Item #200693

2019 Integrated Resource Plan Discussion

June 9, 2022

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Today's Discussion

- What's an IRP?
- Overview of 2019 IRP
- Changes with GRU's upcoming IRP

What's an IRP?

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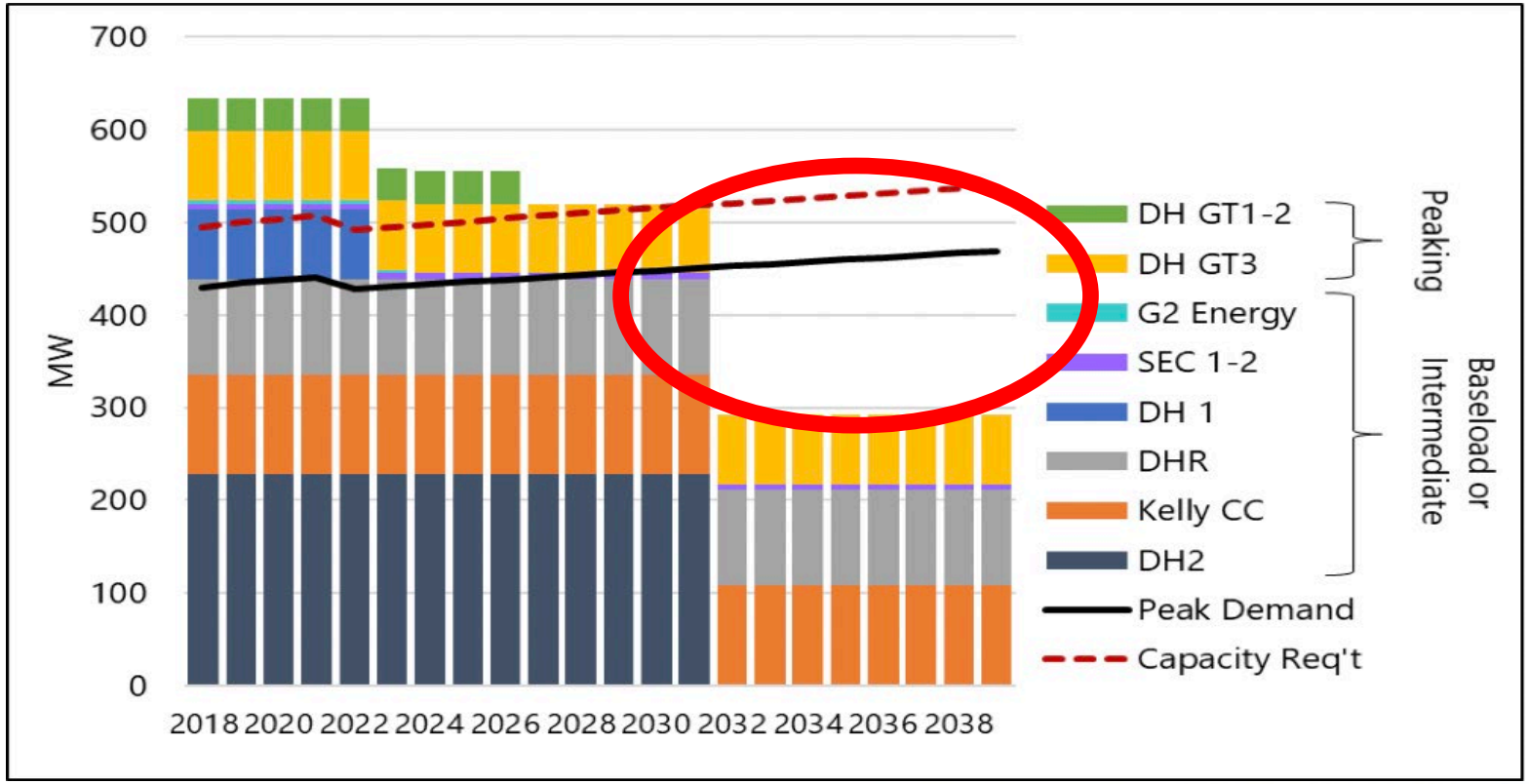
What's an IRP? A tool to help you decide how to meet energy load with energy resources



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Integrated Resource Plan (IRP)

What's an IRP?

A comprehensive planning study which provides a recommended mix of resources a utility may use to meet its customers' future electricity needs.

- Identifies the long-term, strategic needs of the utility
- Utilizes least-cost planning principles and estimates the magnitude of future power supply costs and decisions
- Helps identify risks (fuel diversity/availability, technology, financial, etc.)
- Aids in identifying generation options that perform well over a range of economic, environmental, and regulatory scenarios

What’s Not an IRP? GRU’s Ten Year Site Plan (TYSP)

What's a Ten-Year Site Plan?

Planning tool for the Florida Public Service Commission which follows a standard format

- Annual requirement for all electric utilities with more than 250 MW of generation or utilities planning to build a unit larger than 75 MW within 10 years
- Gives state, regional, and local agencies advance notice of proposed power plants and transmission facilities
- Gives an estimate of how utilities may meet its customers' electrical demands over the next 10 years
- Includes tentative data and is not a binding plan of action on electric utilities
- **Primary purpose is to assure utilities have adequate generation capacity**

What's in a Ten-Year Site Plan (TYSP)?

Four Sections of all TYSPs

- Description of Existing Facilities
- Forecast of Electric Energy and Demand Requirements
- Forecast of Facilities Requirements (generation additions and retirements)
- Environmental Land Use Information (if adding new generation)

All generation and transmission plans are based on **existing** or **approved** options

- No options from the current IRP are included
- Only includes options that have been approved or in active development

http://www.gru.com/AboutGRU/Content/FuturePowerNeedsFAQs.aspx

An IRP is Strategic

- Identifies the long-term, strategic needs of the electrical generation of the utility within the parameters set for the IRP
- Utilities must take a long-term approach to meeting customers' needs
  - Utilities are capital-intensive
  - Infrastructure planning, permitting, and construction are multi-year
- Taking a short-term approach may ultimately lead to higher costs long-term

An IRP Evaluates Long-term Costs

- Specialized software solves for the lowest life-cycle cost (capital cost, fuel costs, and operating costs) within a set of constraints
- The lowest cost option is considered the “reference case”
  - Other options provided are compared to the reference case
- The total life-cycle costs paid by GRU’s customers are a key component that cannot be overlooked

IRPs Makes Comparisons Easier

Multiple scenarios allow comparison across changing criteria:

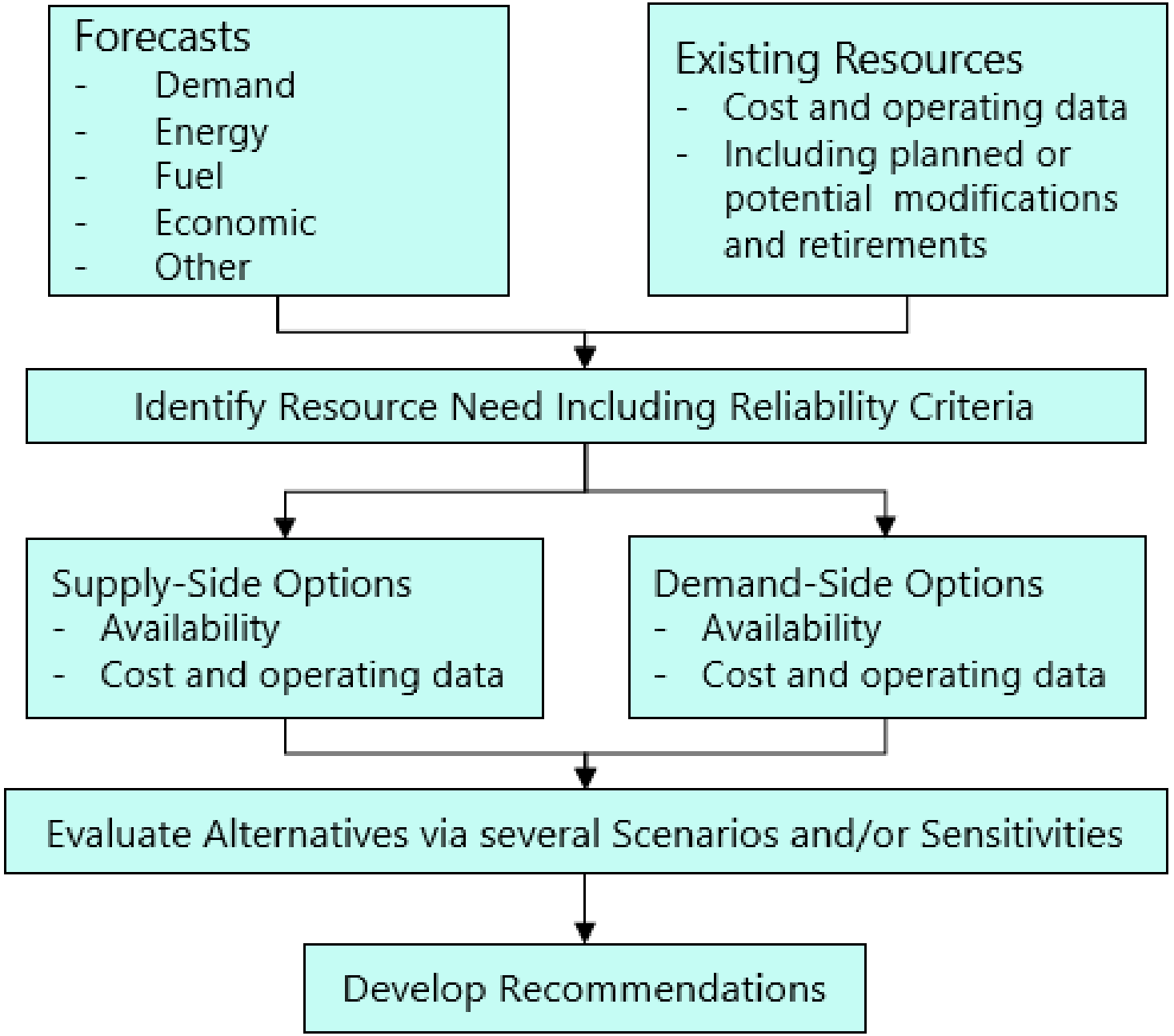
Economic Drivers
- Changing fuel prices (higher or lower)
- Access to a power market
- Load changes (higher or lower)

Environmental Drivers
- Emissions limits
- Renewable energy requirements

Regulatory Drivers
- NERC Reliability

Technological Drivers
- Availability of technology

Methodology



Overview of 2019 IRP

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Evolving IRP Parameters for 2019 IRP

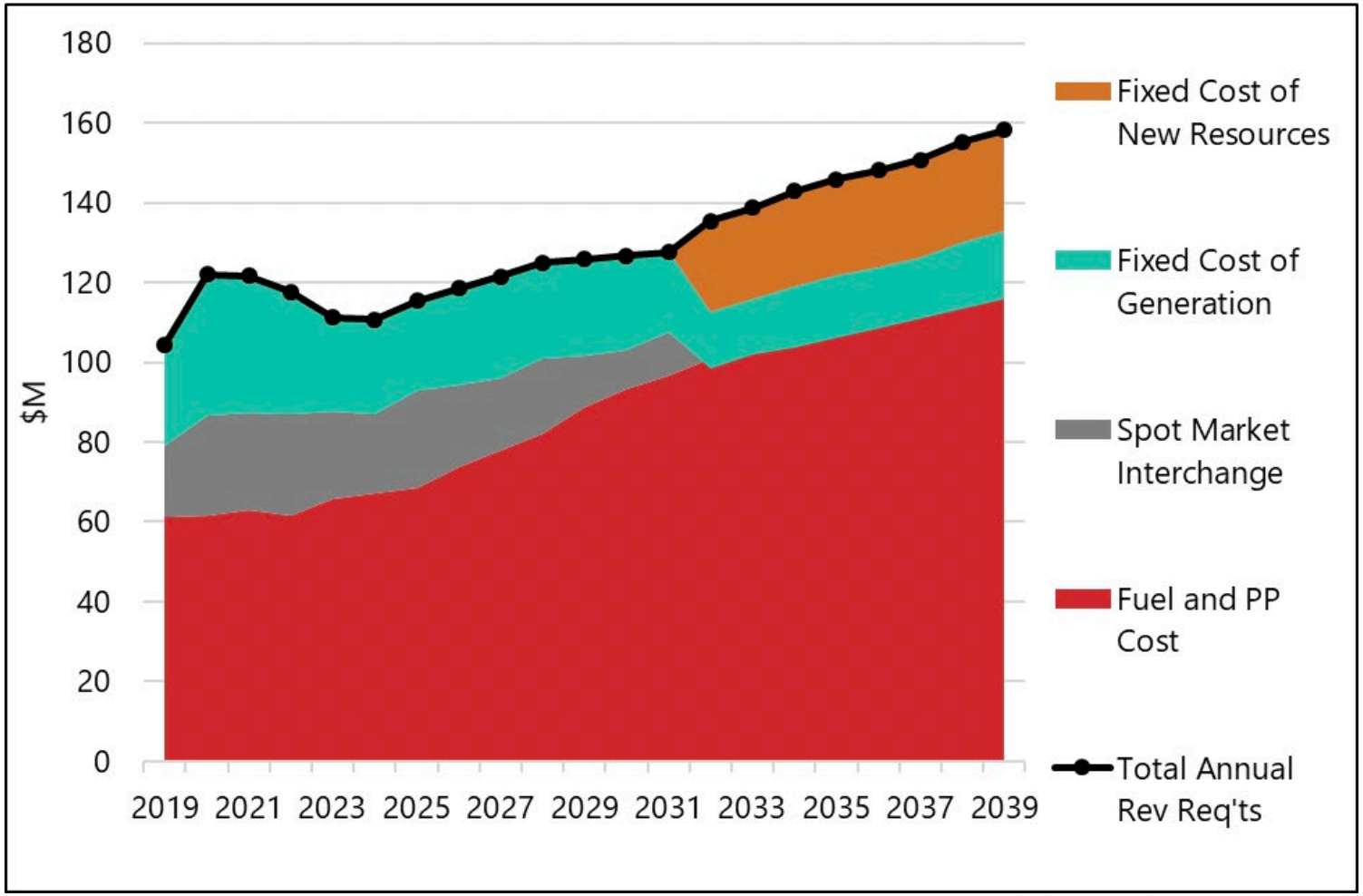
- IRP kicked off in February 2018
- Scope grew and changed over 18 months
  - 2045 Net Zero Emissions resolution – October 2018
  - Area Control Error (ACE) Study – February 2019
  - Kelly Steam Turbine 8 upgrade
  - GRU Solar ITN
  - Resulted in many more scenarios than originally planned
- Report includes scenarios that do and do not meet the 2045 net zero resolution

Reference Case Results

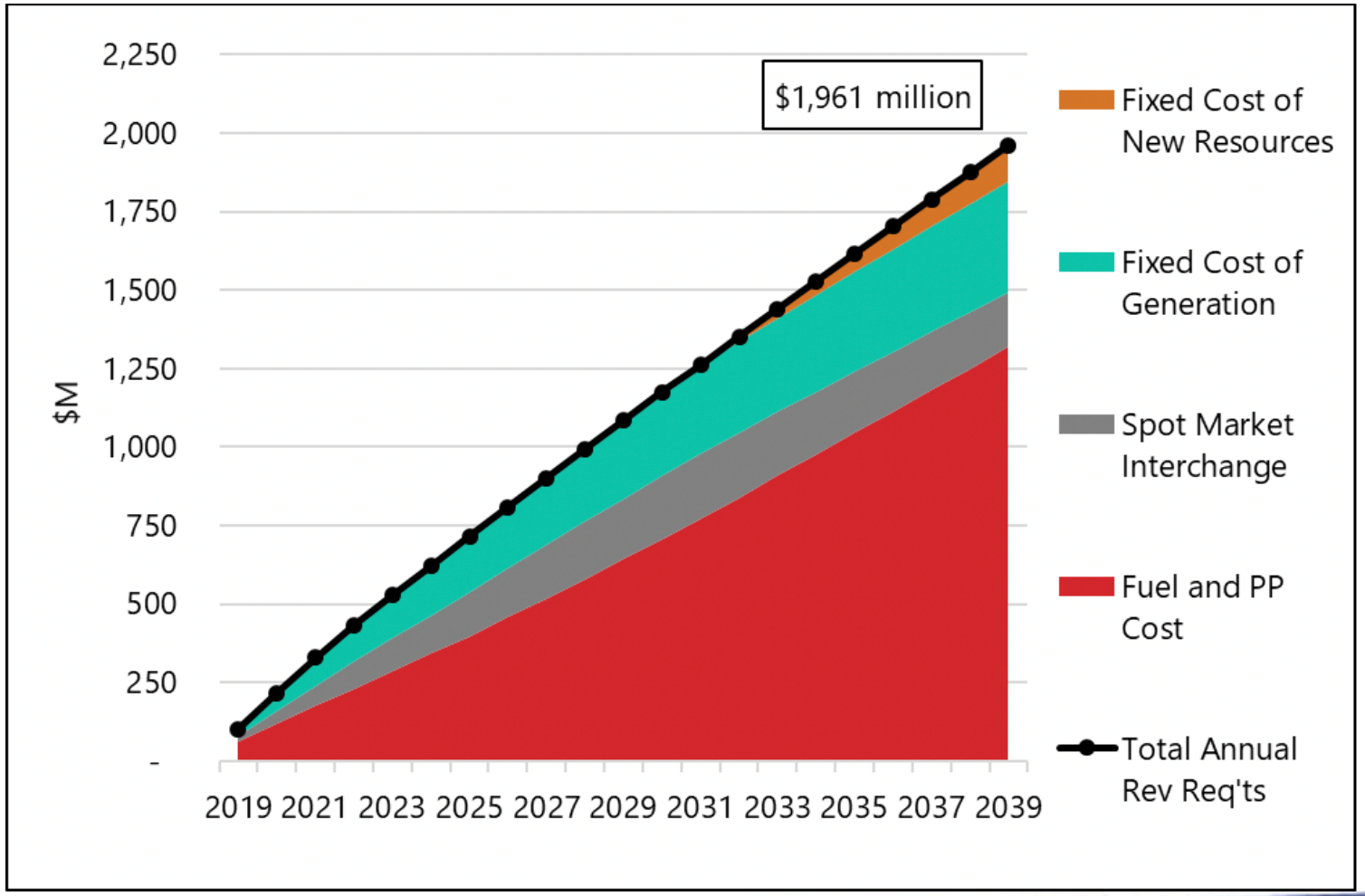
Year	Generation Source	Additional MW
2021	New solar PPA	80 MW (28 MW add'l capacity)*
2031	NG-fired 3x1 Combine Cycle	198 MW
2032	Reciprocating Internal Combustion Engine (RICE)	27 MW
2034	Reciprocating Internal Combustion Engine (RICE)	9 MW
2038	Battery Storage	5 MW

*Solar PPA capacity for summer reserve margin criteria is 35% of nameplate capacity; 9% for winter capacity

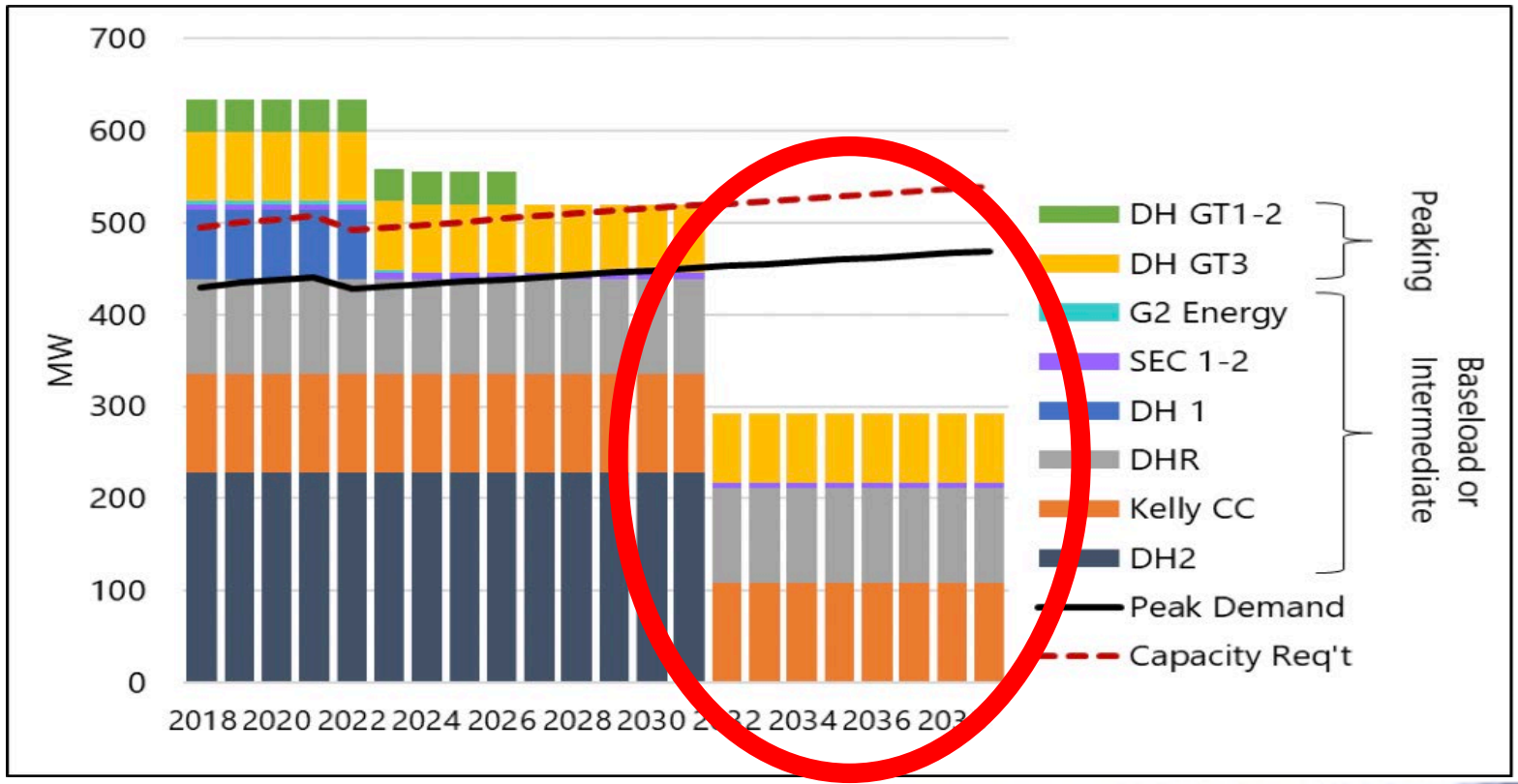
Reference Case Annual Revenue Requirements



Reference Case Cumulative Net Present Value



The Reference Case Is Only the Beginning



Alternate Scenarios

- Scenarios vary constraints and/or inputs to show the value or cost relative to the reference case
- Scenarios can also help identify or build future/additional scenarios to study

Alternate Scenarios

<u>Grouped into the following categories:</u>

- Sensitivity and Expanded Analysis
  - Gas Price Sensitivities
- System Scenarios
  - Changes to reference case electric system
- Load Scenarios
  - Evaluates impacts of load to reference case
- Area Control Error (ACE) Scenarios
  - Impacts to rapid response capacity due to solar
- Renewable Scenarios
  - Impacts resulting from Greenhouse Gas (GHG) goals and 2045 resolution

System Scenarios

- Ease Transmission Constraint
  - Import limit adjusted from 120 MW to 200 MW
- Allow Early Retirements of Any Existing Unit
- Allow Early Retirements of Any Existing Unit except DHR

Load Scenarios

Low Load

- Assumed loss of all City of Alachua load after current contract ends 2/28/22

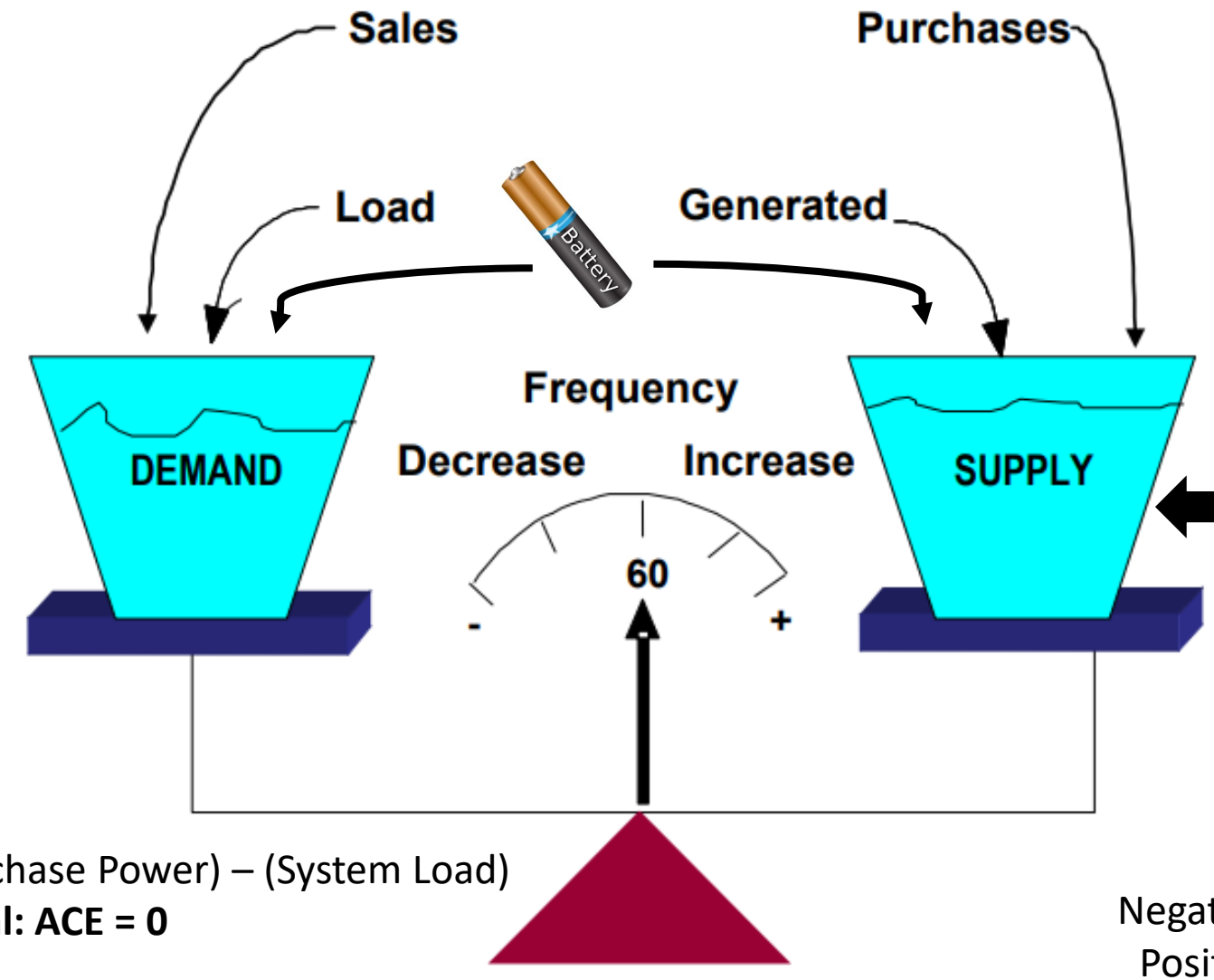
High Load

- Addition of 30 MW of load

Winter Peaking

- Simulated winter peaking load
- Winter peak equal to summer forecasted peak

ACE: System Balance



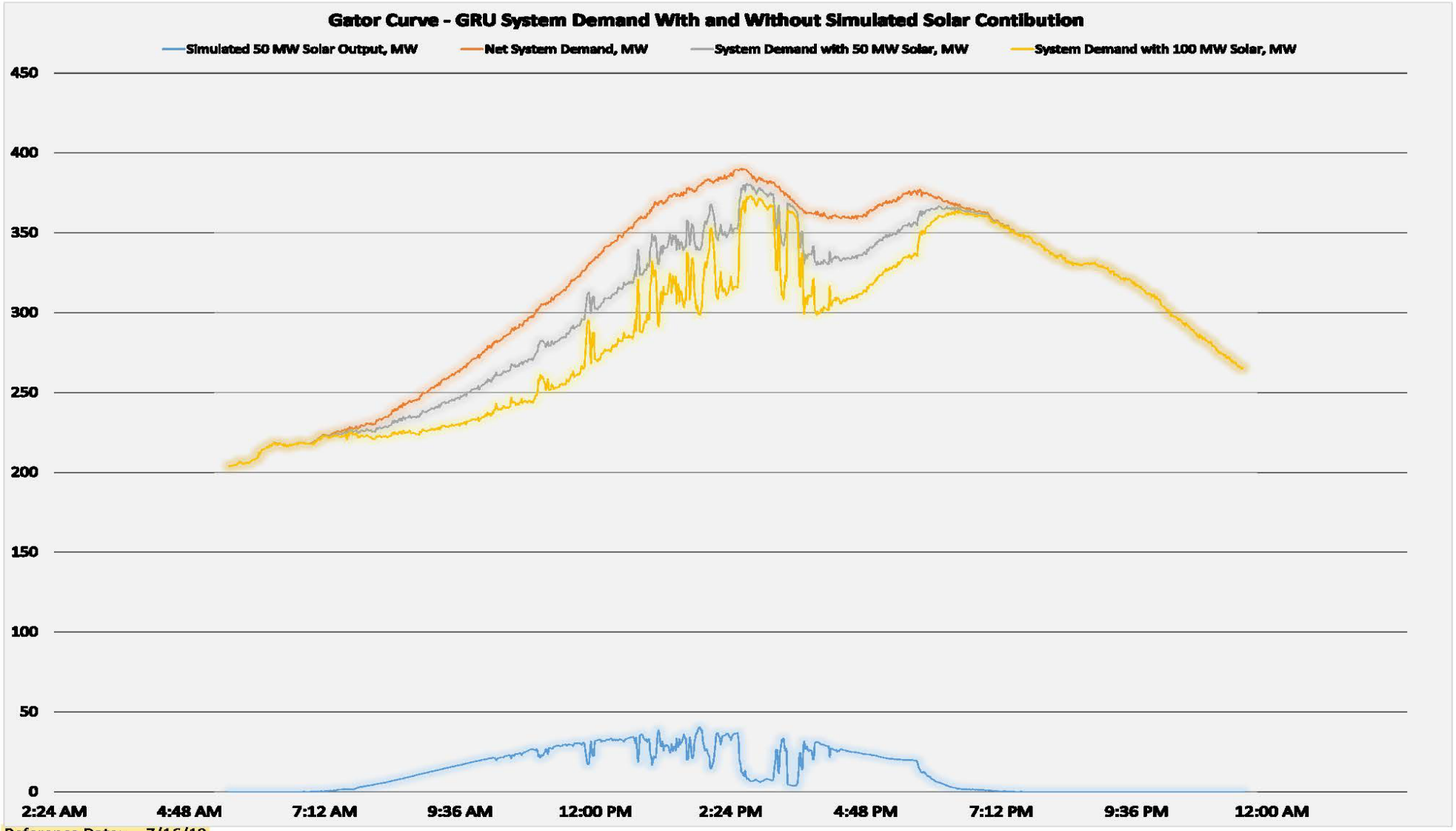
ACE = (Generation/Purchase Power) – (System Load)

Goal: ACE = 0

Negative ACE = Under-generating

Positive ACE = Over-generating

ACE: Solar Impact

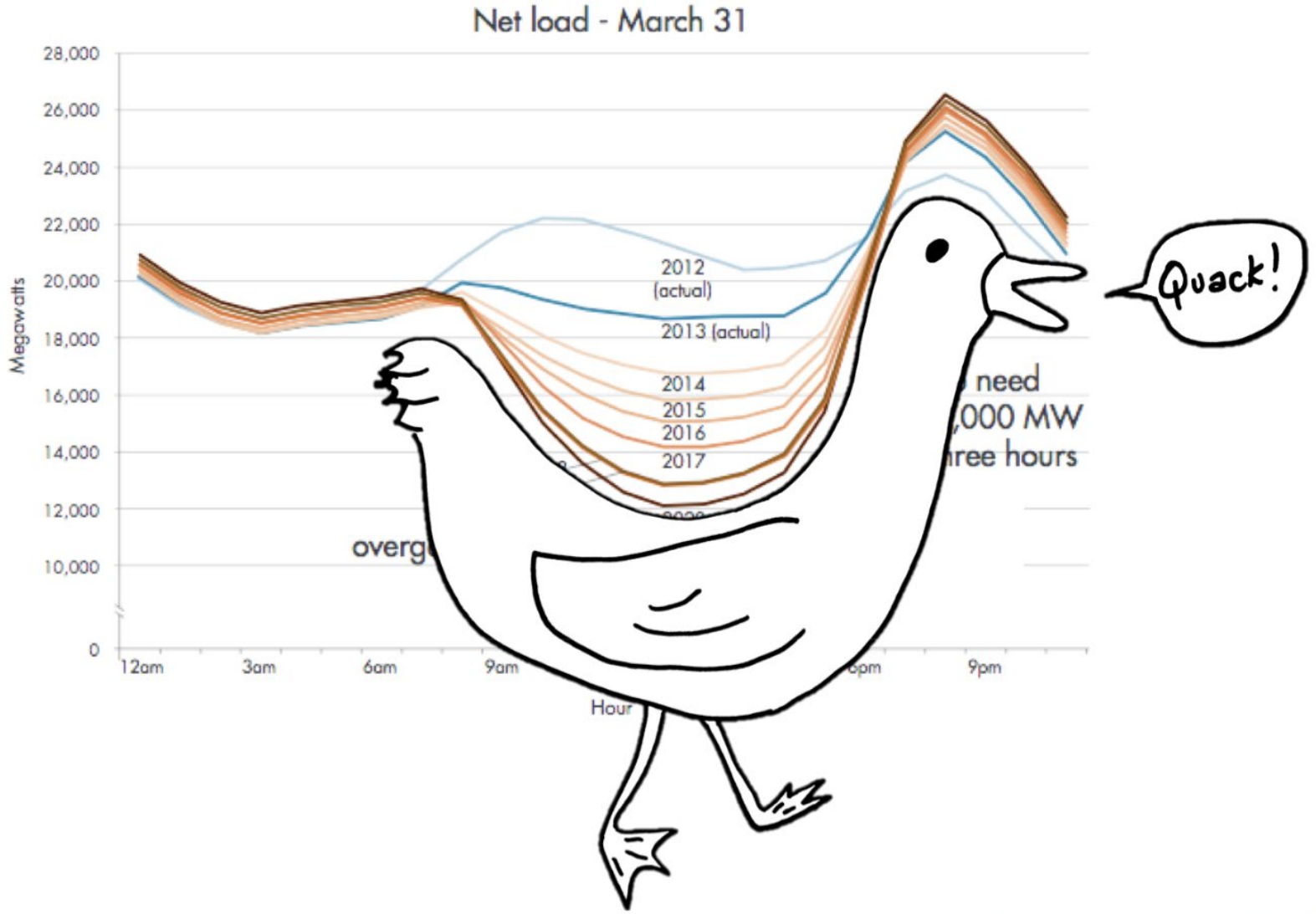


Reference Date: 7/16/19

Source: Solar Data - Idylwild solar field output scaled to 50 and 100 MW respectively for date above with no ramp rate limits.

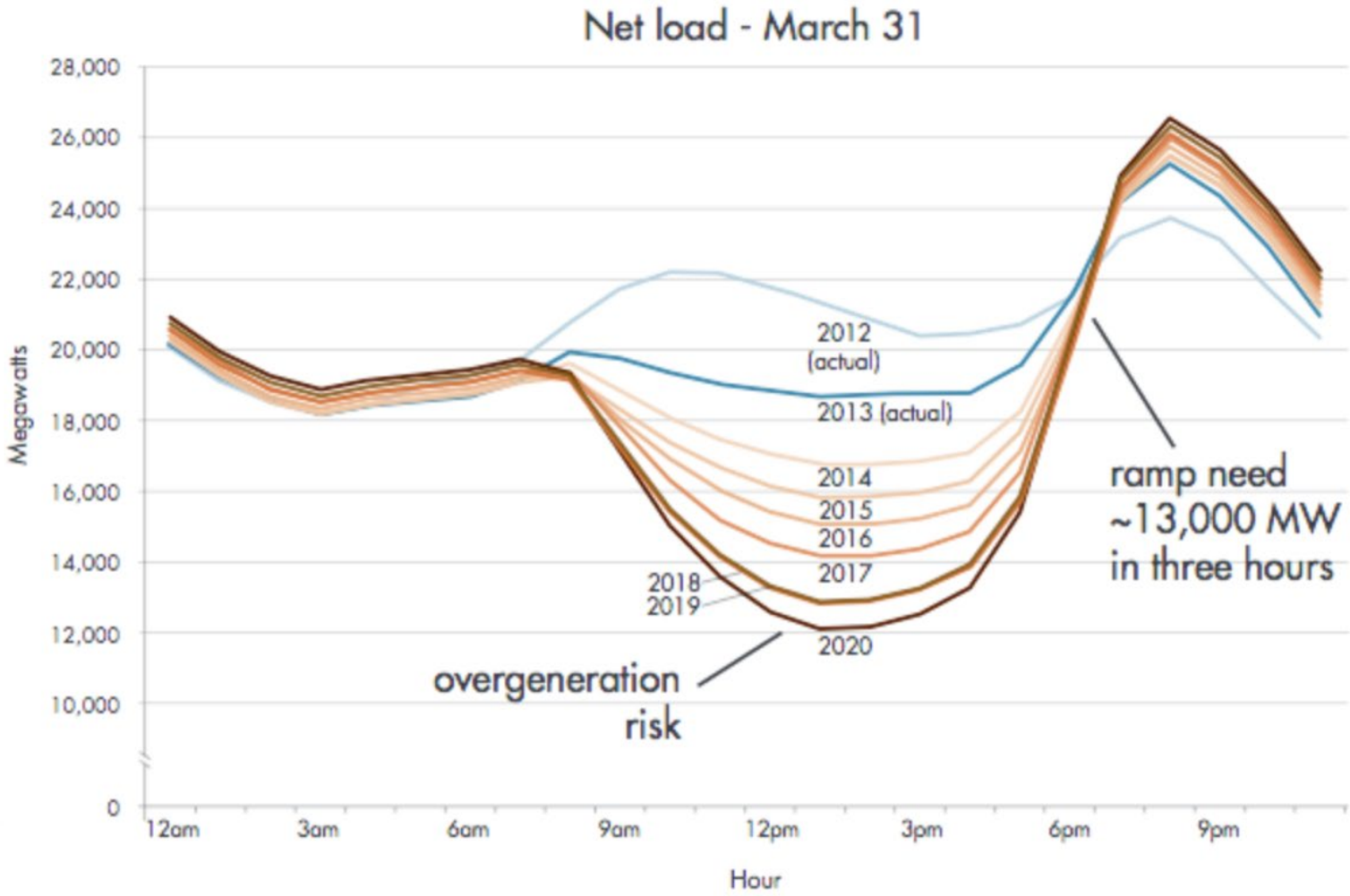
Source: Net Demand - GRU System net energy demand for date above.

Duck Curve



California ISO / Jordan Wirfs-Brock

Duck Curve



Net load curves for March 31, from 2012 to 2020, based on analysis by California ISO. Source: California ISO.

Solar and its Impact on ACE

Current Technology

- Intermittency must be balanced
- High ramp rates
- Inverters have limitations (VAR support and harmonics)
- Large land area requirements
- Geographic diversity is desired
- Inability to call for reserves

ACE Mitigation Option: Energy Storage

Current Lithium Battery Technology

- Fast-responding
- Cost has been decreasing, but still relatively high
- Two to four hour storage
- Relatively short life-cycle, or must be over-built
- Potential safety risks

Upcoming Flow Battery Technology

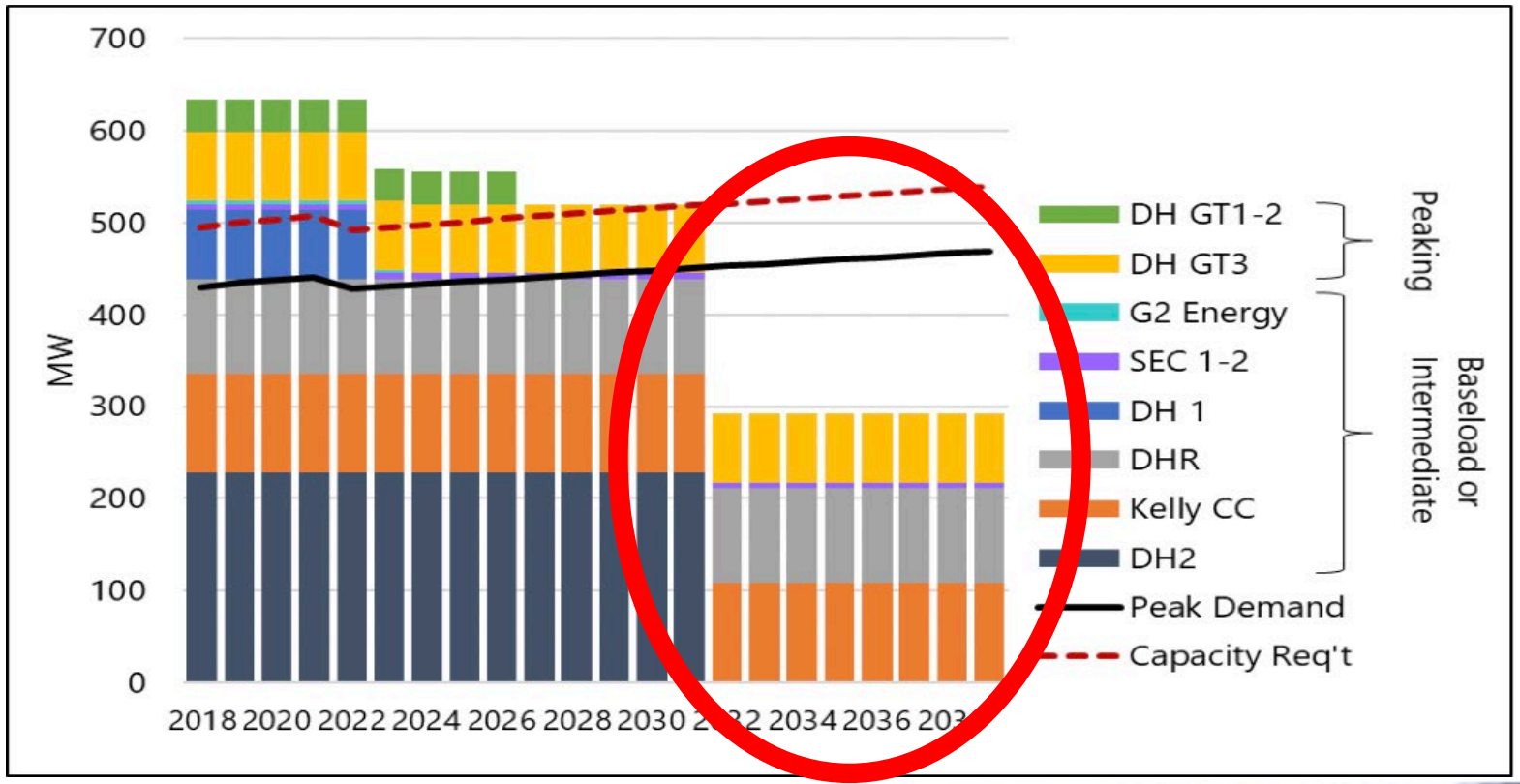
- Longer duration (8-10 hour)
- Reduced safety risks
- Not a lot of utility-scale projects
- Higher cost than lithium, but it is improving

ACE Mitigation Option: RICE

<u>Reciprocating Internal Combustion Engine</u>

- Fast start and quick ramp rates enable more intermittent renewable energy
- Efficient heat rate across operating range
- Compatible with blends of next-gen fuels (hydrogen, RNG, etc.)

Transition to Net Zero



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Net Zero Scenarios

<u>Included Three Net Zero Resource Scenarios</u>

- Each plan includes adding solar and biomass
- Plans address negative ACE impacts caused by solar intermittency through:
  - Battery Storage
  - Quick-start RICE
  - Renewable-based market power

Net Zero Scenarios

Renewable Scenario A (IRP Scenario 12) – GRU Island

- No renewable Market available
- No RICE used to meet load or counted towards generation capacity
  - Reliability only
- 5 MW installed for every 20 MW of solar

Renewable Scenario B (IRP Scenario 13) – Purchase Renewable

- Renewable Market available
  - 50 MW import
  - $50 per MW
- No RICE used to meet load or counted towards generation capacity
  - Reliability only
- 5 MW installed for every 20 MW of solar

Renewable Scenario C (IRP Scenario 14) – RICE and Renewable

- No Renewable Market available
- RICE contributes to energy and capacity
- 5 MW installed for every 20 MW of solar

Net Zero Scenario Generation Additions

	Renewable Scenario A, IRP Scenario 12	Renewable Scenario B, IRP Scenario 13	Renewable Scenario C, IRP Scenario 14
Generation Source	**No Market & No Rice Contribution**	**Renewable Market & No RICE Contribution**	**No Market with RICE Contribution**
Solar PPA (MW)*	780	780	700
Battery (MW)^	195	195	175
Biomass (MW)	103	103	103
RICE (MW)	119.4	119.4	119.4
NPVRR ($M)	$2,557	$2,461	$2,399

*Solar PPA capacity for summer reserve margin criteria is 35% of nameplate capacity; 9% for winter capacity

^4 hour battery

Key Resources Considerations

<u>Resource Scenarios that Meet 2045 Net Zero Resolution</u>

- Results increase costs by approximately $430 - $600 million over the study period (thru 2039)
- All scenarios included the construction of additional biomass unit
  - Contributes to system reliability and fuel diversity
- All scenarios include RICE technology to provide quick-start support
- All scenarios result in a significant increase in excess (dump) energy

Key Resources Considerations

Excess (Dump) Energy

Excess energy occurs when:

- Generation exceeds load
- The ability to reduce generation output is exhausted
- Excess energy is sold (dumped) onto the energy market at below cost

Excess energy may be mitigated by:

- Curtailment of solar production
- Market sales (if available)

Key Resources Considerations

<u>On the Path to 2045...</u>

- Measured increments of large (50 MW+) installations of solar allow:
  - Battery storage technology to improve
  - Battery storage pricing to decrease
  - May allow large-scale use of battery storage instead of RICE for quick-start support
- Large solar additions will also likely require transmission and distribution system upgrades

Key Resources Considerations

<u>The IRP Process is Iterative</u>

- Long-term – Provides strategic direction
- Short-term – Provides actionable options to evaluate/execute
- IRP results are not cast in stone
  - Technologies change
  - Regulations change
  - Needs change
- New IRPs are often created every 4-5 years

Changes with GRU's Upcoming IRP

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What Will Change With the New IRP?

- More input from customers and oversight boards
  - More input is critical to receiving buy-in
  - Customer Workshops, CC/UAB Workshops, online forums, etc.
  - Will likely work with 3rd party to glean this input
  - Customer and board inputs will have impact on scenario rankings
- Base case will meet 2045 net zero resolution
- Updates to pricing of technologies, particularly energy storage
- May include demand management and conservation measures
- Term will be longer (at least 25 years)

Next Steps

- Learning from other Florida municipal utilities' customer outreach process
- Issuing RFI for 3rd party customer engagement
- Mapping out IRP process
- Gathering info on technologies that weren't considered in previous IRPs (flow batteries, anaerobic digester, etc.)
- Create scope for customer outreach and receive cost approximations
- Create and issue RFP/ITN for customer engagement firm

Questions on 2019 IRP?