

# Integrated Resource Plan

TVA'S ENVIRONMENTAL AND ENERGY FUTURE

Stakeholder Review Group  
Working Session

July 21, 2010  
Chattanooga, TN 2010





# Agenda – July 21<sup>st</sup>

---

9:00-9:15	Introduction and Recap from Day 1	Randy McAdams
9:15-9:45	Review of the IRP Scorecard and Evaluation Metrics	Gary Brinkworth
9:45-11:15	Ranking Metrics and Strategic Metrics	Gary Brinkworth
11:15-12:00	Open Discussion	
12:00-12:30	Lunch	
12:30-1:30	Preliminary Observations	Gary Brinkworth
1:30-2:30	Open Discussion of Results	
2:30-3:00	Next Steps	
3:00-3:15	Wrap-Up	Randy McAdams





# Review of IRP Scorecard and Evaluation Metrics

## IRP Scorecard

- ◆ 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 strategy 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 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**



# Review of IRP Scorecard and Evaluation Metrics

## IRP Scorecard (Cont'd)

Ranking Metrics				Strategic Metrics				
Energy Supply				Environmental Stewardship		Economic Development		Technology Innovation
Portfolios	Cost	Risk	Ranking Metric Score	Carbon Footprint	Composite Impact	Total Employment	Growth in Personal Income	Technology Indicator
			<b>Total</b>					

### Overview

- ◆ The IRP scorecard was developed to reflect components of TVA’s mission that influence the long-range power supply plan: energy supply, environmental stewardship, economic development, and technology innovation
  
- ◆ The portfolios shown on the far left column are created by applying a planning strategy in a scenario
  - One scorecard will be developed for each planning strategy (5 total)
  - Ranking metrics are financial measures of cost and risk that are used to rank planning strategies
  - Strategic metrics are paired with ranking metrics to complete the IRP scorecard for selection of preferred portfolios



# Review of IRP Scorecard and Evaluation Metrics

## IRP Scorecard – Application

The IRP Scorecard will be applied to inform selection of a preferred 20-year resource plan

Step 1

- ◆ Planning strategies are ranked by summing financial scores for a planning strategy in all scenarios
  - Sensitivity analysis is conducted to refine preliminary results and/or capture other portfolio options
  - Reference resource portfolios are selected from one or more planning strategies using ranking and judgment

Portfolios	Energy Supply		Ranking Metric Score
	Cost	Risk	
Portfolio #1	124	92	113
Portfolio #2	127	86	116
Portfolio #3	99	62	88
Portfolio #4	122	29	160
Portfolio #5	167	89	140
Portfolio #6	153	45	109
Portfolio #7	201	119	172
Total Ranking Metric Score:			898

Rank	Planning Strategies	Total Ranking Metrics Scores
1	Planning Strategy B	Highest
2	Planning Strategy C	↓
3	Planning Strategy A	
4	Planning Strategy D	
5	Planning Strategy E	Lowest

Step 2

- ◆ Selected resource portfolios from the planning strategies are included in the draft IRP and discussed in the associated Environmental Impact Statement (EIS)
  - Sufficient portfolios will be included to maintain breadth of evaluation
  - Strategic metrics will be constructed for all selected portfolios

Scorecard for Selected Portfolios

Selected Portfolios	Ranking Metrics			Strategic Metrics				
	Energy Supply			Environmental Stewardship		Economic Development		Technology Innovation
	Cost	Risk	Ranking Metric Score	Carbon Footprint	Composite Impact	Total Employment	Growth in Personal Income	Technology Indicator
Portfolio #1	Green	Yellow	Yellow	Green	Red	Yellow	Yellow	Green
Portfolio #2	Green	Yellow	Yellow	Green	Red	Yellow	Yellow	Green
Portfolio #3	Green	Yellow	Yellow	Green	Red	Yellow	Yellow	Green
Portfolio #4	Green	Yellow	Yellow	Green	Red	Yellow	Yellow	Green
Portfolio #5	Green	Yellow	Yellow	Green	Red	Yellow	Yellow	Green
Portfolio #6	Green	Yellow	Yellow	Green	Red	Yellow	Yellow	Green
Portfolio #7	Green	Yellow	Yellow	Green	Red	Yellow	Yellow	Green

Step 3

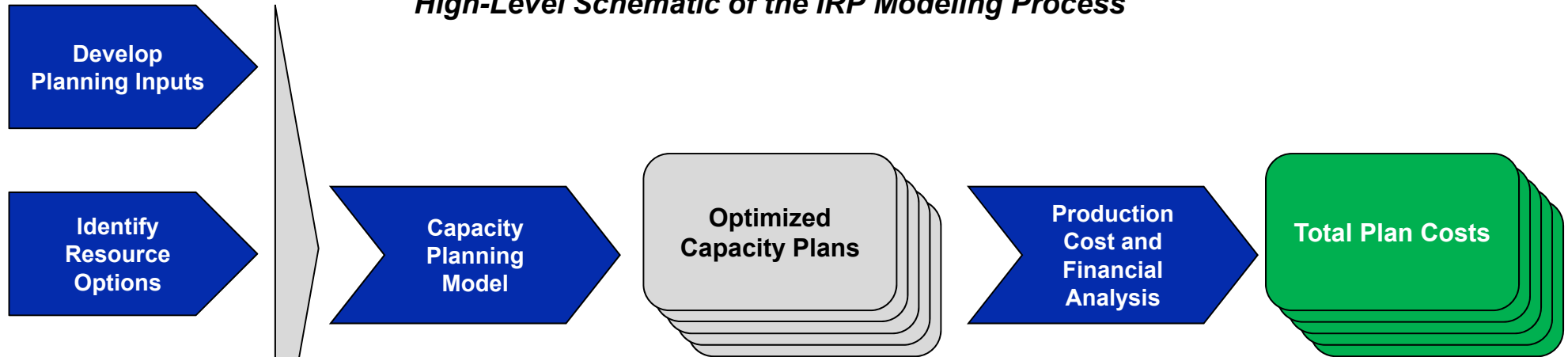
- ◆ Resource portfolios are refreshed and re-scored (as necessary) following the public comment period
- ◆ A short list of resource portfolios for implementing one or more planning strategies are presented for consideration with ranking metrics and strategic metrics
- ◆ The Board sets a strategic direction for TVA by adopting a preferred planning strategy

Scorecard for Final Portfolios

Final Portfolios	Ranking Metrics			Strategic Metrics				
	Energy Supply			Environmental Stewardship		Economic Development		Technology Innovation
	Cost	Risk	Ranking Metric Score	Carbon Footprint	Composite Impact	Total Employment	Growth in Personal Income	Technology Indicator
Portfolio A	Green	Yellow	Yellow	Green	Red	Yellow	Yellow	Green
Portfolio B	Green	Yellow	Yellow	Green	Red	Yellow	Yellow	Green
Portfolio C	Green	Yellow	Yellow	Green	Red	Yellow	Yellow	Green



## High-Level Schematic of the IRP Modeling Process



- ◆ The capital expansion model (CapEx) The capacity planning model finds the “optimum” combination of resources to meet projected demand/energy requirements over the study period subject to constraints
- ◆ A total of 35 portfolios are produced

- ◆ The optimized capacity plans selected by CapEx are inputs to production cost and financial analysis (Midas)
- ◆ Midas estimates probability distributions of potential outcomes by allowing for simultaneous random-walking variation in many inputs over time
- ◆ A stratified monte-carlo distribution comprised of 72 stochastic iterations is developed for each of the 35 portfolios
- ◆ A total of 2,520 cases (35 portfolios x 72 stochastic iterations) are considered



# Ranking Metrics and Strategic Metrics Ranking Metric Worksheet

- ◆ The table to the right is an interim worksheet used to calculate the ranking metrics
- ◆ The results shown are the expected values (averages) from stochastic analysis in Midas

**Ranking Metric Worksheet**

	Scenarios								
	Strategy	1	2	3	4	5	6	7	Average
<b>Average of PVRR (2010B\$)</b>	A	180	137	116	138	135	109	134	<b>136</b>
	B	173	134	114	137	133	107	133	<b>133</b>
	C	170	133	115	136	133	106	131	<b>132</b>
	D	180	141	121	145	141	110	139	<b>140</b>
	E	173	135	118	139	135	108	134	<b>135</b>
<b>Average of ST Rates \$/mwh(level 2011-18)</b>	A	76.82	75.92	78.42	74.47	75.75	77.31	74.97	<b>76.24</b>
	B	78.67	76.22	76.22	75.88	77.04	74.91	75.72	<b>76.38</b>
	C	79.95	76.73	78.93	77.25	76.99	77.11	77.35	<b>77.76</b>
	D	84.61	83.31	82.78	82.19	83.50	80.44	81.80	<b>82.66</b>
	E	80.41	79.39	82.05	77.91	79.40	79.82	78.52	<b>79.64</b>
<b>Average of Risk/Benefit</b>	A	1.45	1.36	0.91	1.27	1.26	0.99	1.25	<b>1.21</b>
	B	1.41	1.24	0.97	1.16	1.18	1.00	1.18	<b>1.16</b>
	C	1.38	1.28	0.89	1.13	1.16	0.91	1.14	<b>1.13</b>
	D	1.40	1.22	1.00	1.21	1.17	0.96	1.18	<b>1.16</b>
	E	1.40	1.23	0.91	1.17	1.16	0.89	1.14	<b>1.13</b>
<b>Average of Risk</b>	A	0.25	0.22	0.09	0.19	0.18	0.13	0.17	<b>0.18</b>
	B	0.24	0.20	0.10	0.16	0.16	0.14	0.16	<b>0.16</b>
	C	0.23	0.20	0.08	0.15	0.16	0.12	0.15	<b>0.16</b>
	D	0.23	0.19	0.10	0.16	0.16	0.13	0.16	<b>0.16</b>
	E	0.24	0.19	0.08	0.17	0.16	0.11	0.15	<b>0.16</b>



# Ranking Metrics and Strategic Metrics

## Ranking Metric Worksheet (Cont'd)

- ◆ Actual values of ranking metrics (e.g., PVRR, short-term rate impacts) will be converted to a Kepner-Tregoe (K-T) style score on a 100 point scale
  - The highest ranking (“best”) value will receive 100
  - The rest of the scores will be based on their relative position to the “best” value (i.e., a value that is 75% of the “best” would receive a 75)
  
- ◆ All ranking metrics will be shown as a qualitative (color-coded) score to demonstrate relative difference across portfolios
  - There will be a scorecard for each planning strategy (5 total)
  - An example is shown to the right
  
- ◆ The shading indicates relative performance of planning strategies within each scenario
  - Dark green indicates the highest K-T score (“best”) within a scenario
  - Red indicates the lowest K-T score (“worst”)
  - Colors range from dark green to red based on relative position in the range

Ranking Metrics			
Energy Supply			
Portfolios	Cost	Risk	Ranking Metric Score
Portfolio #1	Yellow	Dark Green	Yellow
Portfolio #2	Dark Green	Red	Light Green
Portfolio #3	Dark Green	Yellow	Dark Green
Portfolio #4	Yellow	Yellow	Yellow
Portfolio #5	Red	Orange	Red
Portfolio #6	Yellow	Yellow	Yellow
Portfolio #7	Light Green	Orange	Yellow
Total Score			Yellow

Legend	
Dark Green	Highest K-T Score
Light Green	75th Percentile
Yellow	50th Percentile
Orange	25th Percentile
Red	Lowest K-T Score



# Ranking Metrics and Strategic Metrics

## Ranking Metric Worksheet (Cont'd)

The following is an example calculation of raw ranking metric values to K-T scores

Raw ranking metric values for short-term rate impacts in scenario 1 as included on the previous slide are shown to the right

**Ranking Metric Scores**

	Strategy	Scenario 1
<b>Average of ST Rates \$/mwh(level 2011-18)</b>	A	76.82
	B	78.67
	C	79.95
	D	84.61
	E	80.41

The "best" (in this case lowest) value within a scenario gets a score of 100

Strategy D is 10.13% higher than the "best" value and receives a K-T score of 89.87

K-T scores are converted from the raw scores as shown and are included in the planning strategy scorecards on the following slide

**Converted K-T Scores**

	Strategy	Scenario 1
<b>Average of ST Rates \$/mwh(level 2011-18)</b>	A	100.00
	B	97.59
	C	95.93
	D	89.87
	E	95.34

All other scores are assigned a value best on their relative position to the "best" score



# Ranking Metrics and Strategic Metrics

## Ranking Metric Results

### Planning Strategy A – Limited Change in Current Resource Portfolio

Scenarios	Ranking Metrics				
	PVRR	Short-Term Rate Impacts	Risk/Benefit Ratio	Risk Ratio	Ranking Metric Score
1	94.70	100.00	94.55	90.55	94.94
2	97.23	100.00	88.69	82.33	93.42
3	98.68	97.12	97.61	94.12	97.16
4	98.49	100.00	88.10	76.52	92.56
5	98.13	100.00	91.17	86.56	95.07
6	96.93	96.80	88.47	78.71	91.72
Baseline	97.83	100.00	90.71	84.40	94.40
<b>Total Ranking Metric Score</b>					<b>659.27</b>

**Total Ranking Metric Score = Sum of Ranking Metrics Scores for all seven scenarios**

$$\begin{aligned}
 \text{Ranking Metric Score} &= 65\% * (65\% * \text{PVRR} + 35\% * \text{ST Rate}) + 35\% * (35\% * \text{Risk/Benefit} + 65\% * \text{Risk}) \\
 &= 65\% * (65\% * 98.13 + 35\% * 100) + 35\% * (35\% * 91.17 + 65\% * 86.56) = 95.07
 \end{aligned}$$



# Ranking Metrics and Strategic Metrics

## Ranking Metric Results (Cont'd)

### Planning Strategy B – Baseline Plan Resource Portfolio

Scenarios	Ranking Metrics				Ranking Metric Score
	PVRR	Short-Term Rate Impact	Risk/Benefit	Risk	
1	98.51	97.59	97.90	96.67	97.81
2	99.20	99.60	98.52	96.99	98.71
3	100.00	100.00	90.54	83.50	95.09
4	99.38	98.11	97.66	93.01	97.43
5	99.46	98.30	98.10	97.94	98.68
6	99.27	100.00	86.94	76.31	92.70
Baseline	99.09	99.01	96.61	93.31	97.45
<b>Total Ranking Metric Score</b>					<b>677.87</b>

### Planning Strategy C – Diversity Focused Resource Portfolio

Scenarios	Ranking Metrics				Ranking Metric Score
	PVRR	Short-Term Rate Impact	Risk/Benefit	Risk	
1	100.00	95.93	100.00	100.00	99.07
2	100.00	98.93	95.16	93.93	97.78
3	99.23	96.45	100.00	100.00	98.87
4	100.00	96.26	100.00	100.00	99.15
5	100.00	98.37	100.00	100.00	99.63
6	100.00	97.07	97.35	92.19	97.23
Baseline	100.00	96.83	100.00	99.99	99.28
<b>Total Ranking Metric Score</b>					<b>691.01</b>



# Ranking Metrics and Strategic Metrics

## Ranking Metric Results (Cont'd)

### Planning Strategy D – Nuclear Focused Resource Portfolio

Scenarios	Ranking Metrics				Ranking Metric Score
	PVRR	Short-Term Rate Impact	Risk/Benefit	Risk	
1	94.29	89.87	98.37	99.46	94.96
2	94.34	90.27	100.00	100.00	95.40
3	93.98	91.40	86.75	73.73	87.90
4	93.51	89.64	93.48	95.28	93.03
5	93.86	89.77	98.68	99.71	94.85
6	96.35	92.62	91.44	82.00	91.64
Baseline	94.54	90.90	96.53	95.15	94.09
<b>Total Ranking Metric Score</b>					<b>651.87</b>

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

Scenarios	Ranking Metrics				Ranking Metric Score
	PVRR	Short-Term Rate Impact	Risk/Benefit	Risk	
1	98.28	95.34	98.52	97.73	97.51
2	98.93	95.43	99.43	98.98	98.21
3	96.65	92.35	97.07	98.00	96.03
4	98.01	95.38	96.47	90.73	95.57
5	98.34	95.18	99.57	94.88	96.98
6	98.70	93.45	100.00	100.00	97.96
Baseline	98.20	95.27	99.80	100.00	98.14
<b>Total Ranking Metric Score</b>					<b>680.41</b>



# Ranking Metrics and Strategic Metrics

## Strategic Metrics

- ◆ Strategic indicators compare relative environmental performance of different portfolio options
  - Monetized impacts of environmental strategic indicators are captured in the ranking metrics
  - Strategic metrics make environmental performance more transparent
  
- ◆ The table to the lower right is an interim worksheet used to calculate the CO<sub>2</sub> Footprint indicator
  - The results shown are the expected values (averages) from stochastic analysis in Midas
  - Raw values are converted to K-T scores following the same process discussed with the ranking metrics

Strategic Metrics				
Environmental Stewardship		Economic Development		Technology Innovation
Carbon Footprint	Composite Impact	Total Employment	Growth in Personal Income	Technology Indicator

**Strategic Metric Worksheet**

	Scenarios								
	Strategy	1	2	3	4	5	6	7	Average
Average of CO <sub>2</sub> (MMtons, sum 2011-28)	A	2,054	1,719	1,402	1,775	1,723	1,190	1,767	<b>1,661</b>
	B	1,774	1,461	1,317	1,518	1,480	1,138	1,533	<b>1,460</b>
	C	1,673	1,418	1,210	1,408	1,422	1,035	1,427	<b>1,371</b>
	D	1,468	1,170	1,058	1,256	1,204	962	1,249	<b>1,195</b>
	E	1,613	1,299	1,106	1,410	1,303	959	1,352	<b>1,292</b>



# Ranking Metrics and Strategic Metrics

## Strategic Metrics (Cont'd)

- ◆ The following table contains the CO<sub>2</sub> footprint scores for all 35 portfolios

**IRP Strategic Metrics – CO<sub>2</sub> Footprint**

Strategy	Scenario							Total CO <sub>2</sub> Footprint Score
	1	2	3	4	5	6	7	
A. Limited Change in Current Resource Portfolio	60	53	68	59	57	76	58	431
B. Baseline Plan Resource Portfolio	79	75	76	79	77	81	77	544
C. Diversity Focused Resource Portfolio	86	79	86	88	82	92	86	599
D. Nuclear Focused Resource Portfolio	100	100	100	100	100	100	100	700
E. EE/DR and Renewables Focused Resource Portfolio	90	89	96	88	92	100	92	647



# Ranking Metrics and Strategic Metrics

## Strategic Metrics (Cont'd)

- ◆ The composite environmental indicator has evolved based on the input received from the SRG in the last working session
- ◆ The composite indicator has been streamlined to focus on water and waste impacts
  - Air impacts (i.e., sulfur dioxide, nitrogen oxide, and mercury) are no longer included as it will follow CO<sub>2</sub> impacts

Strategic Metrics				
Environmental Stewardship		Economic Development		Technology Innovation
Carbon Footprint	Composite Impact	Total Employment	Growth in Personal Income	Technology Indicator

- ◆ The waste component will estimate waste resulting from coal and nuclear generation
  - It will be calculated as follows:

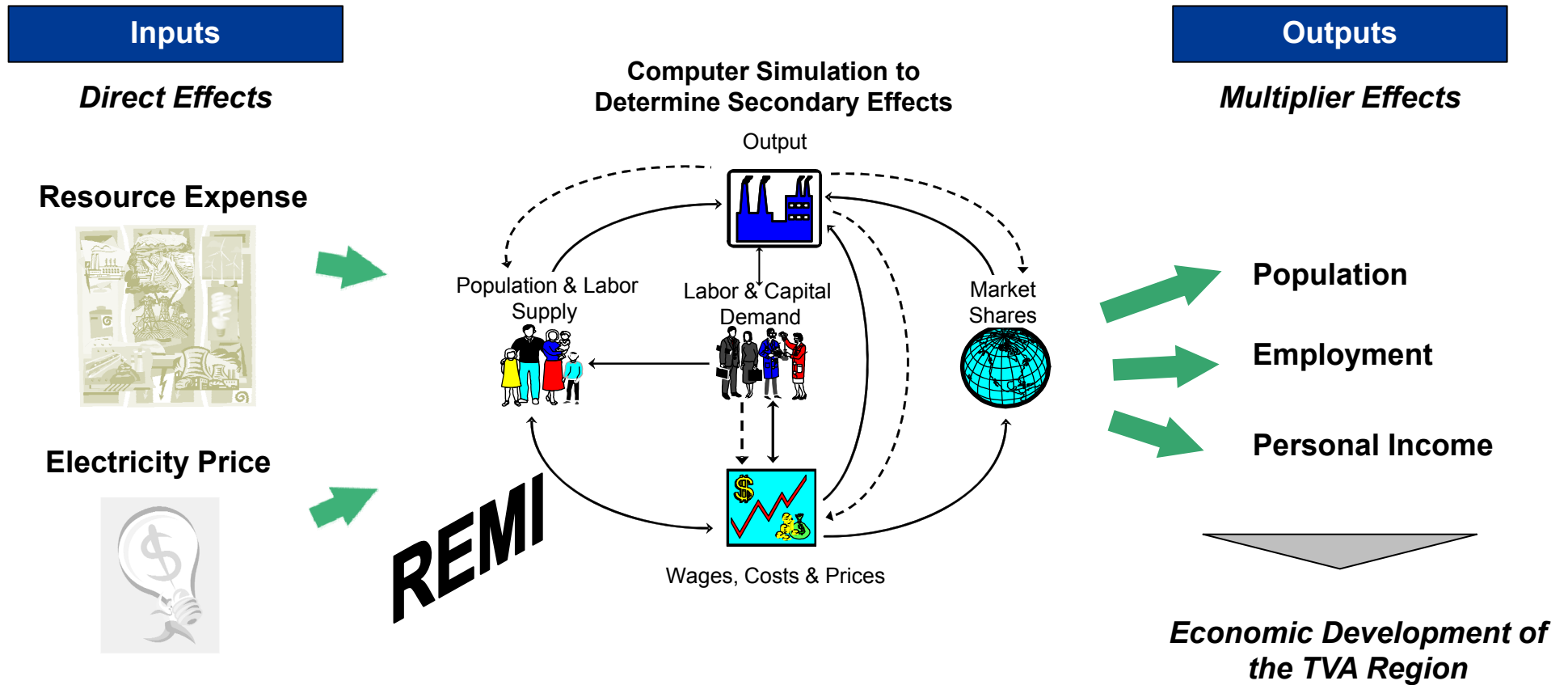
$$\text{Waste Impact} = \text{Total generation by fuel type (GWh)} \times \text{Waste factor (tons/GWh)} \times \text{Handling Costs}$$

- ◆ The water component will focus on the thermal impacts of generation
  - The water impact is estimated based on the total BTUs of heat dissipated by the condenser in the generation cooling cycle; the impact is greater as BTUs increase
  - It will be calculated as follows:

$$\text{Water Impact} = \text{Generation by fuel type (GWH)} \times \text{heat input} \times \text{design factor}$$

**The environmental composite metrics are still being calculated. Further details will be provided during the July 21<sup>st</sup> Working Session**

The following describes how economic development effects will be evaluated



*The economic development metrics are still being calculated. Further details will be provided during the July 21<sup>st</sup> Working Session*



## Ranking Metrics and Strategic Metrics Strategic Metrics (Cont'd)

- ◆ TVA is considering the selection of “signature” technologies to focus research and development efforts
  
- ◆ Signature technologies under consideration include:
  - Small modular nuclear reactors
  - Electric vehicle charging stations (infrastructure)
  - Smart grid enhancements for the transmission system
  
- ◆ The technology innovation metric is a qualitative measure of the opportunity for TVA to be a leader in a particular technology
  - Portfolios that utilize selected technologies will score higher

***The technology innovation metric is still under development.  
Further details will be provided during the July 21<sup>st</sup> Working Session***

***Preliminary Observations***

---

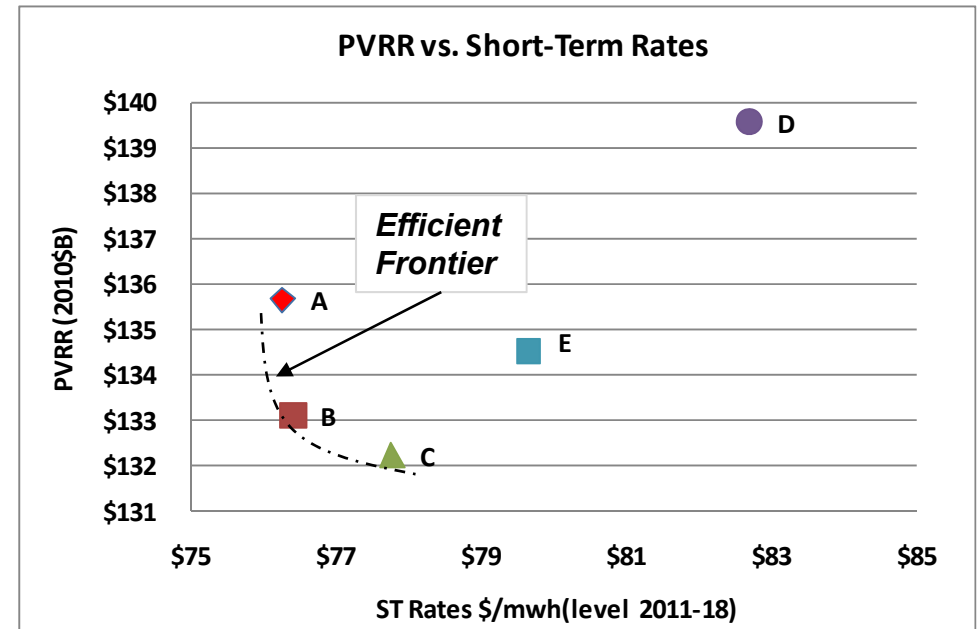
- ◆ Capacity additions vary significantly across the seven scenarios (plausible futures) analyzed
  - Portfolios in scenario #1 (Economy Recovers Dramatically) add up to 25,000 MW of capacity
  - Portfolios in scenarios with nearly flat load growth (e.g., #3 Prolonged Economic Malaise) result in minimal capacity additions
  
- ◆ Nuclear capacity beyond Watts Bar 2 is prominent throughout analysis results
  - Nuclear was not selected in scenarios with nearly flat load growth
  - At least two nuclear units (and up to four) are added in 19 of 28 possible portfolios
  - First nuclear unit is selected between 2018 and 2022
  
- ◆ Avoided capacity from energy efficiency and demand response generally displace natural gas capacity and power purchases
  
- ◆ Nuclear and coal have the largest swings in percentage of total energy produced
  - Nuclear overtakes coal as the leading energy producer in the majority of portfolios
  
- ◆ The intensity of CO<sub>2</sub> emissions decreases in all portfolios
  
- ◆ Coal capacity additions are very infrequent
  - IGCC units with carbon capture were selected after 2025 in 3 of 21 possible portfolios
  - SCPC with carbon capture was added in only 1 of 21 possible portfolios

## Preliminary Ranking Metric Results

Rank	Planning Strategies	Ranking Metric Scores	Preliminary Observations
1	C - Diversity Focused Resource Portfolio	691	- Performs the best against PVRR and risk metrics - Near the median for short-term rates
2	E - EE/DR and Renewables Focused Resource Portfolio	680	- At the median for PVRR and near the worst for short-term rates - Performs near the best for risk and CO <sub>2</sub>
3	B - Baseline Plan Resource Portfolio	678	- Ranks near the best for PVRR, short-term rates, and risk - Near the middle for CO <sub>2</sub>
4	A - Limited Change in Current Resource Portfolio	659	- Ranks the best for short-term rates - Performs the worst on risk and CO <sub>2</sub>
5	D - Nuclear Focused Resource Portfolio	652	- Ranks the worst for PVRR and rates - Performs the best of all strategies in CO <sub>2</sub>

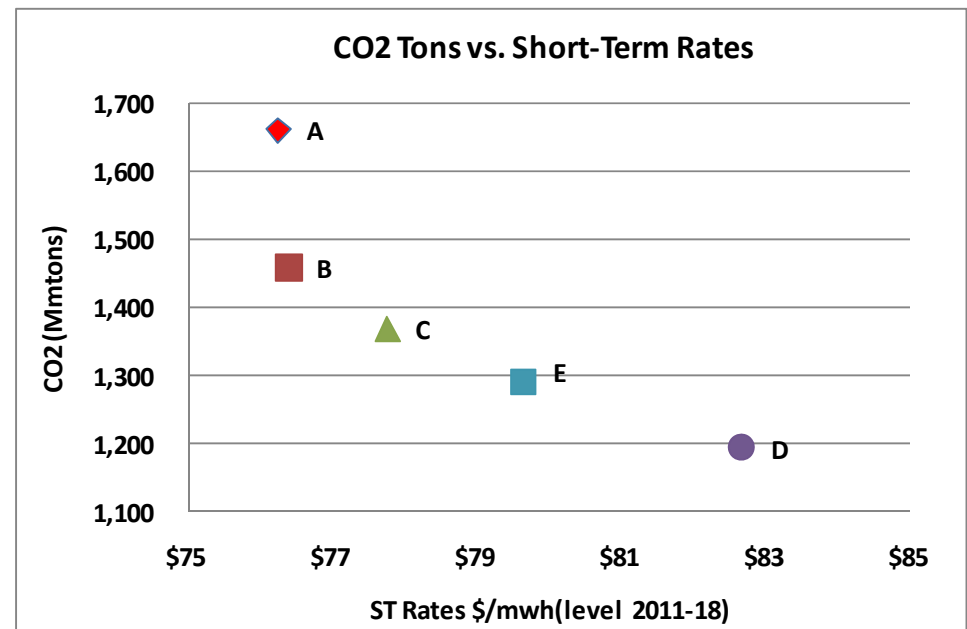
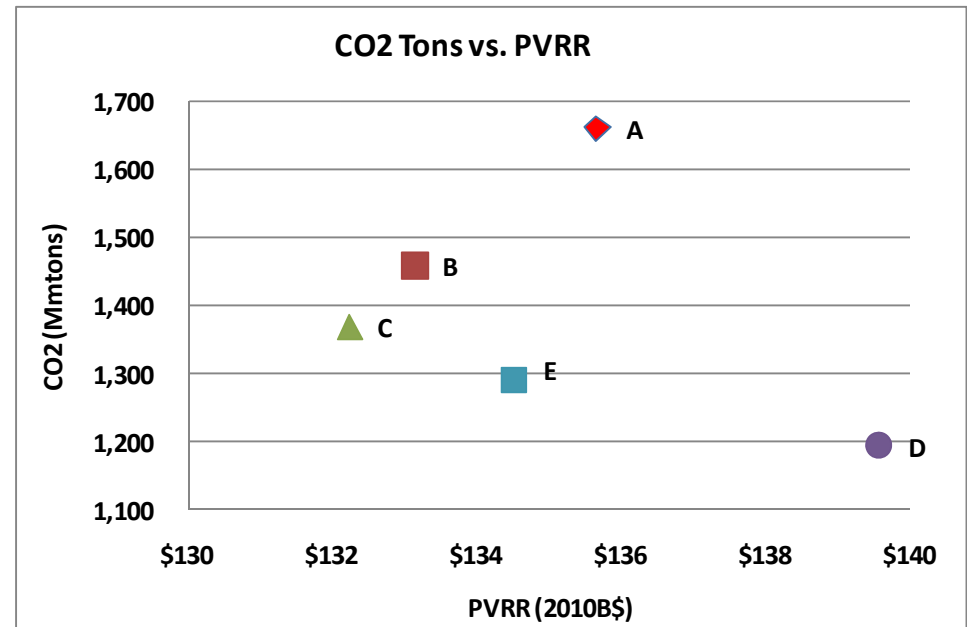
- ◆ Based on only the preliminary ranking metric results:
  - Planning Strategy C would be the preferred strategy
  - Planning Strategies E and B rank second and may also be considered as the preferred option
  - Planning Strategies A and D do not appear to be strong candidates for the preferred strategy
  
- ◆ Ranking of planning strategies remain generally consistent even as weightings of cost and risk change
  - The strategy rank order only changes at the weighting extremes (e.g., 100% short-term rates)

- ◆ X-Y charts are constructed of two variables and can be used to show the tradeoffs between them
- ◆ An example X-Y chart for PVRR vs. short-term rates is shown to the right
- ◆ The “efficient frontier” is the lowest possible short-term rate impact for a given PVRR
  - It is shown as the lower-left boundary of values in the plot
  - Planning strategies A, B, and C fall near the efficient frontier in this example
  - Planning strategies E and D are off of the efficient frontier



# Preliminary Observations (Cont'd)

- ◆ The two charts to the right illustrate the tradeoffs between
  - Tons of CO<sub>2</sub> vs. PVRR
  - Tons of CO<sub>2</sub> vs. short-term rate impacts
  
- ◆ Planning strategy C appears to be at an inflections point for the lowest combination of PVRR and tons emitted
  - Planning strategies B and E are near C
  - Planning Strategies A and D are substantially higher in tons emitted and PVRR respectively
  
- ◆ Planning strategies B, C, and E appear to be on the efficient frontier for tons emitted vs. short-term rate impacts
  - Planning strategy A has higher emissions for a negligible decrease in short-term rate impacts
  - Planning strategy D has the lowest tons emitted, but also has the highest impact on short-term rates





# *Preliminary Observations* Implications for Draft IRP

- ◆ Preliminary IRP modeling results suggest the following:
  - The baseline (planning strategy B) performs reasonably well
  - Incremental changes to the current resource approach (planning strategy C) appears to be much better
  - Increasing EE/DR and renewables also performs reasonably well (planning strategy E)
  - The worst performing strategies either have limited change (planning strategy A) or significant change (planning strategy D)
  
- ◆ Implications for the Draft IRP
  - Maintain portfolios from planning strategies C, E, and B for further analysis
  - Remove portfolios from planning strategies A and D from consideration

***Next Steps and Wrap Up***

---



# Next Steps Sensitivity Analysis

- ◆ The IRP considered a broad range of defined model inputs and constraints in planning strategies as well as significant changes in uncertainties
- ◆ Planning strategy C would be the preferred strategy based on preliminary results and will be used as the primary starting point for sensitivity analysis
  - Planning strategies E and B will also be evaluated
- ◆ The objective is to identify modifications to planning attributes that would further improve planning strategy C's performance or modify planning strategy E or B so it outperforms strategy C
- ◆ The following sensitivities have been identified to date:

## Sensitivity Descriptions

C1 – Strategy C with pumped storage hydro removed

E1 – Strategy E with greater fossil layups (7,000 MW)

C2 – Strategy C1 with no capacity additions prior to 2018

E2 – Strategy E with lower (2,500 MW) renewable portfolio

**Sensitivity analysis will continue between draft publication and preparation of the final IRP and the SRG will be involved throughout the process**





# Appendix IRP Ranking Metric Detail

## IRP Ranking Metrics – PVRR<sup>1</sup>

Strategy	Scenario							Total PVRR Score
	1	2	3	4	5	6	7	
A. Limited Change in Current Resource Portfolio	95	97	99	98	98	97	98	682
B. Baseline Plan Resource Portfolio	99	99	100	99	99	99	99	694
C. Diversity Focused Resource Portfolio	100	100	99	100	100	100	100	699
D. Nuclear Focused Resource Portfolio	94	94	94	94	94	96	95	661
E. EE/DR and Renewables Focused Resource Portfolio	98	99	97	98	98	99	98	687

## IRP Ranking Metrics – Short-Term Rate Impacts<sup>1</sup>

Strategy	Scenario							Total ST Rate Score
	1	2	3	4	5	6	7	
A. Limited Change in Current Resource Portfolio	100	100	97	100	100	97	100	694
B. Baseline Plan Resource Portfolio	98	100	100	98	98	100	99	693
C. Diversity Focused Resource Portfolio	96	99	96	96	98	97	97	679
D. Nuclear Focused Resource Portfolio	90	90	91	90	90	93	91	635
E. EE/DR and Renewables Focused Resource Portfolio	95	95	92	95	95	93	95	660

1 – Rows match the corresponding columns in Ranking Metric Results slides 11-13



# Appendix IRP Ranking Metric Detail (Cont'd)

**IRP Ranking Metrics – Risk Ratio<sup>1</sup>**

Strategy	Scenario							Total Risk Ratio Score
	1	2	3	4	5	6	7	
A. Limited Change in Current Resource Portfolio	91	82	94	77	87	79	84	594
B. Baseline Plan Resource Portfolio	97	97	84	93	98	76	93	638
C. Diversity Focused Resource Portfolio	100	94	100	100	100	92	100	686
D. Nuclear Focused Resource Portfolio	99	100	74	95	100	82	95	645
E. EE/DR and Renewables Focused Resource Portfolio	98	99	98	91	95	100	100	681

**IRP Ranking Metrics – Risk Benefit Ratio<sup>1</sup>**

Strategy	Scenario							Total Risk Benefit Score
	1	2	3	4	5	6	7	
A. Limited Change in Current Resource Portfolio	95	89	98	88	91	88	91	640
B. Baseline Plan Resource Portfolio	98	99	91	98	98	87	97	668
C. Diversity Focused Resource Portfolio	100	95	100	100	100	97	100	692
D. Nuclear Focused Resource Portfolio	98	100	87	93	99	91	97	665
E. EE/DR and Renewables Focused Resource Portfolio	99	99	97	96	100	100	100	691

1 – Rows match the corresponding columns in Ranking Metric Results slides 11-13