

# **Integrated Resource Plan**

TVA'S ENVIRONMENTAL AND ENERGY FUTURE

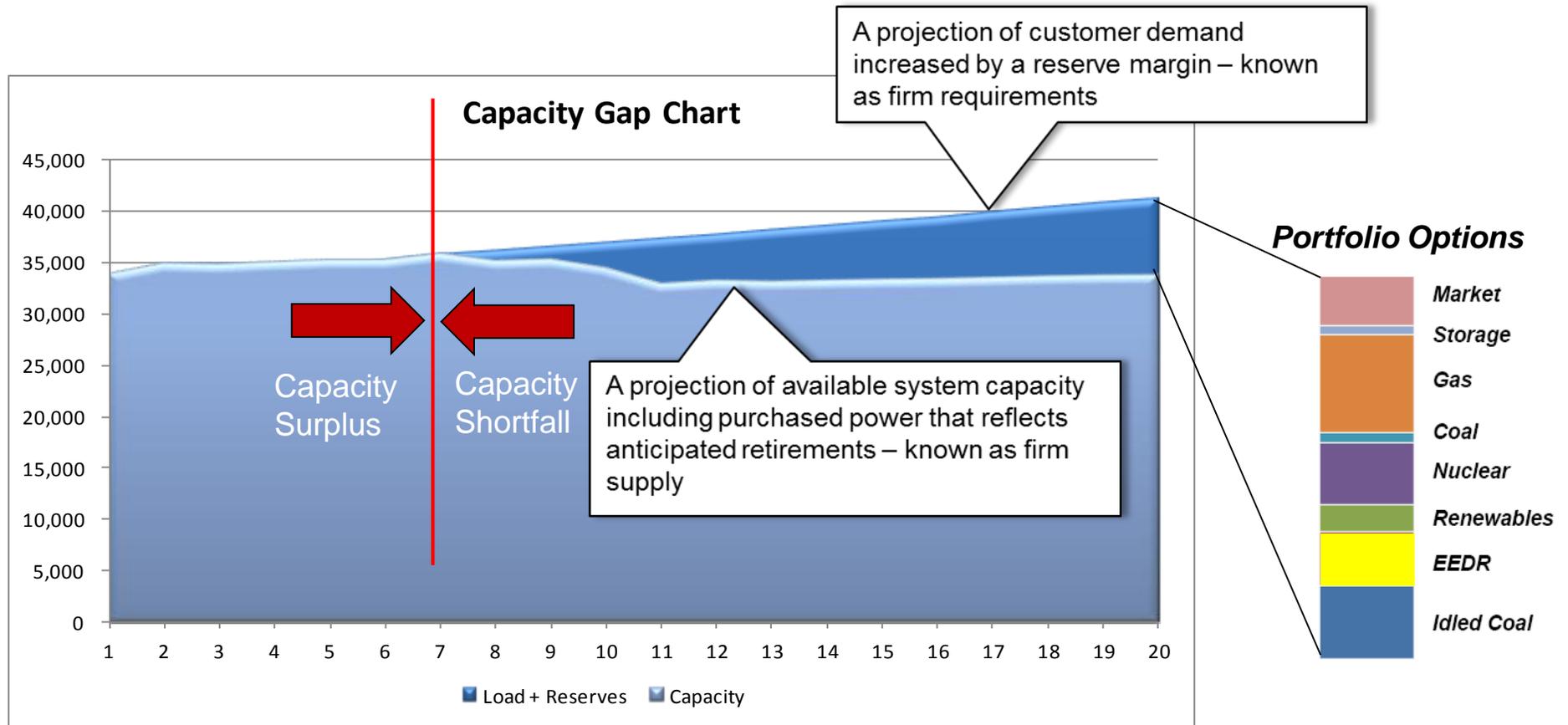
**Georgia Tech IRP Briefing**

**May 2014**



# Resource Planning Addresses Future Capacity Needs

## Resource planning is about optimizing the capacity mix



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

**Recommended path provides low cost, diversity, and flexibility**

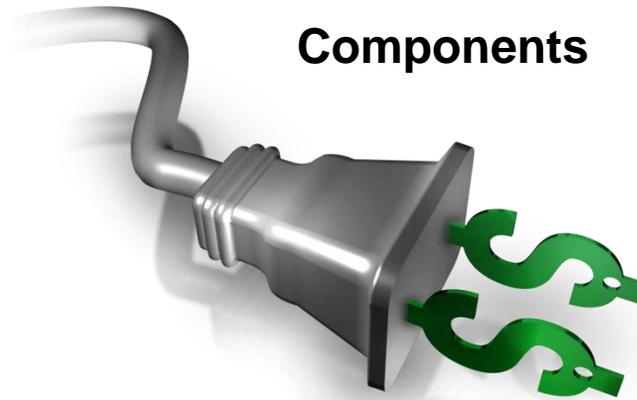
# Finding the Least Cost (Optimum) Resource Plan

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

## The Planning Objective Function

Minimize Exp (PV (Revenue Requirements))  
or Min E (PV (RR))

- ◆ Optimization
- ◆ Uncertainty
- ◆ Time value of money



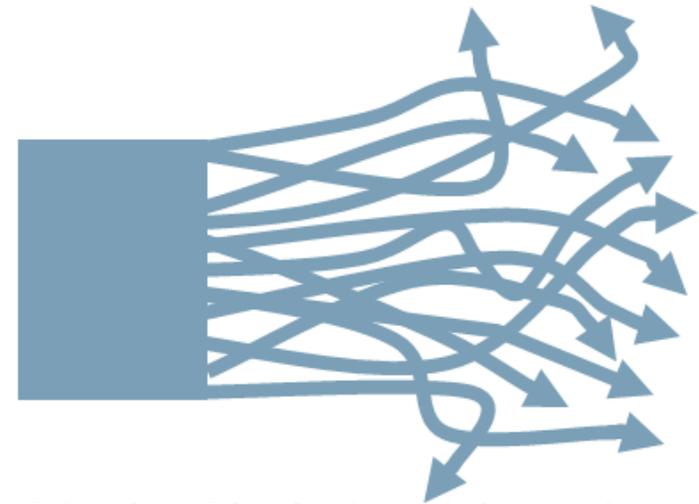
## Components

- ◆ Revenue requirements
  - Operating expenses
  - Return of and on capital
- ◆ Constraints
  - Planning reserve

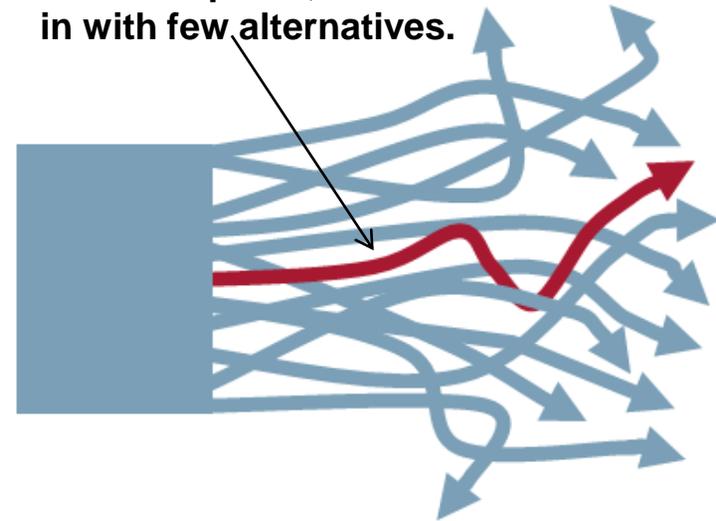
The objective is to find the capacity mix that will produce the minimum cost over the planning horizon

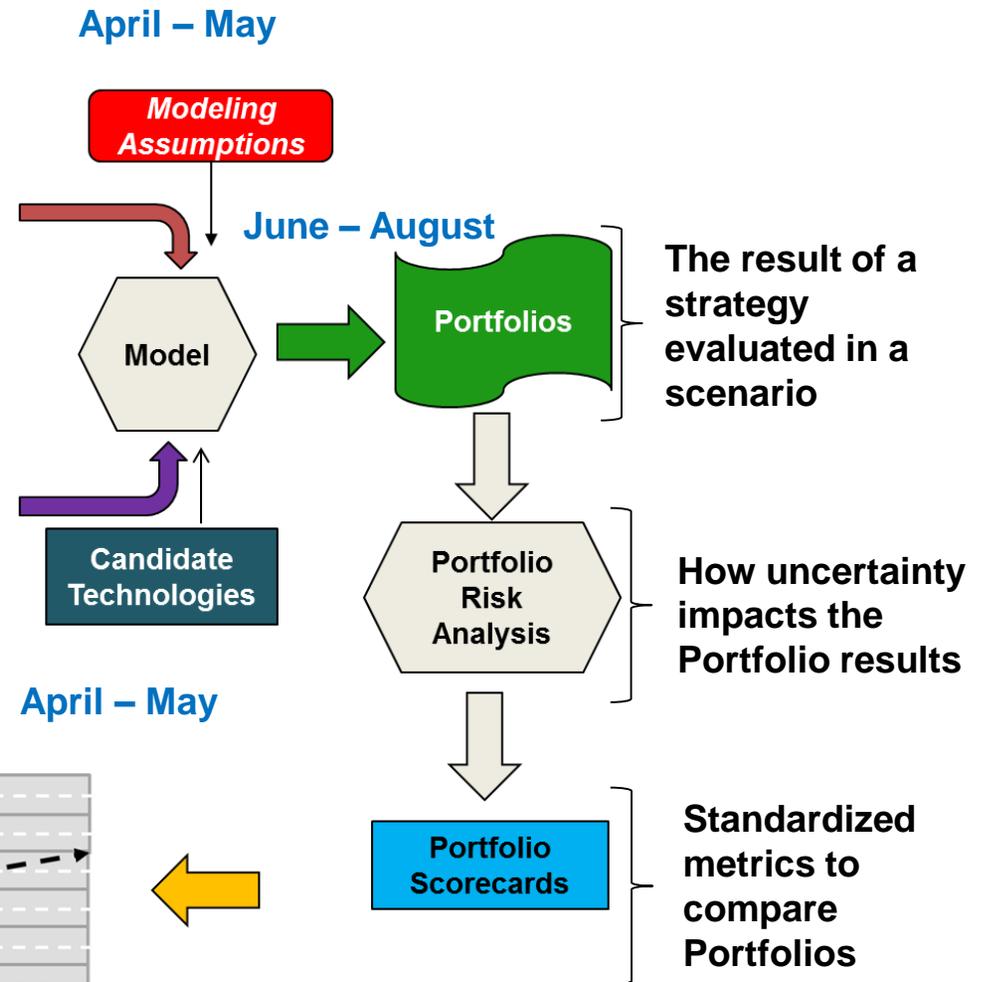
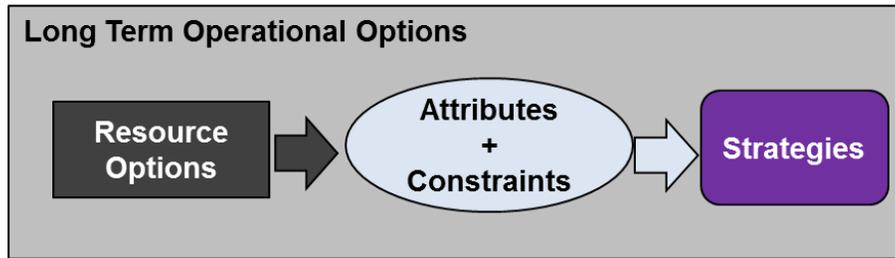
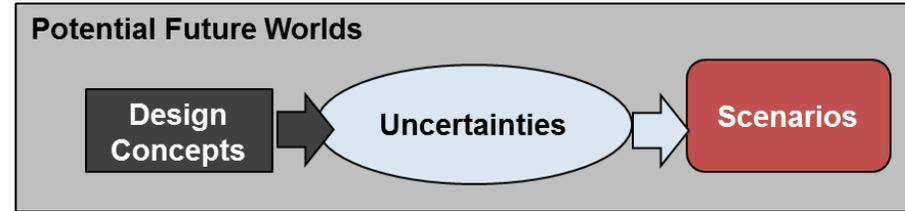
# A Maze of Future Possible Paths

- ◆ Our industry is subject to rapid and unpredictable change, driven by a multitude of challenges including:
  - Uncertain growth rates
  - A highly volatile regulatory future
  - Maturity of new generation technologies
  - Fuel costs
  - Uncertainty over nuclear generation
  - Growth of demand-side resources
- ◆ These drivers interact with each other and with still unknown drivers that will emerge in coming years. The result is a business environment that could evolve along any number of different paths.
- ◆ In the face of complexity and uncertainty, the temptation can sometimes be to gravitate around the path that seems the most likely.
- ◆ This approach is fraught with risks, since commitment to a single forecast could serve as a straitjacket for strategic thinking and significant business risks could be ignored.

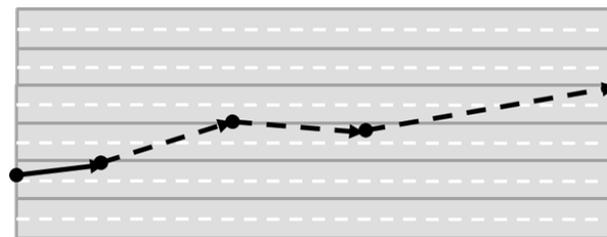


**Adopting this single path forward could be the right choice, but if the future evolves along one of the other paths, we will be locked in with few alternatives.**





### IRP Results



## Forum for Input

- ◆ Public scoping meetings

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- ◆ IRP working group

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- ◆ Quarterly public briefings

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- ◆ Draft IRP public comment period

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- ◆ External Web page

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Fall 2013

*Input will be incorporated throughout the process*

Spring 2015

# Scenarios and Strategies Establish the Planning Framework

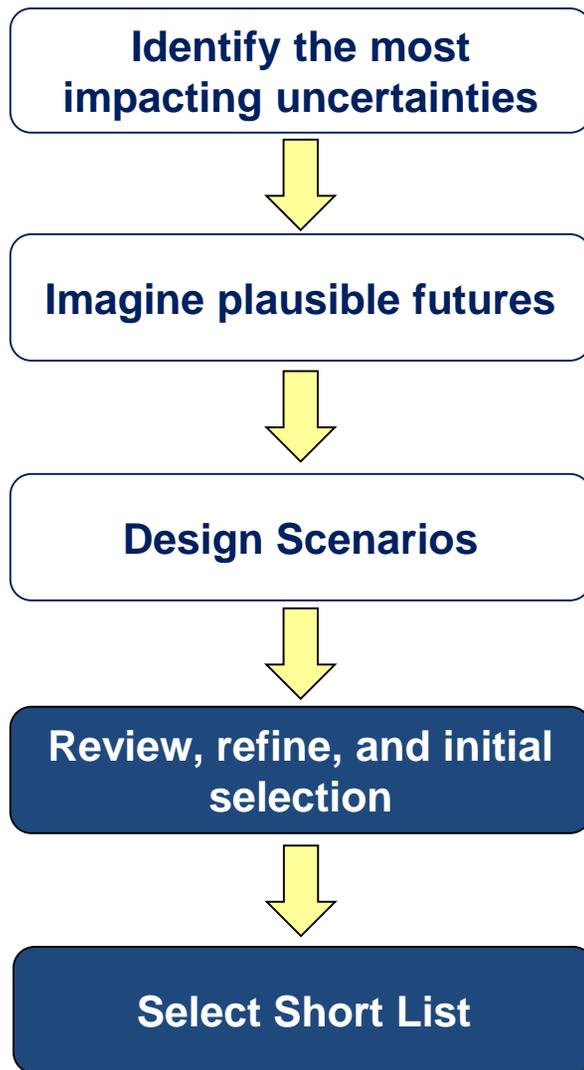
## Scenarios

- ◆ Describe potential outcomes of factors (uncertainties) outside of TVA's control.
- ◆ Represent possible conditions and are not predictions of the future.
- ◆ Include uncertainties that are volatile and could significantly impact operations such as:
  - Commodity prices
  - Environmental regulations

## Planning Strategies

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

# TVA's Process for Building Scenarios



- ◆ **Uncertainties:** trends and factors that could potentially affect its business environment
- ◆ Selected ones with the biggest impact on TVA's business
  
- ◆ Use uncertainties to frame potential future conditions that matter to TVA
  
- ◆ **Scenario:** story that describe the plausible futures.
- ◆ Defined the list of scenarios and group them by common "themes."
  
- ◆ Evaluate scenarios to ensure they consider a wide range of possible futures.
- ◆ Obtain input from internal and external stakeholders.
  
- ◆ Select scenarios that cover a wide range of possible futures and critical uncertainties.

# TVA 9 Scenarios Considered, 5 Selected

## Critical Uncertainties

TVA sales
Natural gas prices
Electricity prices into TVA
Coal prices
Regulations (non CO2)
CO2 regulations/price
Distributed generation
National energy efficiency
Economic outlook (national/regional)

### ✓ Current TVA Outlook

#### A Declining Economy (DE)

- DE1: Major industry leaves the Valley
- DE2: Prolonged stagnant national economy
- ✓ • DE3: Stringent environmental regulations lead to weak energy sales

#### Economic Growth (EG)

- EG1: Economic boom
- ✓ • EG2: Game-changing technology increased load

#### Stringent Environmental Requirements (SE)

- ✓ • SE1: De-carbonized energy future
- SE2: Southeast hot & dry

#### Changing Paradigm (CP)

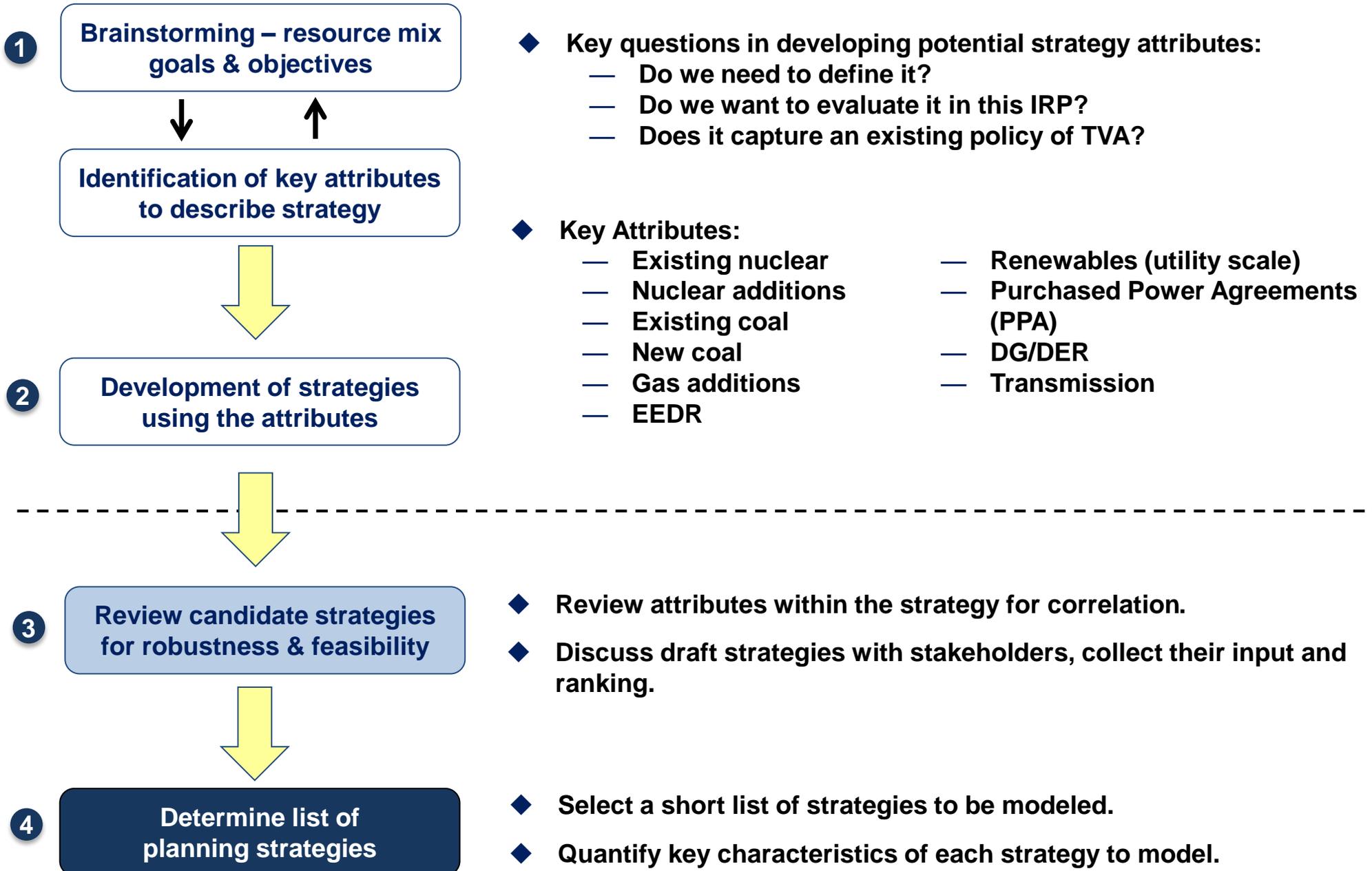
- ✓ • CP1: Customer-driven competitive resources

#### Other Possible Futures (OF)

- OF1: Existing coal exploited

**Scenarios describe potential outcomes of factors (uncertainties) outside of TVA's control**

# TVA Strategies: Test various business options within TVA's control

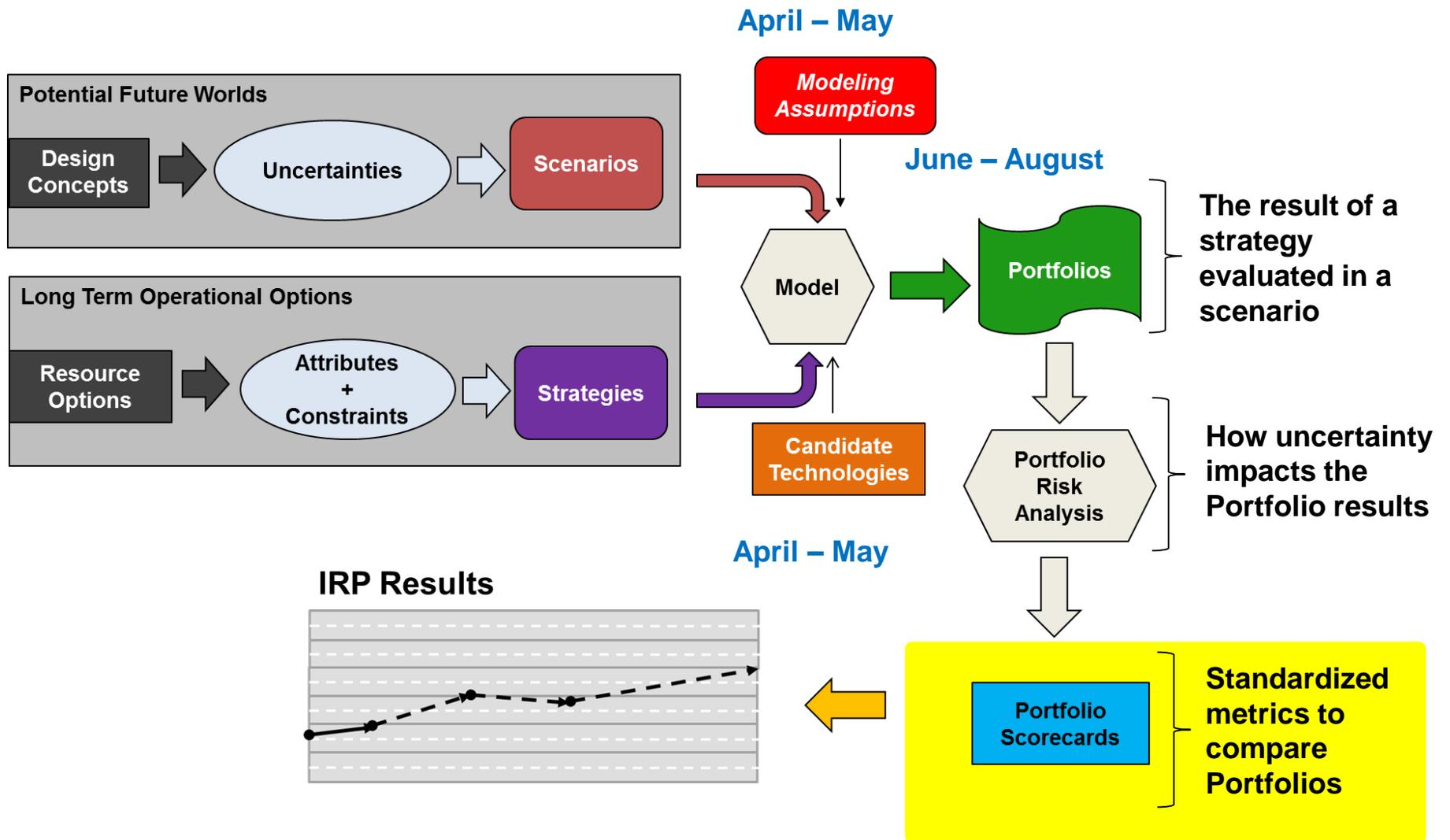


Strategies	
A	“Traditional” least cost planning
B	Meet an emission target
C	Lean on the market
D	Do gas only
E	Doing more EEDR
F	Embracing renewables
G	Energy-water nexus
H	No nuclear



**Strategy development has stakeholder input and evaluation**

# 2015 IRP Process – Metric Development





# Portfolio Scorecards – How to Read Results

## Example: 2011 IRP Results

Scenarios	Ranking Metrics				
	Energy Supply				
	PVRR	Short-Term Rate Impact	PVRR Risk/Benefit	PVRR Risk	Total Plan Score
1	99.00	95.13	100.00	99.53	98.36
2	100.00	95.58	99.40	95.30	97.85
3	100.00	100.00	99.81	89.37	97.56
4	100.00	97.40	100.00	95.37	98.36
5	100.00	96.43	100.00	100.00	99.19
6	100.00	100.00	100.00	86.69	96.97
7	100.00	97.24	100.00	97.03	98.70
8	99.84	96.66	98.35	97.93	98.50
Total Ranking Metric Score					785.49

Quantitative metrics

Strategic Metrics				
Environmental Stewardship			Economic Impact	
CO <sub>2</sub> Footprint	Water	Waste	Total Employment	Growth in Personal Income
			0.9%	0.7%
			0.2%	0.1%

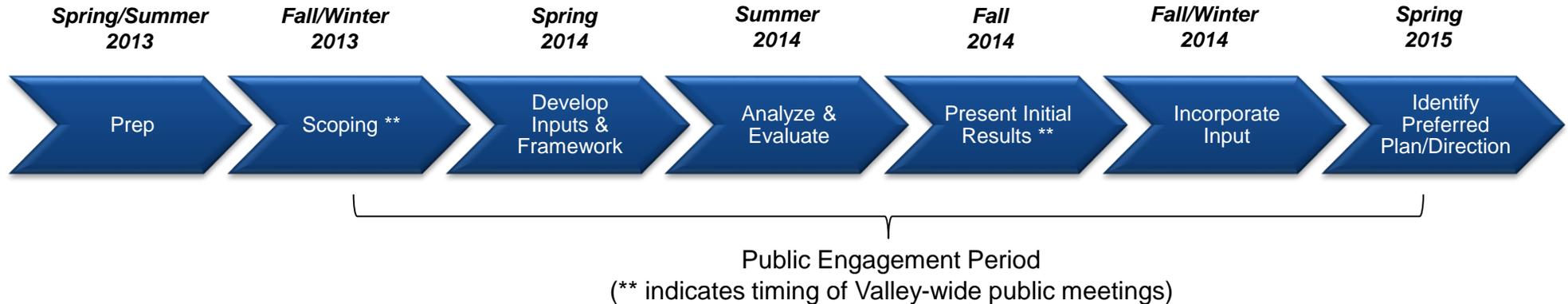
Qualitative metrics

For the 2015 IRP, asking:

- *Are these the right metrics?*
- *Are they weighted appropriately?*
- *Are they quantified well enough?*



*The 2015 IRP is intended to ensure transparency and enable stakeholder involvement*



### Key tasks/milestones in this study timeline include:

- ◆ Establish stakeholder group and hold first meeting (Nov 2013)
- ◆ Complete first modeling runs (June 2014)
- ◆ Publish draft Supplemental Environmental Impact Statement (SEIS) and IRP (Nov 2014)
- ◆ Complete public meetings (Jan 2015)
- ◆ Final publication of SEIS and IRP and Board approval (exp. Spring 2015)