



Regional Energy Resource Council

June 14, 2018
Chattanooga, Tennessee



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

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 Snavelly

Commonwealth of Kentucky

John Warren

Commonwealth of Virginia

Lloyd Webb

Olin Chlor Alkali

Susan R. Williams

SRW & Associates

*RERC Chair

** Administrative approval in process

Safety Moment



Building Emergency Plan

Introductions



- Name
- Organization and Role
- A favorite vacation spot or activity



Agenda and Meeting Protocols

Agenda – June 14, 2018

8:30	DFO and RERC Chair Welcome	Dr. Joe Hoagland/ Designated Federal Officer (DFO) Dr. Wayne Davis, RERC Chair
8:40	Introductions	Jo Anne Lavender, Facilitator and Council Members
8:50	FACA / RERC Orientation	Khurshid Mehta, Office of the General Counsel
8:55	Meeting Purpose / DFO Briefing	Hoagland, Vice President, Enterprise Relations and Innovation
9:10	The 2019 IRP	Brian Child, Director, Enterprise Forecasting and Financial Planning Ashley Pilakowski, NEPA Specialist III
9:45	<i>Break</i>	
10:00	Intro to IRP Focus Areas	Child
10:10	IRP Focus Area 1: System Flexibility IRP Focus Area 2: Distributed Energy Resources	Aaron Melda, Vice President, Transmission Operations & Power Supply Dr. Joe Hoagland
11:00	<i>Break</i>	
11:10	IRP Focus Area 3: Portfolio Diversity	Melanie Farrell, Director, Resource Planning and Strategy
11:45	Lunch	
12:40	Public Engagement in the IRP	Amy Henry, Sr. Manager, Enterprise Relations & Strategic Partnerships
1:00	Public Comment Session	Lavender, and Council Members
2:10	RERC Discussion	Lavender, and Council Members
2:45	Break	Lavender, and Council Members
3:00	Form Advice Statement	Lavender, and Council Members
3:30	Wrap up and Adjourn	Davis / Hoagland/ Lavender

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



The Federal Advisory Committee Act
and
The Regional Energy Resource Council

FACA Briefing—Third Term
Khurshid Mehta, Attorney
Office of General Counsel

Historical Background on Advisory Committees

- ❖ Growth in advisory committees occurred after WWII
- ❖ Congressional concerns:
 - Proliferation of committees
 - Domination by special interest groups
 - Lack of transparency and accountability
 - Waste of federal funds

Federal Advisory Committee Act of 1972

- ❖ U.S. Congress formally recognized the merits of seeking advice and assistance
- ❖ The Act assures that advisory committees provide advice that is relevant, objective and open to the public, and comply with record keeping requirements

Key Elements of the Federal Advisory Committee Act

Public access and transparency

- ❖ Meetings (reasonably accessible and timely notice required—generally open to the public)
- ❖ Records (available for public inspection, subject to limitations)

Structured management

- ❖ Filed charters
- ❖ Expiration after two years
- ❖ Attendance of a federal officer

Advisory Committees Today

- ❖ Play an important role in shaping programs and policies of the federal government
- ❖ Approximately 1000 committees with more than 60,000 members
- ❖ Advise the President of the United States and the executive branch
- ❖ Subject to FACA and General Services Administration (GSA) Regulations

TVA's Regional Energy Resource Council

- ❖ Created by TVA in 2013 “to provide advice on its energy resource activities and the priorities among competing objectives and values”
- ❖ TVA's energy resource activities include:
 - Constructing and operating various supply-side resources, including fossil-fueled power plants, nuclear plants, hydroelectric dams, and renewable resources
 - The development and management of demand-side resources, including energy efficiency
 - The design, construction, and operation of power delivery systems
 - The integration of all of these energy resources into plans for meeting future demands for electricity in the TVA region

Key Provisions of RERC Charter

- ❖ Council provides advice only
 - Advice reported to the TVA Board's External Relations Committee
- ❖ Term of Council is two years
 - Third term expires July 31, 2019
- ❖ Approximately two meetings per year
- ❖ Designated Federal Officer (DFO): Joe Hoagland, Vice President, Enterprise Relations and Innovation
- ❖ Balanced Membership



DFO Update

Joe Hoagland, Designated Federal Officer

Recap Term 3 Meetings and TVA Update

- 2 Meetings held for Term 3
 - November 29 and 30, 2017
 - December 22, 2017 (Webinar)
 - Advice provided on:
 - > The principles that TVA should consider when designing wholesale rate changes and
 - > Mechanisms to use to engage Valley stakeholders when making those changes
- TVA Updates

Today's Meeting Purpose

- Provide informational topics on the 2019 Integrated Resource Plan
 - Focus Areas
 - Outreach and Engagement
- Provide TVA Updates
- Host a Public Listening Session
- Obtain Advice
 - On the Focus Areas for the 2019 IRP



The 2019 IRP

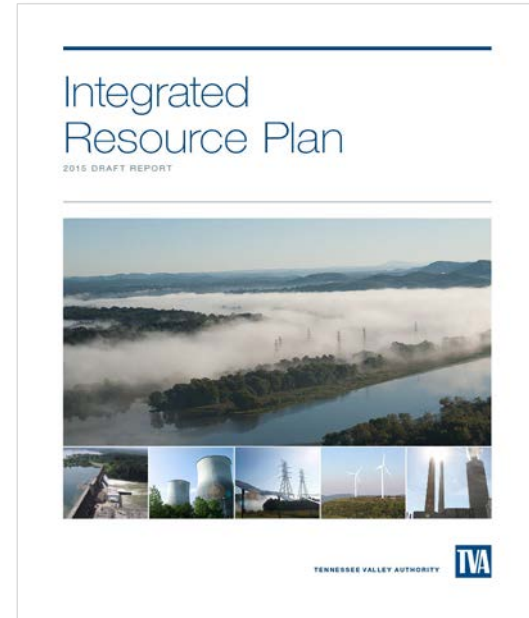
Brian Child

Director, Enterprise Forecasting and Financial Planning

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.



Utility Marketplace is Changing Rapidly

An updated Integrated Resource Plan is needed:

- 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

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

2015 IRP Summary Recommendation



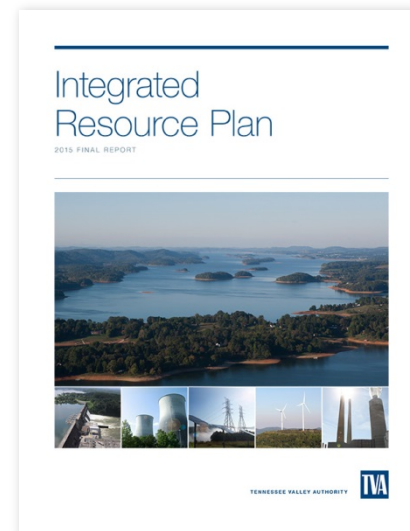
More . . .

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



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

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



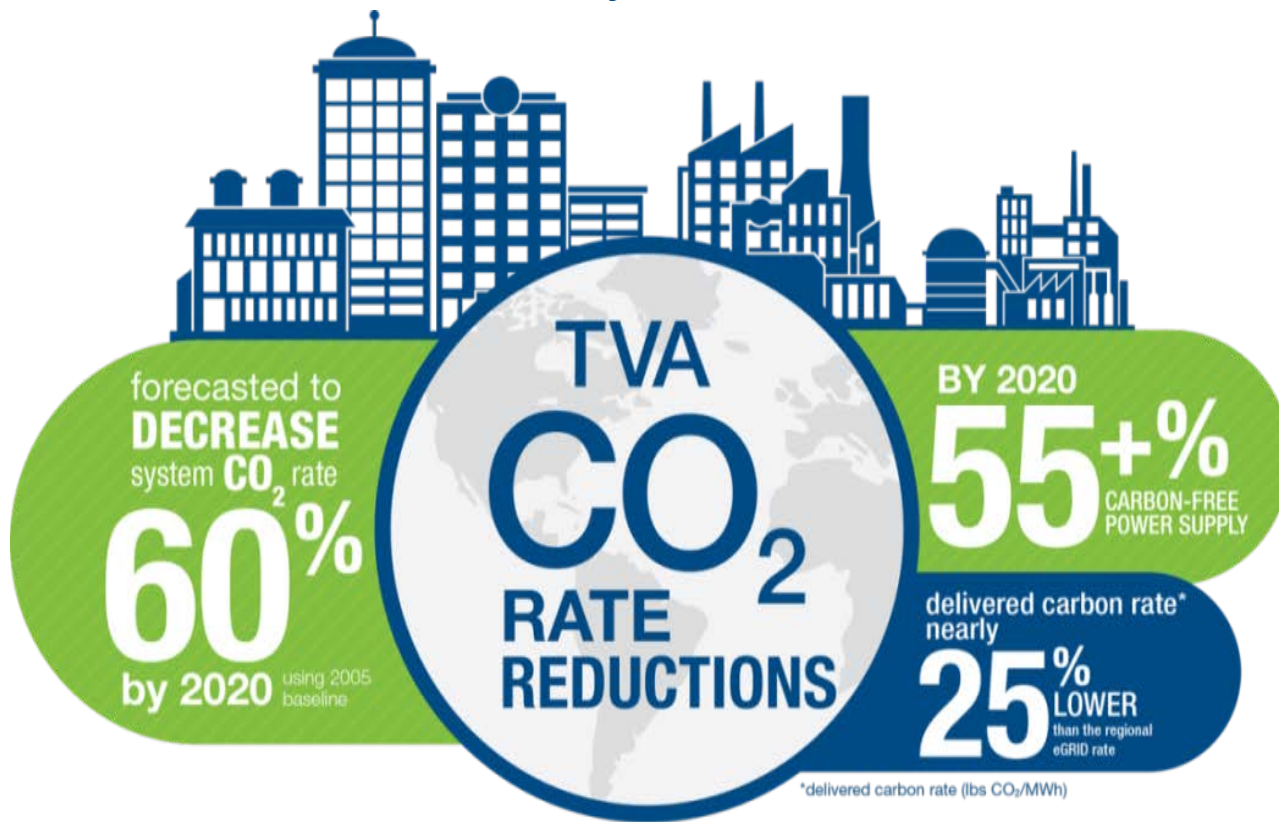
Our Current Portfolio



Hydro	Nuclear	Renewables	EEDR	Gas	Coal
4,200 MW conventional	7,800 MW	1,200 MW wind	1,300 MW avoided capacity	5,800 MW CT and diesels	8,400 MW
1,600 MW pumped storage		130 MW utility-scale solar		8,100 MW CC	
		250 MW programmatic solar/biomass			

Approximately 42 percent of TVA's capacity is emission-free

TVA's Carbon Story



Goals for an Optimal Resource Plan

Low Cost

Risk Informed

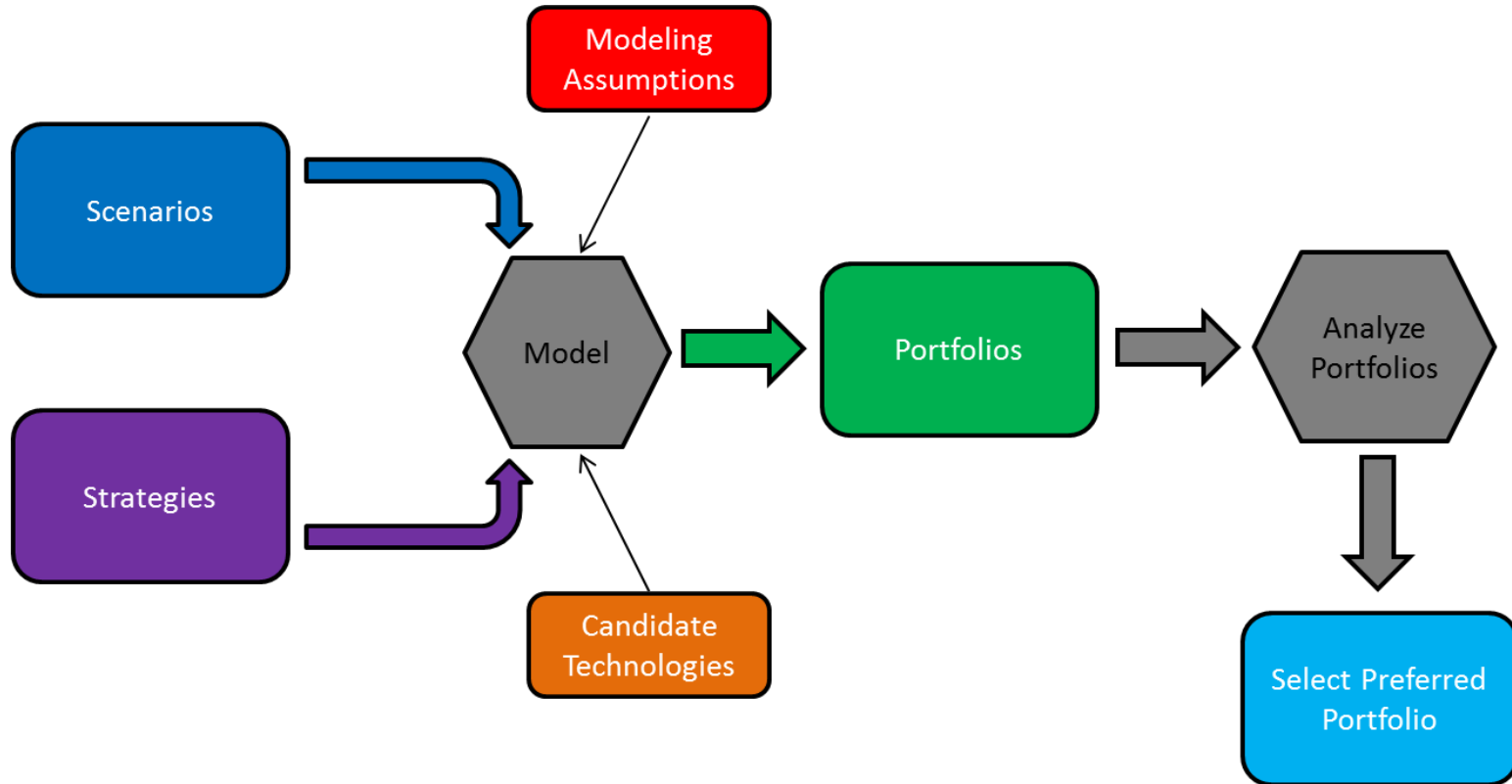
Environmentally
Responsible

Reliable

Diverse

Flexible

How the Resource Planning Process Works





IRP Programmatic Environmental Impact Statement (EIS) and Public Scoping Summary

Ashley Pilakowski
NEPA Specialist III

IRP Environmental Impact Statement - Purpose and Approach

- Determine environmental impacts system-wide
- Inform decision makers of potential impacts
- Provide public involvement

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

The Purpose of Public Scoping

Scoping is a process to help define how the IRP study will be done with help from the general public, TVA customers, organizations and agencies.



Topics included:

- An overview of the IRP Process
- Schedule for 2019 IRP study
- Overview of the environmental impact assessment method



Results

Results are used to define:

- The sources TVA will use to generate power
- How TVA will manage the demand for power
- The important environmental topics to be evaluated

2019 IRP Public Scoping: Effort and Responses

Scoping period: 2/15/2018 to 04/16/2018



Efforts

7 media outlets

2,500 scoping notices

3 meetings



Responses

120 attendees

87 scoping comments received

Major themes

Encouragement of clean energy initiatives, renewable energy, R&D on DERs

Call for special attention to environmental justice/ affected environment analyses on impacts to limited income households

General interest in energy efficiency measures and energy storage alternatives

General input on modeling, metrics/ calculations and evaluation criteria

General comments on fuel diversification options

Next Steps

- TVA is compiling a report summarizing the scoping input.
- The scoping report will describe how TVA is responding to scoping input during the development of the IRP and the EIS.
- The scoping report will also describe scenarios, strategies, and energy resources being carried forward in the IRP and IRP EIS analysis.
- The scoping report is scheduled for posting to the IRP website in early August 2018.



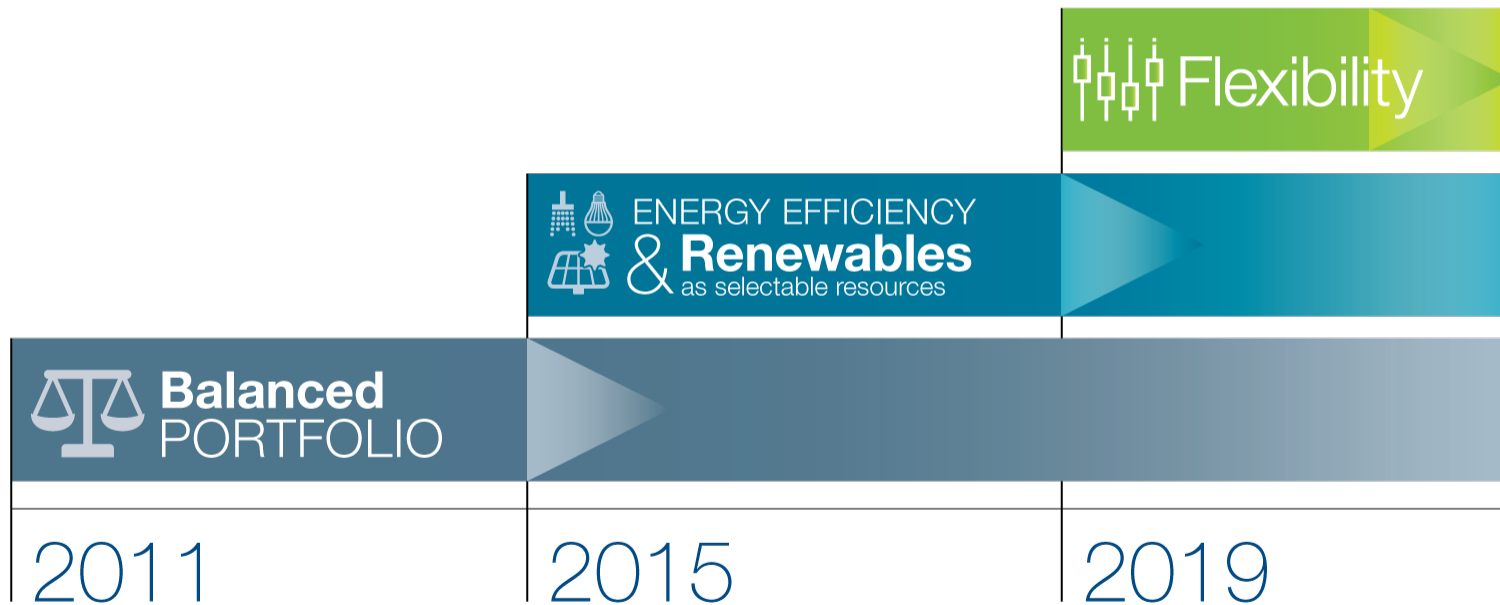


Introduction to IRP Focus Areas

Brian Child

Director, Enterprise Forecasting and Financial Planning

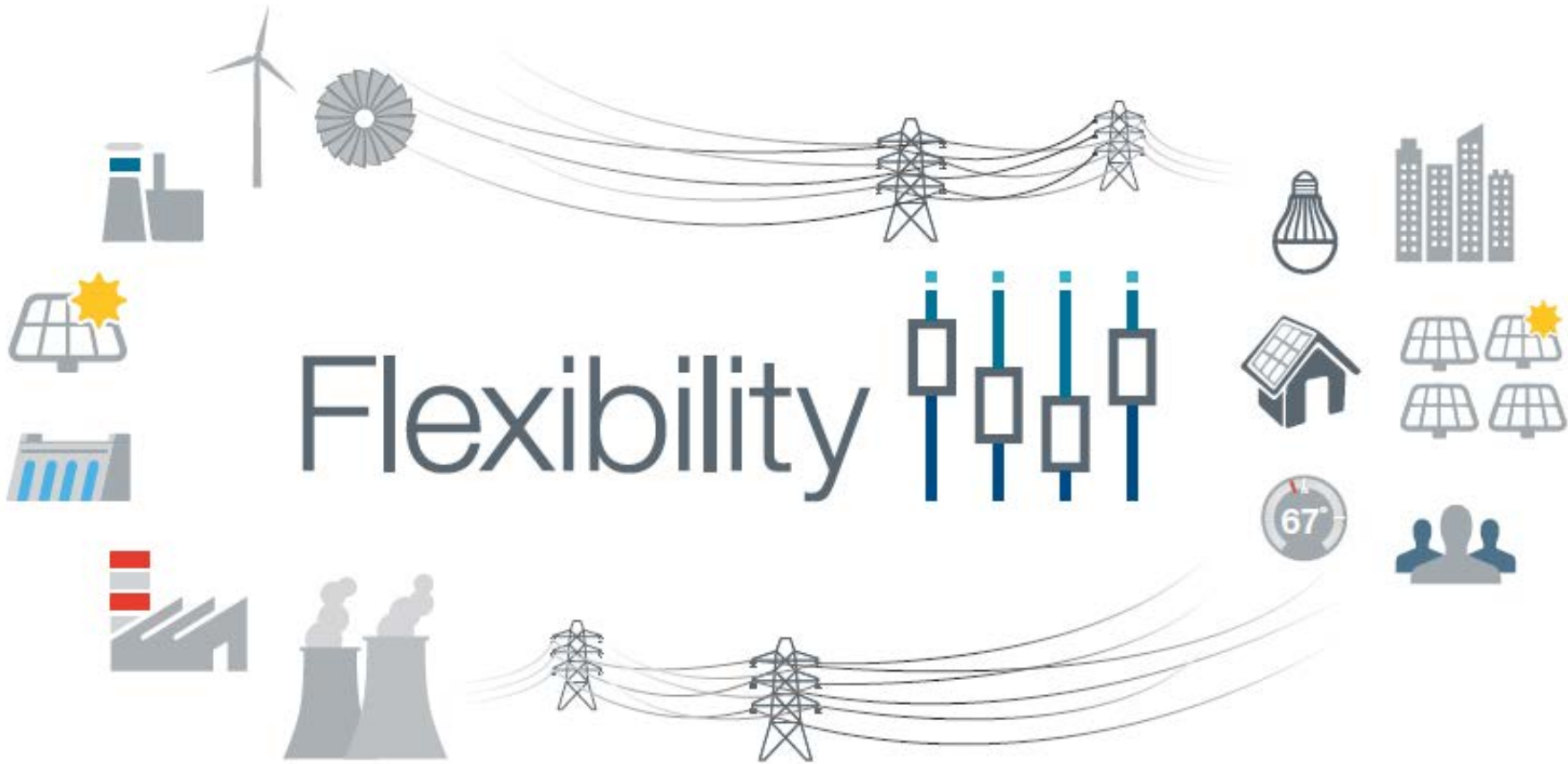
INTEGRATED Resource Plan 2019



2019 IRP Focus Areas

- Distributed Energy Resources
- System flexibility
- Portfolio diversity





Flexibility





IRP Focus Area: System Flexibility

Aaron Melda

Vice President, Transmission Operations and Power Supply

TVA Transmission Overview

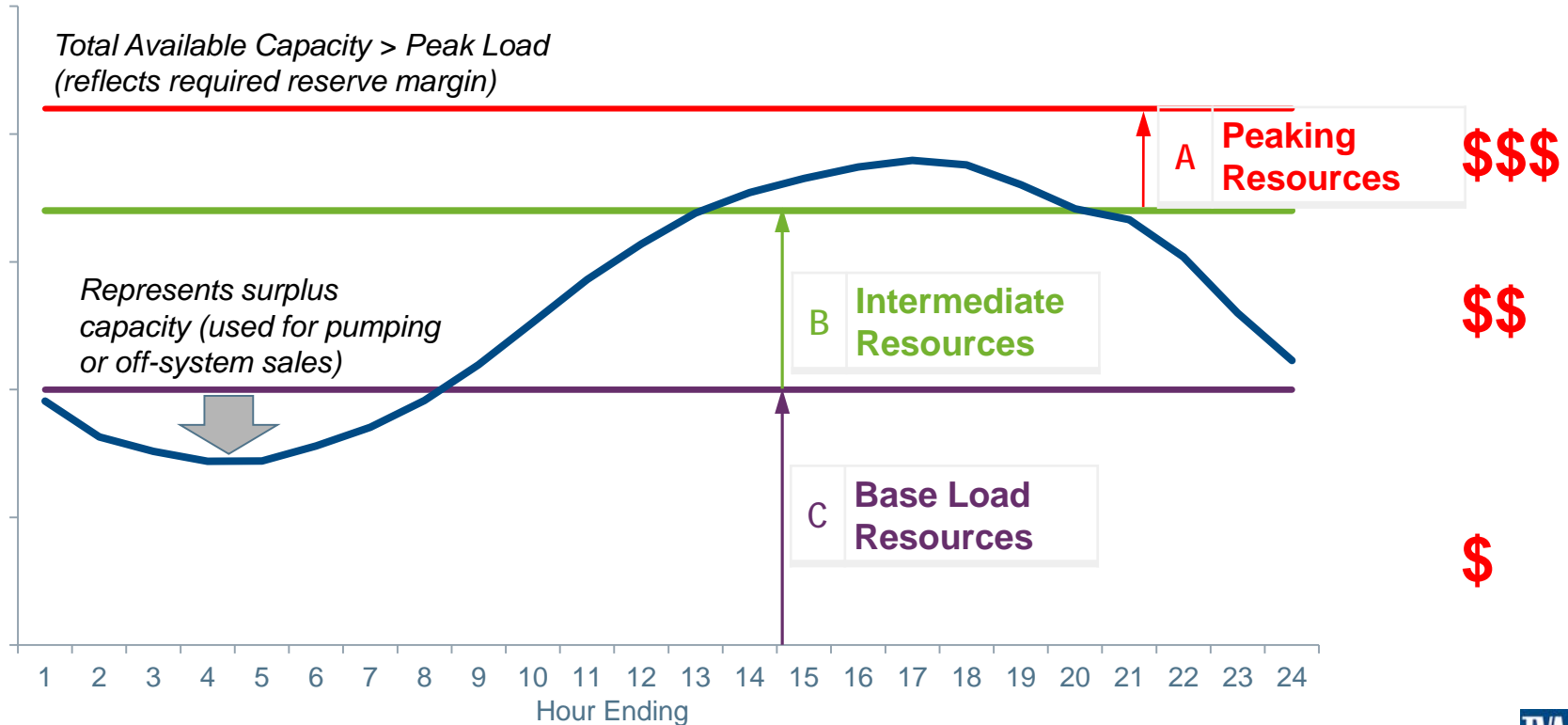
TVA plans, designs, builds, operates and maintains its transmission system to move megawatts in a safe, reliable, compliant and cost-effective manner.



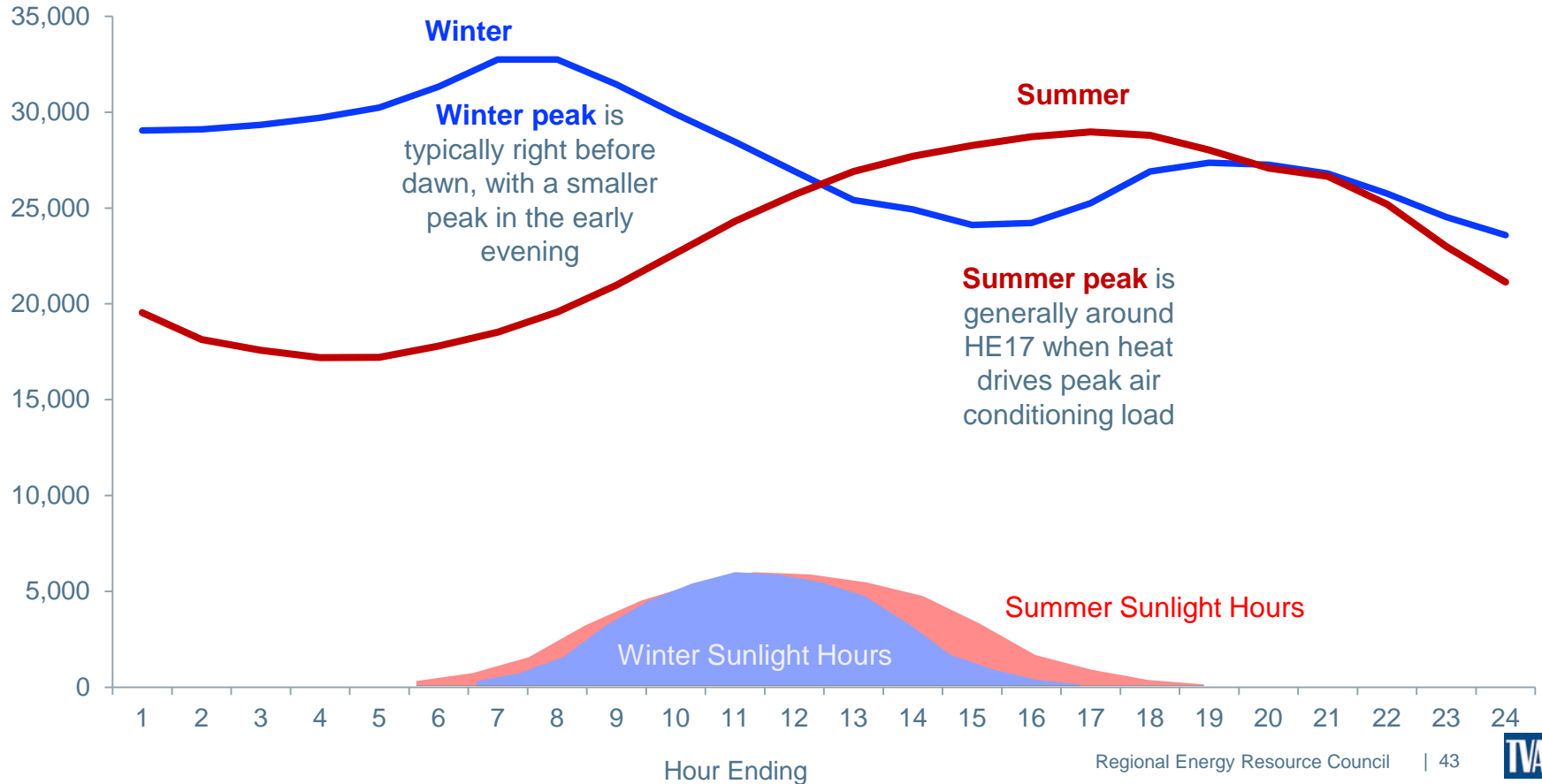
- Over **16,000** miles of transmission lines
- Over **509** substations and switchyards
- Over **104,000** transmission structures
- Over **1,200** customer connection points (includes customer delivery points, generators, and neighboring systems)
- **57** Direct Served Customers
- **154** Local Power Companies

Understanding Resource Needs

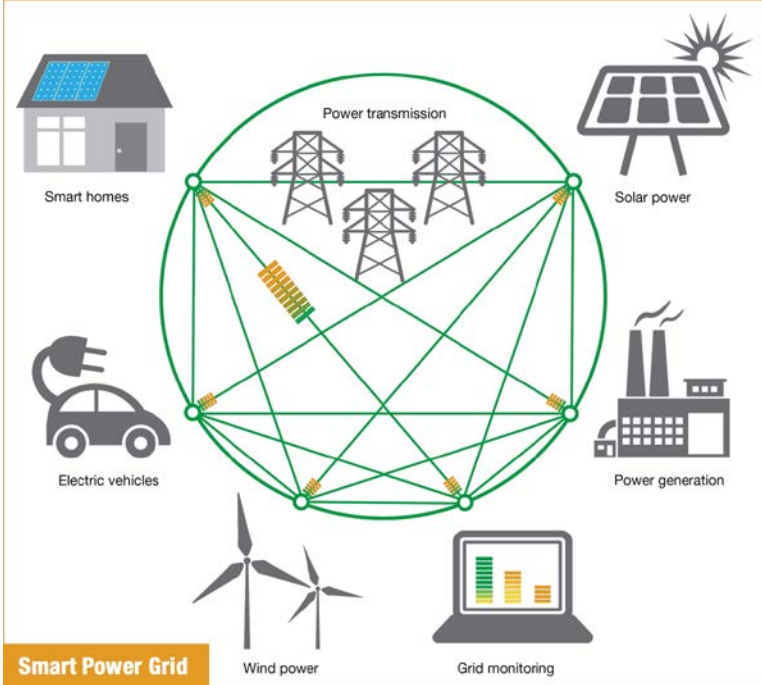
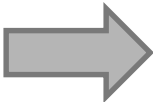
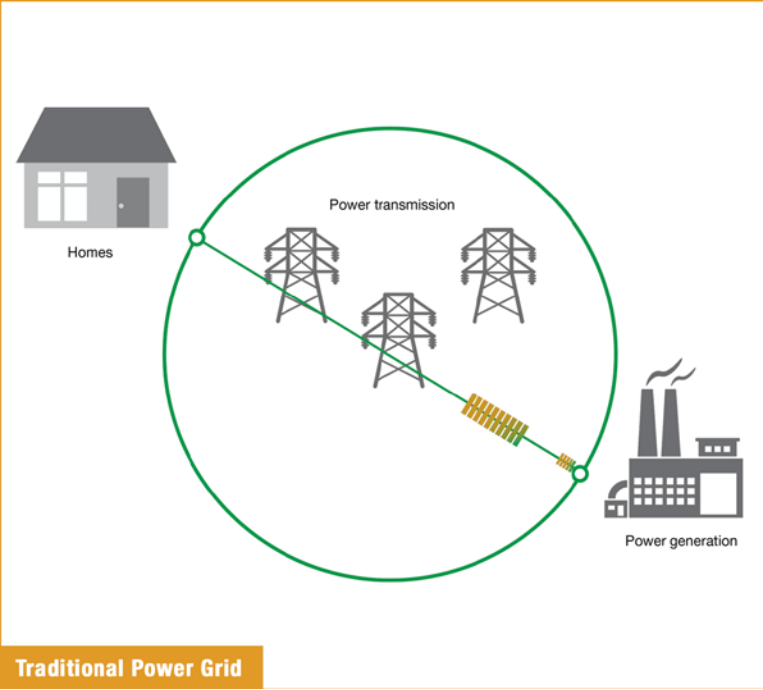
Summer Day Load Shape



Winter and Summer Load Shapes

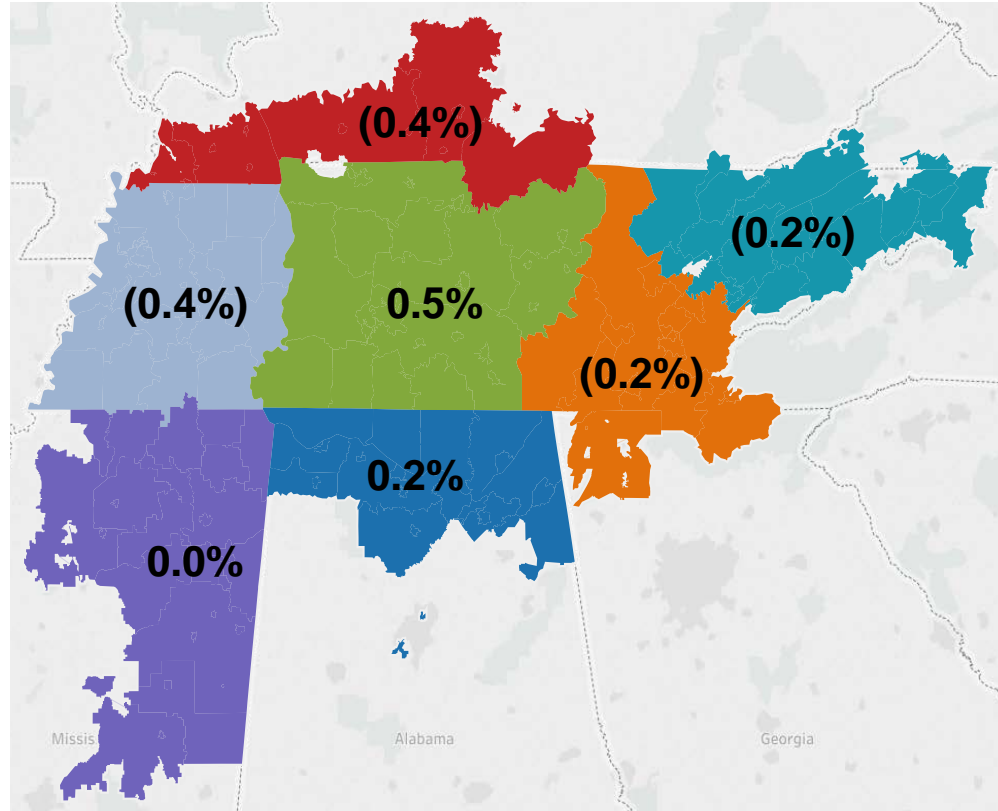


Meeting Customer Needs – Now and in the Future



Locational Value

Total Modeled LPC results 10-yr CAGR = 0.0%



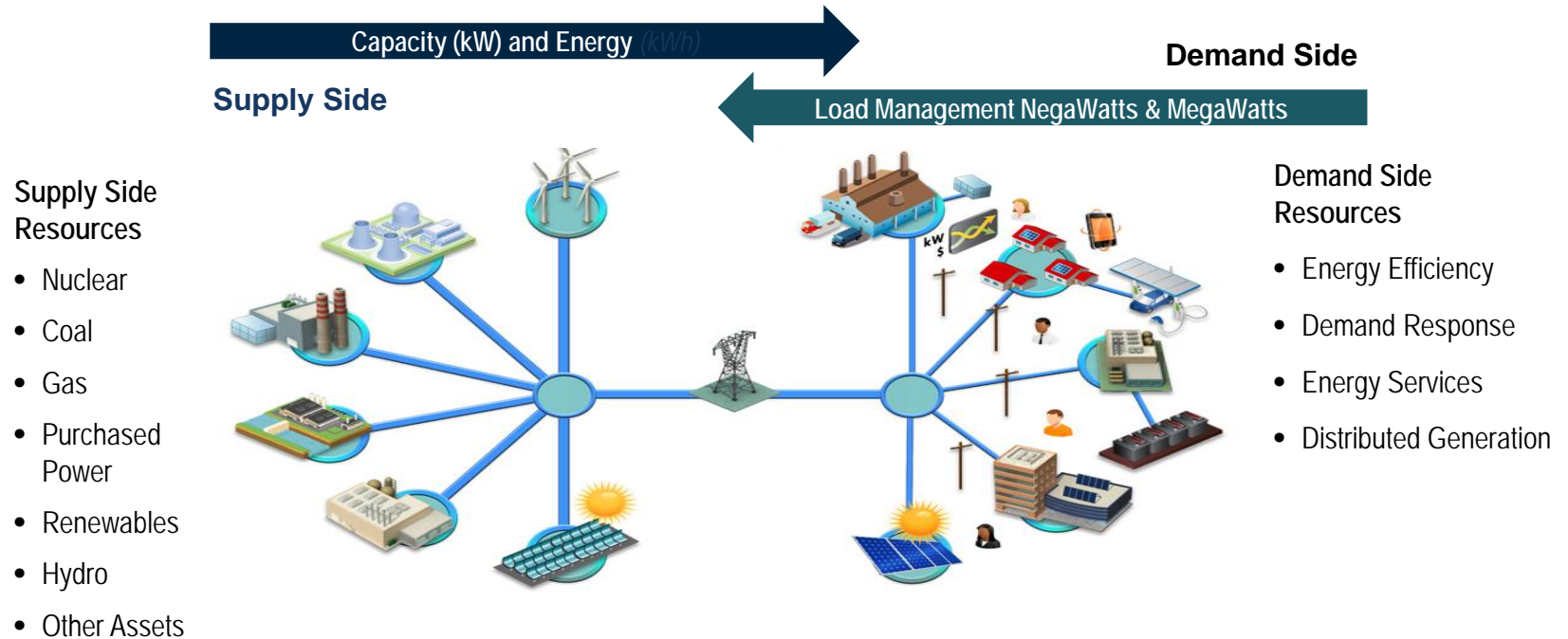




IRP Focus Area: DER

Joe Hoagland
Vice President, Enterprise Relations and Innovation

Distributed Energy Resources



Supply Side Resources

- Nuclear
- Coal
- Gas
- Purchased Power
- Renewables
- Hydro
- Other Assets

Demand Side Resources

- Energy Efficiency
- Demand Response
- Energy Services
- Distributed Generation

A Changing Customer Landscape

- Customer demographics are changing, and so are preferences for how they want to engage with the utility
- Customers are also investigating new devices that can help them use energy in ways (and times) that support their lifestyle
- But customers still expect reliable, resilient and reasonably-priced electricity



-  Smart thermostats
-  Smart appliances
-  Smart lighting
-  Battery storage
-  Home energy management systems



New Players & Opportunities

Value Propositions
are changing



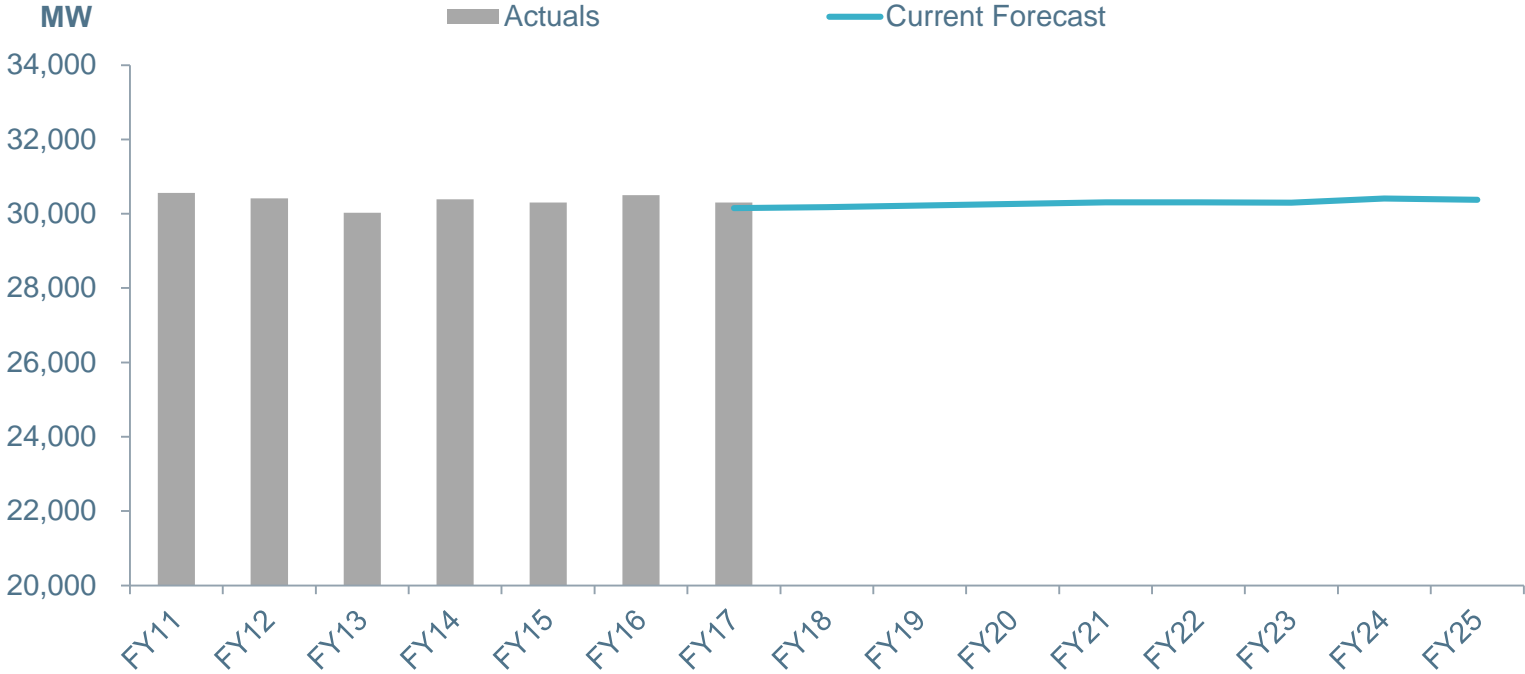
More Competition



More & Cheaper
Technology



Changing Growth Projections



Glimpsing Our Utility Future



- Customer-centric
- Diverse and distributed
- Flexible and resilient
- IoT and connected devices
- Low carbon footprint
- More options; simpler & easier service
- Still economic & reliable

Our Strategic Response

- Technology innovation in the DER marketplace
- R&D to meet both sides of the grid (supply side & demand side)
- Creation of a more flexible grid system is a priority
- Creation of a “smarter” distribution system is a LPC priority

The old paradigm is changing



..... But we must remain relevant

And: Potential Game Changers

Battery Energy Storage Systems



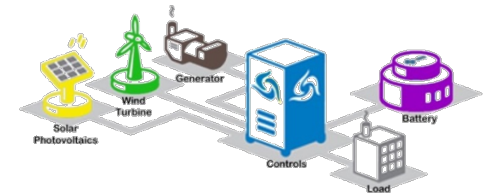
Blockchain Technology



Electrification



Microgrids





IRP Focus Area: Portfolio Diversity

Melanie Farrell

Director, Resource Strategy and Planning

Goals for an Optimal Resource Plan

Low Cost

Risk Informed

Environmentally
Responsible

Reliable

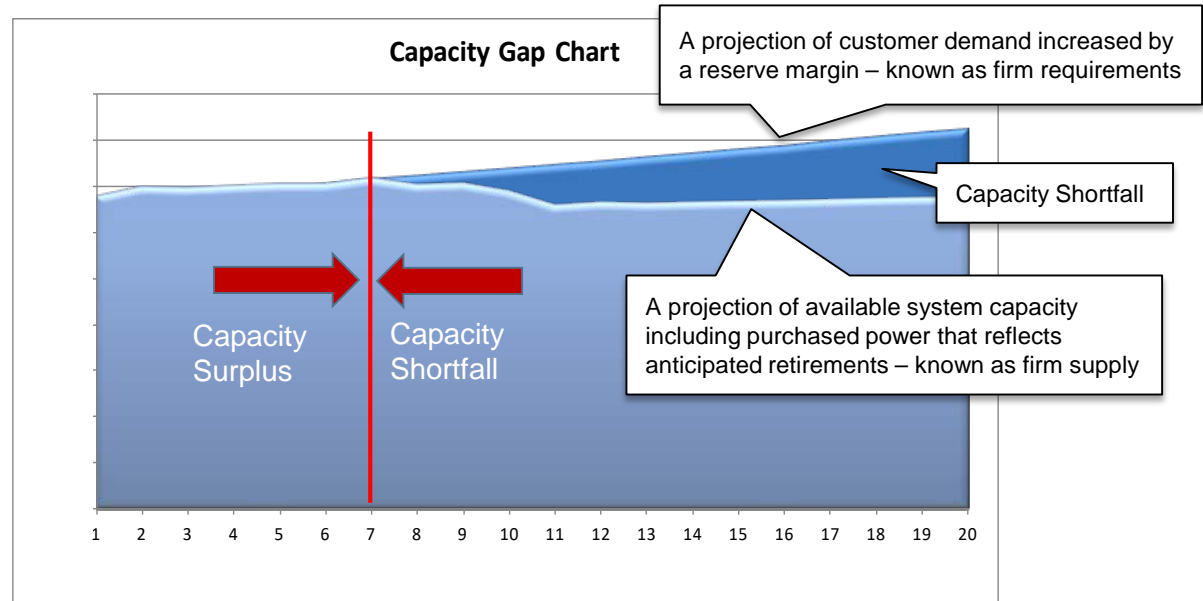
Diverse

Flexible

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
- Time value of money
- Uncertainty



Constraints

- Planning reserve

Revenue Requirements

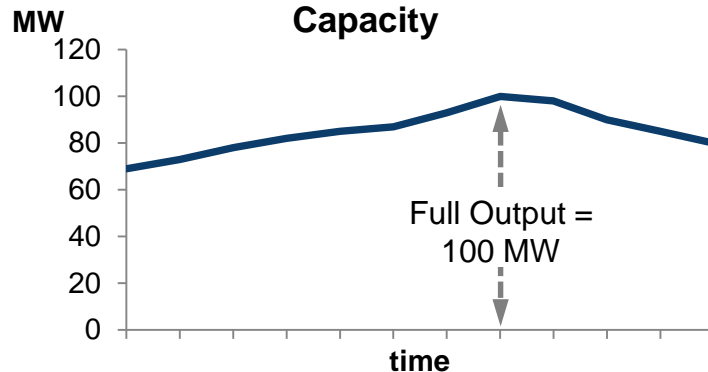
- Operating expenses
- Return of and on capital

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

Definitions

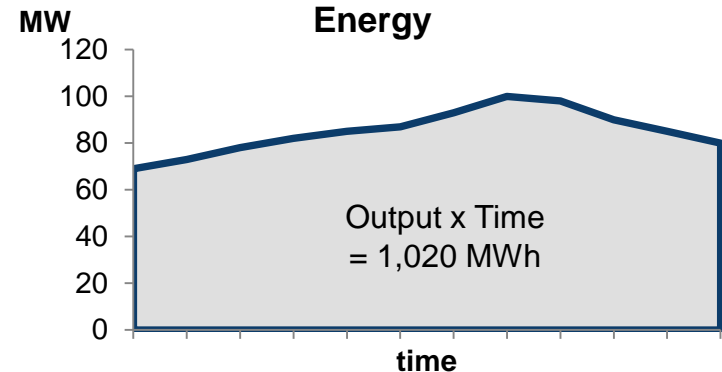
Capacity is the maximum electric output an electricity generator can produce under specific conditions

Energy (or generation) is the amount of electricity a generator produces over a specific period of time



Variations

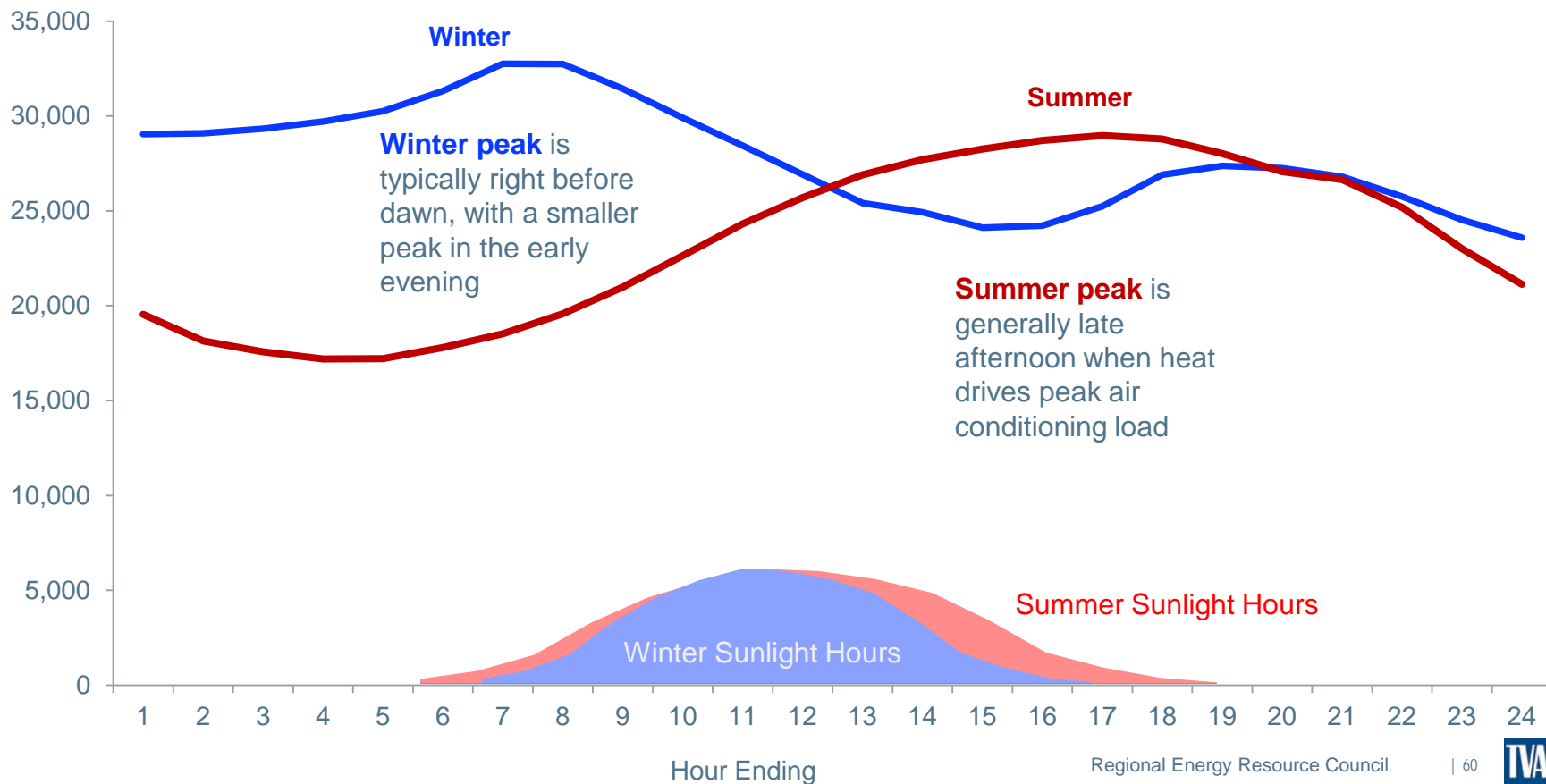
- **Nameplate Capacity** – Manufacturer-defined output under standard conditions
- **Net Dependable Capacity** – expected unit output during specific seasonal conditions (e.g., temperature)



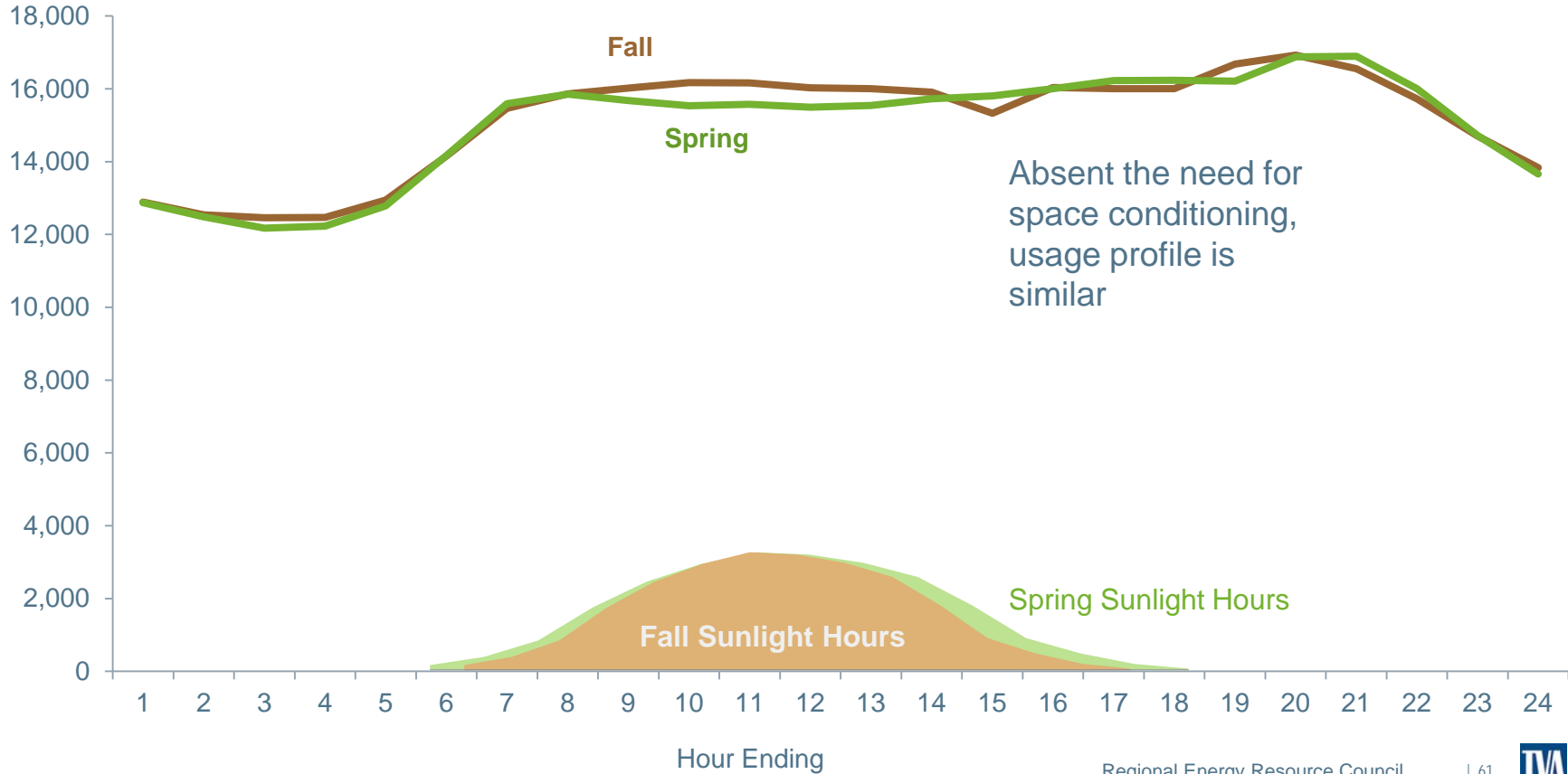
Variations

- **Capacity Factor** – Energy as a percent of the maximum output a unit could have produced over a period of time

Winter and Summer Have Unique Profiles

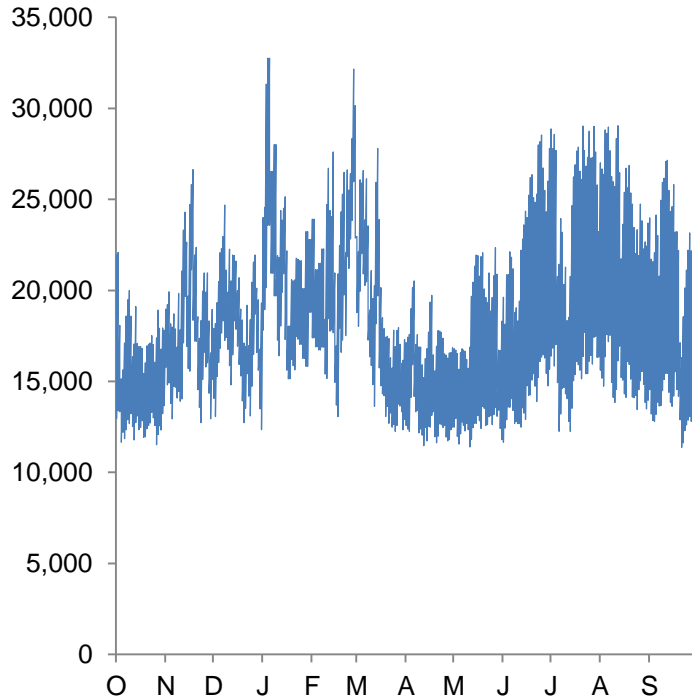


Fall and Spring Have Similar Profiles



Annual Load Profile

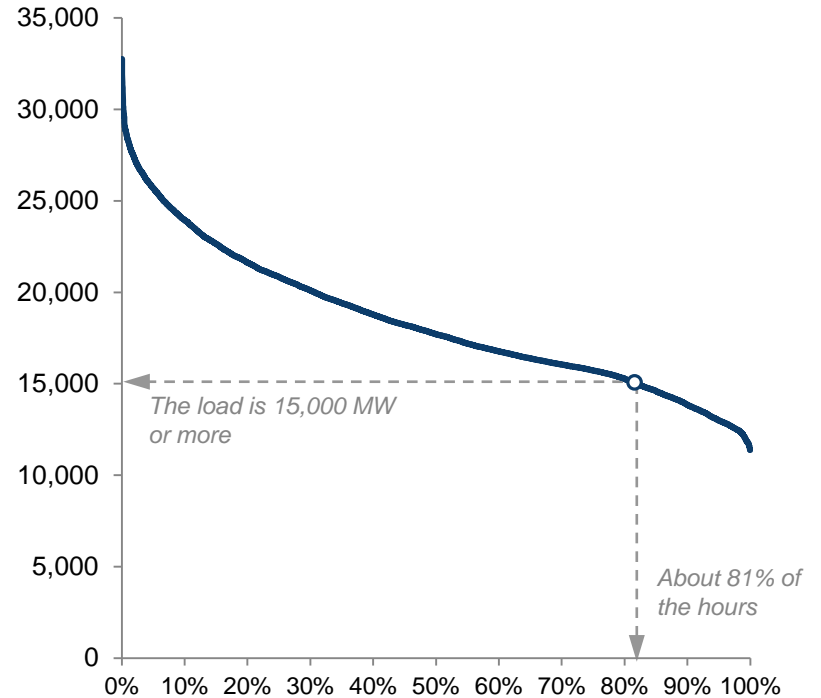
Hourly Loads



Sequential Hours



Load Duration Curve



Percent of hours (8760)

Generating Unit Operating Characteristics

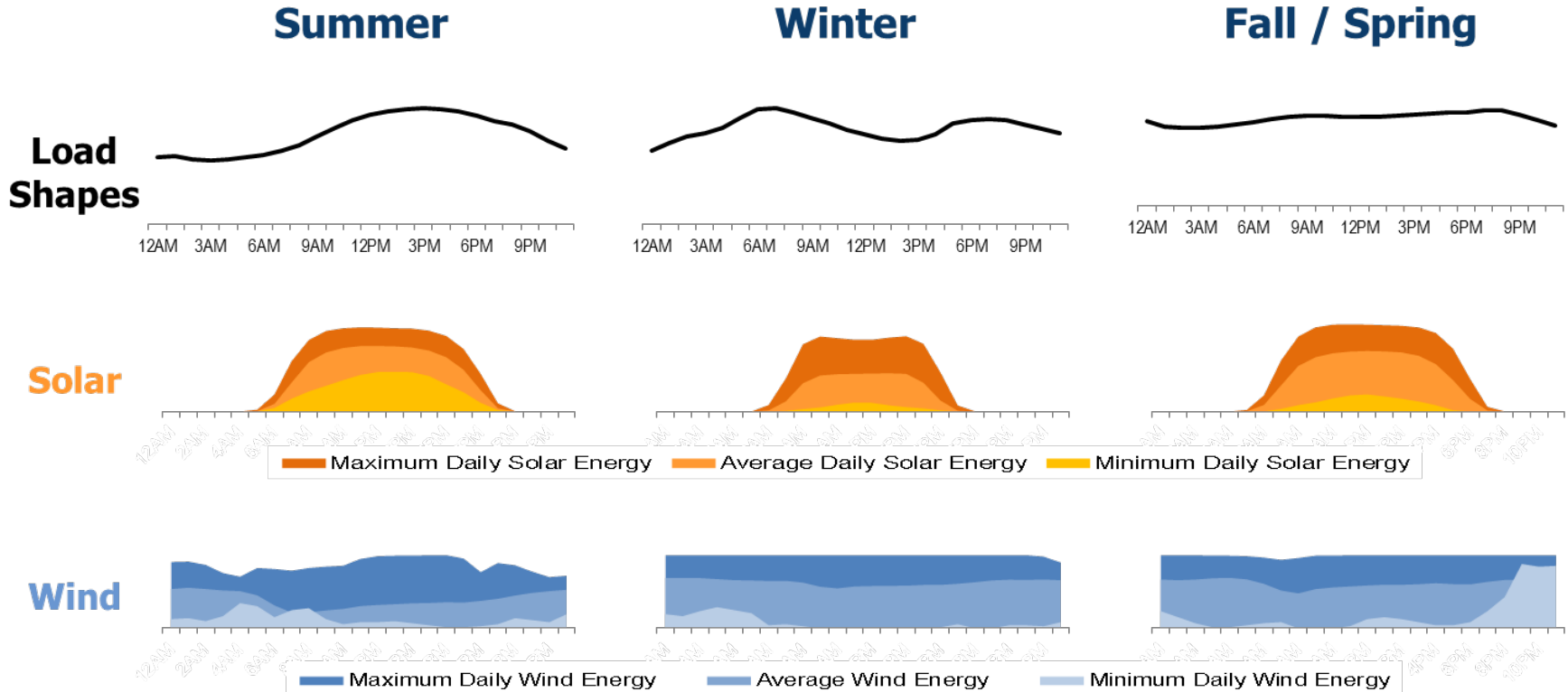
Physical

Item	Measure
Output (capacity)	MW (max dependable)
	MW (minimum)
Availability	Outage Rates
Flexibility	Ramp rate
Duty Cycle	Base, peaking
Control	Dispatchable, non-dispatchable
Fuel	Types of fuel, limits
Emissions	lbs per kWh
Other	Regulations & Constraints

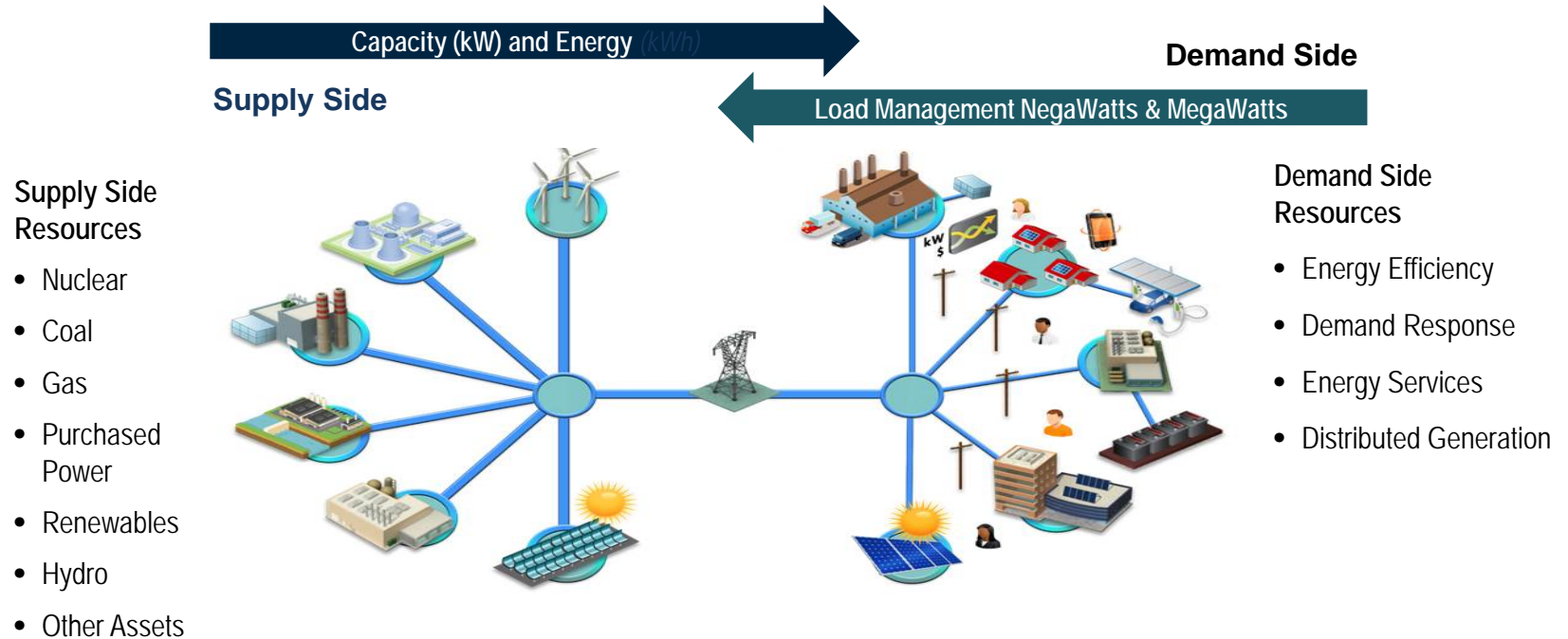
Economic

Item	Measure
Capital Cost	\$ - Installed cost
Efficiency	Heat rate (Btu/kWh)
Operating Cost	Fixed (\$)
	Variable (\$/kWh)
Fuel Cost	\$/Btu
Emissions Cost	\$/lb – as applicable

Seasonal Solar and Wind Shapes

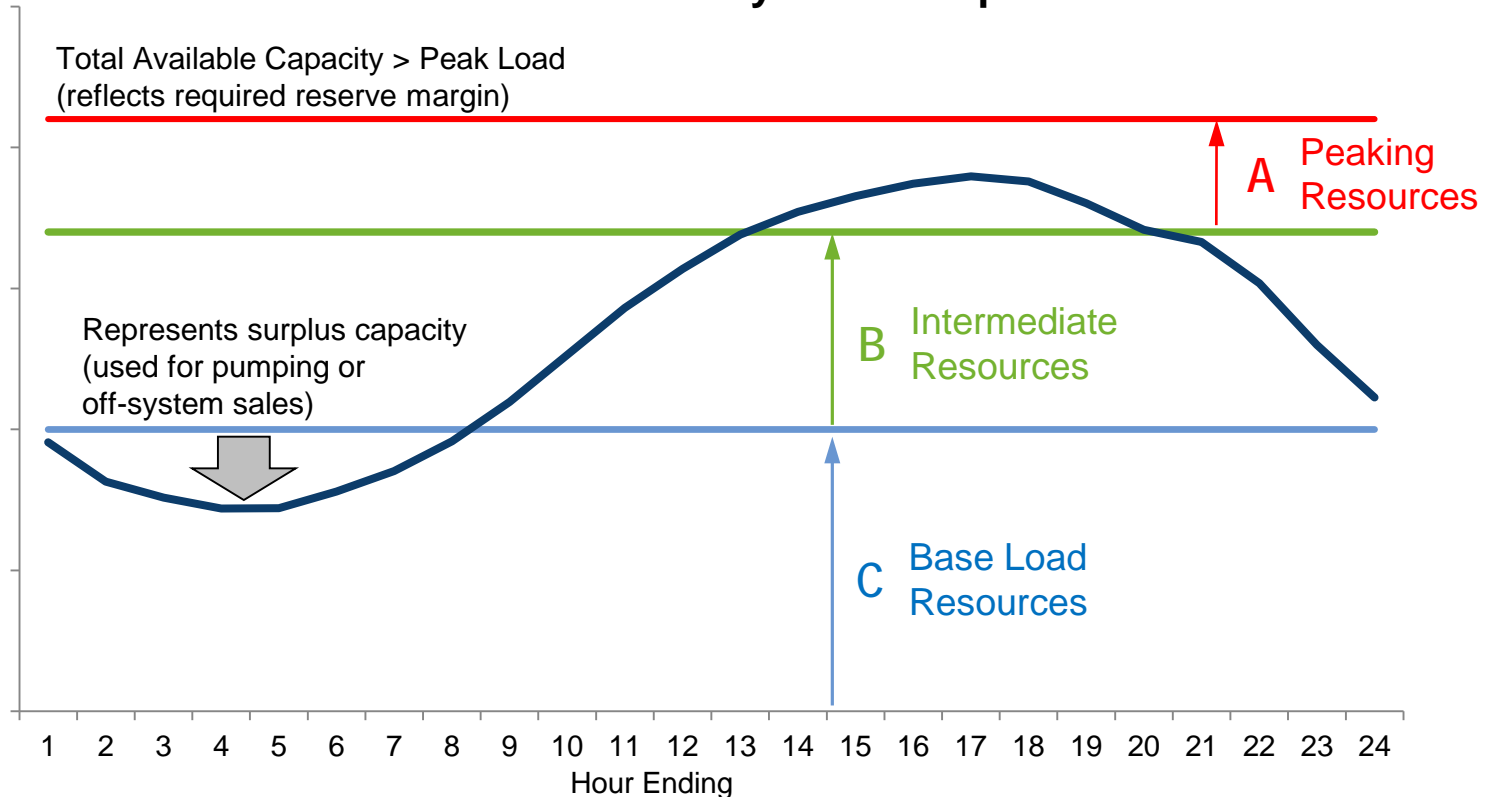


Distributed Energy Resources

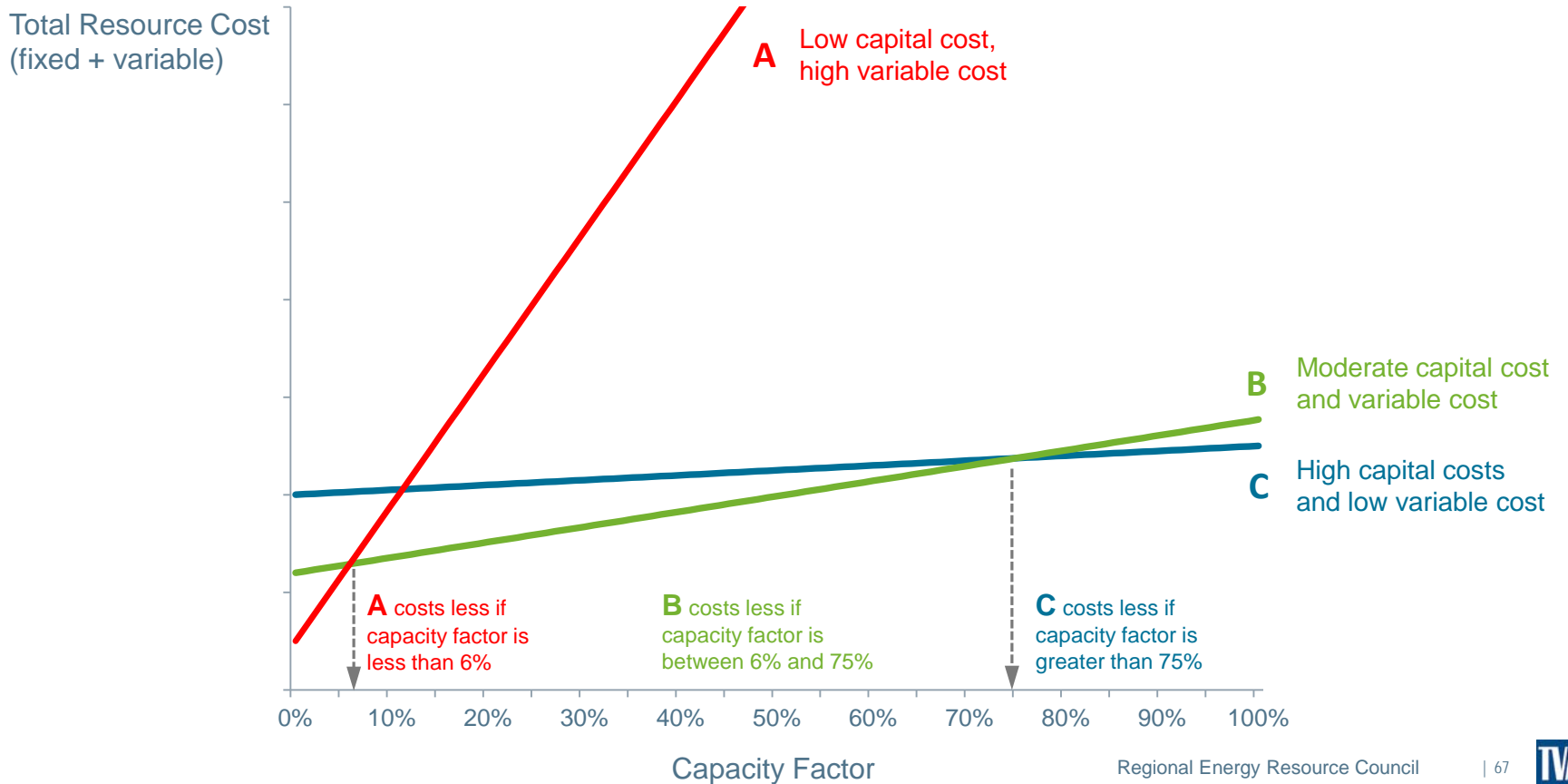


Load Shapes: Understanding Resource Needs

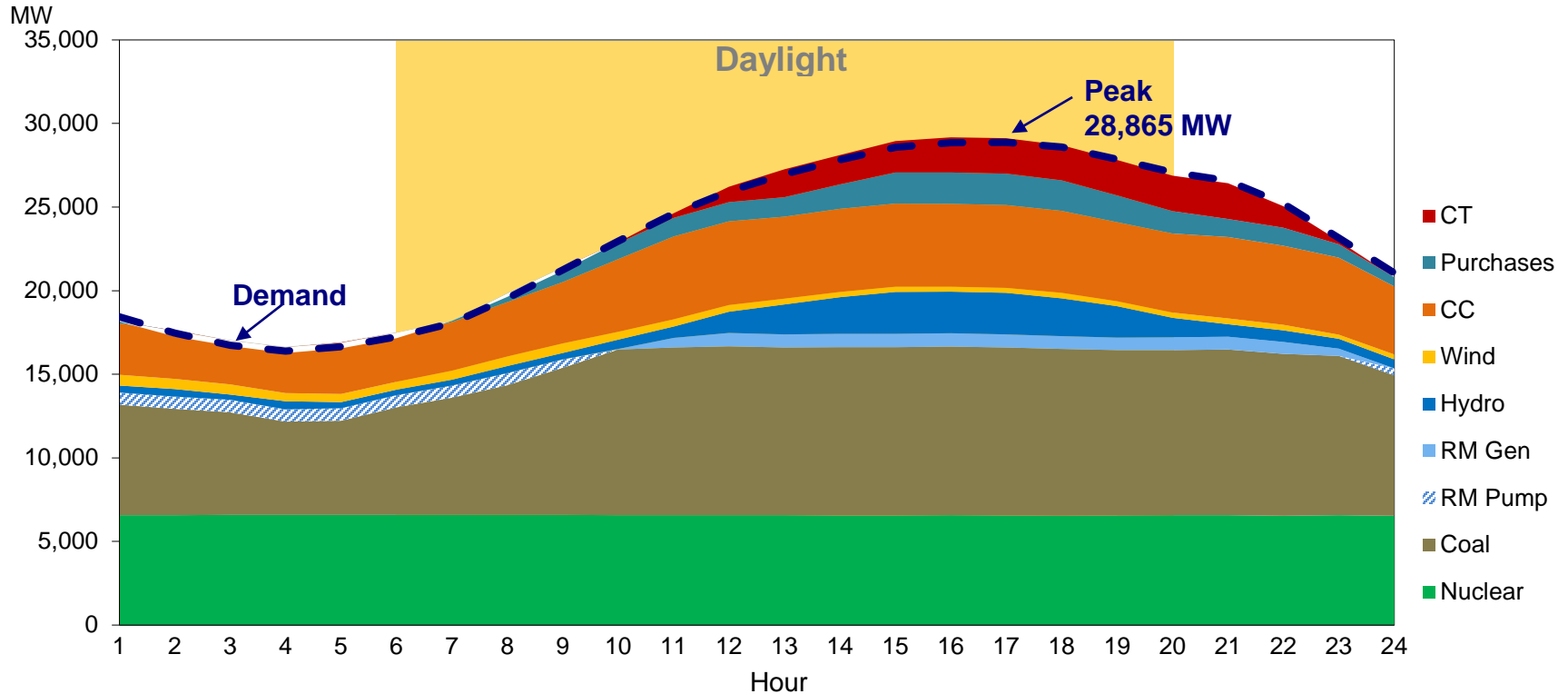
Summer Day Load Shape



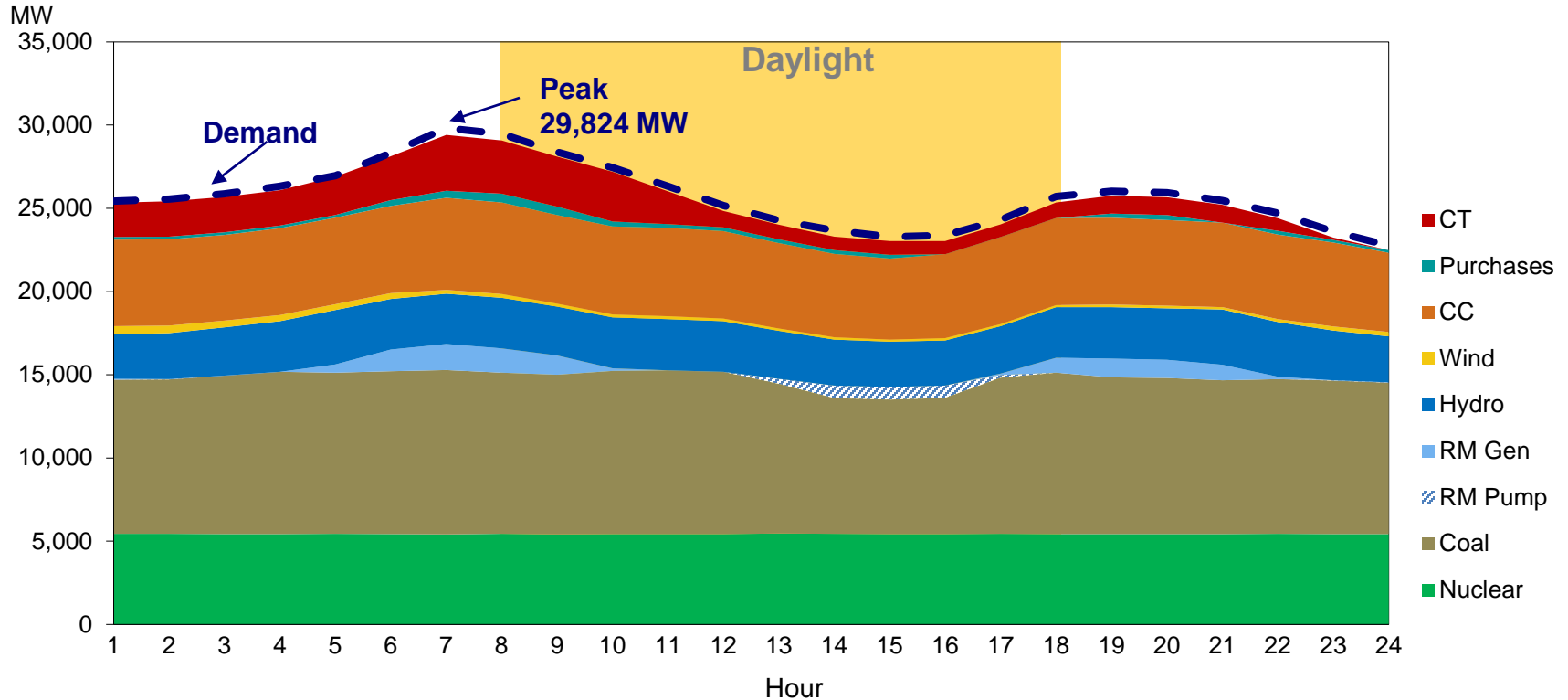
Selecting Appropriate Resource Types



Load Dispatch on Typical Summer Day

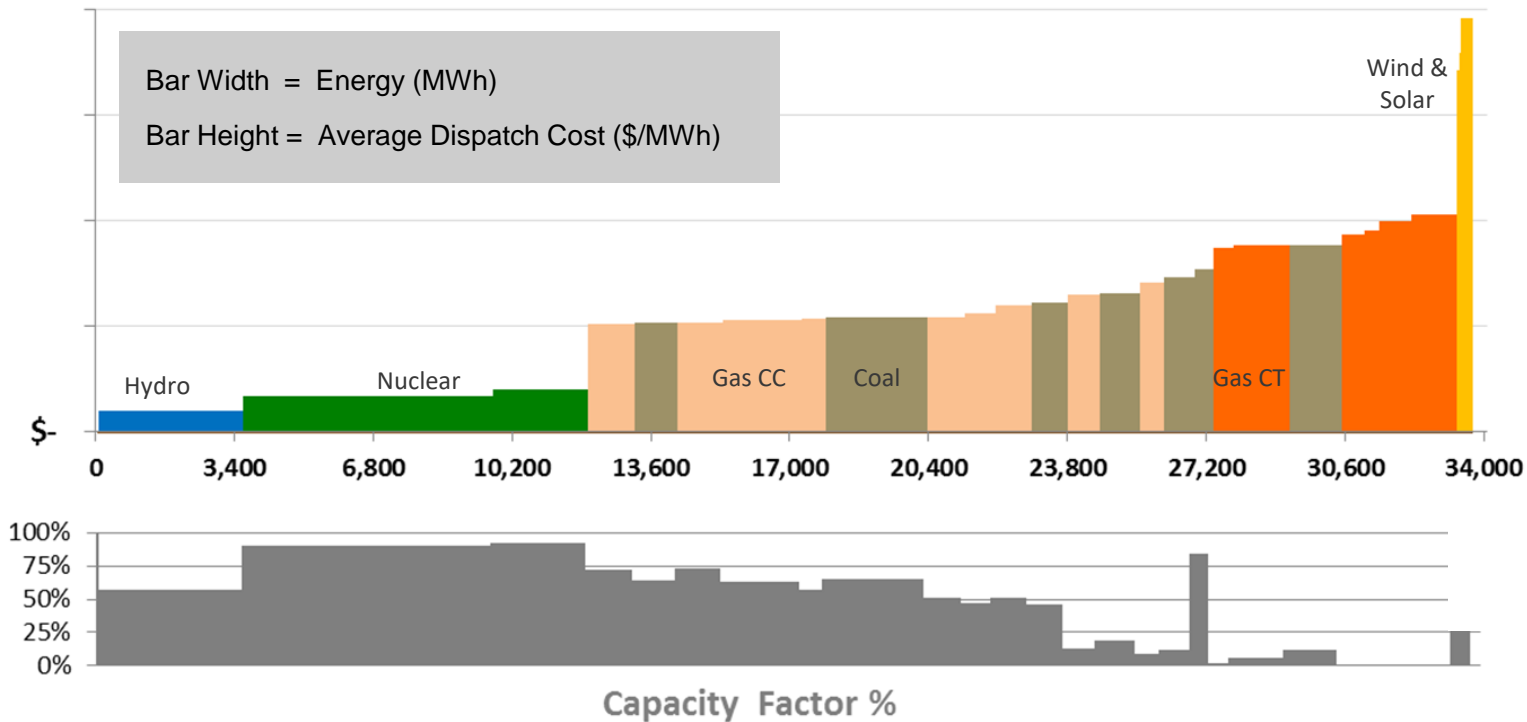


Load Dispatch on Typical Winter Day

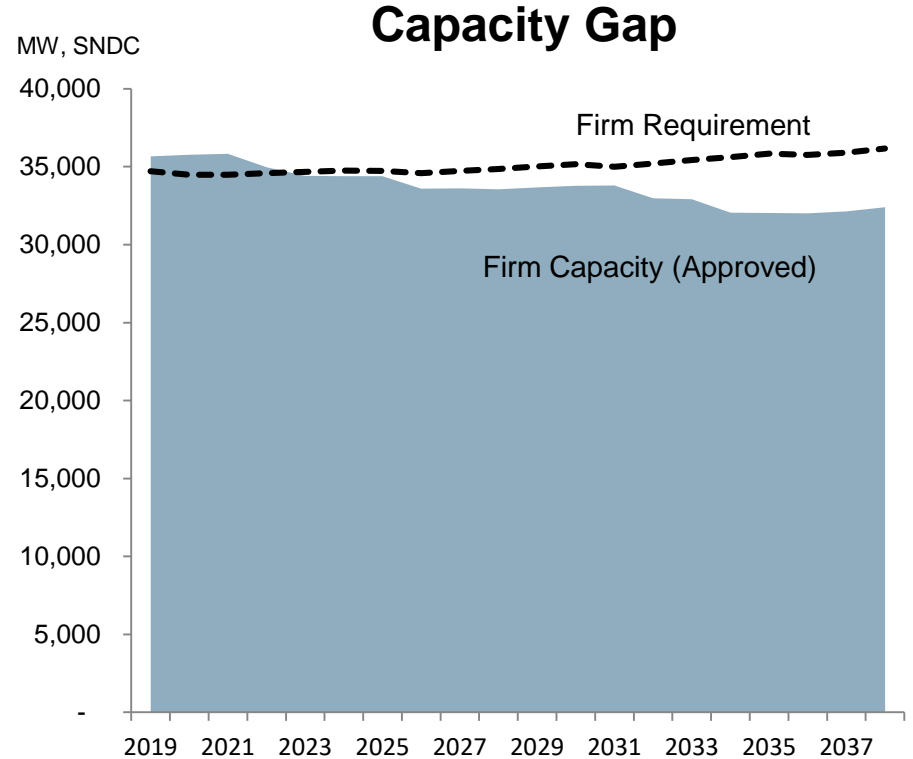
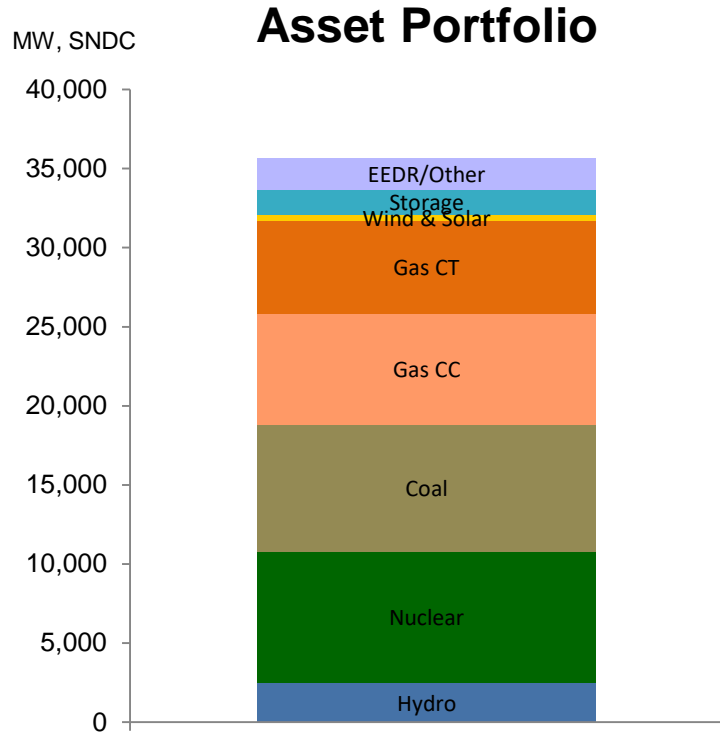


Load Dispatch to Meet Annual Demand

Dispatch Cost (\$/MWh)



Current Portfolio and Projected Gap (Base Case)



Key Takeaways

- A diverse asset mix helps meet load economically and reliably over the long run
- Candidate resource technologies should be mature enough to model and select
- System flexibility enables integration of renewables and DER
- Environmental metrics can be evaluated across portfolios
- Testing the bounds with scenarios informs risk





Adjourn for Lunch Break
Meeting to reconvene at 12:40 PM



Public Engagement in the 2019 IRP

Amy Henry

Senior Manager, Enterprise Relations and Strategic Partnerships

Stakeholder and Public Engagement in the IRP Process

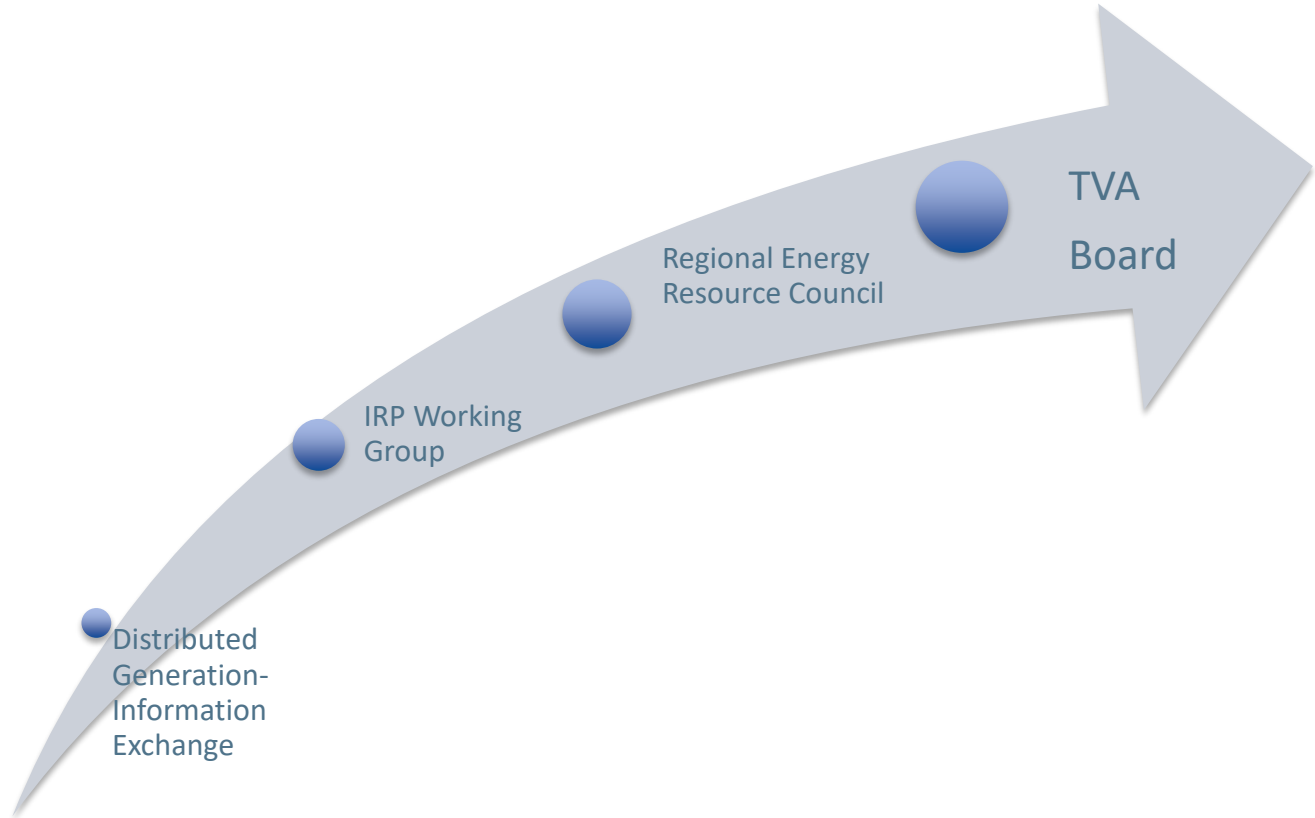
- TVA's Integrated Resource Planning is unique
- More informed decision making
- Better outcomes

IRP - Engagement at Multiple Levels

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



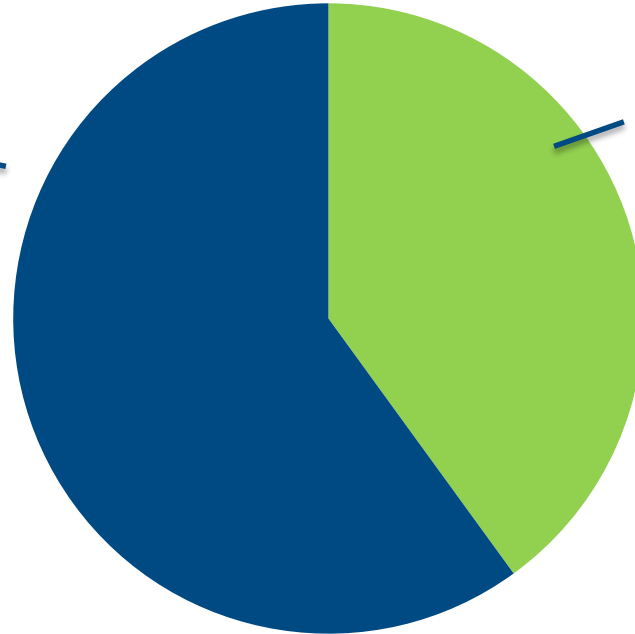
Structured Stakeholder Engagement



2019 IRP Working Group Sectors

Valley At Large:

- Energy and Environmental organizations
- DER / research/ academia
- State Government
- Economic Development
- Community / Sustainability interests



Customer Representatives:

- Local Power Companies
- Customer Trade Organizations
- Industrial customers

20 Members

IRP Working Group

- Provides review and input along the IRP development process
- Individual perspectives and group sentiments
- Input utilized by TVA staff to shape and refine the IRP



Regional Energy Resource Council

- Review overall process
- Validate at key points
- Provide consensus advice to the TVA Board

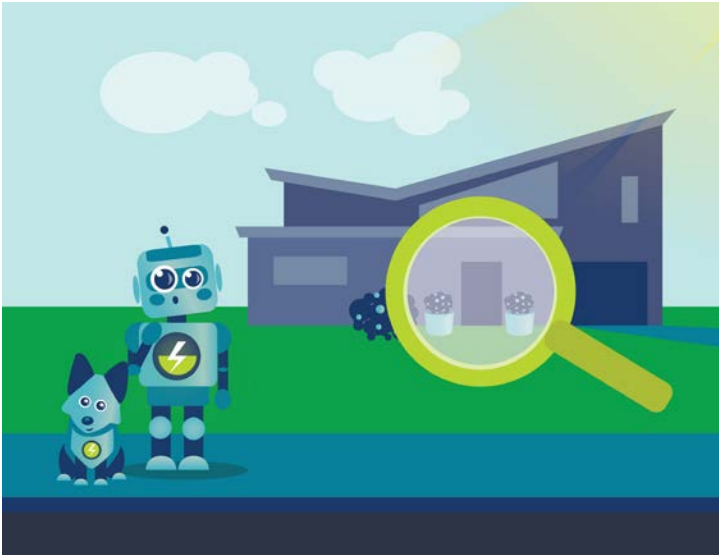


Public Input & Outreach

- Scoping comments & meetings (Spring 2018)
- Draft EIS/IRP comments & meetings (Spring 2019)
- Quarterly webinars with Q&A
- Listening sessions
- TVA IRP Website
- Social media campaign



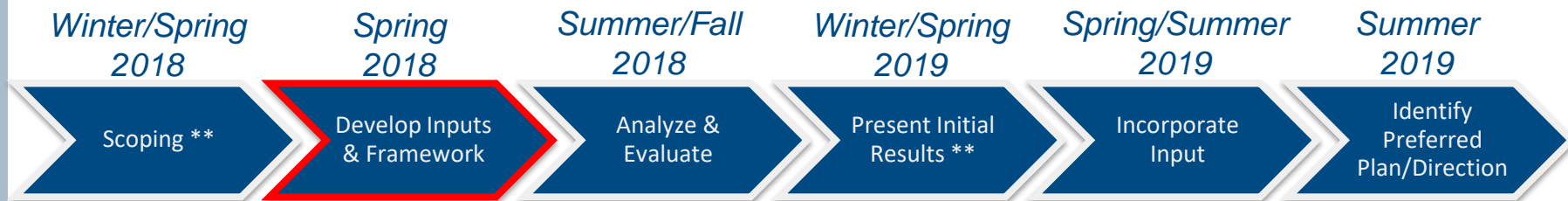
Social Media Campaign



VISIT OUR WEBSITE TO LEARN MORE ABOUT THE 2019 INTEGRATED RESOURCE PLAN!

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)



Public Listening Session

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







RERC Discussion

RERC Individual Perspectives

What aspects of these focus areas are most important to you for TVA to consider and why?

Advisory Questions

1. Given our focus areas for the 2019 IRP of DER, System Flexibility and Portfolio Diversity, are we missing anything?
2. What advice do you have for engaging broader diversity and segments of the public in the IRP?





RERC Discussion and Advice Statement



Wrap Up and Adjourn



Thank you and please travel safely!
