

# Integrated Resource Plan

TVA'S ENVIRONMENTAL AND ENERGY FUTURE

Stakeholder Review Group  
Working Session

May 13, 2010



10:00-10:15	Introduction	Randy McAdams
10:15-10:30	Update: Growth of Generation Partners Program	Susan Curtis
10:30-12:00	Review of the IRP Planning Strategies	Gary Brinkworth
12:00-12:45	Lunch	
12:45-1:45	Open Discussion	
1:45-2:00	Break	
2:00-2:45	Preview of Evaluation Metrics	Gary Brinkworth
2:45-3:30	Open Discussion	
3:30-3:45	Response to Open Action Items: <i>Uranium Price Forecast</i> <i>Coal Price Forecast (90<sup>th</sup> Percentile)</i>	Gary Brinkworth
3:45-4:00	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

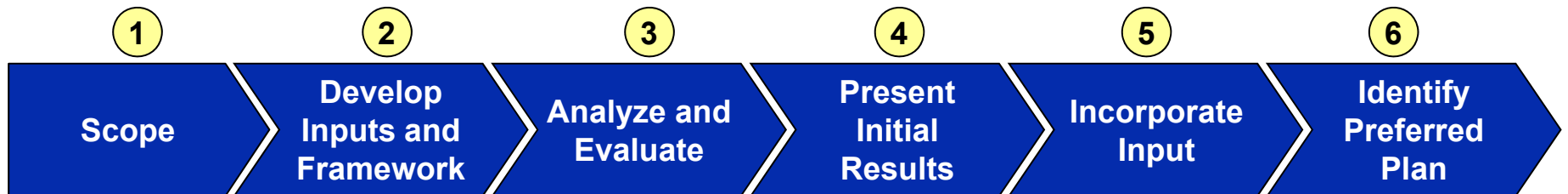
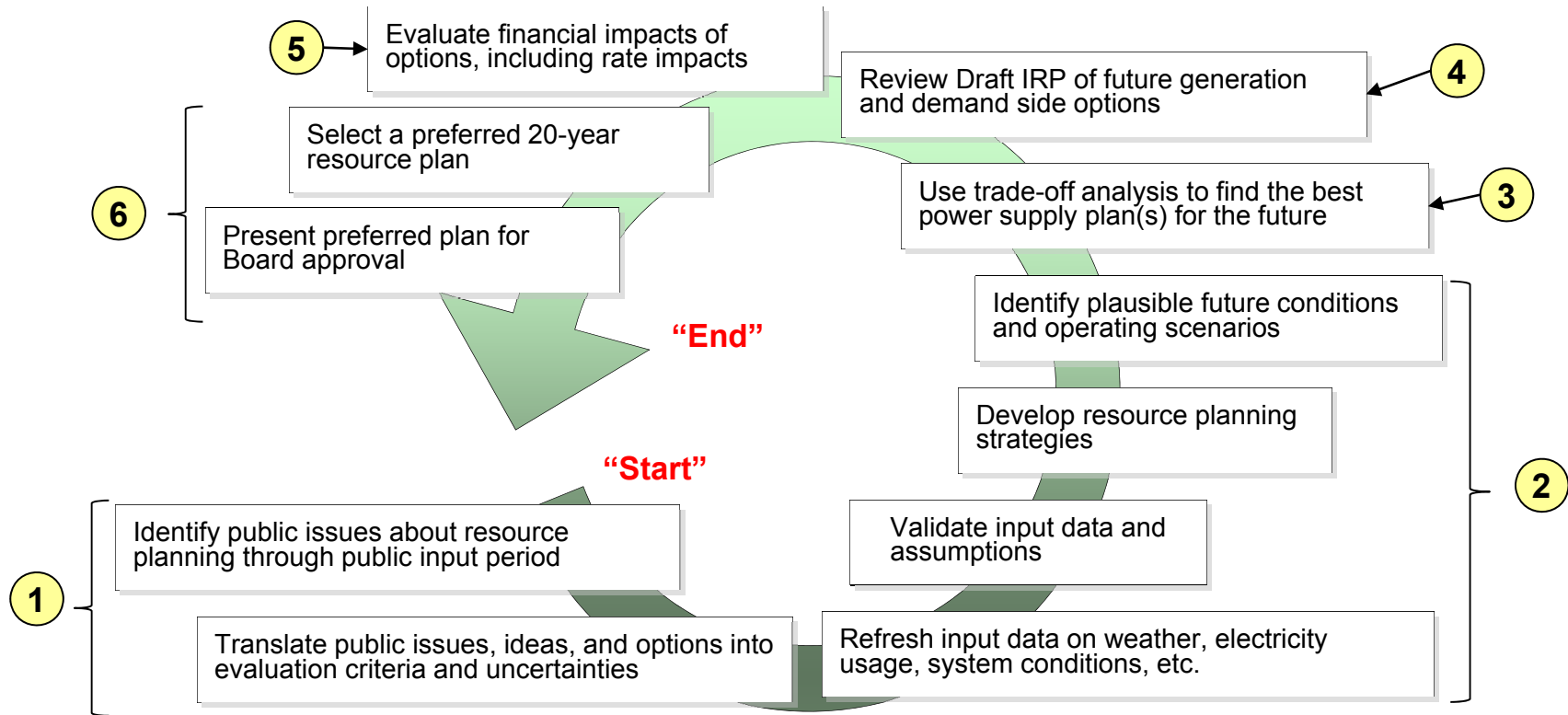
## SRG Meeting Types

- ◆ *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



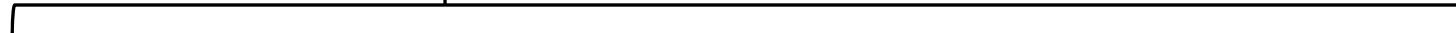
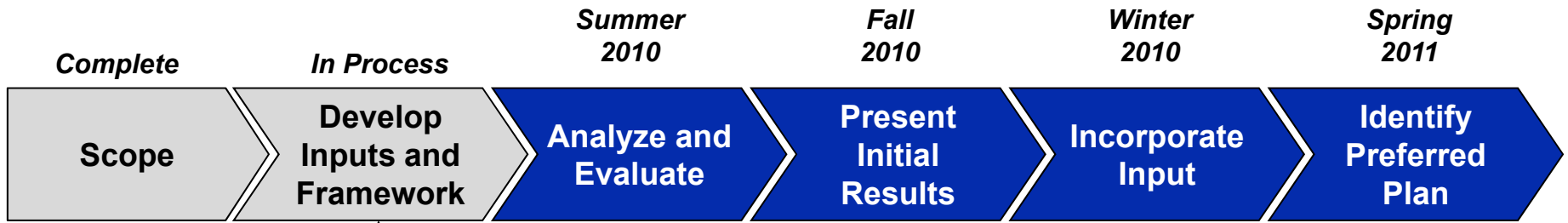
# Introduction IRP Process Review

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





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

**Today's discussion will cover**

- Review of IRP planning strategies
- Preview of evaluation metrics

Complete or In Process  
 Not Started

***Update: Bellefonte***

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# Update: Bellefonte

## Status & Next Steps

- ◆ Bellefonte Final SEIS is being sent to federal and state agencies this week and announcement of availability is planned for May 21.
- ◆ Although the IRP is in progress, waiting until 2011 for its completion before starting evaluation of Bellefonte options could delay availability of generating capacity when needed
- ◆ Preparing the Supplemental Environmental Impact Statement (SEIS) for evaluating nuclear options at Bellefonte does not limit the alternatives considered in the IRP
- ◆ TVA's Board of Directors will consider the information contained in the Final SEIS, as well as the results of additional studies and reviews, in making a decision on whether and how the Bellefonte site will be used for the purpose of nuclear power generation
- ◆ TVA continues to maintain the site in deferred construction status as well as pursue a combined license for the AP1000 advanced reactor design

**No decision on whether or how to proceed on Bellefonte generating options has been made at this time**

***Update: Growth of Generation Partners Program***

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# Update: Growth of Generation Partners Program

## Key Features

- ◆ Pilot launched in 2003 as utility/distributor alternative to “net metering” and to meet consumer requests
- ◆ Residential, commercial, or industrial customer served by participating distributor are eligible
- ◆ Renewable energy supply technologies are solar, wind, biomass, and low-impact hydro
- ◆ Pricing structure - floating premium is above consumer’s retail electricity rate, including Fuel Cost Adjustment (FCA)
  - \$0.12 premium per kWh for solar
  - \$0.03 premium per kWh for all other eligible technologies
- ◆ Maximum capacity up to 999 kW per site
- ◆ New Participant Incentive of \$1,000 with 10 year contract
- ◆ Floating premium above consumer’s retail electricity rate

## Benefits

- ◆ Benefits to consumers
  - Reduces energy cost
  - Pays for 100% of renewable generation
  - Buffers against rate increases for amount generated
- ◆ Other benefits
  - Promotes a cleaner environment
  - Provides a simpler method to procure and develop distributed renewable generation
  - Advances economic activity and the development of renewable energy technologies
  - Encourages growth in new green industries and jobs
  - Provides Green Power Switch supply

# Update: Growth of Generation Partners Program (Cont'd)

## Why now is the right time for growth

- ◆ Consumer interest is high
  - Residential consumers want to demonstrate their commitment to the environment
  - Commercial and industrial consumers want to take the next step in their corporate sustainability plan
  
- ◆ Federal and State incentives potentially available to residential and/or businesses\*
  - 30% Federal Tax Credit/Grant
  - 25% USDA Grant (agricultural business)
  - 40% TN Grant administered by the UT Solar Institute – coming soon
  
- ◆ Generation Partners New Participant Incentive helps offset upfront cost (\$1,000 in participating TVA distributor's area)



**Ruby Falls 16 kW Solar Array**

*\*Visit [www.dsireusa.org](http://www.dsireusa.org) for available incentives*

# TVA Update: Growth of Generation Partners Program (Cont'd)

## Generation Partners has experienced strong growth through February 2010

- ◆ A total of 98 power distributors offer Generation Partners

Valley Wide*	Pre-Expansion (2003 – Jun 2009)	Post-Expansion (Jul 2009 – Feb 2010)	Total Thru Feb 2010**
Solar Installations	69	120	189
Solar kW	412	1052	1464
Wind Installations	8	5	13
Wind kW	42	12.5	54.5
	77 installs 454 kW	125 installs 1064.5 kW	202 installs 1,518.5 kW

\*Currently no biomass or low-impact hydro installations

\*\* Total for Generation Partners only; does not include renewable purchase power

## Generation Partners growth has been *supersized* since April 2010

- ◆ Since April 1, 2010
  - Added 4 additional solar installations completed (60 kW)
  - Provided upfront approval for 15 additional solar installations (4,615 kW) and 1 biomass system (856 kW)
  - Reviewed upfront approval requests for an additional 14 solar installations and 1 biomass system (5647 kW)
  - Tracked progress of 28 solar projects and 6 biomass projects in early planning stages (11,538 kW)
- ◆ New projects coming in everyday



### Consider Multiple Resource Portfolios

- Test different business approaches (planning strategies)
- Evaluate over multiple plausible futures (scenarios)

### Incorporate Sensitivities/Uncertainties

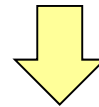
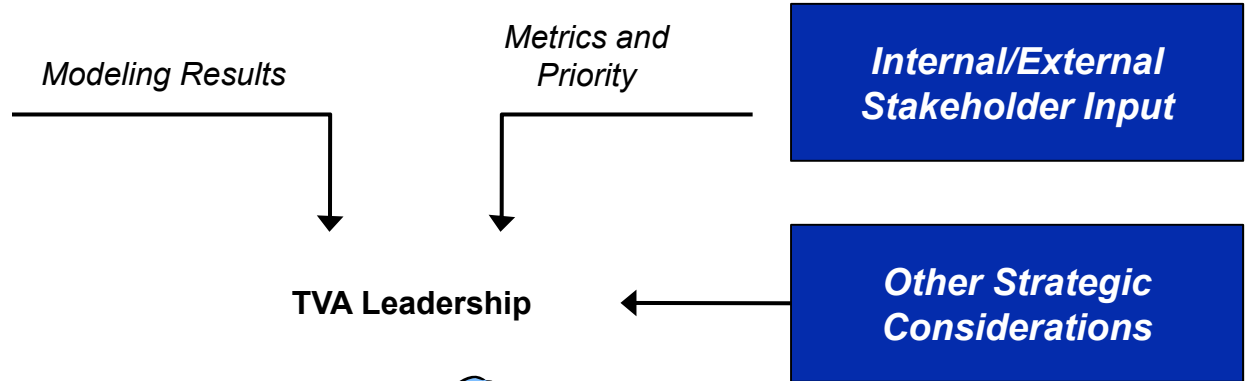
- Identify key assumptions
- Capture uncertainties that can change the outcome

### Identify Risk Exposure for Future Plans

- Scenario analysis identifies broad trends
- Multiple ranking criteria balance competing objectives

### The role of modeling in the decision process

		Scenarios					
		Current Situation	#1	#2	#3	#4	#5
Planning Strategies	Planning Strategy A						
	Planning Strategy B						
	Planning Strategy C						
	Planning Strategy D						
	Planning Strategy E						



**Integrated Resource Plan**

*Modeling serves as only one input for TVA leadership to consider when selecting the optimal resource portfolio*



# Review of the IRP Planning Strategies

## Getting to the Best Solution (Cont'd)

### Why Scenario Planning is useful

- ◆ Scenarios are developed to:
  - Bound key uncertainties to create a wide range of plausible outcomes
  - Present a set of conditions that are “plausible,” but not intended to predict the future
  
- ◆ Scenario planning provides:
  - An understanding of how near-term and future decisions would change under different conditions
  - Near-term decisions that are common across different scenarios may imply that these decisions are less “risky”
  - Major differences in near-term decisions across scenarios may imply possibility of future regret
  
- ◆ Scenarios are different than models:
  - Models focus on what is likely, based largely on historical data
  - Scenarios analysis does not model the annual planning process or determine how the process would react to sudden path changes
  - Models function as if they have perfect foreknowledge of all demands, costs, and conditions

#### **Role of Scenarios:**

Scenarios will provide a foundation to consider various supply and demand options to enable future decision making



# Review of the IRP Planning Strategies

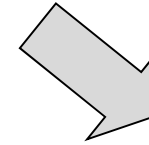
## Planning Strategy Development Approach

Approach to developing IRP planning strategies combines public input, prior TVA work, direction from TVA, market trends and external research

*Active participation from TVA executives and representatives is achieved through weekly working sessions and individual meetings*

### TVA and Stakeholder Input

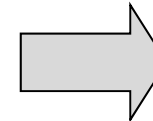
- IRP core team
- TVA executives
- Technical experts
- Key stakeholder input
- Public scoping input



*Prior TVA work and strategic documents help ensure a more efficient process and alignment with strategic direction*

### Prior and Ongoing Work

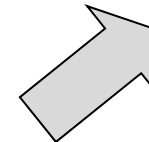
- TVA 2007 Strategic Plan
- TVA 2008 Environmental Policy
- Energy Vision 2020
- Other internal analyses



*Market trends and lessons learned are gained through industry research*

### External Research

- Utility IRPs
- Public power company IRPs
- Public testimony to utility commissions
- Industry reports and analysis



**Planning Strategies**



# Review of the IRP Planning Strategies Background

## Planning strategies (and scenarios) set the boundaries for analysis

- ◆ Scenarios include a number of factors that are outside of TVA's control
  - Updated scenarios were reviewed with the SRG in February
  
- ◆ Planning strategies are designed to test various business options TVA might consider
  
- ◆ TVA staff identified nine resource options (attributes) to describe planning strategies
  
- ◆ Attributes were influenced by
  - Comments received during the public scoping period
  - Staff understanding of the assumptions that would have the greatest impact on the long-term resource plan for TVA
  
- ◆ These attributes fall into one of two groups
  - Specified model inputs: attributes that are “locked in”; the capacity optimization model selects a resource portfolio that presumes these resources already exist
  - Constraints in the model optimization: attributes that form boundary conditions within which the capacity optimization model will identify a solution (the resource portfolio)



# Review of the IRP Planning Strategies Background (Cont'd)

## Planning strategies (and scenarios) set the boundaries for analysis

*Planning strategies evaluate attributes such as:*

- EE/DR portfolio
- Renewable additions
- Fossil asset strategy
- Energy storage
- Gas-fired supply (self-build)
- Nuclear expansion
- Coal technology
- Market
- Transmission

Each cell contains a 20-year resource plan (portfolio)

		Scenarios						
		Current Situation	#1	#2	#3	#4	#5	#6
Planning Strategies	Planning Strategy A							
	Planning Strategy B							
	Planning Strategy C							
	Planning Strategy D							
	Planning Strategy E							

*Scenarios are composed of uncertainties including:*

- Greenhouse gas requirements
- Total load and change in load shape
- Commodity prices
- Renewable energy standards
- Financing and construction costs



# Review of the IRP Planning Strategies Detailed Description Framework

		Planning Strategies				
Planning Strategy Attributes	Attributes	Planning Strategy A	Planning Strategy B	Planning Strategy C	Planning Strategy D	Planning Strategy E
	EE/DR Portfolio					
	Renewable Additions					
	Fossil Asset Strategy					
	Energy Storage					
	Nuclear Expansion					
	Coal Technology					
	Gas-Fired Supply (Self-Build)					
	Market					
	Transmission					

*Attribute values vary from strategy to strategy*

*Attribute values are either an input or constraint to the model*

## Key points

- ◆ IRP planning strategies are used to identify, through modeling, impacts on different evaluation criteria
- ◆ Planning strategies are being used for evaluation purposes only and do not reflect decisions by TVA Management or the TVA Board
- ◆ These planning strategies do not imply that they are the only resource portfolio options considered by TVA

# TVA Planning Strategy Summaries

Strategy	Key Characteristics
◆ A: Limited Change in Current Resource Portfolio	<ul style="list-style-type: none"> <li>— No new units added after Watts Bar Unit 2</li> <li>— Retain &amp; maintain existing generating fleet</li> <li>— Rely on the market to meet future resource needs</li> </ul>
◆ B: Baseline Plan Resource Portfolio	<ul style="list-style-type: none"> <li>— Allows for nuclear expansion after 2018 &amp; new gas-fired capacity as needed for future load growth</li> <li>— Assumes shutdown of some coal capacity</li> <li>— Includes EE/DR portfolio &amp; wind PPA's</li> </ul>
◆ C: Diversity Focused Resource Portfolio	<ul style="list-style-type: none"> <li>— Increases the contribution from EE/DR portfolio and new renewables</li> <li>— Adds a pumped storage hydro unit</li> <li>— Assumes shutdown of coal capacity greater than Strategy B</li> <li>— Retains nuclear and gas-fired capacity as options to meet future need</li> </ul>
◆ D: Nuclear Focused Resource Portfolio	<ul style="list-style-type: none"> <li>— Includes an increased EE/DR portfolio compared to other strategies</li> <li>— Assumes shutdown of coal capacity greater than Strategy C</li> <li>— Includes new renewables at same level as Strategy C</li> <li>— Includes a pumped storage hydro unit</li> <li>— Nuclear expansion can begin in 2018 (similar to Strategy B)</li> </ul>
◆ E: EE/DR and Renewables Focused Resource Portfolio	<ul style="list-style-type: none"> <li>— Assumes most reliance on EE/DR portfolio of any strategy</li> <li>— Includes largest new renewables portfolio</li> <li>— Assumes shutdown of coal capacity between Strategy B and C</li> <li>— Delays nuclear expansion until 2022 &amp; limits additions to no more than 3 units</li> </ul>





# Preview of Evaluation Metrics Background

- ◆ Today's discussion is a preview of evaluation metrics
  - The next SRG working session will discuss metrics in more detail
  
- ◆ A scorecard will be applied to evaluate the results of resource plan modeling
  
- ◆ The viability of different *planning strategies* (not a single portfolio) will be compared across many plausible futures (i.e. scenarios)
  
- ◆ The portfolio scorecard is intended to:
  - Summarize complex analysis into a clear and easy-to-understand picture
  - Solicit input from internal and external stakeholders on prioritizing key metrics
  - Demonstrate the changes in results based on different scorecard priority
  - Facilitate a discussion of trade-offs between key metrics
  
- ◆ The portfolio scorecard will not produce the “answer” but will illustrate the relative positive attributes of various planning strategies across many plausible futures

**Scenario planning, and the modeling that supports it, will inform a strategic decision by TVA leadership**



# Preview of Evaluation Metrics

## IRP Scenario Planning Matrix

- ◆ The IRP will evaluate the viability of different planning strategies across many plausible futures
  - Planning strategies reflect potential TVA resource portfolio approaches
  - Scenarios describe potential outcomes of factors external to TVA (these represent boundary conditions and are not predictions of the future)
  
- ◆ Resource plan modeling will be completed for each of the 35 boxes (portfolios) in the 7x5 matrix shown below

Planning Strategies	Scenarios						
	The Current Situation	Economy Recovers Dramatically	Environmental Focus is a National Priority	Prolonged Economic Malaise	Game-Changing Technology	Reduce Dependence on Foreign Energy Sources	Carbon Legislation Creates Economic Downturn
Limited Change in Current Resource Portfolio							
Baseline Plan Resource Portfolio	IRP Baseline Case						
Diversity Focused Resource Portfolio							
Nuclear Focused Resource Portfolio							
EE/DR and Renewables Focused Resource Portfolio							

*Each cell contains a 20-yr resource plan (portfolio)*

*Each plan will have a resource portfolio "score"*



# Preview of Evaluation Metrics

## Resource Portfolio Scorecard

***TVA will use a scorecard to relatively compare planning strategies and their resulting portfolios***

- ◆ A resource portfolio scorecard can be built by prioritizing key metrics that are calculated using model outputs
  - Internal and external stakeholders will be asked to provide input on selection of key metrics and prioritization
  - Stakeholder input on priority will be used to inform decision-making by TVA leadership
  
- ◆ The final set of key metrics has not been determined, but the following indicators will likely be used to evaluate financial and risk factors
  - 20-year plan cost (present value of revenue requirements)
  - Short-term rate impacts
  - Predicted variance in plan cost (financial risk)
  
- ◆ The process for evaluation of environmental considerations in the IRP is still under development
  - The Environmental Impact Statement on the IRP will complete a detailed review of environmental consequences
  
- ◆ In addition to key metrics, the scorecard may contain one or more strategic indicators (such as diversity, reliability measures, or climate change)

**What key metrics should be considered?**



# Preview of Evaluation Metrics Summary

## Key Takeaways

- ◆ Modeling analysis is an essential part of evaluating potential alternatives in the IRP
  
- ◆ Results of analysis will inform strategic decision-making, but the model alone will not determine the final portfolio
  
- ◆ The proposed portfolio scorecard is intended to:
  - Summarize complex analysis into a clear and easy-to-understand picture
  - Solicit input from internal and external stakeholders on prioritizing key metrics
  - Demonstrate the changes in results based on changes in scorecard priority
  - Facilitate a discussion of trade-offs between key metrics

## Next Steps

- ◆ The next SRG working session (June 29<sup>th</sup>) will discuss evaluation criteria selected





*Response to Open Action Items*  
**Uranium Price Forecast**

**Information is confidential and will be displayed during the working session**



**Information is confidential and will be displayed during the working session**





# 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>