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Harry M. Barton
Senior Counsel
Legal Department -- Regulatory

April 17, 2019

By Hand Delivery
Ms. Lora W. Johnson, CMC, LMMC
Clerk of Council
Council of the City of New Orleans
Room 1E09, City Hall
1300 Perdido Street
New Orleans, LA 70112

Re: **In Re: 2018 Triennial Integrated Resource Plan of Entergy New Orleans, Inc.**
Docket No. UD-17-03

Dear Ms. Johnson:

Entergy New Orleans, LLC ("ENO") respectfully submits its May 1, 2019 Technical Meeting Materials in the above referenced Docket. Please file an original and two copies into the record in the above referenced matter and return a date-stamped copy to our courier.

Should you have any questions regarding the above, I may be reached at (504) 576-2984. Thank you for your assistance with this matter.

Sincerely,

Harry M. Barton

HMB/bkd
Enclosures
cc: Official Service List (*via email*)

RECEIVED
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BY:

Item 4 36

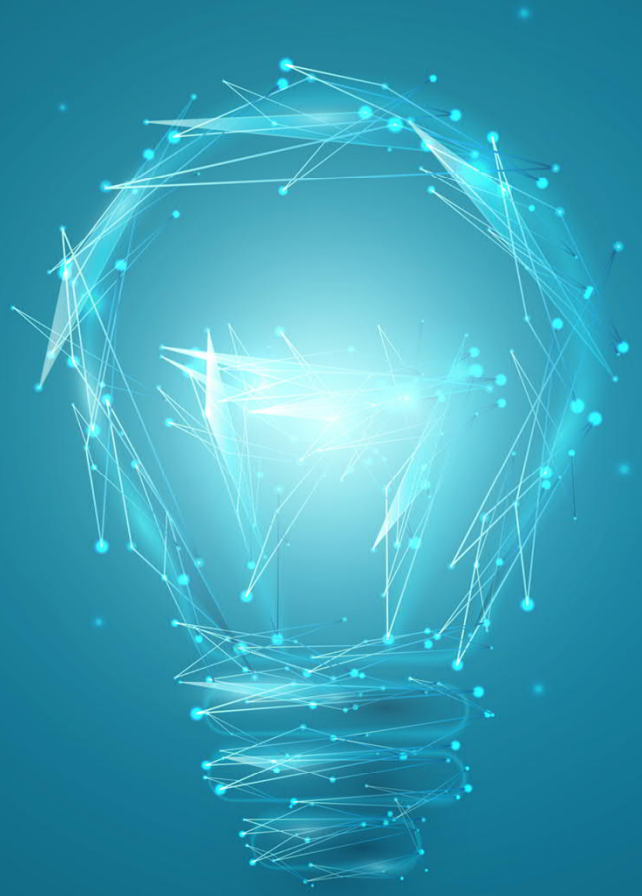
Utility Reimagined

ENOL 2018 IRP Technical Meeting #4

Docket No. UD-17-03

May 1, 2019

Entergy New Orleans, LLC



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Goals and Agenda of Technical Meeting #4

Goals

- The Initiating Resolution (R-17-430) contemplates several goals for this Technical Meeting:
  - First, the parties need to review and discuss the Optimized Resource Portfolios selected through the Aurora capacity expansion modeling, then reach consensus on the subset of portfolios to be carried through the total supply cost analysis and cross testing;
  - Next, the parties need to finalize the Scorecard Metrics initially presented at Technical Meeting #3;
  - Finally, there will be an initial discussion regarding Energy Smart Program budgets and savings goals for Program Years 10-12.

Agenda

1. Optimized Resource Portfolio Discussion
2. Scorecard Metrics Discussion
3. Risk Assessment Discussion
4. Energy Smart Program Discussion
5. Next Steps and Timeline

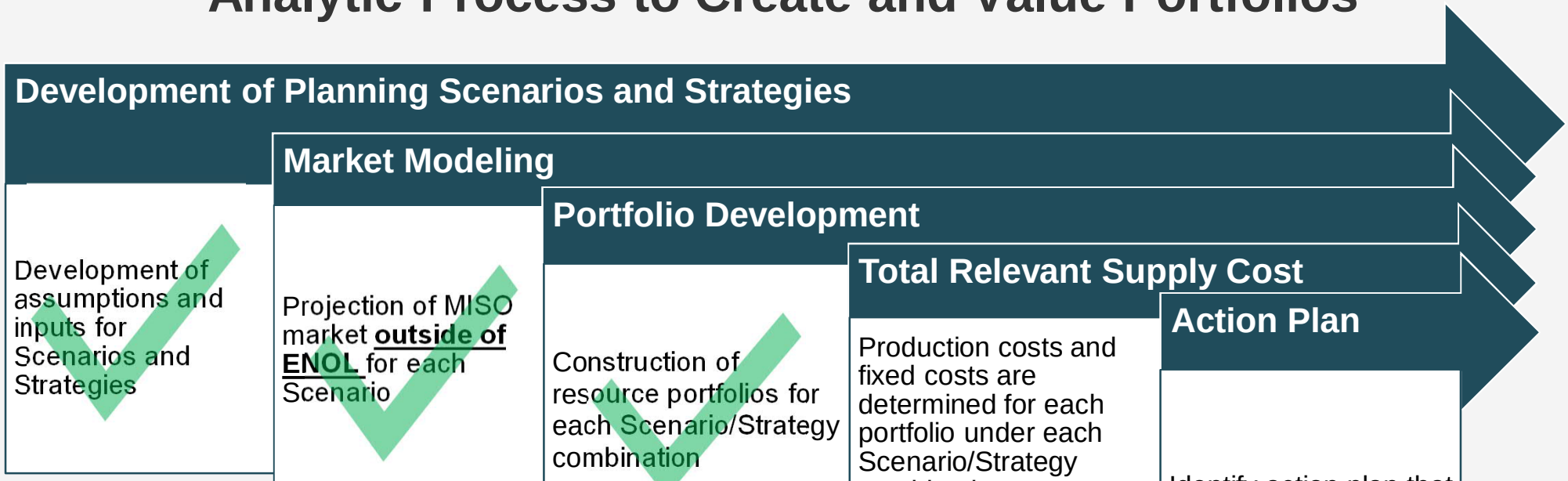
Technical Meeting #3- Follow Ups

- Technical Meeting #3 occurred on November 28, 2018.
- **Strategies and Scenarios**
- The Parties discussed Planning Scenarios and Strategies and reached consensus on 3 Scenarios and 5 Strategies.
- On December 4, 2018, the Council's Advisors circulated slides summarizing the consensus achieved on the Planning Scenarios and Strategies and requested that the Parties disclose any desired modifications, or objections, to the Strategies and Scenarios on or before December 6, 2018. When none were submitted, the Scenarios and Strategies became final for use in modeling.
- **DSM Inputs**
- To enable Aurora to optimize selection of programs from the DSM cases used in Strategies 1 and 5, SPO required additional data files beyond those originally provided. Navigant provided these for Strategy 1 in late January and Optimal provided these for Strategy 5 in mid-February.
- **Score Card Draft Template**
- At Technical Meeting #3, ENO presented a draft Score Card for initial review and comment. As of the date these materials were submitted (April 17, 2019), no written comments or feedback have been received.

Section 1

Optimized Resource Portfolios

Analytic Process to Create and Value Portfolios



Reviewed & finalized inputs, Strategies and Scenarios at Technical Conference #3

Developed and executed market modeling based upon agreed upon Scenarios & Scenarios

Produced optimized portfolios through Aurora's capacity expansion based on agreed upon Strategies & Scenarios. Results summarized within the following slides.

Recommendations for Total Supply Cost analysis and sensitivities are included within the following slides.

Review of the Scorecard is included within the following slides.

IRP Planning Scenarios

Scenarios finalized at ENOL IRP Technical Meeting #3

	Scenario 1 (Moderate Change)	Scenario 2 (Customer Driven)	Scenario 3 (Stakeholder)
Peak Load & Energy Growth	Medium	High	Low
Natural Gas Prices	Medium	Low	High
Market Coal & Legacy Gas Deactivations	60 years	55 years	50 years
Magnitude of Coal & Legacy Gas Deactivations[1]	17% by 2028 57% by 2038	31% by 2028 73% by 2038	46% by 2028 76% by 2038
MISO Market Additions Renewables / Gas Mix	34% / 66%	25% / 75%	50% / 50%[2]
CO_2 Price Forecast	Medium	Low	High (Start 2022)

1. "Magnitude of Coal & Legacy Gas Deactivation" driven by "Market Coal and Legacy Gas deactivation" assumptions (e.g. 55 Years; 31%/73%)
2. Included storage to support market LMPs

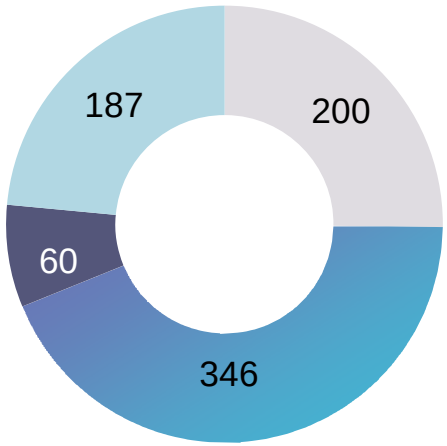
IRP Planning Strategies

Strategies finalized at ENOL IRP Technical Meeting #3

	Strategy 1	Strategy 2	Strategy 3	Strategy 4	Strategy 5
Objective	Least Cost Planning	0.2/2% DSM Goal	Optimal Program Achievable DSM	Navigant High DSM	Stakeholder Strategy
Capacity Portfolio Criteria and Constraints	Meet 12% Long-term Planning Reserve Margin (PRM) target using least-cost resource portfolio	Include a portfolio of DSM programs that meet the Council's stated 2% goal	Meet peak load need + 12% PRM target using Optimal Program Level DSM and resources selected by model	Meet peak load need + 12% PRM target using Navigant High Case DSM and resources selected by model	Meet peak load need + 12% PRM target using Optimal Program Level DSM, renewables, and energy storage
Description	Assess demand- and supply-side alternatives to meet projected capacity needs with a focus on total relevant supply costs	Assess portfolio of DSM programs that meet Council's stated 0.2/2% goal along with consideration of additional supply-side alternatives	Assess portfolio of DSM from Optimal Program Achievable case along with consideration of additional supply side alternatives	Assess portfolio of DSM from Navigant High case along with consideration of additional supply side alternatives	Assess demand and Supply-side alternatives to meet projected capacity need with a focus on adding renewables and storage
DSM Input Case	Navigant Base (Optimized)	Navigant 2%	Optimal Program Achievable	Navigant High	Optimal Program Achievable (Optimized)

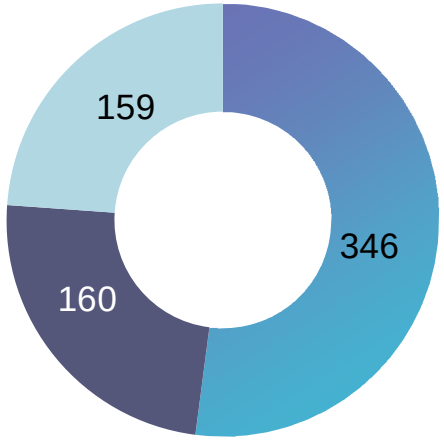
Strategy 1 - Capacity Expansion Portfolios

SCENARIO 1★



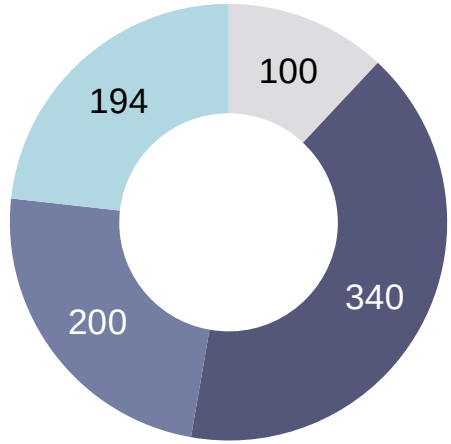
Resource	Year	Installed Cap (MW)
M 501 J CT	2033	346
Solar	2033	200
Battery	2033	20
Battery	2034	20
Battery	2035	20

SCENARIO 2



Resource	Year	Installed Cap (MW)
M 501 J CT	2033	346
Battery	2033	120
Battery	2034	20
Battery	2038	20

SCENARIO 3



Resource	Year	Installed Cap (MW)
Solar	2033	100
Battery	2033	320
Wind	2034	200
Battery	2038	20

Solar ■ M501 CT ■ Battery ■ Wind ■ DSM*

**DSM value represents last year's (2038) peak reduction throughout study period, inclusive of EE and DR contribution*

Resource MW capacity amounts represent installed capacity

★ Indicates initial recommendation for further Total Supply Cost evaluations

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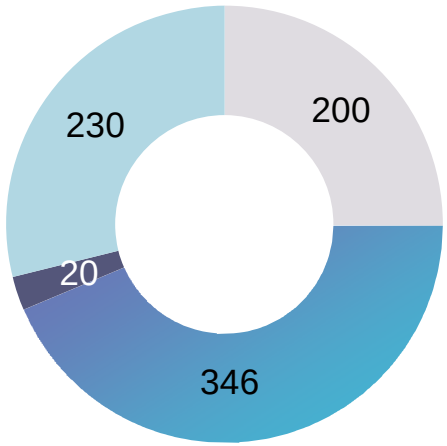
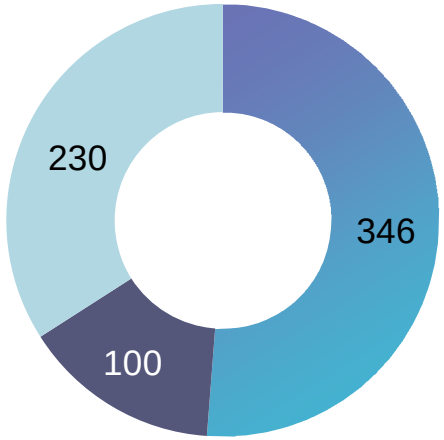
Strategy 2 - Capacity Expansion Portfolios

SCENARIO 1★



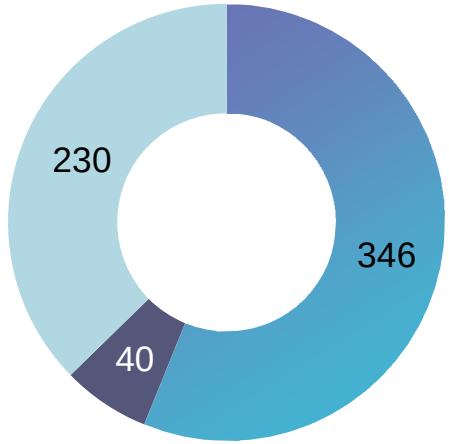
Resource	Year	Installed Cap (MW)
M 501 J CT	2033	346
Solar	2033	200
Battery	2038	20

SCENARIO 2



Resource	Year	Installed Cap (MW)
M 501 J CT	2033	346
Battery	2033	60
Battery	2035	20
Battery	2038	20

SCENARIO 3



Resource	Year	Installed Cap (MW)
M 501 J CT	2033	346
Battery	2038	40

Solar ■ M501 CT ■ Battery ■ Wind ■ DSM*

**DSM value represents last year's (2038) peak reduction throughout study period, inclusive of EE and DR contribution*

Resource MW capacity amounts represent installed capacity

★ Indicates initial recommendation for further Total Supply Cost evaluations

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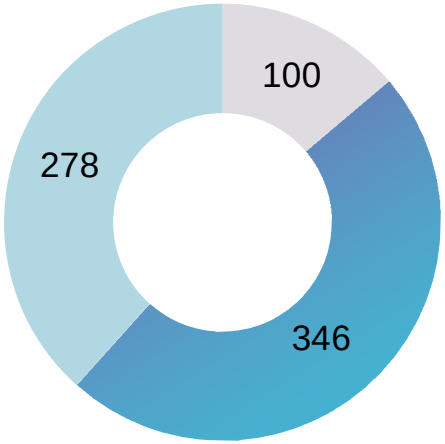
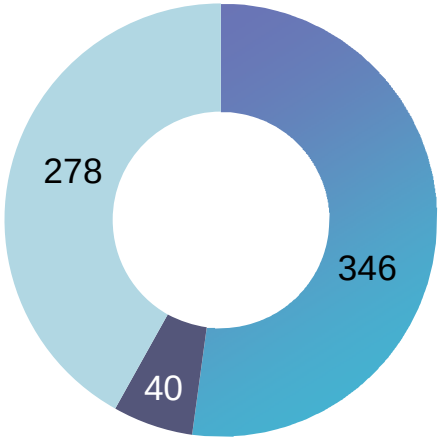
Strategy 3 - Capacity Expansion Portfolios

SCENARIO 1



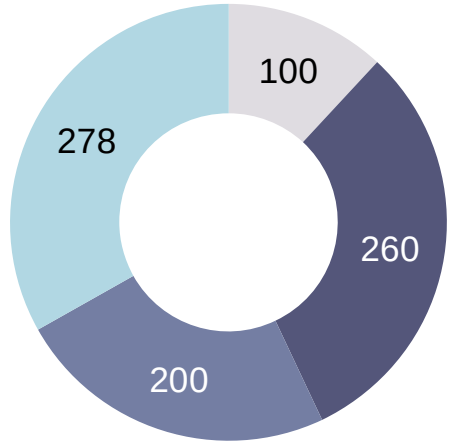
Resource	Year	Installed Cap (MW)
M 501 J CT	2033	346
Solar	2034	100

SCENARIO 2



Resource	Year	Installed Cap (MW)
M 501 J CT	2033	346
Battery	2034	40

SCENARIO 3 ★



Resource	Year	Installed Cap (MW)
Solar	2033	100
Battery	2033	240
Battery	2034	20
Wind	2038	200

Solar ■ M501 CT ■ Battery ■ Wind ■ DSM*

**DSM value represents last year's (2038) peak reduction throughout study period, inclusive of EE and DR contribution*

Resource MW capacity amounts represent installed capacity

★ Indicates initial recommendation for further Total Supply Cost evaluations

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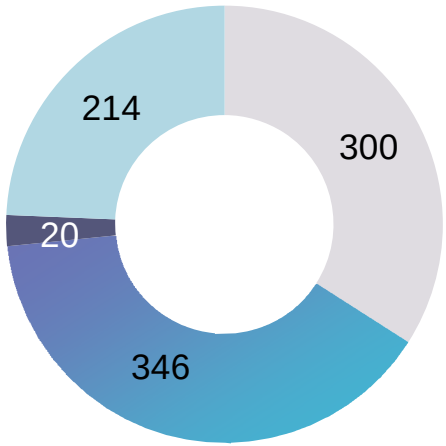
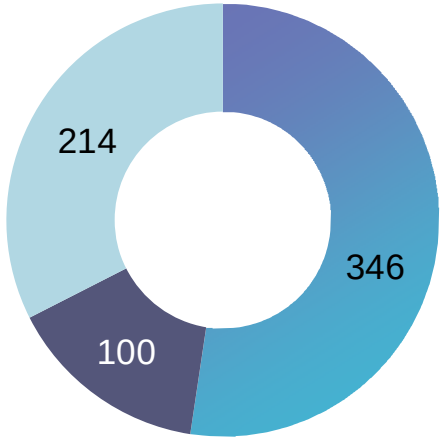
Strategy 4 - Capacity Expansion Portfolios

SCENARIO 1



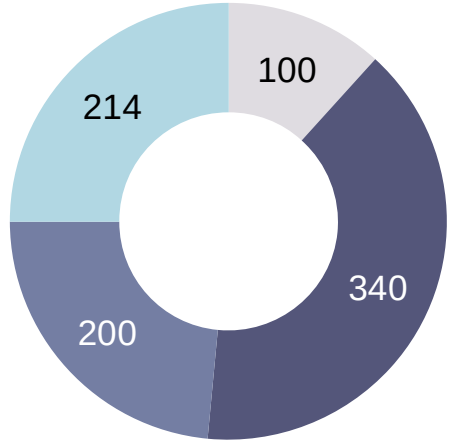
Resource	Year	Installed Cap (MW)
M 501 J CT	2033	346
Solar	2033	100
Battery	2033	20
Solar	2034	100
Solar	2038	100

SCENARIO 2 ★



Resource	Year	Installed Cap (MW)
M 501 J CT	2033	346
Battery	2033	60
Battery	2034	20
Battery	2035	20

SCENARIO 3



Resource	Year	Installed Cap (MW)
Solar	2033	100
Battery	2033	300
Battery	2034	20
Battery	2035	20
Wind	2037	200

Solar ■ M501 CT ■ Battery ■ Wind ■ DSM*

**DSM value represents last year's (2038) peak reduction throughout study period, inclusive of EE and DR contribution*

Resource MW capacity amounts represent installed capacity

★ Indicates initial recommendation for further Total Supply Cost evaluations

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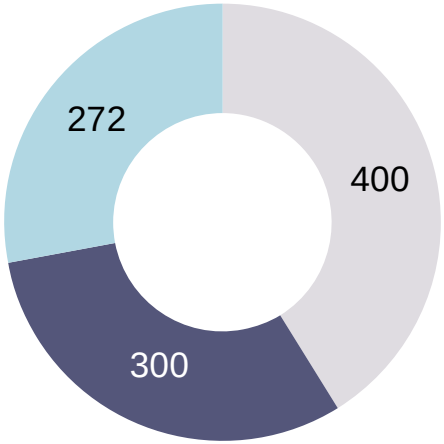
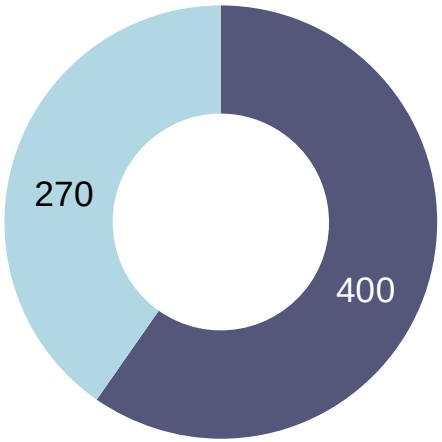
Strategy 5 - Capacity Expansion Portfolios

SCENARIO 1★



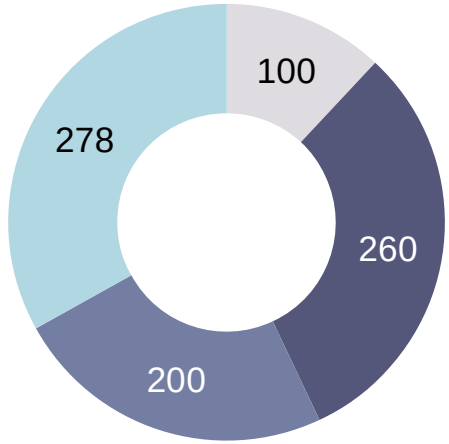
Resource	Year	Installed Cap (MW)
Battery	2033	240
Solar	2033	400
Battery	2034	40
Battery	2038	20

SCENARIO 2



Resource	Year	Installed Cap (MW)
Battery	2033	360
Battery	2034	40

SCENARIO 3



Resource	Year	Installed Cap (MW)
Solar	2033	100
Battery	2033	240
Battery	2034	20
Wind	2038	200

Solar M501 CT Battery Wind DSM*

**DSM value represents last year's (2038) peak reduction throughout study period, inclusive of EE and DR contribution*

Resource MW capacity amounts represent installed capacity

★ Indicates initial recommendation for further Total Supply Cost evaluations

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Capacity Expansion Portfolio Selections

Capacity Expansion Portfolio Selection					
	Strategy 1	**Strategy 2**	**Strategy 3**	**Strategy 4**	**Strategy 5**
Scenario 1	★ 187, 200, 60, 346	★ 230, 200, 20, 346	100, 278, 346	214, 300, 20, 346	★ 272, 400, 300
Scenario 2	159, 346, 160	230, 346, 100	278, 346, 40	★ 214, 346, 100	270, 400
Scenario 3	100, 194, 340, 200	230, 346, 40	★ 100, 278, 260, 200	100, 214, 340, 200	☆ 100, 278, 260, 200

Solar
M501 CT
Battery
Wind
DSM

★ Indicates initial recommendation for further Total Supply Cost evaluations

☆ Strategy 3, Scenario 3 Portfolio is identical to Strategy 5, Scenario 3 Portfolio

Strategy 1 & 5 Energy Efficiency Selections

Under Strategies 2-4, all DSM programs identified in the selected DSM Input cases contributed towards meeting ENOL's supply needs.

Strategy 1 (Navigant Base DSM)			
Program	**Scenario 1**	**Scenario 2**	**Scenario 3**
Com Behavior	✓	✓	✓
Large C&I	✓	✓	✓
Small C&I	✓	✓	✓
Consumer Products	✓ *2033*	✓ *2033*	✓
HPwES	✓	✓ *2033*	✓
HVAC	✓	✓ *2033*	✓
Low Income and Multi Family	✓	✓ *2033*	✓
Res Behavior	✓	✓	✓
School Kits	✓	✓	✓

Strategy 5 (Optimal Program Achievable DSM)			
Program	**Scenario 1**	**Scenario 2**	**Scenario 3**
Home Energy Services	✓	✓ *2033*	✓
Res HVAC	✓	Not Selected	✓
Res Efficient Products	✓	✓	✓
Res Lighting	Not Selected	Not Selected	✓
Efficient New Homes	Not Selected	Not Selected	✓
Appliance Recycling	✓	✓	✓
CVR- Res	✓	✓	✓
Small Business DI	✓	✓	✓
Commercial Prescriptive	✓	✓	✓
Commercial Custom	✓	✓	✓
Retro commissioning	✓	✓	✓
New Construction	✓	✓	✓
CVR – C&I	✓	✓	✓

Demand Response Programs

Under each Strategy, all Demand Response programs identified through the selected DSM Input case were assumed to be economic and contributed to meeting ENOL's supply needs.

Navigant Demand Response	
Program	**Description**
DLC-thermostat- HVAC	Control of cooling load using a PCT.
Dynamic Pricing w/o Enabling Tech	Voluntary opt-in dynamic pricing offer with enabling technology.
Dynamic Pricing with Enabling Tech	Voluntary opt-in dynamic pricing offer without enabling technology.
DLC-Switch-HVAC	Control of cooling load using a load control switch.
C&I Curtailment-Manual HVAC Control	Firm capacity reduction Commitment. $/kW payment based on contracted capacity plus $/kWh payment based on energy reduction during an event.

Optimal Demand Response	
Program	**Description**
RES DLC/ADR	Reduce residential peak demand during load control events through remotely controlled programs and software.
Res- Pricing- PTR	Pay-for-performance incentive programs that pay participants to reduce energy use during certain hours of selected days when a peak event is called.
Large Cust SOP	The customer is paid to allow the utility to curtail load for a maximum number of times during set periods, usually with 24 hour advance notice.

Section 2

Risk Assessment

Proposed Risk Assessments

Following agreement at Technical Meeting #4 on the subset of 5-6 portfolios to be carried through the total relevant supply cost analysis, selected portfolios will be passed through two rounds of risk analysis to comply with Section 8 of the IRP rules:

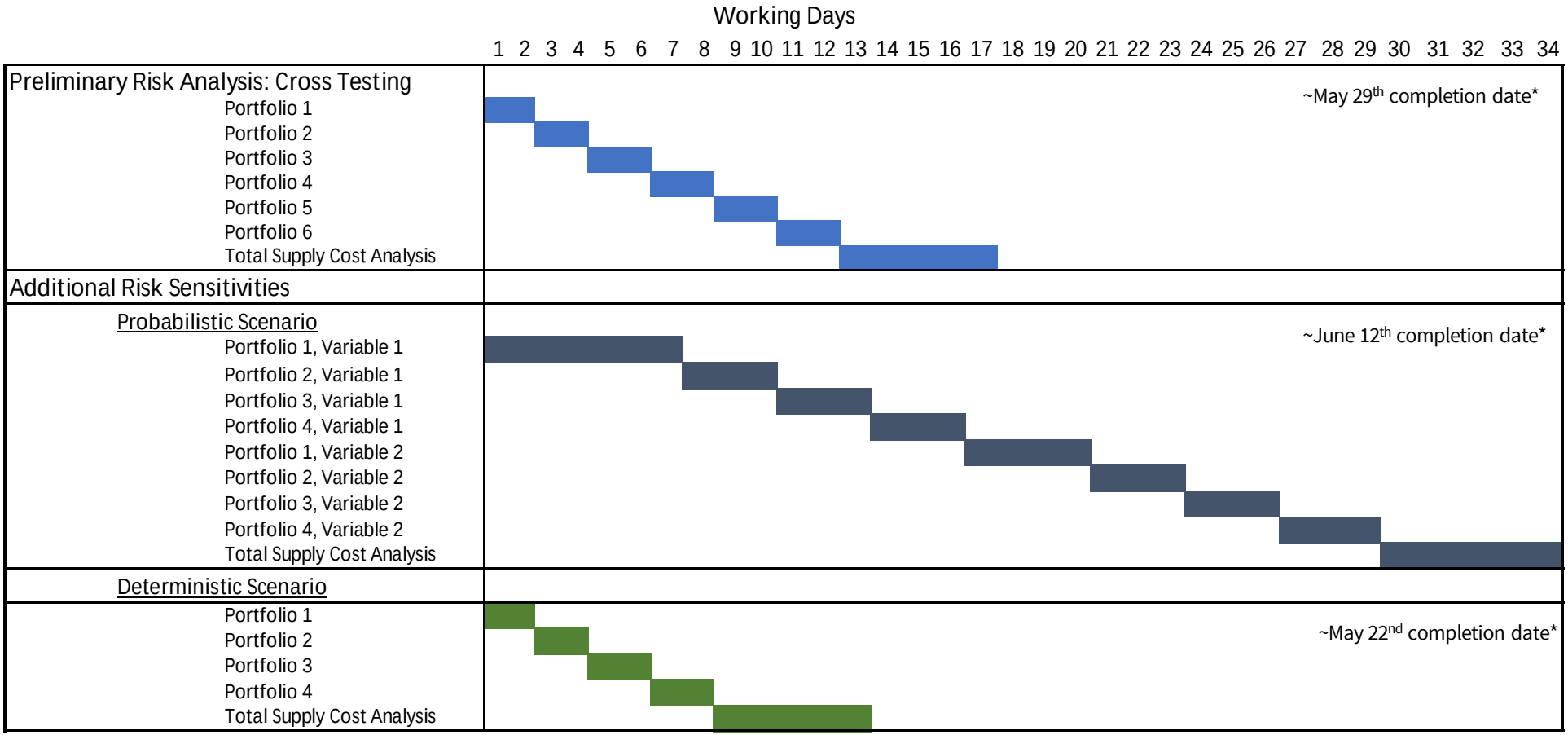
1. Primary Risk Analysis: Cross-Testing
   - A. Time Necessary to Complete: 2 days per portfolio
     - a) Cross-testing determines how each portfolio's total supply costs change under the assumptions of the 3 Scenarios.
2. Secondary Risk Analysis: Additional Sensitivities on Variable Supply Cost Inputs
   - A. ENOL proposes analyzing variations for two key inputs:
     - i. Gas Price
     - ii. CO_2 Forecast
   - B. Next, portfolios would be analyzed using <u>one</u> of two possible Alternative Sensitivity Evaluation methods:
     - i. Probabilistic Assessment: variable supply cost simulation based on a distribution of possible outcomes around two individual inputs.
       - a) Use a single Scenario (recommend Scenario 1)
       - b) 29 days required to complete (assumes four portfolios, which is the limit possible under current timeline)

     <u>OR</u>

     - i. Deterministic Assessment: variable supply cost simulations based on a high or low forecast of a single or multiple inputs
       - a) 2 days per portfolio per scenario to complete

Proposed Risk Assessments

All estimated dates assume a May 6th start date with no schedule modifications.



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Section 3

Scorecard Metrics

Proposed Scorecard

Scoring Criteria	Scoring Weight	Scoring Parameters / Descriptions 1	4	7	10
Cost and Risk	50.0%				
Expected Value (Average Cost Across Futures)	20.0%	≤ 2.50	2.51 - 5.00	5.01 - 7.50	> 7.50
Downside Risk (Maximum Cost - Expected Cost)	15.0%	≤ 2.50	2.51 - 5.00	5.01 - 7.50	> 7.50
Upside Potential (Expected Value - Lowest Cost)	15.0%	≤ 2.50	2.51 - 5.00	5.01 - 7.50	> 7.50
Operational Flexibility	20.0%				
Flexible Resources (MW of Ramp)	6.7%	≤ 2.50	2.51 - 5.00	5.01 - 7.50	> 7.50
Quick-Start Resources (MW of Quick-Start)[1]	6.7%	≤ 2.50	2.51 - 5.00	5.01 - 7.50	> 7.50
UCAP/ICAP Ratio (UCAP/ICAP)	6.7%	≤ 2.50	2.51 - 5.00	5.01 - 7.50	> 7.50
Environmental Impact	20.0%				
CO_2 Intensity (Tons CO_2/GWh)	10.0%	≤ 2.50	2.51 - 5.00	5.01 - 7.50	> 7.50
Groundwater Usage (% of Portfolios with Groundwater Usage)	10.0%	< 33%	> 33%	>66%	= 100%
Policy Goals/Sustainability	5.0%				
100% Low Carbon (% of Carbon Free Energy from New Resource)[2]	1.7%	< 33%	> 33%	>66%	= 100%
255 MW Solar Added (Total Solar MW in Portfolio)	1.7%	< 150 MW	> 200MW	>225 MW	≥ 255 MW
3.3% Annual Energy Savings (CAGR over 20 Years)	1.7%	< 1.0%	> 1.0%	>2.0%	≥ 3.3%
Economic Impact	5.0%				
Macroeconomic Factor (To be developed)	5.0%	≤ 2.50	2.51 - 5.00	5.01 - 7.50	> 7.50

Notes:

1. Quick-Start includes supply and demand side dispatchable
2. Carbon-Free Resources include Energy Efficiency

Section 4

Energy Smart Program

Energy Smart Implementation Plan Timeline

IRP Technical Meeting #4	May 1, 2019
2018 IRP Report filed	July 19, 2019
IRP Technical Meeting #5	August 28, 2019- September 11, 2019
Intervenor Comments (IRP)	September 16, 2019
Draft of Implementation Plan	Early November 2019
Proposed Technical Conference	November 12, 2019 - November 22, 2019
Advisors' Report	December 2, 2019
Implementation Plan Filing	December 9, 2019

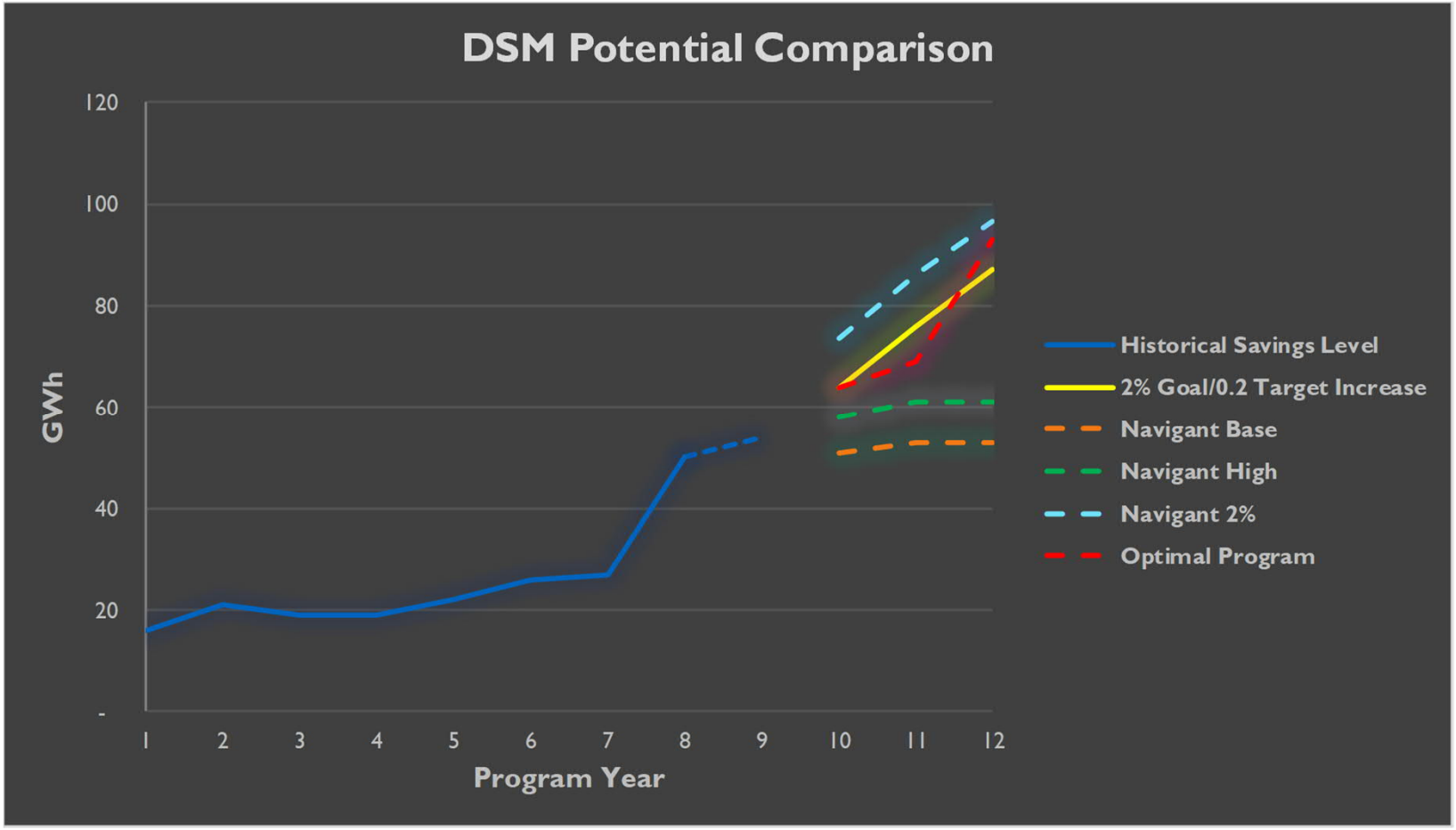
DSM Program Matrix

Current Programs	Navigant	Optimal
Home Performance w Energy Star	Home Performance w Energy Star	Home Energy Services
Energy Smart for Multifamily	Low Income & Multifamily	
High Efficiency AC Tune Up	HVAC	Res HVAC
Residential Lighting and Appliances	Consumer Products	Res Lighting & Res Efficient Products
Behavioral	Residential Behavioral	
	Commercial Behavioral	
Low Income	Low Income & Multifamily	
School Kits	School kits	
Small Commercial Solutions	Small C&I	Small Business DI, Commercial Custom, Retrocommissioning and Commercial Prescriptive
Large Commercial Solutions	Large C&I	
Publicly Funded Institutions		
		New Construction
		Appliance Recycling
		Efficient New Homes
		CVR- Res
		CVR - C&I

Program Year 10-12—Potential New Measures

- Residential Measures
  - Heat Pump
  - Refrigerator Recycling and Replacement
  - Conservation Voltage Reduction
  - Ceiling Fans
  - Dehumidifiers
  - ENERGY STAR windows
  - Residential DR – BYOT/DLC
- Commercial Measures
  - Retrocommissioning
  - LED Tube Replacement
  - ENERGY STAR ice makers
  - Cool Roofs
  - C&I DR - Curtailment

Savings Potential Comparison



Section 5

Timeline and Next Steps

Current Timeline

Description	Target Date	Status
Public Meeting #1- Process Overview	September 2017	✓
Technical Meeting #1 Material Due	January 2018	✓
Technical Meeting #1	January 2018	✓
Technical Meeting #2 Material Due	August 2018	✓
Technical Meeting #2	September 14, 2018	✓
Technical Meeting #3 Material Due	November 14, 2018	✓
Technical Meeting #3	November 28, 2018	✓
IRP Inputs Finalized	December 7, 2018	✓
Optimized Portfolio Results Due	April 8, 2019	✓
Technical Meeting #4 Material Due	April 17, 2019	✓
Technical Meeting #4	May 1, 2019	✓
File IRP Report	July 19, 2019	-
Public Meeting #2 Material Due	July 2019	-
Public Meeting #2 - Present IRP Results	August 2019	-
Public Meeting #3 Material Due	August 2019	-
Technical Meeting #5 Material Due	August 2019	-
Public Meeting #3 - Public Response	September 2019	-
Technical Meeting #5	September 2019	-
Intervenors and Advisors Questions & Comments Due	September 2019	-
ENOL Response to Questions and Comments Due	October 2019	-
Advisors File Report	December 2, 2019	-
Energy Smart PY 10-12 Implementation Plan Filed	December 9, 2019	-

Appendix

Renewable Resource Assumptions (Solar PV & Wind)

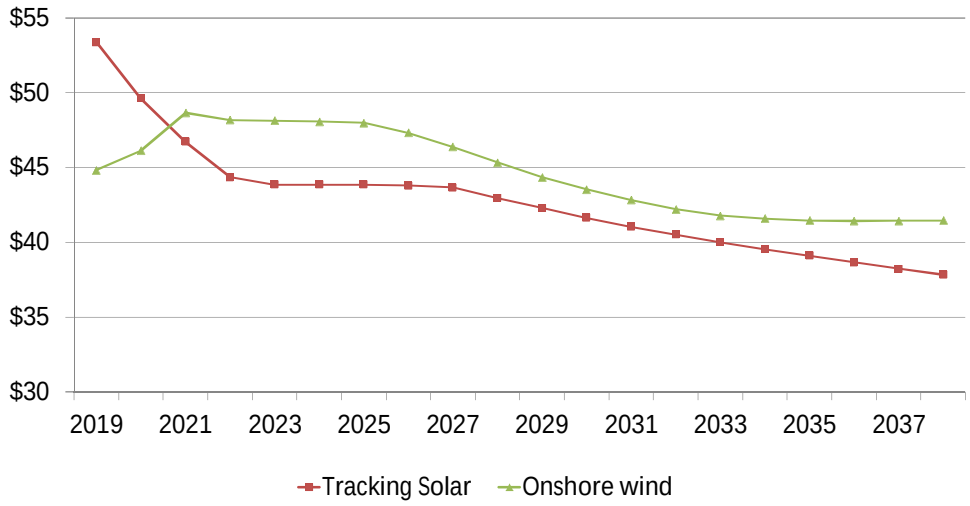
Levelized Real Cost of Electricity (2019$/MWh-AC) [1]

	2019	2020	2021	2022	2023	2026	2029	2032	2035	2038
Solar Tracking [2]	$53.39	$49.64	$46.71	$44.35	$43.86	$43.79	$42.28	$40.51	$39.10	$37.82
Onshore Wind [3]	$44.82	$46.12	$48.65	$48.19	$48.14	$47.32	$44.35	$42.21	$41.47	$41.46

Other Modeling Assumptions

	Solar	Wind
Fixed O&M (2017$/kW-yr-AC)	$16	$36.01
Useful Life (yr)	30	25
MACRS Depreciation (yr)	5	5
Capacity Factor	26%	36%
DC:AC	1.35	N/A
Hourly Profile Modeling Software	PlantPredict	NREL SAM

Levelized Real Cost of Electricity (2019$/MWh) 1



1. Year 1 levelized real cost for a project beginning in the given year
2. ITC normalized over useful life and steps down to 10% by 2023
3. PTC steps down to 40% by 2020 and expires thereafter

Source: The capital cost assumptions for Wind and Solar are based on a confidential IHS Markit forecast.

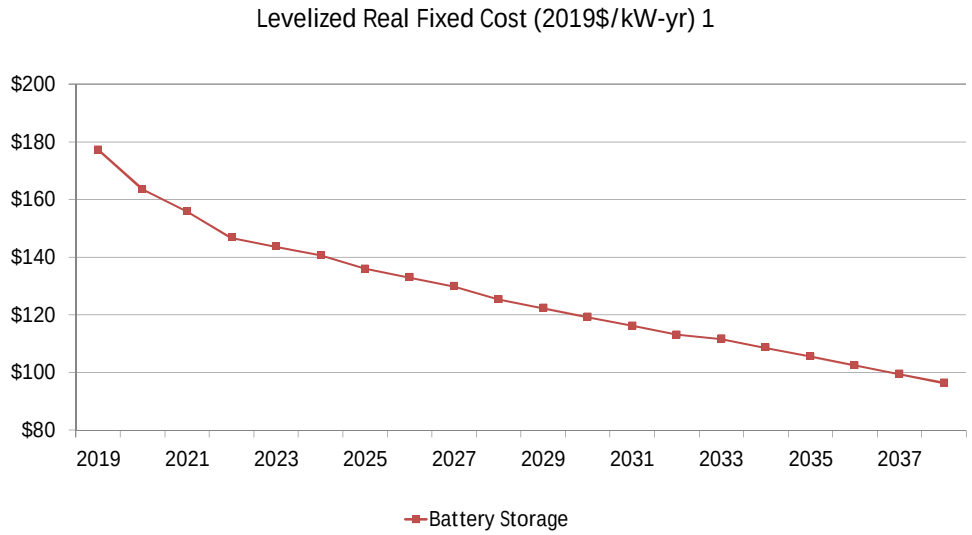
Battery Storage Assumptions

Levelized Real Fixed Cost (2019$/kW-yr) [1]

	2019	2020	2021	2022	2023	2026	2029	2032	2035	2038
Battery Storage	$177	$163	$155	$146	$143	$132	$122	$113	$105	$96

Other Modeling Assumptions

	Battery Storage
Energy Capacity : Power [2]	4:1
Fixed O&M (2017$/kW-yr)	$9.00
Useful Life (yr) [3]	10
MACRS Depreciation (yr)	7
AC-AC efficiency	90%
Hourly Profile Modeling Software	Aurora



1. Year 1 levelized real cost for a project beginning in the given year
2. Current MISO Tariff requirement for capacity credit
3. Assumes daily cycling, no module replacement cost, full depth of discharge

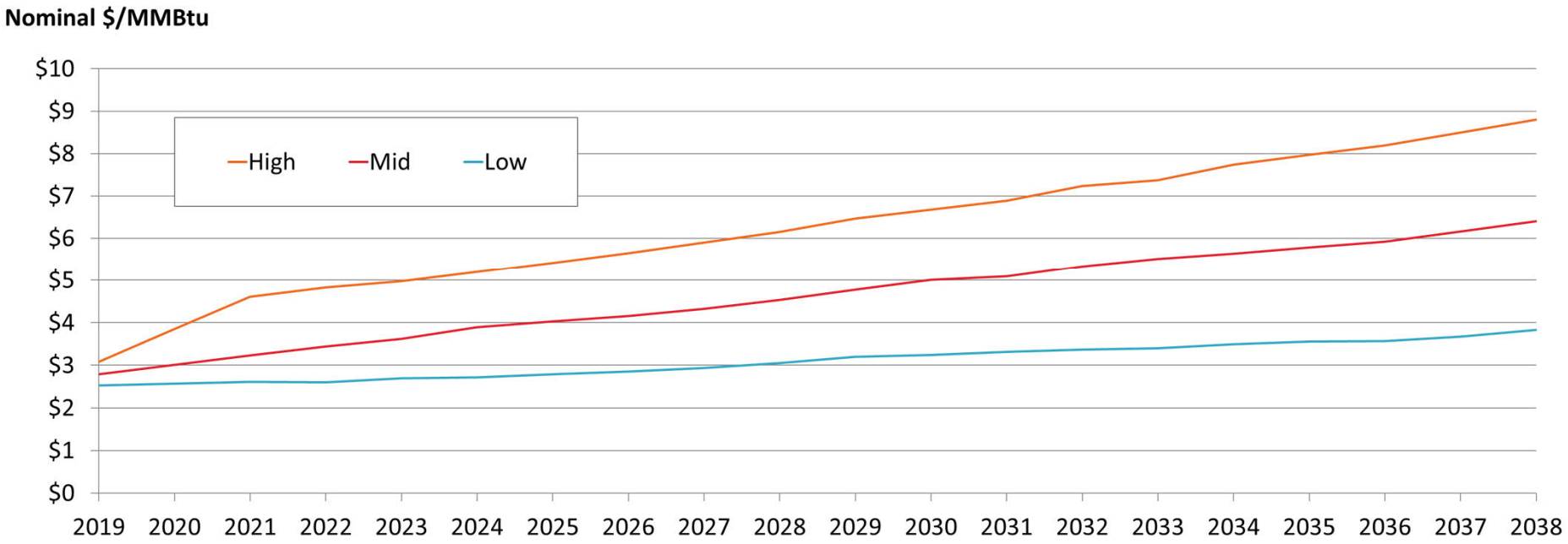
Source: The capital cost assumptions for Battery Storage is based on a confidential IHS Markit forecast.

Gas Resource Assumptions

Technology		Summer Capacity [MW]	Capital Cost [2017$/kW]	Fixed O&M [2017$/kW-yr]	Variable O&M [2017 $/MWh]	Heat Rate* [Btu/kWh]	Expected Capacity Factor [%]
Combined Cycle Gas Turbine (CCGT)	*1x1 501JAC*	605	$1,244	$16.70	$3.14	6,300	80%
Simple Cycle Combustion Turbine (CT)	*501JAC*	346	$809	$2.37	$13.35	9,400	10%
Aeroderivative Combustion Turbine (Aero CT)	*LMS100PA*	102	$1,543	$5.86	$2.90	9,400	20%
Reciprocating Internal Combustion Engine (RICE)	*7x Wartsila 18V50SG*	128	$1,545	$31.94	$7.30	8,400	30%

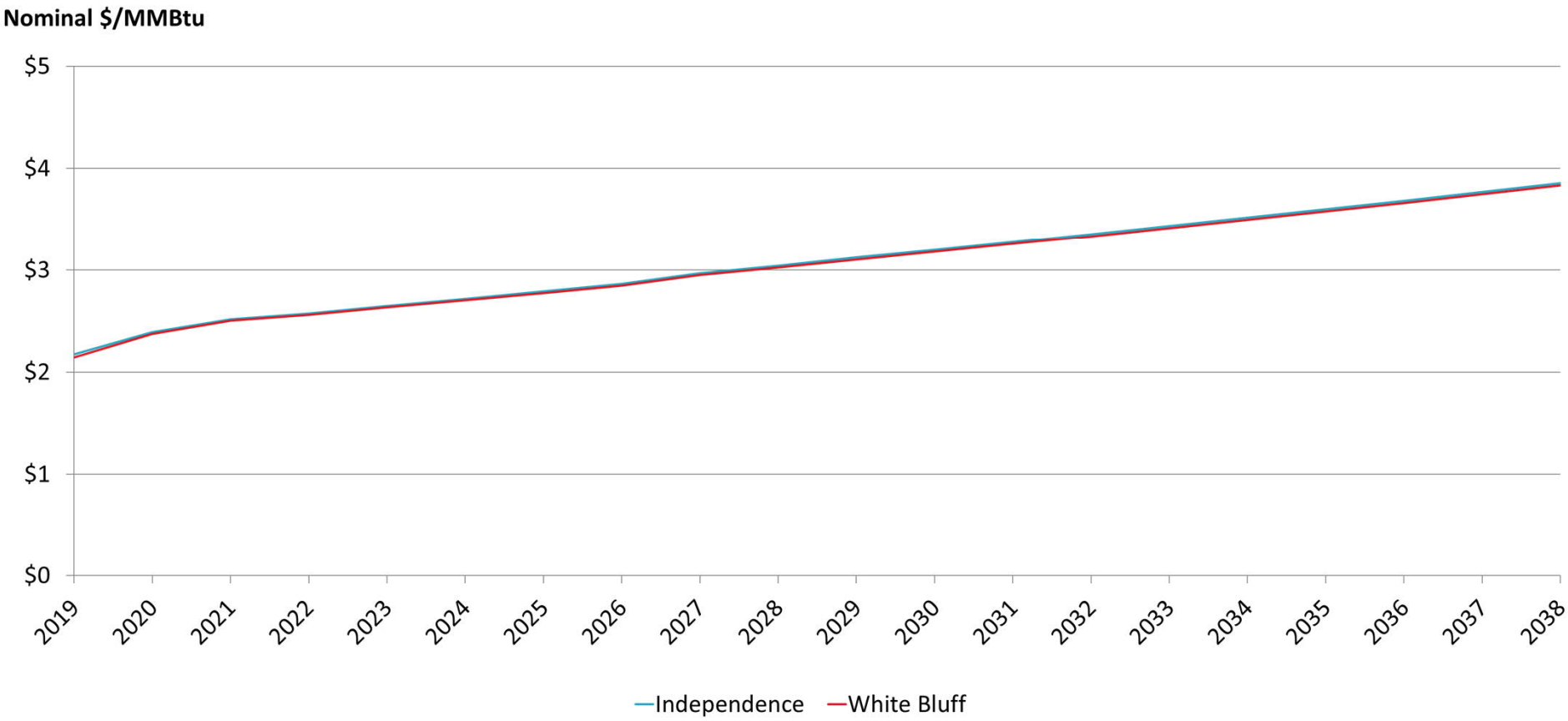
*Heat Rate based on full load without duct firing

Gas Price Forecast

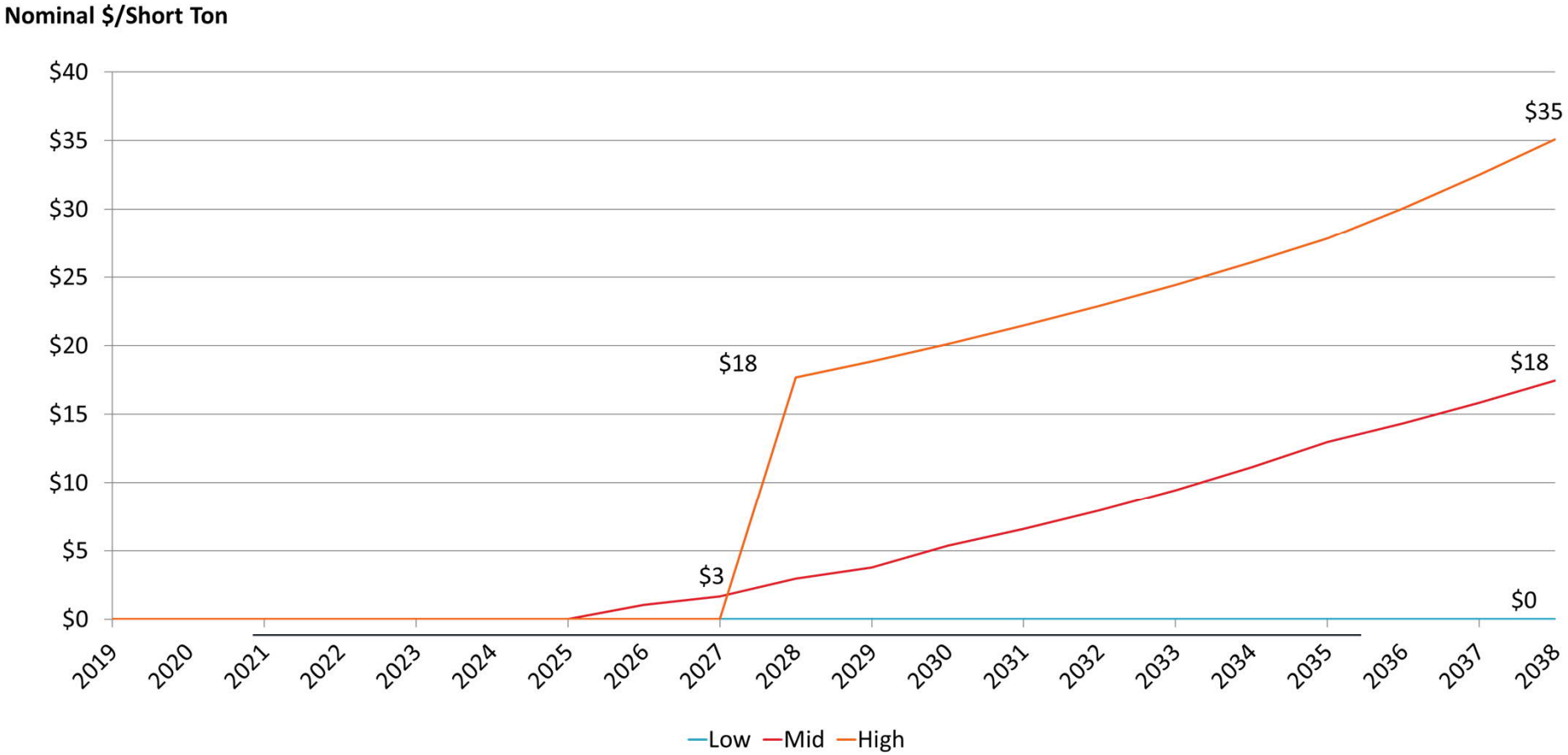


Case	2019	2026	2031	2038
Low	$2.52	$2.86	$3.32	$3.83
Medium	$2.79	$4.15	$5.09	$6.41
High	$3.09	$5.64	$6.89	$8.80

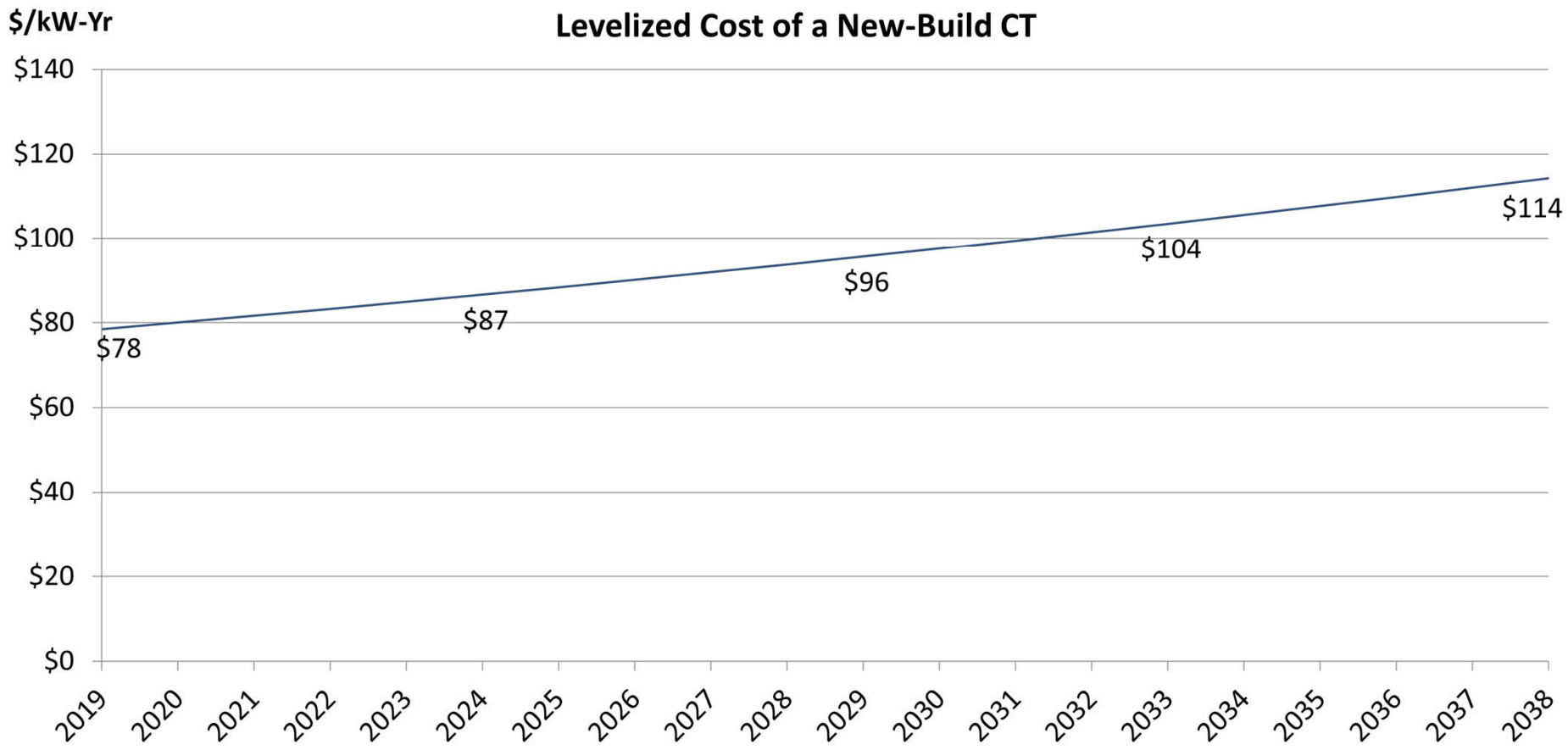
Coal Price Forecast



CO_2 Price Forecast

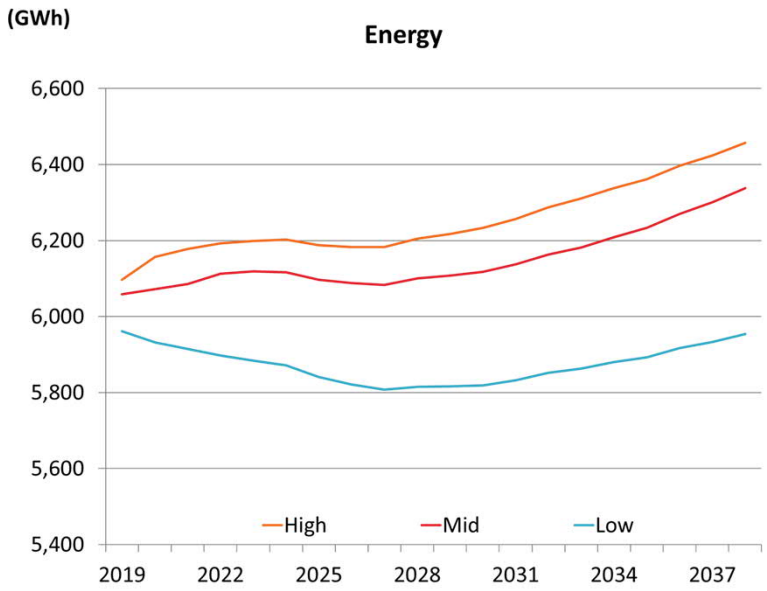


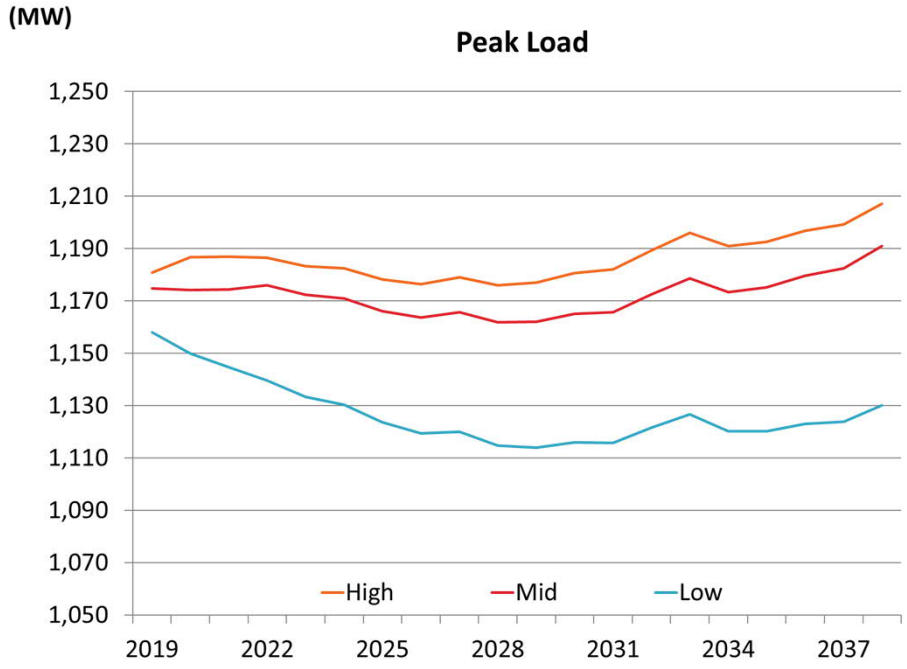
Capacity Value Forecast



Peak Load & Energy Forecast

3 demand forecasts were created for the ENO IRP: a low, medium, and high

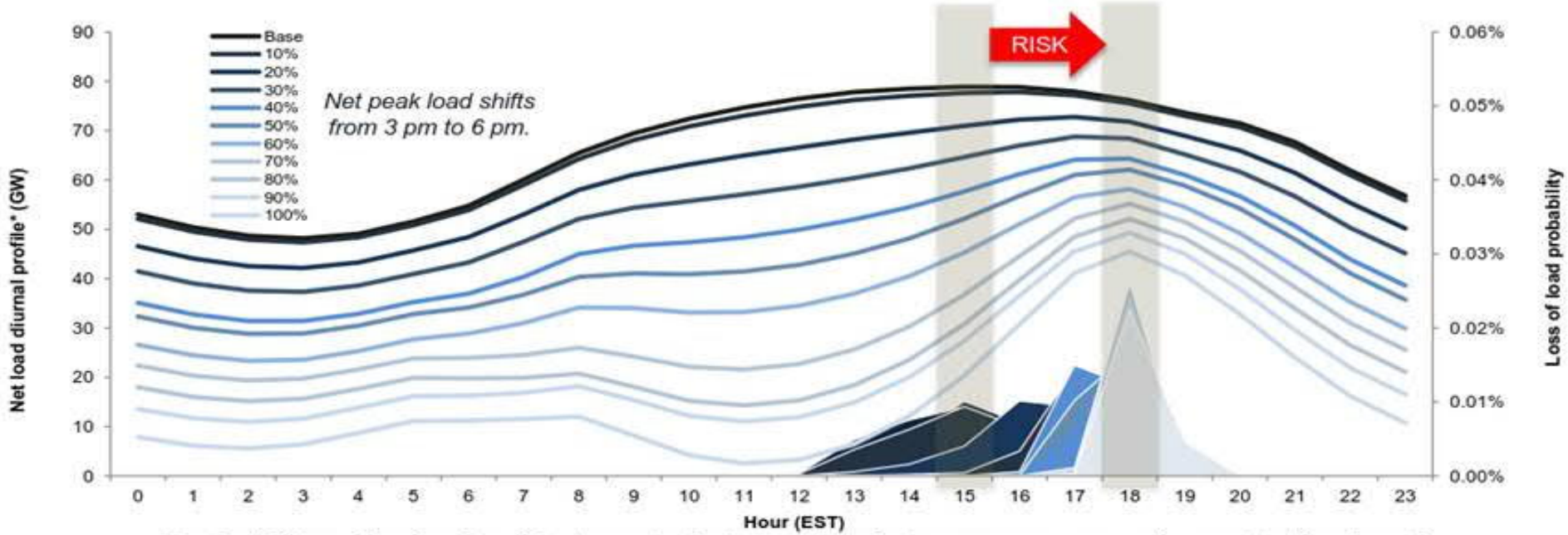




10 Year CAGR (%)	2019 – 2028	2029 – 2038
Low	- 0.28%	0.26%
Medium	0.08%	0.41%
High	0.20%	0.42%

Peak Load (MW)	2019	2024	2029	2033	2038
Low	1,158	1,130	1,114	1,127	1,130
Medium	1,175	1,171	1,162	1,179	1,191
High	1,181	1,182	1,177	1,196	1,207

As renewable penetration increases, the risk of losing load shifts and compresses to a smaller number of hours



- Probability of losing load is targeted at one day in ten years over all penetration levels.
- While aggregate risk remains constant, the risk in particular hours increases.

*Profile shapes represent hourly averages across all days of the 6 study years.

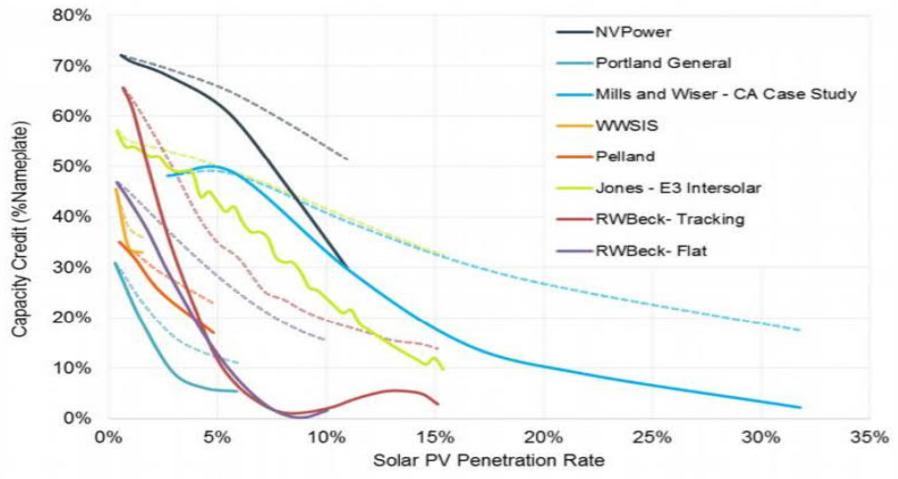
Effective Load Carrying Capability for Solar Generation

Effective Load Carrying Capability (ELCC):

Effective Load Carrying Capability (ELCC) is defined as the amount of incremental load a resource, such as wind or solar, can dependably and reliably serve, while also considering the probabilistic nature of generation shortfalls and random forced outages as driving factors to load not being served.

- ELCC has been used in the determination of capacity value for generation resources as far back as 1966 [1].
- MISO currently uses ELCC to determine the capacity value for wind. The first ELCC-capacity credit in MISO was applied when wind achieved 8% Penetration, or 10 GW Nameplate.

- According to the MISO PY 2019/20 Loss of Load Expectation (LOLE) Study, there is roughly 0.6 GWs of solar active in MISO Market. However, the penetration of solar is expected to increase significantly over the planning horizon.
- MISO along with other balancing authorities have applied or expect to apply in the future an ELCC approach to determining solar capacity value
    - California Public Utility Commission Currently employs this method.
    - PJM is currently studying the implementation of this method.



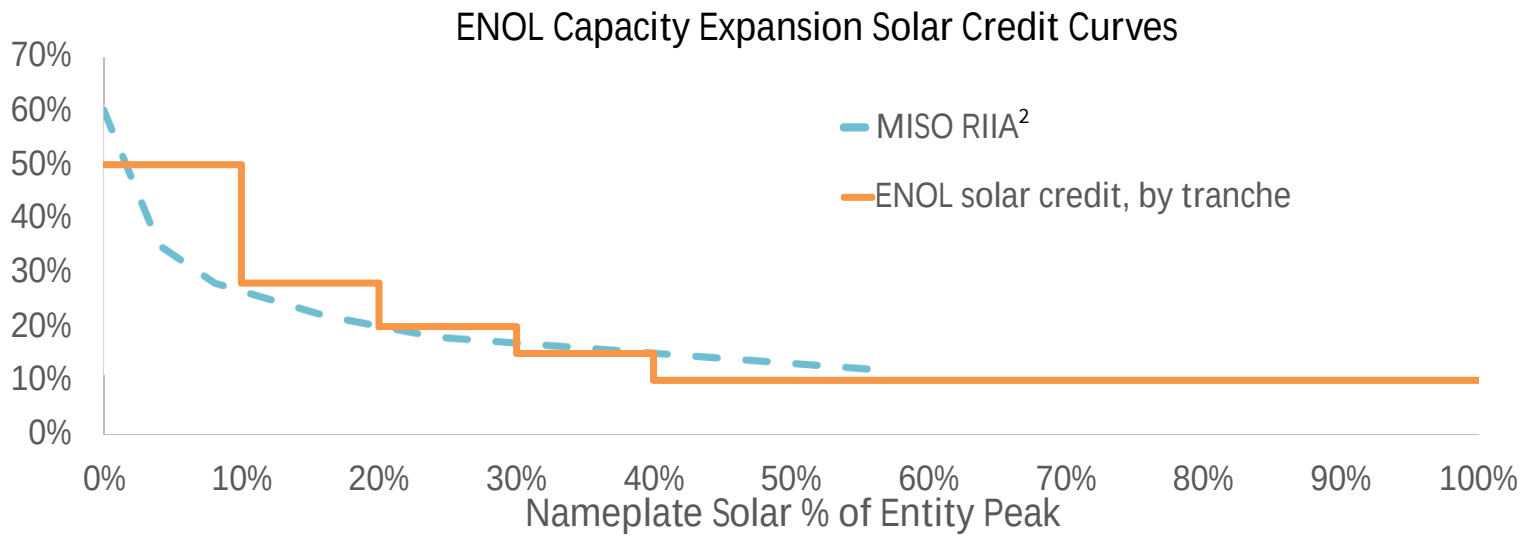
DOE, 2016, "Maintaining Reliability in the Modern Power System", Available Online: https://www.energy.gov/sites/prod/files/2017/01/f34/Maintaining%20Reliability%20in%20the%20Modern%20Power%20System.pdf

Note 1: Garver, L.L.; , "Effective Load Carrying Capability of Generating Units," Power Apparatus and Systems, IEEE Transactions on, vol.PAS-85, no.8, pp.910-919, Aug. 1966

Note 2: *RIIA is MISO's Renewable Integration Impact Assessment; https://cdn.misoenergy.org/20180605%20RIIA%20Workshop%20Presentation213125.pdf

Solar Generation Modeling Assumptions

- Solar Capacity Credit within IRP Evaluation:
  - For the purpose of calculating Total Supply Cost solar will receive 50% Capacity Credit[1]
  - Consistent with the curve reviewed in the MISO Renewable Integration Impact Study (RIIA), for the purpose of capacity expansion beginning in year 2031 solar received decreasing credit towards peak demand based on increasing solar penetration.



Note 1: Consistent with MISO's current solar capacity credit methodology.

Note 2: *RIIA is MISO's Renewable Integration Impact Assessment; https://cdn.misoenergy.org/20180605%20RIIA%20Workshop%20Presentation213125.pdf

CERTIFICATE OF SERVICE
Docket No. UD-17-03

I hereby certify that I have served the required number of copies of the foregoing report upon all other known parties of this proceeding, by the following: electronic mail, facsimile, overnight mail, hand delivery, and/or United States Postal Service, postage prepaid.

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