

NYISO 2019/2020 ICAP Demand Curve Reset

ICAP Working Group

May 19, 2020

Today:

- Financial Parameters: Updated Considerations
- Preliminary Level of Excess (LOE) Adjustment Factor Results
- PILOT Payments and Property Taxes
- Responses to Stakeholder Comments on Net EAS Revenue Model
- Preliminary Reference Point Prices
- Appendix: Review of Net EAS Revenue Model Logic for Fossil Units

Financial Parameters: Updated Considerations

Updated Preliminary Recommendation

After-Tax Weighted Average Cost of Capital (ATWACC)

- Updated Preliminary Recommendation (subject to ongoing evaluation):**
 ATWACC = 8.9% (8.5% in Zone J), reflecting updates to Cost of Debt (COD) and Return on Equity (ROE), to be discussed in the following slides

Inputs	Preliminary Rec. (Mar. 26)		Updated Preliminary Rec. (May 19)	
	Zone J	Other zones	Zone J	Other zones
Return on Equity	12.75%		13.0%	
Cost of Debt	6.1%		7.7%	
Debt to Equity Ratio	55/45		55/45	
WACC	9.1%		10.1%	
	Zone J	Other zones	Zone J	Other zones
Tax Rate ¹	36.4%	27.5%	36.4%	27.5%
ATWACC	7.9%	8.2%	8.5%	8.9%

Note:

[1] ATWACC calculations can vary between zones due to differing state/local tax rates. New York City maintains a corporate income tax that leads to a different ATWACC in Zone J.

Return on Equity (ROE)

Updated Considerations

- Current approach balances estimates of ROE from several perspectives, including publicly traded independent power producers (IPPs) (based on CAPM) and project finance
 - ROEs for publicly traded IPPs range from 6.6% to 10.5%, but represent a small sample (2 companies) with non-IPP business activities (e.g., competitive retail supply, renewables)
 - Project finance ROEs generally range from low- to upper-teens
- New investment in a peaking plant in New York faces a mix of market and regulatory risks that can both increase and decrease market returns – *for example*:
 - Policy and regulatory changes that may affect market outcomes, including changes in loads and the mix of resources participating in the New York markets (e.g., CLCPA, environmental regulations, etc.)
 - NYISO market rule changes that may affect market outcomes (e.g., Master Plan and Grid in Transition initiatives, including potential ancillary service enhancements)
 - Our assessment accounts for these various considerations, along with the general risks facing new merchant investment
- Our assessment also recognizes that the financial parameters should reflect system conditions at a time of capacity need, which may be substantially different from current market conditions

Return on Equity (ROE)

Updated Considerations

- Our updated preliminary recommendation reflects a re-consideration of our initial preliminary recommendation, with a preliminary adjustment to account for the impact of COVID-19 on financial markets
 - Lowered risk-free cost of debt
 - Potentially increased market-wide risk premium
- AG will continue to monitor conditions in the financial markets and will update our recommendation as warranted based on information available at the time of preparing our final report

Updated Preliminary Recommendation: Return on Equity = 13.0%

Cost of Debt (COD)

Updated Considerations

- Our preliminary recommendation reflects a balance of considerations, including recent bond issues for IPPs and generic bond rates for entities with comparable (B rated) credit risk
- B-rated corporate note rates have changed dramatically due to COVID-19 crisis:
 - February 1, 2020 5.5%
 - March 23, 2020 12.4%
 - April 21-27, 2020 (average) 9.3%
- AG will continue monitor conditions in the financial markets and will update our recommendation as warranted based on information available at the time of preparing our final report
 - Cost of debt will need to reflect expectations over the 4-year DCR cycle, which extends beyond the immediate COVID-19 crisis
 - Updated preliminary recommendation reflects an expectation of partial return to prior economic conditions

Updated Preliminary Recommendation: Cost of Debt = 7.7%

Capital Structure (D/E Ratio)

Updated Considerations

- Our preliminary recommendation reflects a reasonable assumption about capital structure given the range of structures used by various entities developing projects
 - Our assumption reflects the inter-relation between the financial parameters, and different approaches to project development (e.g., balance sheet, project finance)
 - Accounts for various details of financing (e.g., financial hedges) implicitly, not explicitly
 - Quantification of hedging costs would be complex, given the need to account for up-front costs and risk-adjusted expected returns over the instrument's lifetime
 - Preliminary recommendation is in line with capital structures from other recent Net CONE studies – 60/40 in ISO-NE, 55/45 in PJM

Preliminary Recommendation (unchanged): 55/45 D/E ratio

Amortization Period

Energy Storage

- AG is proposing to revise its initial recommended amortization period for battery storage after further evaluation of technology-specific considerations, including:
 - There is currently limited operational experience with battery storage technology over extended time periods (e.g., little to no experience beyond a 10-year lifetime)
 - Given the relatively early stage of battery storage technology, advances in operational efficiency likely diminish the competitiveness of resources using current technologies over time
 - Augmentation costs (associated with 20-year physical life) are captured in variable O&M costs, not up-front capital costs
 - Developers indicate substantially shorter time frames for capital recovery

Updated Preliminary Recommendation: 15 year amortization period for battery storage; 17 year amortization period for fossil units (unchanged)

Comparison Across RTO Net CONE Studies

After-Tax Weighted Average Cost of Capital (ATWACC)

- Updated Preliminary Recommendation (subject to ongoing evaluation):**
 ATWACC = 8.9% (8.5% in Zone J), reflecting updates to Cost of Debt (COD) and Return on Equity (ROE)

Inputs	ISO-NE (2017)	PJM (2018)	NYISO (2016)	Updated Preliminary Rec. (May 19)
Return on Equity	13.4%	12.8%	13.4%	13.0%
Cost of Debt	7.75%	6.5%	7.75%	7.7%
Debt to Equity Ratio	60/40	55/45	55/45	55/45
WACC	10.0%	8.7%	10.3%	10.1%
Tax Rate ¹	40.2%	29.25%	39.6%	27.5%
ATWACC	8.1%	7.5%	8.6%	8.9%
Amortization Period	20-year	20-year	20-year	17-year (Fossil) 15-year (Battery)

Note:

[1] ATWACC calculations can vary within each ISO/RTO due to differing state/local tax rates. In NYISO New York City maintains a corporate income tax that leads to a different ATWACC in Zone J (Corporate Income Tax of 36.35% in total).

Preliminary LOE Adjustment Factor Results

Preliminary LOE Adjustment Factors

Overview

- In the calculation of net energy and ancillary services (EAS) revenues, historical LBMPs and reserve prices are multiplied by Level of Excess Adjustment Factors (LOE-AFs) to approximate prices at the tariff prescribed level of excess (LOE) market conditions
- LOE-AFs are determined by the ratio of LBMPs for two cases:
 - “As found” case – current market conditions
 - LOE case – tariff-prescribed LOE conditions
- LBMPs estimated by GE using GE-MAPS software
 - Runs use Congestion Assessment and Resource Integration Studies (CARIS) modeling data from 2019 CARIS Phase 1 base case
- Additional information regarding the method for determining LOE-AFs was presented at the March 10, 2020 ICAPWG meeting

Preliminary LOE Adjustment Factors

Model Run Specification

- Model runs use the following assumptions regarding generation resources and load:
 - “As found” case for 2021-2025:
 - Resources: prediction from 2019 CARIS Phase I Base Case (at summer capacity) + firm net imports + UDRs + SCRs
 - Load: prediction from 2019 CARIS Phase I Base Case
 - “Preliminary LOE” case for 2021-2025:
 - Resources: same as “As found” case
 - Load: load scaled to represent LOE conditions based on applicable minimum requirements, plus 300 MW (300 MW is roughly equivalent to the average of the peaking plant size options being considered)
- Initial results are indicative only and are intended to facilitate development of preliminary results
 - Final LOE-AF values will be determined reflecting the actual MW of recommended peaking plants

Preliminary LOE Adjustment Factors

Granularity of LOE-AFs

- LOE-AF values were calculated for each load zone and month for the following periods (similar to the granularity used in the 2016 DCR):
 - **Peak Load Window hours:**
 - Summer: 1pm to 6pm inclusive during June through August
 - Winter: 4pm to 9pm inclusive during December through February
 - **Peak hours:** all other hours between 7am to 11pm, Monday through Friday, exclusive of NERC holidays
 - **Off-peak hours:** all other hours.

Preliminary LOE Adjustment Factors

Comparison to 2016 DCR LOE-AF values

- In each zone, average LOE-AFs are higher than analogous 2016 DCR values
- Current “as found” base case surplus capacity estimates are higher than 2016 DCR surplus capacity levels

Generation Surpluses in LOE Analysis: 2016 and 2020 DCRs

NYCA	2020 DCR	2016 DCR (Average)	2020 DCR vs. 2016 DCR Comparison
	[A]	[B]	[C] = [A] - [B]
<i>Base Case Surplus (MW)</i>	10,171	6,726	3,445
<i>LOE Case Surplus (MW)</i>	6,988	6,196	792
<i>Difference between Cases (Base - LOE)</i>	3,183	530	2,653

Zone K	2020 DCR	2016 DCR (Average)	2020 DCR vs. 2016 DCR Comparison
	[A]	[B]	[C] = [A] - [B]
<i>Base Case Surplus (MW)</i>	1,316	520	796
<i>LOE Case Surplus (MW)</i>	494	343	151
<i>Difference between Cases (Base - LOE)</i>	822	177	645

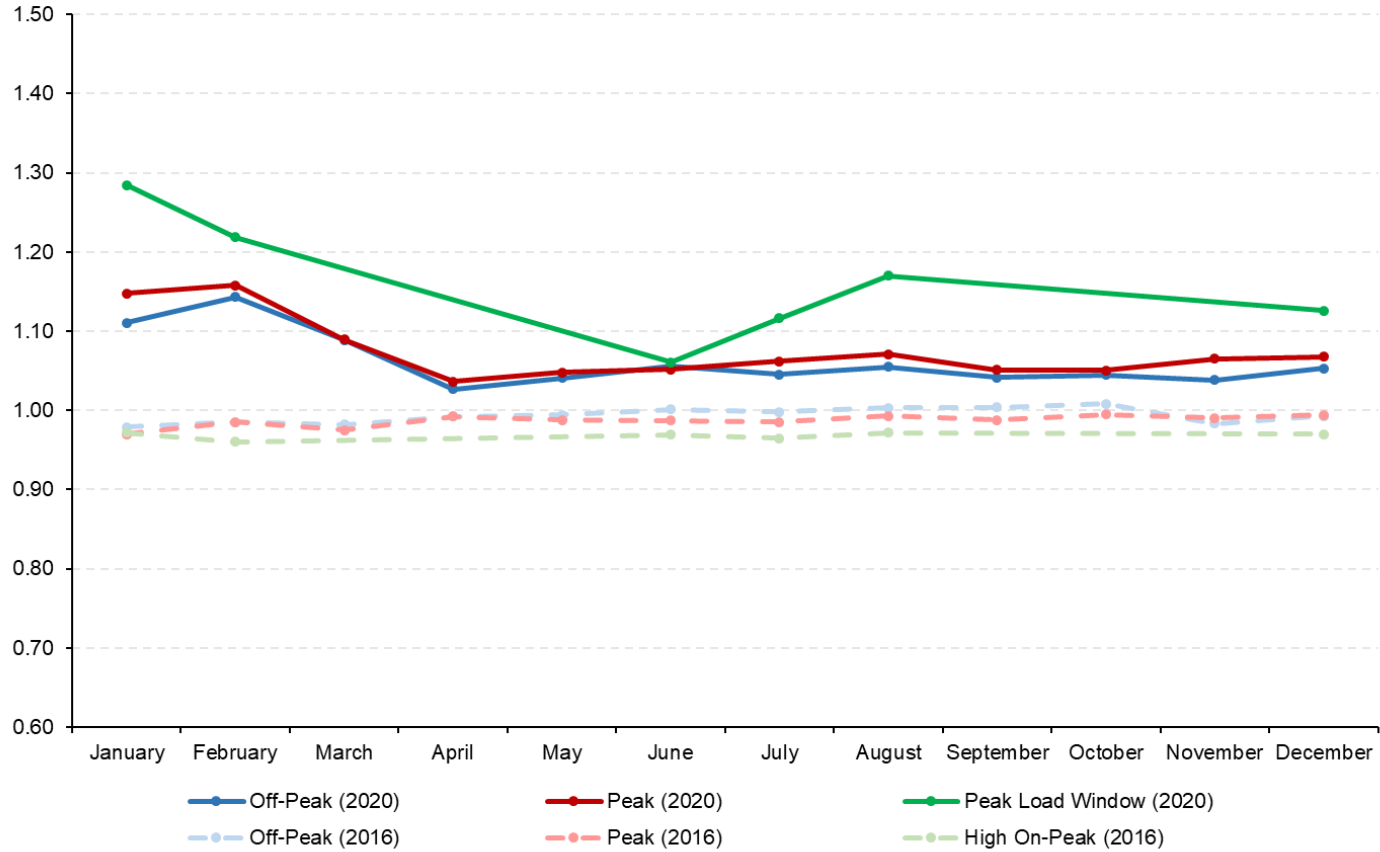
Notes:

[1] Surpluses reflects the difference between generation, SCR, UDR, and net import capacity and load for the specified case (base or LOE).

[2] The proxy unit included in load under the LOE cases is 100MW larger in the 2020 DCR (300MW) than the 2016 DCR (200MW).

Load Zone C

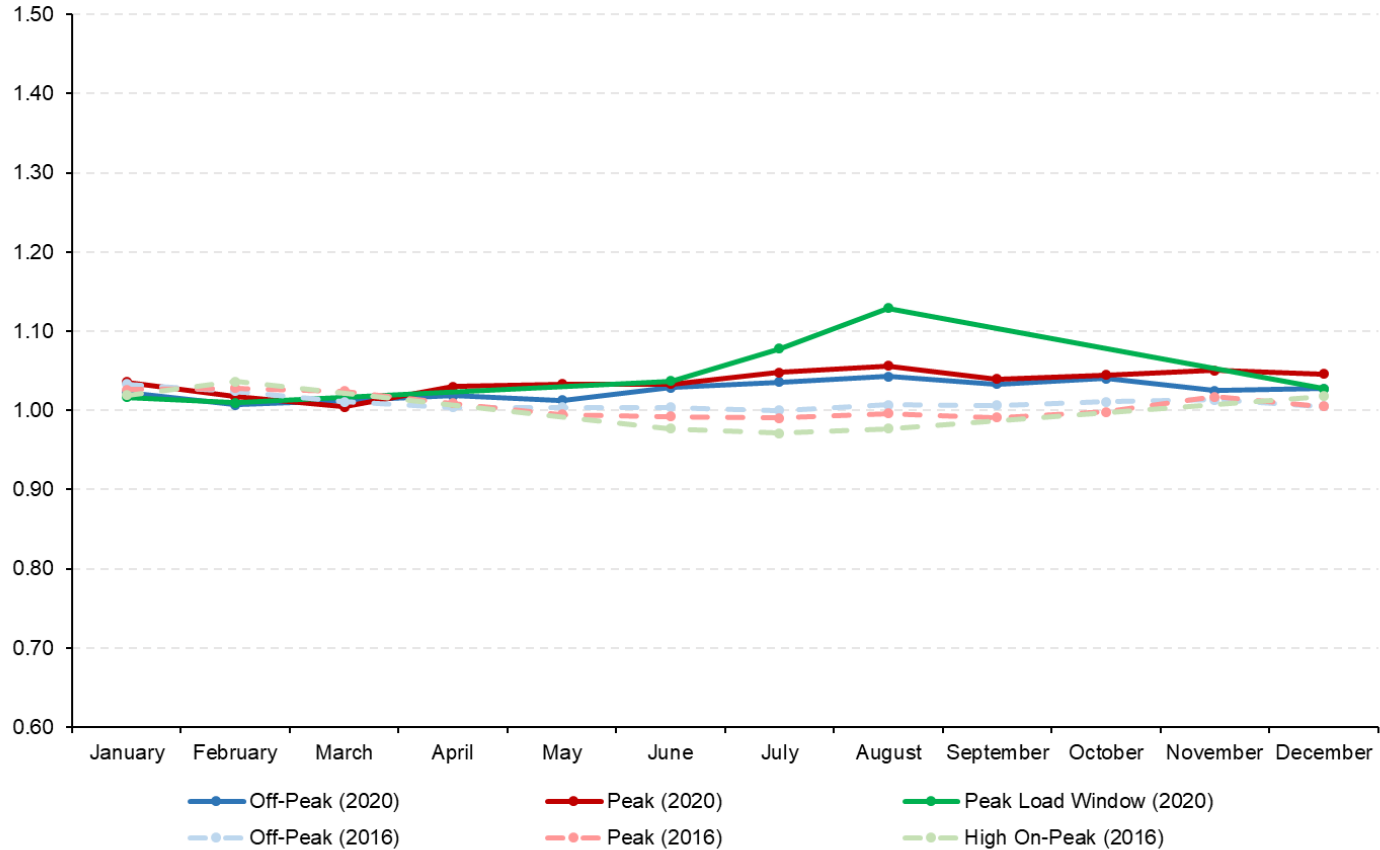
**Level of Excess Adjustment Factors: 2016 vs. 2020
Zone C**



Note: Peak Load Window LOE-AFs are used in the 2020 DCR and cover prices between 4pm and 9pm inclusive in December-February and 1pm and 6pm inclusive June-August. High On-Peak LOE-AFs were used in the 2016 DCR and covered prices between 4pm and 7pm inclusive in December-February and 2pm and 5pm inclusive in June-August.

Load Zone F

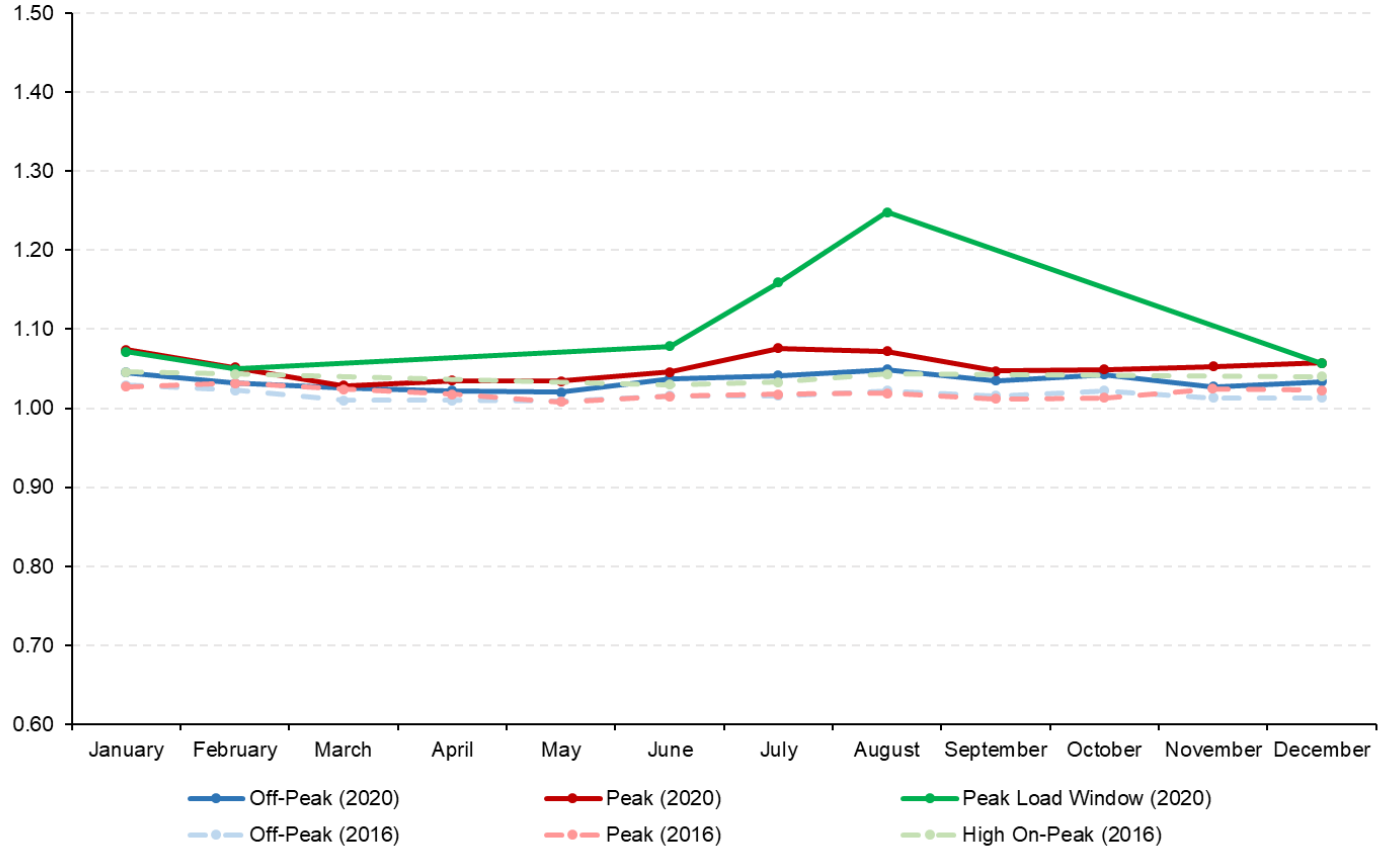
**Level of Excess Adjustment Factors: 2016 vs. 2020
Zone F**



Note: Peak Load Window LOE-AFs are used in the 2020 DCR and cover prices between 4pm and 9pm inclusive in December-February and 1pm and 6pm inclusive June-August. High On-Peak LOE-AFs were used in the 2016 DCR and covered prices between 4pm and 7pm inclusive in December-February and 2pm and 5pm inclusive in June-August.

Load Zone G

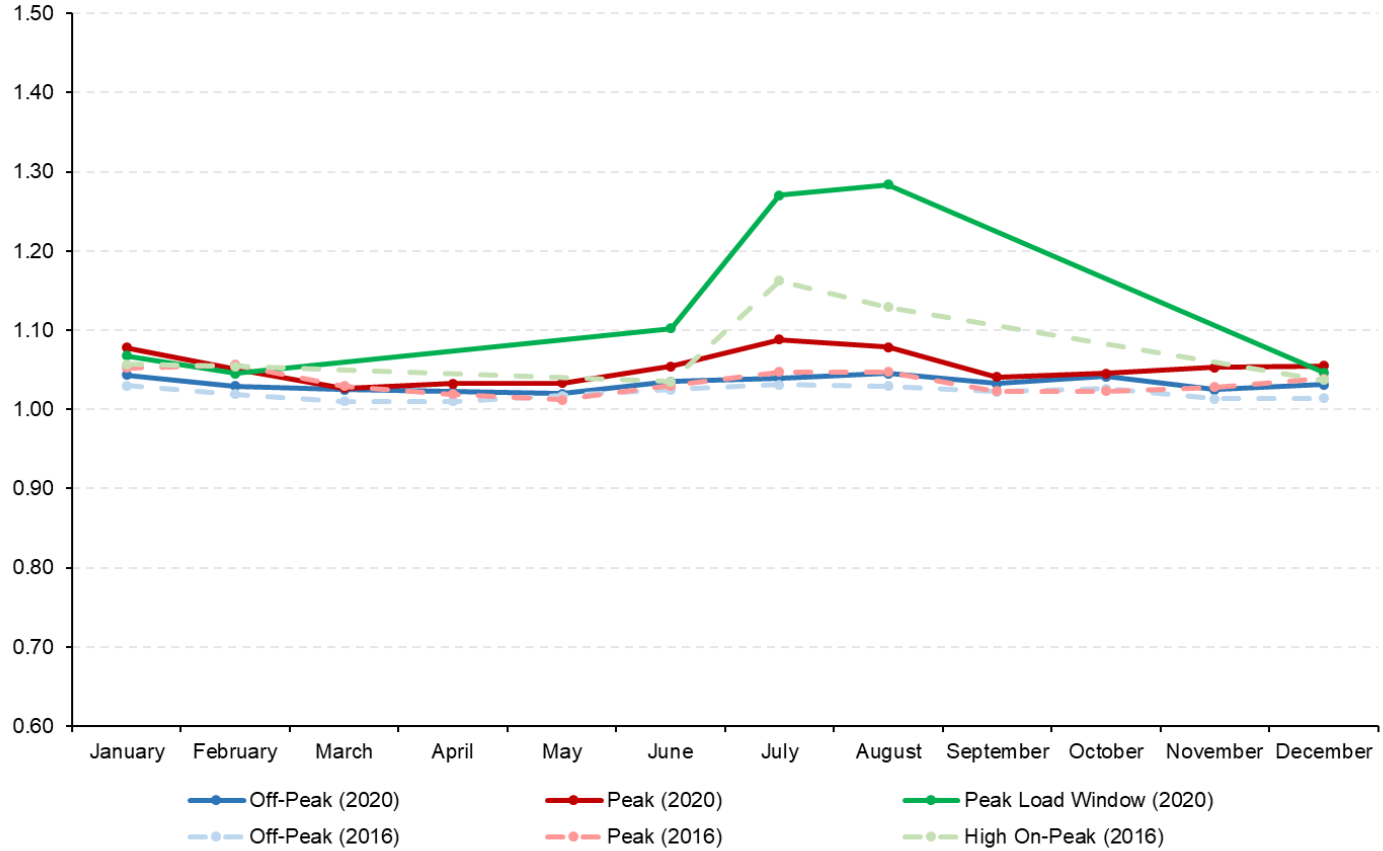
**Level of Excess Adjustment Factors: 2016 vs. 2020
Zone G**



Note: Peak Load Window LOE-AFs are used in the 2020 DCR and cover prices between 4pm and 9pm inclusive in December-February and 1pm and 6pm inclusive June-August. High On-Peak LOE-AFs were used in the 2016 DCR and covered prices between 4pm and 7pm inclusive in December-February and 2pm and 5pm inclusive in June-August.

Load Zone J

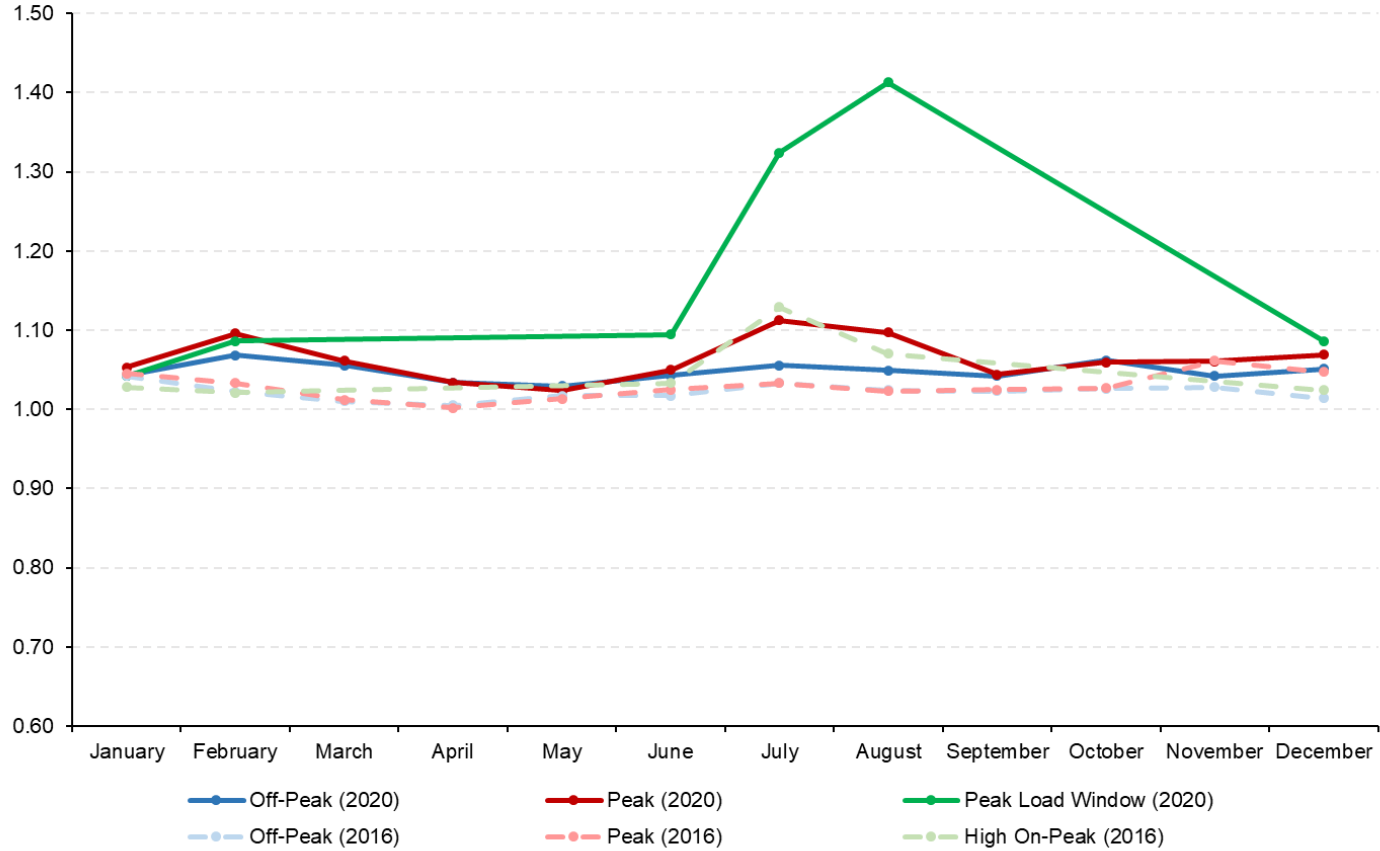
**Level of Excess Adjustment Factors: 2016 vs. 2020
Zone J**



Note: Peak Load Window LOE-AFs are used in the 2020 DCR and cover prices between 4pm and 9pm inclusive in December-February and 1pm and 6pm inclusive June-August. High On-Peak LOE-AFs were used in the 2016 DCR and covered prices between 4pm and 7pm inclusive in December-February and 2pm and 5pm inclusive in June-August.

Load Zone K

Level of Excess Adjustment Factors: 2016 vs. 2020
Zone K



Note: Peak Load Window LOE-AFs are used in the 2020 DCR and cover prices between 4pm and 9pm inclusive in December-February and 1pm and 6pm inclusive June-August. High On-Peak LOE-AFs were used in the 2016 DCR and covered prices between 4pm and 7pm inclusive in December-February and 2pm and 5pm inclusive in June-August.

PILOT Payments and Property Taxes

PILOT Payments

Overview

- Where applicable law does not expressly provide a property tax exemption, it is assumed that peaking plant options outside Load Zone J will enter into a Payment in Lieu of Taxes (PILOT) agreement
 - Tax exemptions are applicable for energy storage options statewide, as well as fossil peaking plant options within Load Zone J (see Slide 23 for additional details)
 - PILOT agreements are typically developed based on project specific and regional economic conditions and are expected to vary based on the unique circumstances of each taxing jurisdiction and project at the time of negotiations.

PILOT Payments

Proposed Value and Analysis

- Outside of Load Zone J, an effective PILOT rate of **0.9 percent** is proposed
 - The proposed 0.9 percent value is consistent with the range of current PILOTs for natural-gas fueled units based on a review of data available through the New York State Comptroller's Office
 - Analysis calculated effective tax rate under publicly reported PILOT agreements for 9 natural gas-fueled generating stations in New York
 - Effective tax rates varied from 0.25% to 2.14% per year with median of 0.93%
 - A 0.75 percent rate was used in the prior two resets

Property Tax Exemptions

NYC and Energy Storage Exemptions

- New York Real Property Tax Law Section 489-BBBBBBB(3)(b-1) provides a 15-year tax abatement in New York City for the peaking unit underlying the NYC ICAP Demand Curve
 - It is assumed that each fossil peaking plant incurs taxes only for years 16 and beyond in the demand curve model
 - In New York City for years 16 and beyond, the property tax rate equals 4.7 percent, which is equal to the product of (1) the Class 4 Property rate (10.5 percent) and (2) the 45 percent assessment ratio
- Energy storage units are provided a 15-year tax abatement statewide pursuant to New York Real Property Tax Law Section 487
 - A 15 year property tax exemption is assumed for all battery storage units in all locations

Responses to Stakeholder Comments on Net EAS Revenue Model

Responses to Stakeholder Commentary

Model Dispatch

- Net EAS revenue model for fossil fueled plants reflects the operation of a peaking plant submitting offers at marginal costs into the NYISO day-ahead (DAM) and real-time (RTM) markets
 - Model accounts for offer start-up and variable operating costs (fuel, emissions, operations and maintenance, and NYISO charges) – see Appendix for review
- Analysis accounts for the incremental impact of new entry on EAS market outcomes
 - LBMPs in net EAS analysis reflect a level of excess adjustment consistent with additional capacity above “at need” conditions
 - LBMPs at LOE reflect current mix of resources, excluding entry of peaking plant or retirements that might occur between today and future period at tariff-prescribed excess conditions
 - Such changes in resource mix could increase or decrease LBMP at LOE

Responses to Stakeholder Commentary

Model Dispatch

- RTM participation accounts for factors that might affect actual dispatch
 - Need to buy-out of DA position
 - Start-up and variable operating/production costs
 - Hourly prices (less sensitive to transient price spikes)
 - Natural gas market operations
 - Real-time fuel costs reflect a 10-30% intraday premium for purchases and intraday discount for sales relative to day-ahead gas prices, which vary by Load Zone.
 - These intraday premiums/discounts reflect potential operating costs, financial risks, or balancing costs to securing fuel in real-time (or securing fuel in advance but selling back such fuel)

Responses to Stakeholder Commentary

Forced Outage Rate (EFORd)

- Assumed EFORd rate for gas turbines of 4.3% is higher than 2.2% used in 2016 DCR
- Assumed EFORd is based on analysis on GADS data of performance since 2012 of gas turbine units that are no more than 10 years old
- Assumed EFORd applied to net annual revenues, which are already weighted towards more profitable hours; limiting the application to only a small number of highest priced hours would represent a disproportionate percentage of net revenue losses

Responses to Stakeholder Commentary

Dual Fuel

- Absent an express requirement, investment in dual fuel capability is primarily an economic decision
- Reliability rules and LDC gas tariffs require dual fuel capability within Load Zones J and K
- For other locations, additional up-front capital costs are balanced against potential for increased net EAS revenues from greater fuel flexibility and resilience, as well as other relevant considerations (reliability, siting, gas availability/constraints, etc.)
- AG's assessment supports investment in dual fuel capability in Load Zone G, but not Load Zones C or F

Preliminary Reference Point Prices

Preliminary Reference Point Prices

Discussion of Indicative Prices

- Preliminary reference point prices are provided for informational purposes only and are subject to change
 - The preliminary values are reflective of the preliminary recommendations for various inputs/assumptions as of the date of this presentation, as described in next two slides
 - The analysis to date indicates that the H-class frame turbine (GE 7HA.02) is the lowest cost technology option in all locations; preliminary values are based on the H-class frame
- Variables that still have the potential to change include, but are not limited to:
 - Financial parameters
 - Peaking plant design (emissions controls and dual fuel capability) in certain locations
 - Fuel gas pricing hubs in certain Load Zones
- Market data that will also need to be updated include:
 - Historical LBMPs, reserve prices, and variable operating costs [fuel and emissions] for the relevant three year period (September 2017 – August 2020)
 - Preliminary values reflect the three year historic period of September 2016 through August 2019
 - LOE-AFs to reflect actual MW size of recommended peaking plant for each ICAP Demand Curve
 - Winter-to-summer ratio for the relevant three year period (September 2017 – August 2020)
 - Preliminary values reflect the three year historic period of September 2016 through August 2019
 - Cost escalation factors

Preliminary Reference Point Prices

Review of Key Assumptions

- Time Period: Preliminary results based on historic data from September 2016 through August 2019
 - Final values for 2021/2022 Capability Year will be based on data from September 2017 through August 2020 (results to be updated in September 2020)

Financial Parameters Summary		
Inputs	Recommended Value	
Return on Equity	13.0%	
Cost of Debt	7.7%	
Debt to Equity Ratio	55/45	
WACC	10.1%	
	<u>Zone J</u>	<u>Other zones</u>
Tax Rate ¹	36.4%	27.5%
ATWACC	8.5%	8.9%

Preliminary Reference Point Prices

Review of Key Assumptions

- Key technical assumptions discussed in 4/22/2020 presentation

	Zone C	Zone F	Zone G (Dutchess)	Zone G (Rockland)	Zone J	Zone K
Unit Design Specification (GE 7HA.02) ¹	15 ppm, Gas-only, no SCR	15 ppm, Gas-only, no SCR	15 ppm, Dual Fuel, no SCR ³	25 ppm, Dual Fuel, with SCR	25 ppm, Dual Fuel, with SCR	25 ppm, Dual Fuel, with SCR
Recommended Proxy Gas Hub	TBD ²	Iroquois Zone 2	Iroquois Zone 2	TETCOM ³	Transco Zone 6 NY	Iroquois Zone 2

Notes:

[1] GE 7HA.02 specification lists base quantity of NO_x emissions before emission control technologies are used.

[2] The recommended gas hub for Load Zone C remains under evaluation. AG anticipates providing preliminary reference point price information for Load Zone C in its draft report.

[3] AG is still evaluating the potential for SCR emissions controls installation in Load Zone G (Dutchess County).

Preliminary Reference Point Prices

Preliminary Reference Point Prices (\$2021/kW-mo.)

	Zone C	Zone F	Zone G (Dutchess) ²	Zone G (Rockland)	Zone J	Zone K
2021/2022 Demand Curve	TBD ¹	\$9.23	\$12.98	\$12.75	\$21.72	\$20.28

Notes:

[1] The recommended gas hub for Load Zone C remains under evaluation. AG anticipates providing preliminary reference point price information for Load Zone C in its draft report.

[2] AG is still evaluating the potential for SCR emissions controls installation in Load Zone G (Dutchess County).

Previous Reference Point Prices (\$/kW-mo.)

	Zone C	Zone F	Zone G (Dutchess)	Zone G (Rockland)	Zone J	LI
2020/2021 Demand Curve	N/A	\$10.65	\$17.67	N/A	\$23.31	\$17.88 (with collar) \$21.13 (w/o collar)
2019/2020 Demand Curve	N/A	\$9.83	\$16.59	N/A	\$21.95	\$15.96 (with collar) \$18.83 (w/o collar)

Preliminary Gross CONE and Net EAS Offset Values

Preliminary Gross CONE (\$2021/kW-yr.)

	Zone C	Zone F	Zone G ² (Dutchess)	Zone G (Rockland)	Zone J	Zone K
2021/2022 Demand Curve	TBD ¹	\$123.40	\$139.81	\$157.23	\$201.25	\$167.35

Preliminary Net EAS Revenues (\$2021/kW-yr.)

	Zone C	Zone F	Zone G ² (Dutchess)	Zone G (Rockland)	Zone J	Zone K
2021/2022 Demand Curve	TBD ¹	\$36.46	\$35.38	\$55.96	\$42.62	\$59.87

Notes:

[1] The recommended gas hub for Load Zone C remains under evaluation. AG anticipates providing preliminary reference point price information for Load Zone C in its draft report.

[2] AG is still evaluating the potential for SCR emissions controls installation in Load Zone G (Dutchess County).

Appendix: Review of Net EAS Revenue Model Logic for Fossil Units

Review of Net EAS Revenue Model Logic for Fossil Units

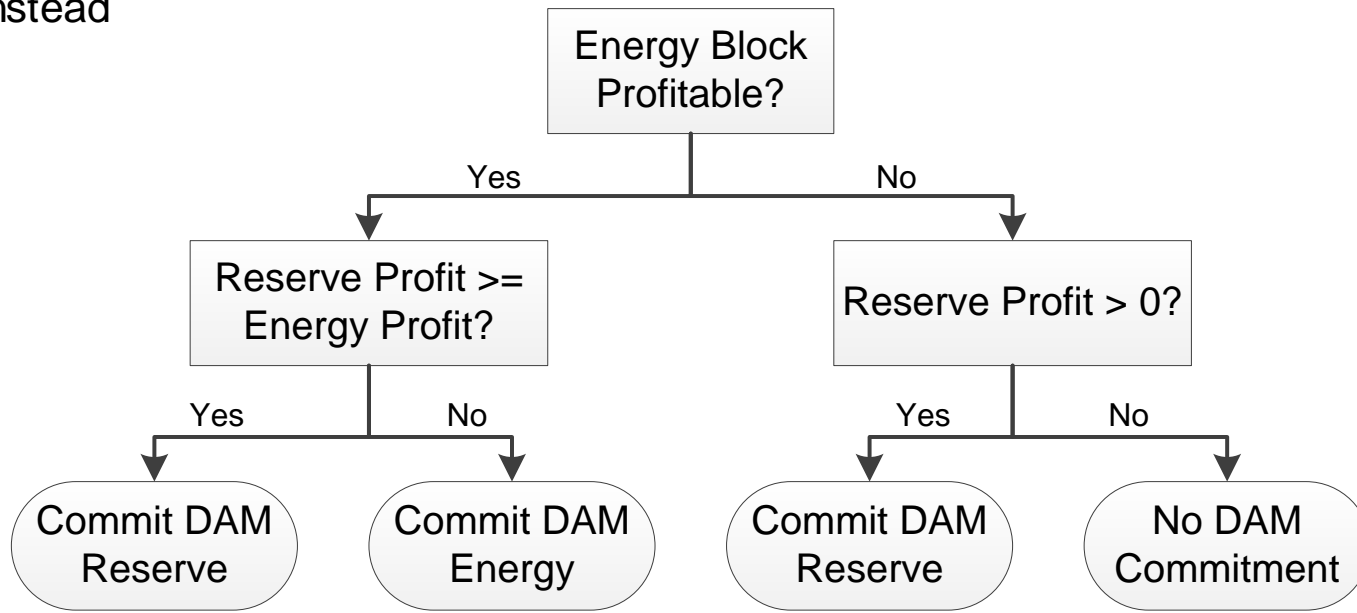
Model Overview

- The net EAS revenue model estimates the net revenues a peaking plant would be expected to obtain by participating in Energy and Operating Reserves markets under the tariff-specified level of excess conditions
 - Hourly model developed in R
 - Utilizes data from S&P Global Market Intelligence subscription service and publicly available data sources
- **The current version of the fossil unit model (unchanged from 2016) includes:**
 - Co-optimization logic for Energy and non-spinning Operating Reserves to commit a peaking plant Day-Ahead and then dispatch in real-time
 - Hourly net revenues based on historical hourly LBMPs, fuel costs, and other variable costs (O&M, emissions, etc. detailed on slide 39) from 3-year historical period
 - Ability to buy out of Day-Ahead position and dispatch differently in real-time
 - Ability to model net EAS revenues in dual-fuel or gas only configuration
 - When operating in dual fuel configuration (if applicable), unit runs on fuel that maximizes hourly profits, given variable O&M and emissions costs for oil or gas and hourly fuel price

Review of Net EAS Revenue Model Logic for Fossil Units

Functionality: Day-Ahead Market

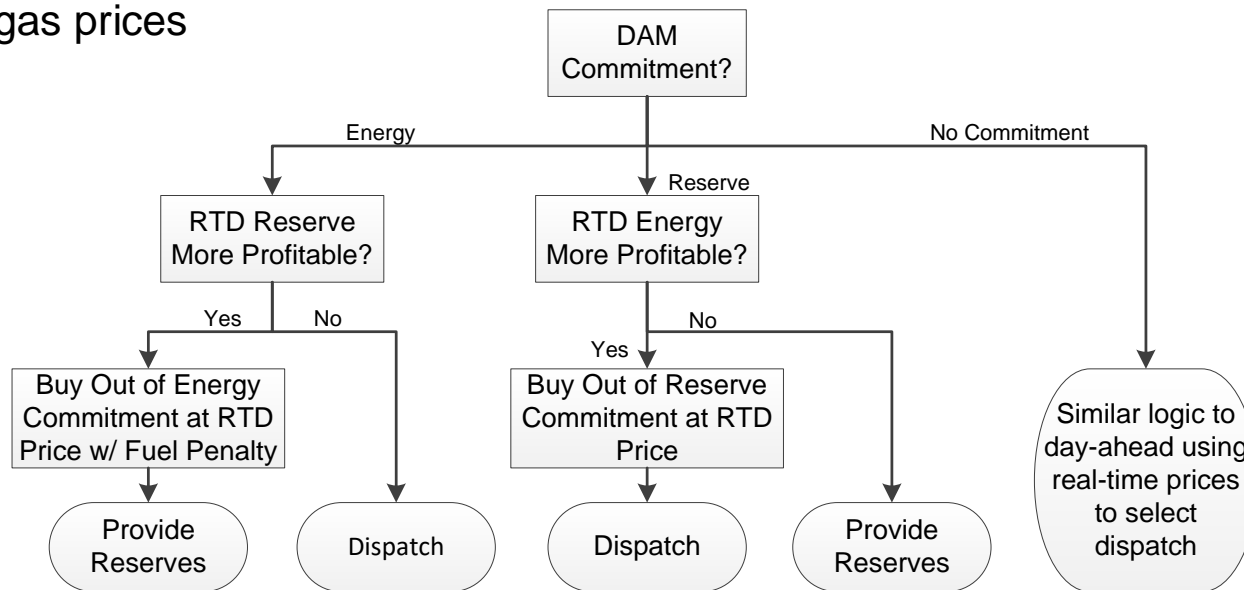
- The model evaluates profitable energy “blocks” of one hour or longer and ensures that all costs, including amortized startup costs, can be recovered before committing to provide energy within each block
- If energy commitment is not profitable, the model may commit the unit for reserves instead



Review of Net EAS Revenue Model Logic for Fossil Units

Functionality: Real-Time Market

- Model will check if buying out of unit's day-ahead position leads to greater profit and will act accordingly
- Model can take advantage of day-ahead energy commitments to extend run time in real-time without incurring additional startup costs
- Day-ahead buyouts require real-time fuel procurement with costs reflecting a 10-30% intraday premium for purchases and intraday discount for sales relative to day-ahead gas prices



Review of Net EAS Revenue Model Logic for Fossil Units

Additional Costs/Revenues

- Net EAS Revenue model additionally accounts for the following:
 - Variable O&M Costs
 - Provided by Burns & McDonnell; varies by technology and fuel used
 - Start-up Costs
 - Provided by Burns & McDonnell; varies by technology
 - Units must recover start-up costs within 1 hour for aeroderivatives in DAM and RTM and within 2 hours for frame turbines in RTM
 - Emissions costs and runtime limitations
 - Costs incurred for emissions of CO₂, NO_x, and SO₂ based on RGGI and EPA allowance auction prices
 - Runtime limitations based on NSPS NO_x and CO₂ limits
 - Rate Schedule 1 Charge for Injections
 - Voltage Support Services Revenues
 - Assumed at \$2.04/kW-year for combustion turbines

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