APEX Power Services Corporation

Presentation

to

SWANA
Florida Summer Conference 2019

Tampa, Florida
July 29th, 2019
About APEX

- An independent energy consultant and advisor
- Experienced in all phases of electric/renewable energy
- Represent large energy consumers/producers and financial institutions in the Americas and Europe
- Experts in leading-edge energy purchase/supply options and energy derivatives (e.g. swaps, revenue puts, volumetric hedging)
- Knowledgeable in Regional ISO policies/procedures
- Specialize in market analytics and asset valuation, and work closely with creditors/debt traders
- Leaders in identifying “economic” enhancement opportunities
- Providers of expert testimony at state & federal levels

Provides “Complete Energy Solutions”
The Power Industry in Transition

- Generally flat to declining consumption, stable peak demand
- Resource Mix: More Renewables and Distributed Energy Resources (DER)
  - Questions: What does this mean for Fossil Generation?
  - Natural gas consumption?
  - Will fossil generation ever have growth again? If so, what type?
- Historical top-down yielding to DER in many forms
  - EE, DSM, NM, Storage
  - Self Generation, Peak Shaving, Time Shifting, Load Management, Micro grids
  - Internet of Things (IoT)
  - Digitalization and more active consumer price response
    - Does everyone need power all the time? Excess reserve margins?? Power plant reliability better than ever with multiple supply resources
    - Is demand side management really of value? Quantifiable value?
    - Customers have real time access/control of homes, appliances, etc.....When requested, load can reduced....Should the customer base be more engaged via apps? And, be compensated based on current market conditions?
CAISO Pricing ($/MWh) & Curtailments

Wind and solar curtailment totals by month

Source: CAISO
High Reserve Margins

<table>
<thead>
<tr>
<th>Region</th>
<th>Reference Margins</th>
<th>Anticipated Margins</th>
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<tbody>
<tr>
<td>Electric Reliability Council of Texas</td>
<td>8.5%</td>
<td>19.3%</td>
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<td>Midcontinent Independent System Operator</td>
<td>13.8%</td>
<td>24.8%</td>
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<tr>
<td>New York Independent System Operator</td>
<td>16.8%</td>
<td>24.9%</td>
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<td>Florida Reliability Coordinating Council</td>
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<td>SERC Reliability Corporation</td>
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<td>Western Electricity Coordinating Council</td>
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<td>PJM Interconnection</td>
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<td>30.7%</td>
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<tr>
<td>Independent System Operator-New England</td>
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<td>31.8%</td>
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<td>Southwest Power Pool</td>
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Source: Wood Mackenzie Power & Renewables
Current Florida Electric Industry Market Conditions

- Extremely low natural gas prices (appears sustainable near term) & majority of new generation is Renewables & NG
- Majority of future NGCC generation sub 6,300 HR
- Consumption stability (& possible decline) and minimal utility capacity expansion
- Extremely low power pricing
- Stable to slightly increasing demand for green/renewable energy (this does NOT include home/commercial solar)
- Excessive reserve margins (plus 20%)
- What will be the impact on energy and capacity markets?
Basically Flat Energy Pricing

FPL
2018 As-Available Price Duration

High: $211.85/MWh
Avg: $21.71/MWh
Low: $0.00/MWh

Percentage of 8760 Hours

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Growth in Natural Gas Generation

2018 FPL System Dispatch Curve

Henry Hub NG

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<td>2.77</td>
<td>2.91</td>
<td>3.03</td>
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Average As-Available Energy: $21.71/MWh
Growth Still Projected

FPL Net Energy for Load

History

Forecast
Effect of Solar PV Growth - 2019

2019 FPL Dispatch Stack and Summer Daily Load

FPL Conceptual Economic Dispatch MW

- Lauderdale GT
- Manatee ST
- Fort Myers GT
- Martin ST
- Scherer 4 Coal ST
- Sanford CC
- Turkey Point CC
- Fort Myers CC
- West County CC
- Martin CC
- Manatee CC
- Port Everglades CC
- Cape Canaveral CC
- Riviera CC
- Okeechobee CC
- Turkey Point NUC ST
- St Lucie NUC ST
- All Solar PV

Peak Demand 24,305 MW
Firm PV: 617 MW

FPL Daily Summer Load Profile

System Load
Net System Load with Firm Summer PV

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Effect of Solar PV Growth - 2022

2022 FPL Dispatch Stack and Summer Daily Load

FPL Conceptual Economic Dispatch (MW)

Lauderdale GT: 30,599
Fort Myers GT: 29,383
Martin ST: 28,424
Scherer 4 Coal ST: 26,555
Sanford CC: 25,664
Turkey Point CC: 23,286
Fort Myers CC: 22,062
West County CC: 20,340
Martin CC: 16,077
Manatee CC: 13,629
Port Everglades CC: 12,404
Cape Canaveral CC: 11,052
Riviera CC: 9,757
Okeechobee CC: 8,462
Dania Beach CC: 6,684
Turkey Point NUC ST: 5,521
St Lucie NUC ST: 3,884
All Solar PV: 1,724

Peak Demand 24,837 MW
Firm PV: 1,724 MW

FPL Daily Summer Load Profile

System Load
Net System Load with Firm Summer PV

Hour of the Day
Load, MW

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Effect of Solar PV Growth - 2026

2026 FPL Dispatch Stack and Summer Daily Load

FPL Conceptual Economic Dispatch (MW)

- Lauderdale GT: 33,873 MW
- Fort Myers GT: 32,657 MW
- Martin ST: 31,698 MW
- Scherer 4 Coal ST: 29,829 MW
- Sanford CC: 28,938 MW
- Turkey Point CC: 26,560 MW
- Fort Myers CC: 25,336 MW
- West County CC: 23,614 MW
- Martin CC: 19,351 MW
- Manatee CC: 16,903 MW
- Port Everglades CC: 15,678 MW
- Cape Canaveral CC: 14,326 MW
- Riviera CC: 13,031 MW
- Okeechobee CC: 11,736 MW
- Dania Beach CC: 9,958 MW
- Unisted CC: 8,795 MW
- Turkey Point NUC ST: 6,909 MW
- St Lucie NUC ST: 5,272 MW
- All Solar PV: 3,112 MW

Peak Demand 26,380 MW
Firm PV: 3,112 MW

FPL Daily Summer Load Profile

System Load
Net System Load with Firm Summer PV

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How does the addition of utility scale solar affect wholesale energy prices?

- Lowers marginal generator pricing to (lower cost of dispatch) units which have about the same heat rate (+/- 500 Btu/kWh)

- Therefore, on-peak pricing will remain relatively flat for some time

- Off-peak pricing will remain within a few dollars per MWh less than on-peak pricing

- Less incentive to move usage from on to off-peak

- Will this trend help modify consumer behavior?

- Question: How will storage provide savings to FPL rate payers and reduce fossil fuel usage?
FPL’s new Battery Storage Project...

- Location – Manatee Power Plant
- Add 409 MW capacity (900 MWh’s)
- “Charged by an existing co-located solar power plant” ...... “By deploying energy from the batteries when there is higher demand for electricity, FPL will offset the need to run other power plants – thus reducing emissions and saving customers money through avoided fuel costs”
- Alleviate transmission constraints?
- Store low cost off-peak to on-peak? Move mid-peak to later peak?

Hourly Day Ahead prices ($/MWh) by Hour Ending (HE) for July 11, 2019, with summer PV Solar capacity factor.

|       | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
|-------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 0%    | 0%| 0%| 0%| 0%| 0%| 0%| 4%| 26%| 36%| 100%| 100%| 100%| 100%| 100%| 59%| 44%| 12%| 1% | 0% | 0% | 0% | 0% | 0% | 0% |
FPL’s new Battery Storage Project...Economics

- How was this project economically justified?
  - Approximately $500 mm @ 900 MWh’s
  - Fixed O&M @ $8.00/kW-yr or $3.272mm annually
  - Variable O&M @ $2.00/MWh

- Case A – Summer Use
  - If exercised @ 80% capacity / 60 occurrences / @ $3.50/MWh delta
  - $64,800 annual operating savings
  - Operating savings do not cover FOM and capex debt service

- Case B – Year-round Use
  - If exercised @ 80% capacity / 320 occurrences / @ $2.00/MWh delta
  - $0 annual operating savings
  - Operating savings do not cover FOM and capex debt service
Can electric vehicles save the day…. Example – Florida

- In 2017 => 599.5 million avg. vehicle travel miles /day
- EV Mileage ~ 4.0 miles/kWh (Hyundai @ 4.6)
- At 1% EV penetration => 1,499 MWh/day
- At 80% CF => 78 MW generating capacity
- 2017 FL summer generating capacity = 54.7 GW
- Thus, 1% EV penetration => 0.14% state gen capacity
- EVs **will not impact** capacity additions anytime soon!
- Many new EV’s are charged via on-site solar generation thereby decreasing fossil fuel usage and the need for grid power.
Market Forecast/Opportunities - Short & Long Term

- **Short Term:**
  - Lower energy pricing with minimal volatility
  - Potential opportunities to contract for slightly higher pricing with smaller electric utilities (make-or-buy decision/higher portfolio heat rates)
  - Excess capacity & high reserve margins - Pricing may get worse near term...
  - Minimal options available for short term PPA’s (FL awash in low cost generation)

- **Long Term:**
  - Spread between on/off peak pricing will continue to decrease
    - Are on/off peak hours still important? Will definitions need to change?
    - Should we change how power is metered and sold?
      - Are traditional pricing models still relevant?
      - Will BTM storage flatten utility dispatch and decease overall revenues?
      - Credit for voluntary load reduction still necessary?
      - Move to fixed pricing per month up to specified maximum? Flat rate pricing..
      - Start incentivizing kWh usage and growth? Why high cost charging stations for EV’s?
  - Excess capacity remains…..But for how long? Will new capacity be required and what type of generation? (quick start IC Engines? DR?)
  - All historic and economic indicators point to potentially incrementally lower long term energy pricing
  - Self-wheeling may be the best option for municipal WTE owned facilities to offset increasing retail costs and decreasing wholesale power pricing. - Nothing to lose....
  - Always offset retail electric usage. The spread between retail & wholesale prices will continue to expand....
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Complete Energy Solutions