



2019 IRP Working Group

Meeting 1: February 28, 2018



Safety Moment



Building Emergency Plan

Introductions



- Name
- Organization and Role
- Interest in the Energy Sector



Agenda

Agenda – February 28, 2019

9:00	Executive Welcome	Laura Campbell, Vice President, Enterprise Planning Joe Hoagland, Vice President, Enterprise Relations and Innovation
9:05	Welcome and Introductions of IRPWG (alternates too?) (each person speak 2-3 mins)	Jo Anne Lavender, Facilitator, and Group
10:15	Introduce TVA 2019 IRP Team	Jo Anne Lavender and Staff
10:30	Break	
10:45	IRPWG Protocols and Logistics	Jo Anne Lavender
11:00	Information Sharing Protocol and Discussion Non Disclosure Agreement Overview	Khurshid Mehta, Office of the General Counsel
11:15	Intro to TVA	Joe Hoagland
11:35	What is Resource Planning	Brian Child Jane Elliott
12:20	Lunch	

Agenda – Continued

1:20	Environmental Reviews	Ashley Pilakowski, Environmental Compliance and Operations
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1:35	Overview of the 2015 Integrated Resource Plan	Brian Child, Enterprise Planning
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1:50	Break	
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2:10	2019 IRP Process and Schedule and Q&A	Brian Child
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3:00	Wrap Up	Jo Anne Lavender
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3:30	Adjourn	
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IRP Working Group Protocols & Logistics

Jo Anne Lavender
Facilitator

Purpose of the 2019 IRP Working Group (IRPWG)

- A key engagement mechanism for TVA and diverse stakeholders
- Provide in-depth ongoing discussion and feedback on the IRP process, approach and assumptions
- Validate the assumptions behind the analysis and the recommendations
- Real time stakeholder input results in greater efficiency
- Distributed Energy Resources will play a more prominent role in future planning.

IRPWG Meeting Starter Ground Rules

- One person speak at a time; be respectful of others; refrain from interrupting while someone is speaking
- Be succinct so that everyone has the opportunity to speak.
- Try to offer alternatives that accommodate your interests and the interests of others.
- Members reserve the right to disagree with any position
- ELMO (Enough Let's Move On)
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IRPWG Meeting Protocols

Agenda

- TVA will prepare each meeting agenda and logistics
- Meeting materials will be sent to IRPWG members ahead of the meeting date using an external file sharing site

Meeting Notes and Actions

- TVA will maintain meeting notes and running action items and responses

Ground Rules

- One person speak at a time; be respectful of others; refrain from interrupting while someone is speaking
- Be succinct so that everyone has the opportunity to speak.
- Try to offer alternatives that accommodate your interests and the interests of others.
- Members reserve the right to disagree with any position
- ELMO (Enough Let's Move On)
-

IRPWG Meeting Protocols

Meeting Frequency

- Meeting locations will likely rotate, with sites chosen in consultation with the IRPWG
- The IRPWG is expected to meet most months for 1-2 days.
- Identify an alternate who is informed and can attend in the event you are not available. If a member/alternate fails to attend three meetings in a row, TVA may seek a replacement

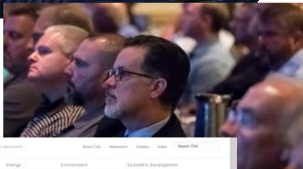
Confidential Information

- Non-disclosure agreements may be needed to facilitate TVA sharing confidential information.

Public Involvement

- While meetings and working sessions of the IRPWG will not be open to the general public, there are multiple ways TVA will be engaging other interested stakeholders and the general public.

Stakeholder & Public Involvement Opportunities



Forums for Public Input

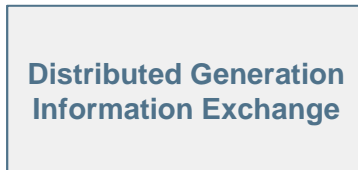
- Public Scoping Meetings
- IRP Working Group (and other stakeholder groups)
- Quarterly Public Briefings / Webinars
- Draft IRP Public Comment Period
- External Web Page

Early 2018

*Input will be
incorporated
throughout the process*

Summer 2019

IRPWG Relationship to Other Stakeholder Groups



- *FACA Committee*
- *Provides Council's advice to TVA Board External Relations Committee on energy policy matters*
- *Working stakeholder groups (not formal FACA committees)*
- *Provides input/counsel into various work efforts and initiatives within TVA*
- *Stakeholder group members speak in "many voices;" no consensus required*



Non Disclosure Agreement Overview

Khurshid Mehta
Office of the General Counsel

Proposed Information Sharing Policy

- TVA is committed to share information required for the IRPWG to fulfill its objectives
- A general guideline of information that will be shared is shown below

Type	General Definition	Treatment
Public Information	<ul style="list-style-type: none">• Suitable for public release or already publicly available	<ul style="list-style-type: none">• Will be provided
Confidential Information	<ul style="list-style-type: none">• If released could reasonably be expected to have an adverse effect on TVA operations, assets or individuals	<ul style="list-style-type: none">• Will be provided under a confidentiality agreement
Sensitive / Restricted Information	<ul style="list-style-type: none">• 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	<ul style="list-style-type: none">• Will not be provided

Non-Disclosure Agreement

Purpose

- Facilitate IRP deliberations by providing access to sensitive information regarding TVA's operations or assets
- Helps TVA maintain confidentiality of the sensitive information
- Written information
 - marked "IRP Workgroup Confidential"
- Oral information
 - stated by TVA to be confidential

IRPWG Member Obligations

- Keep information confidential
- Safeguard information
- Upon request, return information to TVA
- If not requested by TVA, destroy information after its use in IRP deliberations
- Member may share information with its representatives only for purpose of evaluating IRP and after instructing representatives of the restrictions
- Return signed copies (with signatures of member and its representatives) at next IRP Workgroup meeting

Proposed NDA can be found in your folder (and on the file sharing site)



Break





TVA Overview

Joe Hoagland, Vice President, Enterprise Relations and Innovation
Laura Campbell, Vice President, Enterprise Planning

What We Are

- Provider of low-cost, reliable power
- Steward of the Valley's natural resources
- Partner for economic growth



“Power is really a secondary matter.... TVA is primarily intended to change and to improve the standards of living of the people of that valley. Power is, as I said, a secondary consideration. Of course, it is an important one because, if you can get cheap power to those people, you hasten the process of raising the standard of living.”

President Franklin D. Roosevelt

What We Do

- Serve 7 states, 154 local power companies, 57 directly served customers and 80,000 square miles
- Generate \$10.9 billion annual revenue
- Manage the Valley's river systems and environmental resources.



First power pole erected in 1934 in Pontotoc, Miss.



“Father of TVA,” Senator George Norris

Our Mission

Energy



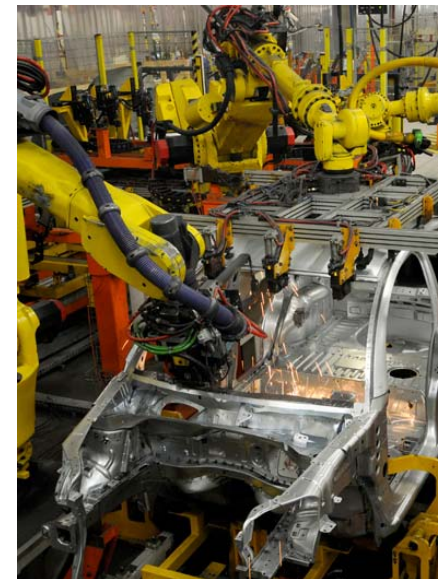
Provide affordable electric power throughout the Tennessee Valley Region

Environment



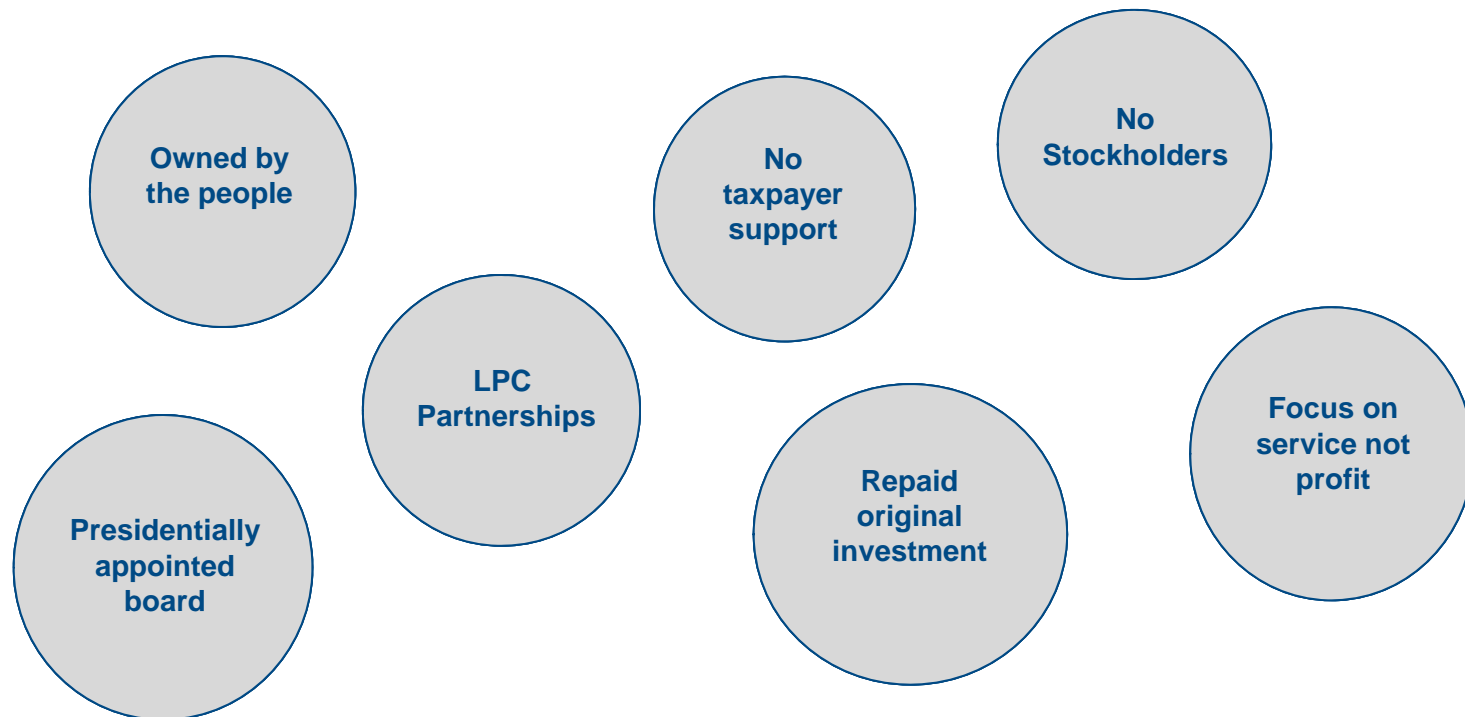
Act as a steward of the Valley's natural resources

Economic Development

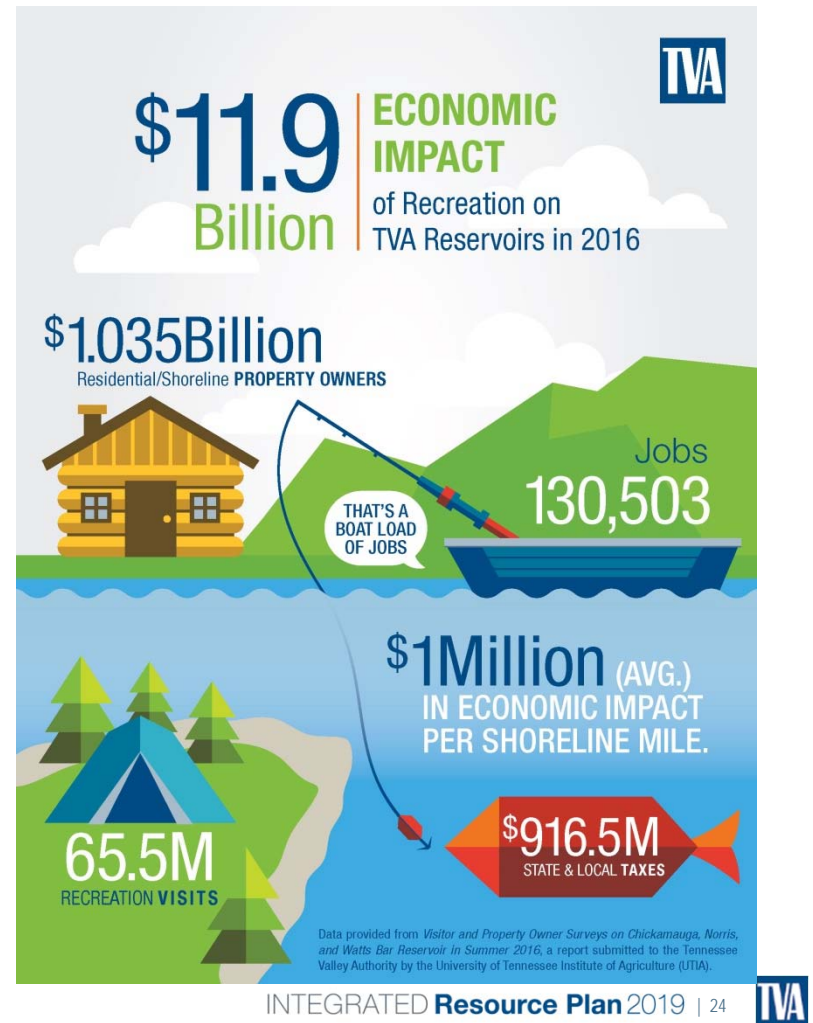


Serve as a catalyst for sustainable economic development

Why We're Unique



Environmental Stewardship



Serving the People of the Valley

Energy Efficiency

381.4 GWh FY16 ERS ACHIEVEMENT

The Valley has exceeded its load management targets nine years in a row.

\$790 million

CAPITAL AVOIDANCE AT \$700 PER
KILOWATT OF INSTALLED COSTS

2.0¢ per kWh

AVERAGE LIFETIME COSTS FOR TVA'S
ENERGY EFFICIENCY PROGRAMS

1,128 MW

AVOIDED CAPACITY ADDITION

>3,120 GWh

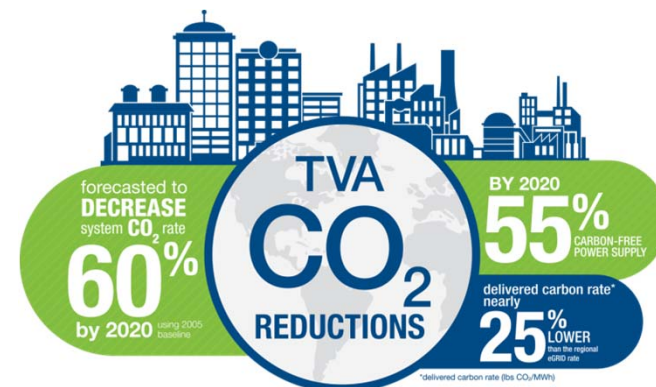
ENERGY NEEDS AVOIDED

Savings of EnergyRight Solutions programs from 2008 to 2016.

Low Rates

Top Quartile Industrial Rates

Cleaner Generation



Economic Development

FY17 TVA Economic Development Year-End Results

<u>Region</u>	<u>Jobs Attracted/Retained</u>	<u>Capital Investment</u>
Alabama	10,700 jobs	\$1.3 billion
Kentucky	6,000 jobs	\$ 1.1 billion
Middle Tennessee	22,700 jobs	\$2.8 billion
Mississippi	6,870 jobs	\$520 million
Northeast Valley	7,760 jobs	\$1.1 billion
Southeast Valley	6,990 jobs	\$790 million
West Tennessee	8,260 jobs	\$540 million

In FY 17:

**\$8.3 billion in
capital investment**

70,000 jobs

The Value of Public Power

- People are first – Accountable to stakeholders, not stockholders
- Rates are set to recover costs and reinvest in facilities – Not maximize profits
- Low-cost, reliable service are the focus – Not shareholders
- Collaborative regulatory process with a clear focus on serving energy consumers



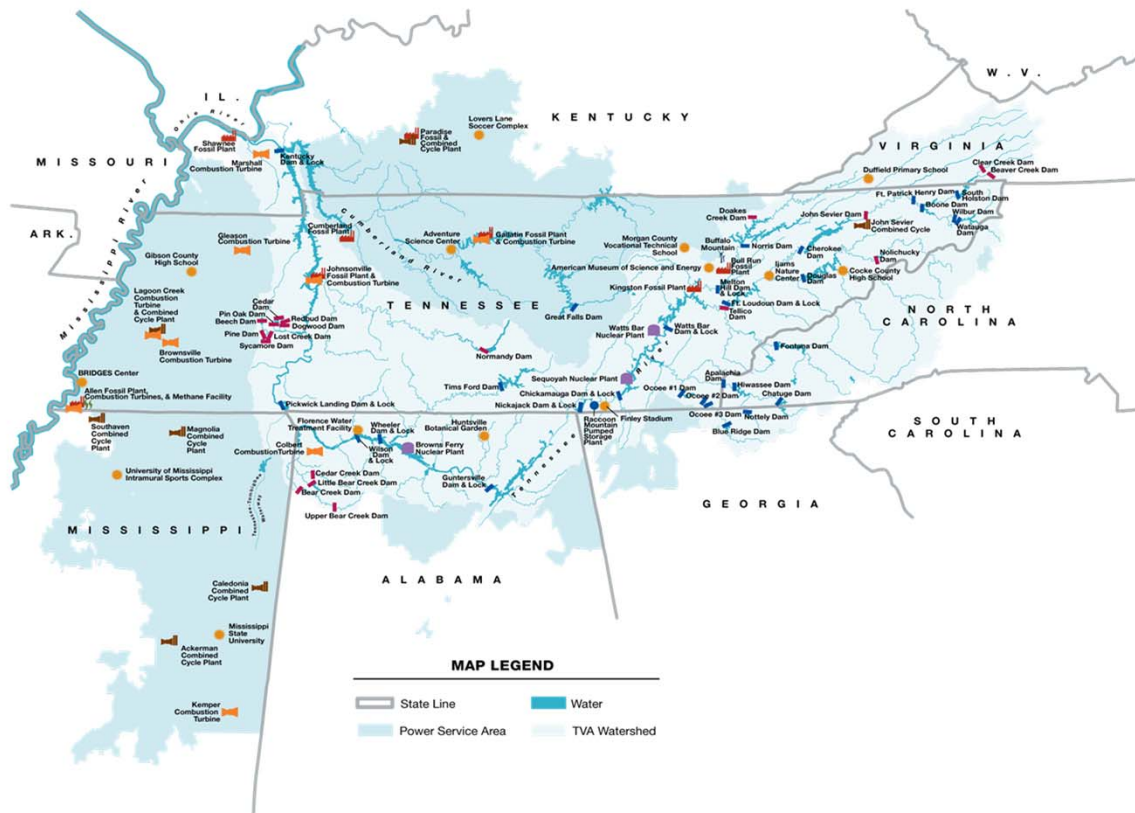
More than 25% of our nation's electricity consumers receive their energy from public power

TVA Governance

- Corporate Agency of the United States, receives no tax dollars / self financing
- Nine-member Board of Directors, nominated by the President, confirmed by the Senate
- CEO, appointed by the TVA Board
- RERC provides advice to the TVA Board



TVA's Service Territory



TVA provides electricity through:

154
local power companies

57
directly served customers

9 Million
residents

7
states

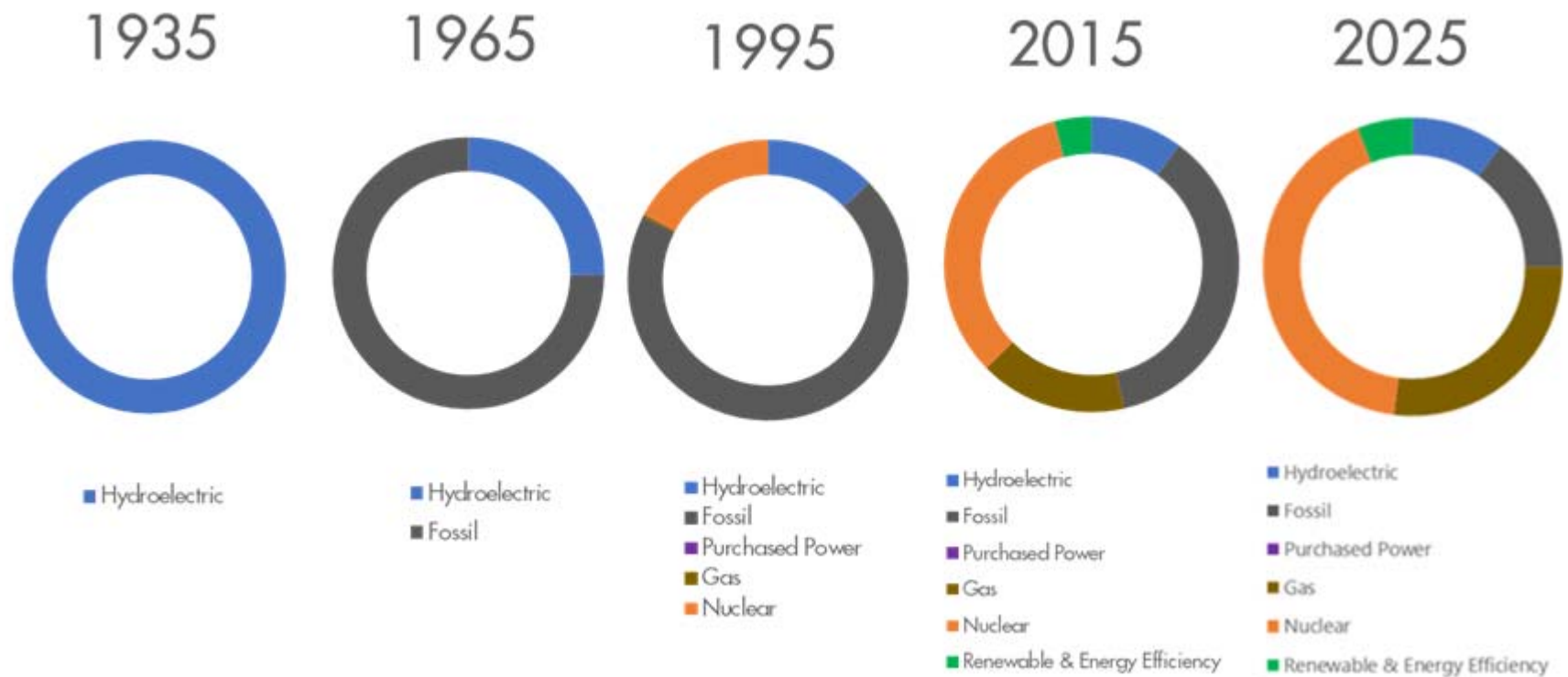
80,000
square miles

Our Transmission System

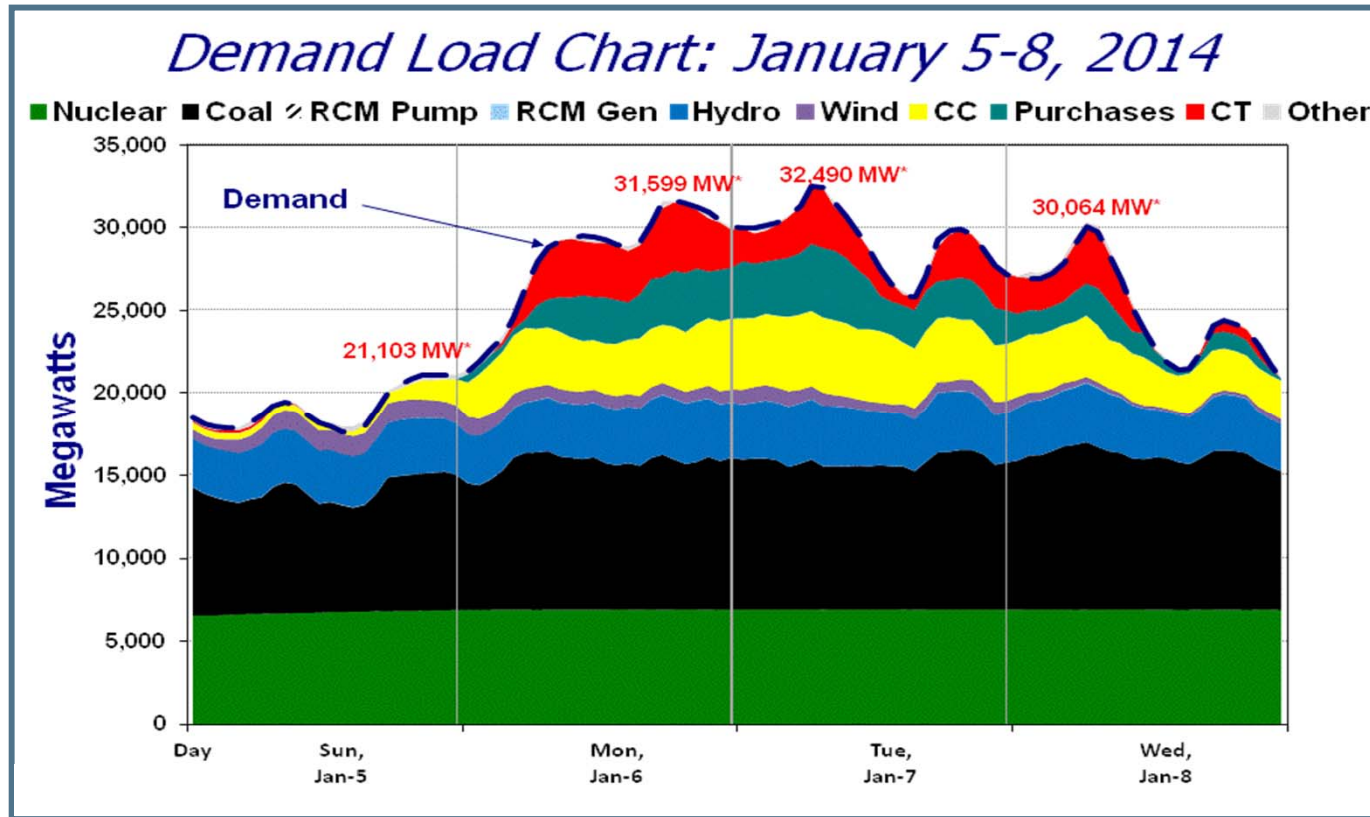


- **99.999** reliability for 18 years
- More than **16,000** circuit miles of transmission line
- Over **400** substations and switchyards (100-kV and above)
- Over **104,000** transmission structures on **236,000** right-of-way acres
- Over **1,200** customer connection points (includes generators and neighboring systems)
- **2** fully-operational Control Centers

Generation Over the Decades



Obligation to Serve the Extremes

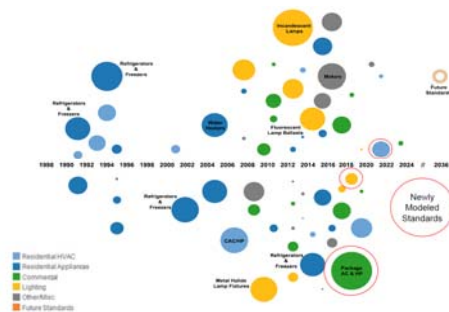


2019 IRP: Why Now?

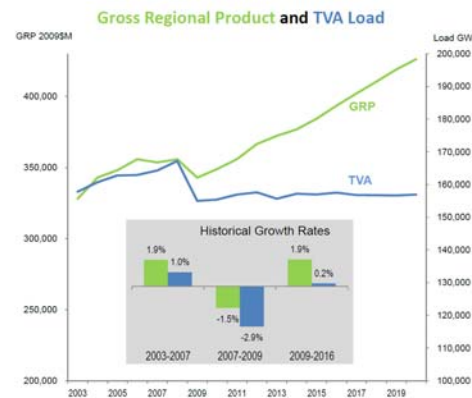
- Proactively plan for the future
- Inform next long-range financial plan
- How might TVA continue to:
 - Provide low-cost, reliable electricity
 - Support environmental stewardship
 - Spur economic development

Consumer behaviors and preferences are changing

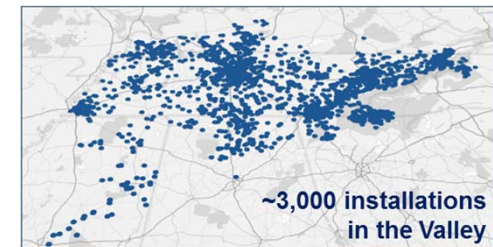
Energy efficiency
penetration continues



Load is declining despite
economic recovery



Renewables are becoming
more attractive



New installed capacity from renewable sources surpassed natural gas, nuclear power, coal and oil combined in 2016

Companies are committing to renewables



- Committed to 100% renewable electricity
- 87 companies to date



Stated Renewable Energy Goals

- Publicly stated renewable energy goals, but not RE100 commitment



- Committed to accelerating procurement of wind and utility-scale solar energy
- 160+ members

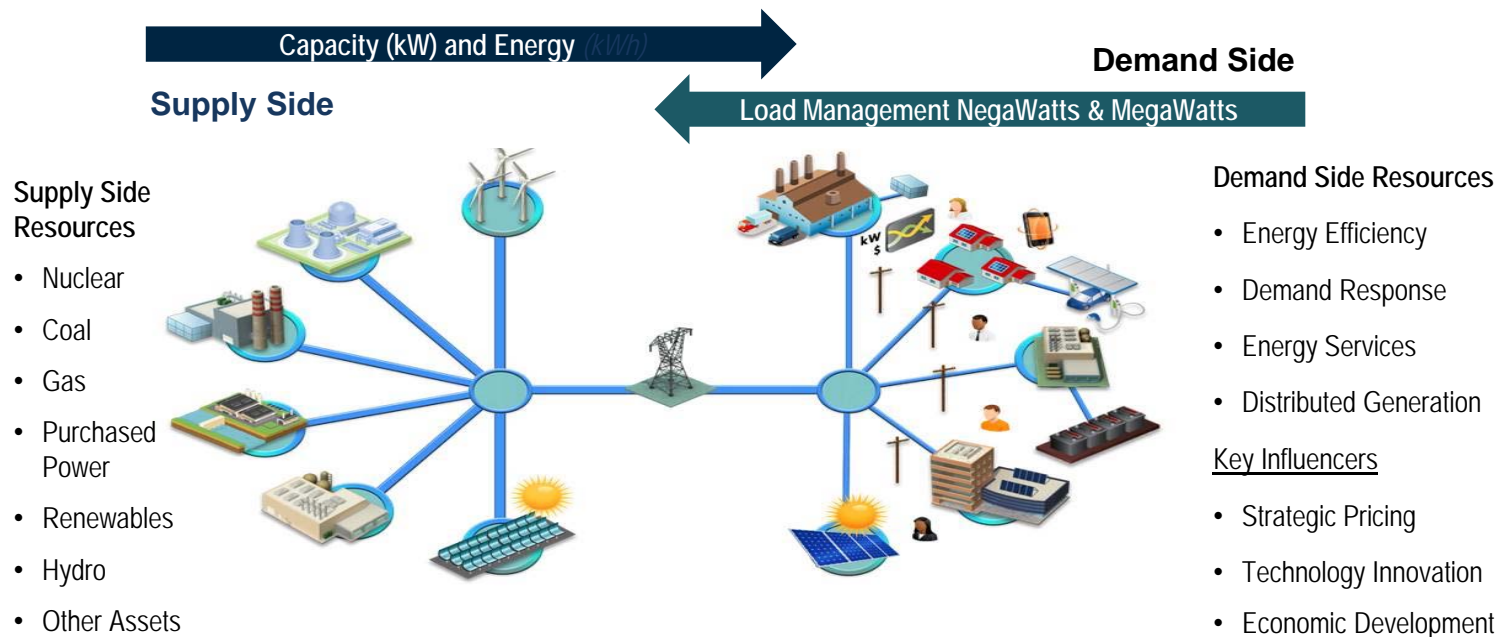


- Goal of growing corporate demand for renewables
- 58 signatures to date



“We intend to achieve this goal, with or without you.” – RE 100 member

Distributed Energy Resources (DER) introduces fundamental change





Resource Planning

Brian Child
Jane Elliott

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

Resource Planning Is About Solving Puzzles



By asking a lot of questions, like ...

How much energy will our customers use in the future?

What alternatives do we have to meet our resource needs?

Are there strategic considerations that will limit the alternatives we can consider?

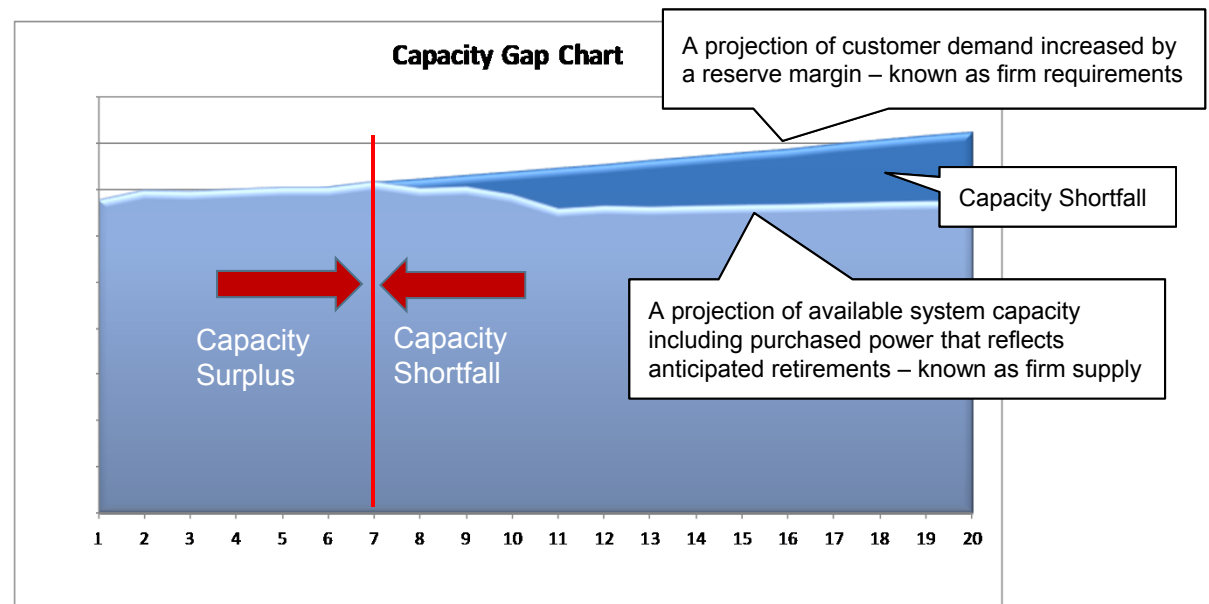
How do we properly evaluate these resource alternatives?

How do we find the best solution?

Resource Planning Addresses Future Capacity Needs

Resource planning is about optimizing the mix of future capacity.

Projections of capacity needed are filled by the most cost-effective resource.



Recommended path provides low cost, reliability, diversity and flexibility

Finding the Least Cost (Optimal) Resource Plan

- Using the reliability limit as a constraint, we optimize by minimizing the customer's delivered cost of power

Planning Objective Function:
**Minimize Expected Present Value of
Revenue Requirements**

Components

- Optimization
- Uncertainty
- Time value of money



Revenue Requirements

- Operating expenses
- Return of and on capital

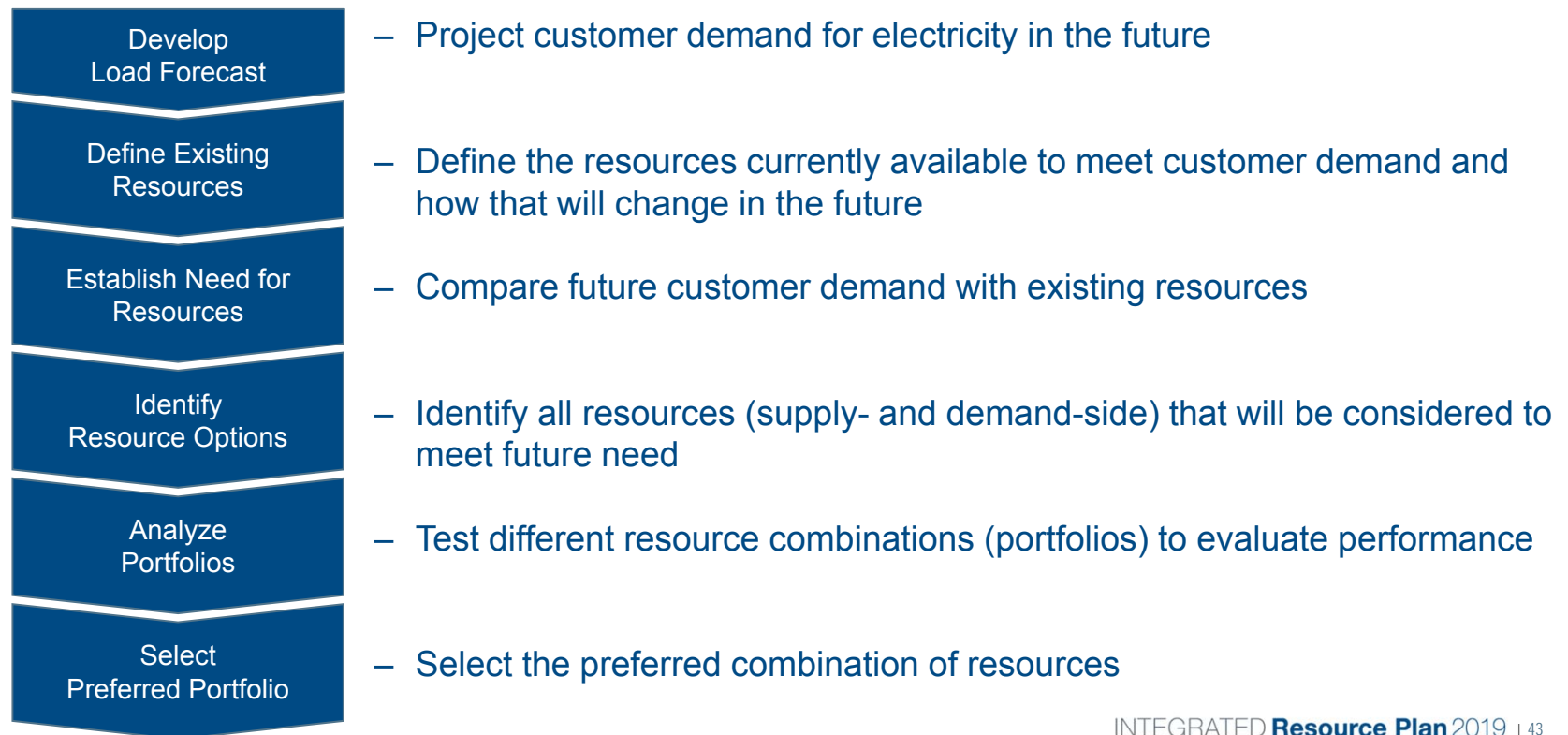
Constraints

- Planning reserve

Objective is to find the capacity mix that produces the minimum cost over the planning horizon

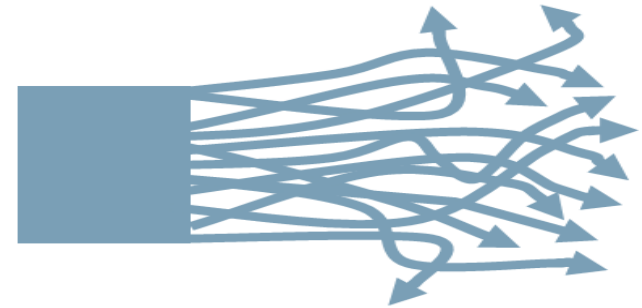
Developing a Resource Plan

Resource Planning is a common tool in the utility industry to identify the least cost solution to meet customer demand over a long horizon (usually 20 years)

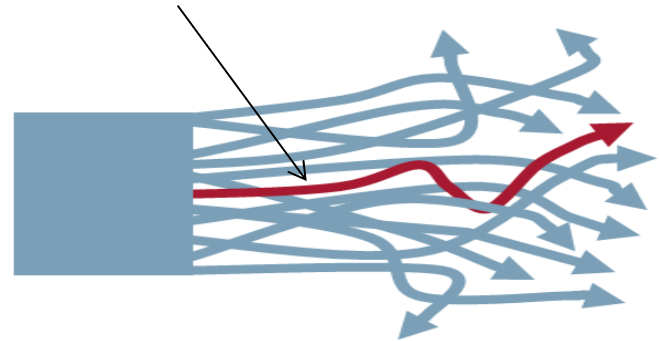


A Maze of Future Possible Paths

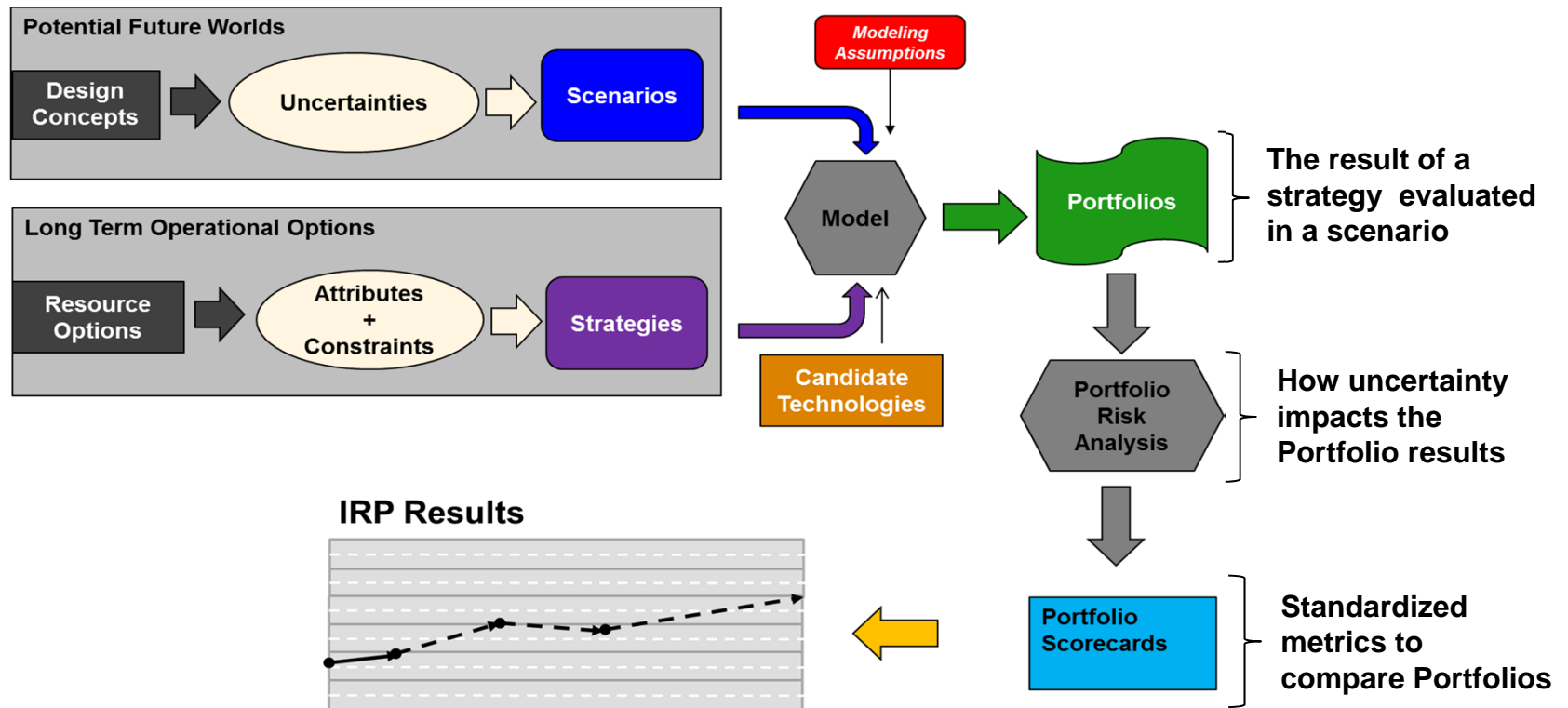
- Our industry faces rapid and unpredictable change, driven by:
 - Uncertain growth rates
 - Volatile regulatory future
 - Maturity of new generation technologies
 - Fluctuating fuel costs
 - Uncertainty over nuclear generation
 - Growth of distributed energy resources
- Drivers interact and new drivers may emerge that can change the future path
- Considering only the most likely path is risky
- Commitment to a single forecast could discourage strategic thinking and ignore significant business risks



Adopting this single path forward could be the right choice, but if the future evolves along one of the other paths, we will be locked in with few alternatives



How Integrated Resource Planning Works



Scenarios and Strategies Establish Framework

Scenarios

Outside TVA's Control

- Describe potential outcomes of factors (uncertainties) outside of TVA's control
- Represent possible conditions and are not predictions of the future
- Include uncertainties that could significantly impact operations, such as:
 - Load forecasts
 - Commodity prices
 - Environmental regulations
- Lends insight to riskiness of portfolio choices

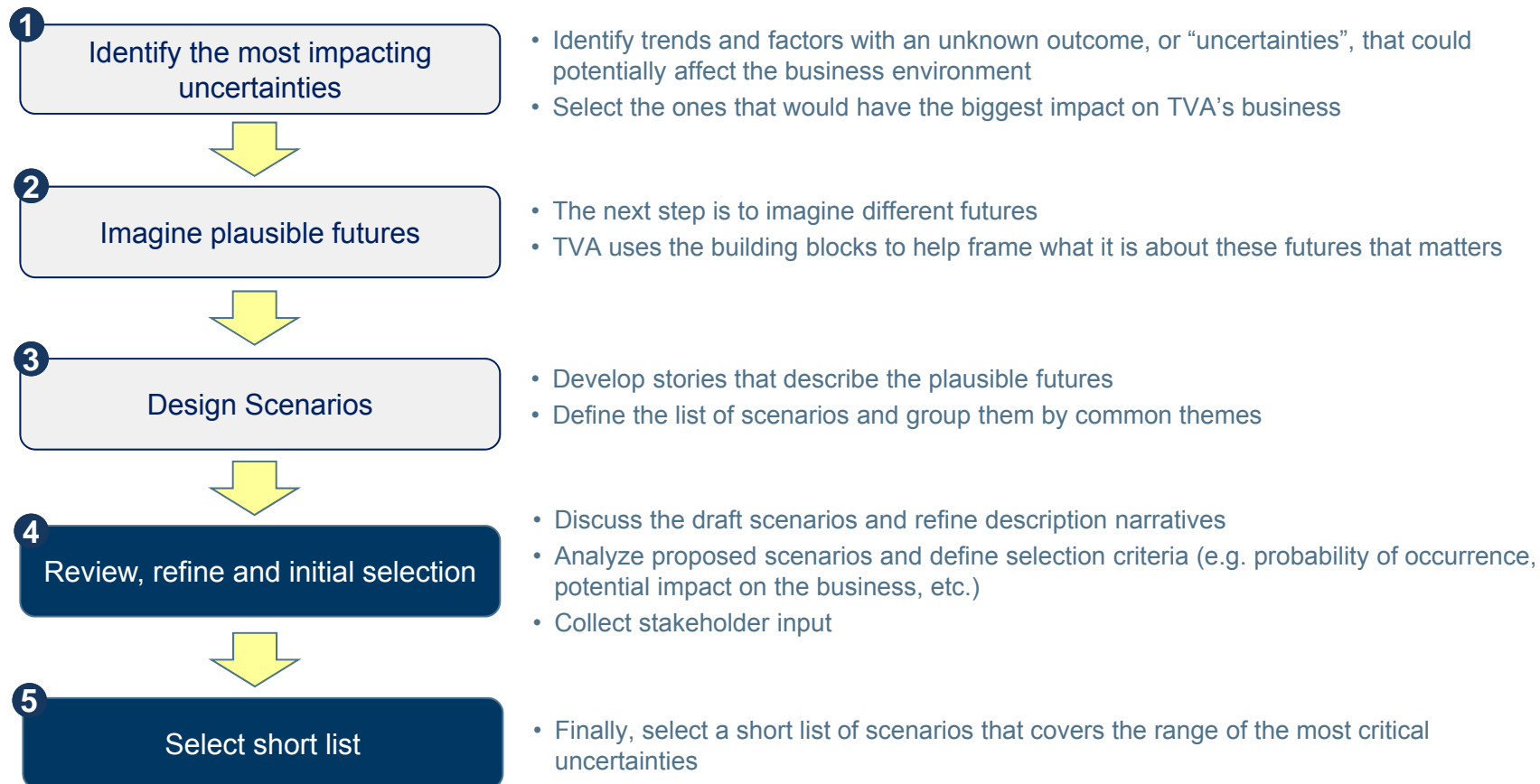
Strategies

Within TVA's Control

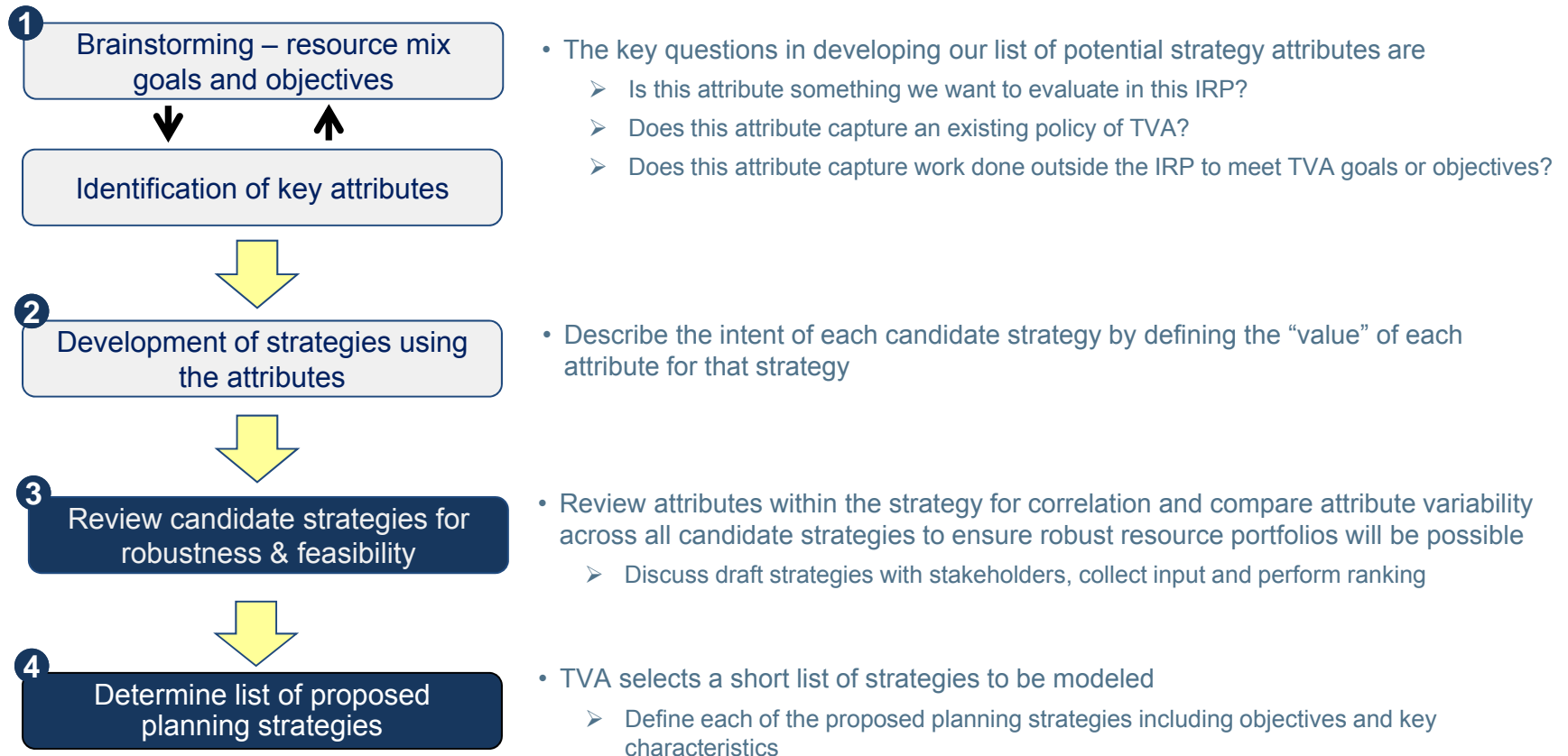
- Test various business options within TVA's control
- Defined by a combination of resource assumptions, such as:
 - DER portfolio
 - Nuclear expansion
 - Energy storage
- Consider multiple viewpoints
 - Public scoping period comments
 - Assumptions that would have the greatest impact on TVA long-term

A well-designed strategy will perform well in many possible scenarios

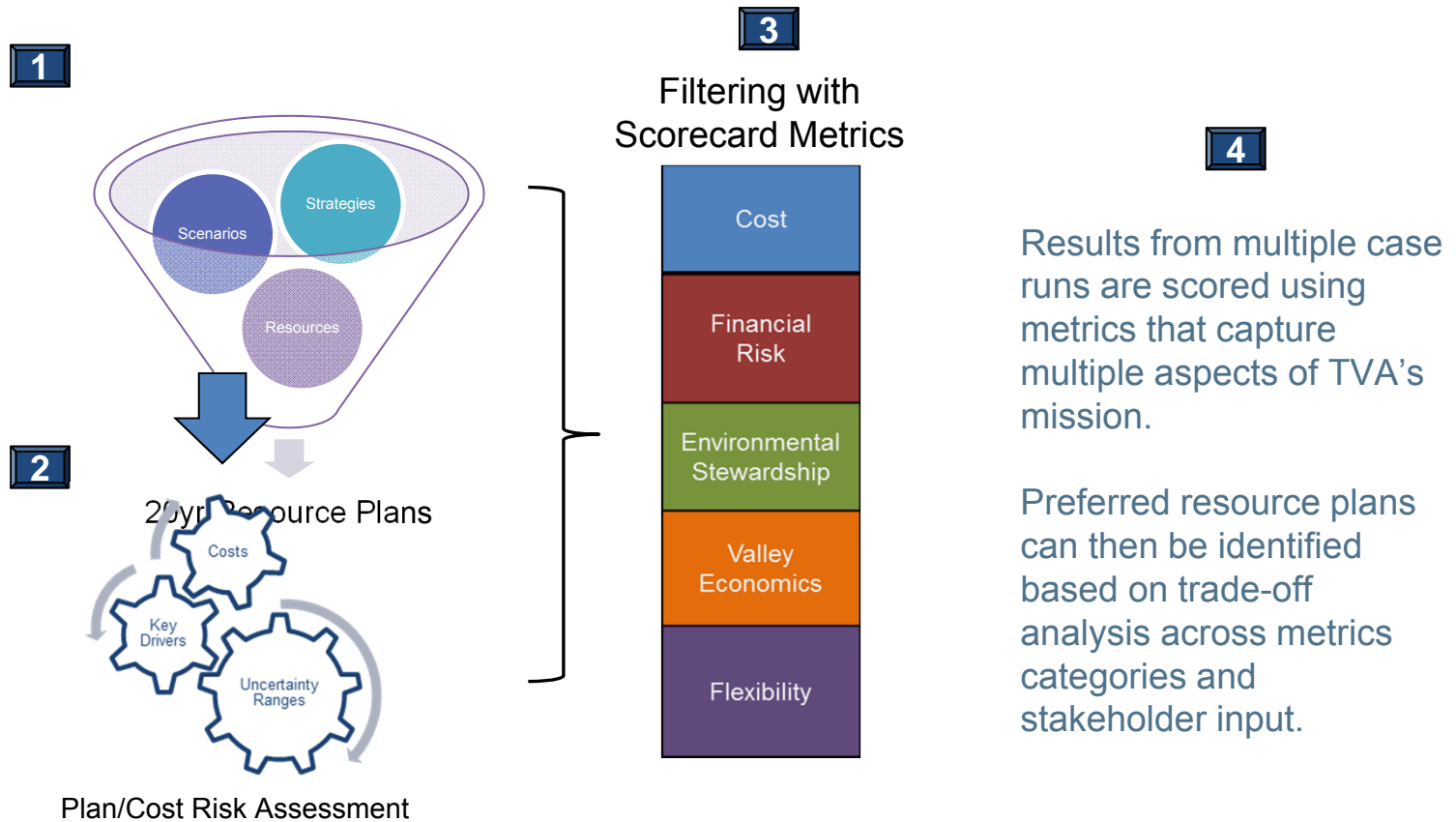
TVA's Process for Building Scenarios



TVA's Process for Building Strategies



Portfolio Metrics & Tradeoffs Inform Recommendation





Lunch





Environmental Review

Ashley Pilakowski
Environmental Compliance and Operations



IRP Environmental Impact Statement - Purpose and Approach

- National Environmental Policy Act (NEPA)
- Analyze alternatives (resource strategies)
- Inform decision makers of potential impacts
- Public involvement
- Determine environmental impacts system-wide
- Subsequent site-specific studies



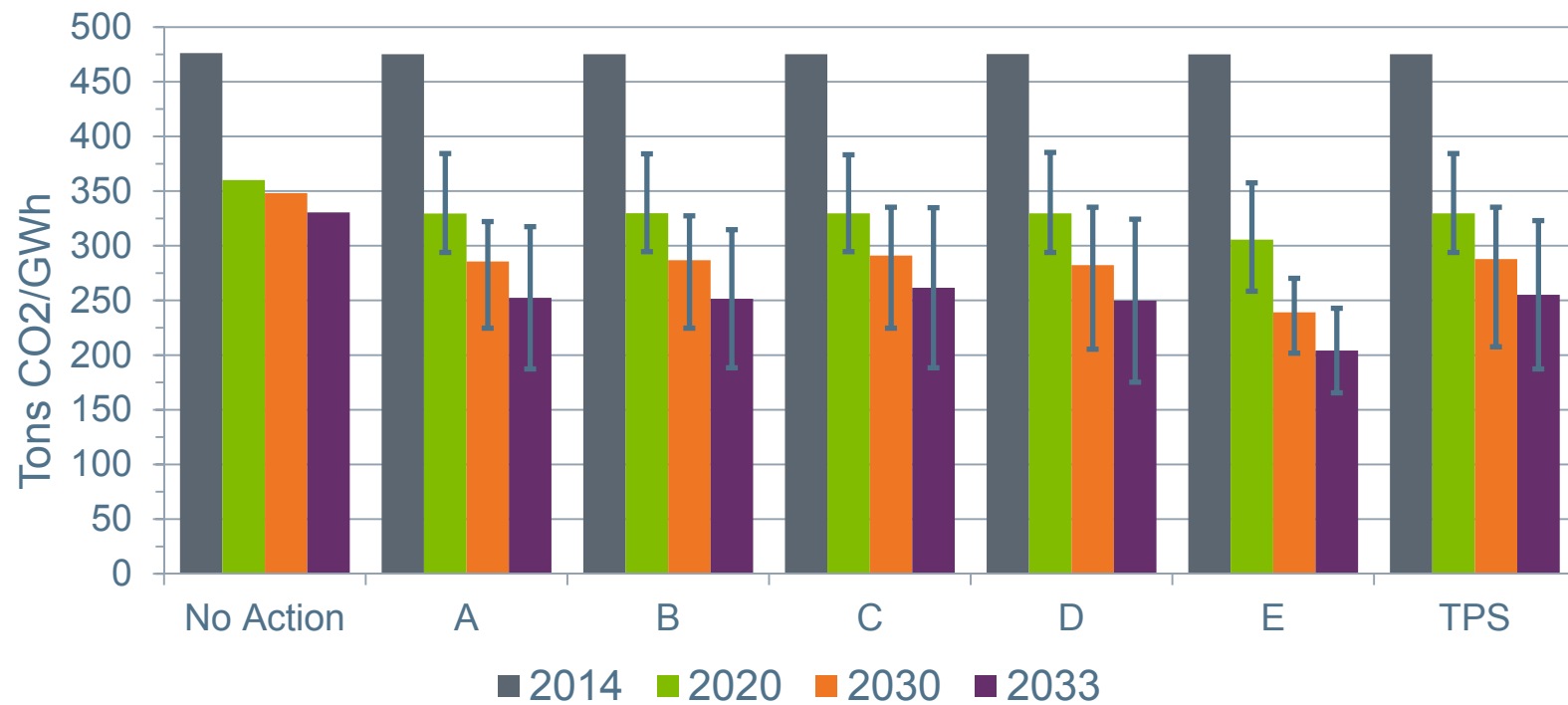
Analyze Key Environmental Factors

The EIS will assess broad region-wide impacts of a new IRP on environmental factors such as:

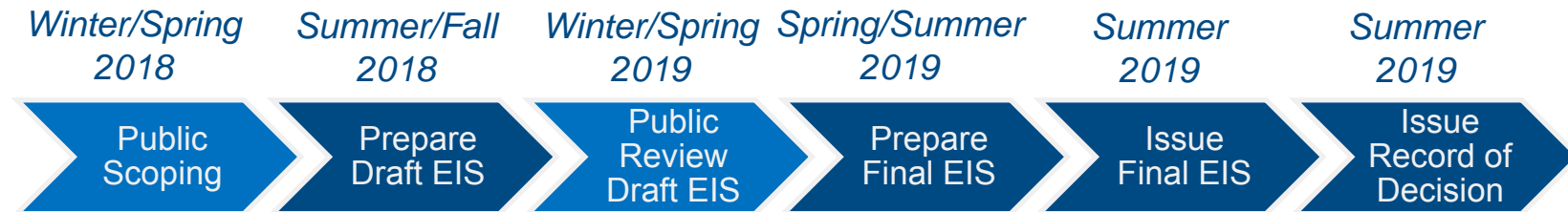
- Air quality
- Water resources
- Fuel requirements
- Waste production
- Land requirements
- Socioeconomics and environmental justice

Example IRP EIS Analysis

Annual CO₂ Emissions Rate by Strategy



Environmental Impact Statement Schedule





Overview of the 2015 IRP

Brian Child

2015 IRP Summary Recommendation



More . . .

- Energy efficiency & demand response
- Natural gas
- Renewables
- Nuclear uprates



- Less coal
- No new base load in the planning horizon after Watt Bar Unit 2 and nuclear uprates

TVA will provide reliable, affordable and sustainable power & strive for economic growth in the Valley

Integrated Resource Plan

2015 FINAL REPORT



TENNESSEE VALLEY AUTHORITY



2015 IRP Major Assumptions

- Scenario planning approach (also used in the 2011 study) included range of plausible futures and uncertainties
- A diverse set of resource options were available for selection
- Strategies were developed to answer some key questions about:
 - Minimizing emissions
 - Market reliance vs. building assets
 - Promoting a greater commitment to EE
 - Increasing the contribution of renewables in the mix



2015 IRP Enhancements

- Energy efficiency as a resource represented by unique modeling solution
- Worked collaboratively with stakeholders to develop unit characteristics for multiple wind and solar options
- Solar, wind, energy efficiency and demand response treated as selectable resource options in the models

2015 IRP Scenarios and Strategies

Scenarios *(Outside TVA's Control)*

1 - Current Outlook

2 - Stagnant Economy

3 - Growth Economy

4 - De-Carbonized Future

5 - Distributed Marketplace

Strategies *(Within TVA's Control)*

A - The Reference Plan

B - Meet an Emissions Target

C – Focus on Long-Term,
Market-Supplied Resources

D - Maximize Energy Efficiency

E - Maximize Renewables

Metrics Used to Evaluate Portfolio Performance



Cost includes both the long-range cost of the resource plan (present value of customer costs) as well as a look at short term average system cost (an indicator of possible rate pressure)

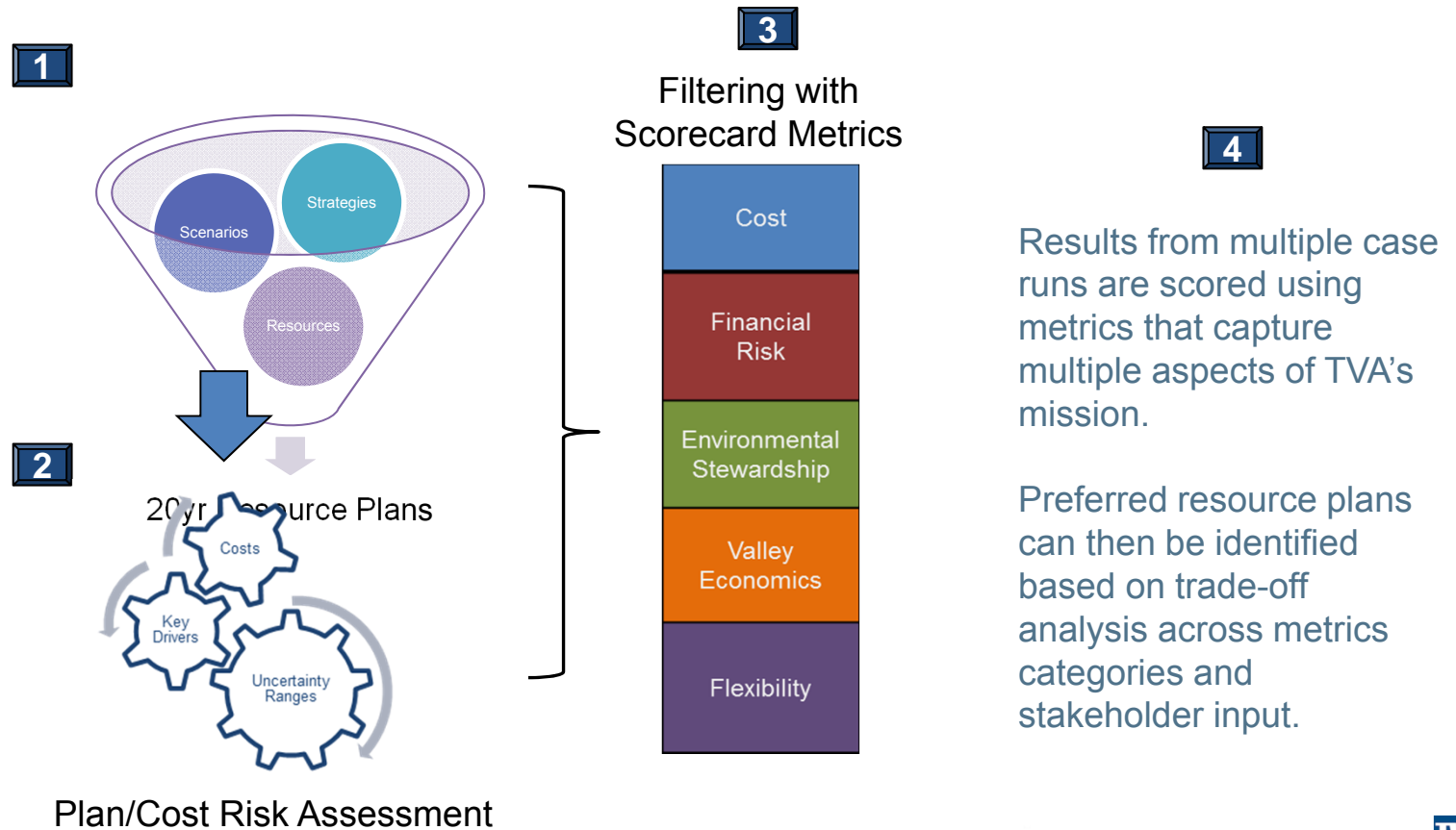
Financial Risk measures the variation (uncertainty) around the cost of the resource plan by assessing a risk/benefit ratio and computing the likely amount of cost at risk; both of these indicators use data from probability modeling

Stewardship captures multiple measures related to the environmental “footprint” of the resource plans, like air emissions and thermal loading impacts

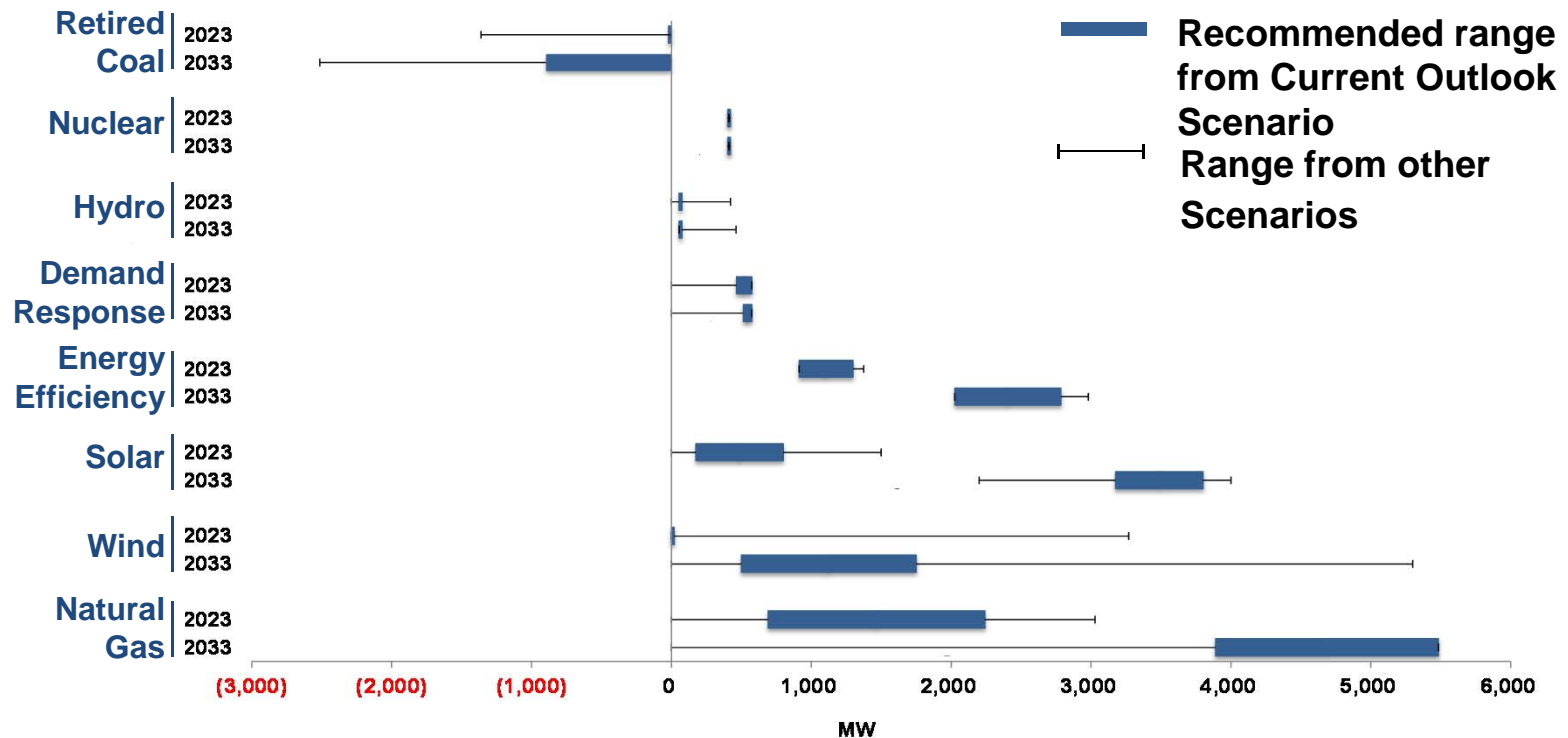
Valley Economics computes the macro-economic effects of the resource plans by measuring the change in per capita income compared to a reference case

Flexibility is a measure of how responsive the generation portfolio of each resource plan is by evaluating the type/quantity of resources and the extent to which this mix can easily follow load swings

2015 IRP Framework: Analyze, Review, Recommend



2015 IRP Recommendation



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



Break





2019 IRP Process and Schedule

Brian Child

2019 IRP Focus Areas

- Distributed Energy Resources
- System flexibility
- Portfolio diversity



Defining the IRP

The IRP Will:

- Use least-cost planning criteria
- Incorporate resource capital and operating costs, fuel costs
- Include Valley economics as key criteria to evaluate strategies
- Evaluate socioeconomic impacts of alternative strategies
- Attempt to understand the speed of DER penetration in the Valley

The IRP Will Not:

- Establish wholesale or retail electricity rates
- Identify specific sites for new resources
- Be a Distributed Integrated Resource Plan (DIRP)

IRP is a Public Process – Stakeholder Engagement is Important

- IRP Working Group
- Regional Energy Resource Council
- Public meetings, webinars, listening sessions

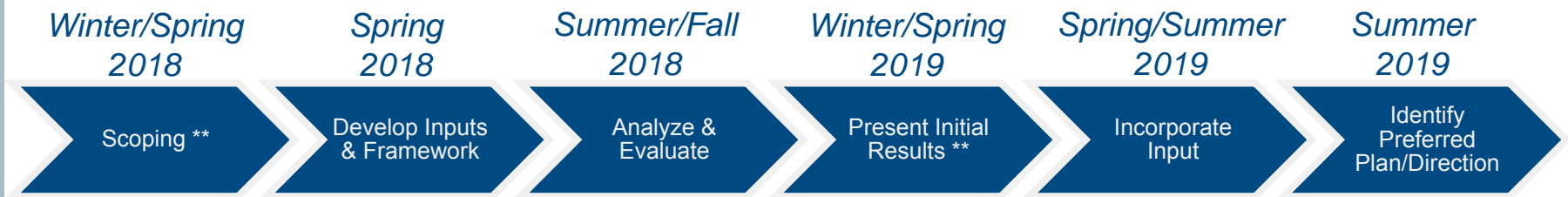


What is Public Scoping?

- TVA periodically updates its power generation strategy. The first step is to understand the environment we're planning in. We call this scoping.
- We ask the general public, our customers, and our partners and regulators about their concerns regarding the sources we use to generate power, how we manage demand and how we deliver power.
- With this information, we develop candidate resource plans that are evaluated for viability, socio-economic and environmental impact.

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)
- Initial modeling (June 2018)
- Publish draft EIS and IRP (Feb 2019)
- Complete public meetings (April 2019)
- Board approval and final publication of EIS and IRP (expected Summer 2019)



Objectives for Upcoming Meetings

- Review planning assumptions
- Review resource options
- Review and rank candidate scenarios
- Review and rank candidate strategies



Questions, Discussion & Review of Action Items

