



ENO 2021 IRP
Technical Meeting #4



January 19, 2022

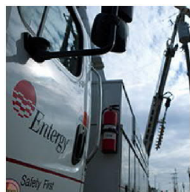
Goals and Agenda of Technical Meeting #4

Goals

- The Initiating Resolution (R-20-257) contemplates several goals for this Technical Meeting:
 - Review and discuss the Optimized Resource Portfolios selected through the Aurora capacity expansion modeling, and reach consensus on the subset of portfolios to be carried through the total supply cost analysis and cross testing;
 - Finalize the Scorecard Metrics initially presented at Technical Meeting #3;
 - Engage in an initial discussion regarding Energy Smart Program Years 13-15 (2023-2025).

Agenda

1. Optimized Resource Portfolio Discussion and Downselection
2. Risk Assessment Discussion
3. Scorecard Metrics Discussion
4. Energy Smart PY 13-15 Program Discussion
5. Timeline and Next Steps



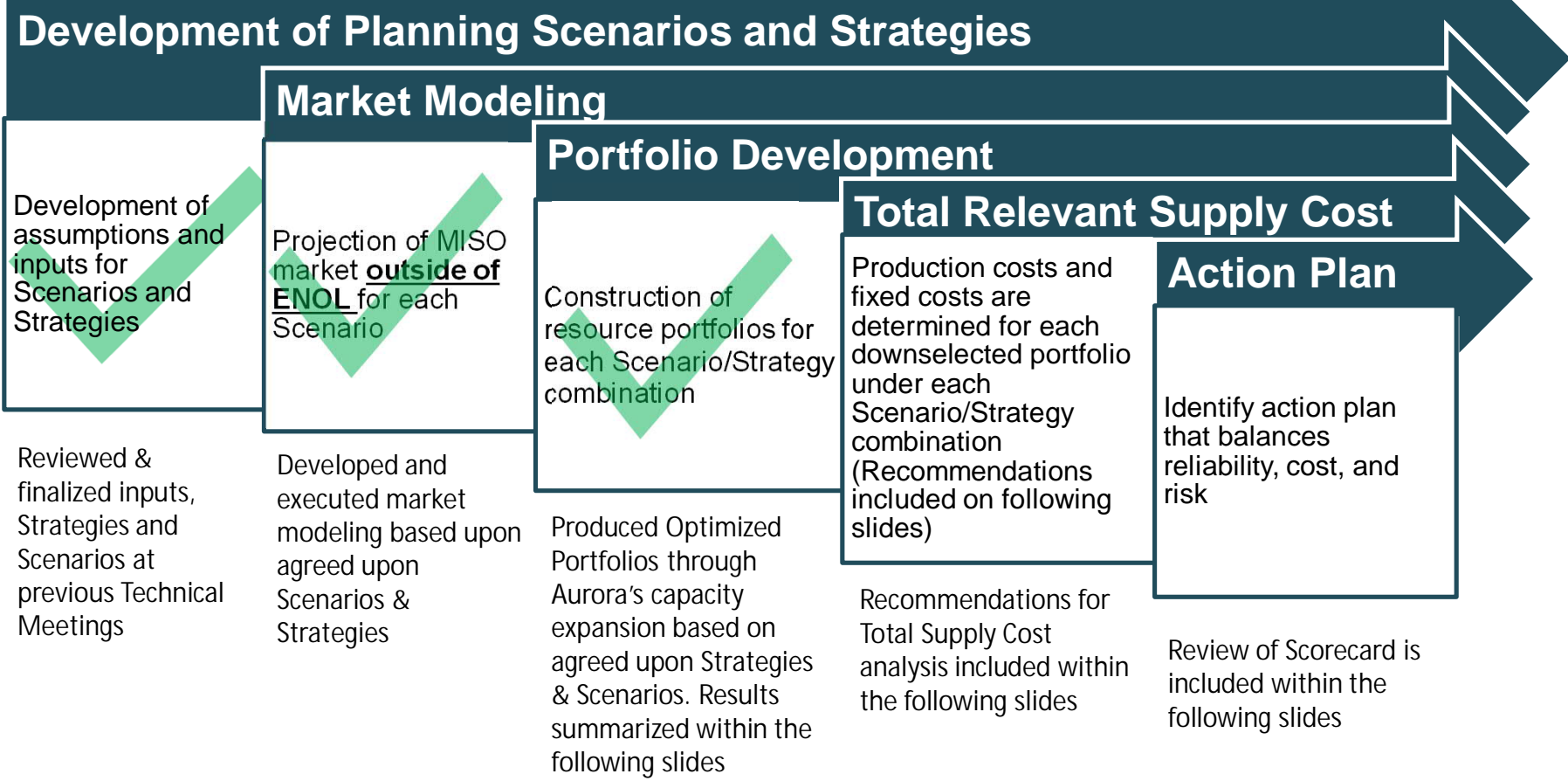
Technical Meeting #3 (8/12/21)—Follow Ups

- Planning Scenarios and Strategies
 - Parties had further discussions regarding Planning Strategies to be analyzed under the Planning Scenarios finalized on 6/29/21.
 - The Parties reached consensus on 8/16/21 regarding four Planning Strategies to be modeled, two of which would include additional manual portfolios and one of which would include a sensitivity case.
 - The Stakeholders agreed to provide the Renewable LCOE values to be used in modeling the Stakeholder Strategy #4 and its associated sensitivity.
 - The final Excel file containing LCOE values was received from Simon Mahan on 9/13/21 and submitted to EPG for review.
 - On 10/4/21, EPG provided an Excel file converting the LCOE values to the \$/MW-week metric required for inputting the renewables costs into Aurora.
- DSM Inputs
 - After follow up discussions, GDS provided the necessary EE and DR input files for EPG to use in modeling Stakeholder Strategy #4 on 9/13 and 9/15/21, respectively.
- Scorecard Draft Template
 - ENO presented a draft Scorecard modeled on the 2018 IRP for review and comment. There was discussion regarding updates to account for the RCPS and the Advisors indicated they would review further and consider proposed edits.

Section 1

Optimized Resource Portfolios

Analytic Process to Create and Value Portfolios



2021 IRP Planning Scenarios—Finalized 6/29/21

	Scenario 1	Scenario 2	Scenario 3
Description	Reference	Decentralized Focus (DSM & renewables)	Stakeholder
Peak / Energy Load Growth	Reference	Low	High
Basis of DR / EE / DER Additions (Adjustment to Load)	Entergy (Medium)	Entergy (High)	Entergy (High)
Natural Gas Prices (Levelized Real, 2021\$/MMBtu)	Reference	Low	High
Market Coal Retirements	Reference (60 years)	Accelerated (55 years)	Accelerated (30 Years)
Legacy Gas Fleet Retirements	Reference (60 years)	Accelerated (55 years)	Accelerated (30 Years)
CO2 Tax Assumption (Levelized Real, 2021\$/short ton)	Reference	Reference	High
New-Build Resource Alignment with MTEP Future #3	No, Aurora capacity expansion tool will be used	No, Aurora capacity expansion tool will be used	Yes, via a manual MISO market portfolio buildout
Renewable Resource Costs	Entergy Technology Assessment	Entergy Technology Assessment	NREL 2020 ATB

2021 IRP Planning Strategies—Finalized 8/16/21

	Strategy 1	Strategy 2	Strategy 3	Strategy 4
Description	Least Cost Planning	But For RCPS (Reference)	RCPS Compliance	Stakeholder Strategy
Resource Portfolio Criteria and Constraints	Meet long-term Planning Reserve Margin (PRM) target using least-cost resource portfolio of supply and DSM resources	Include a portfolio of DSM programs that meet the Council's stated 2% goal and determine remaining needs	Include a portfolio of DSM programs that meet the Council's stated 2% goal and determine remaining needs in compliance with RCPS policy goals	Include a portfolio of DSM programs that meet the Council's stated 2% goal and determine remaining needs in compliance with RCPS policy goals; NREL 2020 ATB LCOE values for renewables costs provided by Stakeholders
Objective	Assess demand- and supply-side alternatives to meet projected capacity needs with a focus on total relevant supply costs.	Design a portfolio that includes a set of potential DSM programs intended to meet the Council's stated 2% goal.	Design a portfolio that includes a set of potential DSM programs intended to meet the Council's stated 2% goal. Excludes new resources that would not be RCPS compliant.	Design a portfolio that includes a set of potential DSM programs intended to meet the Council's stated 2% goal. Excludes new resources that would not be RCPS compliant.
DSM Input Case	Reference Case (Guidehouse)	2% Program Case (Guidehouse)	2% Program Case (Guidehouse)	High Case (GDS)
Manual Portfolio	Alternative Deactivation – Union Power Station (2025) ¹ (Manual Portfolio 1a)	N/A	N/A	Alternative Deactivation – Union Power Station (2025) ² (Manual Portfolio 4a)
Sensitivity	N/A	N/A	N/A	Lower renewables costs provided by Stakeholders ³ (Sensitivity 4b)

¹ An additional manual portfolio informed by the optimized portfolio developed under Strategy 1 and Scenario 1 (“Manual Portfolio 1a”) will be developed.

² An additional manual portfolio informed by the optimized portfolio developed under Strategy 4 and Scenario 3 (“Manual Portfolio 4a”) will be developed.

³ A sensitivity using the alternative cost assumptions provided by the Stakeholders on the resources identified in the optimized portfolio developed under Strategy 4 and Scenario 3 (“Sensitivity 4b”).

Optimized Portfolios – Process and Observations

Process

- For each Scenario and Strategy combination, portfolios are optimized in Aurora capacity expansion using constraints and assumptions
- Three Scenarios and four Strategies produced twelve optimized portfolios
- Stakeholders work together to narrow down the twelve portfolios created in capacity expansion to no more than five to be cross-tested across the three Scenarios
- Limiting to five necessary to maintain the IRP schedule
- The objective of portfolio downselection for cross-testing is to identify a diverse, representative range of potential portfolios, which when tested across each of the Scenarios will provide more information regarding how portfolios' total supply costs change under the different assumptions of the three Scenarios

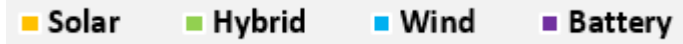
Observations

- No fossil-fired resources selected in any of the twelve portfolios
- Each portfolio is composed of renewable and storage resources in differing amounts and timing
- Each 150 MW Hybrid resource equals 100 MW Solar and 50 MW Storage resulting in resource components that are similar to standalone solar and storage additions

Capacity Expansion Portfolios

	Strategy 1 Guidehouse Low DSM – Optimized (TA - All Resource)	Strategy 2 Guidehouse 2% Program DSM – Forced In (TA - All Resource)	Strategy 3 Guidehouse 2% Program DSM – Forced In (TA - Renewable Only)	Strategy 4 GDS High DSM – Forced In (NREL costs provided by Stakeholders, Solar & wind only)
Scenario 1: (Ref) Reference Gas Reference Demand Reference CO2	<p>600MW 55% 400MW 36% 100MW 9%</p>	<p>700MW 56% 350MW 28% 200MW 16%</p>	<p>600MW 52% 300MW 26% 150MW 9% 100MW 9%</p>	<p>1,200MW 63% 700MW 37%</p>
Scenario 2: (Low) Low Gas Low Demand Reference CO2	<p>500MW 59% 350MW 41%</p>	<p>300MW 46% 250MW 39% 100MW 15%</p>	<p>200MW 31% 300MW 46% 150MW 23%</p>	<p>1,200MW 75% 400MW 25%</p>
Scenario 3: (High) High Gas High Demand High CO2	<p>1,900MW 54% 1,100MW 31% 550MW 15%</p>	<p>1,800MW 50% 1,300MW 36% 500MW 14%</p>	<p>1,500MW 42% 1,600MW 45% 450MW 13%</p>	<p>3,500MW 67% 1,700MW 33%</p>

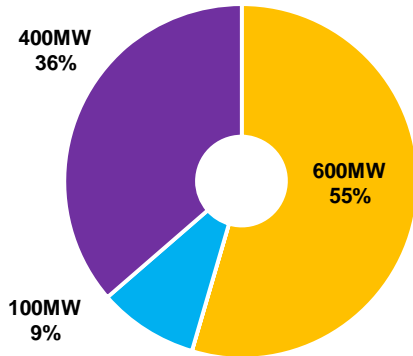
TA=Technology Assessment



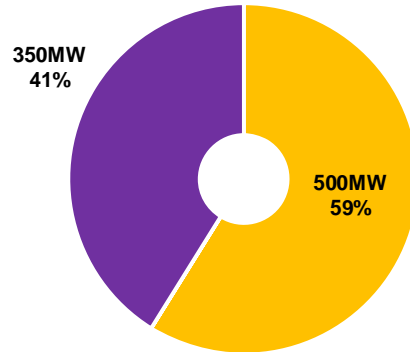
*All capacity stated in ICAP
"Hybrid" resources include solar + storage

Strategy 1 – Capacity Expansion Portfolios

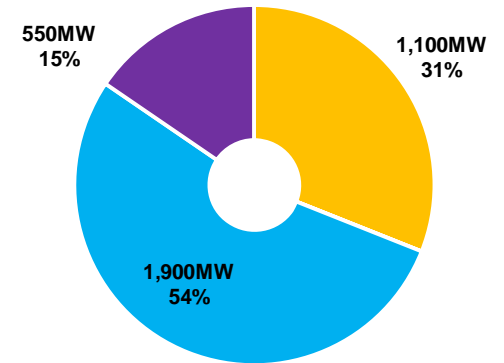
Scenario 1



Scenario 2



Scenario 3



Resource	Year	Installed Cap (MW)
Solar/Battery	2033	400/350
Solar	2034	100
Solar	2035	100
Wind/Battery	2041	100/50

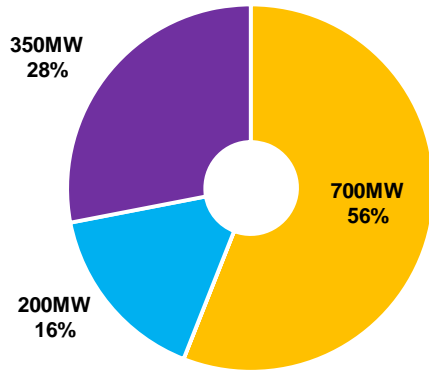
Resource	Year	Installed Cap (MW)
Solar/Battery	2033	300/350
Solar	2038	100
Solar	2041	100

Resource	Year	Installed Cap (MW)
Solar/Battery	2031	200/50
Battery	2032	50
Wind/Solar/Battery	2033	200/700/250
Battery	2034	100
Solar/Battery	2035	100/50
Wind	2036	300
Wind	2037	100
Wind/Battery	2038	300/50
Wind/Solar	2039	100/100
Wind	2040	300
Wind	2041	600



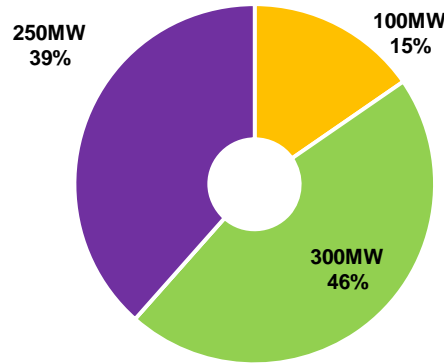
Strategy 2 – Capacity Expansion Portfolios

Scenario 1



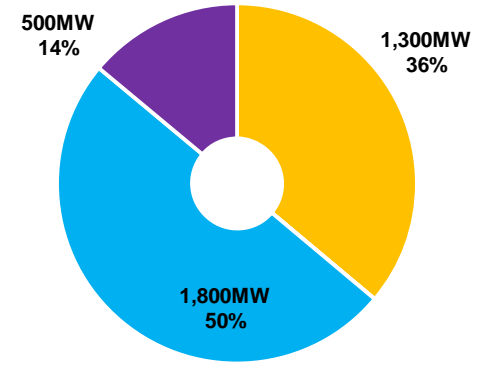
Resource	Year	Installed Cap (MW)
Solar/Battery	2033	500/300
Solar	2034	100
Battery	2035	50
Wind	2038	200
Solar	2041	100

Scenario 2



Resource	Year	Installed Cap (MW)
Hybrid/Battery	2033	300/250
Solar	2038	100

Scenario 3

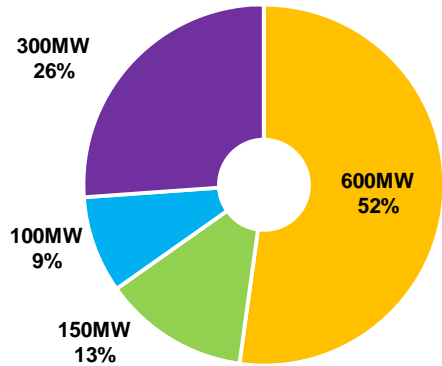


Resource	Year	Installed Cap (MW)
Solar/Battery	2031	100/50
Battery	2032	50
Wind/Solar/Battery	2033	200/500/350
Solar	2034	300
Wind	2035	300
Battery	2036	50
Wind	2037	200
Wind	2038	300
Wind/Solar	2039	200/100
Wind	2040	300
Wind/Solar	2041	300/300

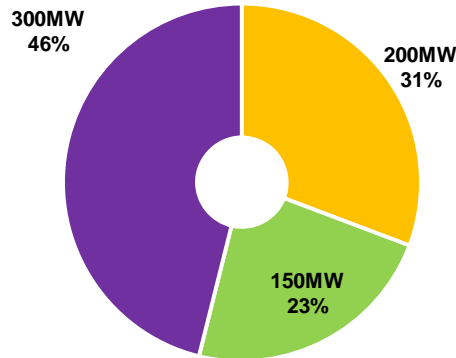


Strategy 3 – Capacity Expansion Portfolios

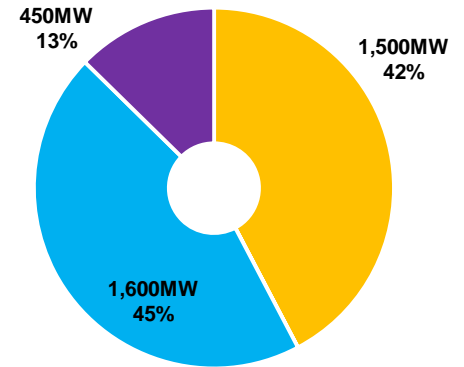
Scenario 1



Scenario 2



Scenario 3



Resource	Year	Installed Cap (MW)
Solar/Battery/Hybrid	2033	400/250/150
Battery	2034	50
Solar	2038	100
Wind/Solar	2041	100/100

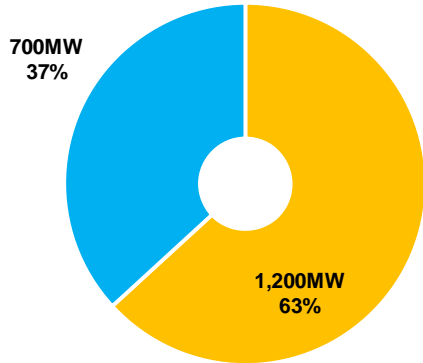
Resource	Year	Installed Cap (MW)
Solar/Battery/Hybrid	2033	100/300/150
Solar	2034	100

Resource	Year	Installed Cap (MW)
Wind/Solar	2031	100/300
Solar	2032	100
Wind/Solar/Battery	2033	200/400/350
Solar/Battery	2034	100/50
Solar	2035	200
Wind	2036	200
Wind/Battery	2037	100/50
Wind/Solar	2038	200/100
Wind	2039	300
Wind	2040	300
Wind/Solar	2041	200/300

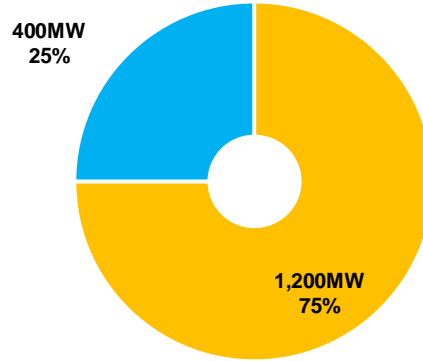


Strategy 4 – Capacity Expansion Portfolios

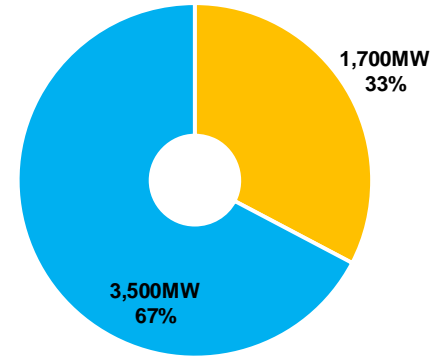
Scenario 1



Scenario 2



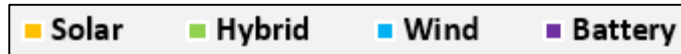
Scenario 3



Resource	Year	Installed Cap (MW)
Wind/Solar	2033	300/1100
Wind/Solar	2034	100/100
Wind	2035	100
Wind	2038	200

Resource	Year	Installed Cap (MW)
Wind/Solar	2033	100/1100
Wind/Solar	2034	100/100
Wind	2035	100
Wind	2038	100

Resource	Year	Installed Cap (MW)
Wind	2031	400
Wind	2032	200
Wind/Solar	2033	100/1500
Wind/Solar	2034	200/200
Wind	2035	500
Wind	2036	300
Wind	2037	300
Wind	2038	400
Wind	2039	300
Wind	2040	300
Wind	2041	500



Capacity Expansion Portfolios and Proposed Downselections

	Strategy 1 Guidehouse Low DSM – Optimized (TA - All Resource)	Strategy 2 Guidehouse 2% Program DSM – Forced In (TA - All Resource)	Strategy 3 Guidehouse 2% Program DSM – Forced In (TA - Renewable Only)	Strategy 4 GDS High DSM – Forced In (NREL costs provided by Stakeholders, Solar & wind only)
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★ Proposed portfolios for cross testing
TA=Technology Assessment

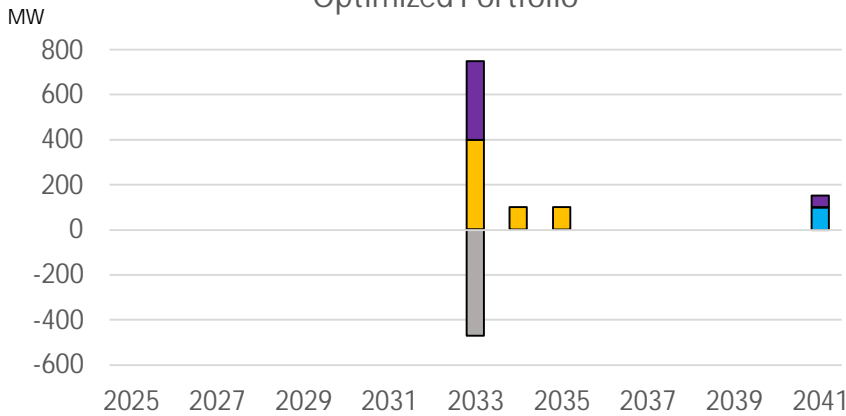
■ Solar
 ■ Hybrid
 ■ Wind
 ■ Battery

*All capacity stated in ICAP
“Hybrid” resources include solar + storage

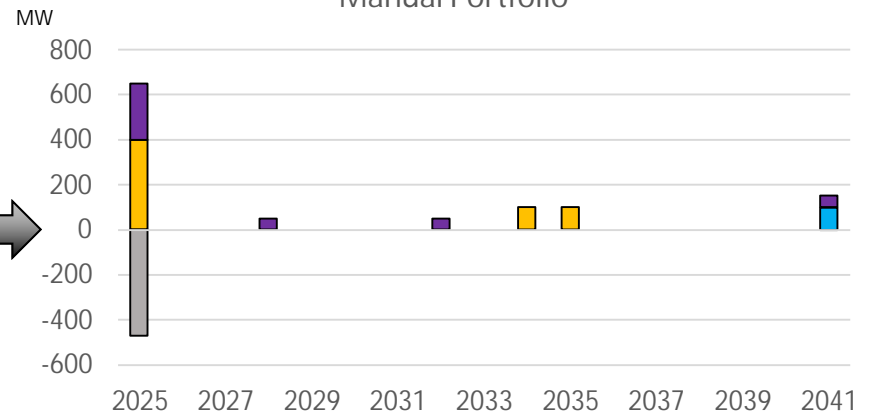
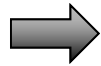
- Manual Portfolio 1a and 4a—Objective and Assumptions
 - Accelerate Union deactivation assumption from 2033 to 2025 and pull forward resources identified in the optimized portfolios developed under Scenario 1/Strategy 1 (Manual Portfolio 1a) and Scenario 3/Strategy 4 (Manual Portfolio 4a), respectively, to maintain target reserve margin.
 - Each manual portfolio will only be tested under the Scenario in which the associated optimized portfolio was created in order to produce Total Relevant Supply Costs.
- Sensitivity 4b—Objective and Assumptions
 - A sensitivity using the alternative renewables cost assumptions provided by the Stakeholders on the resources identified in the optimized portfolio developed under Scenario 3/Strategy 4 (Sensitivity 4b).
 - The sensitivity will only be tested under the Scenario in which the associated optimized portfolio was created (i.e., Scenario 3) in order to produce Total Relevant Supply Costs.

Manual Portfolios

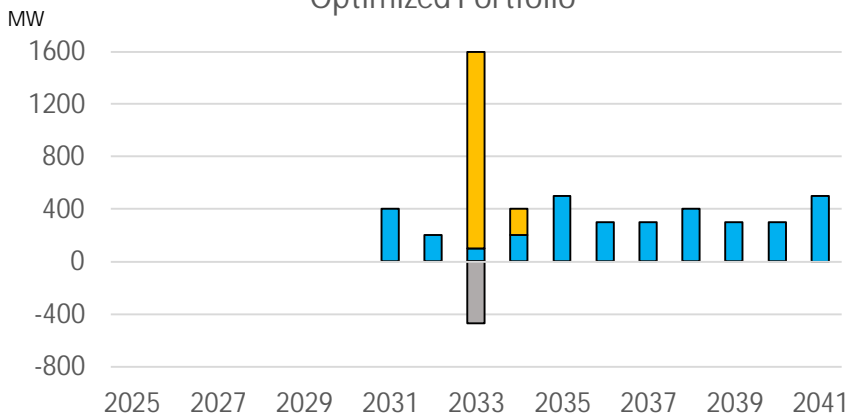
Scenario 1 - Strategy 1
Optimized Portfolio



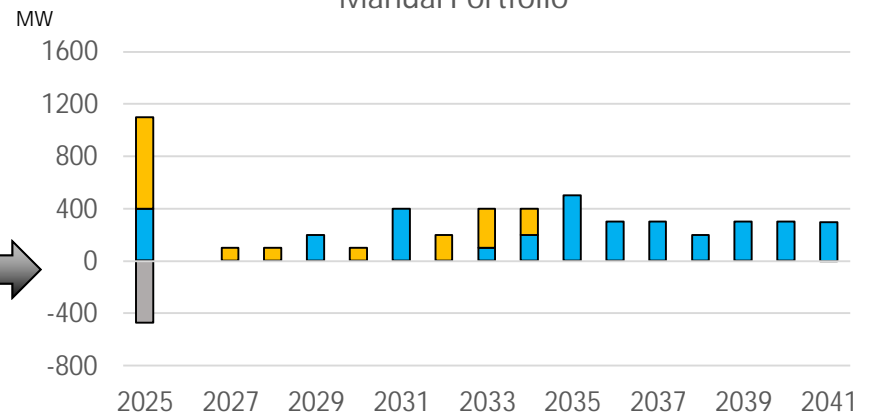
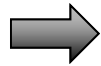
Scenario 1 - Strategy 1
Manual Portfolio



Scenario 3 - Strategy 4
Optimized Portfolio



Scenario 3 - Strategy 4
Manual Portfolio



■ Wind ■ Solar ■ Battery ■ Union Deactivation

Section 2 Risk Assessment

Stochastic Analysis

- The stochastic risk assessment gives an indication of the variability of a Portfolio's costs as underlying assumptions change. For the 2018 IRP, the parties agreed during Technical Meeting #4 to run the stochastic assessment on four of the five downselected Portfolios given procedural schedule deadlines.
- The sensitivity of a Portfolio's performance for the 2018 IRP was assessed relative to changes in assumptions for natural gas prices and CO₂ emission prices through stochastic analysis. ENO proposes to evaluate the same variables for the 2021 IRP.
- Of the five portfolios proposed for downselection on slide 15, the Company proposes performing the stochastic analysis on the following four portfolios (Scenario-Strategy):
 - 1-1
 - 1-2
 - 2-2
 - 3-4

Section 3

Scorecard Metrics

Scorecard Proposed at Technical Meeting #3

Scoring Parameters / Descriptions	Grading Scale (from A to D) ¹			
	A	B	C	D
Utility Cost (Portfolio optimization in Aurora model)				
Expected Value	>7.50	7.50 - 5.01	5.00 - 2.51	≤ 2.50
Utility Costs Impact on ENO's Revenue Requirements				
Net present value of revenue requirements	>7.50	7.50 - 5.01	5.00 - 2.51	≤ 2.50
Nominal Portfolio Value (residential/ other customer classes) - initial 5 years of planning period	>7.50	7.50 - 5.01	5.00 - 2.51	≤ 2.50
Risk/Uncertainty				
Distribution of potential utility costs	>7.50	7.50 - 5.01	5.00 - 2.51	≤ 2.50
Range of potential utility costs	>7.50	7.50 - 5.01	5.00 - 2.51	≤ 2.50
Probability of high CO2 intensity - initial 5 years of planning period	< 33%	> 33%	>66%	= 100%
Probability of high groundwater usage - initial 5 years of planning period	< 33%	> 33%	>66%	= 100%
Operational Flexibility				
Flexible Resources (MW of ramp)	>7.50	7.50 - 5.01	5.00 - 2.51	≤ 2.50
Quick Start Resources (MW of Quick-Start) ²	>7.50	7.50 - 5.01	5.00 - 2.51	≤ 2.50
Environmental Impact				
CO2 intensity (tons CO2/GWh)	>7.50	7.50 - 5.01	5.00 - 2.51	≤ 2.50
Groundwater usage (% of energy generated using Groundwater)	< 33%	> 33%	>66%	= 100%
Consistency with City Policies/ Goals				
Climate Action Plan -- 100% Low Carbon (% of Carbon Free Energy from New Resource) ³	100% Low Carbon	>66% Low Carbon	> 33% Low Carbon	< 33% Low Carbon
Climate Action Plan -- 255 MW Solar added (Total Solar MW in Portfolio)	≥ 255 MW	> 210 MW	> 10 MW	< 150 MW
Climate Action Plan -- 3.3% Annual Energy Savings (CAGR over 20 years)	≥ 3.3%	>2.0%	> 1.0%	< 1.0%
Macroeconomic Impact to CNO				
Macroeconomic Factor (Jobs, local economy impacts)	N/A	N/A	N/A	N/A

Update Pending Advisors Input

- Notes:**
1. Except as otherwise noted, A is top quartile of Portfolios, B is second, C is third, and D is the bottom quartile
 2. Quick-Start includes supply and demand side dispatchable resources
 3. Carbon-free resource include Energy Efficiency

Section 4

Energy Smart Program PY13-15

Energy Smart PY 13-15—Implementation Plan Timeline

IRP Technical Meeting #4	January 19, 2022
2021 IRP Report Filed	March 25, 2022
IRP Technical Meeting #5	April 29 - May 6, 2022
Intervenor Comments on Final IRP	May 9, 2022
Draft of Implementation Plan	June 30, 2022
Proposed Technical Conference	July 11, 2022
Advisors' Report	July 12, 2022
Implementation Plan Filing	July 19, 2022

Energy Smart PY 13-15—RFP Timeline

Task Name	Completion Date
RFP Issued	December 21, 2021
Proposal Submission Deadline	February 11, 2022
Contractors selected	March 12, 2022
Submission of ENO's choice of TPA and TPE to Council	March 25, 2022

Energy Smart PY 13-15—DSM Program Matrix

Current Programs	Guidehouse	GDS
Energy Efficiency		
Home Performance w Energy Star	Home Performance w Energy Star	Home Performance
A/C Solutions	HVAC	High Efficiency Tune-Ups
Retail Lighting and Appliances	Retail	Residential Lighting and Appliances
Residential Behavioral	Residential Behavioral	Scorecard
Income Qualified Weatherization	Low Income_Multifamily	Low Income
Multifamily Solutions		Multifamily
School Kits	School Kits	
Small C&I Solutions	Small C&I	
Large C&I Solutions	Large C&I	Large C&I
New Construction		
Publicly Funded Institutions		

1. Residential

- A. Electric Vehicle Charging (Pilot)
- B. Battery Storage (Pilot)
- C. Critical Peak/ Dynamic Pricing (Pilot)

2. Small C&I

- A. Smart Thermostats
- B. Alternative Small C&I curtailment options offering two-way control
- C. Electric Vehicle Charging (Fleet Electrification) (Pilot)
- D. Battery Storage (Pilot)
- E. Critical Peak/ Dynamic Pricing (Pilot)

3. Large C&I

- A. Electric Vehicle Charging (Fleet Electrification) (Pilot)
- B. Battery Storage (Pilot)
- C. Critical Peak/ Dynamic Pricing (Pilot)

Section 5

Timeline and Next Steps

Current Timeline

Description	Target Date	Status
Public Meeting #1- Process Overview	September 2020	✓
Technical Meeting #1 Material Due	November 2020	✓
Technical Meeting #1	December 2020	✓
Technical Meeting #2 Material Due	April 2021	✓
Technical Meeting #2	April 2021	✓
Planning Scenarios and Non-DSM Inputs Finalized	May 2021	✓
DSM Potential Studies Due	July 2021	✓
Technical Meeting #3 Material Due	July/August 2021	✓
Technical Meeting #3	August 2021	✓
IRP Inputs Finalized	August 15, 2021	✓
Optimized Portfolio Results Due	December 2021	✓
Technical Meeting #4 Material Due	January 2022	-
Technical Meeting #4	January 2022	-
Final IRP Report due	March 25, 2022	-
Public Meeting #2 Material Due	April 2022	-
Public Meeting #2 - Present IRP Results	April 2022	-
Public Meeting #3 Material Due	April 2022	-
Public Meeting #3 - Public Response	April/May 2022	-
Technical Meeting #5 Material Due	April 2022	-
Technical Meeting #5	April/May 2022	-
Intervenors and Advisors Questions & Comments Due	May 2022	-
ENO Response to Questions and Comments Due	June 2022	-
ENO File Reply Comments	June 2022	-
Advisors File Report	July 2022	-