

APEX Power Services Corporation

Presentation

to

SWANA

Florida Summer Conference 2019

Tampa, Florida

July 29th, 2019

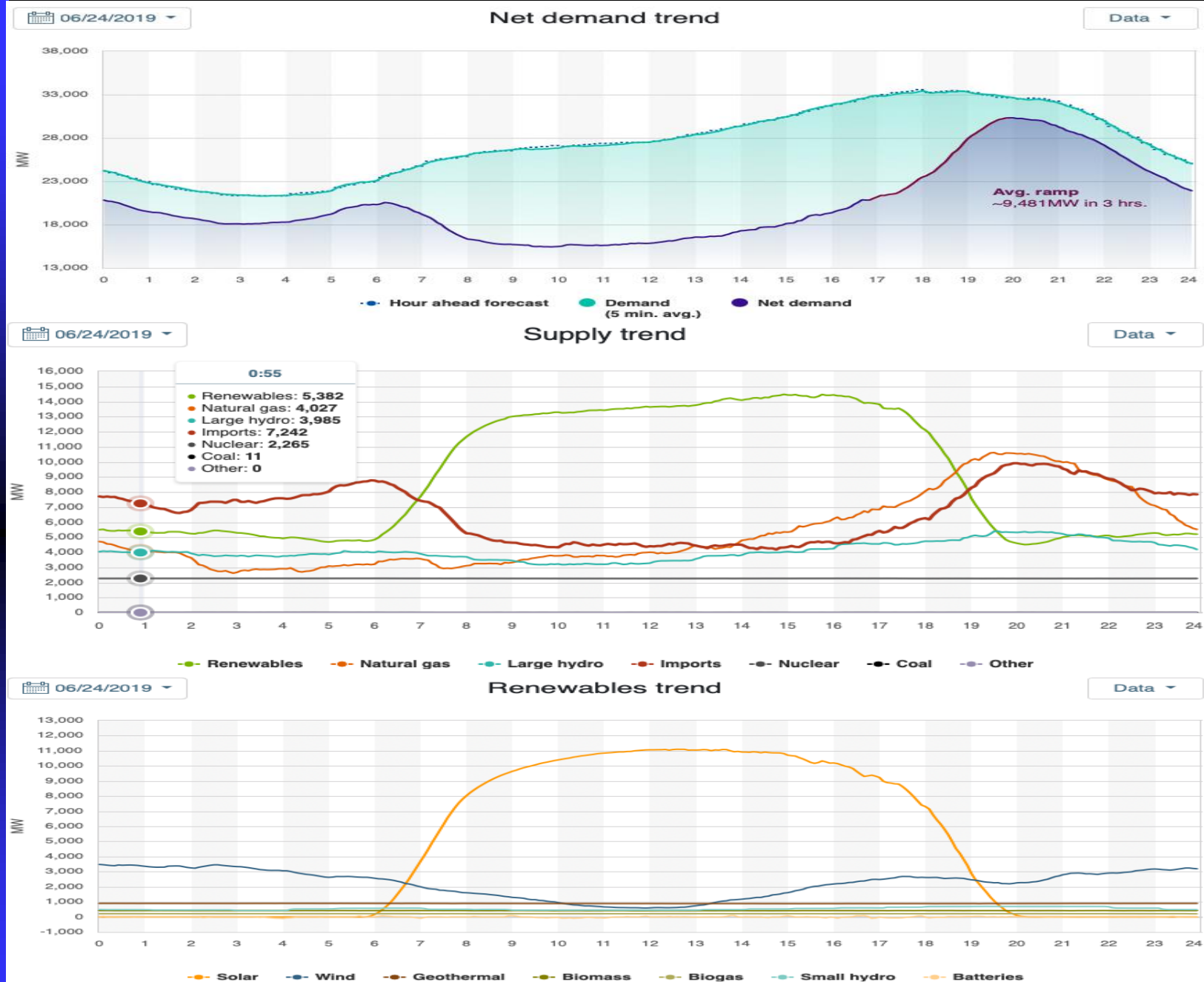
About APEX

- 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

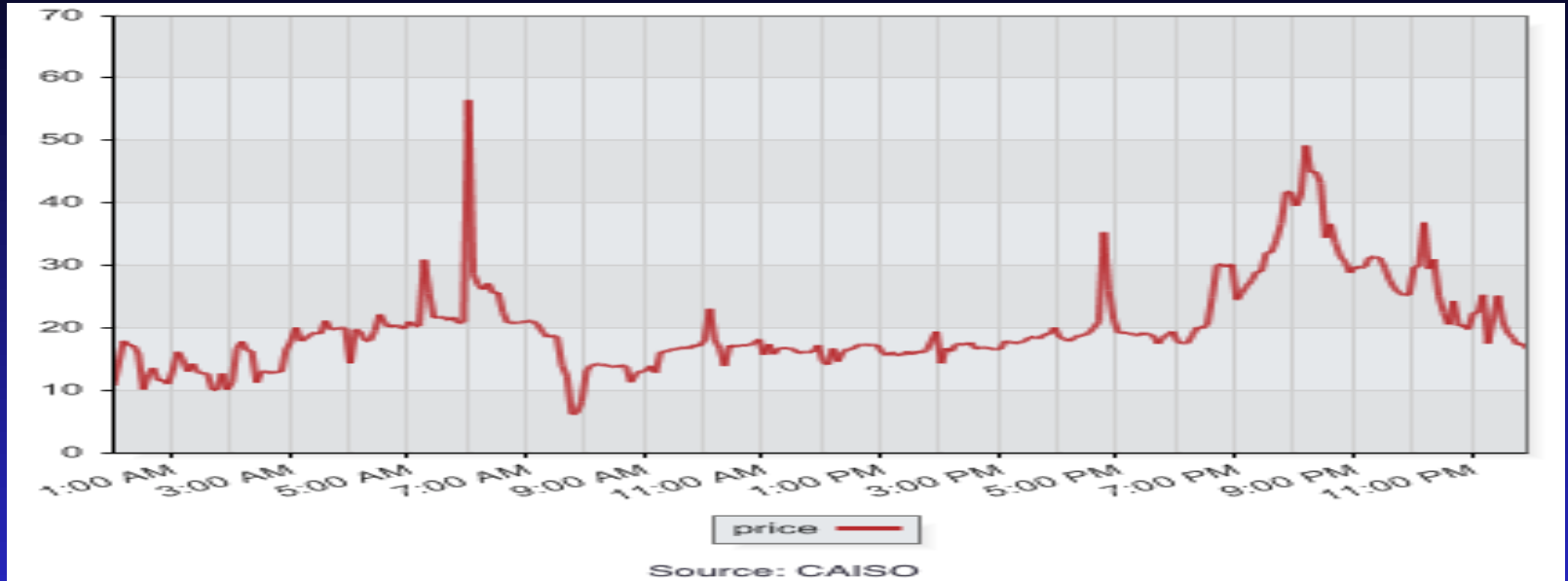
Provides “*Complete Energy Solutions*”

The Power Industry in Transition

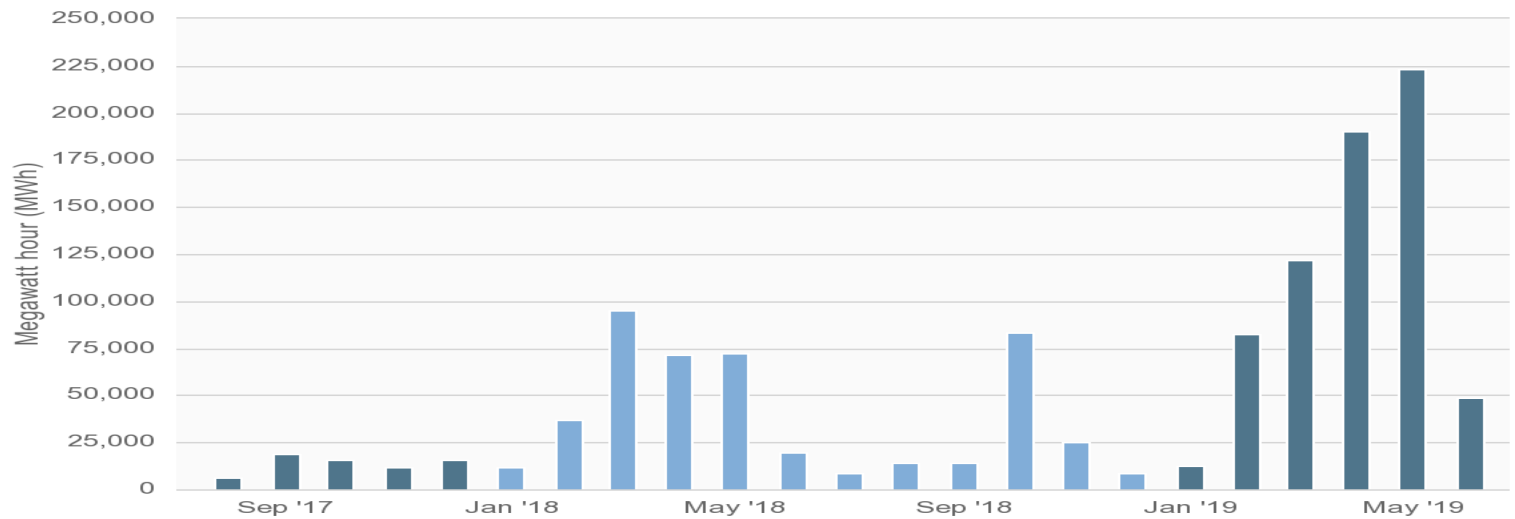
- Generally flat to declining consumption, stable peak demand
- Resource Mix: More Renewables and Distributed Energy Resources (DER)
 - ◆ Questions: What does this mean for Fossil Generation?
 - ◆ Natural gas consumption?
 - ◆ Will fossil generation ever have growth again? If so, what type?
- Historical 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

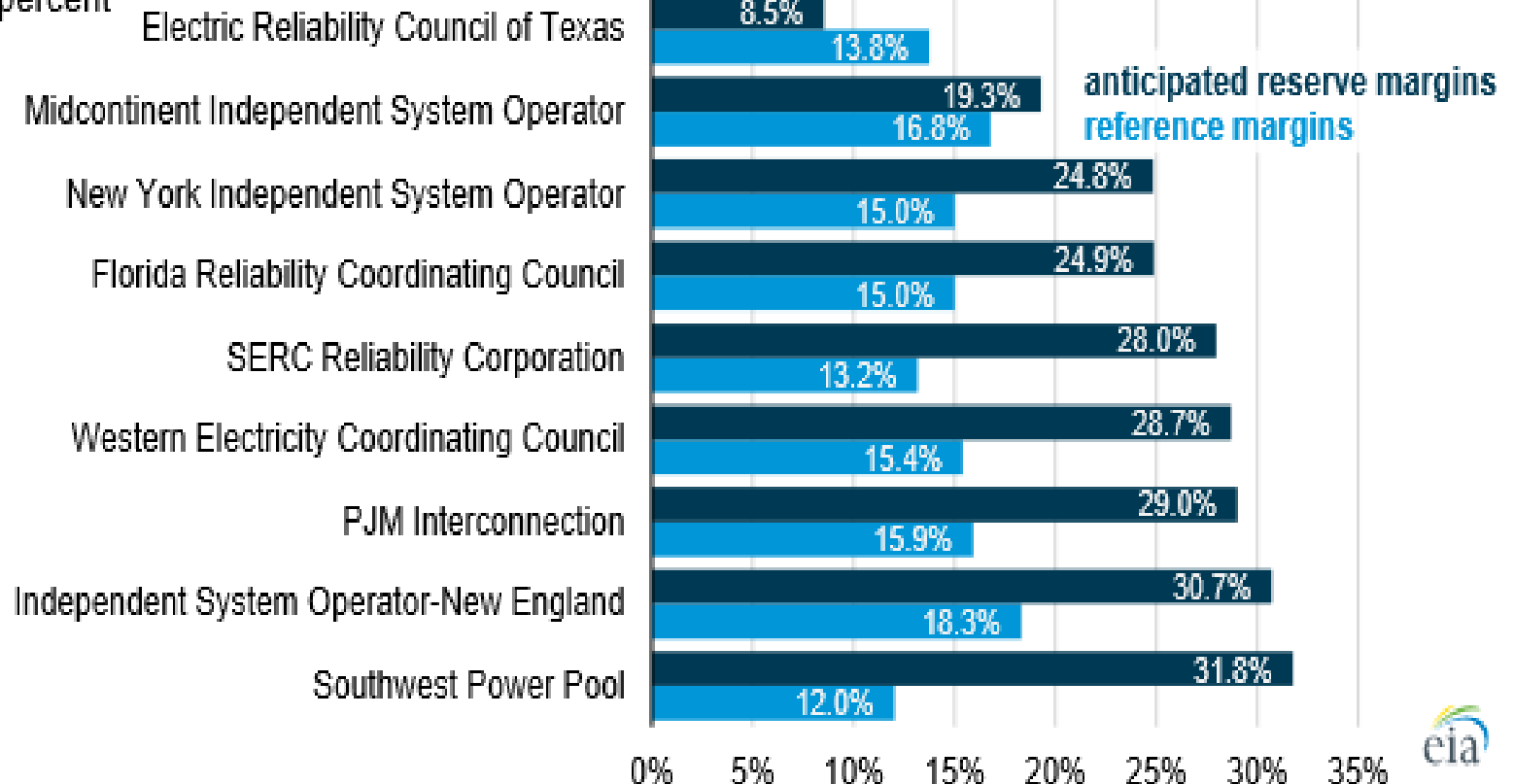


Wind and solar curtailment totals by month



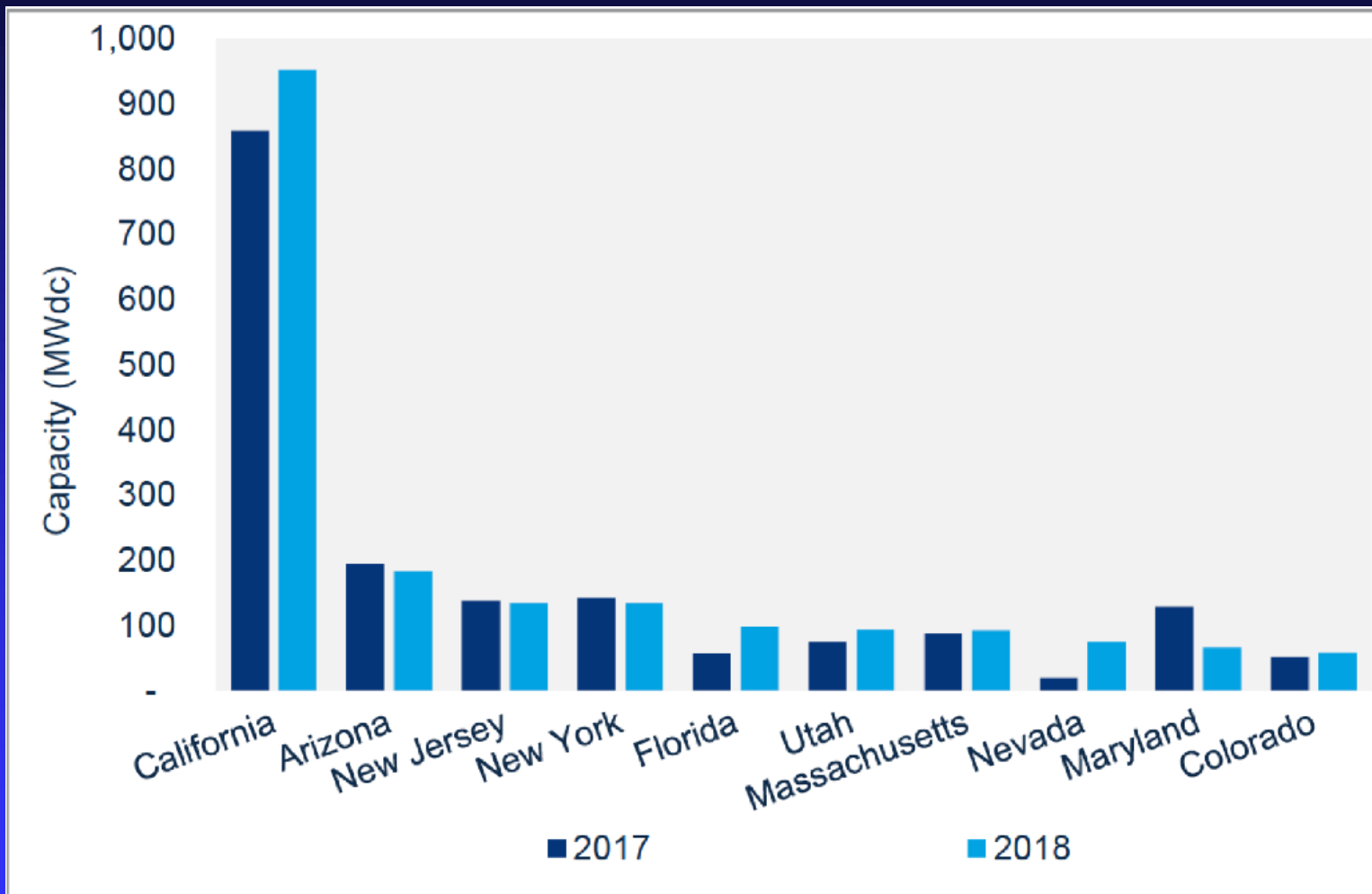
High Reserve Margins

Summer 2019 reference margins and anticipated reserve margins in select NERC regions percent



Source: U.S. Energy Information Administration, based on North American Electric Reliability Corporation (NERC) [2019 Summer Reliability Assessment](#)

Solar Growth (GWh)



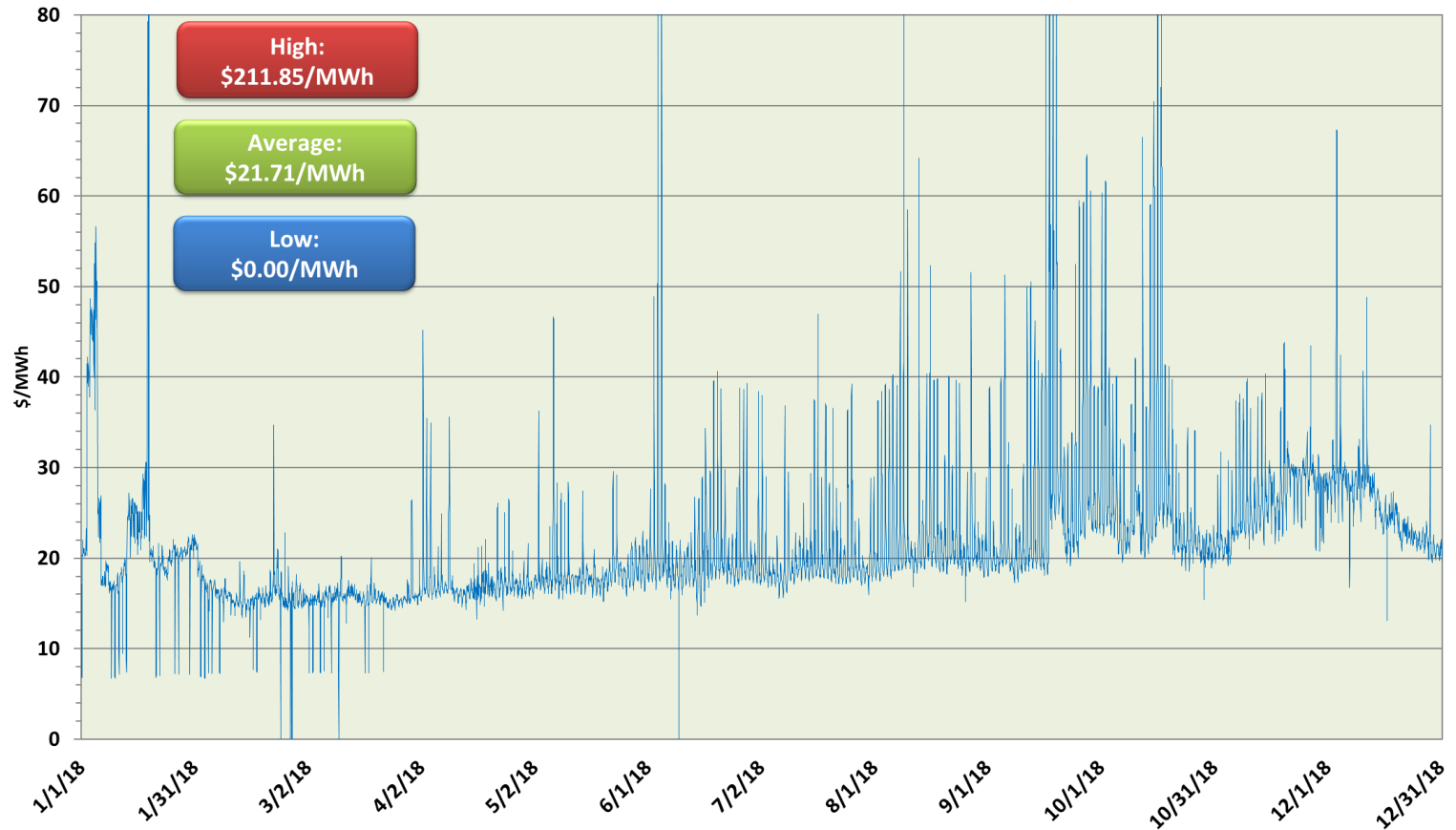
Source: Wood Mackenzie Power & Renewables

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?

Energy Price Environment

FPL Hourly As-Available Price
2018

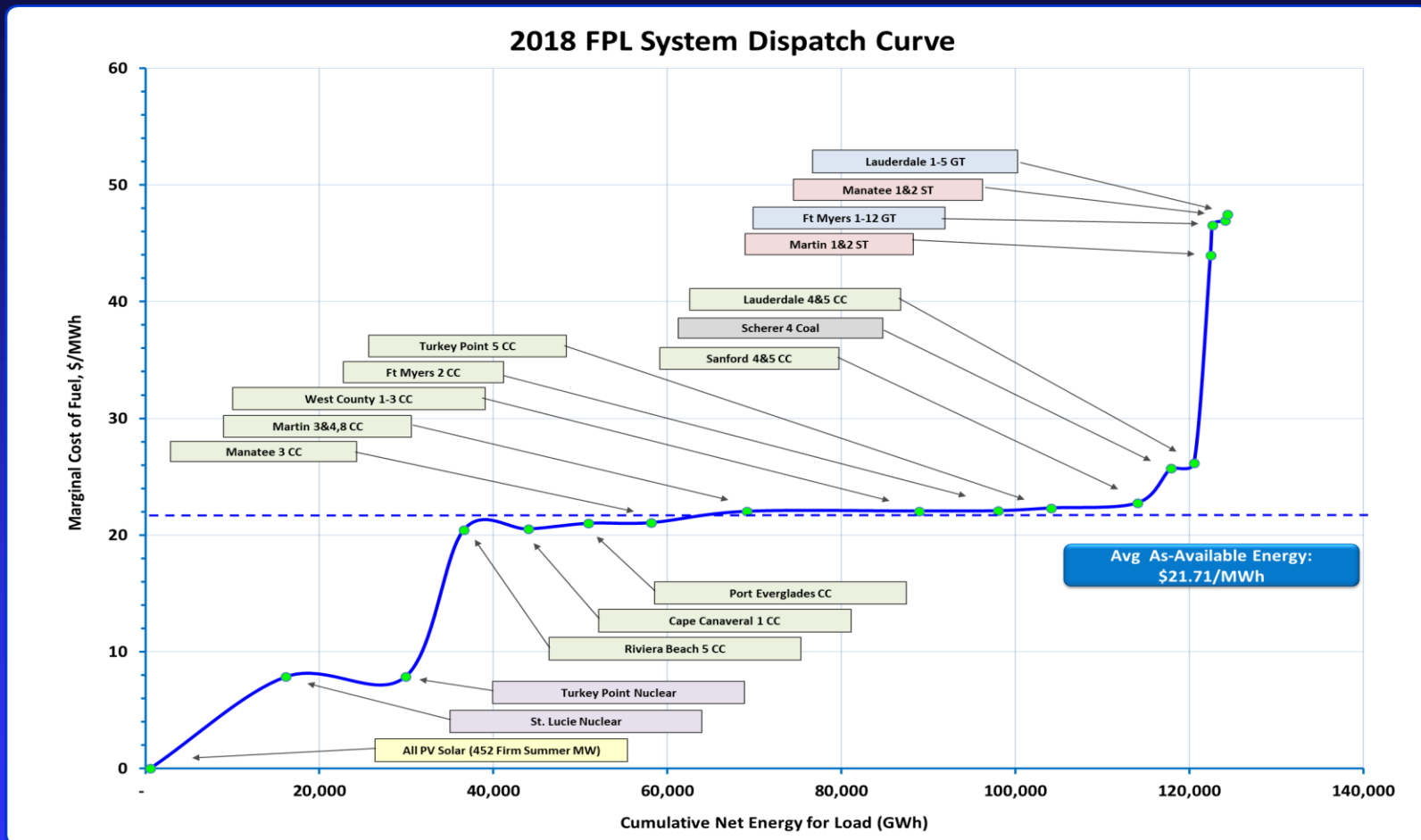


Henry Hub NG										History and Futures as of 7/12/2019									
2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
3.99	4.39	4.04	2.79	3.65	4.41	2.66	2.46	3.11	3.09	2.69	2.60	2.60	2.62	2.68	2.77	2.91	3.03	3.18	3.30

Basically Flat Energy Pricing

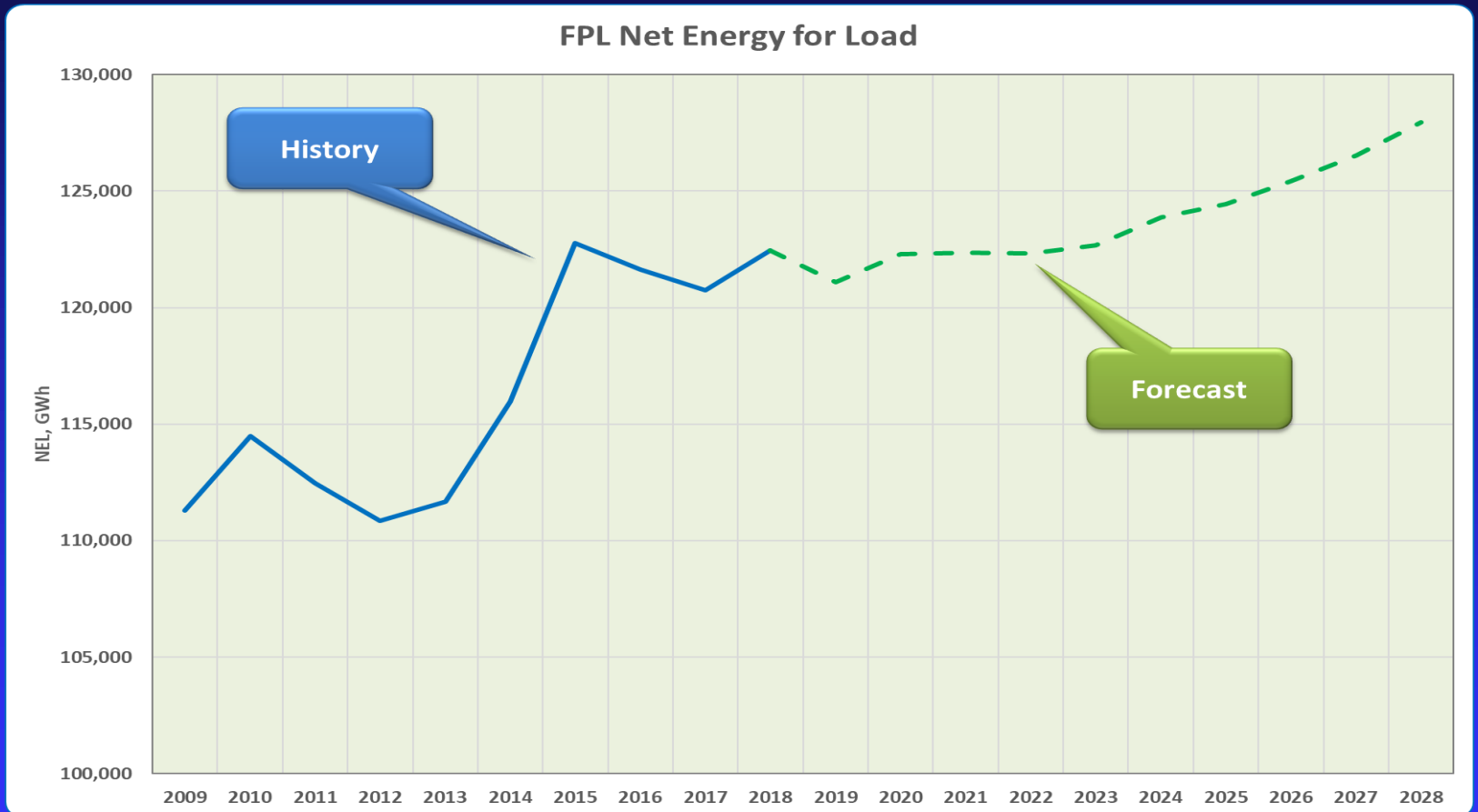


Growth in Natural Gas Generation



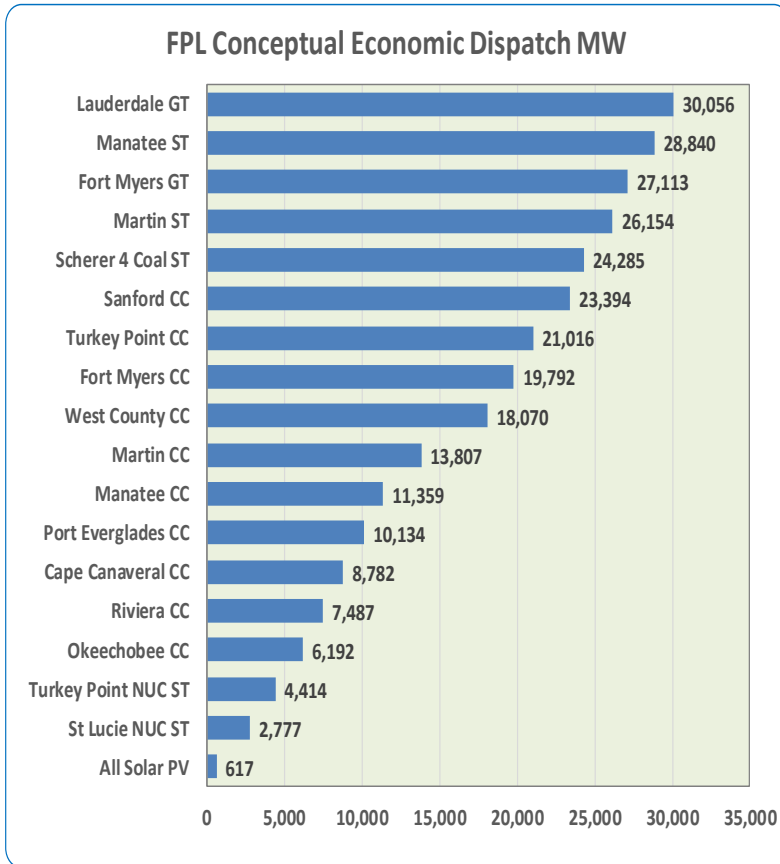
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Growth Still Projected



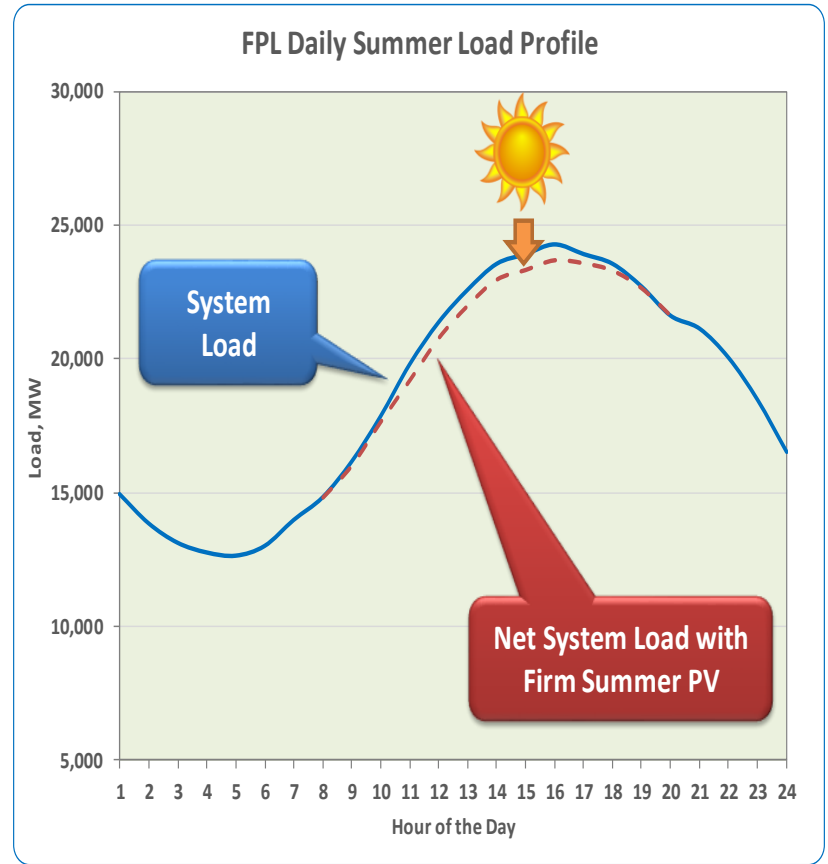
Effect of Solar PV Growth - 2019

2019 FPL Dispatch Stack and Summer Daily Load



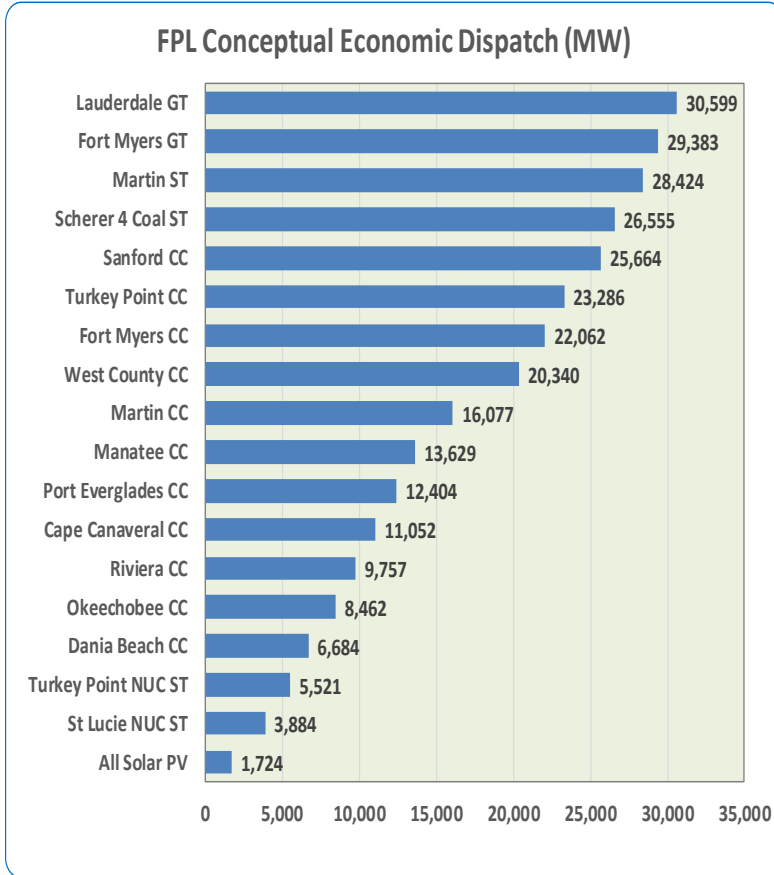
Peak Demand 24,305 MW

Firm PV: 617 MW



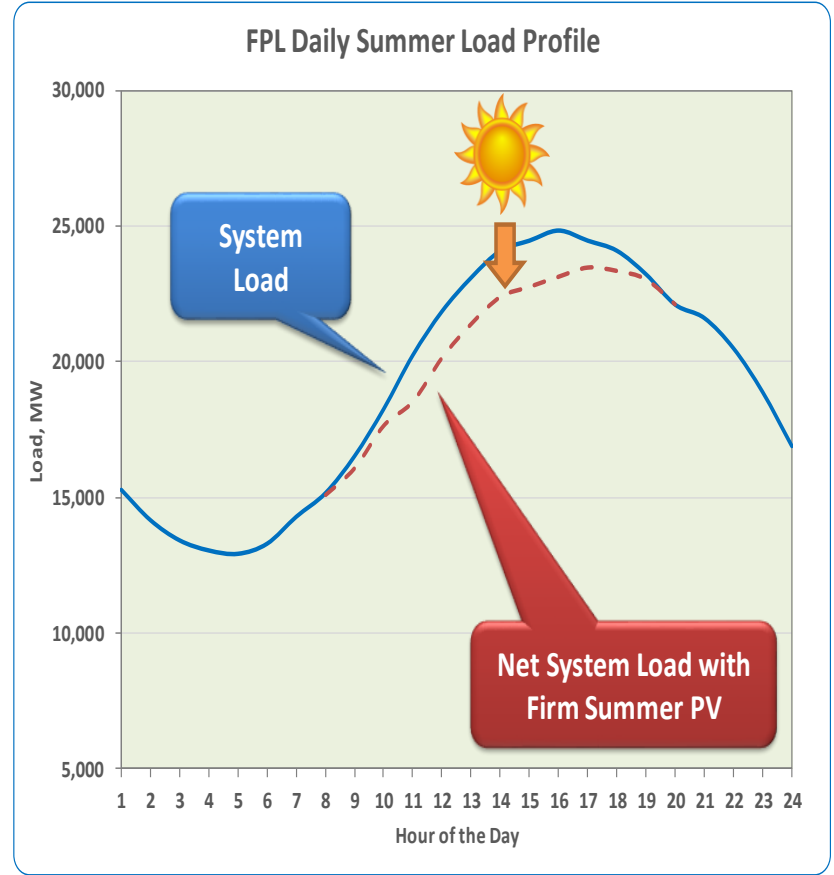
Effect of Solar PV Growth - 2022

2022 FPL Dispatch Stack and Summer Daily Load



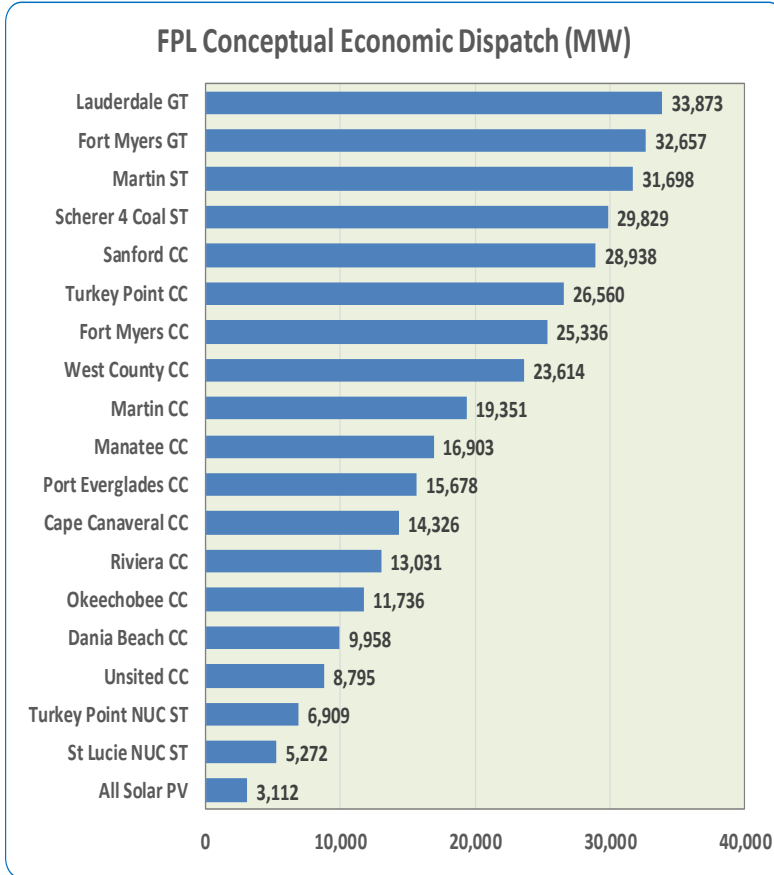
Peak Demand 24,837 MW

Firm PV: 1,724 MW



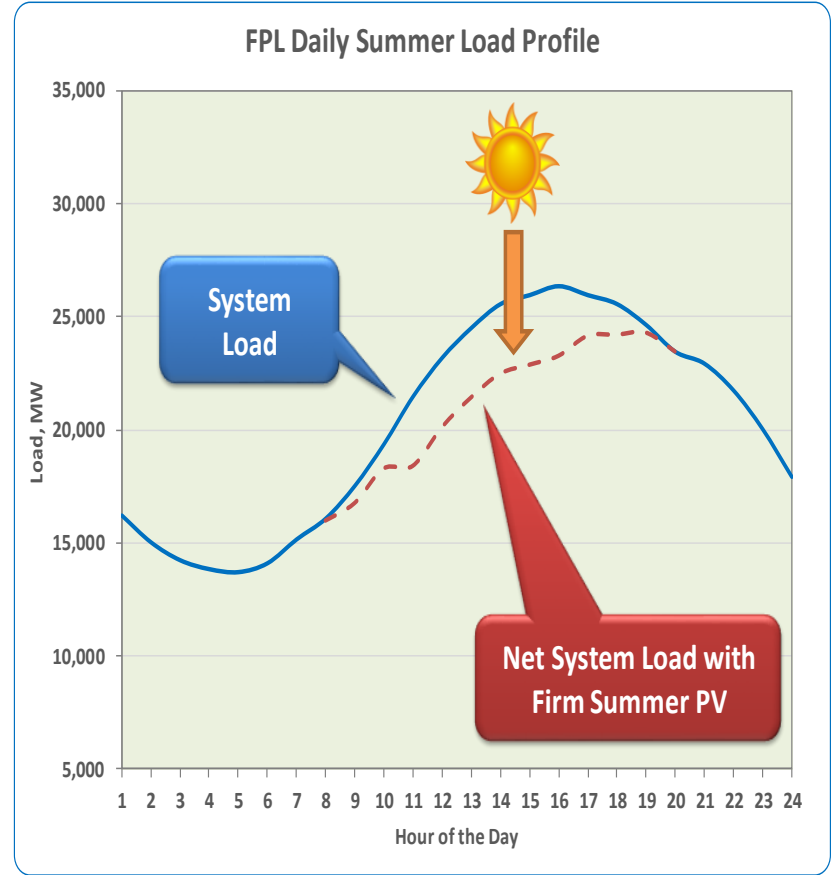
Effect of Solar PV Growth - 2026

2026 FPL Dispatch Stack and Summer Daily Load



Peak Demand 26,380 MW

Firm PV: 3,112 MW



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%	100%	59%	44%	12%	1%	0%	0%	0%	0%
12.69	12.47	12.23	12.10	12.06	12.13	12.16	12.02	12.28	12.85	14.29	16.81	17.64	20.53	15.59	15.61	15.44	18.82	19.02	14.97	14.98	15.66	15.00	15.33

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

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%	100%	59%	44%	12%	1%	0%	0%	0%	0%
12.69	12.47	12.23	12.10	12.06	12.13	12.16	12.02	12.28	12.85	14.29	16.81	17.64	20.53	15.59	15.61	15.44	18.82	19.02	14.97	14.98	15.66	15.00	15.33

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

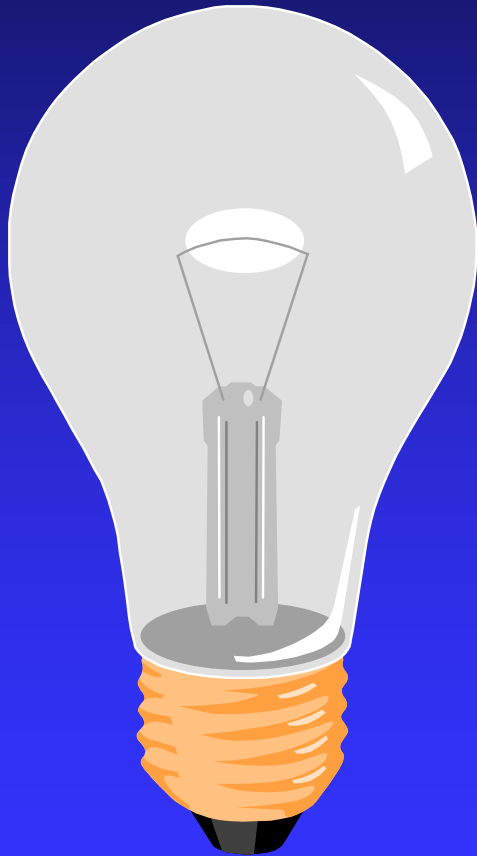
■ Short Term:

- 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 decrease 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