

Integrated Resource Plan

TVA'S ENVIRONMENTAL AND ENERGY FUTURE

Stakeholder Review Group
Working Session

February 17, 2010



10:00-10:15 – Introduction and Working Session Objectives	Randy McAdams
10:15-11:00 – Welcome and Discussion of TVA Reorganization/IRP Impacts	Joe Hoagland / Van Wardlaw
11:00-11:15 – Renewables Update	Belinda Thornton
11:15-11:30 - Review of Overall IRP Process	Randy McAdams
11:30-12:30 – Review of Updated Scenarios/Worlds	Gary Brinkworth
12:30-12:45 – Discussion	
12:45-1:15 – Working Lunch	
1:15- 2:15 - Busbar Screening Results and Supply-Side Technology Options	Gary Brinkworth
2:15-2:30 – Discussion	
2:30-3:15 – Information Sharing Protocol and Discussion	Randy McAdams
3:15-3:30 – Break	
3:30-4:00 – Open Discussion and Action Items	Randy McAdams
 <i>6:00-7:30 – TVA Quarterly Public Briefing (SRG members welcome to attend)</i>	

Renewable Energy Purchases

- ◆ Announced two contracts in October and four more contracts in January
 - CPV Renewable Energy Company LLC (Ashley)
 - Invenergy Wind LLC (Hurricane Lake)
 - CPV Renewable Energy Company LLC (Cimarron)
 - Invenergy Wind LLC (Bishop Hill)
 - Invenergy Wind LLC (White Oak)
 - Streator-Cayuga Ridge Wind Power LLC (Cayuga Ridge)

- ◆ Purchases are competitive with forecasted electricity market prices

- ◆ Delivery is subject to securing firm transmission paths and completing applicable environmental reviews

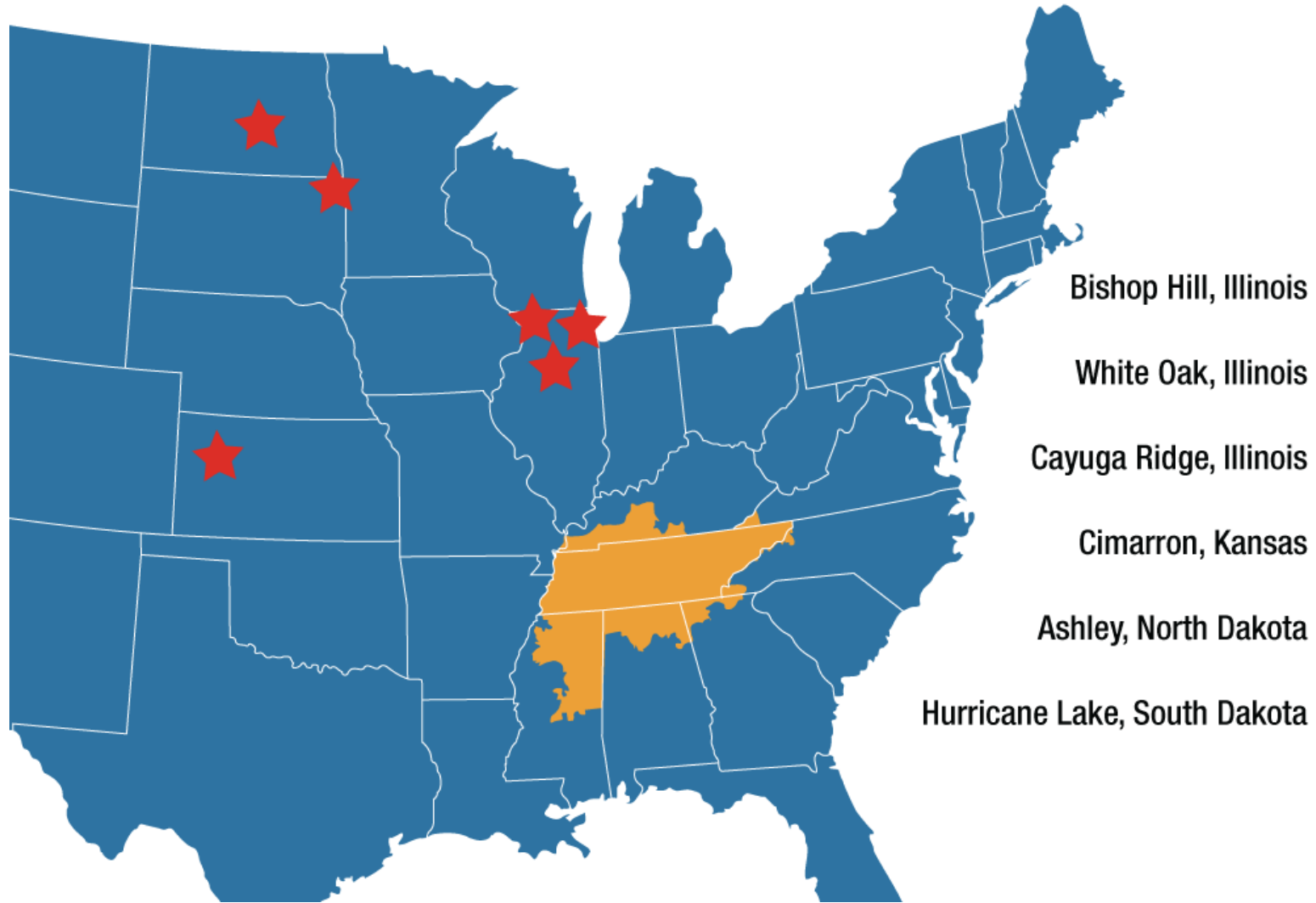
- ◆ Increases TVA's renewable sources by 1,265 MWs

- ◆ Additional contracts are under negotiation

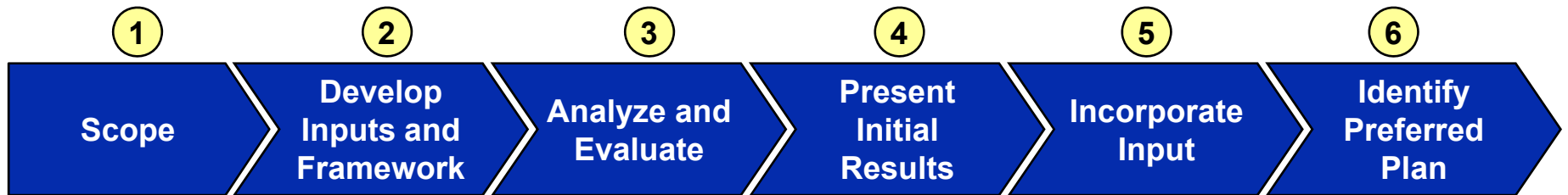
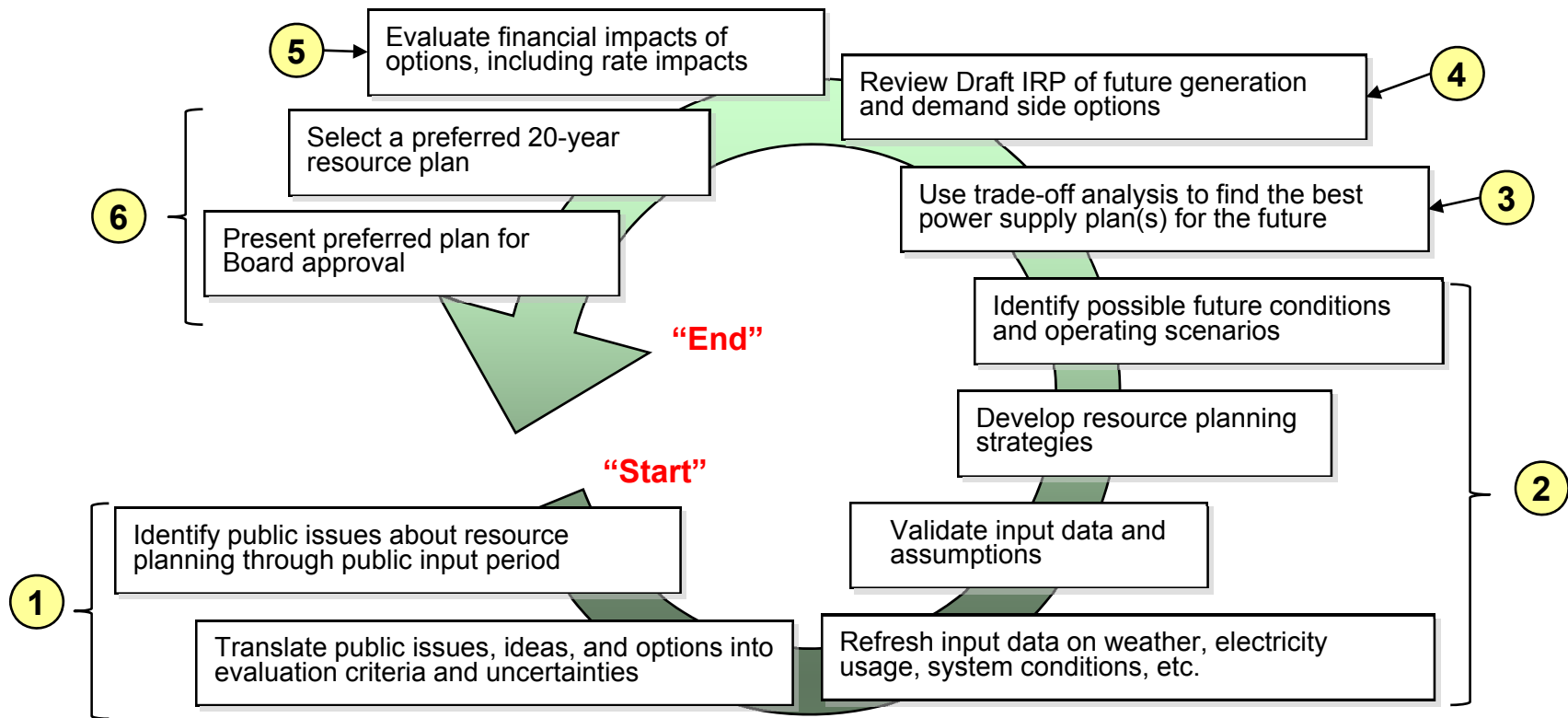


Wind Project Locations

Total Capacity Under Contract: 1,265 megawatts



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





- ◆ **Scope:** Identify public issues and relevant concerns about resource planning through public input period. Translate public issues, ideas, and options into evaluation scoping criteria
- ◆ **Develop inputs and framework:** Specify and quantify key inputs such as forecast of energy needs, existing capacity, supply options (demand-side and supply-side), and commodity prices. Identify possible future operating scenarios and develop resource planning strategies
- ◆ **Analyze and evaluate:** Use capacity expansion optimization and production simulation tool to identify least-cost plans. Apply metrics and critical thinking to evaluate modeling outputs
- ◆ **Present initial results:** Publish draft IRP with initial findings. Collect input from public and key stakeholders on preliminary results through public comment period
- ◆ **Incorporate input:** Incorporate public feedback into evaluation. Revise and refresh key inputs and assumptions as required. Update analysis and evaluate results
- ◆ **Identify preferred plan:** Identify a preferred resource plan, publish final IRP, and present recommendation to the Board for approval

TVA will engage in ongoing discussions and solicit input from different stakeholder viewpoints to validate the process throughout development of the IRP.

- Complete or In Process
- Not Started

TVA IRP Process Review (Cont'd)

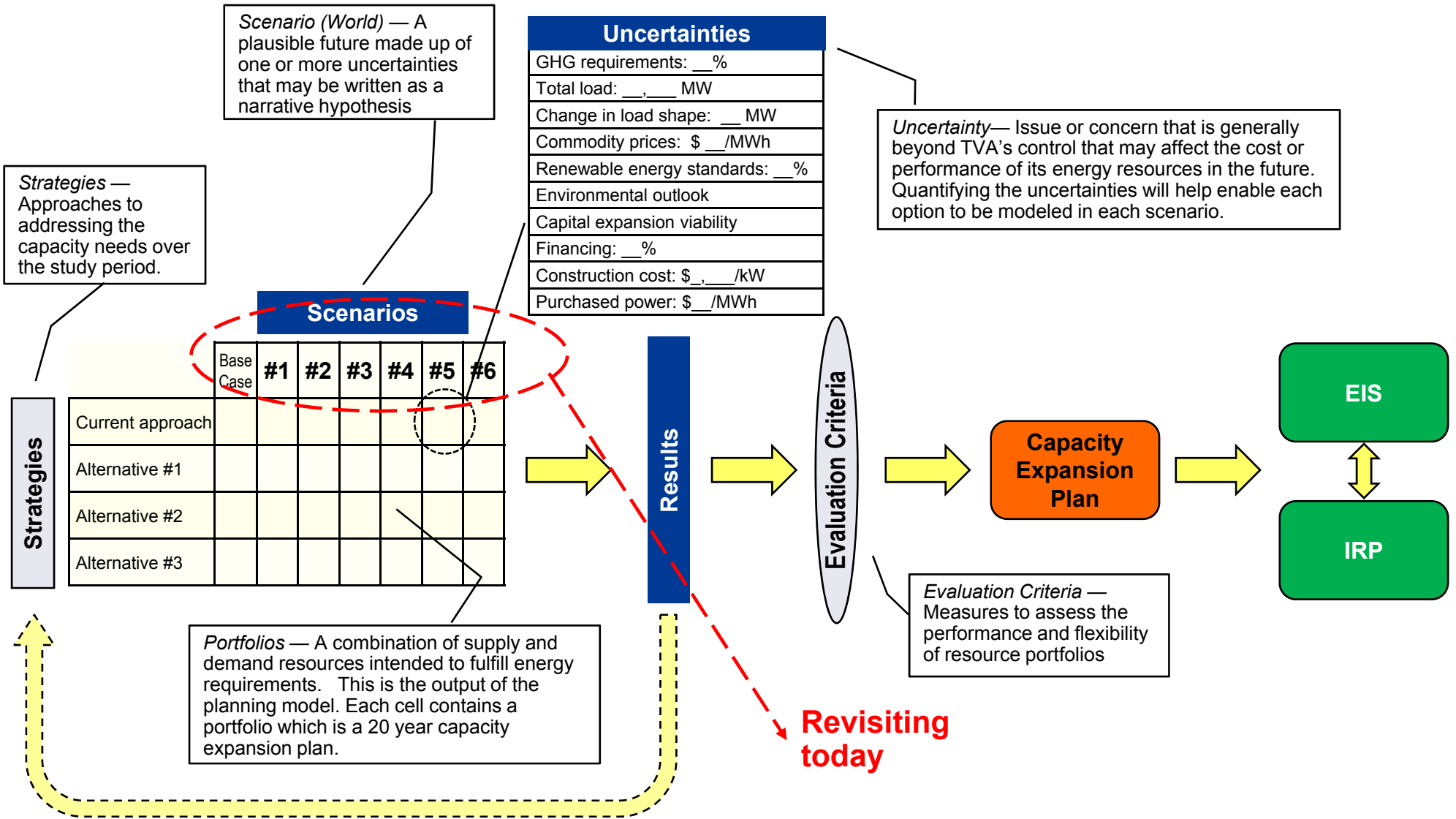
The SRG has reviewed and provided input on the following topics:



- ◆ Planning process
- ◆ Key uncertainties
- ◆ Scenario/Worlds
- ◆ Demand-side resource options
- ◆ 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 updated scenarios/worlds
 - Busbar screening results for supply-side resource options

- Complete or In Process
- Not Started



Why Scenario Planning is useful

- ◆ Scenarios are developed to:
 - Bound key uncertainties to create a wide range of possible 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 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



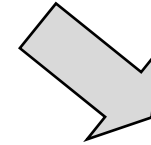
Scenario/World Review Development Approach

The approach combines prior TVA work, input and direction from TVA, and external research

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

TVA and Stakeholder Input

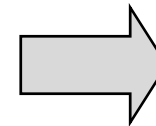
- Scenario Steering Committee
- TVA executives
- Technical experts
- Key stakeholder input



Leveraging of prior TVA work and strategic documents helps 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

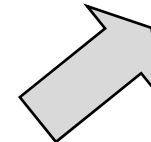


Scenarios

Understanding of best practices and lessons learned is gained through industry research

External Research

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





Scenario/World Review Development Considerations

- ◆ Assess how key uncertainties may be affected by:
 - Economic conditions
 - Legislative and regulatory mandates
 - Significant technology advancements
 - Societal and customer concerns

- ◆ Refine scenarios so that they:
 - Are distinct and reflect plausible, meaningful risks (e.g., uncertainties related to cost, regulation, environment) to TVA
 - “Stress” resource selection to provide a foundation for analyzing the combination of various supply and demand options (capacity plans)
 - Reflect key stakeholder interests, to the extent possible

- ◆ Developed six scenarios that reflect the considerations outlined above:
 - Scenario #1: Economy Recovers Dramatically
 - Scenario #2: Environmental Focus is a National Priority
 - Scenario #3: Prolonged Economic Malaise
 - Scenario #4: Game-Changing Technology
 - Scenario #5: Energy Independence
 - Scenario #6: Carbon Regulation Creates Economic Downturn

Added Scenario #6 as a result of input from August 18th, 2009 SRG working session



Scenario/World Review

Scenario Summaries

The table below summarizes the key characteristics of each scenario / world:

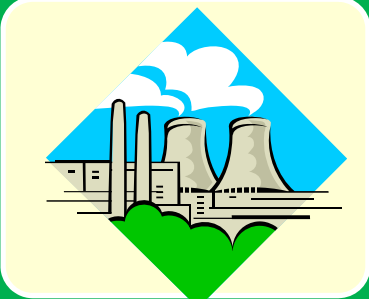
Scenario	Key Characteristics
◆ Economy Recovers Dramatically	<ul style="list-style-type: none"> — Economy recovers stronger than expected and creates high demand for electricity — Carbon legislation and renewable electricity standard are passed — Demand for commodity and construction resources increases — Electricity prices are moderated by increased gas supply
◆ Environmental Focus is a National Priority	<ul style="list-style-type: none"> — Mitigation of climate change effects becomes a national priority — The cost of CO₂ allowances, gas, and electricity increase significantly — Industry focus turns to nuclear, renewables, conservation, and gas to meet demand
◆ Prolonged Economic Malaise	<ul style="list-style-type: none"> — Prolonged, stagnant economy results in low to negative load growth and delayed expansion of new generation — Federal climate change legislation is delayed due to concerns of adding further pressure to the economy
◆ Game-Changing Technology	<ul style="list-style-type: none"> — Strong economy with high demand for electricity and commodities — High price levels and concerns about the environment incentivize conservation — Game-changing technology results in an abrupt decrease in load served after strong growth
◆ Energy Independence	<ul style="list-style-type: none"> — The U.S. focuses on reducing its dependence on non-North American fuel sources — Supply of natural gas is constrained and prices for gas and electricity rise — Energy efficiency and renewable energy move to the forefront as an objective of achieving energy independence
◆ Carbon Regulation Creates Economic Downturn	<ul style="list-style-type: none"> — Federal climate change legislation is passed and implemented quickly — High prices for gas and CO₂ allowances increase electricity prices significantly — U.S. based energy-intensive industry is non-competitive in global markets and leads to an economic downturn

Busbar Screening Results



Demand-Side

- Includes all DSM program options (EE & DR)
- Modeled in study as transaction (instead of a load modification)



Supply-Side

- Conventional & advanced/alternative options
- Screened based on feasibility, technology maturity, and levelized (busbar) cost by type and duty cycle



Purchase Power Agreement

- Reflects proposals submitted to TVA from resources inside and outside the Valley
- Includes transmission costs and limitations if applicable
- Excludes generic market purchases

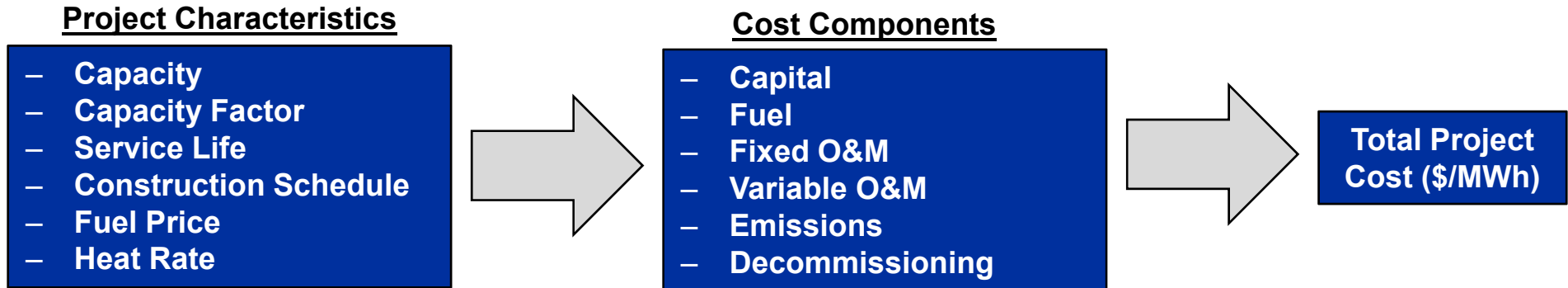


Busbar Screening Results

Busbar Cost Calculations

Busbar costs allow a comparison of different power generation technologies of unequal unit characteristics and cost components.

- ◆ A levelized “all-in” cost for technologies
 - Includes capital, operating costs, emissions
 - Fuel costs based on average (levelized) value from base forecast
 - Emissions costs (CO₂, etc) also use levelized value



- ◆ Calculations compare levelized costs by duty cycle or type
 - Base/intermediate/peaking/non-dispatchable
 - Conventional, alternative, renewable
- ◆ Capacity planning model uses set of options chosen from lowest cost technologies in each duty cycle and other options retained for sensitivity analysis



Busbar Screening Results Combustion Turbine Example

Given Information

Unit Characteristics from Asset Owners

Fuel and Emissions Costs from Financial Services

- ◆ Busbar cost calculation uses actual annual prices to determine contribution of fuel & emission costs to total \$/MWh project cost
- ◆ Equivalent levelized average prices for these commodities are:

**Values are confidential
and will be provided at
the meeting**



Busbar Screening Results Combustion Turbine Example (Cont'd)

Calculations

◆ Energy calculation

- Energy = Capacity × Capacity Factor × Hours per Year
- **Energy = 686MW × 5% × 8760hrs/yr = 300,468MWh/year**

◆ Sum of yearly construction costs

- Year(1) = Overnight Cost × % Construction Cash Flow (then escalated)
- Year(1) = \$433M × 18% = \$75.8M → \$77.62M (2010\$)
- Year(2) = \$111.8M
- Year(3) = \$186.2M
- Year(4) = \$84.7M
- Sum = \$460.3M

◆ Amortized cost over 25 years = \$36M/year (\$32M/year 2009\$)

◆ Capital costs

- Capital Costs = Annual cost in 2009\$ ÷ energy
- **Capital Costs = \$32M ÷ 300,468MWh = \$106.51/MWh**

$$\frac{\$460M}{\left(\frac{1 - \frac{1}{(1 + 6\%)^{25}}}{6\%} \right)}$$



Busbar Screening Results Combustion Turbine Example (Cont'd)

Calculations (Cont'd)

◆ Fixed O&M

- Fixed O&M = 25 years of annualized NPV of Fixed O&M ÷ Energy
- **Fixed O&M = \$3.58M (2009\$) ÷ 300,468MWh = \$11.93/MWh**

◆ Variable O&M

- Variable O&M = 25 years of annualized NPV of (Variable O&M × Energy) ÷ Energy
- **Variable O&M = \$3.03M (2009\$) ÷ 300,468MWh = \$10.08/MWh**

◆ Fuel costs

- Yearly fuel = Heat Rate (Btu/kwh) × Fuel Price (\$/MMBtu) × Energy (MWh)
- Fuel = 25 years of annualized NPV of (Fuel) ÷ Energy
- **Fuel = \$31.56M (2009\$) ÷ 300,468MWh = \$105.04/MWh**

◆ Emissions costs

- NOx costs = Heat Rate (Btu/kwh) × Emissions Rate (lbs/MMBtu) × Energy (MWh) × Price (\$/ton)
- NOx costs = 10,142 Btu/KWh × 0.036 lbs/MMBtu × 300,468MWh × \$1969/ton = \$0.108M
- Emissions Costs = 25 years of annualized NPV of Emissions Costs (SO₂, NO_x, CO₂, Hg) ÷ Energy
- **Emissions Costs = \$6.12M ÷ 300,468MWh = \$20.36/MWh**

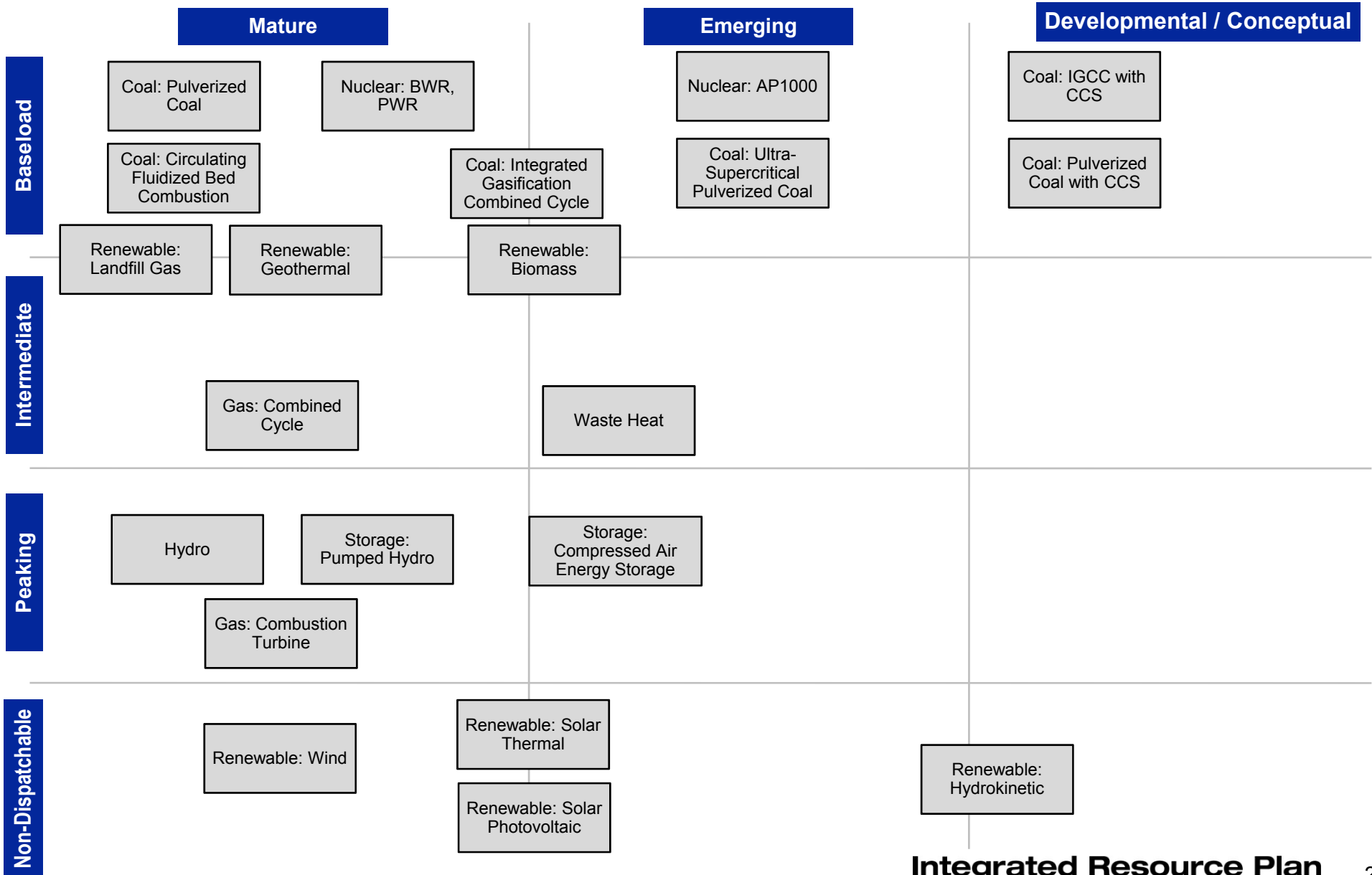
◆ Total Busbar Costs

- Total Busbar Costs = Cap. + Fuel + Fixed O&M + Var. O&M + Emissions
- Total Busbar Costs = \$106.51 + \$105.04 + \$11.93 + \$10.08 + \$20.36
- **Total Busbar Costs = \$254/MWh**



Busbar Screening Results Supply-Side Alternatives

There are many technologies to consider – cost, application, and maturity vary widely. Geography and proximity to supply source are also major factors.





Busbar Screening Results

Supply-Side Alternatives: Nominal Capacity Values

The following table summarizes typical capacity values for different supply-side alternatives.

	Typical Capacity (MW)			
	0 - 50	50 - 100	100 - 500	> 500
Peaking Technology				
Combustion Turbine				✓
Compressed Air Energy Storage			✓	
Pumped Storage Hydro				✓
Hydro Additions - Existing Plant	✓			
Intermediate Technology				
Combined Cycle (2 on 1)				✓
Combined Cycle (3 on 1)				✓
Combined Cycle w/ CCS				✓
Biomass Cofiring - Cyclone Boiler	✓			
Biomass Cofiring - Pulverized Coal	✓			
Biomass - Stoker Boiler		✓		
Biomass - Circulating Fluidized Bed		✓		
Combined Heat & Power - Microturbine	✓			
Combined Heat & Power - Fuel Cells	✓			
Combined Heat & Power - Recip Engine	✓			
Combined Heat & Power - Gas Turbine	✓			
Baseload Technology				
Nuclear AP1000				✓
Bellefonte 1/2				✓
Supercritical Pulverized Coal				✓
Supercritical Pulverized Coal w/CCS				✓
Integrated Gasification Combined Cycle				✓
Integrated Gasification Combined Cycle w/ CCS			✓	
Circulating Fluidized Bed				✓
Ultra-Supercritical Pulverized Coal				✓
Biomass		✓		
Geothermal		✓		
Landfill Gas	✓			
Non-Dispatchable Technology				
Hydrokinetic	✓			
Solar PV	✓			
Solar Thermal		✓		
Wind (not PPA)		✓		

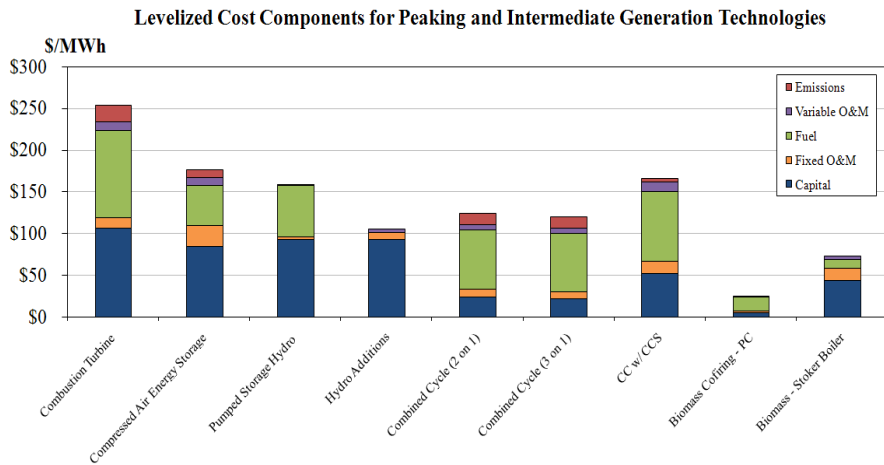


Busbar Screening Results

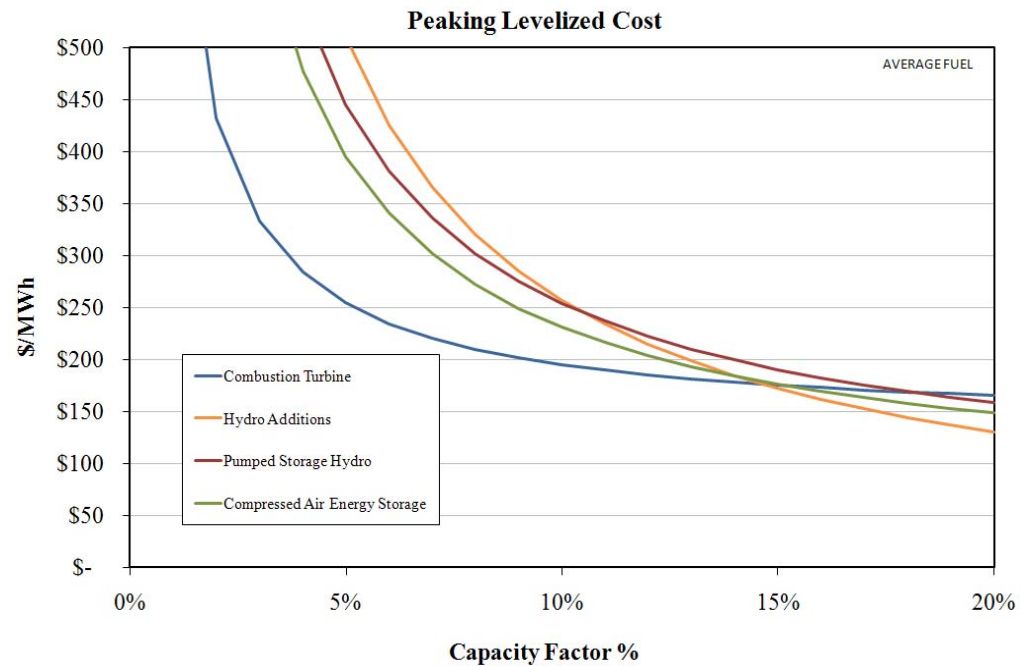
Busbar (Levelized Cost) Curves

Communicating Busbar Costs

- ◆ Stacked bar format is used to highlight components of the busbar cost at an assumed capacity factor



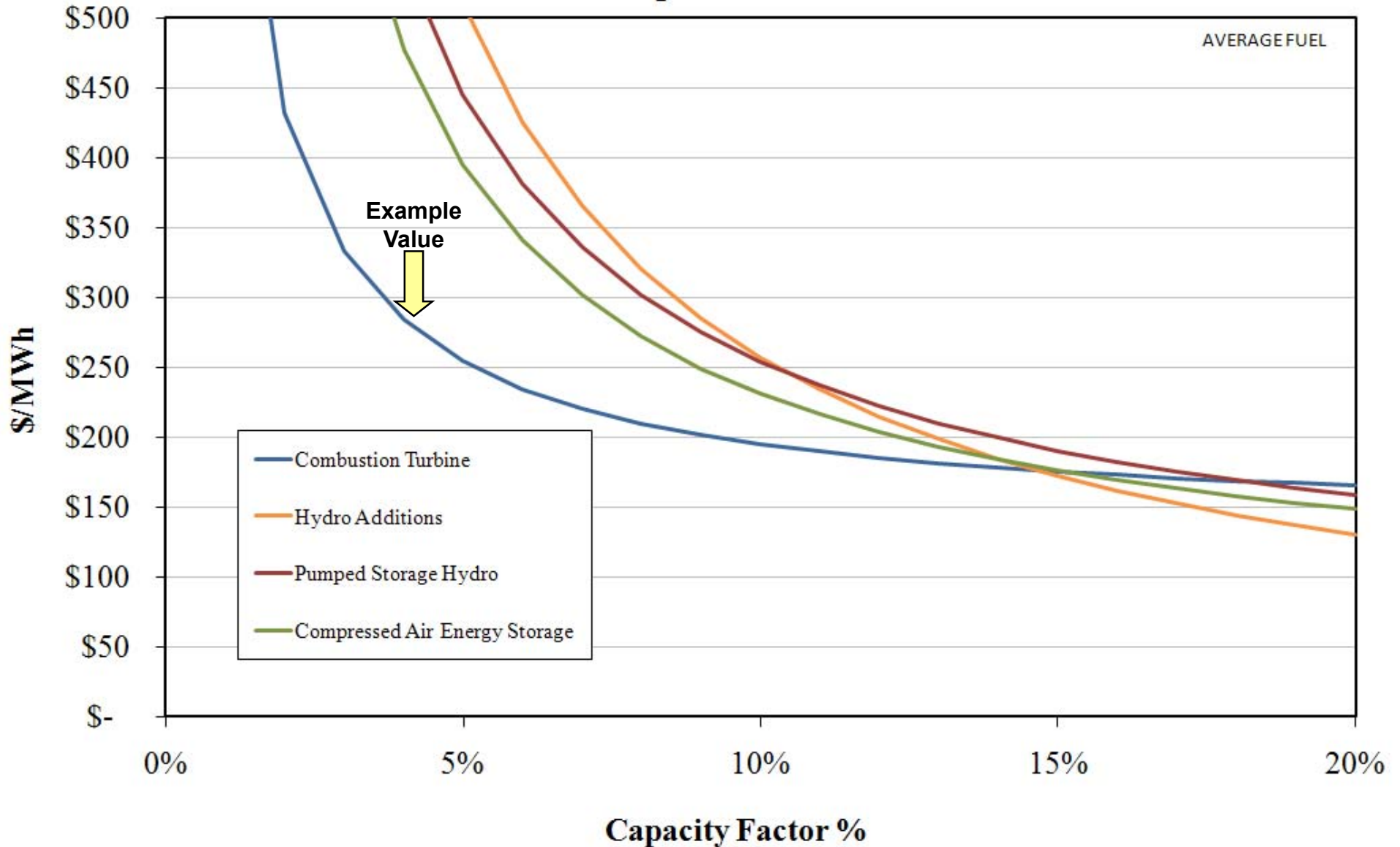
- ◆ Cost vs. capacity factor curves are used to highlight cross-over points between technologies within the duty cycle





Busbar Screening Results Busbar (Levelized Cost) Curves (Cont'd)

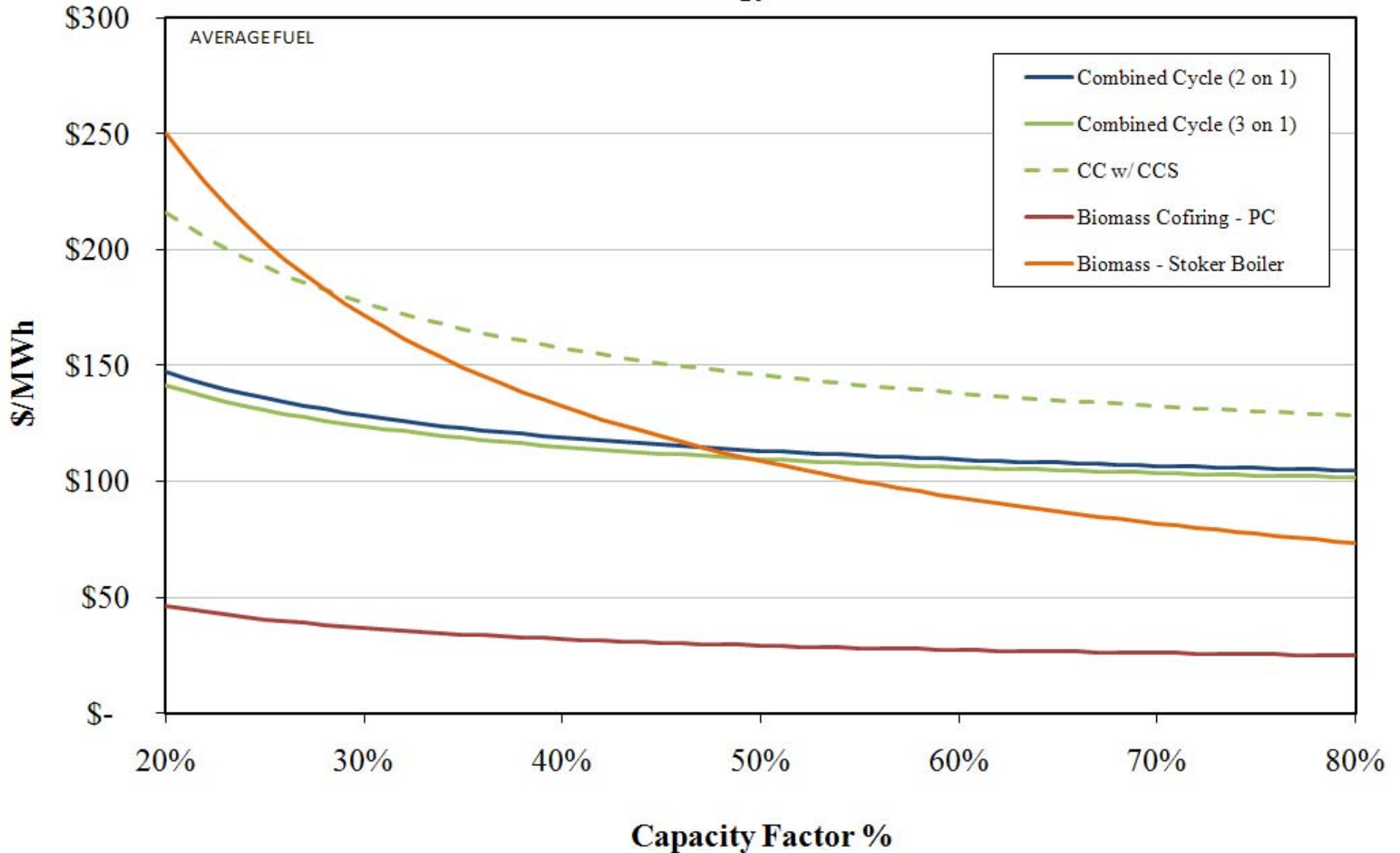
Peaking Levelized Cost





Busbar Screening Results Busbar (Levelized Cost) Curves (Cont'd)

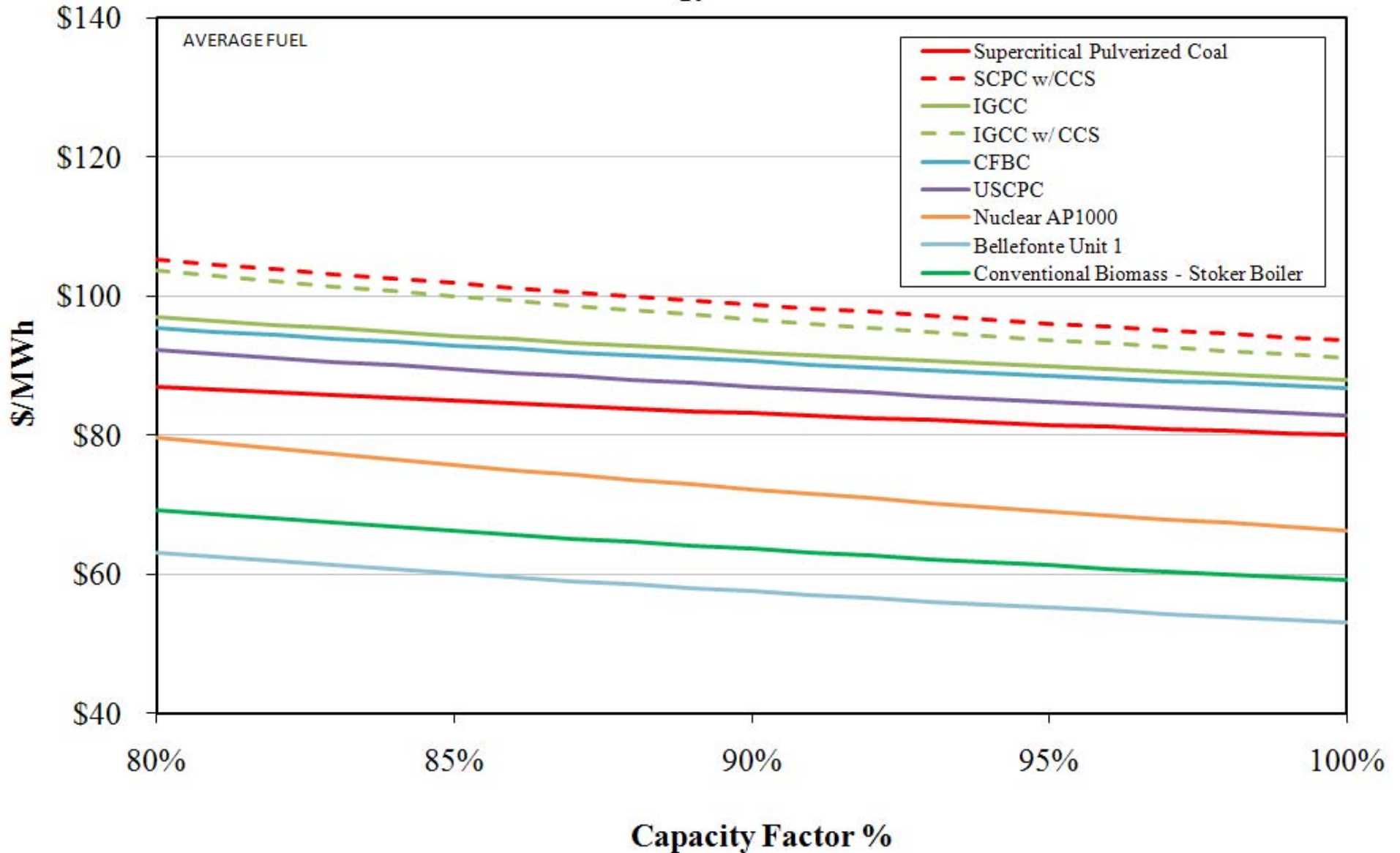
Intermediate Technology Levelized Cost





Busbar (Levelized Cost) Curves (Cont'd)

Baseload Technology Levelized Cost

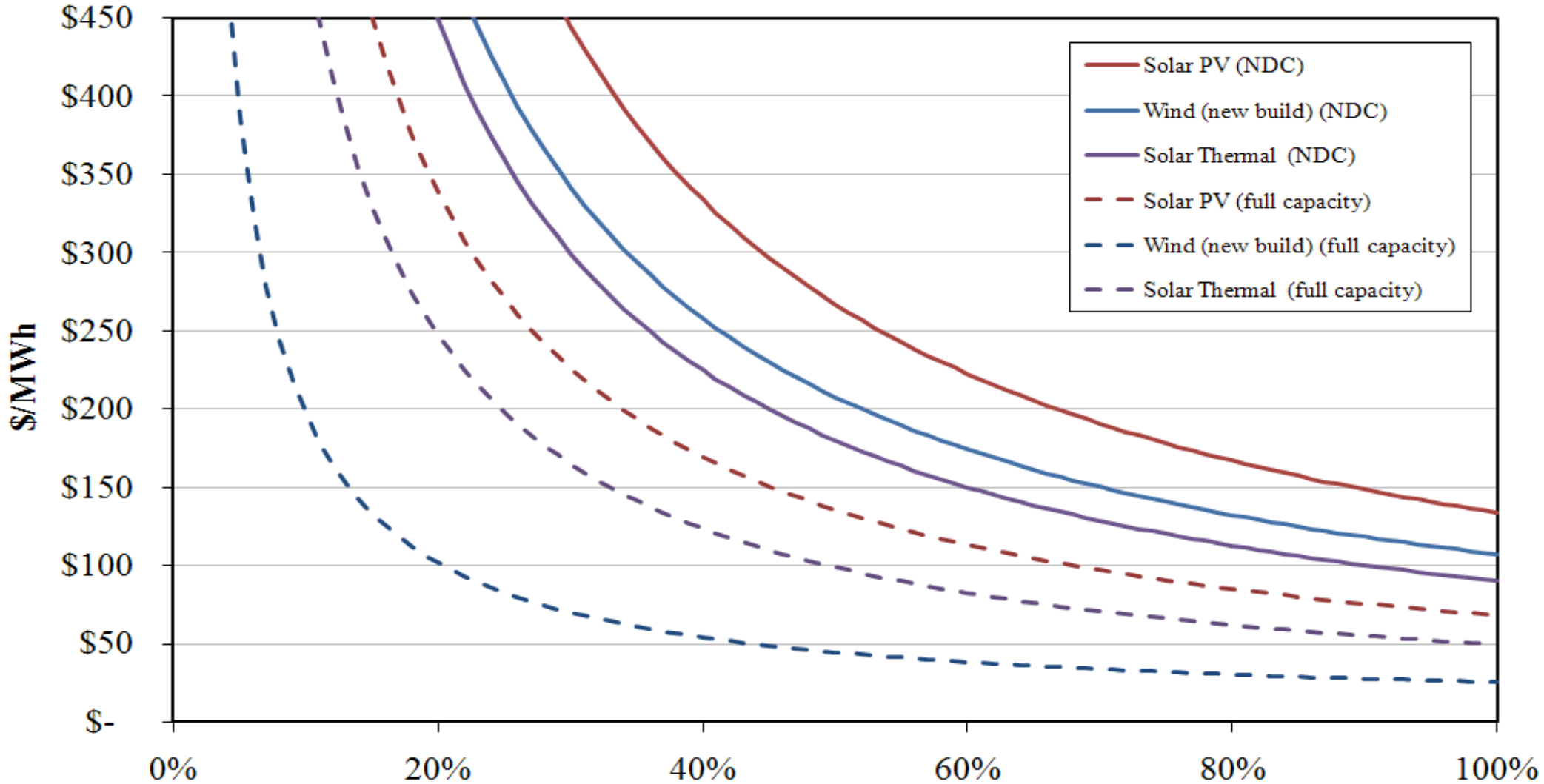




Busbar Screening Results

Busbar (Levelized Cost) Curves (Cont'd)

Renewable Technology Levelized Cost



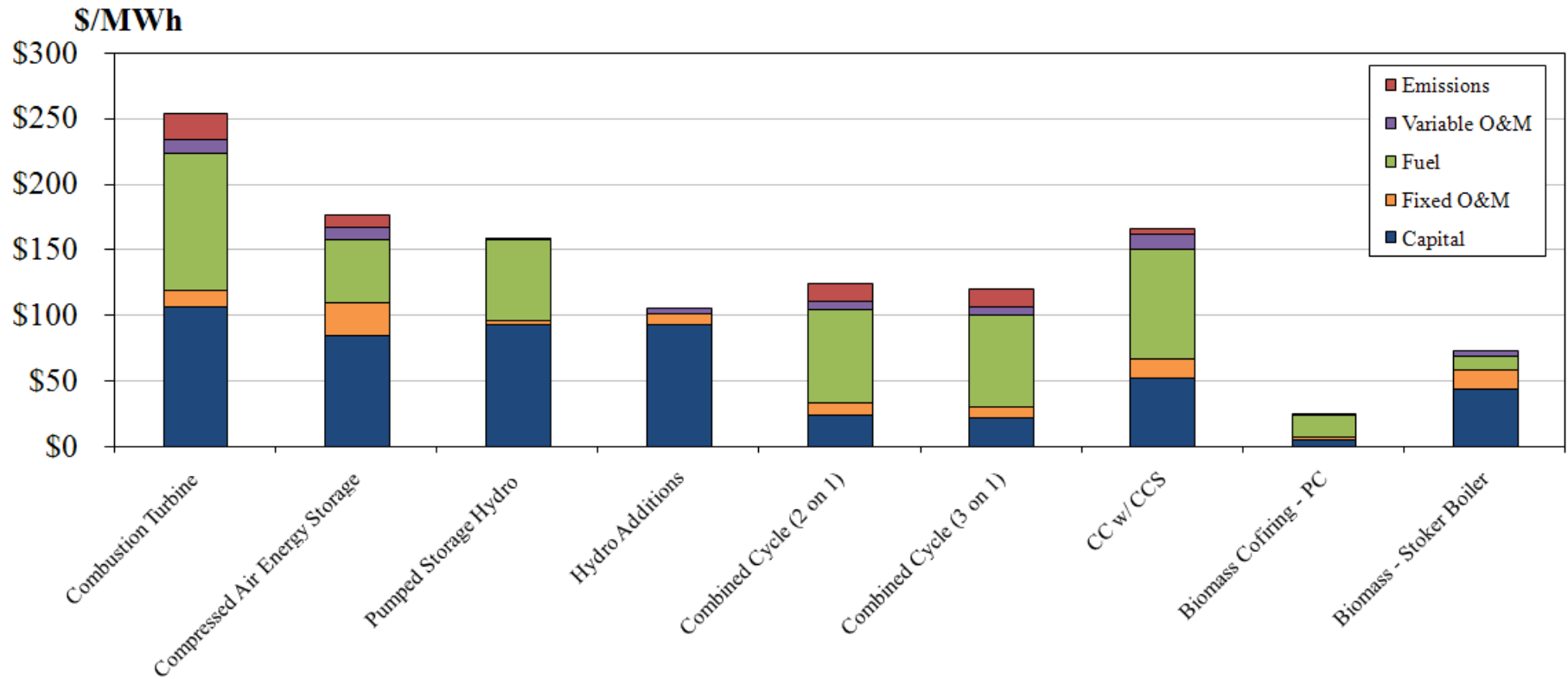
	Full Capacity (MW)	Net Dependable Capacity (NDC) (MW)
Wind (new build)	75	11.25
Solar PV	25	12.5
Solar Thermal	50	25

Capacity Factor %



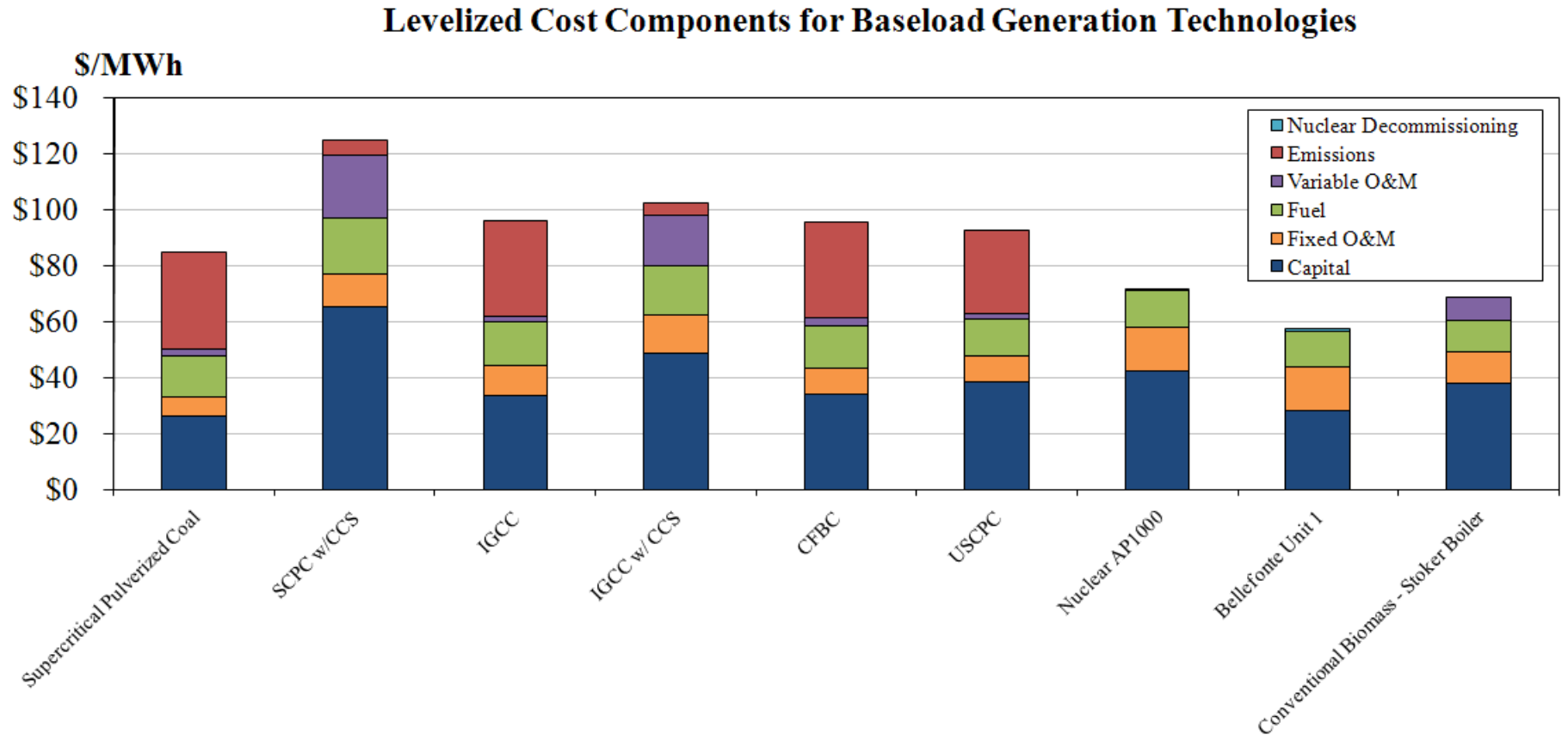
Busbar Screening Results Levelized Cost Components

Levelized Cost Components for Peaking and Intermediate Generation Technologies





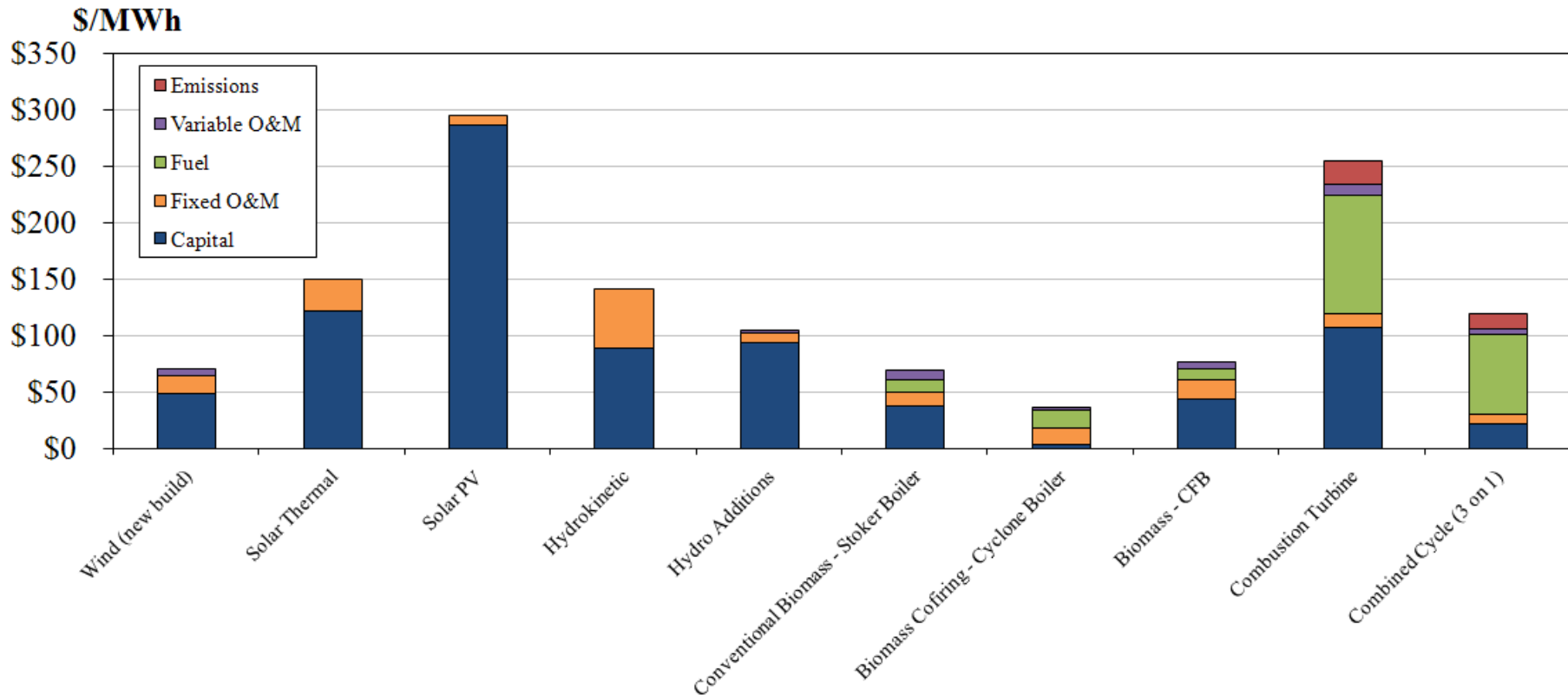
Busbar Screening Results Levelized Cost Components (Cont'd)





Busbar Screening Results Levelized Cost Components (Cont'd)

Levelized Cost Components for Renewable Generation Technologies



Note: these values are based on the full capacity of each renewable technology. The capacity factor curves for the renewable resources display busbar cost curves assuming both full capacity & net dependable capacity. TVA's capacity planning model uses net dependable capacity for renewable resources.



Busbar Screening List: Supply-Side Alternatives

Retained for use in capacity planning model:

- Supercritical Pulverized Coal
- Supercritical Pulverized Coal with CCS
- IGCC
- IGCC with CCS
- Nuclear AP1000
- Bellefonte Units 1&2 (B&W design)
- Conventional Biomass **
- Combustion Turbine
- Pumped Storage Hydro
- Compressed Air Energy Storage
- Combined Cycle (2 on 1)
- Combined Cycle (3 on 1)
- Solar PV **

Under further review:

- Biomass co-firing
- CHP **
- Enhanced renewable resources (wind + storage, solar + storage, etc)

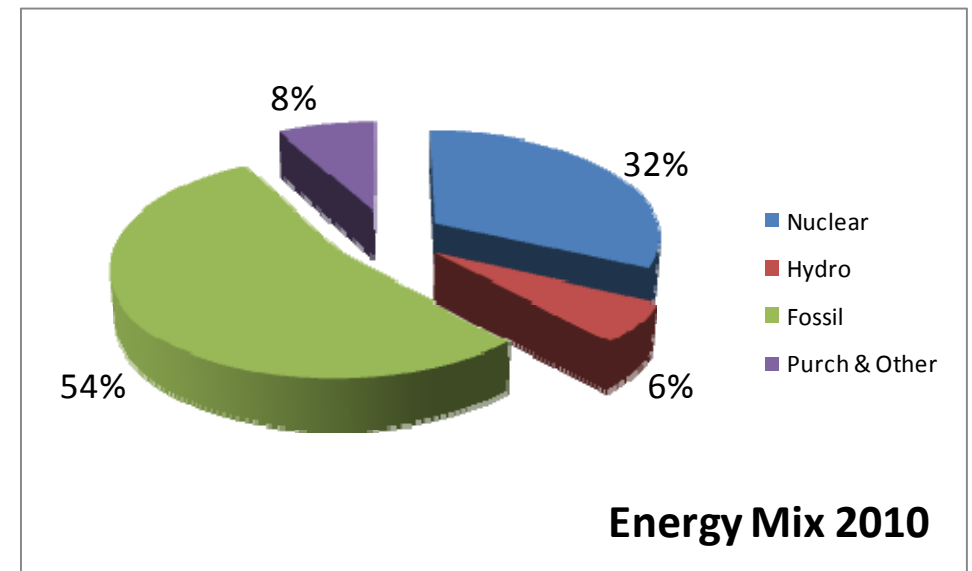
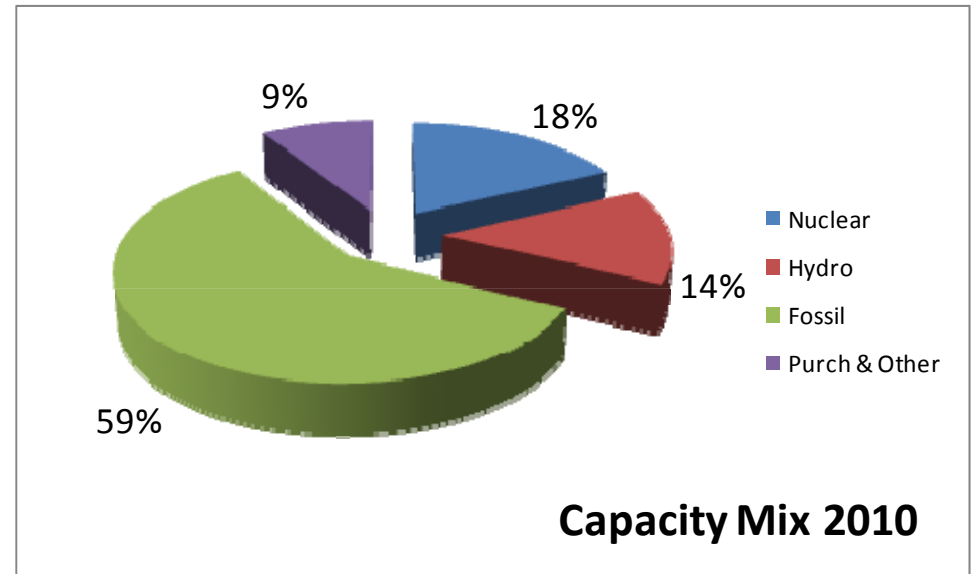
Not included in initial resource dataset:

- CFB (circulating fluidized bed)
- Ultra Supercritical Pulverized Coal (USCPC)
- Landfill Gas **
- Combined Cycle with CCS
- Wind (new build) **
- Solar Thermal
- Hydrokinetic
- Hydro Additions

** Also evaluated as purchased power alternatives

Incorporation of PPAs

- ◆ Options are based on proposals submitted to TVA from resources inside and outside the Valley
- ◆ These are usually tied to a specific project for a defined term at a negotiated price
- ◆ Transmission costs and import limitations are included in the PPA characteristics if applicable
- ◆ PPA's are not screened
 - They are included in the database as proposed
 - The model treats these PPA's as a fixed transaction that can only be selected based on terms defined in the offer
 - PPA's cannot be rescheduled or selected in amounts that do not conform to the proposal
- ◆ TVA is evaluating six to eight PPA's that could be chosen as part of the least cost resource plan
- ◆ The figures on the right show the capacity and energy mix in 2010 including the contribution from current PPA's



SRG Purpose

- ◆ Provide TVA in-depth ongoing discussion and input from different stakeholder viewpoints
- ◆ Serves 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

Information Sharing Protocol

- ◆ TVA's goal is to provide information necessary to help the SRG independently evaluate the IRP process
- ◆ TVA is striving to provide them information that has some business risk but doing so under a confidentiality agreement
 - Capital cost estimates
 - Commodity price forecasts
 - McKinsey study
 - PA Consulting report
- ◆ There is some information that will not be released because it is commercially proprietary and poses a serious risk to TVA and ratepayers. In addition, information that could put safety at risk or that is not relevant to the IRP process will also not be shared



Information Sharing Protocol (Cont'd)

- ◆ TVA is committed to provide timely information required for the SRG to fulfill its objectives and has initiated a process to capture, assess, and respond to input from the SRG
 - All requests for information (Action Item or Questions) will be captured
 - TVA will post an updated tracking sheet of Action Items and Questions to the SRG SharePoint within five business days of each working session or workshop
 - The tracking sheet will include an expected completion date for each item

- ◆ TVA evaluates all requests *in accordance with the SRG's objectives*, sensitivity, and *time to assemble* to determine an appropriate response

Information Type	General Definition	Treatment
Public Information	◆ Information that is deemed suitable for public release or is already publicly available	◆ Will be provided**
Confidential Information	◆ Information that if released could reasonably be expected to have an adverse effect on TVA operations, assets or individuals	◆ Will be provided under the confidentiality agreement**
Sensitive / Restricted Information	◆ Information that if released could reasonably be expected to cause serious risk of harm to TVA operations, assets or individuals. Primarily, this is either: <ul style="list-style-type: none"> – Commercially proprietary information that could put TVA at a serious disadvantage in the marketplace – Information that would risk safety and security of assets or individuals 	◆ Will not be provided

- ◆ Escalation process: an SRG member may provide written justification for any denied information request and the TVA IRP Executive will review/respond

**Items that require an excessive amount of time or effort to respond may warrant further conversation with the SRG on the relevance to the process



Scenario/World Review

Scenario Framework: Current

Scenarios are outlined in the table below, along with the relative responses of key uncertainties.

Uncertainty	Scenario #1	Scenario #2	Scenario #3	Scenario #4	Scenario #5	Scenario #6	IRP Baseline Case
	Economy Recovers Dramatically	Environmental Focus is a National Priority	Prolonged Economic Malaise	Game-Changing Technology	Energy Independence	Carbon Legislation Creates Economic Downturn	
Greenhouse gas requirements	CO2 price \$27/ton (\$30/metric ton) in 2014 and \$82 (\$90/metric ton) by 2030. 77% allowance allocation, 41% by 2030	CO2 price \$17/ton (\$19/metric ton) in 2012 and \$94 (\$104/metric ton) by 2030. 77% allowance allocation, 28% by 2030	No federal requirement (CO2 price = \$0/ton)	CO2 price \$18/ton (\$20/metric ton) in 2013 and \$45 (\$50/metric ton) by 2030. 77% allowance allocation, 39% by 2030	CO2 price \$18/ton (\$20/metric ton) in 2013 and \$45 (\$50/metric ton) by 2030. 77% allowance allocation, 39% by 2030	CO2 price \$17/ton (\$19/metric ton) in 2012 and \$94 (\$104/metric ton) by 2030. 77% allowance allocation, 28% by 2030	CO2 price \$15/ton (\$17/metric ton) in 2013 and \$56 (\$62/metric ton) by 2030. 77% allowance allocation, 39% by 2030
Environmental outlook	Same as Base Case	SO2 controls 2017 NOX controls Dec 2016 Hg MACT 2014 HAP MACT 2015	No additional requirements (CAIR requirements, with no MACT requirements)	Same as Base Case	Same as Base Case	Same as Base Case	SCR all units by 2017 FGD all units by 2018 HAPs MACT by 2015
Energy Efficiency (EE) & Renewable Electricity Standards (RES)	RES - 3% by 2012, 20% by 2020 (adjusted total retail sales) EE can meet up to 25% of requirement	RES - 5% by 2012, 30% by 2020 (adjusted total retail sales) EE can meet up to 25% of requirement	No federal requirement	RES - 5% by 2012, 20% by 2020 (adjusted total retail sales) EE can meet up to 40% of requirement	RES - 5% by 2012, 20% by 2020 (adjusted total retail sales) EE can meet up to 40% of requirement	RES - 5% by 2012, 30% by 2020 (adjusted total retail sales) EE can meet up to 25% of requirement	RES - 3% by 2012, 15% by 2021 (adjusted total retail sales) EE can meet up to 25% or requirement
Total load	Med grow to High by 2015; High Dist; Alcoa Returns in 2010+; USEC stays forever; Dept Dist same as Base	Medium case, then 2012 40% rate increase; Low Dist; DS customer reductions (steel/paper plants); USEC stays forever; Dept Dist same as Base	Low Load Case; Low Dist; Alcoa not returning, No HSC & Wacker; USEC leaves June 2013; Dept Dist same as Base	Med-High load growth through 2020, then 20% decrease 2021-2022 including USEC departure, reduced dist sales & extended TOU	Medium case, then 20% rate increase in 2014; unrestricted PHEV included; TOU	Medium load case 2010-2011; 2012 low case then flat w/no growth; USEC leaves 2013; Alcoa not returning, HSC & Wacker not in; TOU	Moderate Growth
Capital expansion viability & costs	Moderate Schedule Risk	High Schedule Risk	Low Schedule Risk	Moderate Schedule Risk	Moderate Schedule Risk	Low Schedule Risk	Moderate Schedule Risk

1. Reflects November 2009 plan with new Regulatory Outlook
2. Reflects average prices through 2030, not inflation adjusted.
3. Schedule risk reflects the potential delay in number of years

Coal price does not include delivery



Scenario Framework: Current (Cont'd)

Scenarios are outlined in the table below, along with the relative responses of key uncertainties.

Uncertainty	Scenario #1	Scenario #2	Scenario #3	Scenario #4	Scenario #5	Scenario #6	IRP Baseline Case
	Economy Recovers Dramatically	Environmental Focus is a National Priority	Prolonged Economic Malaise	Game-Changing Technology	Energy Independence	Carbon Legislation Creates Economic Downturn	
Financing	Higher Than Base Case--Higher inflation due to higher economic growth	Higher Than Base Case--Higher inflation due to looser monetary policy supporting economic growth	Lower Than Base Case--Lower inflation due to lower economic growth	Same as Base Case--Increased productivity due to technology leads to stronger economic, wealth, and <i>non-inflationary</i> money supply growth	Higher Than Base Case--Higher inflation due to looser monetary policy supporting economic growth	Lower Than Base Case--Lower inflation due to lower economic growth	Based on Current Borrowing Rate
Commodity prices	Gas & Coal Higher than Base Case	Gas Higher; Coal Lower than Base Case	Gas Much Lower & Coal Much Higher than Base Case	Gas Lower & Coal Slightly Higher than Base Case	Gas & Coal Higher than Base Case	Gas & Coal Much Lower than Base Case	Gas - \$6-8 / MMBTU Coal \$40 / ton
Contract Purchase Power Cost	Much Higher Cost & Lower Availability	Higher Cost & Lower Availability	Same as Base, then Much Lower Cost with High Availability	Higher Cost & Lower Availability, then Much Lower Cost with High Availability after Load Decrease	Higher Cost & Lower Availability	Lower Cost with High Availability	Moderate Cost & Availability
Construction cost escalation	Much Higher than Base Case--High economic growth causes high demand for new plants and high escalation rate	Somewhat higher than base case--due to "construction costs escalating at high rate due to large volume of nuclear, renewables, and env controls projects". High regulatory scrutiny adds to project costs	Lower than Base Case--Low load growth leads to low escalation	This scenario has two stages of escalation: 1) higher than base due to high load growth early, then 2) lower escalation when game-changing technology hits	Somewhat Higher than Base Case--Moderately strong economy and load growth lead to somewhat higher than base escalation	Lower than Base Case--Negative load growth, very weak economy and high renewables lead to low escalation	Moderate Escalation

1. Reflects November 2009 plan with new Regulatory Outlook
2. Reflects average prices through 2030, not inflation adjusted. Coal price does not include delivery
3. Schedule risk reflects the potential delay in number of years



Scenario/World Review

Scenario Framework: August 18th

Scenarios are outlined in the table below, along with the relative responses of key uncertainties.

Uncertainty	Scenario #1	Scenario #2	Scenario #3	Scenario #4	Scenario #5	TVA's Reference Case ¹
	Economy Recovers Dramatically	Environmental Focus is a National Priority	Prolonged Economic Malaise	Game-Changing Technology	Energy Independence	
Greenhouse gas requirements	CO ₂ price \$25/ton in 2014 and ~\$60/ton by 2030. 75% allowance allocation, 0% by 2040	CO ₂ price \$30/ton in 2012 and ~\$90+/ton by 2030. 75% allowance allocation, 0% by 2040	No cap and trade for CO ₂	CO ₂ price \$20/ton in 2014 and ~\$50/ton by 2030. 75% allowance allocation, 0% by 2040	CO ₂ price \$20/ton in 2014 and ~\$50/ton by 2030. 75% allowance allocation, 0% by 2040	CO ₂ price \$10/ton in 2015 and \$60/ton by 2030. 80% allowance allocation
Environmental outlook	SCR all units by 2020 FGD all units by 2018 HAPs MACT by 2015	SCR all units by 2020 FGD all units by 2018 HAPs MACT by 2015 Additional controls for water/waste	No additional requirements	SCR all units by 2020 FGD all units by 2018 HAPs MACT by 2015	SCR all units by 2020 FGD all units by 2018 HAPs MACT by 2015	SO ₂ – CAIR Cap & Trade NO _x – CAIR & 20% reduction by 2015 Hg MACT by 2015
Renewable Electricity Standards (RES)	3% by 2012 15% by 2020 (adjusted total retail sales)	5% by 2012 30% by 2020 (adjusted total retail sales)	No federal RES	3% by 2012 15% by 2020 (adjusted total retail sales)	3% by 2012 20% by 2020 (adjusted total retail sales)	2% by 2013 11% by 2022
Commodity prices	Same as Reference Case	Gas higher than Reference Case; coal same as Refer. Case	Gas and coal lower than Reference Case	Gas, coal higher than Reference Case; lower after load decrease	Gas and coal higher than Reference Case	Gas - \$6-8 / MMBTU Coal \$40 / ton ²
Total load	Highest growth	Moderate growth	Low or no growth	High growth and sudden decrease	Moderate growth	Moderate growth
Change in load shape	Current shape	Shift from peak	Current shape	Shift from peak	Shift from peak	Current shape
Capital expansion viability	Moderate schedule risk	High schedule risk	Low schedule risk	Moderate schedule risk	Moderate schedule risk	Moderate schedule risk
Financing	Much higher than Reference Case	Higher than Reference Case	In line with Reference Case	Much higher than Reference Case	Higher than Reference Case	Based on current borrowing rate
Construction cost escalation	Higher than Reference Case	Much higher than Reference Case	Lower than Reference Case	Higher than Reference Case	Same as Reference Case	Moderate escalation
Contract Purchase Power Cost	Higher cost and lower availability than Reference Case	Cost much higher and availability much lower than Reference Case	Cost and availability in line with Reference Case	High cost/ low avail. then moderate after load decrease	Cost much higher and availability much lower than Reference Case	Moderate cost and availability

1. Reflects the July 2009 plan – Base Case will be created to reflect new Regulatory Outlook, updated commodity prices, and updated capital costs
2. Reflects average prices through 2030, not inflation adjusted. Coal price does not include delivery