ENO 2015 IRP

Public Technical Conference

MAY 12, 2016

Entergy

WE POWER LIFE℠

CONFERENCE OBJECTIVES

- Development of the 2015 IRP
  - Process Recap
  - ENO's resource needs
  - IRP Scope and Objectives

- Overview of Final ENO 2015 IRP
  - Primary IRP Scenarios
  - Stakeholder Input
  - Stakeholder Input Case

- Conclusions
  - Preferred Portfolio
  - Action Plan

Process Recap

Recap of Previous Milestones

The 2015 IRP process included multiple milestones to communicate progress to the various stakeholders and incorporate their feedback.

Milestone 1 June 2014
- DSM Potential Study Overview
- IRP Overview

Milestone 2 Oct 2014
- DSM Potential Study
- Portfolio Design Analytics
- Technology Assessment

Milestone 3 Feb 2015
- Modeling Results
- Response to Public Comments and Q&A

Milestone 4 June 2015
- ENO IRP Draft Report
- Preferred Portfolio

Final IRP Feb 2016
- Update to Milestone 4
- Update to Action Plan
- Stakeholder Input Case

COUNCIL PROCEDURAL SCHEDULE

- On April 7 the City Council Issued Resolution R-16-104 outlining the schedule for review of Entergy New Orleans' 2015 IRP:
  - May 12th – ENO to host Public Technical Conference to review Final 2015 IRP
  - May 26th – Period for public questions and comments ends
  - June 15th – Advisors to host Community Hearing at City Hall
  - June 30th – Deadline for Intervenor comments on Final 2015 IRP
  - Aug 1st – Deadline for ENO response to questions and comments
  - Sept 20th – Advisors to file report with Council on Final 2015 IRP

QUESTIONS AND COMMENTS

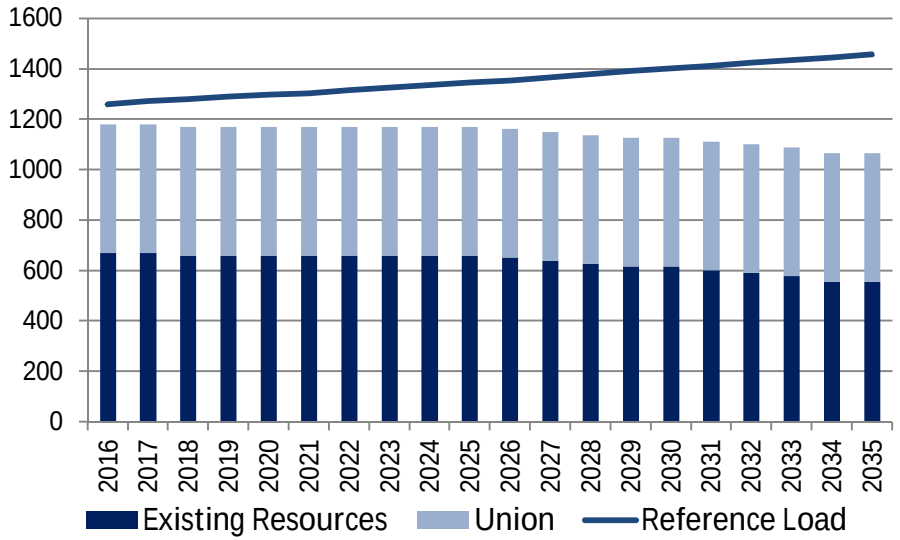
- After this meeting, ENO will accept questions and comments relevant to the IRP through its website:
  - Visit www.entergy-neworleans.com/IRP/
  - Fill out the “Submit a Question” Form
  - The last day to submit a question is May 26th
  - ENO will post responses to questions specific to the IRP as soon thereafter as practicably possible, but no later than August 1, 2016

OBJECTIVES OF 2015 IRP

ENO Resource Needs

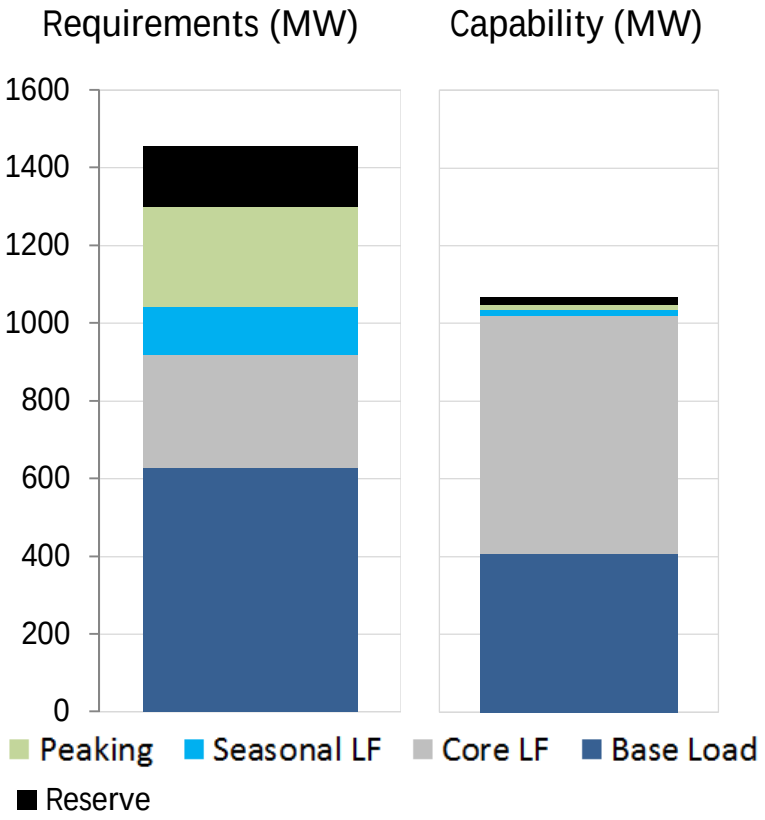
Before IRP additions, ENO has a need for peaking and reserve capacity. Base load and load following needs are met by the addition of Union Power Block 1.

ENO Load and Capability (2016-2035)



Supply Role Needs (2035)			
	Need	Resources	Surplus /(Deficit)
Base Load and Load Following (MW)	1,043	1,036	(7)
Peaking & Reserve (MW)	414	30	(384)
Totals	1,457	1,066	(391)

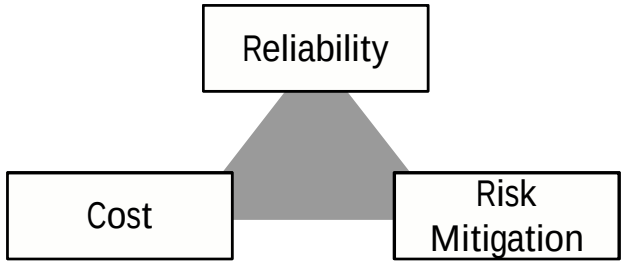
ENO Supply Role Need (2035)



IRP OBJECTIVES

- Integrated resource planning is a process utilized by the utility industry to develop long-range plans for meeting customers' future needs (e.g., 10 – 20 years out into the future)
  - Importantly an IRP establishes a framework to guide and inform future decision making – it is neither static nor prescriptive

- Through the IRP process, Entergy New Orleans seeks to identify the portfolio of resources capable of meeting customers' future needs while balancing key objectives



- The objectives are measured from a customer perspective consistent with the goal of meeting electric customers needs at the lowest reasonable cost while considering risk

IRP Process Overview

Broadly speaking, there are 3 primary steps in the Integrated Resource Planning process. The outcome of this process is the selection of a Preferred Portfolio of supply and demand-side resources capable of meeting ENO's long-term resource needs

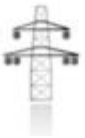
1 Develop Assumptions

- Load Forecast
- Fuel Prices
  - Natural Gas Prices
  - Coal
- Environmental Assumptions
  - (e.g., CO_2)
- Power Prices
- Market Model

2 Identify & Assess Alternatives

- Generation

- Demand-side



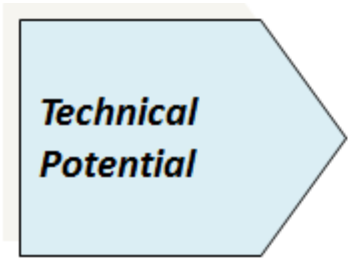
- Transmission

3 Portfolio Design & Risk Assessment

This effort assesses various portfolios to identify the preferred portfolio that best meets planning objectives.

DSM Potential

There are 3 types of demand-side management potential – technical, economic and achievable. The 2015 IRP included a thorough process to identify Achievable DSM Potential for ENO's customers which is appropriate for a long-term planning study.



The estimated level of energy and capacity savings that could be achieved without consideration of cost, customer behavior or other barriers. Assumes customers adopt 100% of what is feasible. ✗

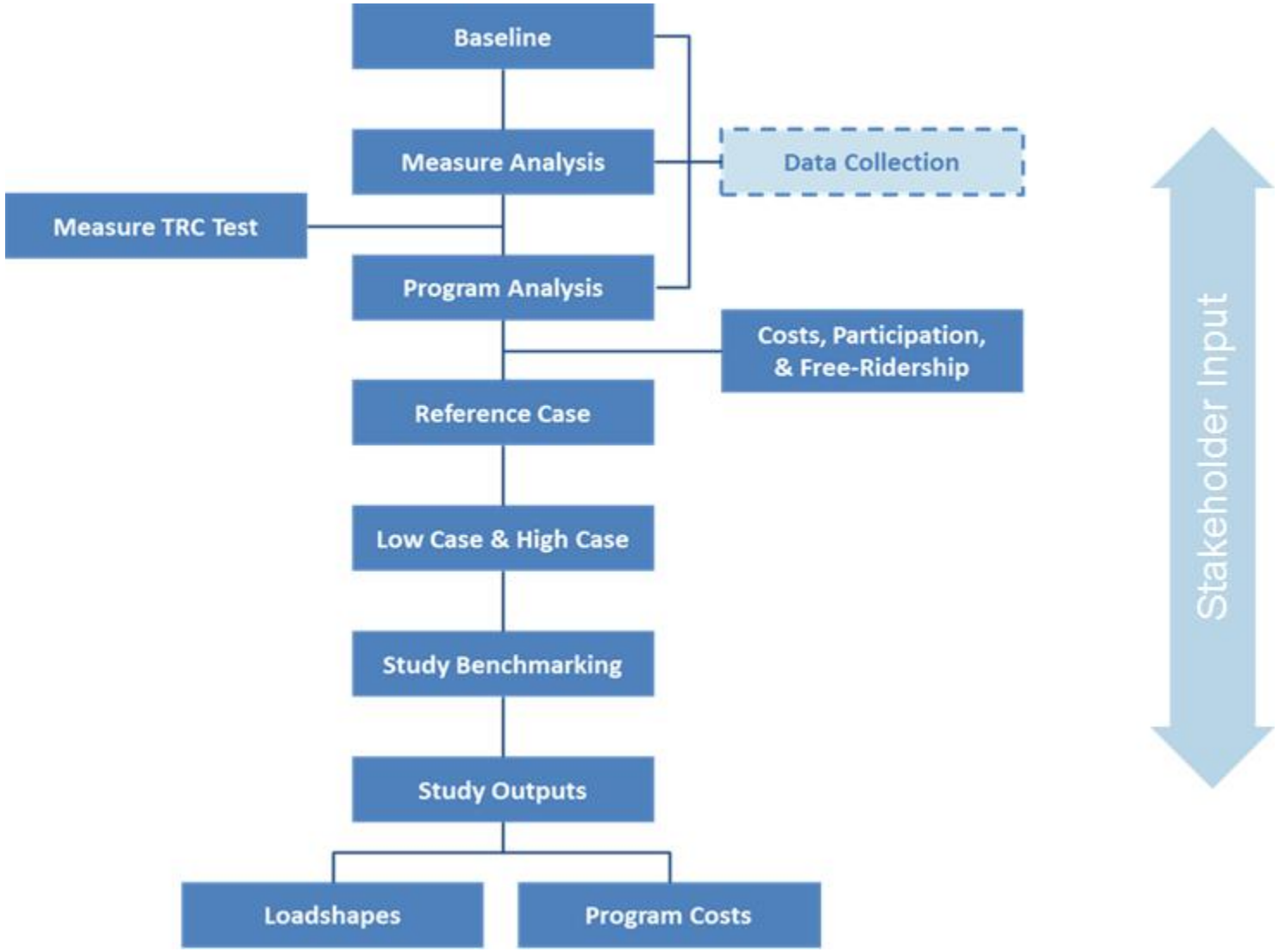
Cost effective sub-set of Technical Potential. Ignores customer financial constraints, behavioral issues or other market barriers. ✗

Sub-set of Economically Achievable potential. In other words, what is likely to be achieved given customer profile and local market conditions. Focus of the ICF DSM Potential Study. ✓

✓	Appropriate For IRP
✗	Not Appropriate For IRP

2015 DSM Potential Study

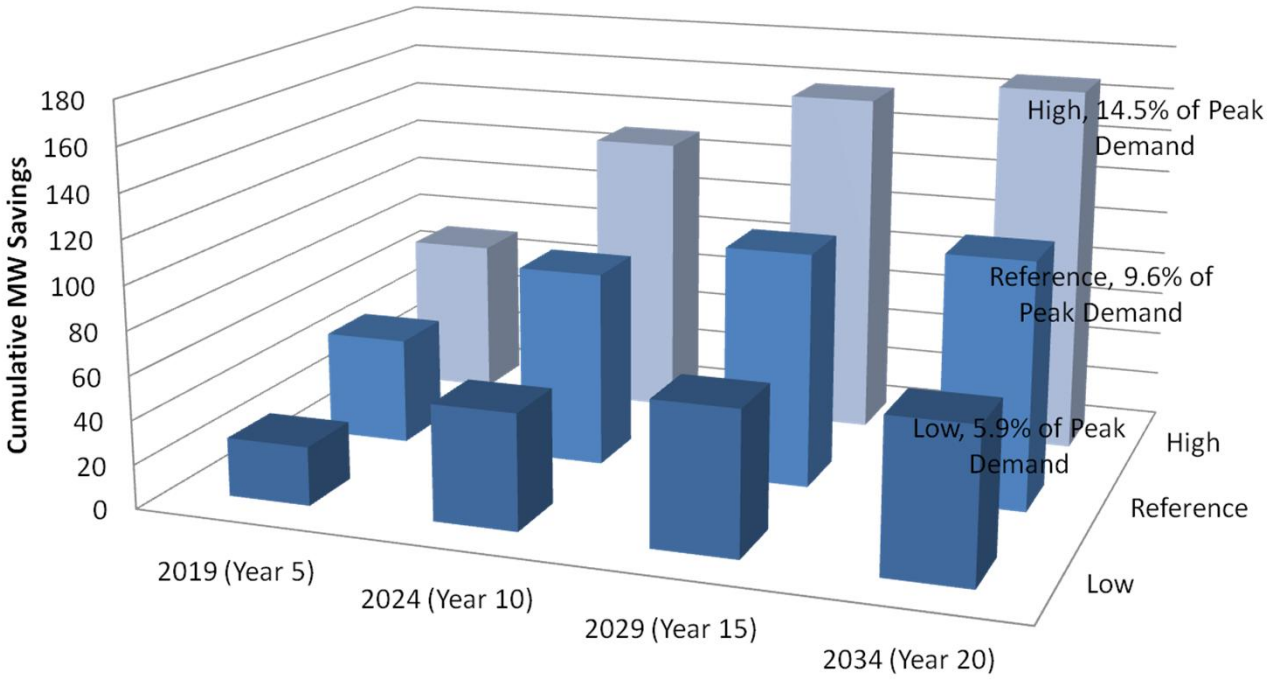
ICF followed the process below to conduct the 2015 DSM Potential Study. The methodology and inputs to ICF's study were provided at the Milestone 1 public technical conference in June 2014.



DSM POTENTIAL STUDY OVERVIEW

The DSM Potential Study conducted by ICF estimated a potential cumulative peak reduction of 69 to 168 MW and cumulative energy savings of 3.9% to 10% percent of annual sales by 2034 depending on program incentive level. The results of ICF's Potential Study were provided at the Milestone 2 public technical conference in October 2014.

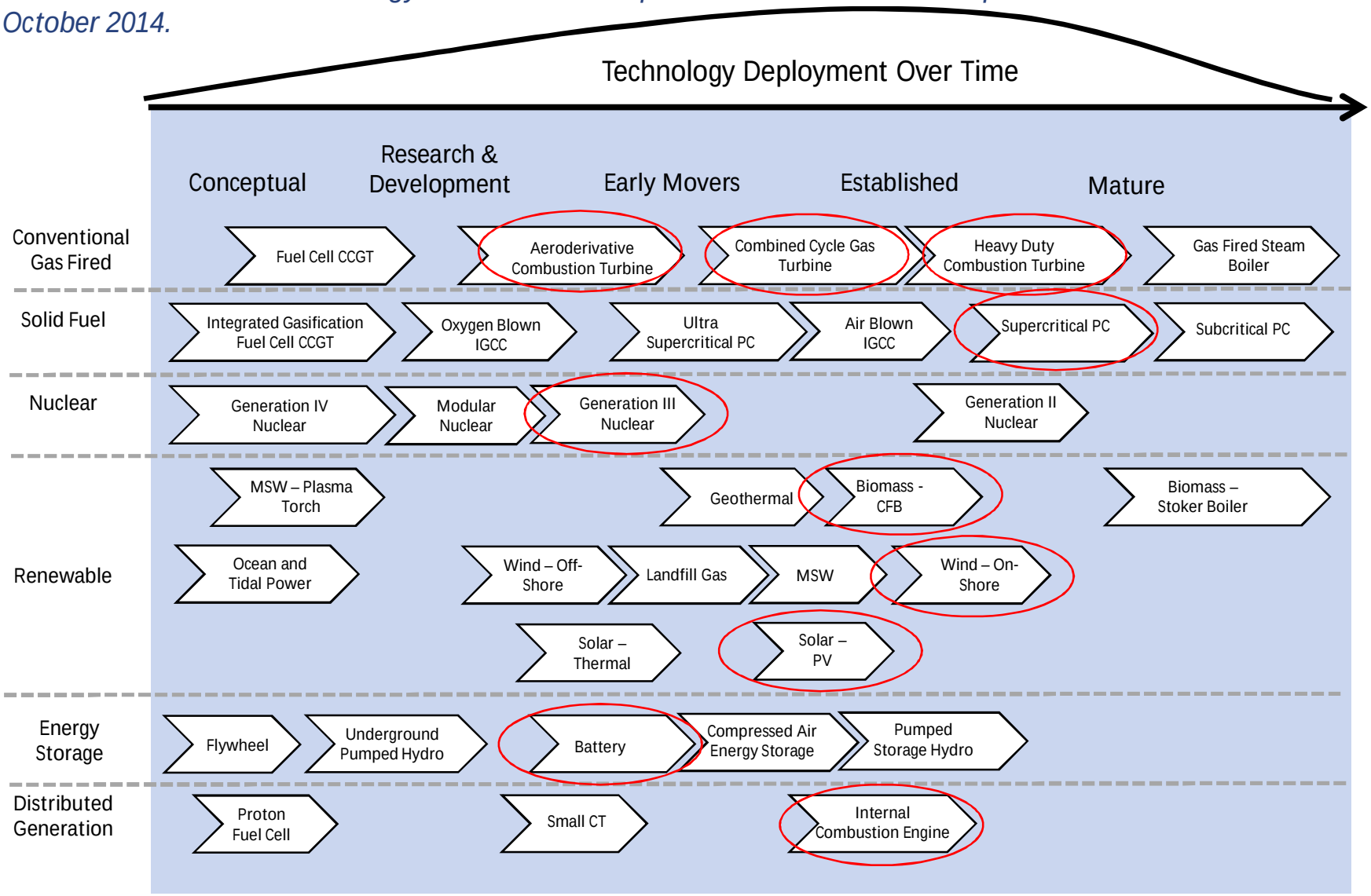
Cumulative Net MW Savings Potential



% savings values are cumulative

SUPPLY ALTERNATIVES

The technology assessment for the 2015 IRP supported the selection of a number of viable supply–side resources from a range of technologies capable of being deployed in or near ENO's service area for further evaluation in the IRP. The results of the Technology Assessment were provided at the Milestone 2 public technical conference in October 2014.



PRIMARY IRP SCENARIOS

SCENARIO OVERVIEW

A total of four macro-economic scenarios were designed to use in evaluating the supply and demand-side resource alternatives in the 2015 IRP.

Industrial Renaissance (IR) (Reference Case)
- Reference load, gas, oil and coal prices
- No direct CO_2 cap and trade or tax on existing resources

Business Boom (BB)
- Low fuel prices
- High load growth
- High capital cost for new generation
- Mild CO_2 cap and trade program effective in 2023

Distributed Disruption (DD)
- Medium/high fuel prices
- Slow power sales growth
- Distributed generation impacts utility sales
- Mild CO_2 cap and trade program effective in 2023

Generation Shift (GS)
- High fuel prices
- Low power sales
- High CO_2 cost effective in 2023

DEMAND SIDE MANAGEMENT

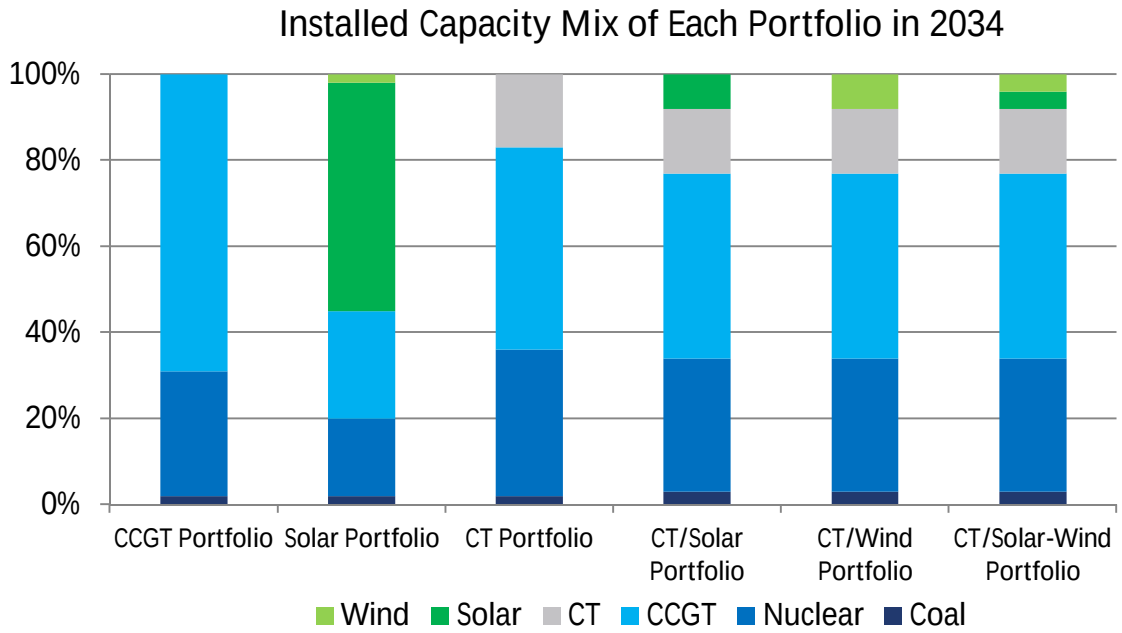
ICF identified 24 DSM programs for further evaluation in the IRP. These 24 programs were evaluated both with and without consideration of supply-side alternatives to arrive at the optimal DSM portfolio. The Preferred DSM Portfolio originally included 14 programs consistently shown to be cost-effective across a range of input assumptions, and was later expanded to include additional programs based on sensitivity analysis conducted during the IRP.

AURORA Capacity Expansion Portfolio Design Mix				
	Industrial Renaissance (Ref. Case)	Business Boom	Distributed Disruption	Generation Shift
DSM Programs	14 Programs	12 Programs	15 Programs	17 Programs

Alternative Portfolio Design Mix – Installed Capacity				
	CT Portfolio	CT/Solar Portfolio	CT/Wind Portfolio	CT/Wind/Solar Portfolio
DSM Programs	14 Programs	14 Programs	14 Programs	14 Programs

PORTFOLIO OVERVIEW

A total of 6 portfolios were created for the IRP analysis, consisting of two portfolios created in the capacity expansion model AURORA and four manual portfolios.

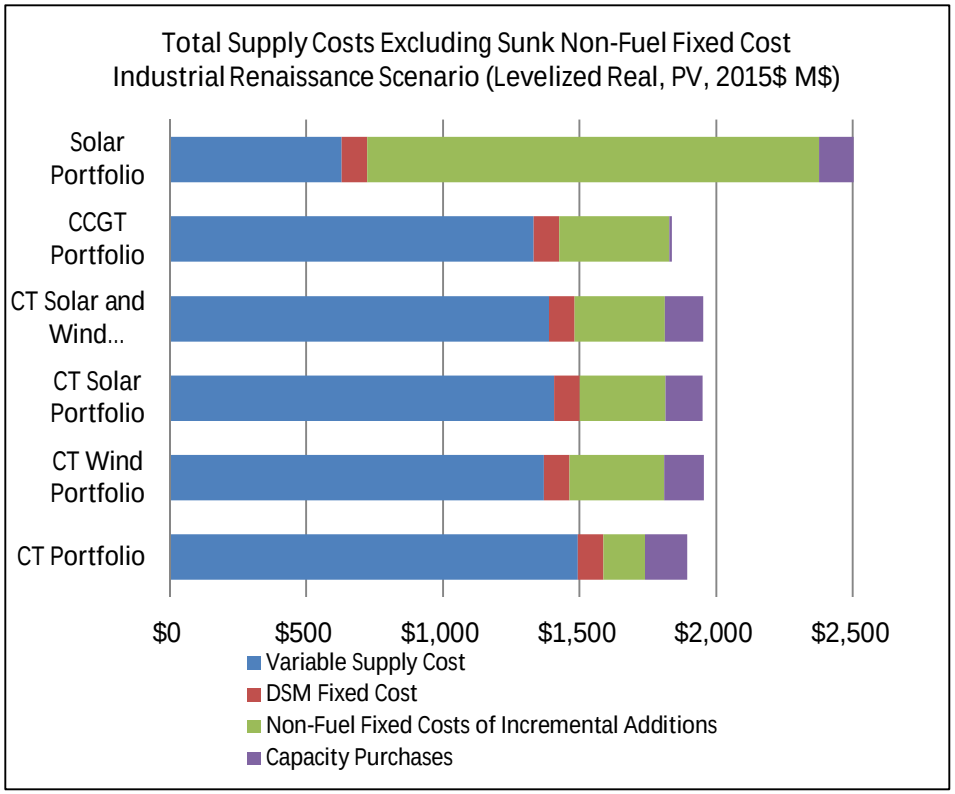


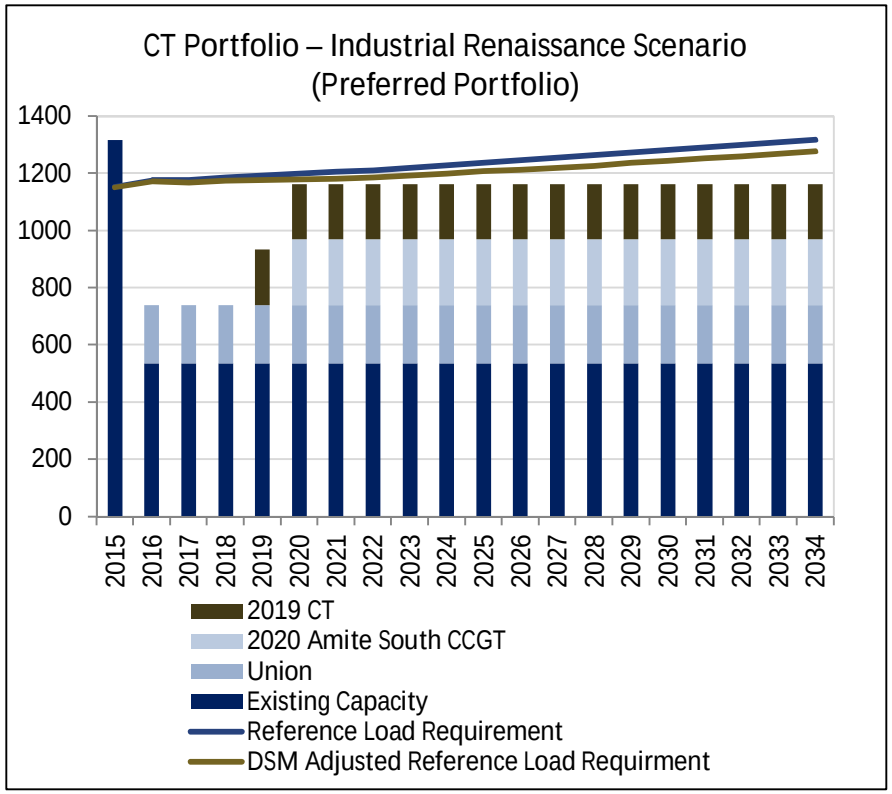
Resource Type	Resource
Renewables	Wind
	Solar
Peaking	CT
Base Load and Load Following	CCGT
	Nuclear
	Coal

- Capacity expansion optimization in AURORA resulted in the CCGT Portfolio under the IR, BB, and DD scenarios
- Capacity expansion optimization in AURORA resulted in the Solar Portfolio under the GS scenario
- Manual portfolios were designed to meet ENO's identified peaking and reserve supply role needs consistent with ENO's planning objectives
- Renewable resources were added to 3 of the manual portfolios to assess the potential for renewables to increase portfolio performance in terms of cost and risk

Total Supply Cost and Portfolio Rankings

The CT portfolio performed well across most scenarios and was selected as the Preferred Portfolio. All 6 portfolios include the Preferred DSM Portfolio.





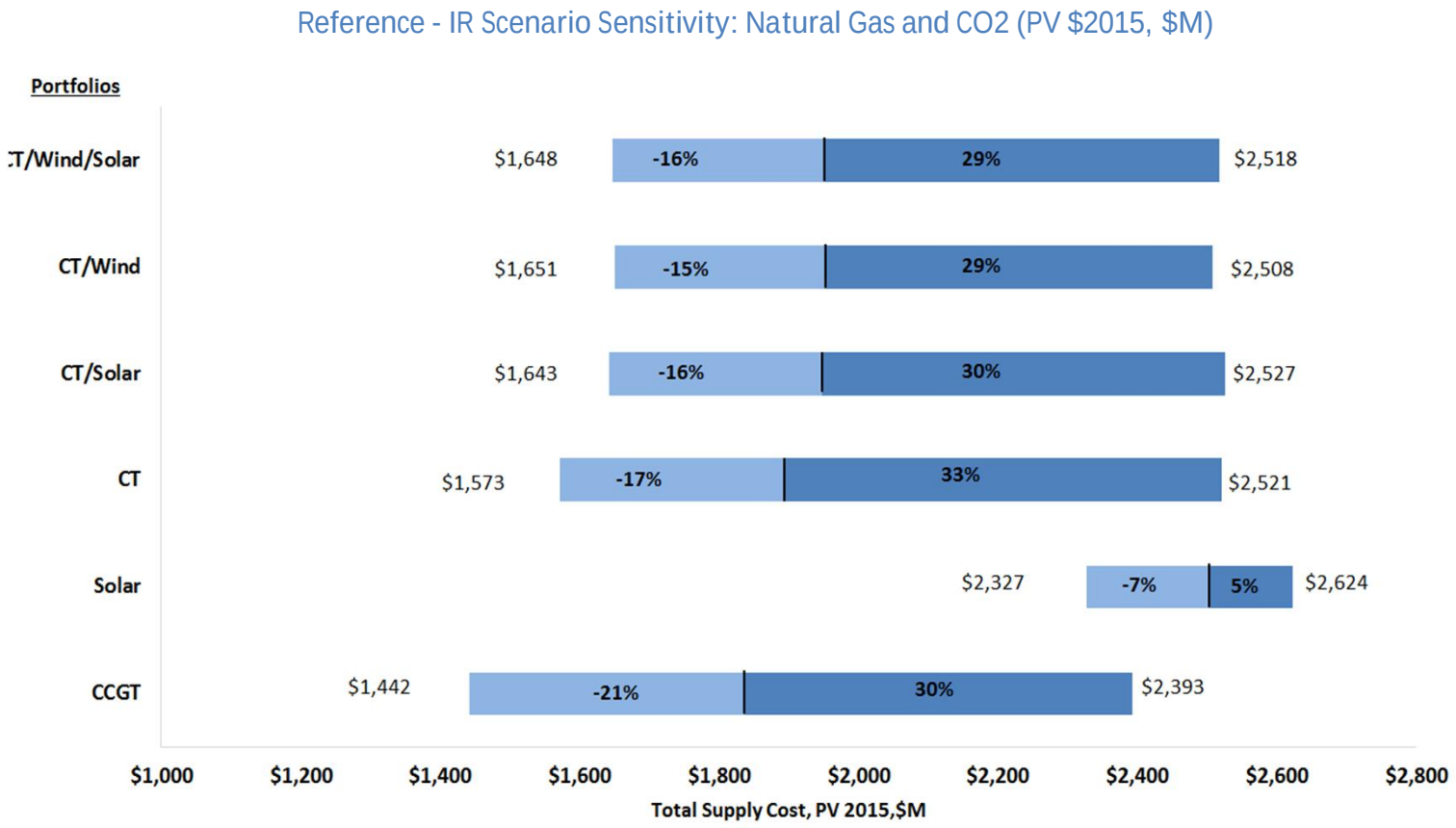
Portfolio Ranking by Scenario

	Industrial Renaissance (Reference)	Business Boom	Distributed Disruption	Generation Shift
AURORA – CCGT Portfolio	1	1	1	2
AURORA – Solar Portfolio	6	6	6	1
CT Portfolio	2	2	2	6
CT/Solar Portfolio	3	3	5	5
CT/Wind Portfolio	5	5	3	3
CT/Solar/Wind Portfolio	4	4	4	4

Resource	MW (ICAP)	MW (Effective)
Union	204	204
ENO CT	194	194
Amite South CCGT	229	229
Total	627	627

SENSITIVITY ANALYSIS

Sensitivity analysis was conducted on the primary portfolios using a wide range of natural gas and CO_2 prices.



STAKEHOLDER INPUT

STAKEHOLDER INPUT

Topic	ENO Action to Address
DSM	
Cost of DSM Measures	• ENO expounded on process used by ICF to benchmark measure cost and • Detailed the basis for differences between measure costs for programs implemented in Arkansas versus New Orleans
Terminal Value	• ENO ran further analysis on the 7 DSM programs not originally chosen. Based on the trailing benefits past the 20 year evaluation period, 2 programs (Pool Pump, and Water Heating program) became economic and were included in the Stakeholder Input Case.
Demand Response	• Based on additional analyses, all 3 Demand Response programs were determined to have a net benefit to customers and were included in the Preferred Portfolio. ENO also included a "State of the Market" for Demand Response write up in the Final IRP.

STAKEHOLDER INPUT

Topic	ENO Action to Address
Renewables	
Cost of Renewables	• ENO used the most current costs for solar PV resources from IHS CERA and • Included a comparison of those cost estimates to the publicly available industry costs provided by the Advisors • ENO included the scope and timeline for the Renewable RFP in the Final IRP
Match-Up Cost	• In the IRP a capacity "match up" reflects the fact that some renewable resources receive partial capacity value in MISO due to their intermittent nature. However, the capacity match-up is only used in the screening analysis of supply-side resources in the Technology Assessment. When modeled in AURORA, renewable resources are evaluated without the capacity match up relative to other resources.

STAKEHOLDER INPUT

Topic	ENO Action to Address
Input Assumptions	
Natural Gas price	• The natural gas price forecast used in the Stakeholder Input Case was lower than the reference case forecast used in the Industrial Renaissance scenario. This forecast was influenced by historically strong production driven by the continued economics of Northeast shale gas combined with mild weather. These factors have created a supply and storage glut.
Carbon price	• The Stakeholder Input Case CO2 price forecast was taken from Entergy corporate CO2 POV developed in March 2015 and • Shows CO2 prices that begin in 2020 at $1.39/U.S. ton and escalate more quickly than the mid-price forecast
Load and Capability	• In the Stakeholder Input case, the load was changed to reflect the load forecast of the most current business plan, which also included the Algiers transfer.

STAKEHOLDER INPUT CASE ("SIC")

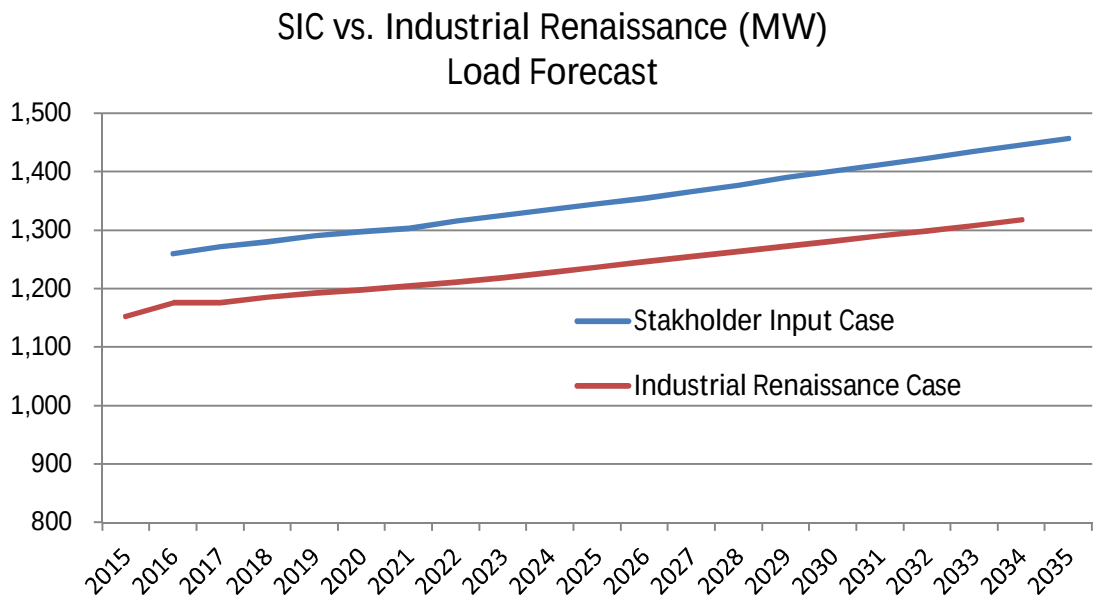
STAKEHOLDER INPUT CASE OVERVIEW

In response to stakeholder and Advisor comments, ENO performed additional analyses using updated assumptions in support of the Final ENO 2015 IRP.

- Updated Supply Needs
  - Reallocation of Union/St. Charles Power Station
  - Algiers Transfer
  - Load Forecast
- Updated Technology Assumptions
  - CT Technology Assumption
  - Solar Install Cost
- Updated Price Forecasts
  - Natural Gas Price Forecast
  - CO2 Price Forecast
    - Mid Level Price Assumption
- DSM Analysis
  - Inclusion of DR with implementation date sensitivity (3 new programs)
  - Trailing Benefits Analysis (2 new programs)
- Planning Period Adjustment
  - 2015-2034 to 2016-2035

STAKEHOLDER INPUT CASE - SUPPLY NEEDS

Planned additions increased by 77 MW due to the reallocation of Union and Amite South Resource while the load forecast and resource portfolio changed due to the Algiers Transfer. Total need for the SIC was 391 MW in 2035.



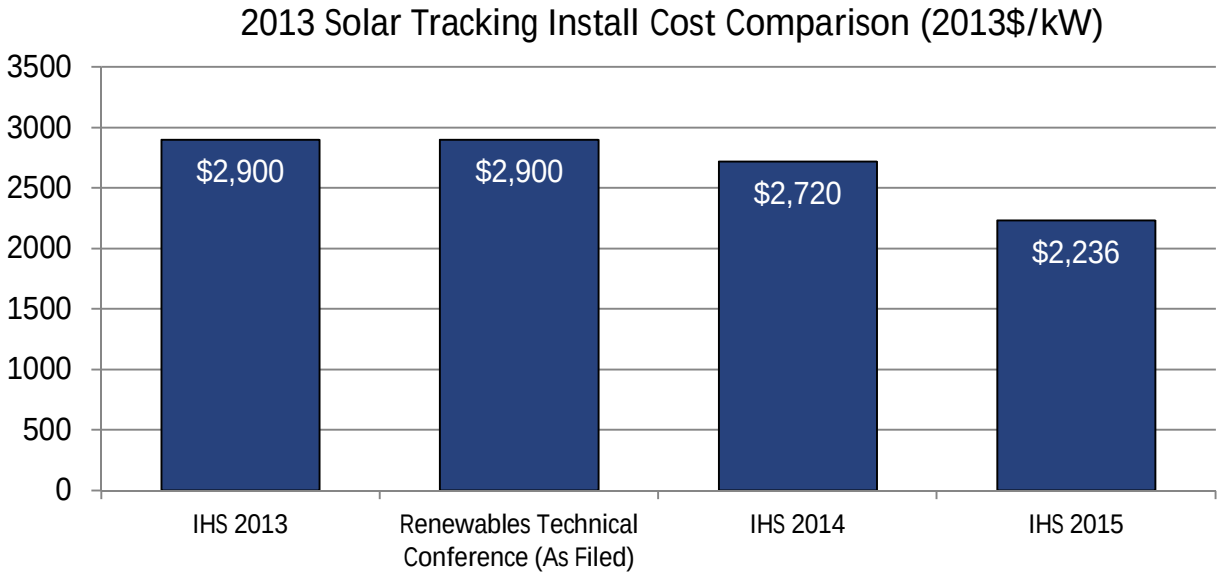
Reallocation of Planned Resource Additions			
Resource	IR/BB/DD/GS Scenarios (MW)	SIC (MW)	Change
Union	204	510	306
Amite South	229	0	(229)
Totals	433	510	77

SIC Supply Role Needs (2035)			
	Need	Resources	Surplus /(Deficit)
Base Load and Load Following (MW)	1,043	1,036	(7)
Peaking & Reserve (MW)	414	30	(384)
Totals	1,457	1,066	(391)

STAKEHOLDER INPUT CASE - TECHNOLOGY ASSUMPTIONS

The SIC reflects the most current IHS assumptions for solar install cost for MISO South, showing a decrease of approximately $660/kW in 2013 dollars from the original assumption. The capacity of the CT technology increased by 56 MW.

Solar Technology Assumption Change:

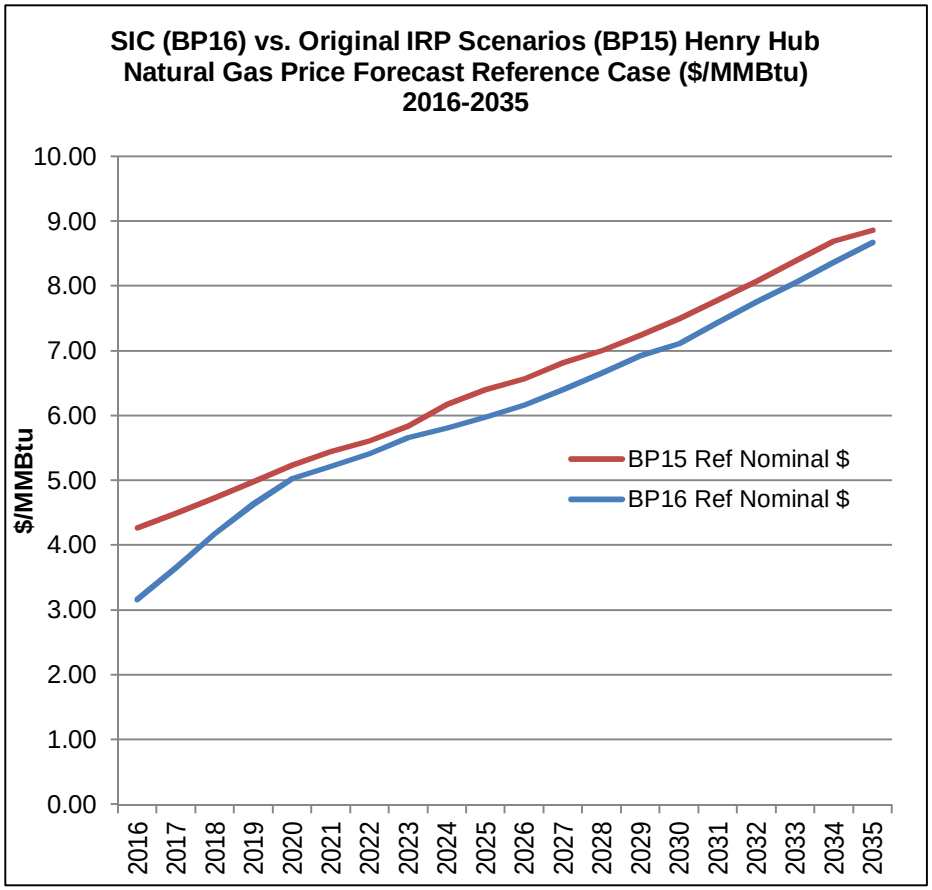


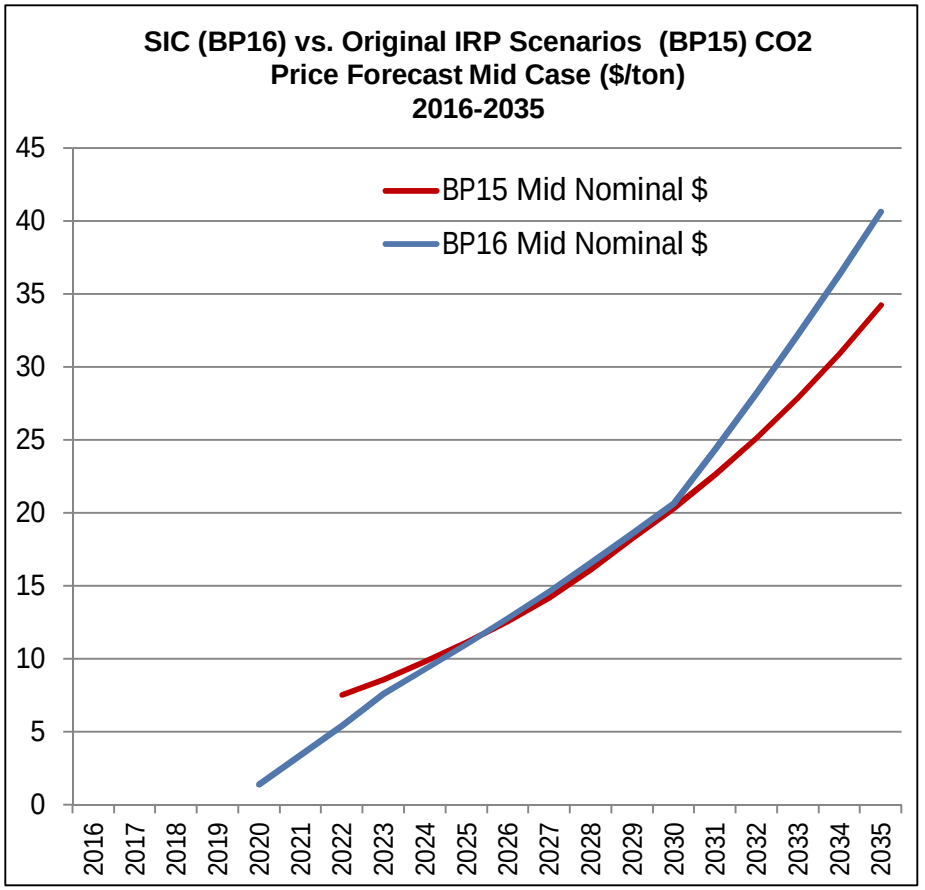
CT Technology Assumption Change:

SIC CT Technology Assumption	
Technology	Capacity (MW)
G Frame CT	250
F Frame CT	194
Delta	+56

STAKEHOLDER INPUT CASE - UPDATED PRICE FORECASTS

The updated forecasts for the SIC showed a decreased natural gas price forecasts and a CO_2 forecast that accelerated the pricing of CO_2 forward.





DEMAND SIDE MANAGEMENT

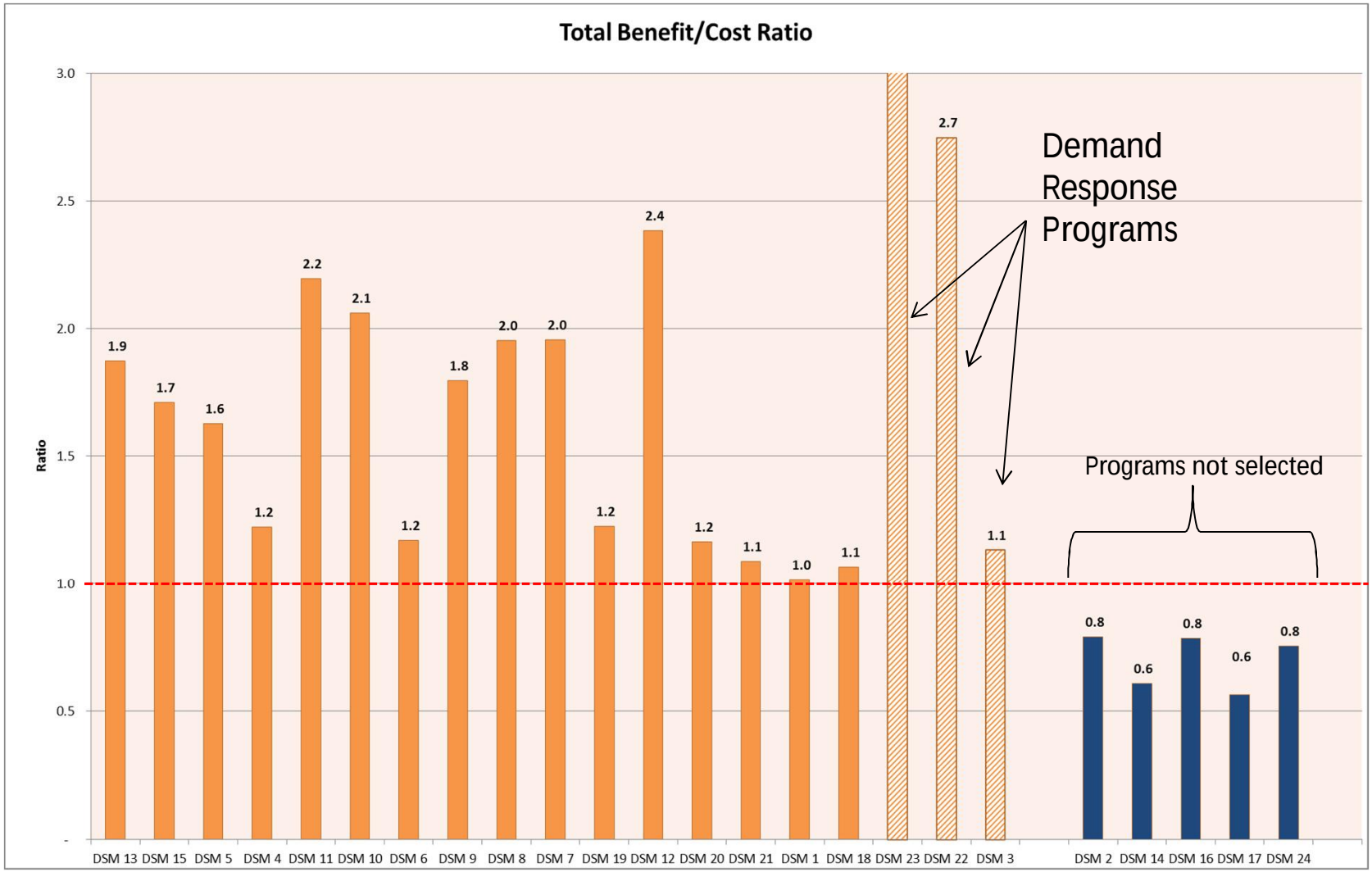
The SIC included an additional 3 demand response programs and two DSM programs that were not previously included in the DSM Portfolio. These were included due to additional analyses provided by ICF and the inclusion of trailing benefits.

Sector	Program Name	DSM Program #	2035 Load Reduction [MW]*
Commercial	Non-Residential Dynamic Pricing	DSM 3	4.5
Residential	Direct Load Control	DSM 22	12.3
Residential	Dynamic Pricing	DSM 23	17.4
Residential	Water Heating	DSM 20	0.8
Residential	Pool Pump	DSM 21	0.9

*Values not grossed up for reserve margin and transmission losses

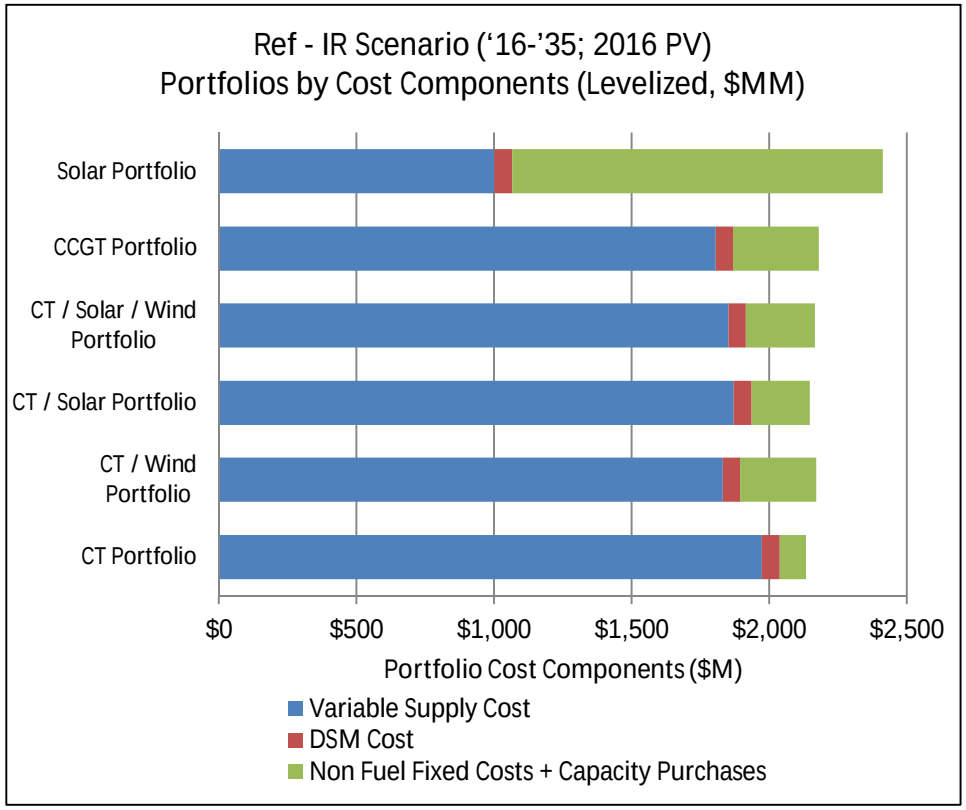
COST-EFFECTIVE DSM POTENTIAL

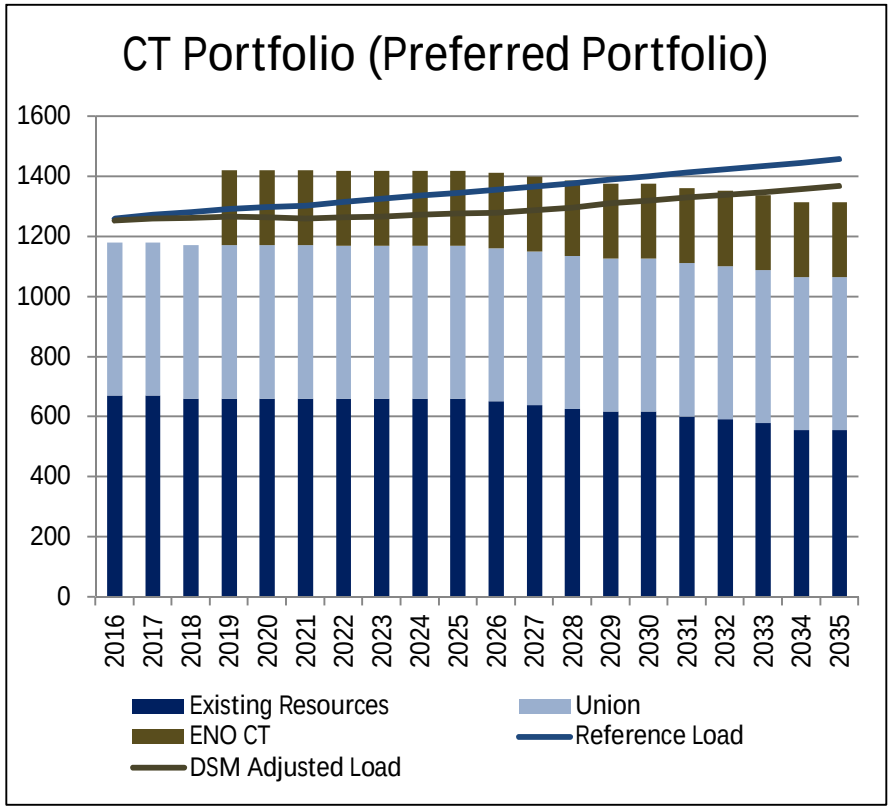
The chart below shows the total benefit/cost ratio for all 24 DSM programs, reflecting the updated demand response analysis and the trailing benefits analysis.



STAKEHOLDER INPUT CASE RESULTS

The CT portfolio was shown to be the lowest cost portfolio in the SIC, confirming the original selection of the CT portfolio as the Preferred Portfolio which was based on the analysis of the IR, BB, DD, and GS scenarios.





Portfolios	Total Relevant Supply Cost Levelized Real ($MM)	Ranking
Solar	$2,413	6
CCGT	$2,180	5
CT Solar_Wind	$2,165	3
CT Solar	$2,146	2
CT Wind	$2,171	4
CT	$2,132	1

Resource	MW (ICAP)	MW (Effective)
Union	510	510
ENO CT	250	250
Total	760	760

CONCLUSIONS

SUMMARY OF PREFERRED PORTFOLIO

The Preferred Portfolio represents ENO's best available strategy for meeting customers' long-term power needs at the lowest reasonable supply cost, while considering reliability and risk

- In order to reliably meet the power needs of customers at the lowest reasonable cost, ENO will maintain a portfolio of generation resources that includes the right amount and types of long-term capacity resources.
  - ENO plans to maintain sufficient generating capacity to meet its peak load plus a 12% planning reserve margin.
  - ENO needs incremental peaking and reserve supply role resources and the inclusion of modern, proven, highly reliable CT capacity is the best alternative available to meet that need.

- ENO will continue to meet the bulk of its reliability requirements with either owned assets or long-term PPAs.

- A portion of ENO's near-term resource needs may be met through a limited reliance on short-term power purchase products including zonal resource credits available through the MISO capacity market while new long-term resources are deployed

- Some level of DSM is considered economically attractive over the long-term assuming appropriate regulatory treatment

- While renewable resources were not selected as economically attractive relative to conventional gas turbine technology to meet ENO's projected resource needs, ENO is committed to continuing to study renewable alternatives
  - ENO is nearing completion of a 1 MW solar pilot with battery storage
  - ENO is in the process of conducting an RFP for up to 20 MW of renewable generation

2015 IRP Action Plan

Category	Action to be taken	Status Update
Deactivation of Michoud Units 2 and 3	➢ Confirmed Attachment Y deactivation request complete for Michoud 2and 3 pursuant to the MISO tariff. ➢ Units 2 and 3 will be deactivated June 1, 2016 subject to completion of necessary transmission upgrades as required by Attachment Y	➢ Majority of transmission upgrades complete ➢ Single remaining upgrade nearing completion
Union Power Station	➢ Obtained council approval on November 19, 2015 for ENO purchase of Union Power Block 1 ➢ Transaction scheduled to close in early 2016	➢ Transaction closed in March 2016
ENO Solar Pilot	➢ Construction to begin 1st quarter 2016 ➢ Target in service date Summer 2016	➢ Construction began Feb 2016 ➢ On schedule June 2016 COD
In-region Peaking Generation	➢ Continue development activities and finalize preliminary design and site location ➢ File for Council approval in a timely manner targeting 2019 in-service date	➢ Design and site selection studies complete ➢ Target filing with Council in June 2016
Clean Power Plan	➢ Continue to monitor pending litigation of the rule and the status of Louisiana Department of Environmental Quality plan to comply	➢ Continue to monitor
DSM	➢ Continue implementation and performance monitoring of Council approved programs for EnergySmart Years 5 and 6 through March 2017	➢ Began Year 6 April 1st
Resource Needs	➢ Continue to monitor resource needs (load, customer count, net metering, resource deactivations) and adjust near-term action items plan accordingly	➢ Continue to monitor
Renewable RFP	➢ Conduct a Renewable RFP to obtain actionable information on the cost and deliverability of renewable resources	➢ Draft RFP issued May 6th
Distributed Generation	➢ Evaluate alternative methods for the treatment of DG in the integrated resource planning process for opportunities for improvement	➢ In prep for 2018 IRP cycle
AMI	➢ Entergy is currently considering various future investments to modernize the distribution grid and more fully utilize new technologies ➢ AMI continues to be analyzed and ENO plans to talk further with the City Council and the Advisors regarding potential future AMI investments	➢ Discussions ongoing with Council and its Advisors