CONVERSIONS

Re-Pouring CONCRETE, Rivets, P.I. ORGANS
- Will REQUIRE REBUILDING SUBSTATIONS

TRANSFORMERS - CRADLE TO GRAVE

DESIGN LIFE - 30-35 YEARS

Will RUN 50 YEARS (NOT ALWAYS USED
TO CAPACITY)

Never TRANSFORMERS AS INHALE, LESS MARGINS IN DESIGN
- CURRENTLY HEAVY LOADING

REGULATORS (SEPARATE FROM TRANSFORMERS) - Pre-CAPITALIZED
CRADLE TO GRAVE

~ 15-20 YEARS, CAN BE REBUILT

TRANSFORMER RETIREMENTS

Stream of OWNERSHIP; TRACE OIL, PARTS, ETC.
Will REMOVED

ADDS TO COST

SPECIALIZED TRANSFORMER CONTRACTORS

CONTRACTOR Will SALVAGE EVERYTHING
THEY CAN!

CAUSES of RETIREMENTS

- RETIRED WHEN GENERATE GAS

- MONITORING SYSTEM

- FAILURE (LESS COMMON THAN IN
PAST, DUE TO MONITORING - UNCOMMON)

TRANSFORMERS

WILL HAVE MULTIPLE UNITS OF PROPERTY
(COOLERS)
COOLERS, ARRESTORS, ETC.
BUSHINGS, TAP CHANGER

RELAYS

MOVING FROM ELECTROMECHANICAL TO CPU BASED

BREAKERS - SPECIFIC REQUIREMENTS

TRANSMISSION - AIR SF6 SINCE 1987
DISTRIBUTION - VACUUM

STILL MANY OIL BREAKERS ON SYSTEM

VACUUM - VACUUM -> LONGER LIFE THAN OIL

GAS -> SIMILAR LIFE TO OIL?

- SIMILAR DESIGN LIFE TO TRANSFORMERS
LIFE IMPACTED BY NUMBER OF FAULTS

CAUSES OF RETIREMENT

- FAILURE, END OF FUNCTIONAL LIFE

NEW BREAKER ~ \$25K

REPLACEMENT ~ \$18K

(EXAMPLE WE SAW HAD

677 - 337

INSTALLATION (COIL SPLIT))

POZ - ESTIMATING PROGRAM

SUBSTATION DESIGN

- MODIFIABLE - OSHA LIFE

HIGHER LOADS, LESS MARGINS (IN PART DUE
TO NOT CONSTRUCTION
ALIAS LINES)
→ SHORTER LIFE
FOR ESTIMATES

- ALSO, MANUFACTURING TOLERANCE

BUILDING 1-2 STORIES PER YEAR
(WAS 10/YEAR IN 2000)

RARELY POLE STAYS

- SOME INDOOR SUBSTATIONS IN MIAMI, MIAMI BEACH
- SHORTER LIFE DUE TO HEAT

CLIMATE - SALT / OCEAN (A.I.A. LEADS TO MORE
RUST THAN ELSEWHERE IN COUNTRY
(HAVE RETURN SOME IN 20-25 YEAR RANGE)

DISTRIBUTION

6/15/2012

Lisa Huff

MASONRY PIPES

1) POLE INSPECTION PROGRAM (PIP)

- INSPECT EVERY POLE IN SYSTEM EVERY 8 YEARS
- REPLACE IF CONDITION W/IN NOT ALLOW TO LAST NEXT 8 YEARS

- POLES - 1.1 MILLION POLES

6050: 25% CONCRETE

75% WOOD

ADD. MORE CONCRETE

> ESP. CRITICAL COMPONENTS (= 5% of POLES)

CONCRETE NOW SET 11-12' DIA (WAS 6')

~ 55-60 FT POLES

- PIP WILL LEAD TO INCREASE IN REPLACEMENT

- REPLACE AN CRACKS WHEN ENCOUNTERED

2) ENERGY SMART FLORIDA (SMART GRID)

- a) AMI Meters
- b) "MESH NETWORK" - COMMUNICATIONS
- c) SWITCHES, RECLOSERS

- WILL LEAD TO POLE REPLACEMENTS
 - NEED CAPACITY & MAY BE CRITICAL (CHANGE TO CONCRETE)

CONCRETE POLES

- MANY REQUIRE CRANE RENTAL, MORE HEAVY DUTY CONSTRUCTION
- HEAVY INSTALLATION & REMOVAL
 - PERMITTING, POLICE (SECURITY)
- LONGER LIFE THAN WOOD, EXCEPT HAVE PROBLEMS IN SALT SPRAY AREAS (CRACKING, ETC.)
 - MORE LOAD IN SALT SPRAY AREAS

REPLACEMENTS

- CRITICAL HIGHWAYS - ROLLING ROADBLOCK
- HIGH COST
- STANDARD WOOD POLE (SINGLE PHASE) \Rightarrow 3 \$4,000 TO REPLACE
 - HIGHER FOR MORE DEFERRED JOB UP TO \$10,000 OR MORE

PERMITTING

- BIGGEST COST DRIVER IS RESTRICTIONS ON LOCATION, WORK TIME, ETC.

REPLACEMENT

- TRANSFER FPL WIRES
- THAN TELECOM TRANSFERS
- THAN FPL REVENUE TO REMOVE POLE

SAFETY

- TRAINING ^{MATERIAL} PERMITS (WARNING NOTES)
- OSHA ARC FLASH RULES

ENVIRONMENTAL

- EVERY BIRD IN FLORIDA PROTECTED
ex: CUT OUT HOODPILLA NEST AND ATTACH TO NEW POLE
- FL DEP CONSIDERS MANY DITCHES W/ SWANS
- RELOCATE TORTOISES
- RAPTOR PROTECTION AT \$1,000

COPPER CHROMIUM ARSENIC

POLE TREATMENT - MOSTLY CCA (DOES NOT PASS AS CMB AS CREOSOTE)

- HAZARDOUS WASTE IN SOME LOCATIONS
- VENDOR REMOVED FROM YARD

CAUSES OF RETIREMENT

- DETERIORATION (FOUND w/ PIP)
- CAPACITY (RECONSTRUCTION, ETC.)
- RELOCATIONS (SMALL PCT, BUT HIGH W/ A.R.R.A.)
- ACCIDENTS
- UNDERGROUND CONVERSIONS

Acc 365
CONDUIT

STANDARD IS OBTAINED
- ACR (STEEL CONDUITS)

- 100, 300, 500

~ 657. 04, 357. 06

04 - 5 MILIMETER DB

DB - LONGEST LIFE

PVC - HEAT CAN DECREASE LIFE

All NEW CONSTRUCTION - IN CONDUIT

INITIATIVE TO REPLACE DIRECT BORED CABLES ^{BUT CAN REPAIR}
- LIVES HAVE TURNED OUT CLOSE TO 25 YRS
PH S... MECHANICAL DAMAGE (AT INSTALLATION)
SPICES & POSID TO MOISTURE, ETC.

PERFORMED CABLE INSULATION

DB - INSTALLED UNTIL LATE 1980s

CONDUIT - PVC PIPE

SOME TRANSFER IN OLD YEARS (ASBESTOS BASE)

- NORMALLY LEFT IN PLACE

MANHOLE DUCT SYSTEM

- Removal costs higher
- TRAFFIC CONTROL, PUMP GAS, ETC.

CONDUIT REPLACEMENT

- TRY TO REMOVE & REPLACE IN OLD CONDUIT
- IF NOT, HAVE TO DIMENSIONAL BORE
- CONDUIT NOT ALWAYS REPLACED w/ POLES
- SERVICES NOT ALWAYS REPLACED w/ CONDUIT

CONDUIT HIT REUSED

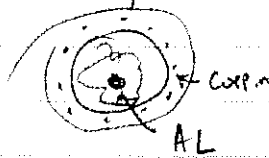
ACR MAY HAVE HIGHER SCRAP VALUE THAN ACSR

RETIREMENTS

OH → EXCESSIVE SPLICES, CAPACITY, SALT SPRAY, RELOCATIONS, STORMS

W

High Dissolving Polymers
ALUMINUM CONCENTRIC NEMATOL (COPPER)



Needs to be cut up in solution,
So recovery of COPPER is minimal

REMEMNIS

- VIBRATION, DISPERGATION, RELOCATIONS

LINE TRANSFORMERS

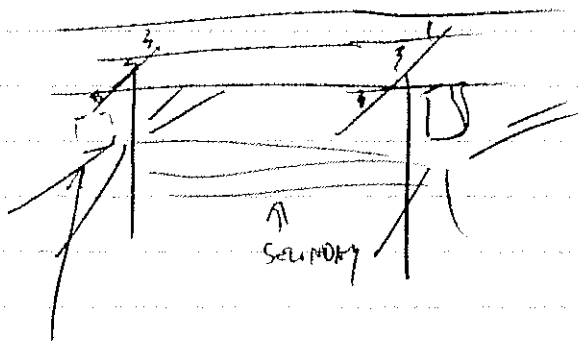
MAYBE
807 TO 207.
MANY MORE OLD THAN PADMOUNT → USE 3 PHASE OR 3-PHASE
VS. 1 PHASE PADMOUNT.

RETIREMENTS

- INCREASED LOAD, RUST (ESP. SAT. SPRAY),
CHANGE TO CUSTOMER REQUIREMENTS, CHANGE
OF LOAD CHANGES
- PADMOUNTS MORE PRONE TO RUST
- LESS TOLERANCE IN DESIGN
- LEAD TO INSTALLING LARGER TRANSFORMERS

MAY HAVE EARLIER FAILURE IF NOT SIZED
PROPERLY

- HAVE CHANGED STANDARD TO NOT USE SECONDARY
LINES AS MUCH → MAKES MORE TRANSFORMERS



Now Add 2nd Transformer AND REMOVE SECONDARY

DISPOSAL - REMOVE OIL, SERIAL HANDLING

SOME RECONDITIONED & REUSED (ALSO RE-CAPITALIZED)

CAPITALIZED ON PURCHASE, REVALUED AT END OF LIFE
(CRADLE TO GRAVE)

SERVICES

MORE ON THAN VL

NEW VL IS IN CONDUIT (PVC)

ON REMOVAL

- OVER ROADS, UTZ

MORE DIFFICULT TO REMOVE

- TENSE CONDUCTOR, ALSO + BE CAREFULLY
REMOVED

(CAN BE MORE DIFFICULT TO REMOVE
THAN INSTALL)

- PERMITTING, TRAFFIC, UTZ.

8/7/2012

2:00 PM

FPL PRODUCTION

NED ALLIS
DICK CLARKE
TOM BACCI

GINA GARINO (FLEET)
KEN STENROOS (ON TELY SERVICE)
CHARLES ROSE

COMBINED CYCLE

COASTAL ENVIRONMENT - SEA, etc.

MIN & PEAK LOAD - WIDE RANGE

CONCEPT - FOR ECONOMIC REASONS, RUN MOST EFFICIENT UNITS MOST FREQUENTLY

- CAP. SPARE PARTS - BASED ON FACTORED HOURS

CYCLE → TURN OFF PLANT & RESTART

TRIP → INVOLUNTARY CYCLE, MORE WORK & TIME

BASE UNITS

NEWER CC
NUCLEAR

INTERMEDIATE

- RUN, BUT MAY POWER DOWN, RUN LESS GT'S
OTHER CC

PEAK

WILL BE SHUT OFF DAILY (IF NOT MORE)

HEAT RATE - FERC FORM 1 - NET HEAT RATE

ANOHR (AVERAGE NET OPERATING HEAT RATE)
- PREFERRED FOR TENDENCY COMPARISONS

COMBINED CYCLE

HYDROGEN COOLED, 10 KV 20 KV GENERATORS
DIFFERENT SIZES, MANUFACTURERS

- ALL HAVE SIMILAR DESIGN LIFE TIME

MAJOR COMPONENTS

→ 2000s GENERATOR REWINDS - EXTENDED
LIVES OF PLANTS (STEAM PLANTS)
- NO CURRENT PROGRAM, NORMALLY
ASSESSED ON CONDITION BASIS

• 1960s STEAM PLANTS

- DESIGN LIFE OF 40 YEARS

- REWINDS, IMPROVEMENTS EXTENDS TO 50 YEARS

CANAVERA (3x1 1100 MW AC) near 2000

GENERATION RETIRED IN 2000s,
Now RETIRED, REPLACED w/ COMBINED CYCLE

- HIGH EFFECT DISPATCH OF PUTNAM, SANBORN
- MUST SIGNIFICANTLY
- INCREASED HOURS INCREASE, MORE CYCLING

PUTNAM

OLDER UNITS, DIFFERENT TANK TEMPERATURES,
MAJOR REPAIRS/REPLACEMENTS

- BOTTOM OF DISPATCH ORDER

LOADS

PEAK LOAD, WINTER 2010 \approx 25,000 MW

CLIMATE

- HIGHER TEMPERATURE - AGES EQUIPMENT
 - HIGHER AVG TEMP WITH LOAD TO SHORT LIFE
 - BUT CAN DESIGN TO MITIGATE AGAIN -
- CHLORIDE ISSUES
 - AIR & WATER
 - CT INTAKE - SALT AIR
 - HIGHER CORROSION THAN STEAM TURBINE

GTS 2011

MINS

LANDING

PT RUMBLE AX 2

- GE TRAIN NET → BLACK START (3A & B)
- } PART WINDING

FLORIDA POWER AND LIGHT

Meetings June 12-15, 2012 (Richard Clarke notes)

June 13, 2012 Juno Beach/Plumosos Substation

Transmission and Distribution Substations Discussions

Ken Veronee FPL

Tony Biacci FPL

Ned Allis Gannett Fleming

Dick Clarke Gannett Fleming

Toured Plumosos Substation which is a 230Kv, 138Kv and a 23Kv substation, after tour we went to Juno Beach office of Ken Veronee where the following discussions were held.

Reliability Replacement Program....breaker program to replace oil circuit breakers with gas circuit breakers...gas is priority...have installed only gas for transmission substations since 1986...have had to replace some gas breakers.....program based on budget

Other Programs....largest relay program is to replace all solid state with digital....distribution feeder breakers are being replaced...regulators are being replaced

Budget has 80% for reliability and 20% for new construction

Breakers and transformers have a 30-35 year design life...but can last longer as FPL operate at low capacity...new transmission are SF6 gas breakers...new breakers of gas or vacuum may have a longer life than oil...also more diagnostic testing could results in longer life...diagnostics include oil monitoring and monitoring of relays

Increases in transformer removal costs...labor costs increase, environmental costs, stream of ownership (getting the right personnel on site for removal), transformer specialists required, preparation and clean-up costs are increasing, outside contractors often involved, safety requirements, permits, etc.

Primary causes of transformer failure are age, start to generate gas, many faults, replaced before they go to failure.

New transformers don't last as long as old transformers, tolerances by manufacturer less, design and construction not as good as in the past

Transformers have multiple units of property, for instance a surge arrestor is now a unit of property, radiators, units of property, bushings if replace all, one is expensed

There could be some decreasing of life do to removing some of the margin due to increasing capacity, using the older property longer not building new because of budget constraints

FPL is adding 1-2 distribution substations annually do to new areas opening up and some decisions to expand areas where old sub can't take on any additional load.

FPL does have 3-4 indoor substations in the Miami area...life is less for these substations due to heat, dust, difficult to cool

FPL substations have a problem with the climate which has much rain and wind as well as salt spray all causing rusting and earlier than normal replacement of parts

June 14, 2012

St. Lucie Nuclear Station

Jonathan Pearson FPL

Tony Biacci FPL

Ned Allis Gannett Fleming

Dick Clarke Gannett Fleming

Discussion centered on "uprates" that are being performed at St. Lucie over the past couple of years. The current output from this station is about 1700 MW but with the new uprates the company plans on getting another (approximately) 300 MW. The site is on the east coast of Florida and consists of two pressurized water type reactors. The Atlantic Ocean provides the primary source of circulating water. The plant uses ocean water for cooling and does not have cooling towers.

The largest uprates to the nuclear units consist of steam reheaters, steam turbine upgrades and feed pumps; there are significant other pumps, motors, piping, valves, etc.

We were provided a tour of Unit 1 and shown what comprised the uprates for that unit.

June 15, 2012

West County Combined Cycle

Tony Biacci FPL

Ned Allis Gannett Fleming

Dick Clarke Gannett Fleming

A number of West County employees FPL

West County is comprised of three large combined cycle plants with a 3 X1 configuration, that is three 240 MW gas turbines equipped with HRSG's feeding a 423 MW steam generator (517 MW with duct firing). Each unit producing 1237 MW's for a total capacity of 3711 MW's at this station. The cooling water originally came from the Floridan Aquifer but has since been changed to use reclaimed water from Palm Beach County.

A presentation was made describing the plant and how it operates.

A tour was provided for Unit 1 and a walk around of the remaining facility. This facility is quite large and is in fact the largest combined cycle facility in the United States.

June 15, 2012

Transmission and Distribution poles and lines discussion

Brian

Tony Biacci FPL

Ned Allis Gannett Fleming

Dick Clarke Gannett Fleming

POLES

Pole inspection program (PIP) inspects poles so each pole will be inspected every 8 years...the program will lead to improvements in reliability, but an increase in retirements, as poles found to be deficient will be replaced....1.1 million poles, 25% concrete, 75% wood...little steel. Inspection aimed at wood poles. Critical poles are being changed out to concrete poles, 55-60 foot poles set 10 feet deep. Will be replacing as part of inspection program...poles are Class A to Class E depending on diameter and height. Concrete poles in some locations last longer than wood, but do not in others as salt spray can get into cracks and deteriorates them. Current cost to replace a pole is \$4-10 thousand. Concrete poles can cost more to remove than wood poles, as a crane rental is often required due to the weight of the poles. Wood pole replacement is douglas fir wood treated 45 feet on average.

Replacement costs could be high because replacing with concrete instead of wood, concrete is more expensive. Replacement costs are also high

because of rise in permitting costs, additional police (FHP) required for roadblocks and road closures, critical highways have rolling roadblocks, work lasting longer than a day requires underground plating and smooth road surfaces which increases daily costs, time constraints on when work can be completed, location costs vary, and increasing safety costs. Often time's jobs need to be coordinated with other utilities causing timing problems. Environmental laws are increasing causing time delays and price increases such a bird protection, including woodpecker protection. Tortoises and raptors in wet lands areas are protected often causing work to be relocated or extended to other areas.

Removal cost of poles is increasing due to a number of issues including hazardous waste handling, additional vendor handling, special dump yards, creosote poles need special handling.

Reasons for retirement of poles are mostly the pole replacement program, deterioration, capacity, reconductoring and upgrading of lines, underground conversions, relocation of lines and accidents (car or machinery hit pole).

Energy Smart Florida... smart grid....consists of AMI meters, communication network, switches and reclosers change out. This program could cause retirement of poles and replacement of reclosers.

LINES

ACR is standard conductor with 1.0, 3.0, and 5.68... system is 35% underground and 65% overhead....municipality determines if undergrounding is warranted however the standard is overhead, customer would pay the difference. The life of cable for overhead and underground is similar.

Currently underground is 75% in conduit and 25% direct buried, however over time all direct buried will be replaced with conduit. FPL has an initiative to replace direct buried cable, which was installed until the late 1980s. Cable in conduit does not necessarily last any longer than direct buried cable however it is much easier to replace. Other reasons not to use direct buried are the ph level in the soil in Florida, mechanical damage, and

splices are exposed more to moisture. In cities, FPL also has cable in manhole duct systems. Removal costs are higher for cable in the duct systems, due to traffic control, permitting, the need to inject gas, etc.

High cost of replacement of overhead conductor are similar to replacement of poles. Replacement costs are also high because of rise in permitting costs, additional police (FHP) required for roadblocks and road closures, critical highways have rolling roadblocks, time constraints on when work can be completed, location costs vary, and increasing safety costs. Often time's jobs need to be coordinated with other utilities causing timing problems. Environmental laws are increasing causing time delays and price increases. Underground replacement is costly although some lines are easily removed if in conduit, often times requirement include additional manholes, removing at splices locations only, and directional boring to remove conductor. Used conductor is usually scrapped.

Causes of retirement of cable are upgrading, excessive splices, relocations, storm damage, pole damage, salt spray damage.

LINE TRANSFORMERS

Many more overhead transformers than pad mount (maybe 80% to 20%), because there are more overhead transformers per line...similar to substation transformers, there is less tolerance in current designs, so lives may be shorter for newer transformers. Pad mounted transformers rust quicker than overhead and are subject to more customer damage and certainly customer complaints. The average life for overhead transformers has been around 40 years and less for underground.

FPL has modified its standards to use less secondary line, which requires the use of more transformers.

Disposal requires special handling to remove the oil. Some transformers may be reconditioned and reused (will not be retired, as transformers are accounted for on a cradle to grave basis).

Causes of overhead transformer retirements are rust due to salt spray, increased load, customer requirements, failure, load changes, cold fronts. As mentioned causes of pad mounted are customer damage, rusting, customer requirements, increased load and storms.

SERVICES

Overhead services with pole mounted transformers are 75% of system and other 25% is underground with pad mounted transformers. Underground services are all in conduit.

High cost of replacement of overhead services are lines stretched across roads, high residential areas and hard to get at areas, spring effect of conductor causes more required manpower, permitting costs are rising, may of the same reasons as conductor.