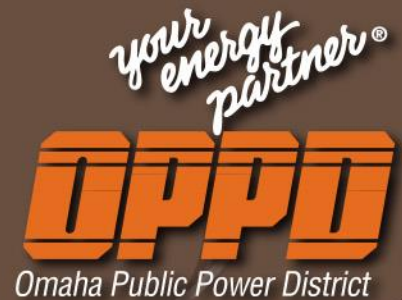


Integrated Resource Plan Update

Brad Underwood

Director Corporate Planning & Analysis

November 17, 2016



Agenda

- Integrated Resource Plan Overview
- Assumptions
- Portfolios
- Stochastic Review
- Comparative Summary of Portfolios
- Stakeholder Outreach Plan
- Next Steps

INTEGRATED RESOURCE PLAN OVERVIEW

Integrated Resource Plan (IRP)

- Comprehensive, forward-looking decision support tool utilized in evaluating efficiency of options to serve electrical requirements
 - Critical as the utility experiences dynamic changes at an accelerated pace
 - IRPs evolve over time to reflect the changing environment

Purpose

- Integrated Resource Plan is prepared as part of OPPD's contractual commitment to the Western Area Power Administration (WAPA)
- Five year written plan to WAPA

Preparation

- Developed in accordance with Board Strategic Directives:
 - SD-2 Competitive Rates
 - SD-4 Reliability
 - SD-7 Environmental Stewardship
 - SD-9 Resource Planning
 - SD-11 Economic Development
 - SD-13 Stakeholder Outreach & Communication
 - SD-15 Enterprise Risk Management

Preparation

- Integrates a variety of inputs that reflect the changing energy market landscape in order to prepare the IRP filing with WAPA:
 - Fuel Costs
 - Power Prices
 - Resource Costs
 - Technology Options

Technologies Evaluated

- Gas Turbines
- Combined Cycles
- Natural Gas Reciprocating Engines
- New Utility Grade Solar
- New Wind
- Long Duration Batteries
- Demand Side Management

ASSUMPTIONS

Assumptions

- Southwest Power Pool (SPP) imposed system reserve margin
 - 12%
- Total energy generation not to exceed 30% above OPPD's retail load
- North Omaha maintained in current state through 2018
- 20 Year Study Duration
 - 2017-2036

Assumptions

- Additional information from FCS analysis
 - Updated market related inputs
 - Incorporated site specific generation estimates
 - Retained North Omaha 1-3 on gas for capacity purposes
- Portfolio solutions must comply with the Clean Power Plan (CPP)

PORTFOLIOS EVALUATED

Portfolios

- Four portfolios developed
- Each of the portfolios have unique traits

	Percent Renewables ⁽¹⁾	Economic Evaluation of DSM ⁽²⁾	Wind ⁽³⁾	Solar ⁽³⁾	Battery
Blue	50%	X	X		
Yellow	50%	X	X		X
Orange	50%	X	X	X	
Pink	40%	X	X		

(1) As a percentage of retail sales

(2) Demand Side Management program components were evaluated in the model

(3) Cost estimated using responses to a June 2016 competitive Request for Proposal

Portfolio Blue

- Includes a maximum constraint of 50% renewables for retail sales
- “Rebalanced Portfolio” that was identified during the FCS analysis

Portfolio Blue Results

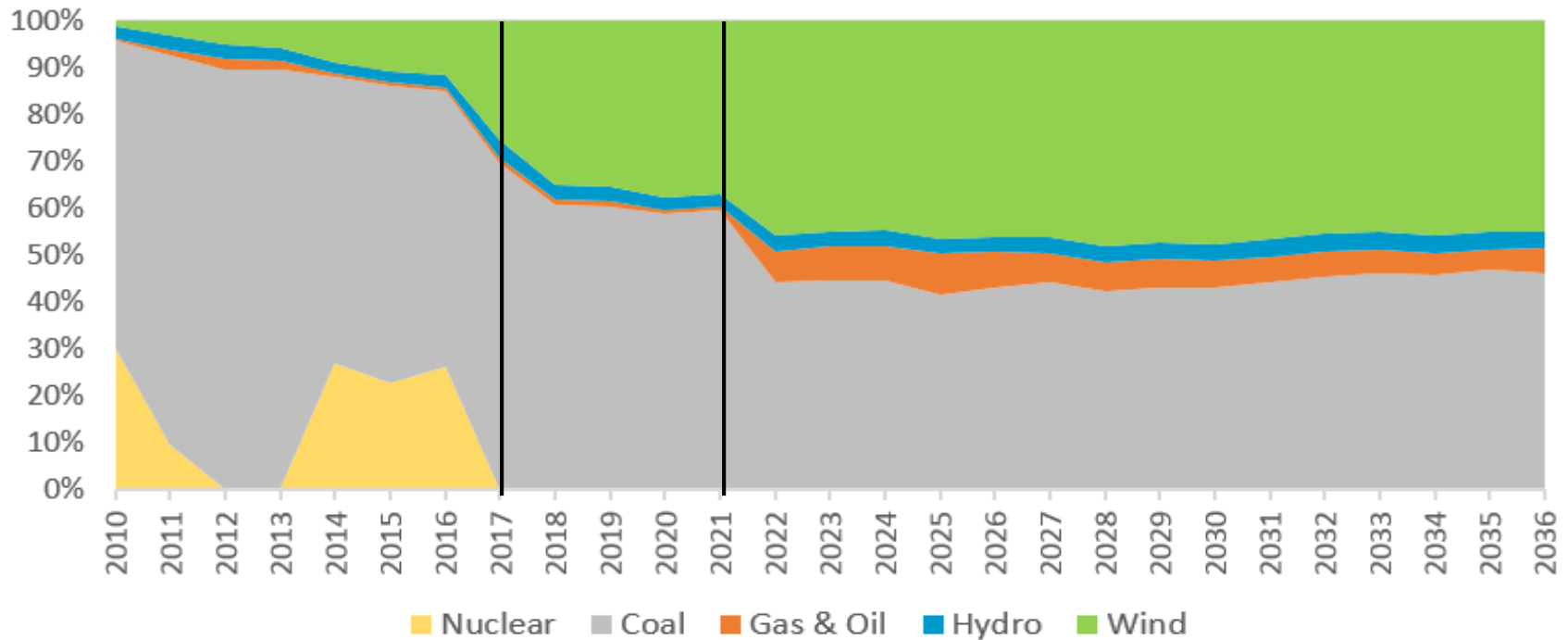
	2017-2021 Proposed Portfolio Changes
2017	Re evaluate 46 MW of planned DSM programs
2018	160 MW Wind
2020	266 MW Wind

		Attributes
NPV Cost⁽¹⁾		\$5.199 B
Emissions⁽²⁾	SO _x	(69%)
	NO _x	(70%)
	Hg	(88%)
	CO ₂	(51%)

(1) Portfolio Net Present Value cost over a 20 year period, displayed in billions

(2) Emissions reductions are comparative from actual 2015 to estimated 2025

Portfolio Blue Results



Fuel sources by percent of total generation

Portfolio Yellow

- Includes a maximum constraint of 50% renewables for retail sales
- Forces selection of 10 MW of battery storage

Portfolio Yellow Results

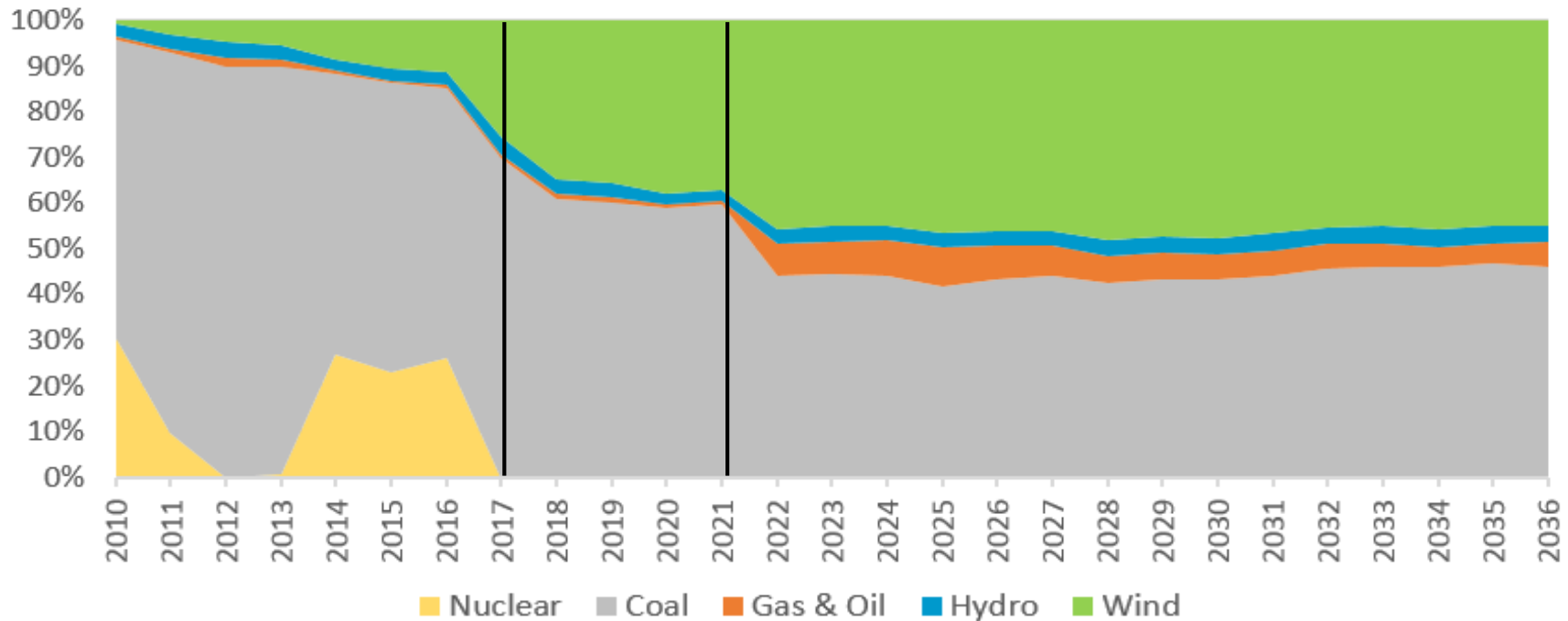
	2017-2021 Proposed Portfolio Changes
2017	Re evaluate 46 MW of planned DSM programs
2018	160 MW Wind
2020	266 MW Wind 10 MW Battery Storage

		Attributes
NPV Cost⁽¹⁾		\$5.216 B
Emissions⁽²⁾	SO _x	(69%)
	NO _x	(70%)
	Hg	(88%)
	CO ₂	(52%)

(1) Portfolio Net Present Value cost over a 20 year period, displayed in billions

(2) Emissions reductions are comparative from actual 2015 to estimated 2025

Portfolio Yellow Results



Fuel sources by percent of total generation

Portfolio Orange

- Includes a maximum constraint of 50% renewables for retail sales
- Forces the selection of approximately 100 MW of utility grade solar

Portfolio Orange Results

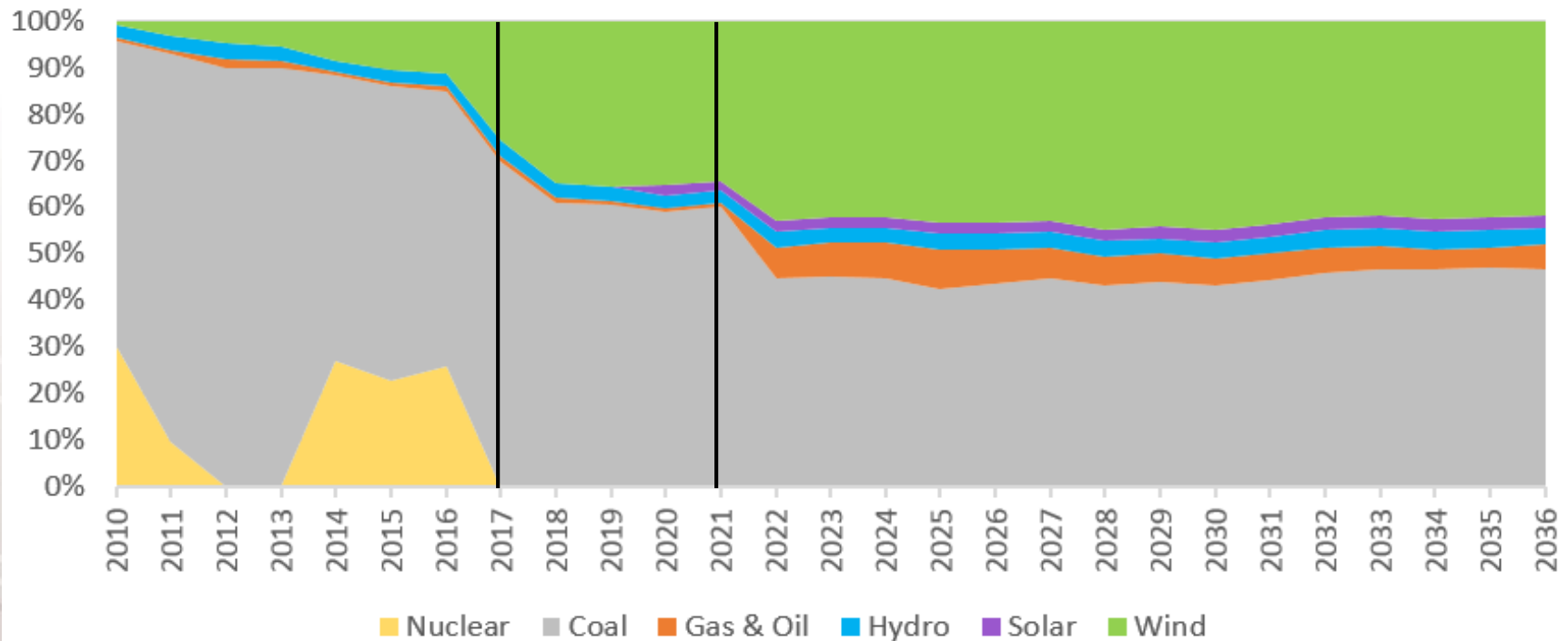
	2017-2021 Proposed Portfolio Changes
2017	Re evaluate 46 MW of planned DSM programs
2018	160 MW Wind
2020	166 MW Wind 100 MW Solar

		Attributes
NPV Cost⁽¹⁾		\$5.398 B
Emissions⁽²⁾	SO _x	(68%)
	NO _x	(69%)
	Hg	(88%)
	CO ₂	(51%)

(1) Portfolio Net Present Value cost over a 20 year period, displayed in billions

(2) Emissions reductions are comparative from actual 2015 to estimated 2025

Portfolio Orange Results



Fuel sources by percent of total generation

Portfolio Pink

- Includes a maximum constraint of 40% renewables for retail sales
- Allows a more moderated inclusion of renewables

Portfolio Pink Results

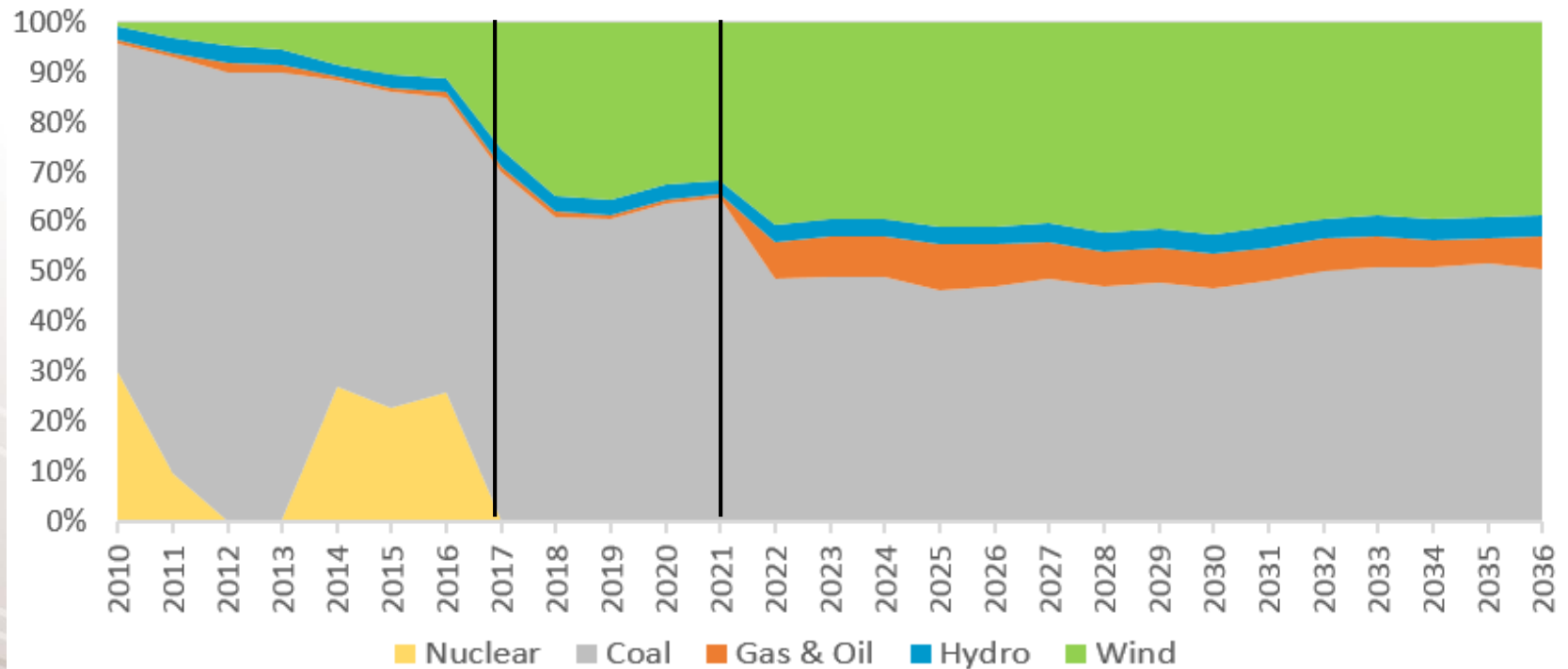
	2017-2021 Proposed Portfolio Changes
2017	Re evaluate 46 MW of planned DSM programs
2018	160 MW Wind

		Attributes
NPV Cost⁽¹⁾		\$5.479 B
Emissions⁽²⁾	SO _x	(68%)
	NO _x	(69%)
	Hg	(88%)
	CO ₂	(50%)

(1) Portfolio Net Present Value cost over a 20 year period, displayed in billions

(2) Emissions reductions are comparative from actual 2015 to estimated 2025

Portfolio Pink Results



Fuel sources by percent of total generation

STOCHASTIC RESULTS

Stochastic Analysis

- Risk profile: Cost-Risk Tradeoff
- Model inputs are intentionally varied to create many potential future scenarios
- Conclusion is a distribution of possible outcomes

Assumptions

- Markets:
 - Scenarios are developed using the volatility 'behavior' of the market.

Drivers:

Gas Prices
Coal Prices
System Load
Technology Costs



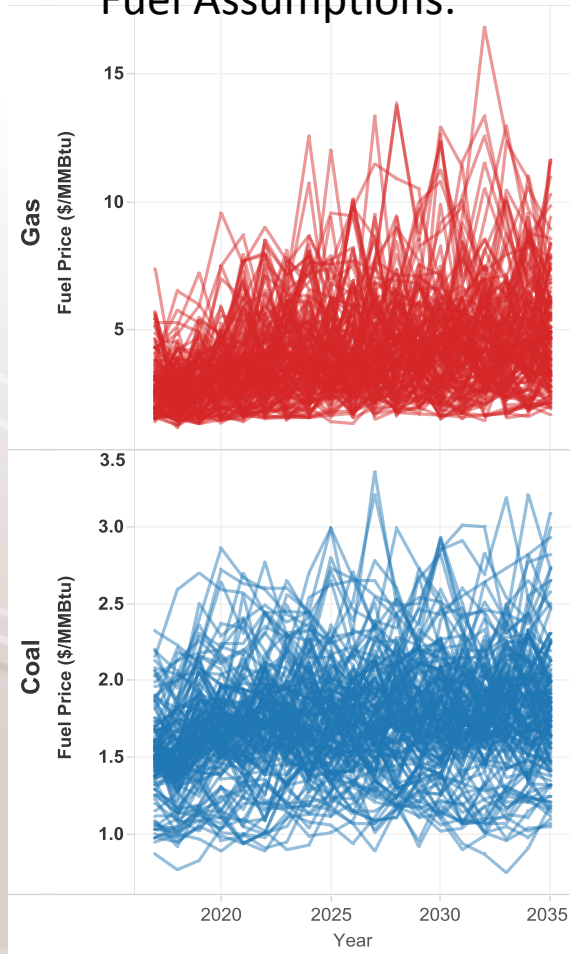
Results:

Power Prices
Unit Dispatch
Wind Penetration
Total Portfolio Costs

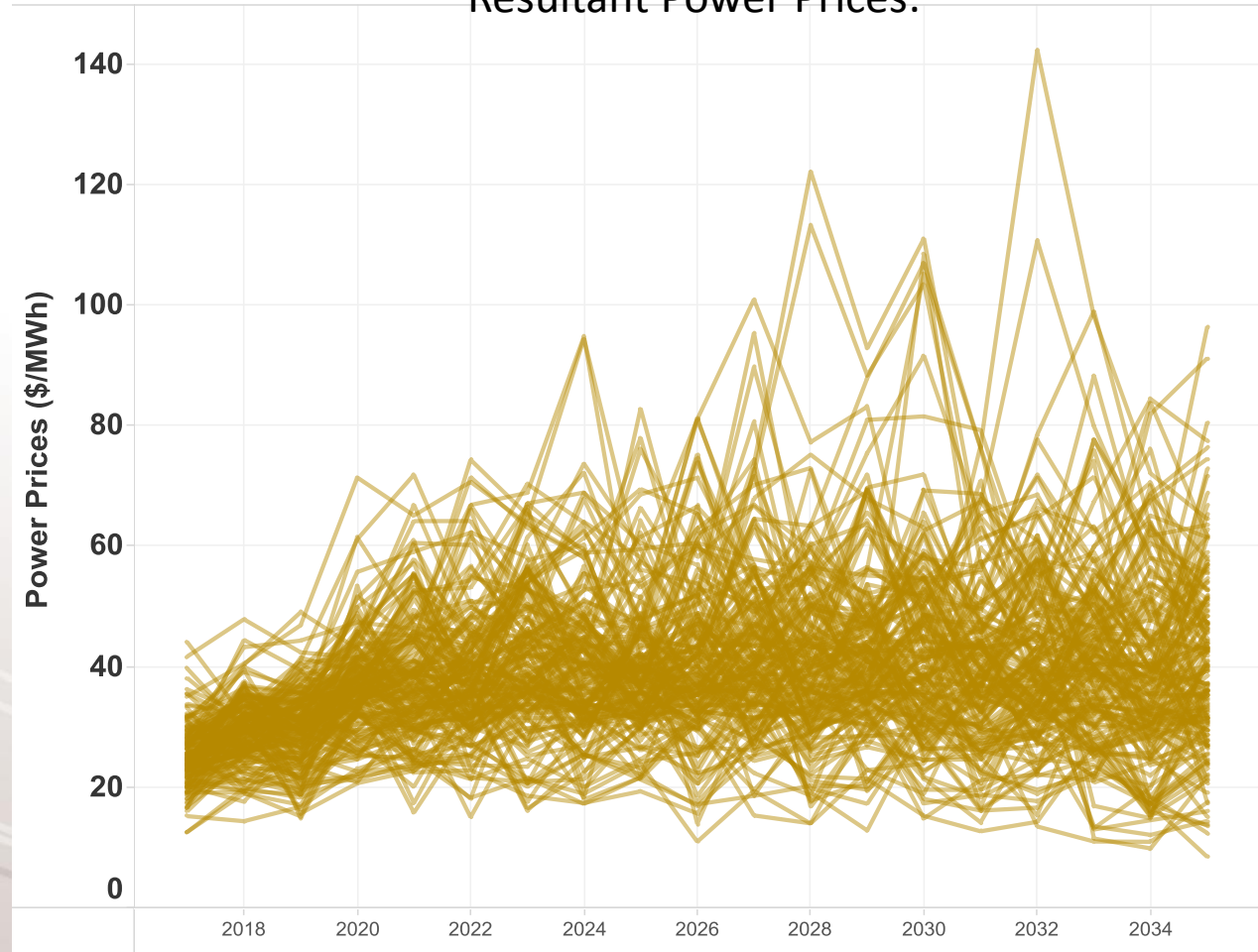
- Modeling Process:
 - Each portfolio tested in 200 scenarios

Assumptions - Markets

Fuel Assumptions:

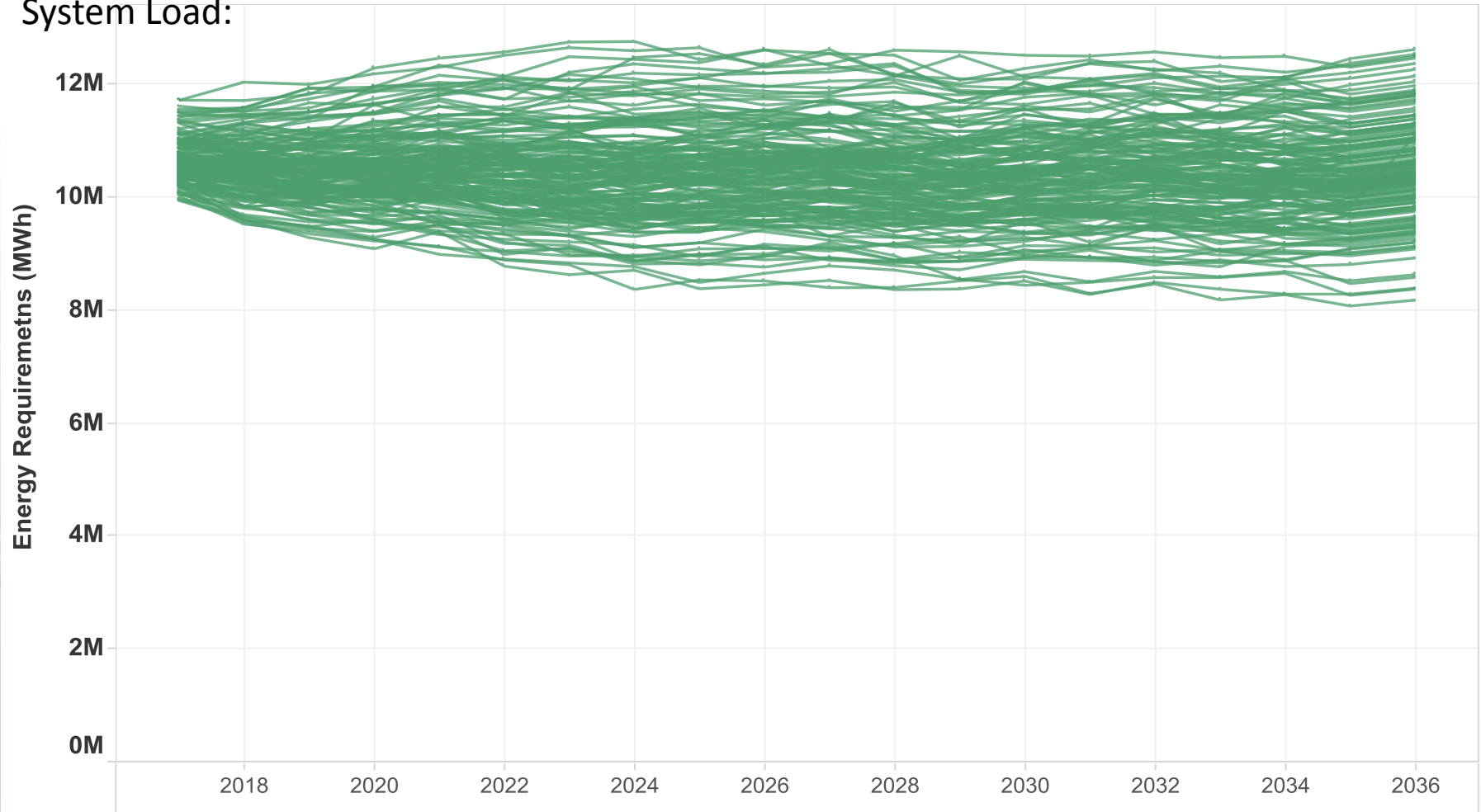


Resultant Power Prices:

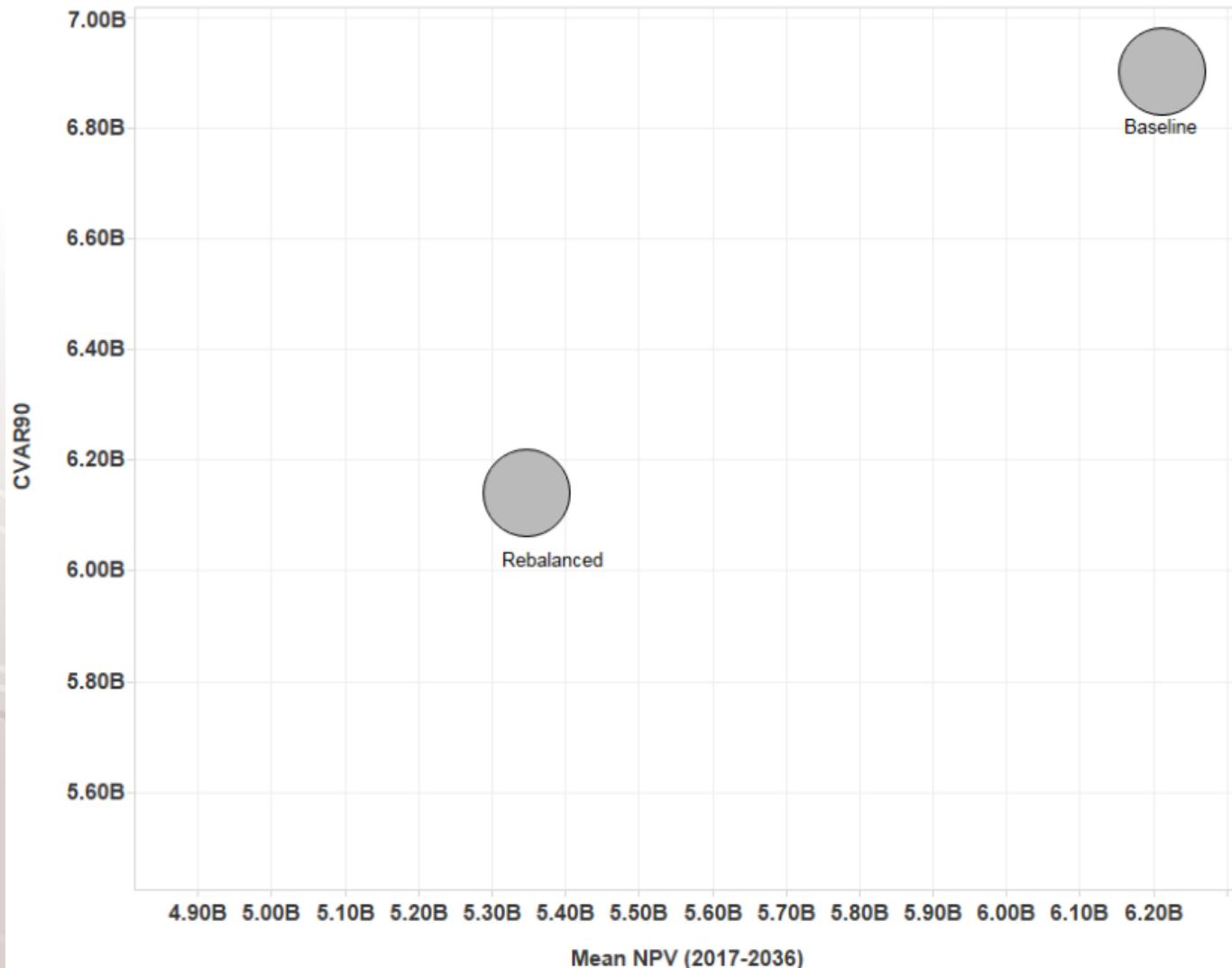


Assumptions – System Load

System Load:

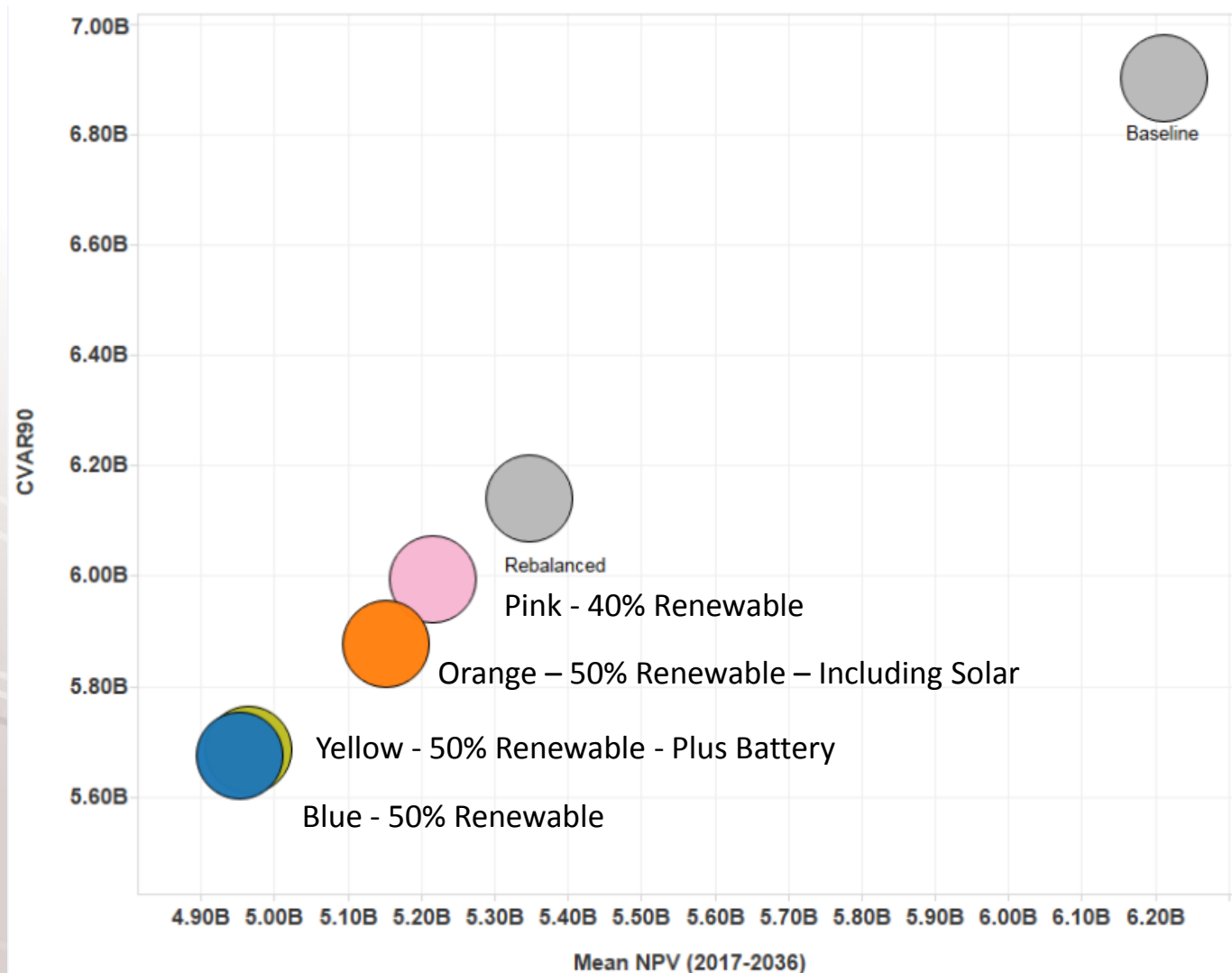


Results – Modeled Cost vs. Risk



Amounts expressed in billions of dollars

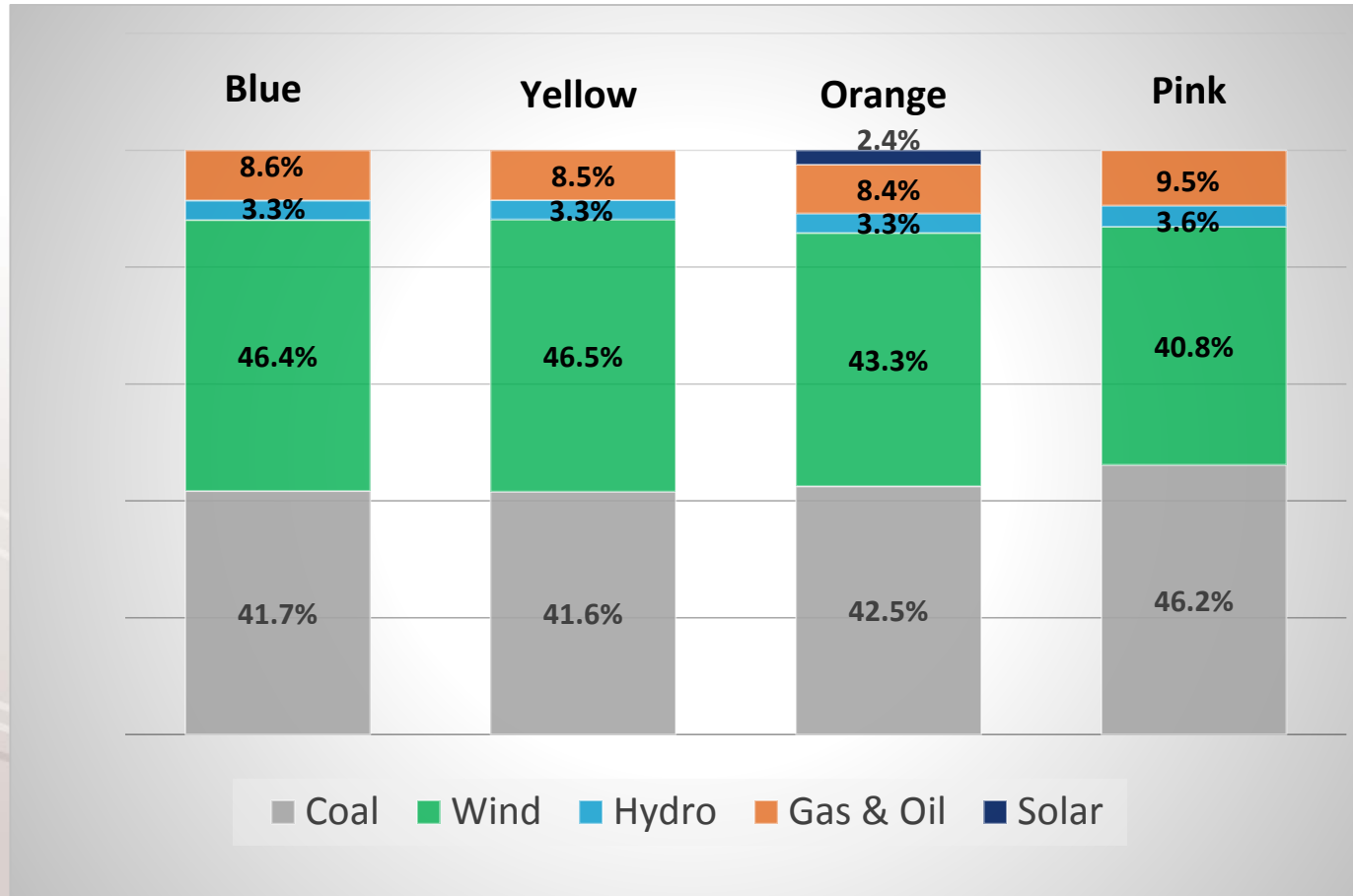
Results – Modeled Cost vs. Risk



Amounts expressed in billions of dollars

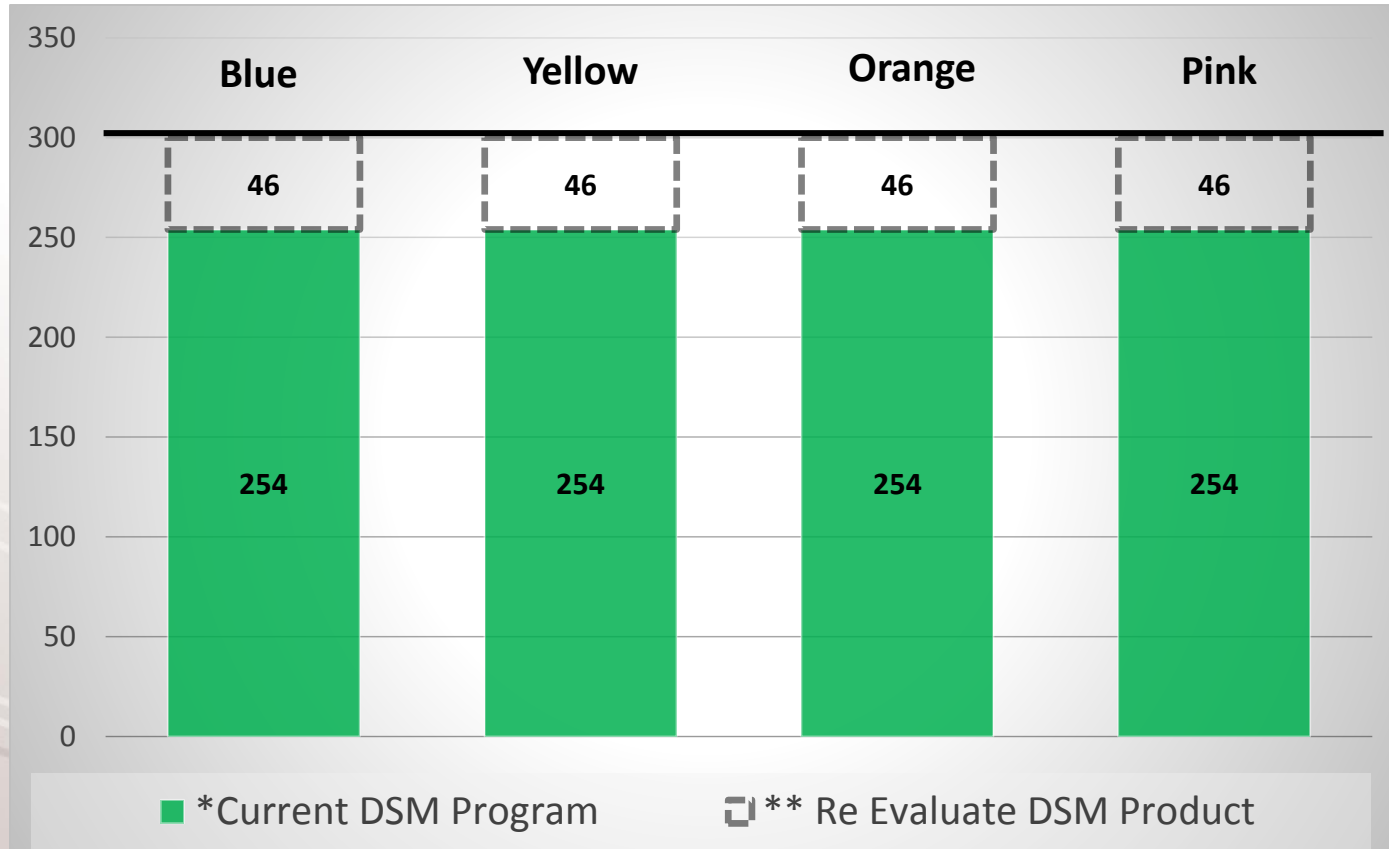
COMPARATIVE PORTFOLIO SUMMARY

Energy Sources Summary*



*Based on 2025 generation, expressed as a percent of total generation




DSM Program Summary (MW)



*As of October 2016, the District has implemented approximately 12MW of energy efficiency and 110MW of demand response out of the 300 MW program.

** Re evaluate the 46MW of planned Business Direct Load Control

Financial Summary

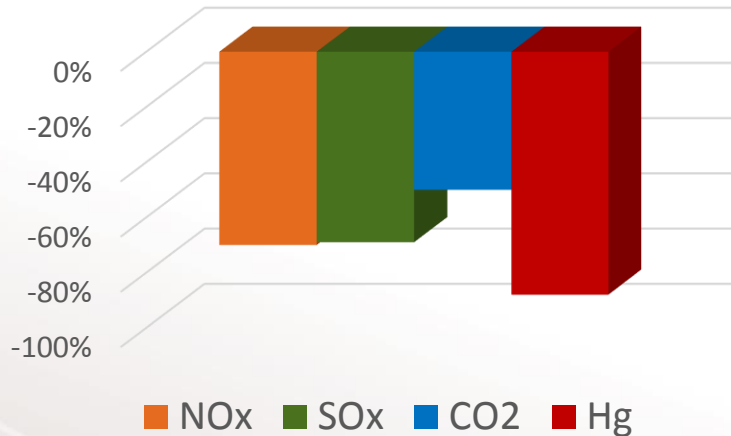
Portfolios	Attributes	Total Cost ⁽¹⁾ (\$ Billions)	Incremental Cost (\$ Millions)
Blue	50% Renewables	\$5.199 B	Baseline
Yellow	50% Renewables + 10 MW Battery	\$5.216 B	 \$16.9 M
Orange	50% Renewables including 100 MW utility grade solar	\$5.398 B	 \$199.4 M
Pink	40% Renewables	\$5.479 B	 \$280.4 M

(1) Amounts are expressed in terms of Net Present Value over a 20 year period

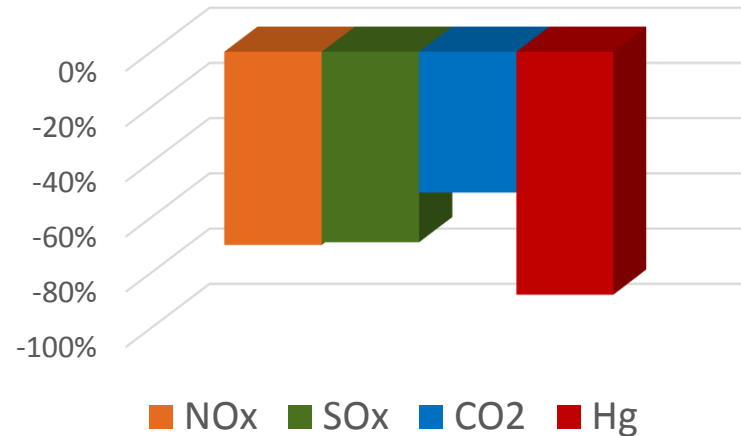
(2) Incremental amounts are expressed relative to Portfolio Blue

Emissions Summary*

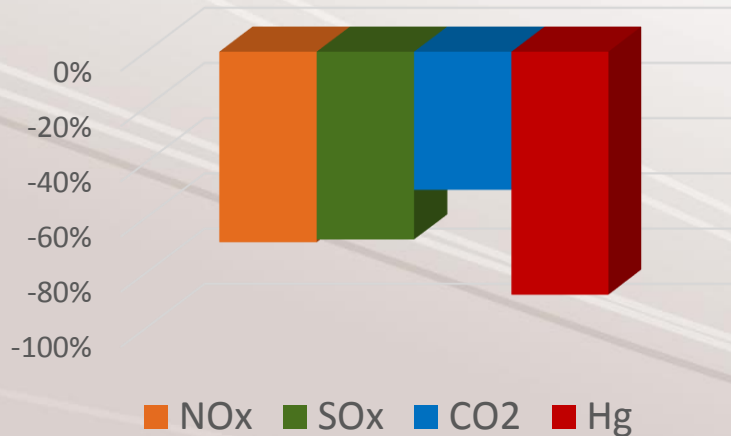
Blue



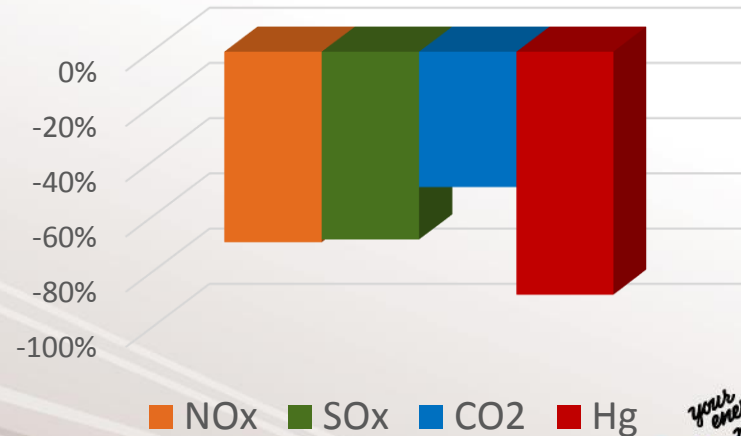
Yellow



Orange



Pink



*Emissions reductions are comparative from actual 2015 to estimated 2025

STAKEHOLDER OUTREACH

Stakeholder

- Stakeholder process (November – December)
- Information Releases
 - Social Media
 - Email (Governmental Affairs, Economic Development Stakeholders)
- Information readily available:
 - OPPDListens.com
 - OPPDtheWire.com
- Stakeholder Outreach Open Houses
 - Metro (UNO)
 - North (Blair)
 - South (Syracuse)

Stakeholder Schedule

Dates	Activities
November 17	Presentation to Board
November 17	Materials made available on OPPDListens.com for 24/7 feedback
November 21	Weekly feedback report to the Board
November 28	Weekly feedback report to the Board
November 29	Employee Open House
November 29	Stakeholder Outreach (Metro) 5-7 P.M. UNO Barbara Weitz Center
November 30	Stakeholder Outreach (North) 5-7 P.M. Blair City Council Chamber Room
December 1	Stakeholder Outreach (South) 5-7 P.M. Syracuse Center
December 5	Weekly feedback report to the Board
December 12	Final weekly feedback report to the Board
December 15	Management provides stakeholder feedback summary to Board

NEXT STEPS

Next Steps

- Engage stakeholders for feedback
- Evaluate pursuit of common resource options across the portfolios
- Aggregate feedback and report back to Board in December
- File with WAPA in early 2017
- Continue to review the portfolio on an ongoing basis