



Regional Energy Resource Council

February 19-20, 2019
Murfreesboro, Tennessee



Safety Moment



Building Emergency Plan

Term 3 RERC Members

Michael Butler

Tennessee Wildlife Federation

Wayne Davis*

University of Tennessee

Rodney Goodman

Habitat for Humanity

Dan Ionel

University of Kentucky

Wes Kelley

Huntsville Utilities

Doug Lawyer

Knoxville Chamber

Peter J. Mattheis

Tennessee Valley Industrial Committee

Shari Meghreblian

State of Tennessee (retired)

Jennifer Mundt

State of North Carolina

Jeremy Nails

Morgan County Economic Development Association

Alice Perry**

State of Mississippi

Doug Peters

Tennessee Valley Public Power Association

Derwin Sisnett

Gestalt Community Schools

Stephen Smith

Southern Alliance for Clean Energy

Charles Snavely

Commonwealth of Kentucky

John Warren

Commonwealth of Virginia

Lloyd Webb

Olin Chlor Alkali

Susan R. Williams

SRW & Associates

*RERC Chair

** Retired from the RERC June, 2018

Introductions



- Name
- Organization and Role
- An activity you enjoy doing in the winter time



Agenda and Meeting Protocols

Agenda – February 19, 2019

1:00	Welcome Chair Davis, DFO and Facilitator Safety Moment Building Emergency Plan	
1:15	DFO Update and Meeting Purpose DFO Joe Hoagland / Alt DFO Amy Henry Recap December 2018 Meeting	
1:30	RERC Overview and Meeting Protocols	Jo Anne Lavender
1:35	2019 IRP Update Brian Child	
1:45	IRP Process Refresh Hunter Hydas and Amy Henry	
2:00	Break	
2:15	Draft IRP Documents and Preliminary IRP Results	Jane Elliott
3:45	Discussion Time – RERC	
4:15	Break to prepare for Public Open House	
4:30	Public Open House - 2019 Draft Integrated Resource Plan and EIS	
5:00 – 6:00	Public Listening Session	
6:00	Adjourn	

Agenda – February 20, 2019

8:30	Welcome, Recap and Day 2 Overview Lavender, Davis, Hoagland
8:40	Scorecard Results Hunter Hydas
9:10	IRP EIS Matthew Higdon
9:20	Break
9:35	IRP Discussion & Questions Lavender and RERC
10:15	Break
10:30	Continue Discussion Lavender and RERC
11:00	IRP Report and Next Steps Hunter Hydas
11:15	Next Steps and Wrap Up, Lavender, Hoagland, Davis
11:30	Adjourn

RERC Discussion

RERC Meeting Protocols

Agenda

- ◆ Agenda prepared and approved by the Designated Federal Officer (DFO) in consultation with Council Chair
- ◆ Agenda distributed to Council and published in the Federal Register prior to each meeting
- ◆ Topics may be submitted to the DFO by any member of the Council, or non-members, including members of the public

Meeting Minutes

- ◆ DFO will ensure that minutes are prepared for each meeting, approved by the Chair, and made available to Council members

Voting

- ◆ Any member of the Council may make a motion for a vote
- ◆ Recommendations to TVA Board shall require an affirmative vote of at least a simple majority of the total Council members present on that date
- ◆ Council members may include minority or dissenting views

Discussion

- ◆ DFO (or his designee) will facilitate and ensure good order during all open discussions
- ◆ Only one speaker or attendee is permitted to comment at a time
- ◆ To be recognized by the Chair (or meeting facilitator) in order to provide comment, please turn your name card on its side



TVA Update

Meeting Purpose and Recap

Joe Hoagland, Designated Federal Officer

TVA / DFO Update

Recap Term 3 Meetings

- 5 Meetings held so far in Term 3
- 3 Focused on the 2019 IRP development process:
 - June 14, 2018, Advice provided on focus areas and public engagement for the 2019 Integrated Resource Plan
 - September 5, 2018, Sentiments provided around the 2019 IRP Scenarios and Strategies
 - December 18, 2018, Advice provided on metrics and scorecards; Considerations as TVA applies these metrics
 - Today and Tomorrow: Focus on the Draft IRP and EIS; Input on the process and engagement.

December 18, 2018 Meeting - Recap

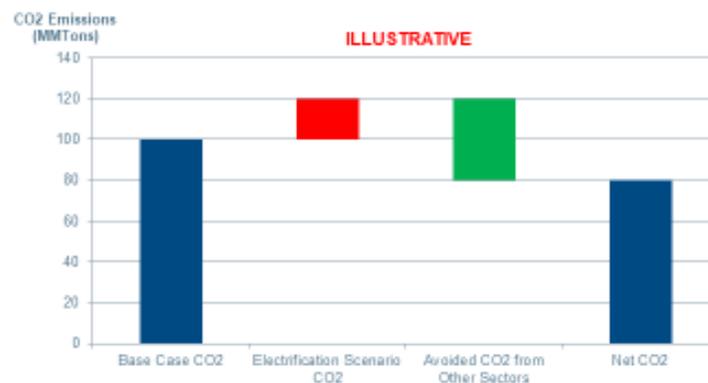
2019 IRP Primary Metrics

Category	Primary Metric	Formula
Cost	PVRR (\$Bn)	Present Value of Revenue Requirements over Planning Period
	System Average Cost Years 1-10 (\$/MWh)	$\frac{NPV \text{ Rev Req (2019-2028)}}{NPV \text{ Sales (2019-2028)}}$
	Total Resource Cost (\$Bn)**	PVRR + Participant cost net of savings (bill savings, tax credits)
Risk	Risk/Benefit Ratio	$\frac{95th_{(PVRR)} - Expected_{(PVRR)}}{Expected_{(PVRR)} - 5th_{(PVRR)}}$
	Risk Exposure (\$Bn)	95th Percentile $(_{PVRR})$
Environmental Stewardship	CO2 (MMTons)	Average Annual Tons of CO2 Emitted During Period
	Water Consumption (MMGallons)	Average Annual Gallons of Water Consumed During Period
	Waste (MMTons)	Average Annual Tons of Coal Ash and Scrubber Sludge Produced During Period
Operational Flexibility	Flexible Resource Coverage Ratio**	$\frac{\text{Flexible Capacity Available for 3-Hour Ramp}}{\text{Capacity Required for Maximum 3-Hour Ramp}}$
Valley Economics	Percent Difference in Per Capita Income	Percent Difference in Per Capita Personal Income for each scenario

** New metric for 2019



Net CO₂ Emissions



Dec 18, 2018 Advice Statement

- The RERC has reviewed the metrics and scorecards planned for use in evaluating the 2019 Integrated Resource Plan portfolios. The RERC believes that the metrics and scorecards developed represent a reasonable basis to evaluate the differences and trade-offs among the various portfolios. However, to increase clarity for the public, TVA should consider renaming the metric categories to more meaningful titles such as Traditional instead of Primary, and Emerging or Developing instead of Secondary.

Dec 18, 2018 Advice Statement

- We understand the land-use category is a developing metric that may need further refinement by staff. Further, the RERC suggests that metric definitions be included to increase general understanding. TVA should also consider meshing the financials with the metrics to increase broader understanding of the impacts of the strategies. The RERC looks forward to reviewing the draft IRP and EIS where the draft portfolios will be fully described and the metrics and scorecards applied.

Today's Meeting Purpose

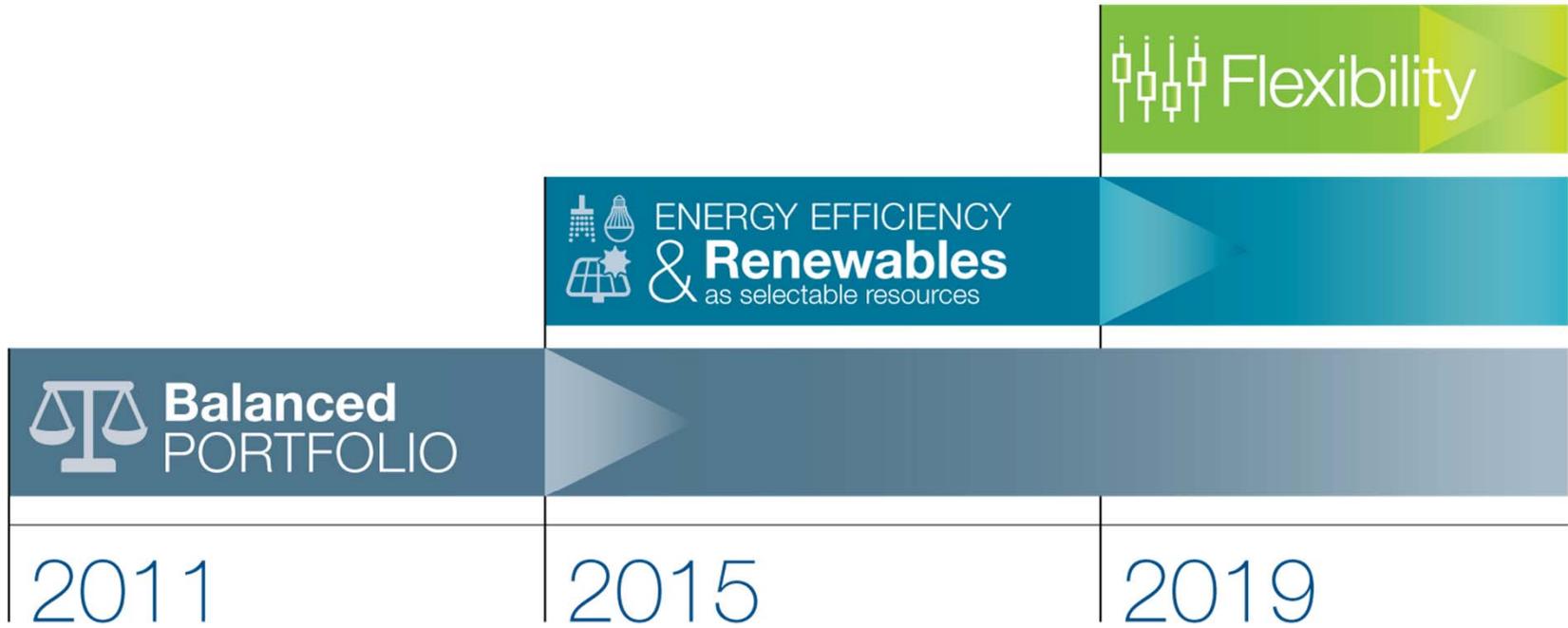
- Provide informational topics on the 2019 Integrated Resource Plan
 - Overview update
 - Results in the Draft IRP and EIS
 - Gain insights on the development process of the IRP
- Host a Public Listening Session
- Hear your views:
 - On TVA's IRP Process to date, and;
 - On how TVA can better brief or engage the RERC in the IRP Process to build understanding and support for its approach.



2019 IRP Update

Brian Child, Director, Enterprise Forecasting and Financial Planning

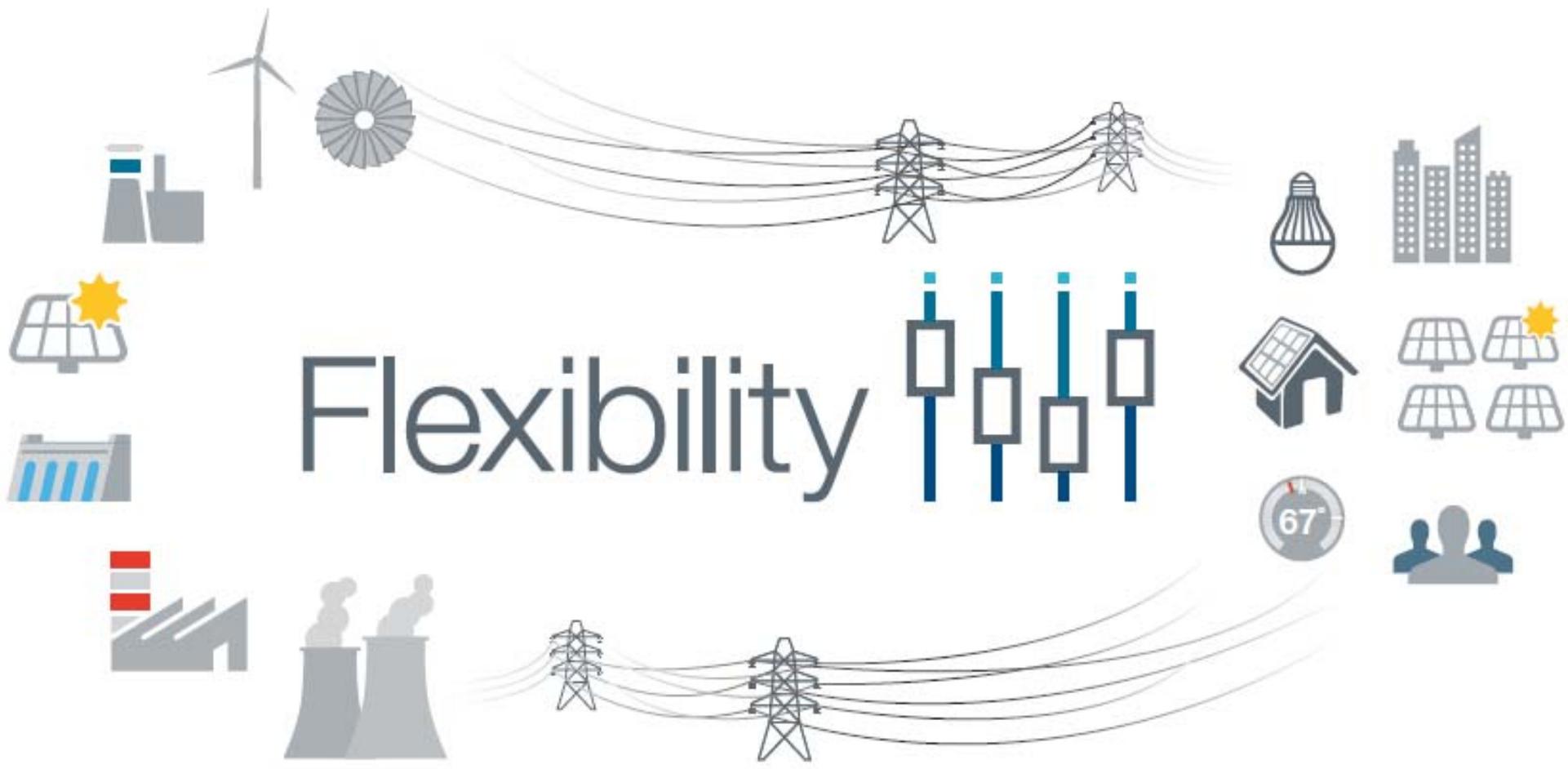
INTEGRATED Resource Plan 2019



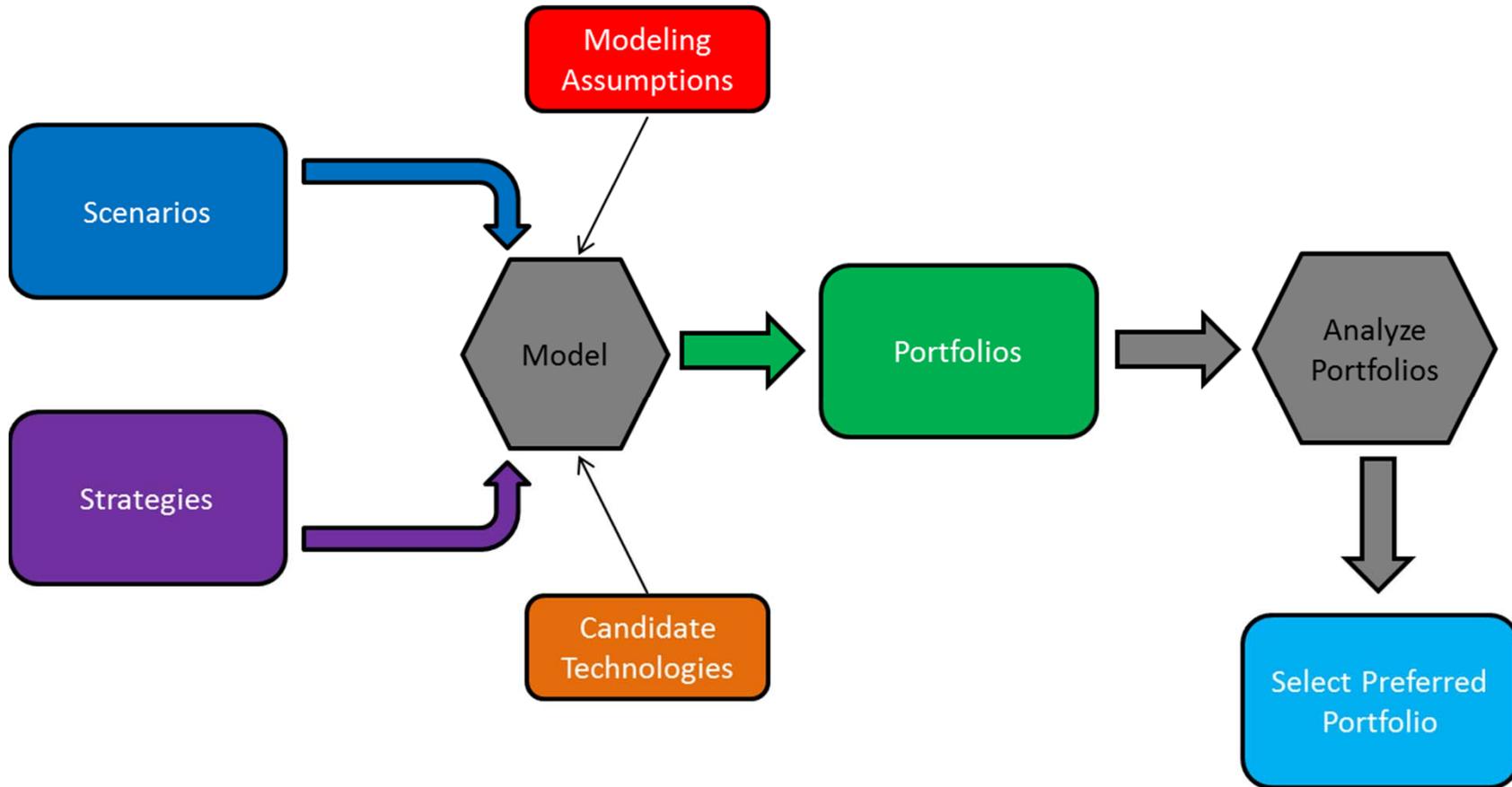
2019 IRP Focus Areas

- System flexibility
- Distributed Energy Resources
- Portfolio diversity





Integrated Resource Planning Process



2019 IRP Scenarios and Strategies

Scenarios

1. *Current Outlook*
2. *Economic Downturn*
3. *Valley Load Growth*
4. *Decarbonization*
5. *Rapid DER Adoption*
6. *No Nuclear Extensions*

Strategies

- A. *Base Case*
- B. *Promote DER*
- C. *Promote Resiliency*
- D. *Promote Efficient Load Shape*
- E. *Promote Renewables*

2019 IRP Schedule: Schedule & Milestones

The 2019 IRP Study Approach is intended to ensure transparency & enable stakeholder involvement



(** indicates timing of Valley-wide public meetings)

Key Tasks/Milestones in this study timeline include:

- Establish stakeholder group and hold first meeting (Feb 2018)
- System modeling (June - December 2018)
- Publish draft EIS and IRP (Feb 2019)
- Complete public meetings (March 2019)
- Board approval and final publication of EIS and IRP (expected Summer 2019)



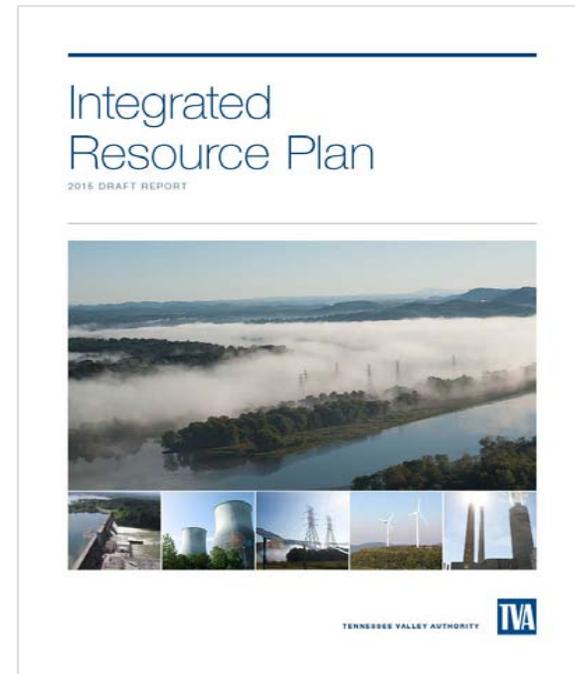
2019 IRP Process Refresh

Hunter Hydass and Amy Henry

TVA's Integrated Resource Plan

The IRP is a study of how TVA could meet customer demands across a variety of future environments

A programmatic Environmental Impact Statement (EIS) accompanies the IRP to analyze the impacts associated with an updated IRP to the Valley.



Integrated Resource Planning

- Collaboration with stakeholders to envision the generation needs of the future
- Based on least-cost planning foundation
- Provides foundation for developing long-range financial plans
- Considers a number of potential futures to help predict changes in the marketplace



The IRP functions like a compass, not a GPS

Goals for an Optimal Resource Plan

Low Cost

Risk Informed

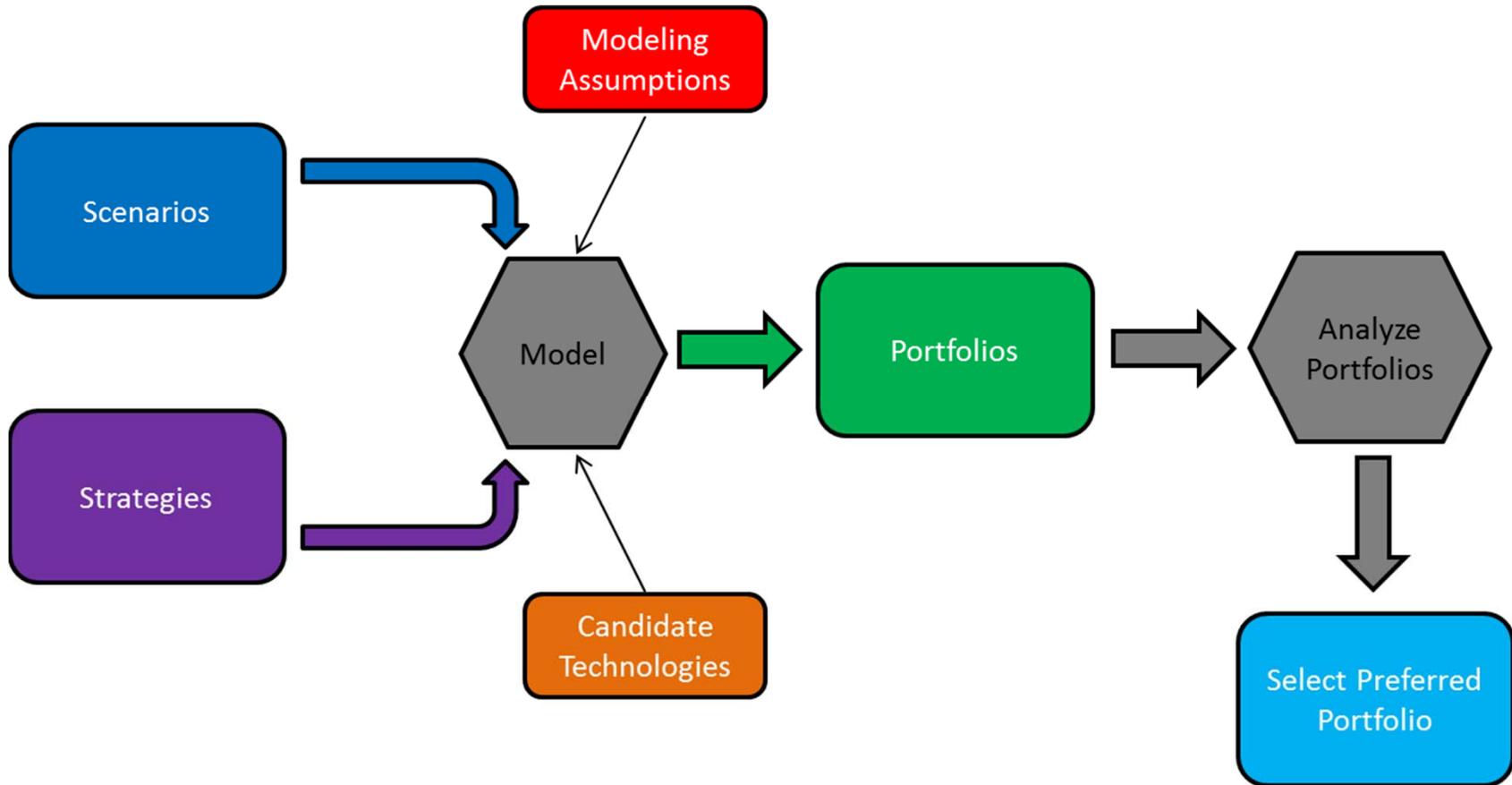
Environmentally
Responsible

Reliable

Diverse

Flexible

How the Resource Planning Process Works



EIS Process



IRP Process



(** indicates timing of Valley-wide public meetings)

Stakeholder Engagement is a Cornerstone of TVA's IRP Process

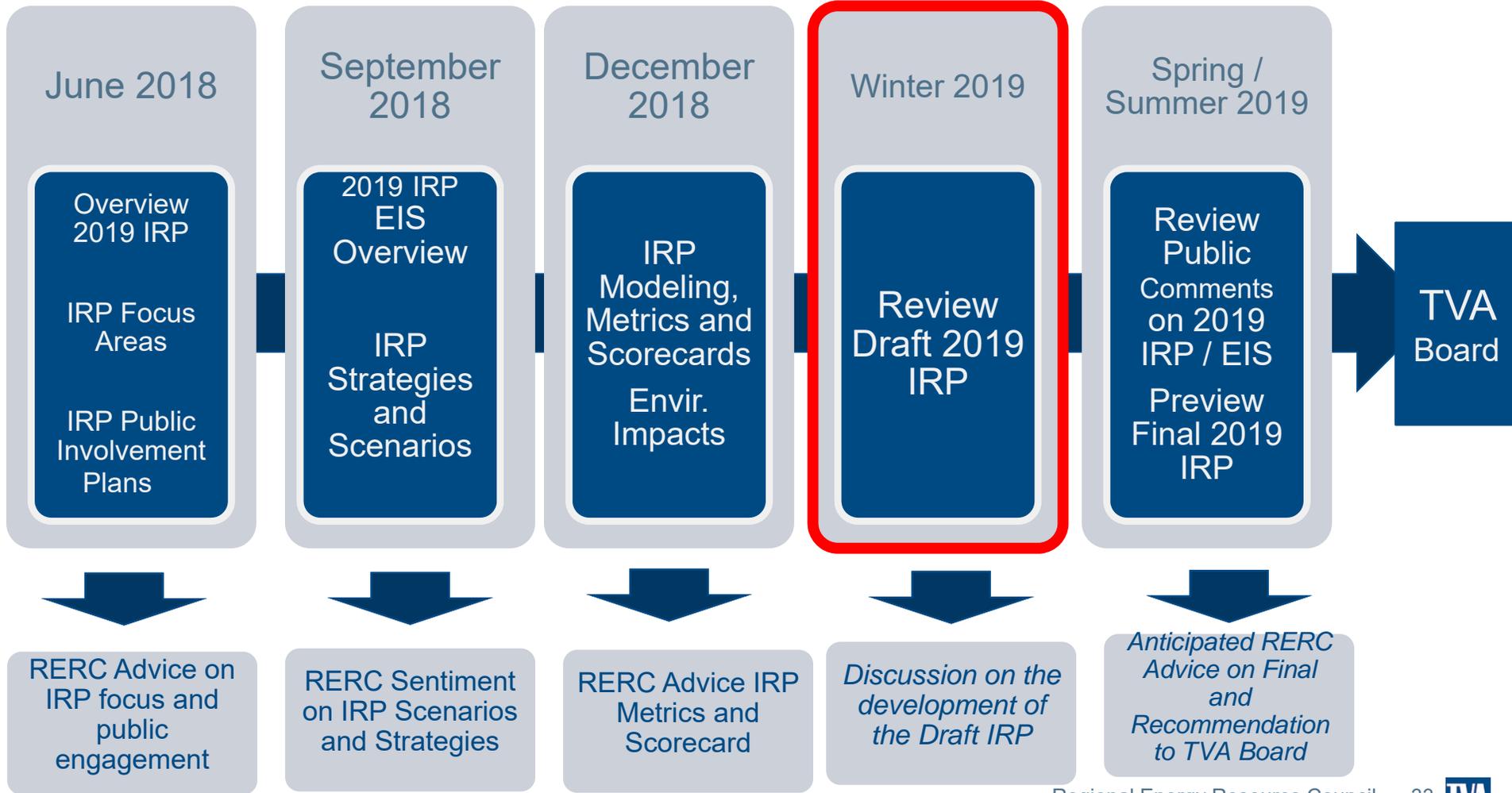
- TVA's Integrated Resource Planning is unique
- More informed decision-making
- Better outcomes
- As a federal agency, TVA complies with the National Environmental Policy Act (NEPA)

2019 IRP Working Group

- Diverse Representatives
 - 8 customer representatives, including:
 - 12 stakeholder representatives, including:
 - > 3 energy and environmental non-governmental organizations
 - > 3 from research and academia with expertise in distributed energy resources (DERs)
 - > 2 from state government
 - > 2 representing economic development
 - > 2 representing community and sustainability interests
- Robust meetings to share details/
gain input
- 10 Meeting held through January,
2019

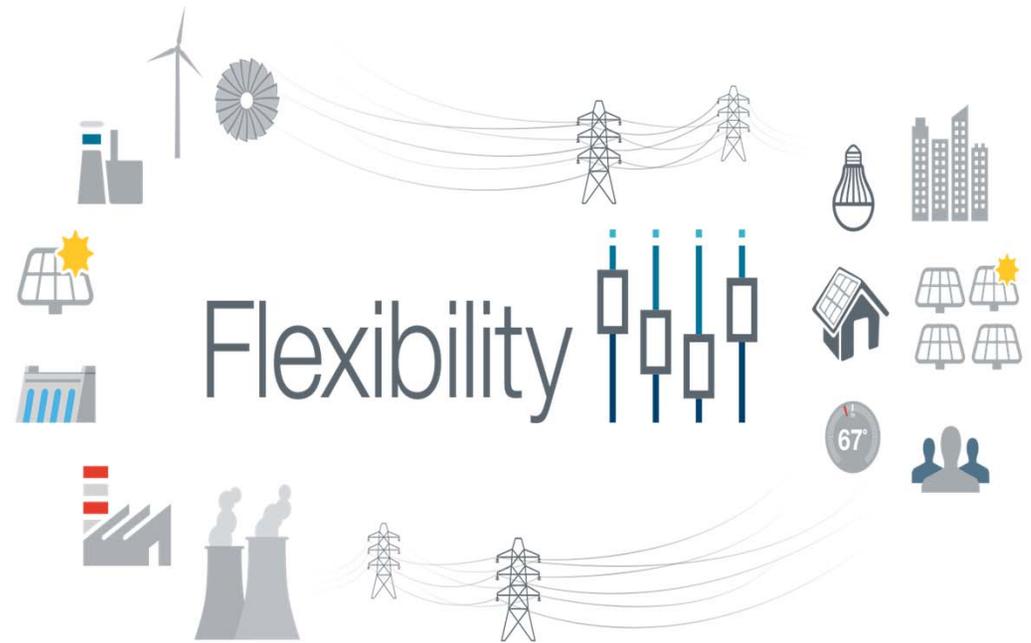


RERC Review and Input to 2019 IRP

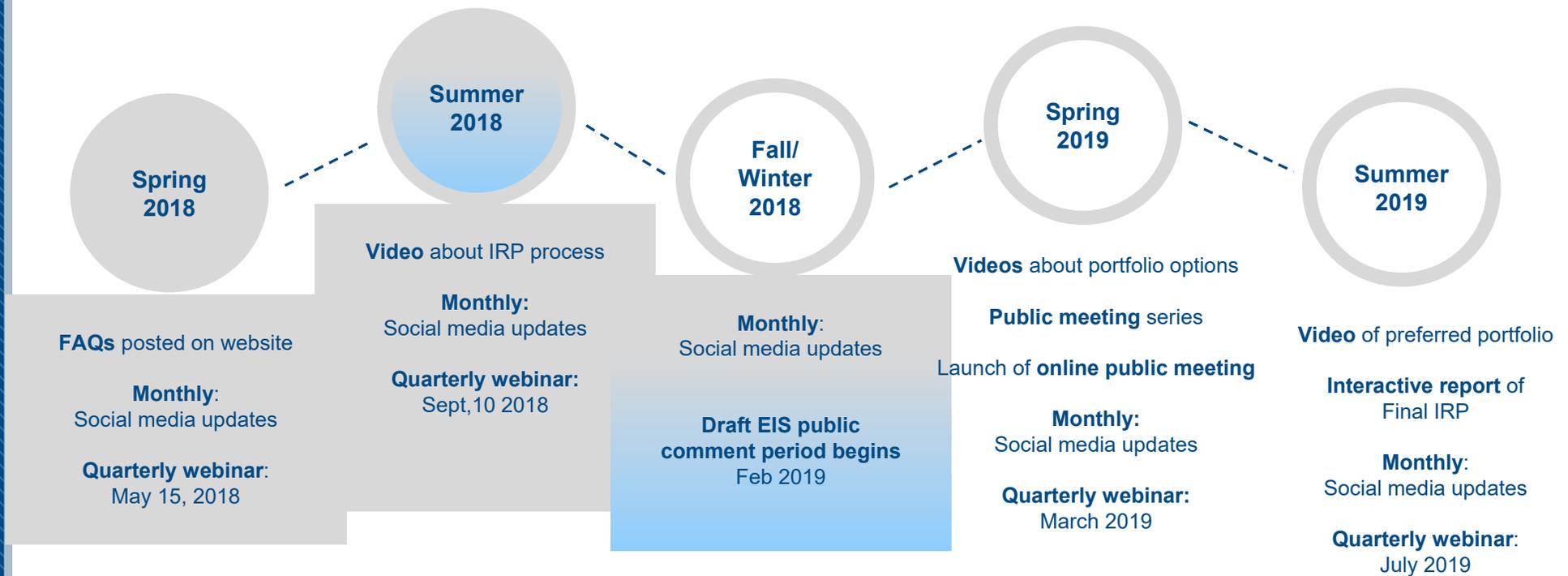


IRP Communications Objectives

- Educate various audiences about IRP and its importance
- Keep various audiences informed throughout the IRP process
- Use simple language to explain technical concepts
- Gather input and gain buy-in from customers and stakeholders



IRP Public Outreach



Note: Dates Subject to Change

Outreach to Stakeholders & Public

- Social Media Campaign
 - Facebook
 - LinkedIn
 - Twitter
 - Instagram
 - YouTube
- Other Formats
 - Videos
 - Interactive Report
 - IRP Fact Sheet
 - IRPWG Meeting Summaries
 - FAQs on Website

WHAT IS AN INTEGRATED RESOURCE PLAN (IRP)?

The IRP is a decision support tool that helps guide us on how to best meet future electricity demand.

WHAT IS THE IRP SCOPING REPORT?

Your feedback is a vital part of developing the IRP. The Scoping Report summarizes TVA's outreach and comments received in the 60-day public comment period following the launch of the IRP.

IN THE REPORT:

- View final strategies and scenarios under consideration in the IRP
- See a summary of IRP topics
- View comments received



Public Outreach Events

- Quarterly public webinars
- Public scoping meetings
- Public meetings
- Online meetings

HAVE YOUR VOICE HEARD!

Your feedback is a vital part in helping us to develop a balanced resource portfolio that meets the needs of our many diverse communities across the Valley!

NOW! VISIT "TVA.COM/IRP" TO:

- View content from public scoping meetings
- See slides from past webinars
- Join our mailing list
- Request more information on the IRP



COMING SOON!

- Webinar with update on IRP progress
- Public meetings in your area
- Online meeting with comment function



TVA – 2019 IRP Website

TVA Tennessee Valley Authority

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Energy Environment Economic Development

You are here: Home / Environment / Environmental Stewardship / Integrated Resource Plan

2019 Integrated Resource Plan

TVA has begun work on the 2019 Integrated Resource Plan (IRP)—a comprehensive study that provides direction on how to best meet future electricity demand. Building upon the work done in prior plans, TVA has started the 2019 IRP to proactively address the changing utility marketplace.

The 2019 IRP will explore various scenarios related to expansion of distributed energy resources (DER) in the Tennessee Valley. We will also seek to improve TVA's understanding of the impact and benefit of system flexibility with increasing renewable and distributed resources.

Quarterly Public Webinar About IRP Held Sept. 10

TVA held a Quarterly Public Webinar for the 2019 IRP on Sept. 10, 2018. The Webinar recording is below.

EIS Process

www.tva.com/irp

- Nearly 8,000 views
- Average 2.5 minutes per visit





Overview of Draft Documents

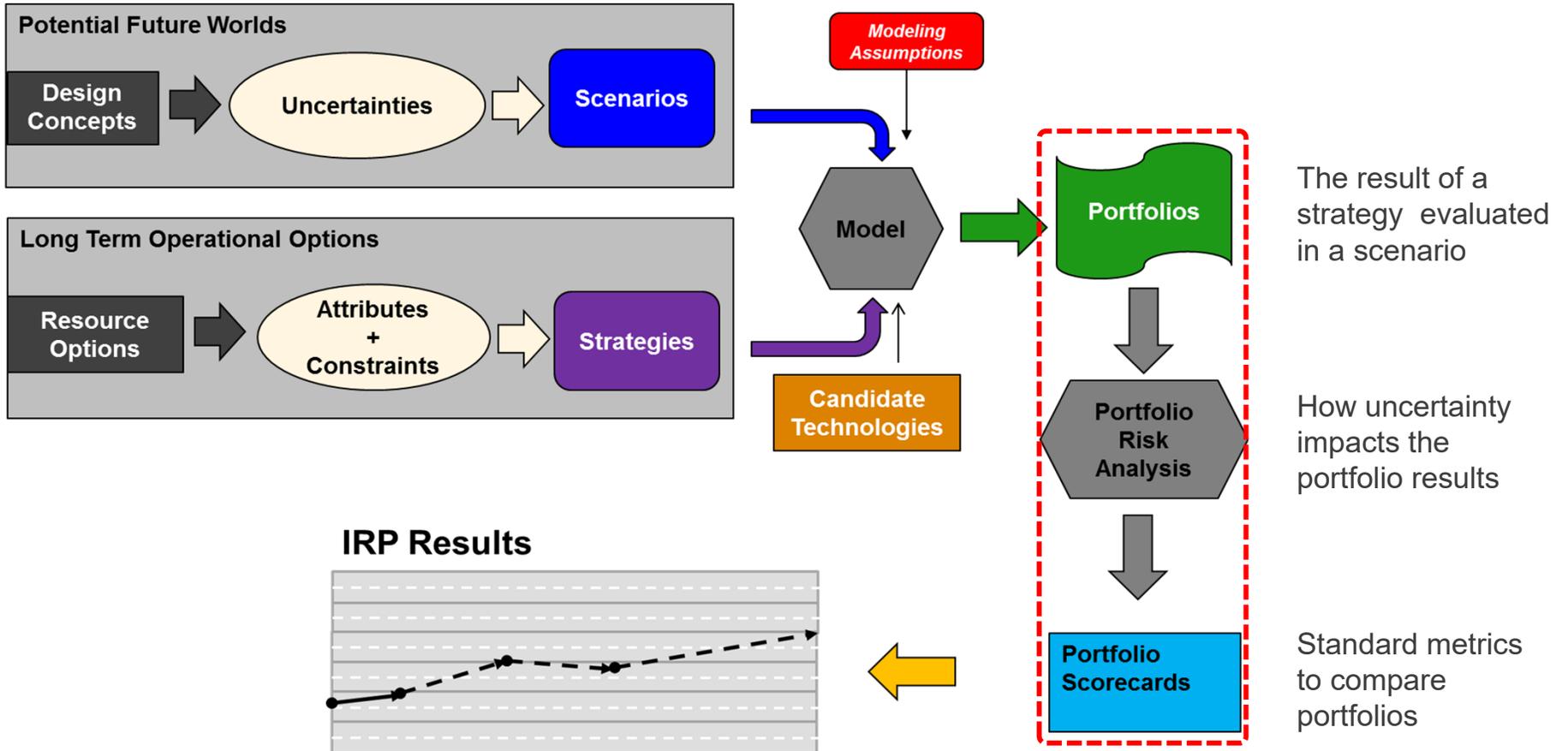


Portfolio Results

Jane Elliott

Senior Manager, Resource Strategy

Portfolio Results



2019 IRP Scenarios and Strategies

Scenarios

1. *Current Outlook*
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3. *Valley Load Growth*
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Strategies

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- B. *Promote DER*
- C. *Promote Resiliency*
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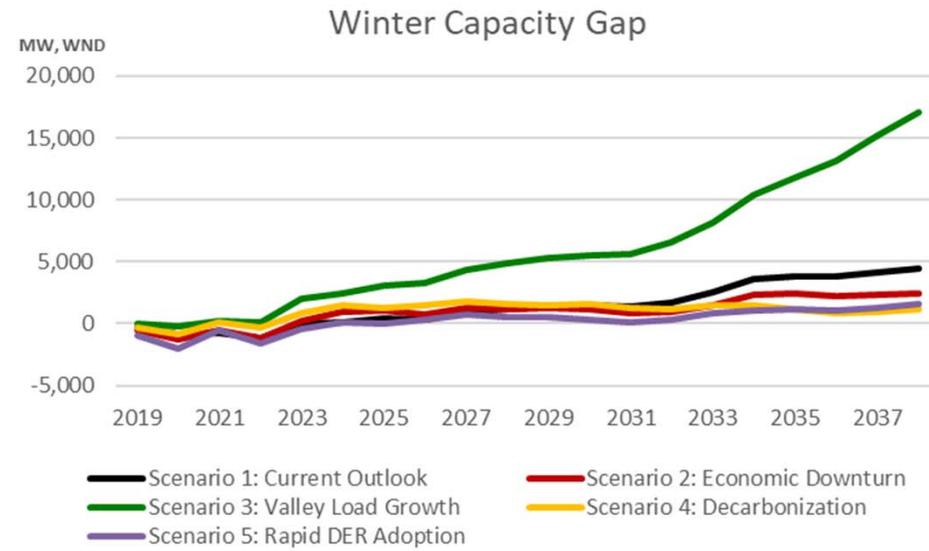
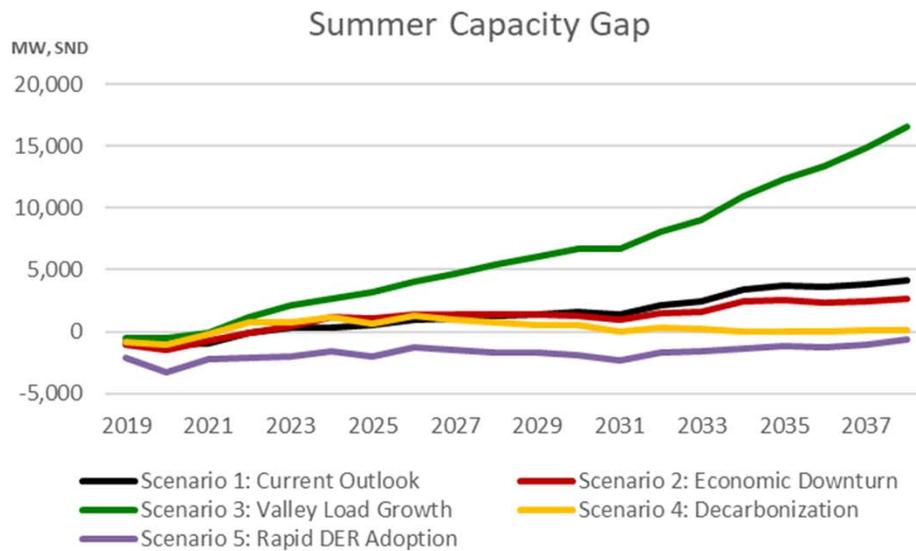
Preliminary Expansion Observations

Strategies

- A. Base Case
- B. Promote DER
- C. Promote Resiliency
- D. Promote Efficient Load Shape
- E. Promote Renewables

- New capacity is needed in all scenarios modeled, even in the lower load futures, in part to replace expiring and retiring capacity
- Solar expansion plays a substantial role, driven by its attractive energy value beginning around the mid-2020 time frame
- Varying levels of gas, storage, and demand response are added depending on strategic focus, to ensure reliability and provide flexibility
- No wind or hydro resources are added, indicating that solar backed up by gas and/or storage is the more optimal choice
- No baseload resources are added, except in one case where high-cost Small Modular Reactors are promoted for resiliency
- Key considerations when evaluating potential coal retirements are uncertainty around future environmental standards for CO₂ and the outlook for load and gas prices
- Energy efficiency levels are relatively similar across portfolios and decrease over time as efficiency impacts from codes and standards increase over time

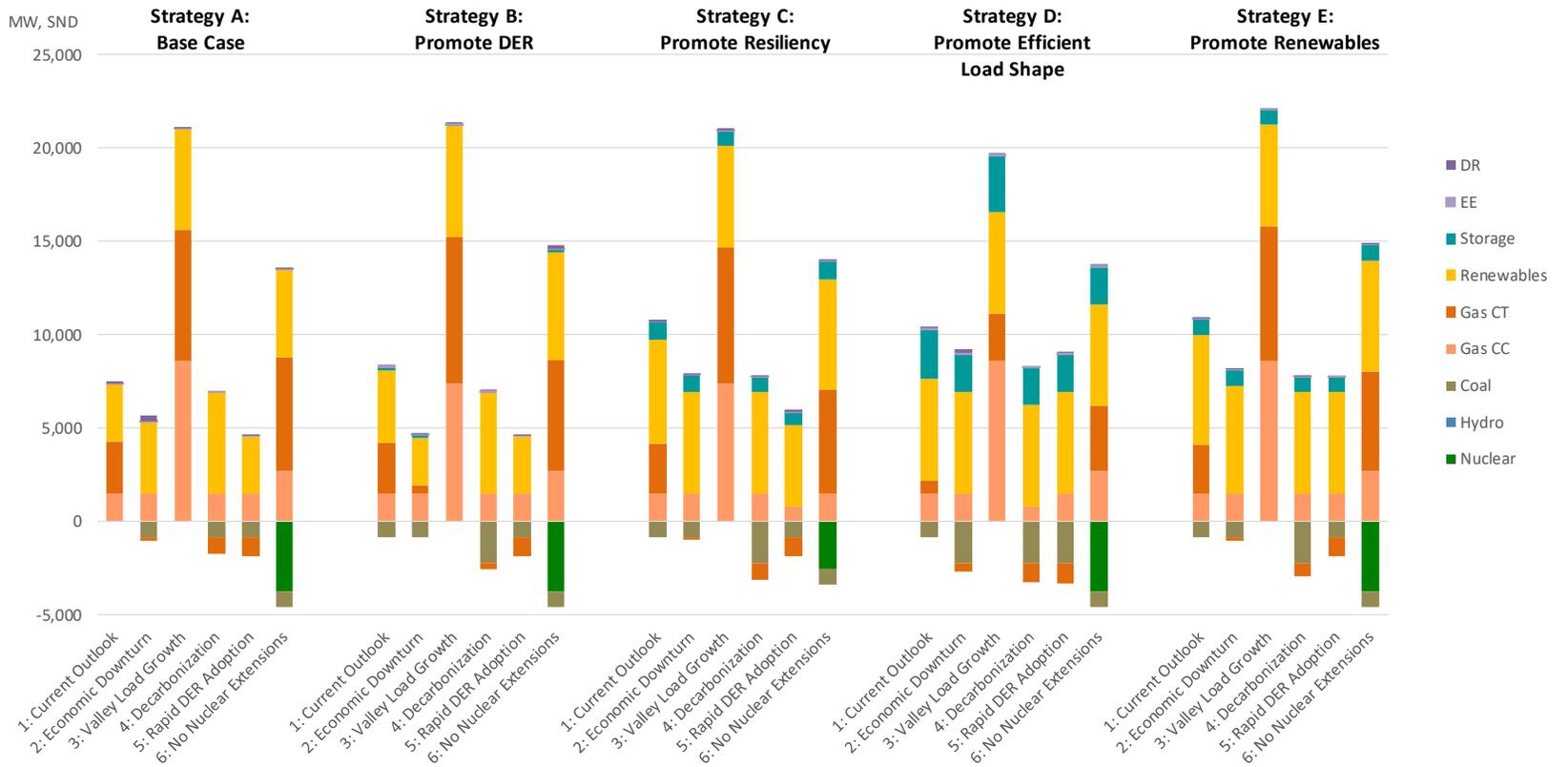
Scenario Capacity Gaps



Scenario 6 is the same as the Current Outlook

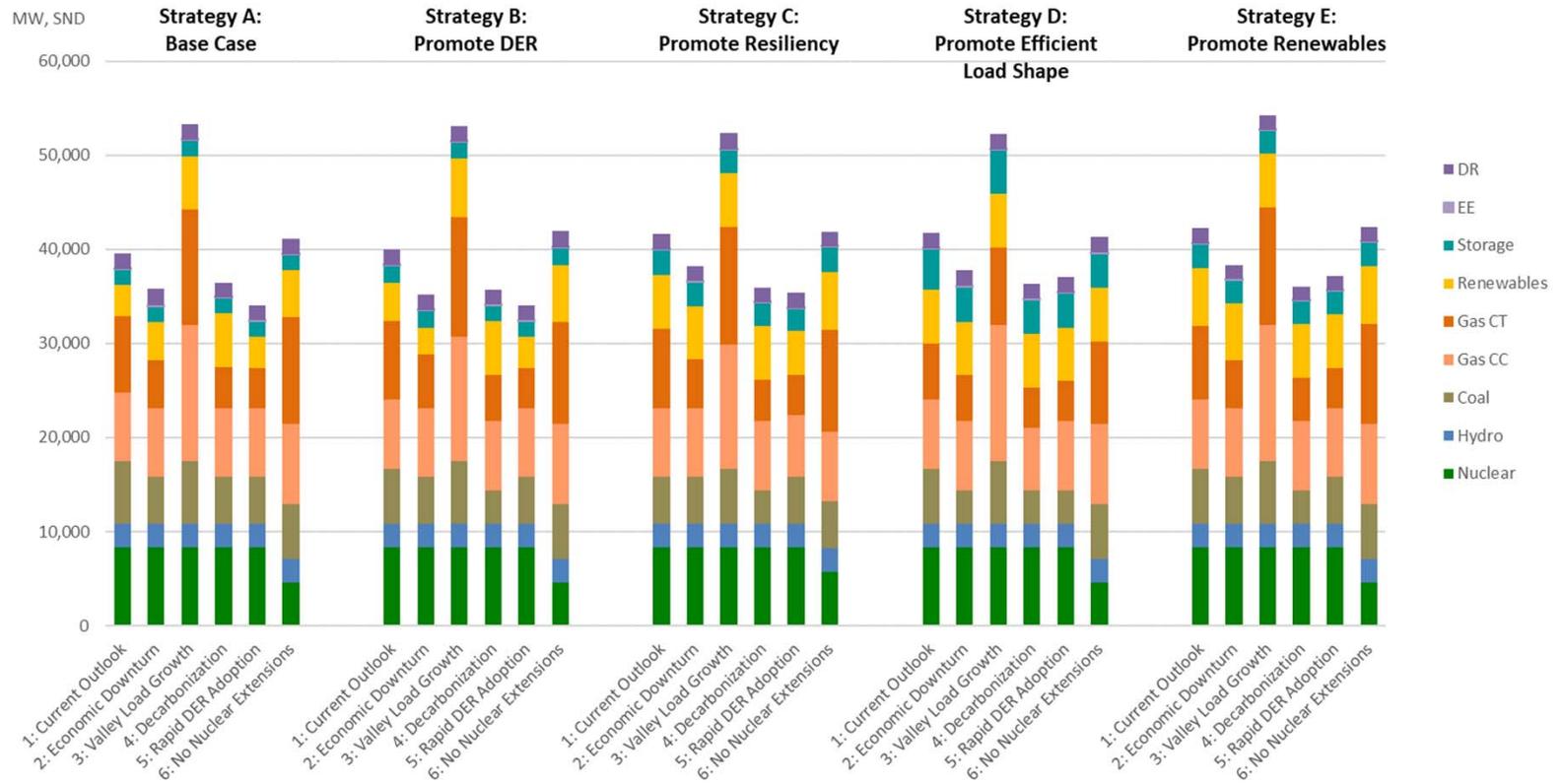
Incremental Capacity by 2038

Incremental Capacity by 2038

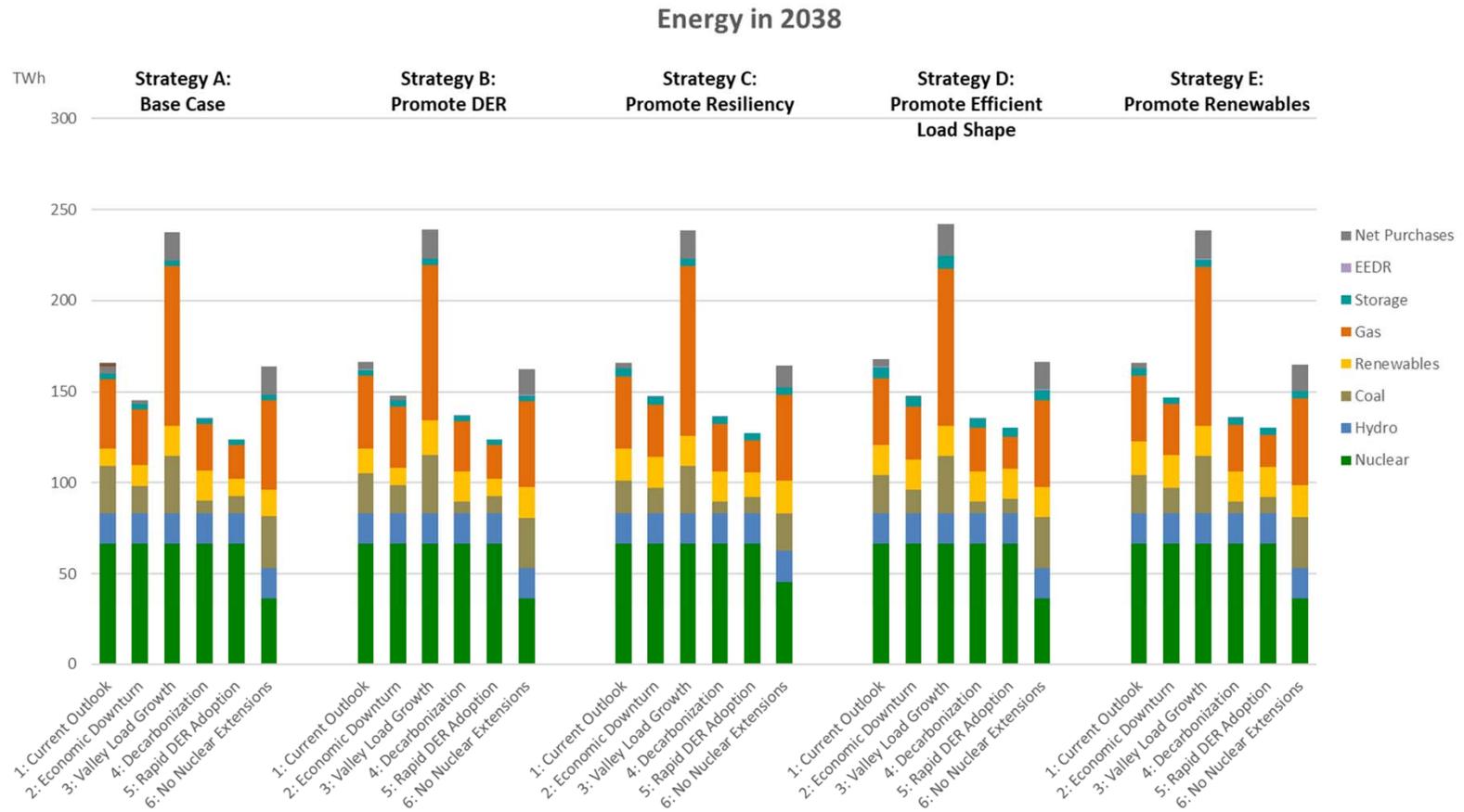


Capacity in 2038

Capacity in 2038

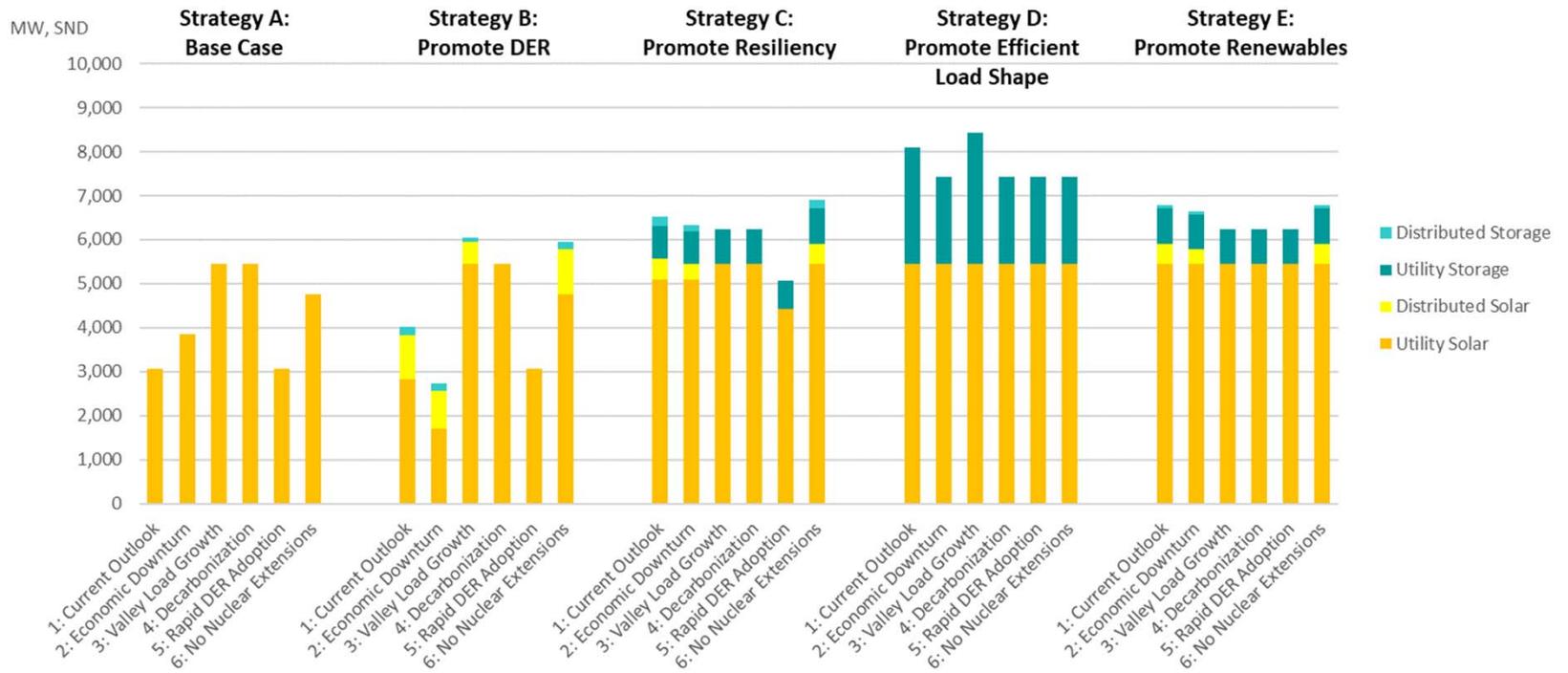


Energy in 2038

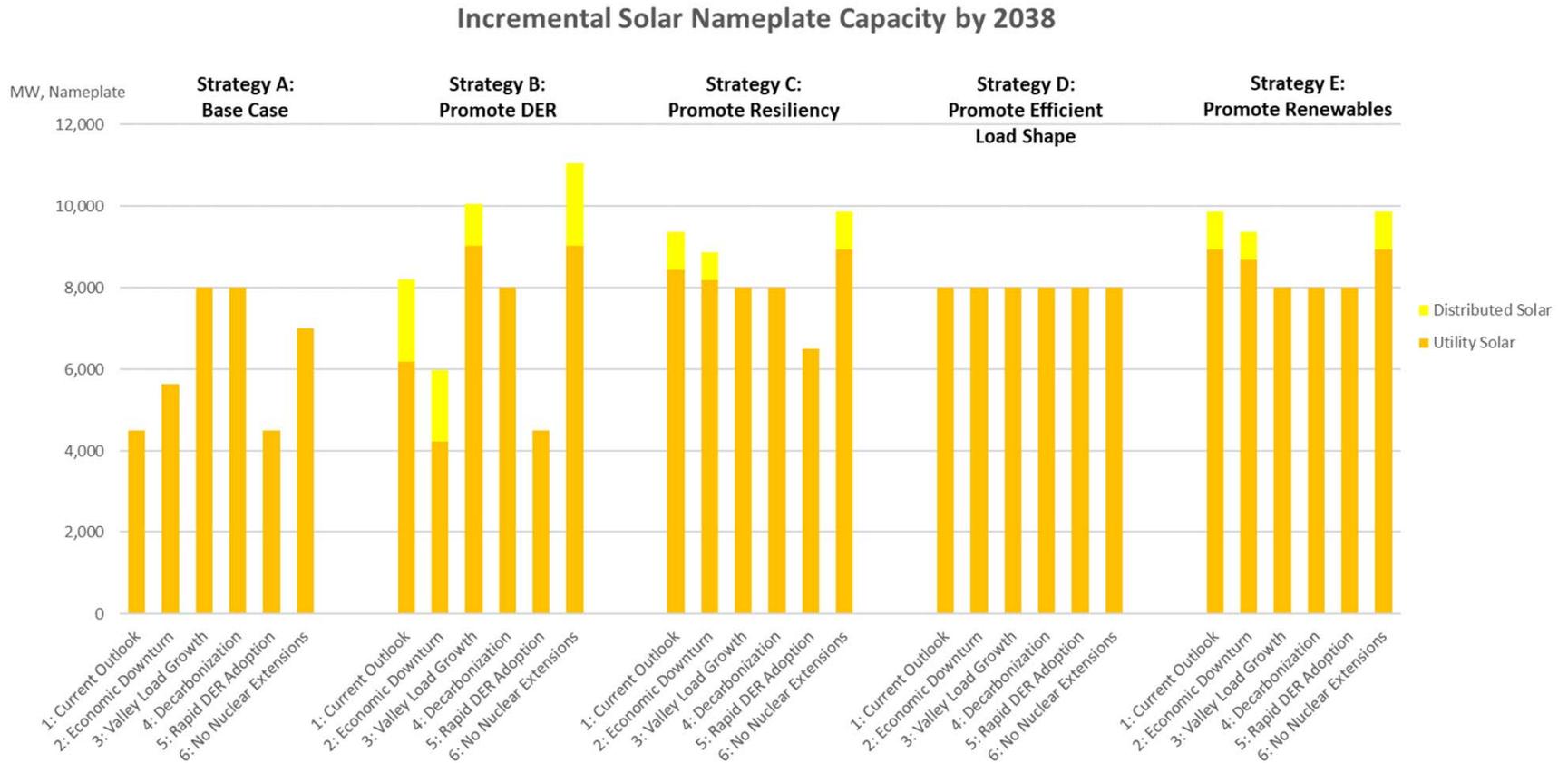


Incremental Solar & Storage by 2038

Incremental Solar & Storage Capacity by 2038



Incremental Solar Nameplate by 2038

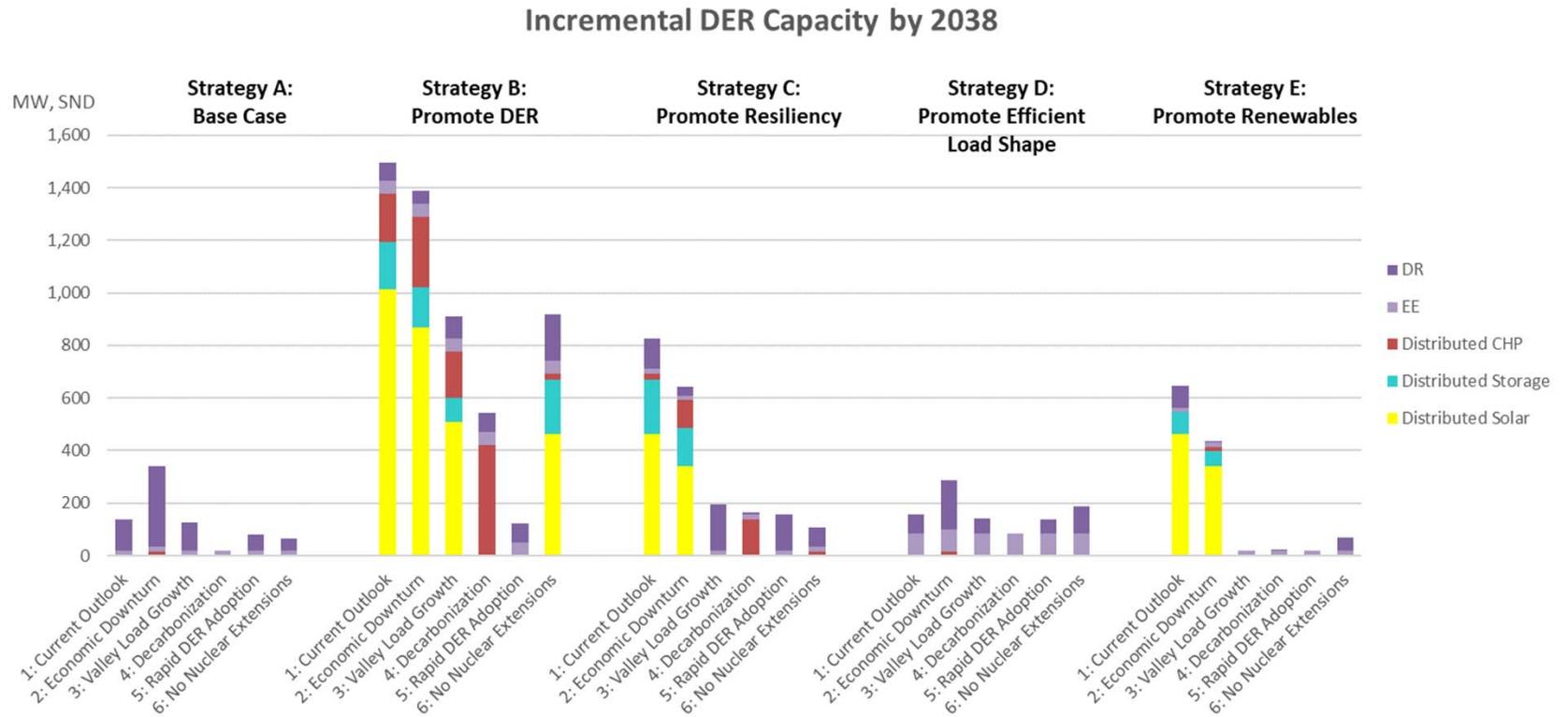


Incremental Thermal Capacity by 2038

Incremental Thermal Capacity by 2038

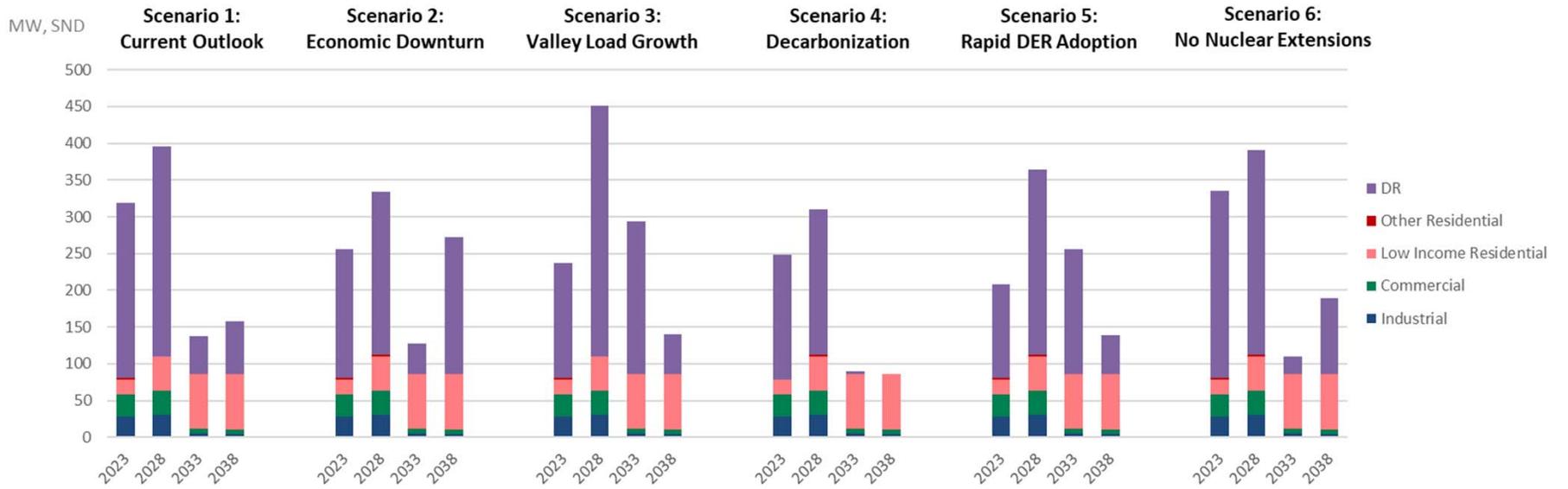


Incremental DER Capacity by 2038



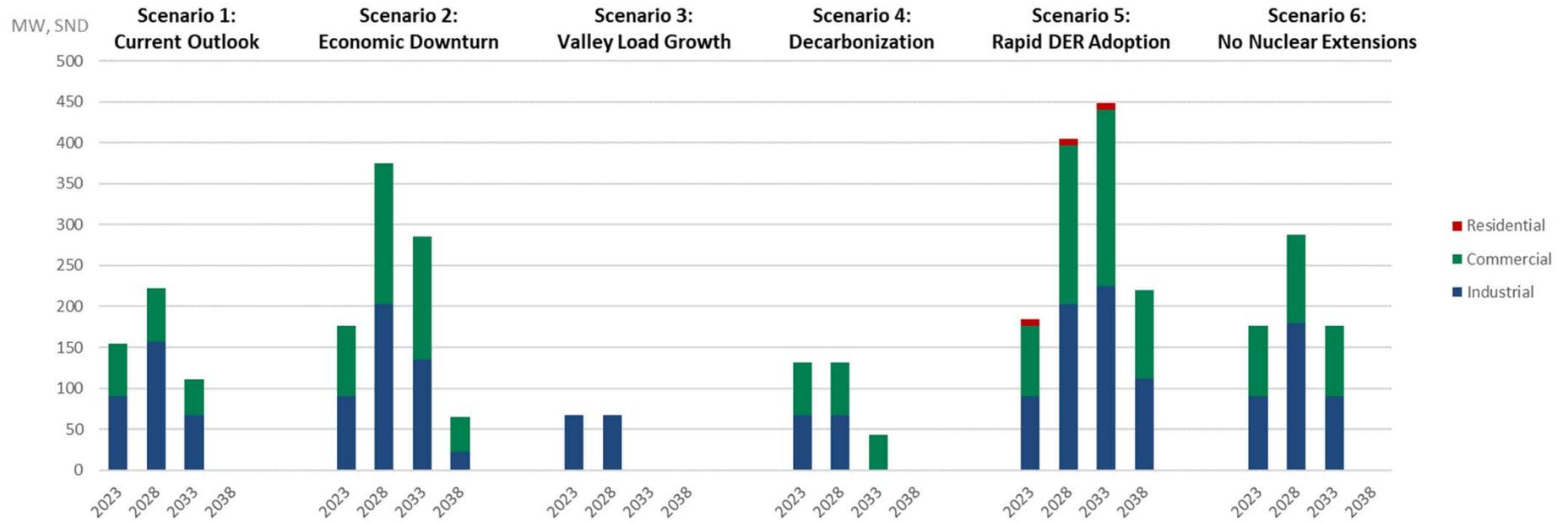
Incremental EE & DR in Strategy D

Strategy D: Efficient Load Shape
Incremental EE & DR Capacity

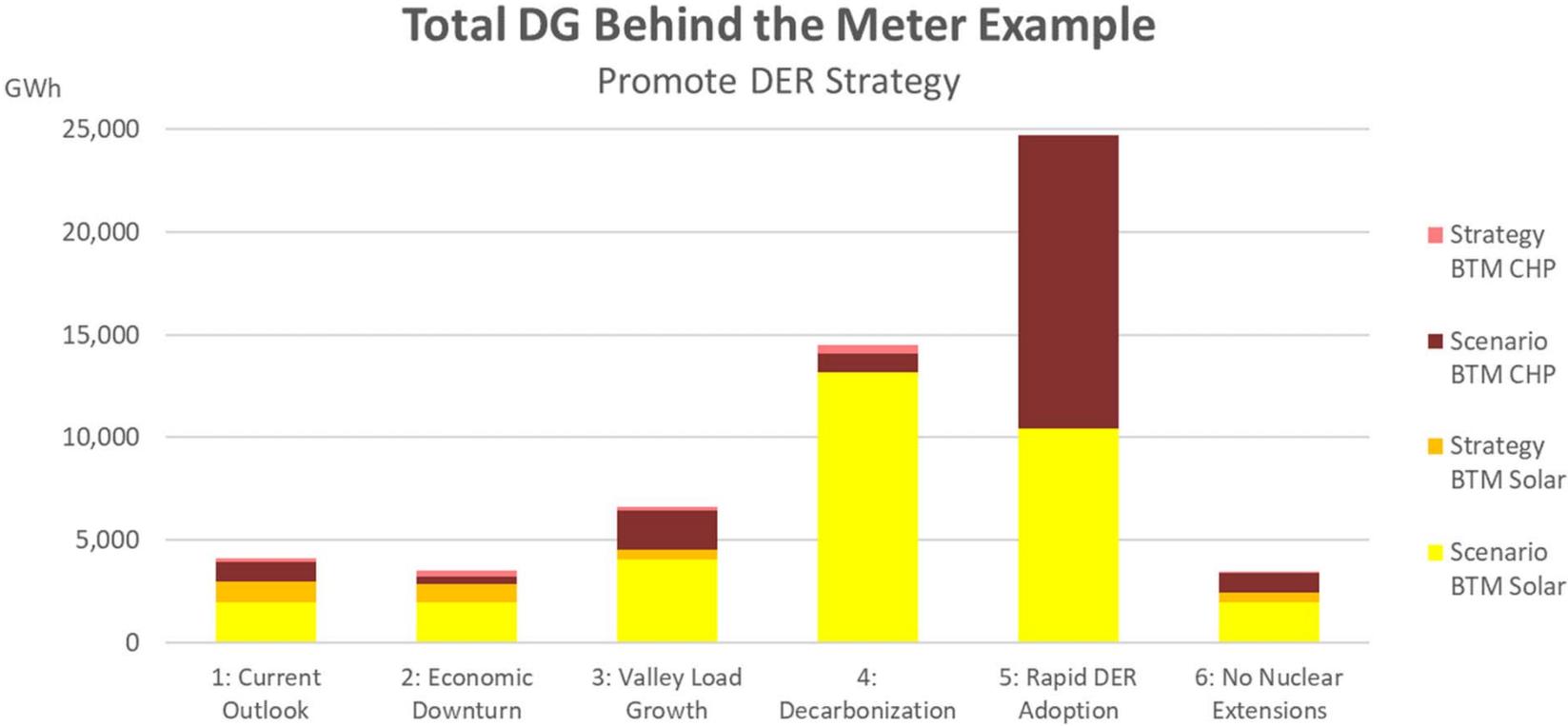


Incremental BE in Strategy D

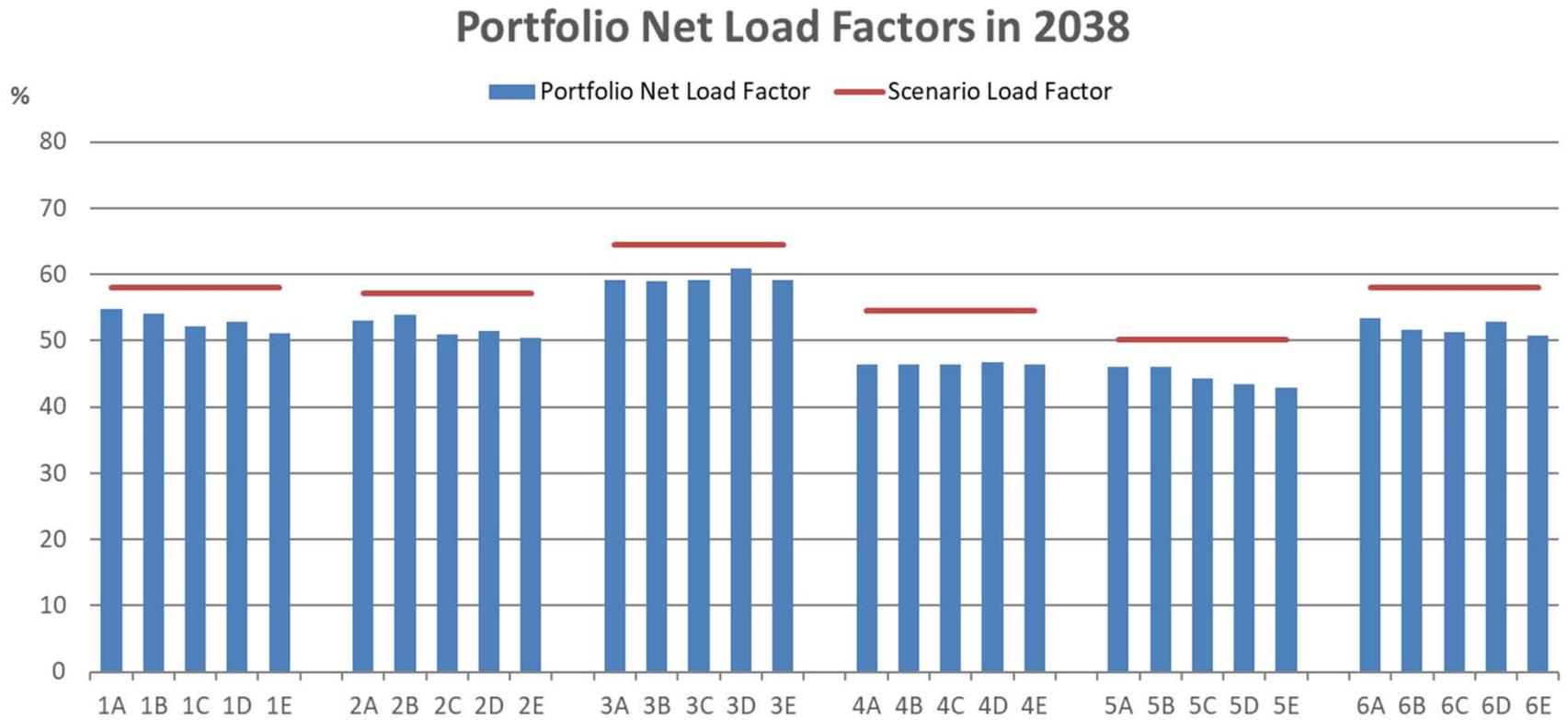
Strategy D: Efficient Load Shape
Incremental BE Capacity



Total DG Behind the Meter View



Portfolio Net Load Factors in 2038



Planned Sensitivities

- Gas prices
- Storage, wind and SMR capital costs
- EE and DR market depth
- Integration cost and flexibility benefit
- Accelerated solar to meet customer demand
- Ongoing operating costs for coal plants

Public comments will inform additional areas meriting further sensitivities



Q&A / RERC Discussion

Discussion Questions

- What initial observations or questions do you have about the Portfolio Results?



Break – Prepare for Public Open House to begin at 4:30

Public Open House – 2019 Draft IRP and EIS



- Informational Posters and TVA experts available
- RERC Listening Session begins at 5:00 PM

Public Listening Session

- **Public participation is appreciated**
- **This is a listening session; responses are typically not provided**





Thank you and Travel Safely

The RERC will reconvene tomorrow at 8:30





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11:30	Adjourn



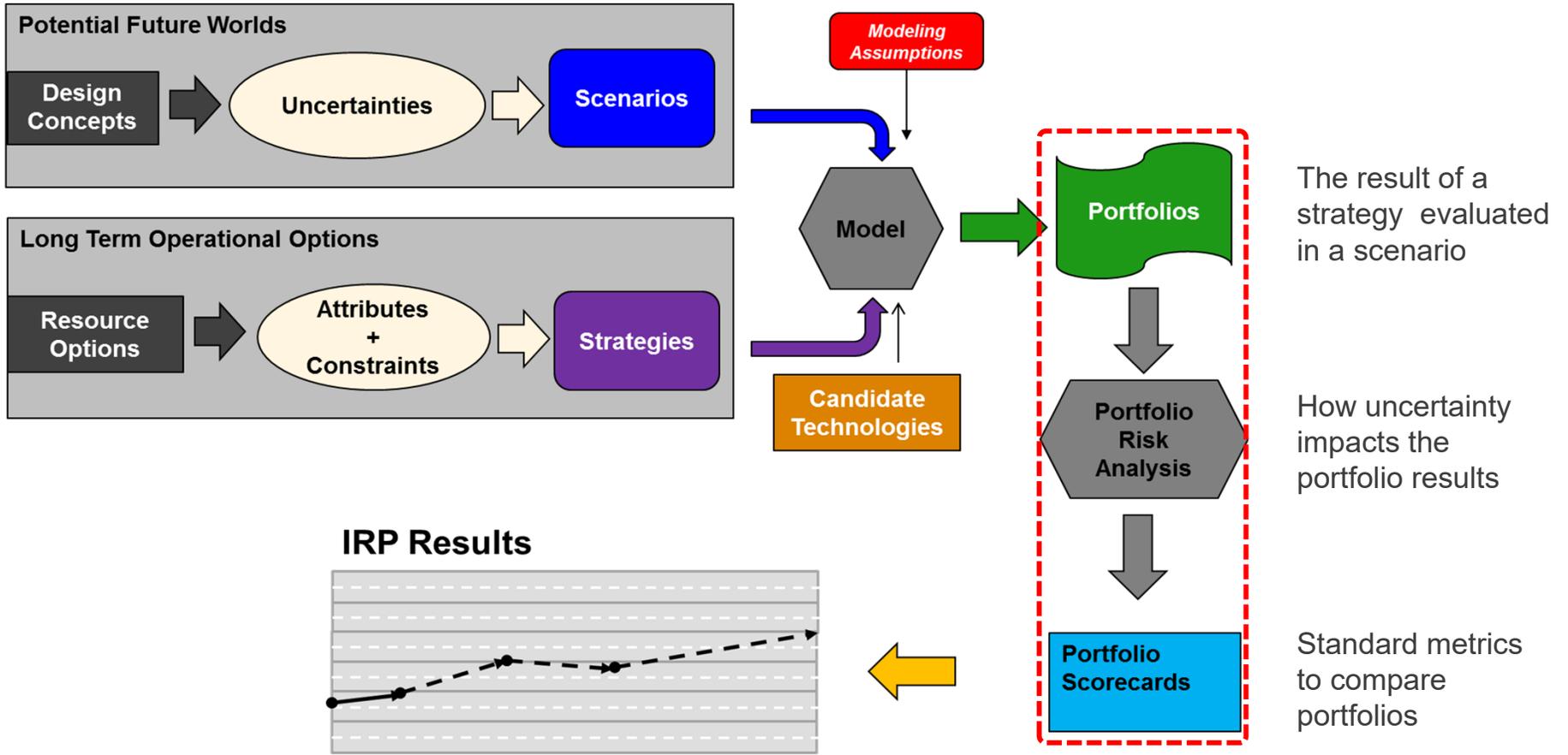
RERC Meeting Recap



Scorecard Results

Hunter Hydas
IRP Project Manager

Scorecard Results



2019 IRP Metrics

Category	Metric	Definition
Cost	PVRR (\$Bn)	Total plan cost (capital and operating) expressed as the expected (stochastic) present value of revenue requirements over the 20-year study period
	System Average Cost (\$/MWh)	Expected average system cost for the study period, computed as the levelized annual average system cost (annual revenue requirements divided by annual sales)
	Total Resource Cost (\$Bn) *	Total plan cost (capital and operating) expressed as the expected present value of revenue requirements over the study period plus participant cost net of bill savings and tax credits
Risk	Risk/Benefit Ratio	Area under the plan cost distribution curve between P(95) and expected value divided by the area between expected value and P(5) based on stochastic analysis
	Risk Exposure (\$Bn)	The point on the plan cost distribution below which the likely plan costs will fall 95% of the time based on stochastic analysis
Environmental Stewardship	CO2 (MMTons)	Expected annual average tons of CO2 emitted over the study period
	CO2 Intensity (lbs/MWh)	Expected CO2 emissions expressed as an emission intensity, computed by dividing emissions by energy generated and purchased
	Water Consumption (MMGallons)	Expected annual average gallons of water consumed over the study period
	Waste (MMTons)	Expected annual average quantity of coal ash, sludge and slag projected based on energy production in each portfolio
	Land Use (Acres) *	Expected acreage needed for expansion units in each portfolio in 2038
Operational Flexibility	Flexible Resource Coverage Ratio *	The ratio of flexible capacity available to meet the maximum 3-hour ramp in demand in 2038 to the maximum 3-hour ramp demand in 2038
	Flexibility Turn Down Factor	Ability of the system to serve low load periods as measured by percent of must-run and non-dispatchable generation to sales
Valley Economics	Percent Difference in Per Capita Income	The change in per capita personal income expressed as a change from a reference portfolio in each scenario
	Percent Difference in Employment	The change in employment expressed as a change from a reference portfolio in each scenario

* New metric for 2019 IRP

2019 IRP Metrics Alignment

IRP Scorecard Metrics		Low-Cost Reliable Power	TVA Mission Economic Development	Environmental Stewardship
Cost	PVRR (\$Bn)	✓	✓	
	System Average Cost (\$/MWh)	✓	✓	
	Total Resource Cost (\$Bn)	✓		
Risk	Risk/Benefit Ratio	✓		
	Risk Exposure (\$Bn)	✓		
Environmental Stewardship	CO2 (MMTons)		✓	✓
	CO2 Intensity (lbs/MWh)		✓	✓
	Water Consumption (MMGallons)			✓
	Waste (MMTons)			✓
	Land Use (Acres)			✓
Operational Flexibility	Flexible Resource Coverage Ratio	✓		
	Flexibility Turn Down Factor	✓		
Valley Economics	Percent Difference in Per Capita Income	✓	✓	
	Percent Difference in Employment		✓	

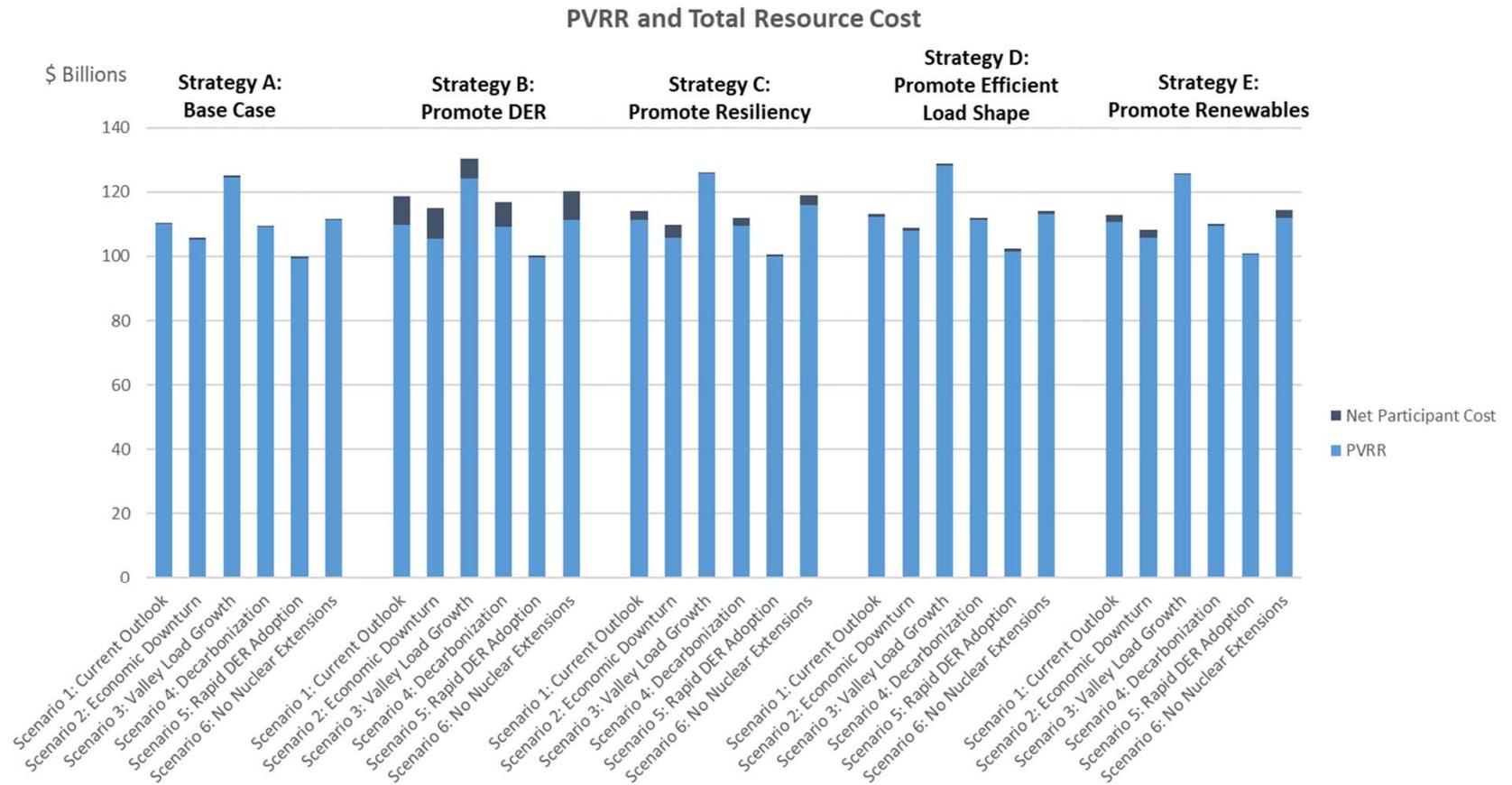
Preliminary Scorecard Observations

Strategies

- A. Base Case
- B. Promote DER
- C. Promote Resiliency
- D. Promote Efficient Load Shape
- E. Promote Renewables

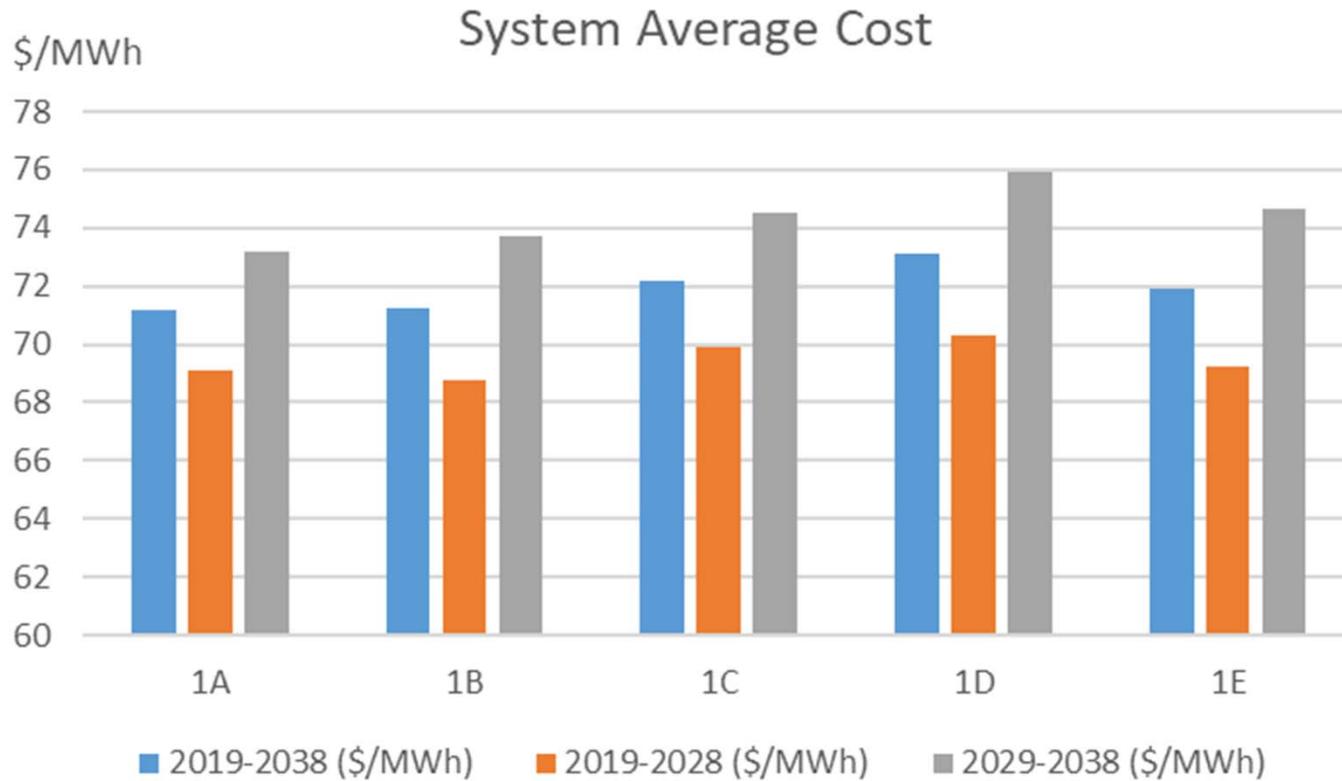
- The Base Case strategy, which most leverages utility-scale resources, is the most economic and has the lowest risk exposure
- The strategy that promotes DER has a similar PVRR to the Base Case but has the highest Total Resource Cost, which considers costs borne by participants
- The strategy that promotes Efficient Load Shape most leverages storage and has the highest revenue requirements, driven by current projections for storage prices
- Strategies that promote Resiliency, Efficient Load Shape, and Renewables drive the most solar expansion and coal retirements, resulting in lower environmental impact overall but higher land use
- These strategies that drive more solar expansion also tend to have lower operational flexibility
- All strategies have similar impacts on the Valley economy as measured by per capita income and employment

PVRR and Total Resource Cost in 2038



System Average Cost (Current Outlook)

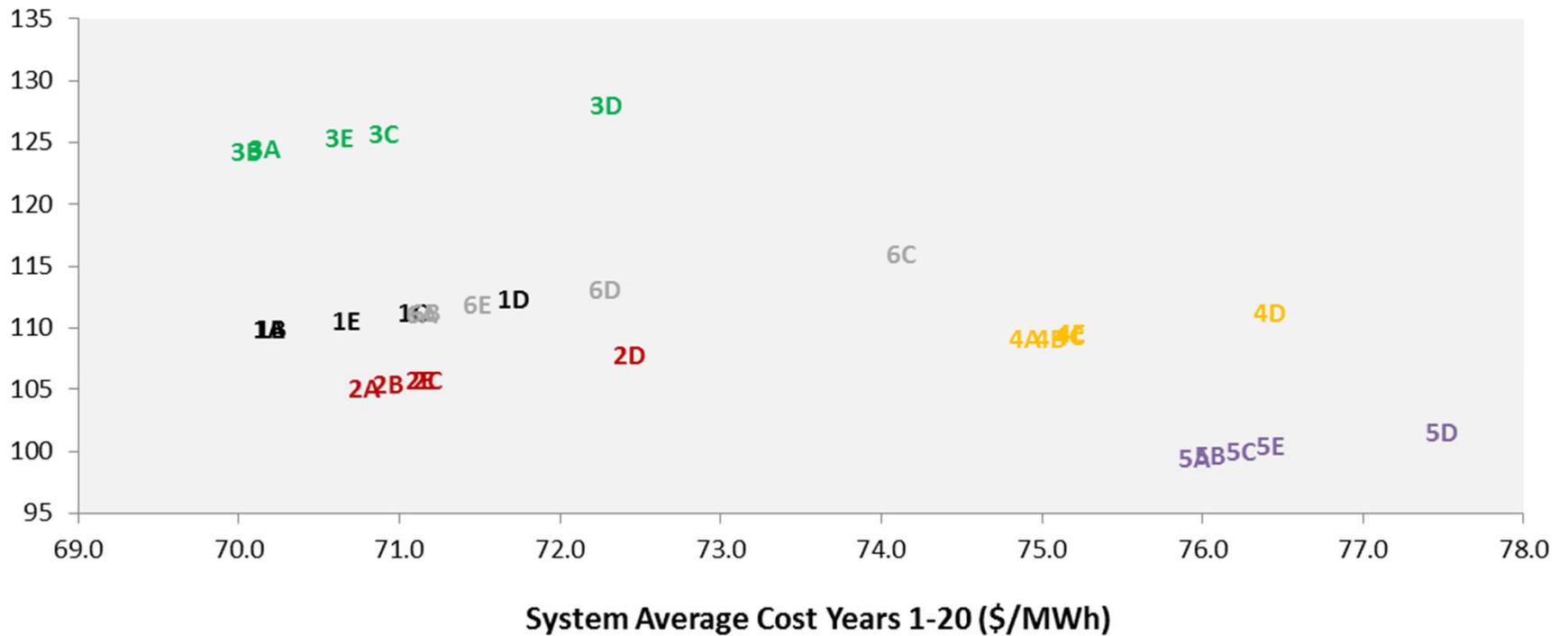
- Strategies
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Portfolio Cost Tradeoffs

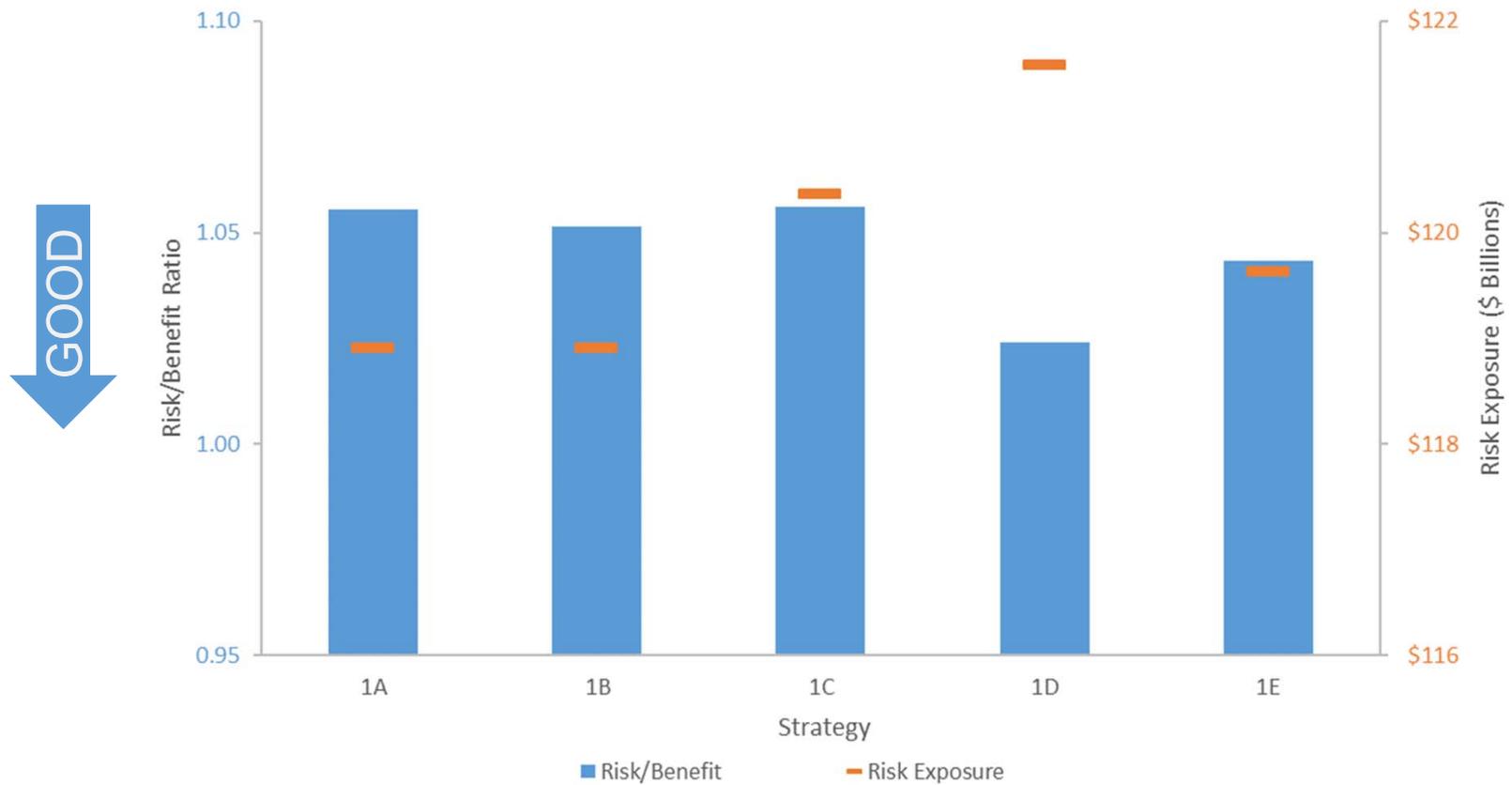
Scenarios	Strategies
1. Current Outlook	A. Base Case
2. Economic Downturn	B. Promote DER
3. Valley Load Growth	C. Promote Resiliency
4. Decarbonization	D. Promote Efficient Load Shape
5. Rapid DER Adoption	E. Promote Renewables
6. No Nuclear Extensions	

PVRR (\$Bn)



Risk Metrics (Current Outlook)

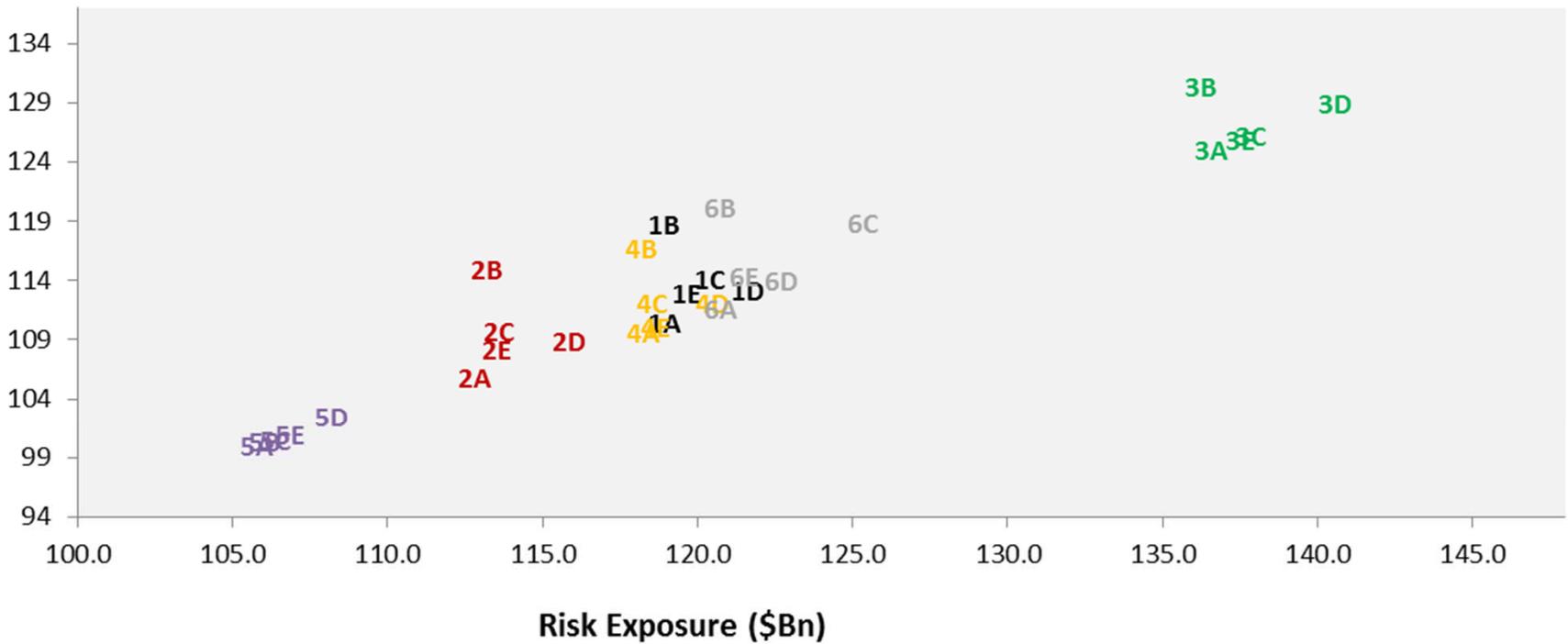
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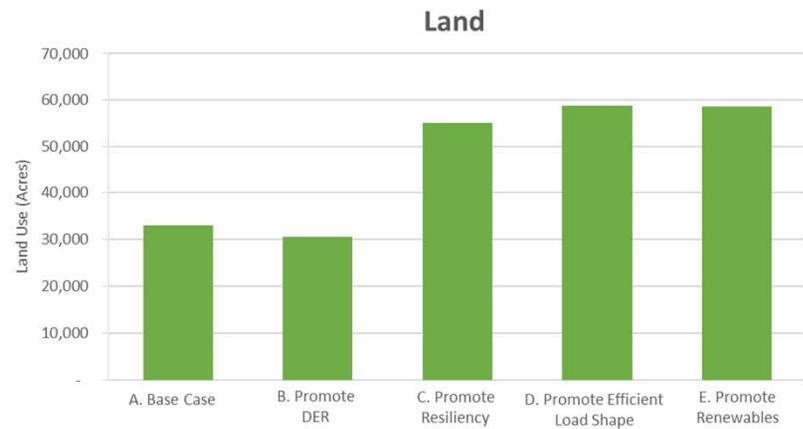
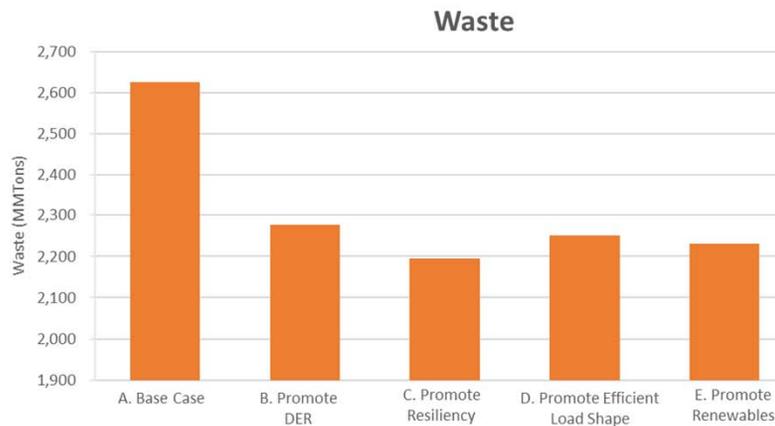
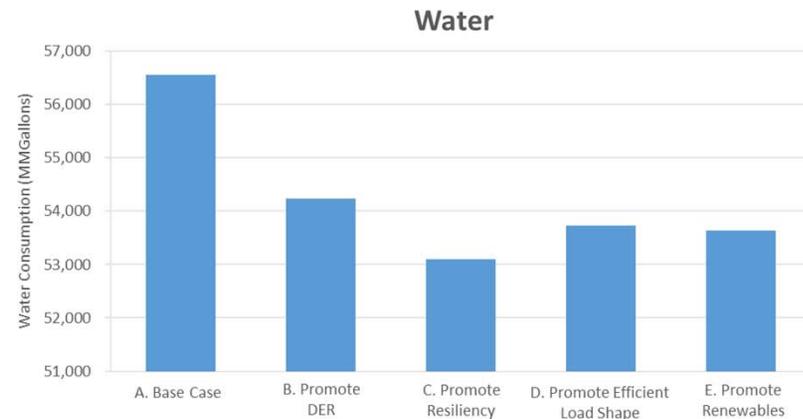
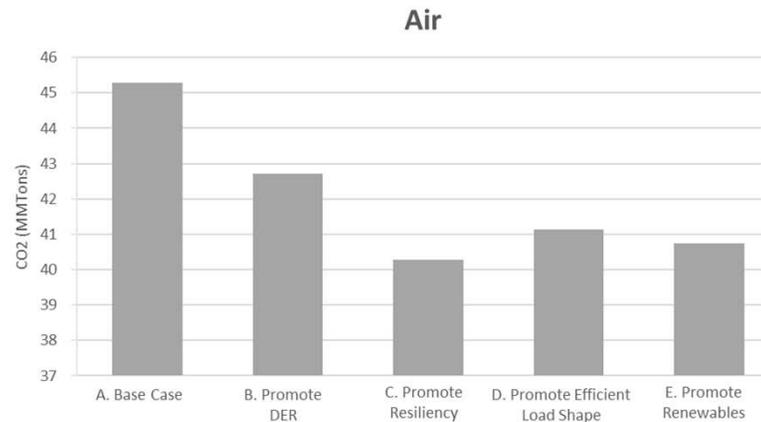
Portfolio Cost and Risk Tradeoff

Scenarios	Strategies
1. Current Outlook	A. Base Case
2. Economic Downturn	B. Promote DER
3. Valley Load Growth	C. Promote Resiliency
4. Decarbonization	D. Promote Efficient Load Shape
5. Rapid DER Adoption	E. Promote Renewables
6. No Nuclear Extensions	

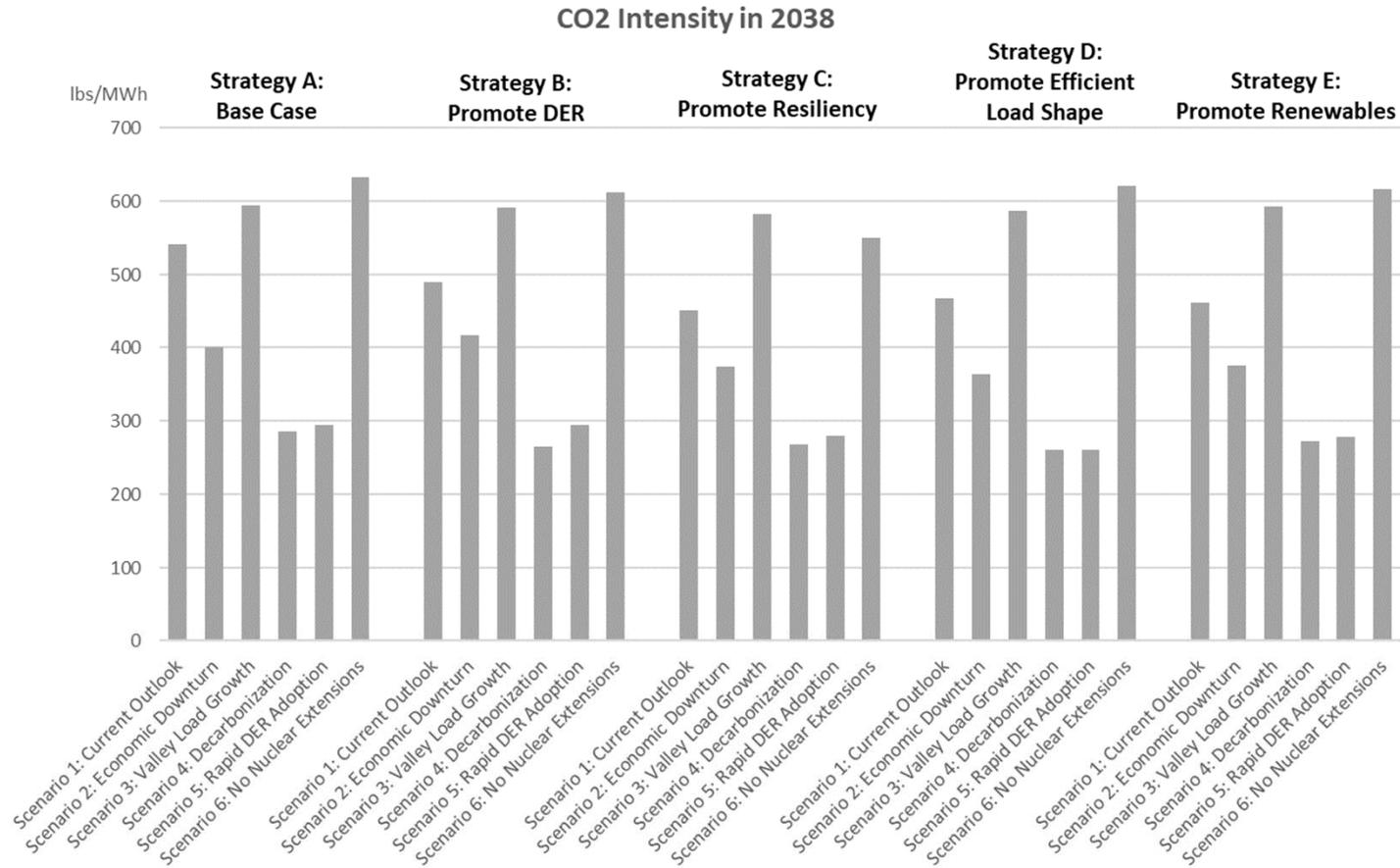
Total Resource Cost
(\$Bn)



Environmental Metrics (Current Outlook)



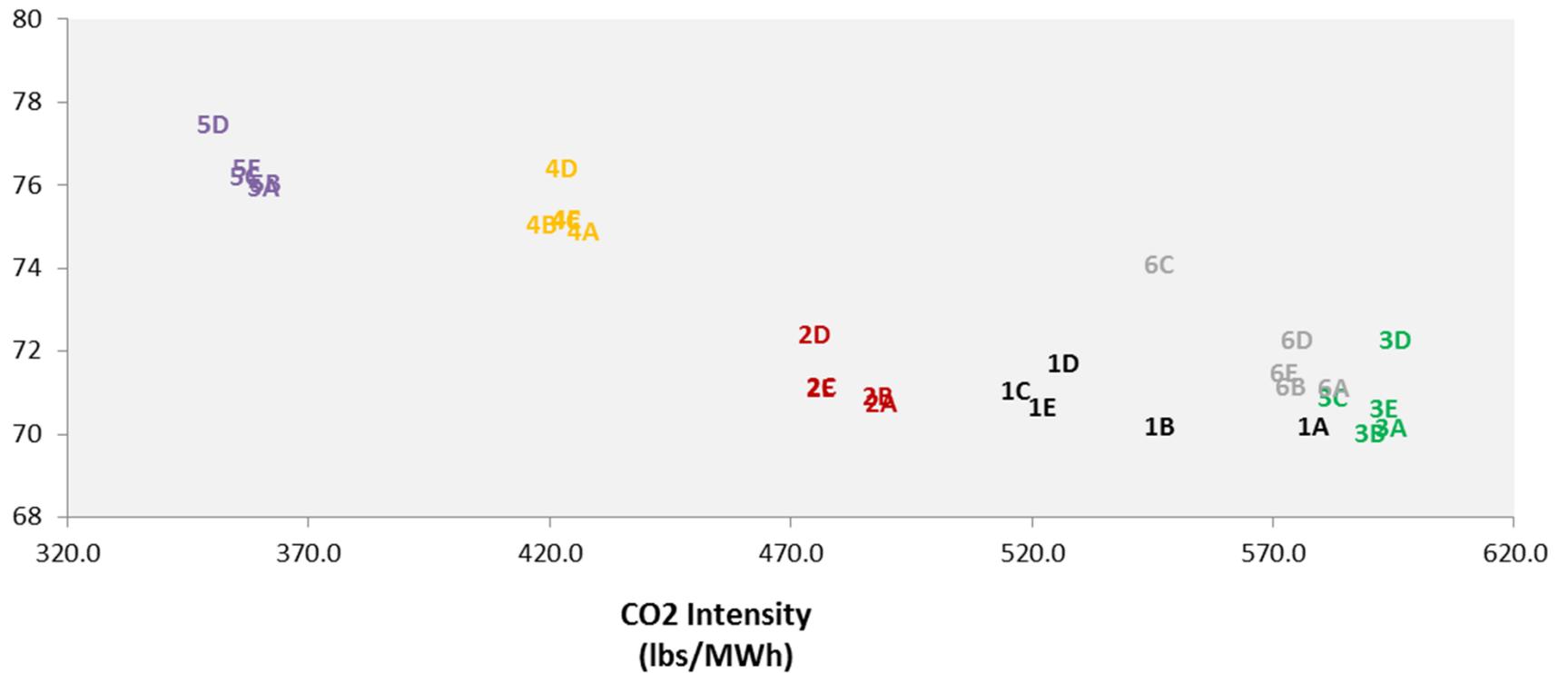
CO2 Intensity in 2038



Portfolio Cost and CO2 Tradeoff

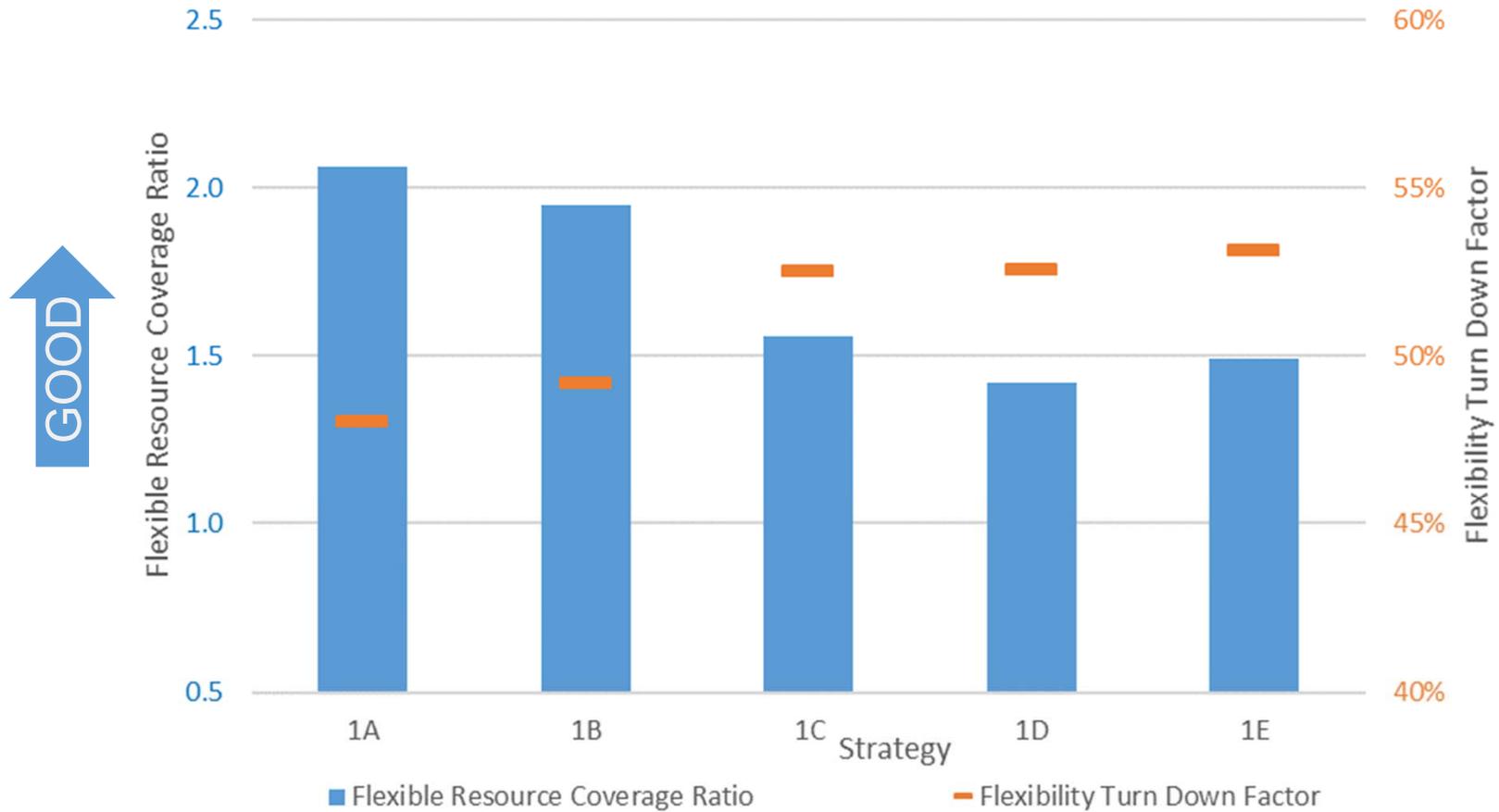
Scenarios	Strategies
1. Current Outlook	A. Base Case
2. Economic Downturn	B. Promote DER
3. Valley Load Growth	C. Promote Resiliency
4. Decarbonization	D. Promote Efficient Load Shape
5. Rapid DER Adoption	E. Promote Renewables
6. No Nuclear Extensions	

System Average Cost
Years 1-20 (\$/MWh)



Flexibility Metrics (Current Outlook)

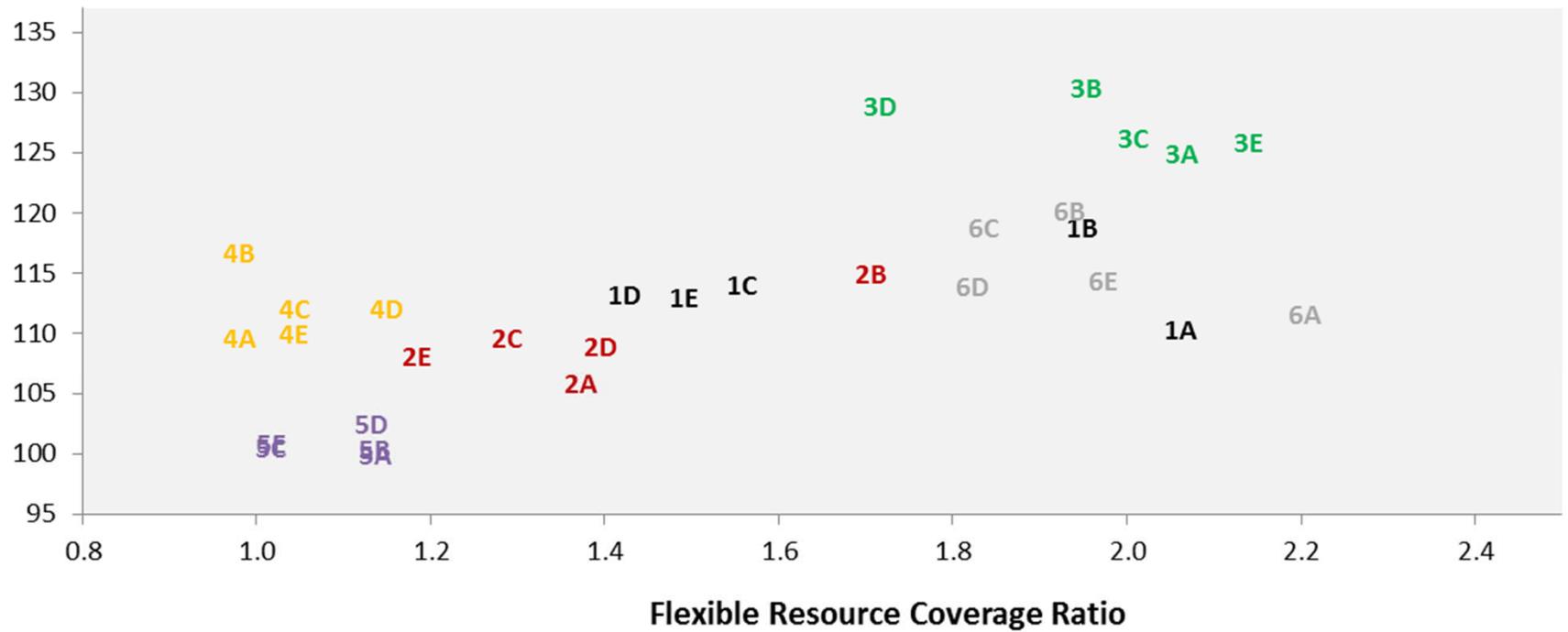
- Strategies**
- A. Base Case
 - B. Promote DER
 - C. Promote Resiliency
 - D. Promote Efficient Load Shape
 - E. Promote Renewables



Portfolio Cost and Flexibility Tradeoff

- | Scenarios | Strategies |
|--------------------------|---------------------------------|
| 1. Current Outlook | A. Base Case |
| 2. Economic Downturn | B. Promote DER |
| 3. Valley Load Growth | C. Promote Resiliency |
| 4. Decarbonization | D. Promote Efficient Load Shape |
| 5. Rapid DER Adoption | E. Promote Renewables |
| 6. No Nuclear Extensions | |

Total Resource Cost
(\$Bn)



Scenarios Have a Greater Impact on Results

METRIC	SCENARIOS					
	Current Outlook	Economic Downturn	Valley Load Growth	Decarbonization	Rapid DER Adoption	No Nuclear Extensions
System Average Cost	Better	Better	Best	Good	Good	Best
Present Value of Revenue Requirements	Better	Better	Good	Best	Best	Good
Total Resource Cost (including Participant Cost)	Better	Better	Good	Best	Best	Good
CO ₂ Intensity	Better	Better	Good	Best	Best	Good
Land Use	Better	Better	Good	Good	Better	Good
Flexible Resource Coverage Ratio	Better	Better	Best	Good	Good	Best

Scenario Observations

- Current Outlook and Economic Downturn scenarios are mid-range across all aspects of performance relative to other scenarios
- Valley Load Growth and No Nuclear Extensions scenarios result in lower rate but higher debt pressure, less carbon reduction, increased land use, and improved flexibility
- Decarbonization and Rapid DER Adoption scenarios are generally similar, resulting in higher rate but lower debt pressure, more carbon reduction, and reduced flexibility
- Decarbonization also results in increased land use, while Rapid DER Adoption results in land use levels more similar to the Current Outlook and Economic Downturn scenarios

Strategies Influence Outcomes within Scenarios

Metric	STRATEGIES				
	Base Case	Promote DER	Promote Resiliency	Promote Efficient Load Shape	Promote Renewables
System Average Cost	Best	Best	Better	Good	Better
Present Value of Revenue Requirements	Best	Best	Better	Good	Better
Total Resource Cost (including Participant Cost)	Best	Good	Better	Better	Better
CO ₂ Intensity	Good	Better	Best	Better	Better
Land Use	Best	Best	Better	Good	Good
Flexible Resource Coverage Ratio	Best	Best	Good	Good	Better

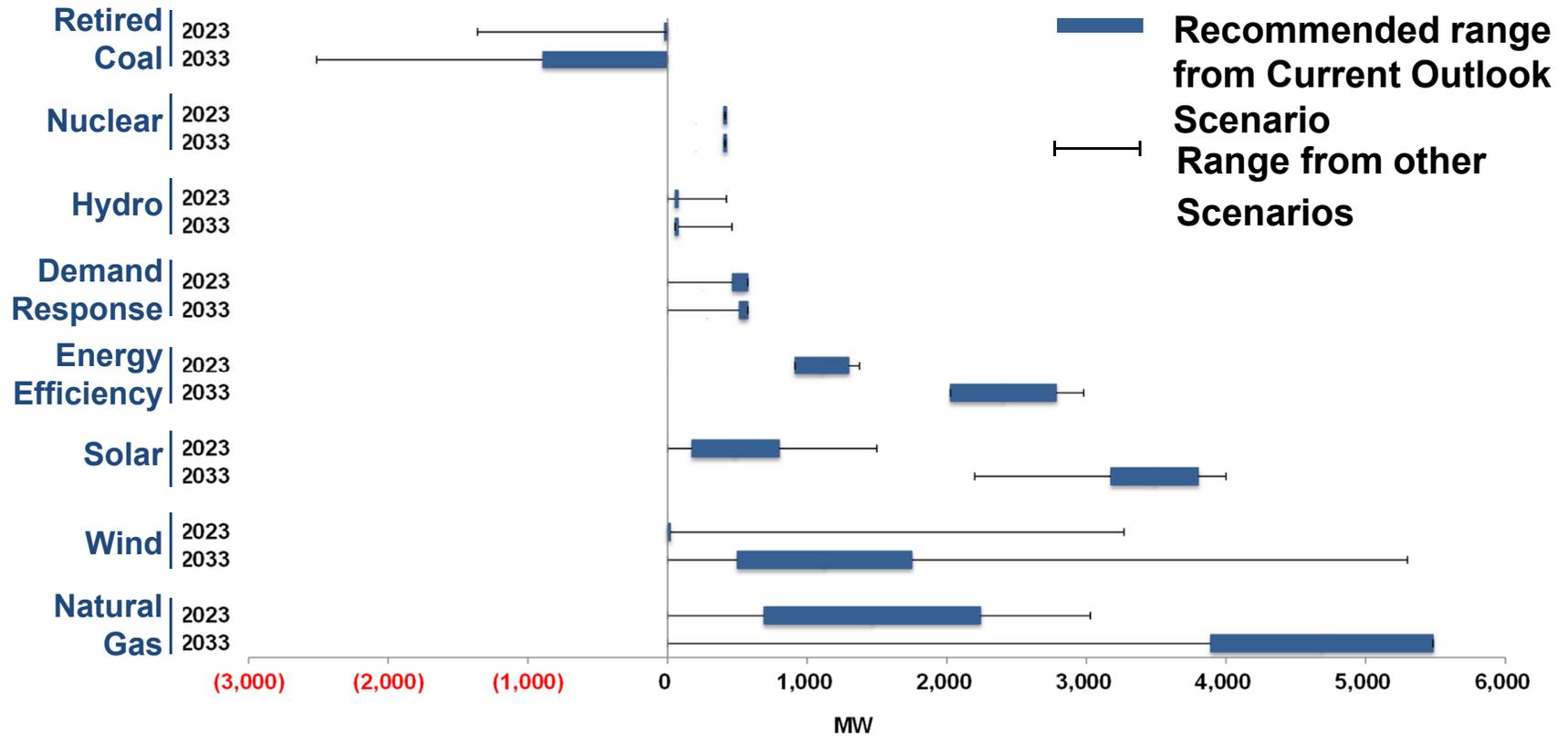
Strategy Observations

- Base Case strategy results in the best metric performance overall, with the exception of carbon reduction
- Promote DER strategy results in the highest total cost (including net participant cost), but more carbon reduction
- Promote Resiliency and Promote Renewables strategies result in higher cost, more carbon reduction, increased land use, and reduced flexibility
- Promote Resiliency strategy results in the most carbon reduction overall, driven by the highest amount of coal retirements
- Promote Efficient Load Shape strategy has the highest revenue requirements, but is generally similar to the Promote Resiliency and Promote Renewables strategies in other aspects

Considerations for Developing Recommendation

- Draft IRP portfolio results and scorecards
- Tradeoff considerations
- Public comments
- Sensitivity results

2015 IRP Recommendation



MWs are incremental additions from 2014 forward. Board-approved coal retirements and natural gas additions as of August 2015 are excluded.



ENVIRONMENTAL IMPACT STATEMENT

Matthew Higdon
February 20, 2019

DEIS Chapter 5. Anticipated Environmental Impacts

- Facility Siting and Review Processes
- Environmental Impacts of
 - Supply-Side Resource Options
 - Energy Efficiency and Demand Response Programs
 - Transmission Facility Construction and Operation
 - **Alternative Strategies and Portfolios**
- Potential Mitigation Measures
- Unavoidable Adverse Environmental Impacts

Environmental Impacts Quantified in EIS

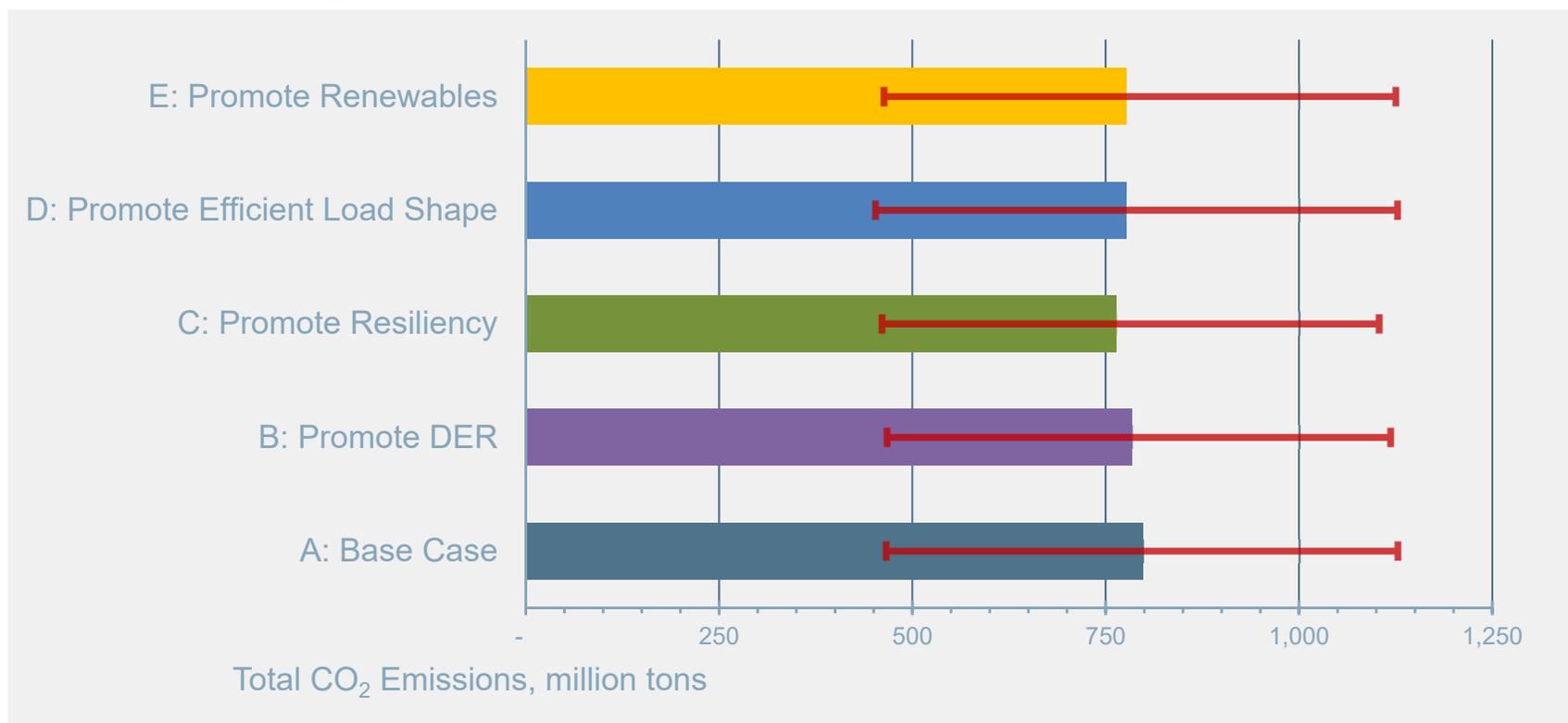
- CO2 total emissions
- CO2 intensity
- **net CO2 emissions**
- SO2 emissions
- NOx emissions
- total water use
- total water consumption
- **water use by basin and source (surface, groundwater)**
- **water consumption by basin and source**
- land use – facility land requirements
- Coal Combustion Residual production
- coal consumption
- natural gas consumption
- uranium consumption
- spent nuclear fuel production
- change in per-capita income (REMI results)
- change in employment (REMI results)

* Underline = primary metrics used in Scorecard

* **Bold** = new impacts included in 2019 IRP

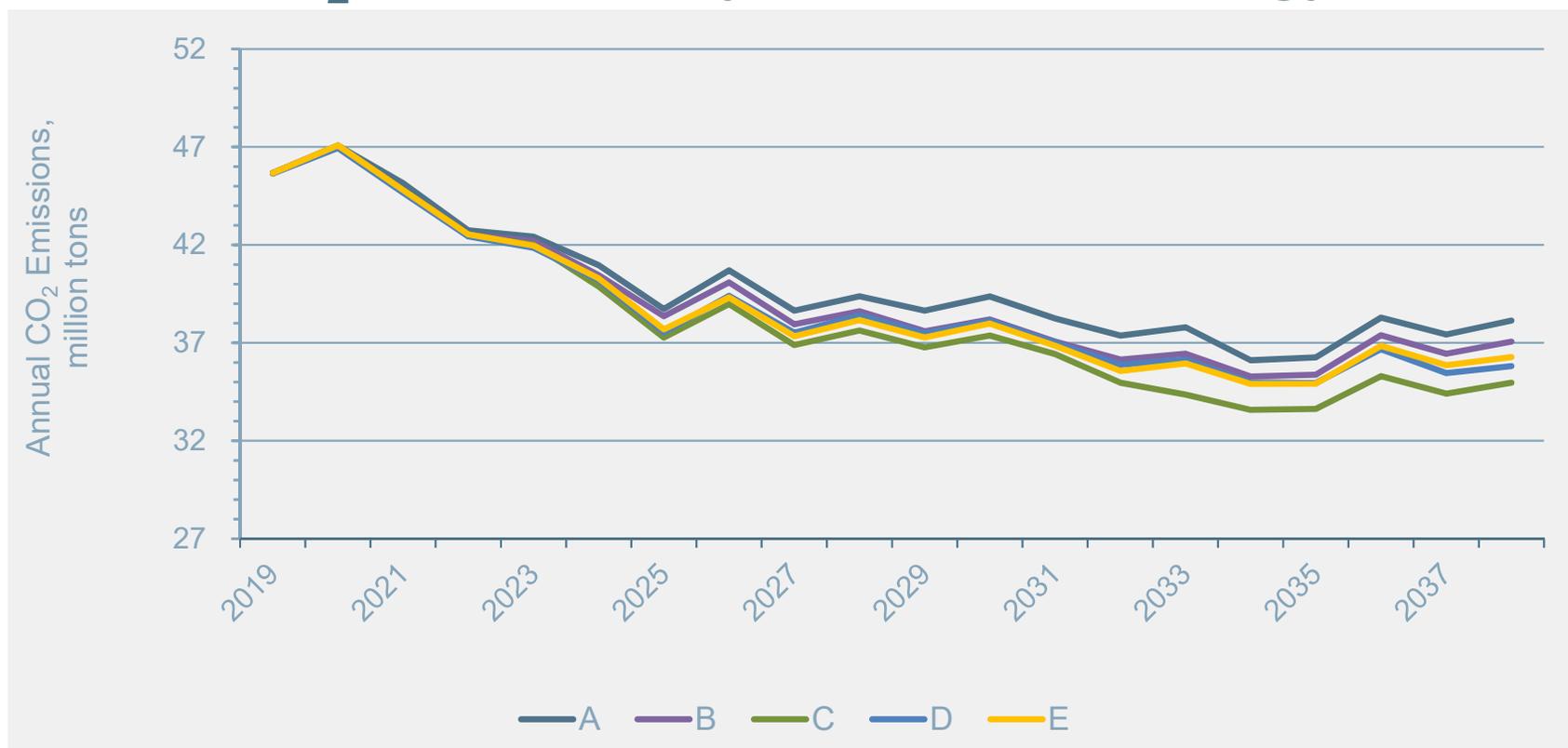
Anticipated Environmental Impacts

CO₂ Emissions by Alternative Strategy



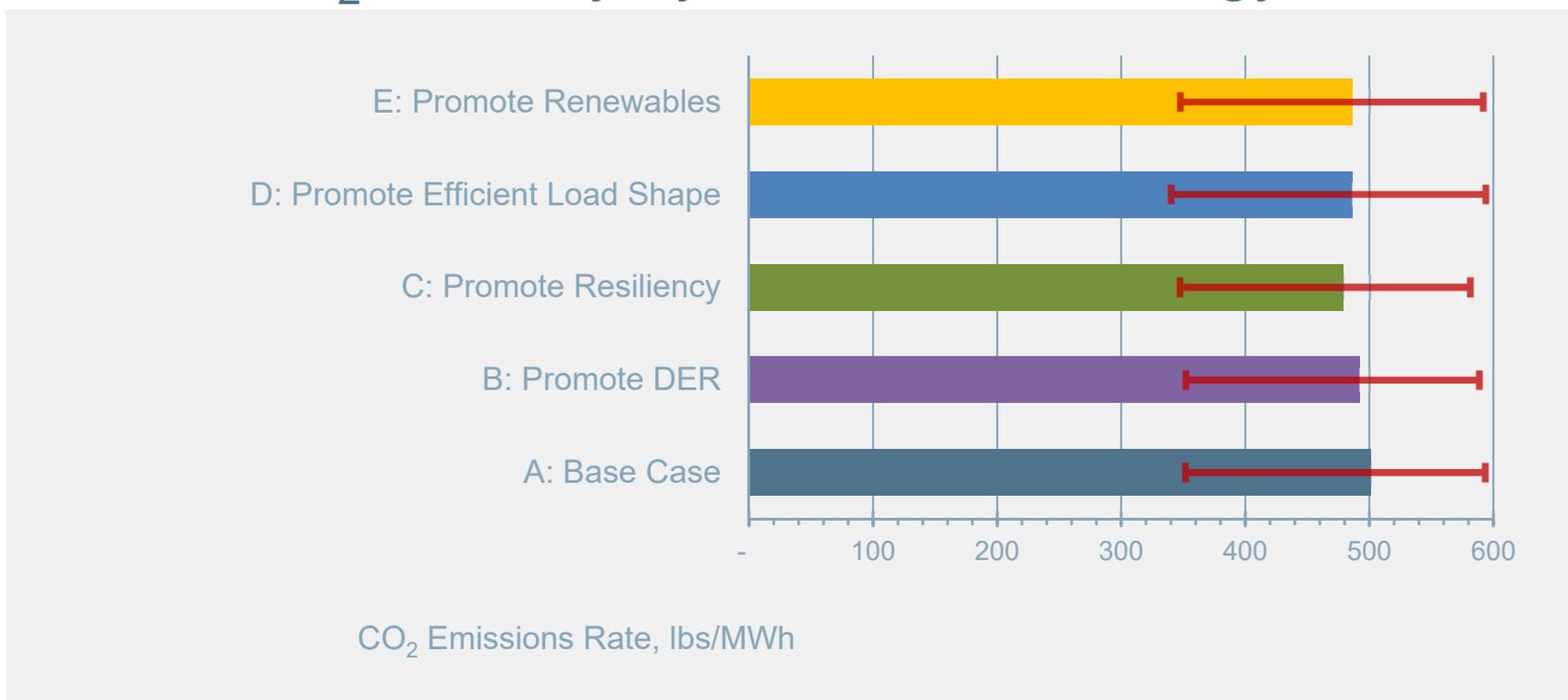
Anticipated Environmental Impacts

CO₂ Emissions by Alternative Strategy



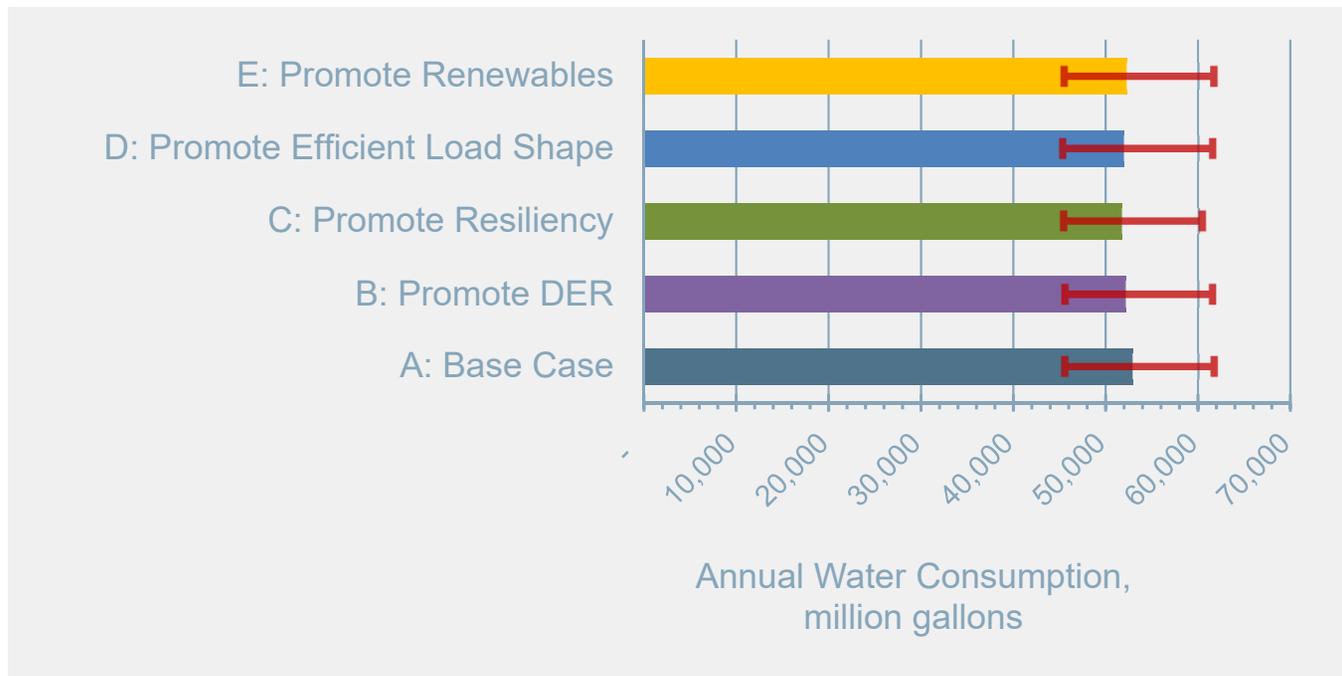
Anticipated Environmental Impacts

CO₂ Intensity by Alternative Strategy



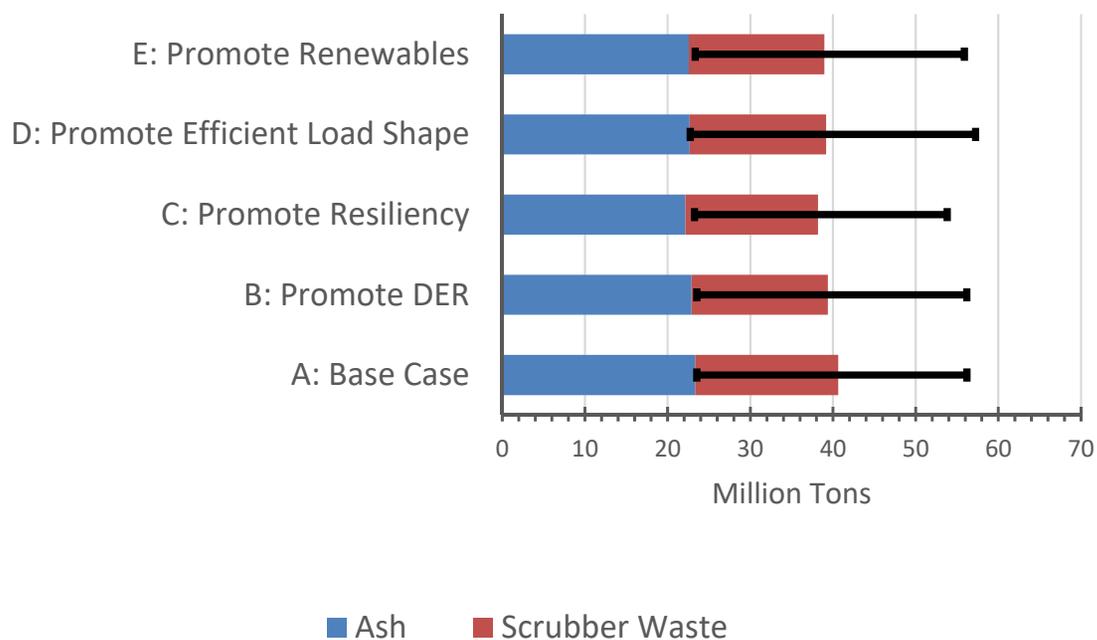
Anticipated Environmental Impacts

Water Consumption by Alternative Strategy



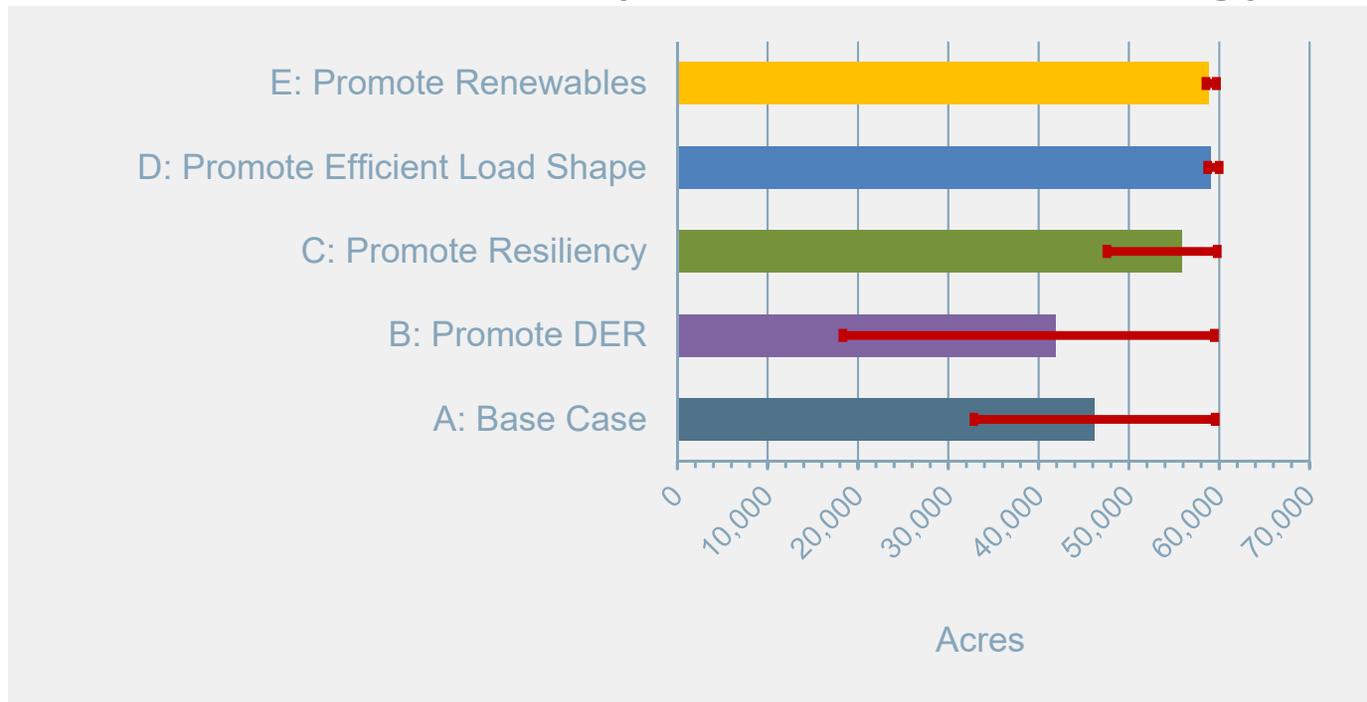
Anticipated Environmental Impacts

Coal Waste Production by Alternative Strategy



Anticipated Environmental Impacts

Land Requirements by Alternative Strategy









RERC Discussion

RERC Discussion







RERC Discussion (cont'd)

RERC Discussion





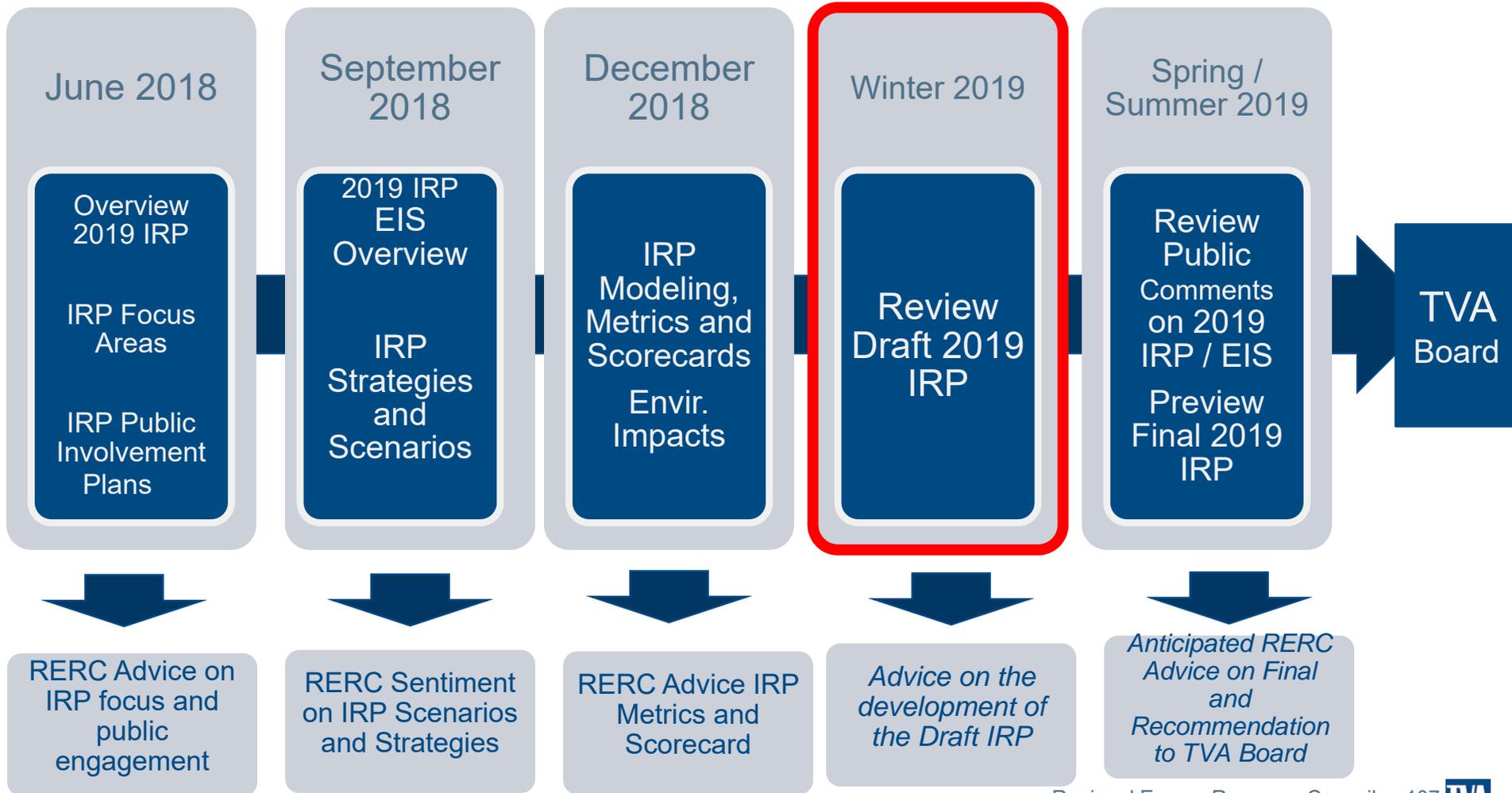
IRP Next Steps

Hunter Hydas- Project Manager, 2019 IRP

Developing the Final IRP and EIS

- Gather public comments through April 8, 2019
- Evaluate and address comments
- Run sensitivities in model
- Analyze and develop preliminary recommendations
- Continue working with the IRP Working Group and RERC to develop final IRP

RERC Review and Input to 2019 IRP



We'd like to hear from you!

The public comment period is open until April 8, 2019. Share your feedback with us online, in-person or by mail!

- Attend a public meeting and submit a comment card
- View our interactive report and submit a comment online, visit www.tva.com/irp
- Mail-in a comment form:
 - Hunter Hydas, TVA, MR 3-C, 1101 Market Street, Chattanooga, TN 37402
- Email us at irp@tva.gov

Visit us at a Public Meeting!



February 19 – RERC Open House, Murfreesboro, TN (4:30 – 6:00 PM)



February 26 – Public Webinar



February 27 - Knoxville, TN



March 18 - Memphis, TN



March 19 – Huntsville, AL



March 20 - Chattanooga, TN



March 26 - Bowling Green, KY

Meetings

5 p.m. to 6:30 p.m. local time

Can't make it in-person?

- View our live webinar on February 26 11:00 AM ET
- Visit our Interactive Report online
- Visit www.tva.com/irp for details

Next Steps

We are here!



(** indicates timing of Valley-wide public meetings)

Key Tasks/Milestones in this study timeline include:

- Establish stakeholder group and hold first meeting (Feb 2018)
- System modeling (June - December 2018)
- Publish draft EIS and IRP (Feb 2019)
- Complete public meetings (March 2019)
- Board approval and final publication of EIS and IRP (expected Summer 2019)



Wrap Up and Adjourn

Future RERC Tentative Meeting Dates

- April 17-18, 2019, Knoxville, Tennessee
 - Review Public Comment Themes
 - Development of final recommendation
- June 26-27, 2019, Chattanooga, Tennessee
 - Review final IRP results and recommendation
 - RERC advice to TVA Board on 2019 IRP





Thank you and please travel safely!
