

# Integrated Resource Plan

TVA'S ENVIRONMENTAL AND ENERGY FUTURE

Stakeholder Review Group  
Working Session

August 26, 2010  
Chattanooga, TN 2010



10:00-10:15	Introduction	Randy McAdams
10:15-10:30	Review of August 20 <sup>th</sup> Board Meeting	Van Wardlaw
10:30-11:45	Review of Draft IRP Contents (Chapters 1 – 6)	Gary Brinkworth
11:45-12:15	Lunch	
12:15-1:45	Review of Draft IRP Contents (Chapter 7)	Gary Brinkworth
1:45-2:15	Open Discussion	
2:15-2:45	Next Steps and Open Discussion on the Process	Gary Brinkworth
2:45-3:00	Wrap-Up	Randy McAdams



## SRG Purpose

- ◆ Provide TVA with in-depth ongoing discussion and input from different stakeholder viewpoints
- ◆ Serve as a source of information, a coordination mechanism, and a professional review group
- ◆ Build efficiency into the study process by providing real-time public input to IRP issues and processes
- ◆ Validate the various steps in the IRP process

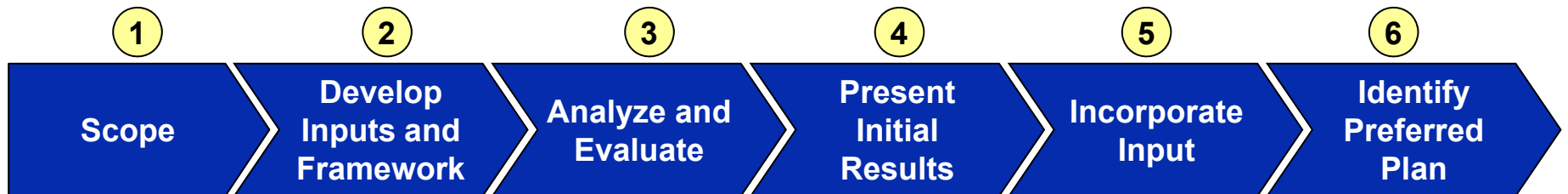
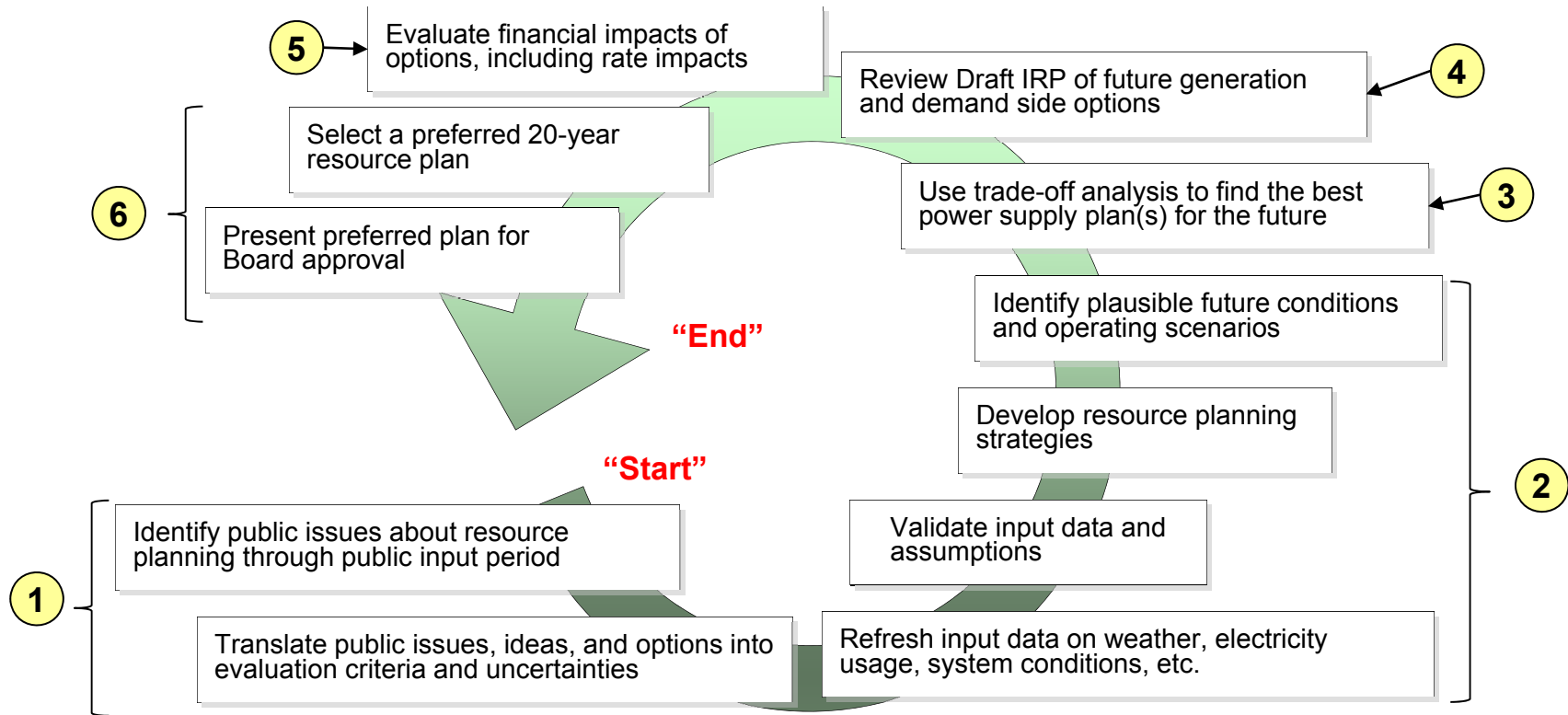
## SRG Meeting Types

- ◆ *Working Sessions* – regular meetings that are not open to the general public
- ◆ *Workshops* – the SRG, by majority vote, can request TVA hold additional “workshops” to provide more in-depth information on specific topics to those members who are interested in attending
- ◆ *Public Comment Sessions* – by majority vote, the SRG may host a public comment session to receive input on specific topics



# Introduction IRP Process Review

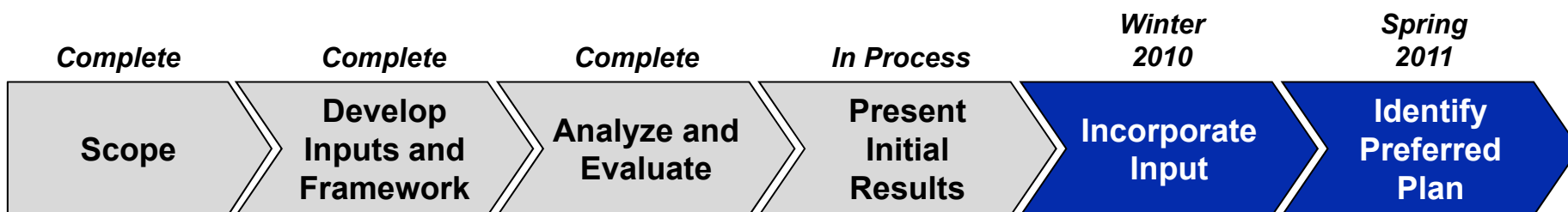
The IRP process that has been previously shared can be summarized into six high-level steps







# Introduction IRP Process Review (Cont'd)

The SRG has reviewed and provided input on the following topics:



- ◆ Planning process
- ◆ Key uncertainties
- ◆ Updated scenario/worlds
- ◆ Demand-side resource options
- ◆ Supply-side resource options
- ◆ Busbar screening results for supply-side resource options
- ◆ Load forecast
- ◆ Environmental outlook
- ◆ Commodity price forecasts
- ◆ Financial parameters
- ◆ Energy efficiency and demand response
- ◆ Planning strategies
- ◆ IRP scorecard and evaluation metrics
- ◆ Preliminary model results

 Complete or In Process  
 Not Started

***Review of August 20<sup>th</sup> Board Meeting***

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# Review of August 20<sup>th</sup> Board Meeting

*TVA announced the adoption of a new vision and strategic direction to become one of the nation's leading providers of low-cost and cleaner energy by 2020*

- ◆ TVA intends to become
  - The nation's leader in improving our air quality
  - The nation's leader in increased nuclear production
  - The Southeast's leader in increased energy efficiency
  
- ◆ The vision includes plans to:
  - Replace 1,000 MW of our older coal-fired generation in the near future
  - Increase the energy efficiency budget for 2011
  - Provide funding to continue the engineering studies needed for a possible decision on Bellefonte next year

# Review of August 20<sup>th</sup> Board Meeting (Cont'd)

*The input and advice that TVA has received from the Stakeholder Review Group (SRG) over the past year have helped pave the way for the announcements on August 20<sup>th</sup>*

- ◆ The vision is consistent with SRG input that TVA has received over the past year to:
  - Increase the commitment to energy efficiency
  - Reduce reliance on the oldest and least-economical coal-fired generation units
  - Preserve the option for additional non-emitting baseload capacity
  
- ◆ The SRG process has been very valuable to the development of the IRP
  
- ◆ TVA proposes to do the following to continue the process:
  - Continue SRG interaction between the draft and final IRP
  - Building on the demonstrated value of the SRG and this IRP's approach, it is anticipated the draft will contain a commitment from TVA to begin the next IRP effort by 2015

**Thank you for your service to the people of the TVA region and we look forward to continuing to work with you in the months ahead**



## The IRP project will produce two primary deliverables

### Integrated Resource Plan

- ◆ The IRP will evaluate reliable, cost-effective resource options for meeting future customer demand for electricity subject to economic and operating constraints
  
- ◆ The IRP will contain the following sections
  - Executive summary (~10 pages)
  - Body of the document (~100 pages)
  - Appendix (~150 pages)
  
- ◆ The document will be very similar to IRPs produced by investor-owned utilities

### Environmental Impact Statement

- ◆ The Environmental Impact Statement (EIS) will evaluate the environmental impacts of alternatives considered in the IRP for meeting customer demand
  
- ◆ The EIS is a requirement of the National Environmental Policy Act (NEPA)
  
- ◆ Multiple volumes will be produced in the EIS in accordance with NEPA
  
- ◆ The NEPA process requires that Draft and Final documents are issued for public comment
  - All comments must be documented along with a response as a volume in the Final document

**As a federal agency, TVA has a unique requirement to complete an Environmental Impact Statement in addition to the IRP**



# Draft IRP Table of Contents

- ◆ Executive Summary
- ◆ Chapter 1 – Introduction to TVA’s Environmental and Energy Future
- ◆ Chapter 2 – Public Participation
- ◆ Chapter 3 – Need for Power Analysis
- ◆ Chapter 4 – Energy Resource Options
- ◆ Chapter 5 – Resource Plan Development and Analysis
- ◆ Chapter 6 – Resource Plan Results
- ◆ Chapter 7 – Recommended Planning Strategy

**Today’s discussion will review key elements of the Draft IRP**

# Review of Draft IRP Contents – Executive Summary

- ◆ The executive summary provides a condensed version of key topics and results in the IRP
  - Introduction
  - Need for Power Analysis
  - Approach
  - Key Themes from Results
  - Recommended Planning Strategy
  
- ◆ The “Recommended Planning Strategy” section will be further developed after the Draft IRP

## Key Themes in the Draft IRP

- ◆ Nuclear expansion is present in the majority of portfolios
  - First nuclear unit is selected between 2018 and 2022
  - Nuclear overtakes coal as the leading energy producer during the period

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- ◆ Some level of fossil layups is favorable compared to maintaining the existing fleet
  - Results indicate that optimum fossil layups are between 2,000 and 5,000 MW

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- ◆ Energy Efficiency and Demand Response (EE/DR) and renewable generation play an increasing role in future resource portfolios

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- ◆ Natural gas capacity additions are a viable resource option

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- ◆ The intensity of CO2 emissions decreases in all portfolios

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# Review of Draft IRP Contents – Chapter 1

## Chapter 1 – Introduction to TVA’s Environmental and Energy Future

- ◆ Brief description of TVA history, mission, current operations/system
- ◆ Planning methodology concepts and development
- ◆ Concise statement of goals and objectives for resource planning and statement on key drivers in plan development

### Goals of the IRP

- ◆ Ensure that TVA can meet the demand for electricity in a cost-effective, reliable manner with due regard for protection of public health and the environment
- ◆ Develop a robust solution that best balances competing objectives while minimizing risks and retaining the flexibility to respond to future risks and opportunities as they unfold
- ◆ Adopt a preferred planning strategy that accounts for the expectations of the majority of stakeholders, while supporting TVA’s multi-faceted mission
- ◆ Engage the public in a transparent process that solicits and ensures public input, while also educating participants on the constraints and tradeoffs required to produce a plan of this magnitude

## Chapter 2 – Public Participation

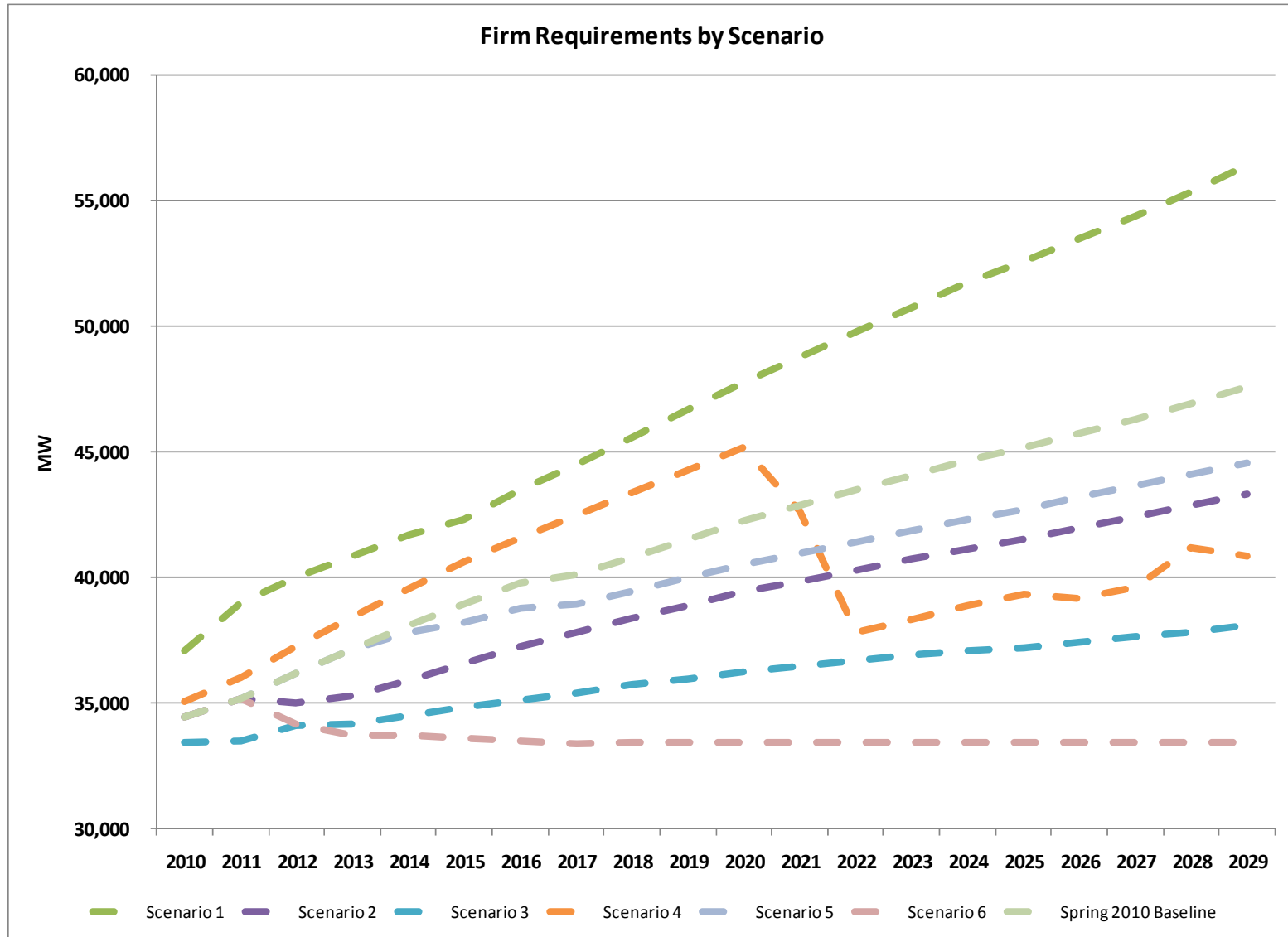
- ◆ Describes three distinct phases for engaging the public
  - Scoping period
  - Analysis and evaluation period
  - Draft IRP public comment period
  
- ◆ Outlines techniques for collecting public input
  - Quarterly public briefings
  - Phone surveys
  - Webinars
  - Written comments
  
- ◆ Description of the Stakeholder Review Group purpose and members
  
- ◆ There are four public meetings scheduled during the public comment period
  - October 5, Bowling Green, KY
  - October 7, Olive Branch, MS
  - October 13, Knoxville, TN
  - October 14, Huntsville, AL

## Chapter 3 – Need for Power Analysis

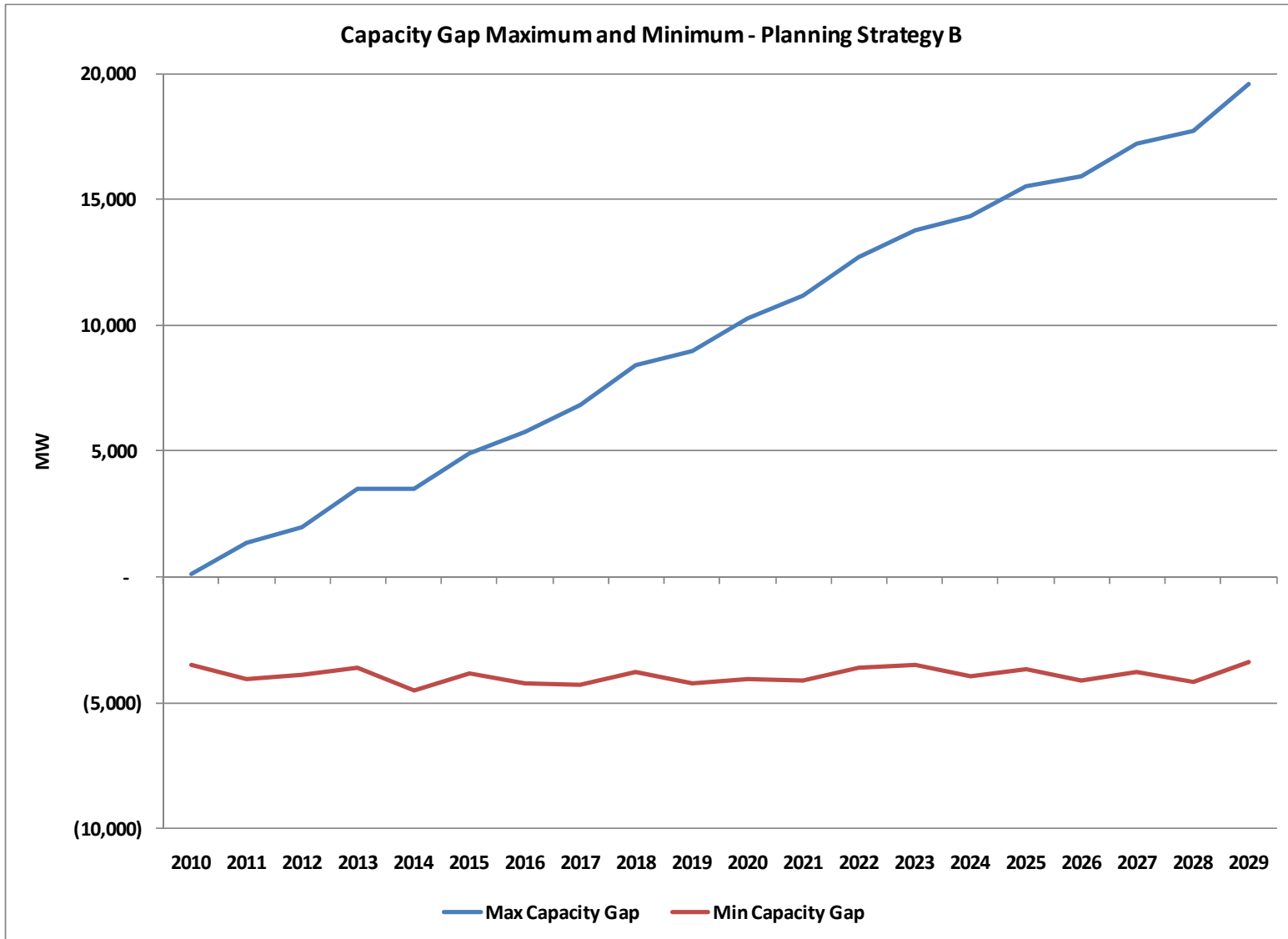
- ◆ Describes the analysis and key components used to establish the need for power
- ◆ Presents the forecast ranges of peak demand and annual energy requirements
  - Minimum and maximum forecasts correspond to Scenarios 6 and 1 respectively
- ◆ Discusses the factors affecting growth of demand
  - The key drivers and methodology for developing the load and energy forecasts were discussed in the October 23<sup>rd</sup>, 2009 Working Session
- ◆ Describes the current energy resource mix
- ◆ Concludes that in the majority of scenarios, the forecasted demand plus reserve margin exceeds existing resources
  - Therefore, a need for power is established



# Review of Draft IRP Contents – Chapter 3 (Cont'd)



**Firm requirements (load forecast – interruptible + reserve margin) were reviewed in the July 20<sup>th</sup>, 2010 Working Session**



**Capacity gaps were reviewed in the July 20<sup>th</sup>, 2010 Working Session**

## Chapter 4 – Energy Resource Options

- ◆ Details the energy resource options considered in the IRP including:

<ul style="list-style-type: none"> <li>— Supply-side resources</li> </ul>	<ul style="list-style-type: none"> <li>● Capital costs were reviewed in the October 22<sup>nd</sup>, 2009 Working Session</li> <li>● Screening of supply-side alternatives discussed in February 17<sup>th</sup>, 2010 Working Session</li> </ul>
<ul style="list-style-type: none"> <li>— Demand-side resources</li> </ul>	<ul style="list-style-type: none"> <li>● Demand-side programs reviewed in detail during December 10<sup>th</sup> and 11<sup>th</sup>, 2009 Workshop</li> </ul>
<ul style="list-style-type: none"> <li>— Power imports</li> </ul>	<ul style="list-style-type: none"> <li>● Reviewed in February 17<sup>th</sup>, 2010 Working Session</li> </ul>

- ◆ Presents energy resource options in three groups
  - Options identified but not considered
  - Options not requiring new generation
  - Options requiring new generation
  
- ◆ Describes evaluation of resource alternatives that is based on qualitative assessment as well as costs and performance characteristics
  
- ◆ The EIS will contain a more comprehensive review of environmental measures

## Chapter 5 – Resource Plan Development and Analysis

- ◆ Discusses the development of key inputs and framework for scenario planning approach

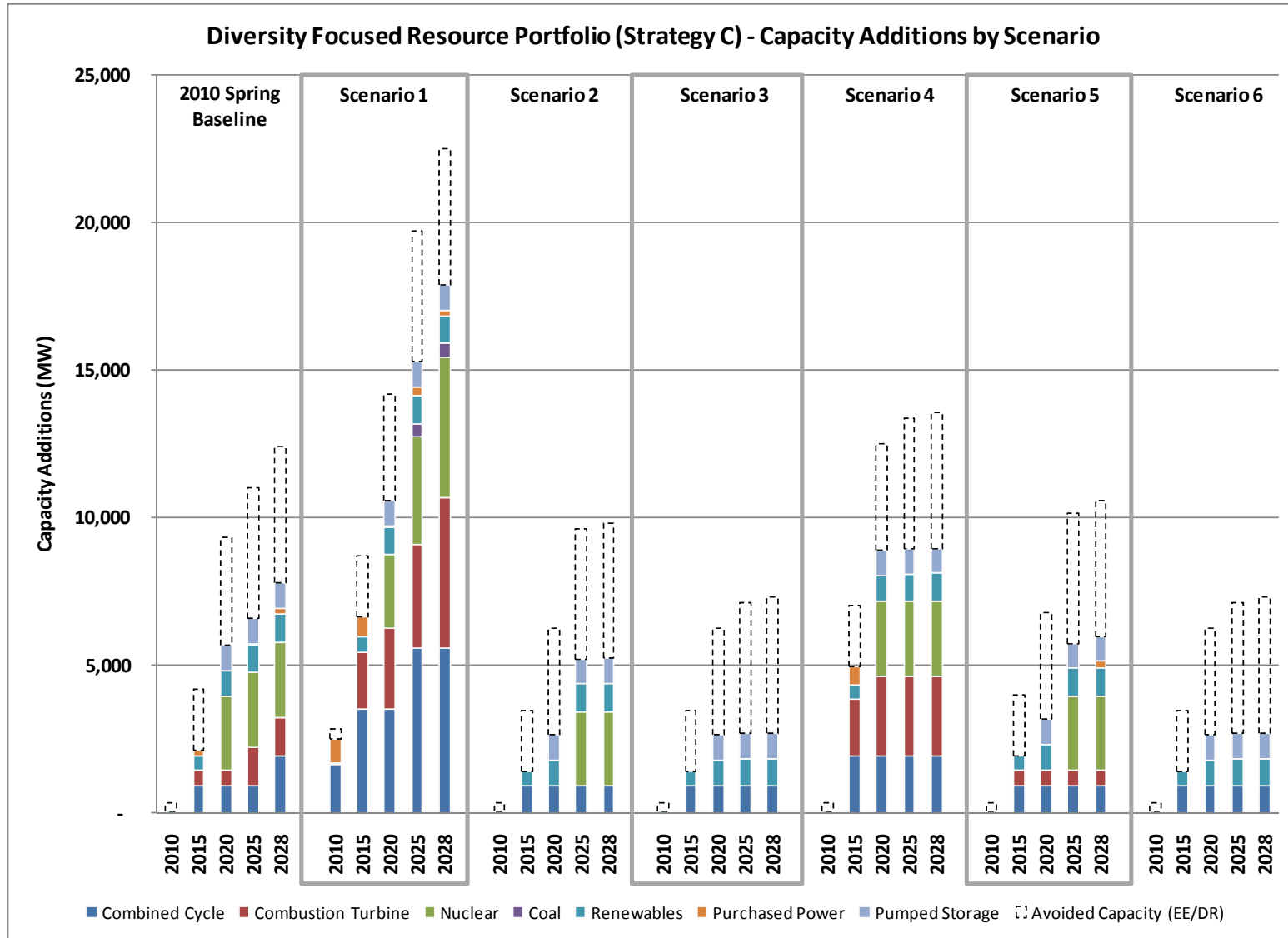
— Scenario development process	<ul style="list-style-type: none"> <li>• Development of the scenarios and key uncertainties were reviewed in the August 18<sup>th</sup>, 2009 Working Session</li> <li>• Updated scenarios were discussed in the February 17<sup>th</sup>, 2010 Working Session</li> </ul>
— Discussion of key uncertainties and how they were used to develop scenarios	
— Description of planning strategies and attributes	<ul style="list-style-type: none"> <li>• Planning strategies and key inputs were reviewed in the May 13<sup>th</sup>, 2010 Working Session</li> </ul>
— Explanation of portfolio development and incorporation of key inputs	
— Descriptions of CapEx and Midas	<ul style="list-style-type: none"> <li>• Review of the modeling process was completed in the June 29<sup>th</sup>, 2010 Working Session</li> </ul>
— Introduction to scorecard and method for application	<ul style="list-style-type: none"> <li>• The IRP scorecard design and application was discussed in the June and July 2010 Working Sessions and August 12<sup>th</sup>, 2010 webinar</li> </ul>

## Chapter 6 – Resource Plan Results

- ◆ Review of firm requirements by scenario
  
- ◆ Discussion of the capacity gap charts by planning strategy
  
- ◆ Expansion plan and unit addition schedules for all 35 portfolios
  
- ◆ Overview of energy mix by planning strategy
  
- ◆ Discussion of portfolio performance on the following factors
  - Present Value of Revenue Requirements (PVRR)
  - Short-term rate impacts



# Review of Draft IRP Contents – Chapter 6 (Cont'd)



**Resource plan results were reviewed in detail in the July 20<sup>th</sup> and 21<sup>st</sup>, 2010 Working Sessions**



## Chapter 7 – Recommended Planning Strategy

- ◆ Completed IRP scorecards with ranking metrics and strategic metrics
- ◆ Recommended planning strategies to retain for further analysis
- ◆ Example implementing portfolios
- ◆ The “Recommended Planning Strategy” section will be further developed after the Draft IRP

**Results will be reviewed in today’s discussion**







# Completed IRP Scorecards (Cont'd)

## Planning Strategy B –Baseline Plan Resource Portfolio

Scenarios	Ranking Metrics					Strategic Metrics				
	Energy Supply					Environmental Stewardship			Economic Development	
	PVRR	Short-Term Rate Impact	Risk/Benefit	Risk	Total Plan Score	CO <sub>2</sub> Footprint	Water	Waste	Total Employment	Growth in Personal Income
1	97.71	97.59	98.40	97.34	97.68					
2	97.76	98.85	100.00	99.98	98.79					
3	99.61	98.70	91.37	83.79	94.79					
4	98.38	98.11	98.25	93.79	97.26					
5	98.44	98.14	98.61	98.94	98.51					
6	96.55	96.96	88.56	78.46	91.55					
Baseline	98.01	99.01	96.50	94.26	97.20					
<b>Total Ranking Metric Score</b>					<b>675.78</b>					

## Planning Strategy C – Diversity Focused Resource Portfolio

Scenarios	Ranking Metrics					Strategic Metrics				
	Energy Supply					Environmental Stewardship			Economic Development	
	PVRR	Short-Term Rate Impact	Risk/Benefit	Risk	Total Plan Score	CO <sub>2</sub> Footprint	Water	Waste	Total Employment	Growth in Personal Income
1	100.00	97.48	100.00	100.00	99.43					
2	99.58	100.00	96.20	96.17	98.49					
3	100.00	97.13	100.00	100.00	99.35					
4	100.00	97.94	100.00	100.00	99.53					
5	100.00	100.00	100.00	100.00	100.00					
6	98.59	96.09	98.19	93.22	96.75					
Baseline	100.00	98.71	100.00	100.00	99.71					
<b>Total Ranking Metric Score</b>					<b>693.25</b>					



# Completed IRP Scorecards (Cont'd)

## Planning Strategy D – Nuclear Focused Resource Portfolio

Scenarios	Ranking Metrics				
	Energy Supply				
	PVRR	Short-Term Rate Impact	Risk/Benefit	Risk	Total Plan Score
1	97.40	97.54	96.41	96.81	97.18
2	97.90	98.51	99.04	98.90	98.40
3	99.41	100.00	81.31	69.12	90.43
4	97.40	97.97	90.14	92.05	95.42
5	97.86	98.47	96.57	92.60	96.64
6	100.00	100.00	89.16	78.46	93.77
Baseline	98.56	99.79	92.15	91.33	96.41
<b>Total Ranking Metric Score</b>					<b>668.26</b>

Strategic Metrics				
Environmental Stewardship			Economic Development	
CO <sub>2</sub> Footprint	Water	Waste	Total Employment	Growth in Personal Income
●	◐	●	●	●
●	◐	●		
●	●	●		
●	◐	●		
●	●	●		
◐	●	●	◐	◐
●	●	●		

## Planning Strategy E – EE/DR and Renewables Focused Resource Portfolio

Scenarios	Ranking Metrics				
	Energy Supply				
	PVRR	Short-Term Rate Impact	Risk/Benefit	Risk	Total Plan Score
1	99.43	99.21	97.82	96.78	98.58
2	100.00	99.22	99.79	100.00	99.80
3	99.15	96.03	95.91	97.73	97.72
4	99.45	99.58	95.32	89.57	96.73
5	99.83	99.50	98.87	99.47	99.56
6	99.16	95.61	100.00	100.00	98.64
Baseline	99.68	99.77	98.98	98.96	99.45
<b>Total Ranking Metric Score</b>					<b>690.47</b>

Strategic Metrics				
Environmental Stewardship			Economic Development	
CO <sub>2</sub> Footprint	Water	Waste	Total Employment	Growth in Personal Income
◐	●	◐	◐	◐
◐	●	◐		
◐	◐	◐		
◐	●	◐		
◐	◐	◐		
●	◐	◐	●	●
◐	◐	◐		



# Observations from Preliminary Results

- ◆ Based on the preliminary ranking metric results Planning Strategy C ranks the highest
  - Planning strategy C has the highest overall score and performs the best in 5 out of 7 scenarios
  - The primary concern with planning strategy C is performance on short-term rate impacts
  - Planning strategy E is a close second and planning strategy B ranks third
  - Planning Strategies D and A do not appear to be strong candidates

**Ranking Metric Results**

Rank	Planning Strategies
1	C - Diversity Focused Resource Portfolio
2	E - EE/DR and Renewables Focused Resource Portfolio
3	B - Baseline Plan Resource Portfolio
4	D - Nuclear Focused Resource Portfolio
5	A - Limited Change in Current Resource Portfolio

- ◆ Preliminary strategic metric results suggest:
  - Planning strategies D and E have the best relative performance for environmental and economic development
  - Planning strategy C is above average
  - Planning strategies B and A have the lowest relative performance
- ◆ Implications of preliminary results
  - Planning strategy C is the best performer with planning strategy E a close second
  - Planning strategy B may also be a viable candidate and will be retained in the draft since it represents the “no action” alternative in the EIS
  - Planning strategies A and D are the worst performers and will be removed from further consideration



# Portfolios Included in the Draft IRP

- ◆ Portfolios produced from planning strategies C, E, and B have been retained in the draft
  
- ◆ Results indicate that differing scenarios tended to produce very similar expansion plans (particularly before 2020) and those similarities appeared between:
  - Scenarios 1 and 4
  - Scenarios 2 and 5
  - Scenarios 3 and 6
  
- ◆ Four representative expansion plans were selected from planning strategies C, E, and B
  - Only one expansion plan is shown when two scenarios produced very similar portfolios as noted above (e.g., scenarios 3 and 6)
  
- ◆ Sensitivity analysis will continue beyond draft publication to further refine the best performing planning strategies
  
- ◆ A total of 12 recommended portfolios for the draft IRP are shown on the following slide



# Portfolios Included in the Draft IRP (Cont'd)

Year	Planning Strategy C			
	SC1	SC 2	SC 3	SC 7
2010	PPA's & Acq			
2011				
2012	JSF CC	JSF CC	JSF CC	JSF CC
2013				
2014	CTa			
2015	CT GL CT Ref CC			GL CT Ref CTa
2016	CT			
2017				
2018	BLN1			BLN1
2019				
2020	BLN2 PSH	PSH	PSH	BLN2 PSH
2021	CT			
2022	CC	BLN1		
2023	CC			
2024	NUC	BLN2		
2025	IGCC			CT
2026	NUC			
2027	CT			CC
2028	CT			
2029	IGCC CTa	NUC		CTa

Defined Model Inputs	
Fossil Layups	3,252 MW by 2015
Renewable Firm Capacity	953 MW by 2029
	8,791 GWh by 2029
EE/DR	4,638 MW by 2029
	14,032 GWh by 2029

Planning Strategy E			
SC1	SC 2	SC 3	SC 7
PPA's & Acq			
JSF CC	JSF CC	JSF CC	JSF CC
GL CT Ref CTa CC (2)			GL CT Ref CTa
CT			
CT			CC
CC			
CC			
CTa			
BLN1	BLN1		BLN1
CT			
BLN2	BLN2		BLN2
CT			
CT			CT
CT			
NUC			CTa
CT			CTa

Defined Model Inputs	
Fossil Layups	4,730 MW by 2015
Renewable Firm Capacity	1,157 MW by 2029
	12,251 GWh by 2029
EE/DR	6,043 MW by 2029
	16,455 GWh by 2029

Planning Strategy B			
SC1	SC 2	SC 3	SC 7
PPA's & Acq			
JSF CC	JSF CC	JSF CC	JSF CC
CTa CT GL CT Ref			
CT CC	GL CT Ref		GL CT Ref CTa
CT			CT
CT			CTa
BLN1			BLN1
CT	BLN1		
BLN2			BLN2
CC	BLN2		
CT CC			CC
CT			CT
NUC			
IGCC	NUC		CT
NUC			
CT	NUC		CT
CC			
IGCC CTa	CTa	CTa	CC

Defined Model Inputs	
Fossil Layups	2,415 MW by 2015
Renewable Firm Capacity	160 MW by 2029
	4,231 GWh by 2029
EE/DR	2,520 MW by 2029
	7,276 GWh by 2029



# Boundaries Established by Retaining Planning Strategies B, C, and E in the Draft IRP/EIS

◆ The shaded columns below generally represent the “boundaries” established by the Draft IRP

## Range of Capacity Additions by Type At Summer Peak (MW)<sup>1</sup>

Type	2014		2021		2028	
	Minimum <sup>3</sup>	Maximum <sup>3</sup>	Minimum <sup>3</sup>	Maximum <sup>3</sup>	Minimum <sup>3</sup>	Maximum <sup>3</sup>
Nuclear <sup>2</sup>	0	0	0	2,520	0	4,754
Combustion Turbine <sup>2</sup>	0	1,393	0	5,107	0	7,495
Combined Cycle <sup>2</sup>	0	1,620	0	5,684	0	5,684
IGCC <sup>2</sup>	0	0	0	0	0	467
Avoided Capacity (EE/DR) <sup>4</sup>	1,363	2,431	2,216	5,353	2,516	6,009
Renewables <sup>4</sup>	155	493	160	1,074	160	1,154
Pumped Storage <sup>4</sup>	0	0	0	850	0	850
Coal Plants Idled <sup>4</sup>	935	935	2,415	4,730	2,415	4,730

## Range of Energy Contribution of EE/DR and Renewables (GWh)

Type	2014		2021		2028	
	Minimum <sup>3</sup>	Maximum <sup>3</sup>	Minimum <sup>3</sup>	Maximum <sup>3</sup>	Minimum <sup>3</sup>	Maximum <sup>3</sup>
Avoided Capacity (EE/DR) <sup>4</sup>	2,610	6,827	6,248	14,768	7,287	16,450
Renewables <sup>4</sup>	4,231	6,936	4,231	12,013	4,231	12,238

- Notes:
- 1 – Values shown are for dependable capacity at the summer peak. Nameplate capacity of renewables range from 1,300 to 3,500 MW
  - 2 – Capacity additions shown represent the highest/lowest for each type and are not from a single portfolio
  - 3 – Minimums and maximums exclude Board approved projects
  - 4 – Defined model input

***Next Steps***

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# Sensitivity Analysis

- ◆ Planning strategy C will be used as the starting point for sensitivity analysis
- ◆ Sensitivity analysis is used to identify modifications that would improve planning strategy performance
- ◆ The following sensitivities have been tested so far:

Sensitivity Description	Basis for Selection
C1 – Strategy C with pumped storage hydro removed	Test for improvement in short-term rate impacts by removing defined model input for pumped storage hydro unit
C2 – Same as Sensitivity C1 with no capacity additions prior to 2018	Test for improvement in short-term rate impacts by deferring near-term capacity additions. Modeled after strategy A, which performs the best on rates
E1 – Strategy E with greater (7,000 MW) fossil layups (same as Strategy D)	Test to see if largest values for EE/DR, renewables, and fossil layups significantly improve the PVRR and short-term rate impacts of strategy E
E2 – Strategy E with lower (2,500 MW) renewable portfolio (same as Strategy C)	Improve PVRR and short-term rates by using the lower renewable portfolio applied in strategy C



# Sensitivity Analysis – Preliminary Results

**Preliminary Ranking Metric Results with Sensitivities**

Planning Strategies	Ranking Metric Scores
C1 - Sensitivity	689
C - Diversity Focused Resource Portfolio	688
C2 - Sensitivity	687
E - EE/DR and Renewables Focused Resource Portfolio	686
E2 - Sensitivity	680
E1 - Sensitivity	676
B - Baseline Plan Resource Portfolio	673
D - Nuclear Focused Resource Portfolio	665
A - Limited Change in Current Resource Portfolio	655

## Implications

- ◆ The table above updates the preliminary ranking metric results to include the sensitivity cases
  - Sensitivity C1 is a slight improvement over planning strategy C and now has the highest ranking metric score
  - Sensitivity C2 is slightly lower than strategy C
  - Sensitivities E1 and E2 do not improve over strategy E and can be removed from consideration

# Sensitivity Analysis – Planned Additional Cases

The following sensitivity cases are planned for evaluation between the draft and final IRP

- ◆ This list is not comprehensive and is likely to evolve based on input received during the public comment period

Sensitivity Description	Comment
Evaluate alternate fossil layups values for planning strategy C	Plan to test all layups assumptions from other planning strategies
Evaluate increment/decrement of EE/DR impacts for planning strategy C	Developing incremental layers of EE/DR programs for sensitivity analysis
Evaluate increment/decrement of renewable additions for planning strategy C	Review of assumptions currently in progress
Develop “Scenario 8” with attributes that match the most recent planning assumptions	Under development
Release “no nuclear before 2022” constraint on Strategy E	To be developed
Test deferral of nuclear expansion in planning strategy C until 2020	Based on input from the SRG
Test gas-only expansion (no nuclear or coal additions) in planning strategy C	Based on input from the SRG
Evaluate an aggressive EE/DR portfolio that targets 50% of the energy gap beginning in 2015	Based on input from the SRG



# Future SRG Working Sessions

## Tentative Topics for Upcoming SRG Working Sessions

## Date

- ◆ Present initial themes from public comment period
- ◆ Provide update on sensitivity analysis
- ◆ Discuss model inputs to be refreshed for final analysis

October 13, 2010

- ◆ Review preliminary results from final analysis
- ◆ Discuss input from public comment period

December 2010

- ◆ Review analysis results
- ◆ Discuss potential recommended portfolios for Final IRP

January 2011

- ◆ Preview of Final IRP

February 2011





# Appendix Scenario Summaries

Scenario	Key Characteristics
◆ Economy Recovers Dramatically	<ul style="list-style-type: none"><li>— Economy recovers stronger than expected and creates high demand for electricity</li><li>— Carbon legislation and renewable electricity standard are passed</li><li>— Demand for commodity and construction resources increases</li><li>— Electricity prices are moderated by increased gas supply</li></ul>
◆ Environmental Focus is a National Priority	<ul style="list-style-type: none"><li>— Mitigation of climate change effects becomes a national priority</li><li>— The cost of CO<sub>2</sub> allowances, gas, and electricity increase significantly</li><li>— Industry focus turns to nuclear, renewables, conservation, and gas to meet demand</li></ul>
◆ Prolonged Economic Malaise	<ul style="list-style-type: none"><li>— Prolonged, stagnant economy results in low to negative load growth and delayed expansion of new generation</li><li>— Federal climate change legislation is delayed due to concerns of adding further pressure to the economy</li></ul>
◆ Game-Changing Technology	<ul style="list-style-type: none"><li>— Strong economy with high demand for electricity and commodities</li><li>— High price levels and concerns about the environment incentivize conservation</li><li>— Game-changing technology results in an abrupt decrease in load served after strong growth</li></ul>
◆ Energy Independence	<ul style="list-style-type: none"><li>— The U.S. focuses on reducing its dependence on non-North American fuel sources</li><li>— Supply of natural gas is constrained and prices for gas and electricity rise</li><li>— Energy efficiency and renewable energy move to the forefront as an objective of achieving energy independence</li></ul>
◆ Carbon Regulation Creates Economic Downturn	<ul style="list-style-type: none"><li>— Federal climate change legislation is passed and implemented quickly</li><li>— High prices for gas and CO<sub>2</sub> allowances increase electricity prices significantly</li><li>— U.S. based energy-intensive industry is non-competitive in global markets and leads to an economic downturn</li></ul>



# Planning Strategies: Detailed Descriptions

Attributes	A – Limited Change in Current Resource Portfolio	B – Baseline Plan Resource Portfolio	C – Diversity Focused Resource Portfolio	D – Nuclear Focused Resource Portfolio	E – EE/DR and Renewables Focused Resource Portfolio
EE/DR	– 1,940 MW & 4,725 annual GWh reductions by 2020	– 2,100 MW & 5,900 annual GWh reductions by 2020	– 3,600 MW & 11,400 annual GWh reductions by 2020	– 4,000 MW & 8,900 annual GWh reductions by 2020	– 5,900 MW & 14,400 annual GWh reductions by 2020
Renewable Additions	– 1,300 MW & 4,600 GWh competitive renewable resources or PPAs by 2020	– Same as Planning Strategy A	– 2,500 MW & 8,600 GWh competitive renewable resources or PPAs by 2020	– Same as Planning Strategy C	– 3,500 MW & 12,000 GWh competitive renewable resources or PPAs by 2020
Fossil Asset Layup	– No fossil fleet reductions	– 2,000 MW total fleet reductions by 2017	– 3,000 MW total fleet reductions by 2017	– 7,000 MW total fleet reductions 2017	– 5,000 MW total fleet reductions by 2017
Energy Storage	– No new additions	– Same as Planning Strategy A	– Add one pumped storage unit	– Same as Planning Strategy C	– Same as Planning Strategy A
Nuclear	– No new additions after WBN2	– First unit online no earlier than 2018 – Units at least 2 years apart	– Same as Planning Strategy B	– Same as Planning Strategy B	– First unit online no earlier than 2022 – Units at least 2 years apart – Additions limited to 3 units
Coal	– No new additions	– New coal units are outfitted with CCS – First unit online no earlier than 2025	– Same as Planning Strategy B	– Same as Planning Strategy B	– No new additions
Gas-Fired Supply (Self-Build)	– No new additions	– Meet remaining supply needs with gas-fired units	– Same as Planning Strategy B	– Same as Planning Strategy B	– Same as Planning Strategy B
Market Purchases	– No limit on market purchases beyond current contracts and contract extensions	– Purchases beyond current contracts and contract extensions limited to 900 MW	– Same as Planning Strategy B	– Same as Planning Strategy B	– Same as Planning Strategy B
Transmission	– Potentially higher level of transmission investment to support market purchases – Transmission expansion (if needed) may have impact on resource timing and availability	– Complete upgrades to support new supply resources	– Increase transmission investment to support new supply resources and ensure system reliability – Pursue inter-regional projects to transmit renewable energy	– Same as Planning Strategy C	– Potentially higher level of transmission investment to support renewable purchases – Transmission expansion (if needed) may have impact on resource timing and availability

Defined model inputs  
 Constraints in model optimization