History of the Northwest Power & Conservation Council

Pacific Northwest Regional Economic Conference

May 12-13, 2016

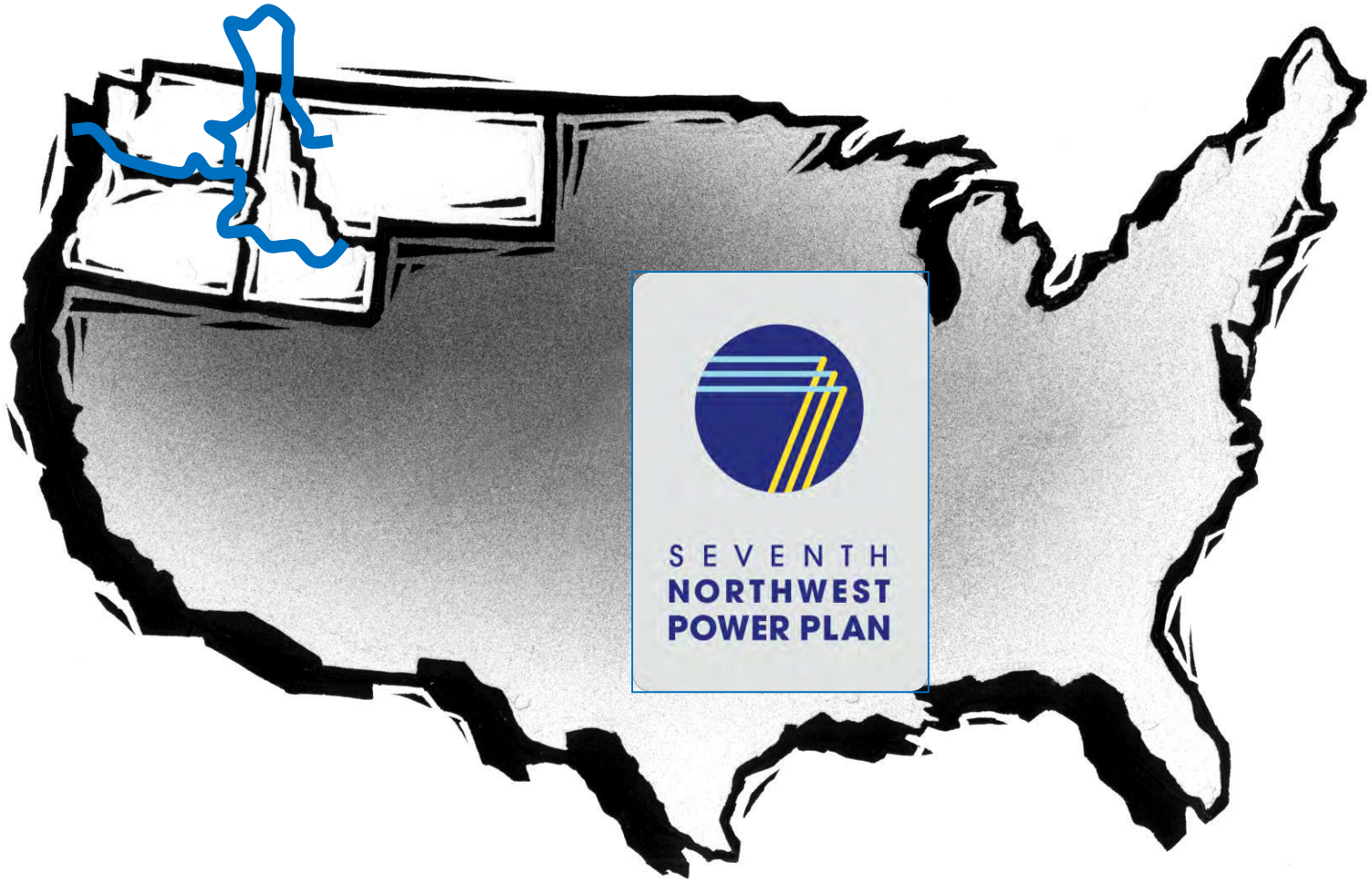
Outline

- Genesis of the NW Power & Conservation Council
- The Dawn of Integrated Resource Planning
- Evolution of Electric Industry Planning
- Mr. Toads Wild Ride
- From Planning to Implementation

GENESIS

Pacific Northwest Region

The 1980 Regional Power Act



Northwest Power and Conservation Council

- An interstate compact
- Eight members, two from each state
- Headquarters in Portland
- Staff of 65; Budget of $9.5 million
- Funded by BPA, but not part of BPA

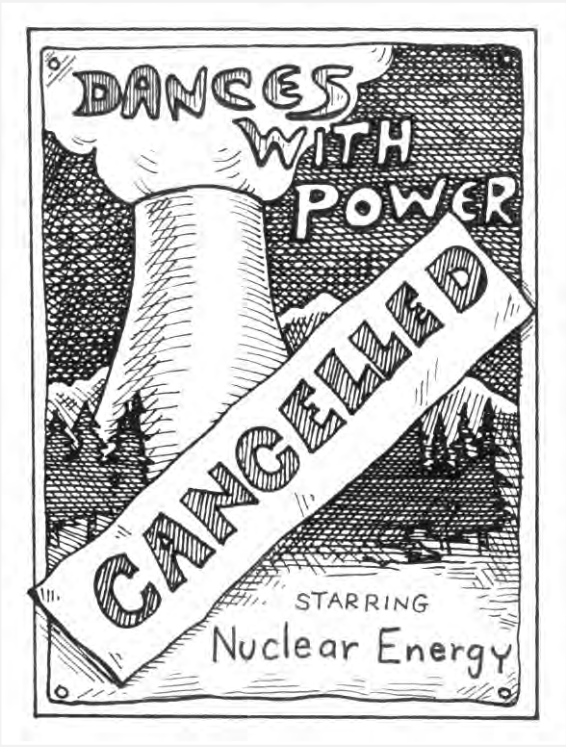
Major Power Planning Eras



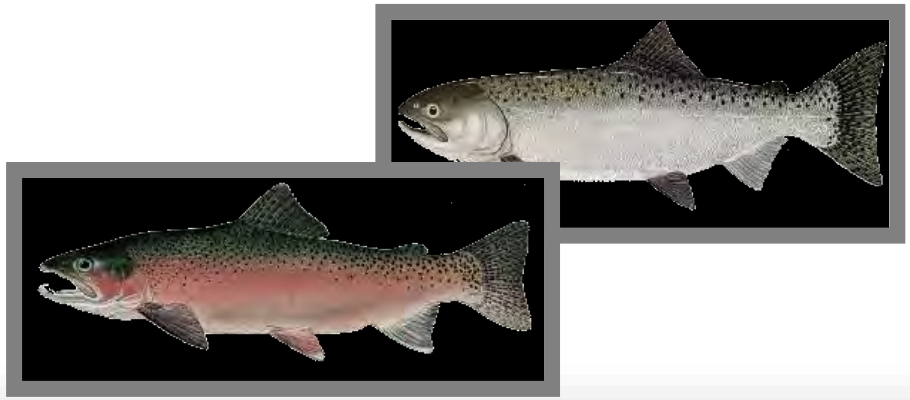

1890-1960 1960-1980 1980-2015

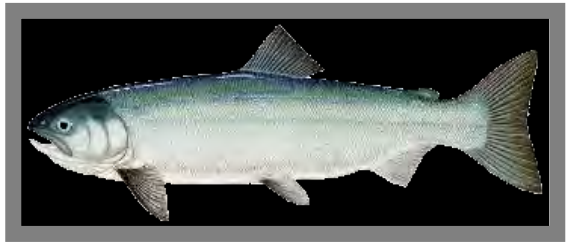
Politicians Engineers Economists

Why a Regional Power Planning Council?

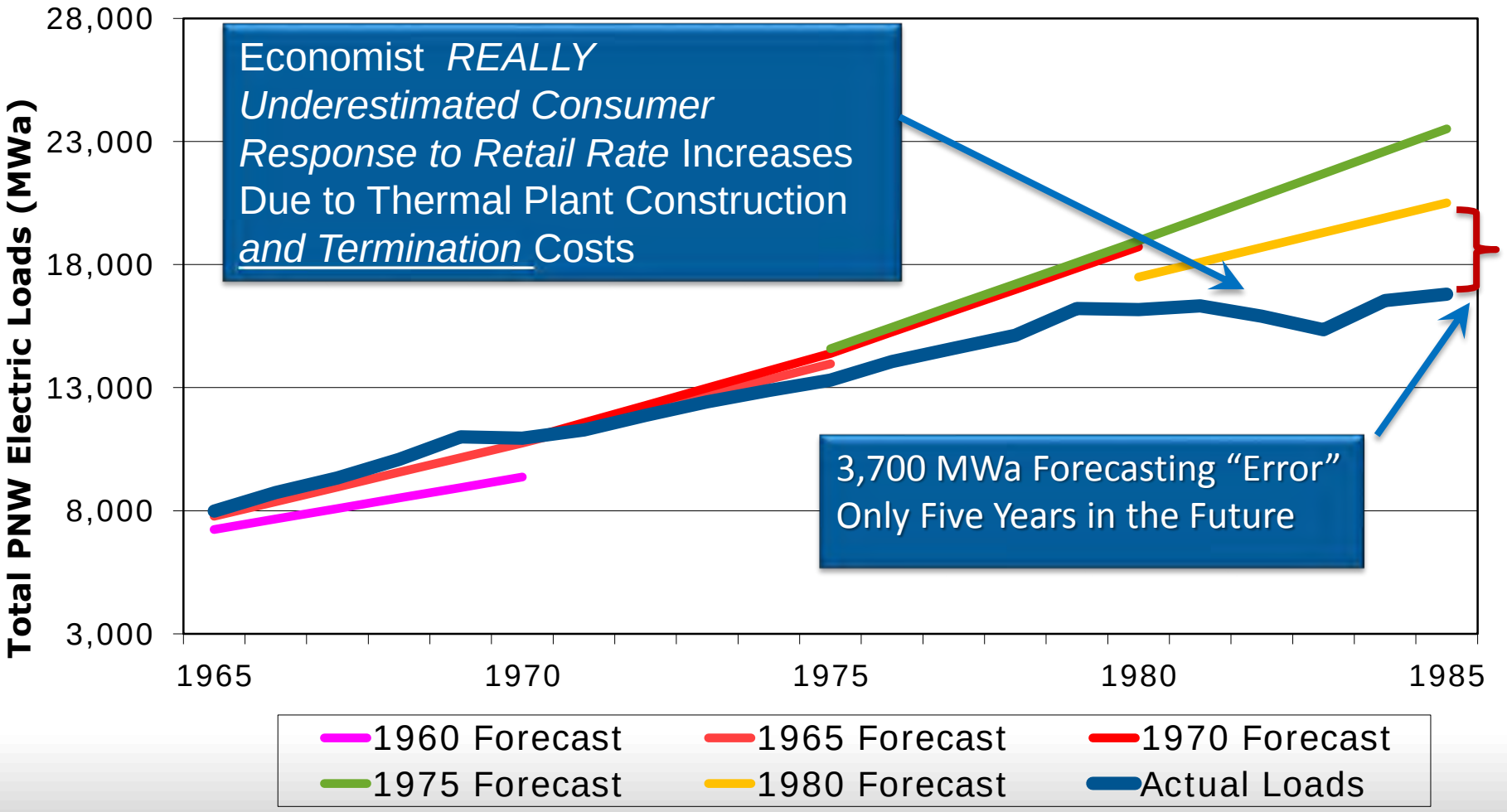


- Avoid big power resource mistakes
  - Like terminating partly-built nuclear and coal plants
- The fish problem
  - Dams get most of the blame

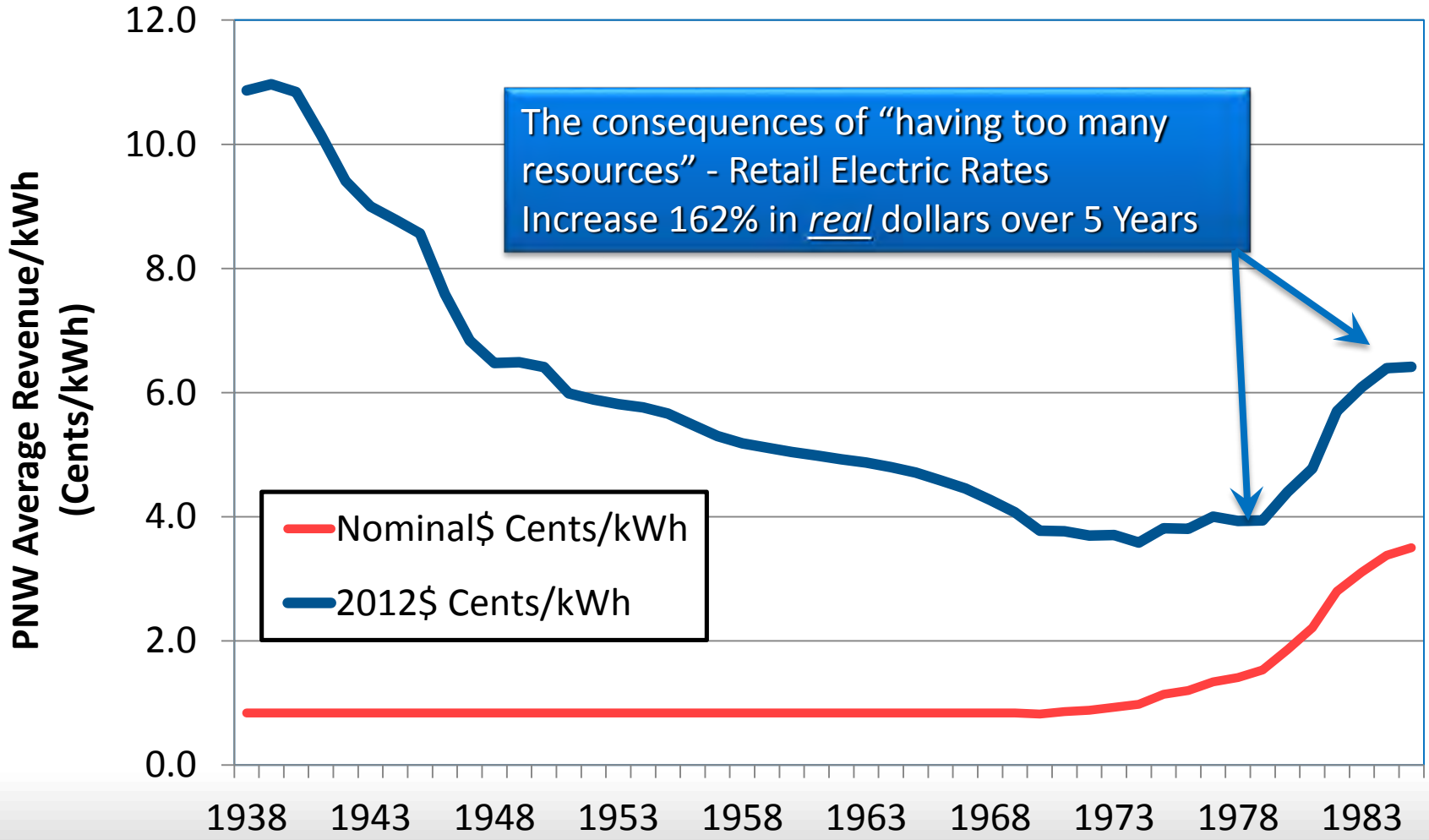




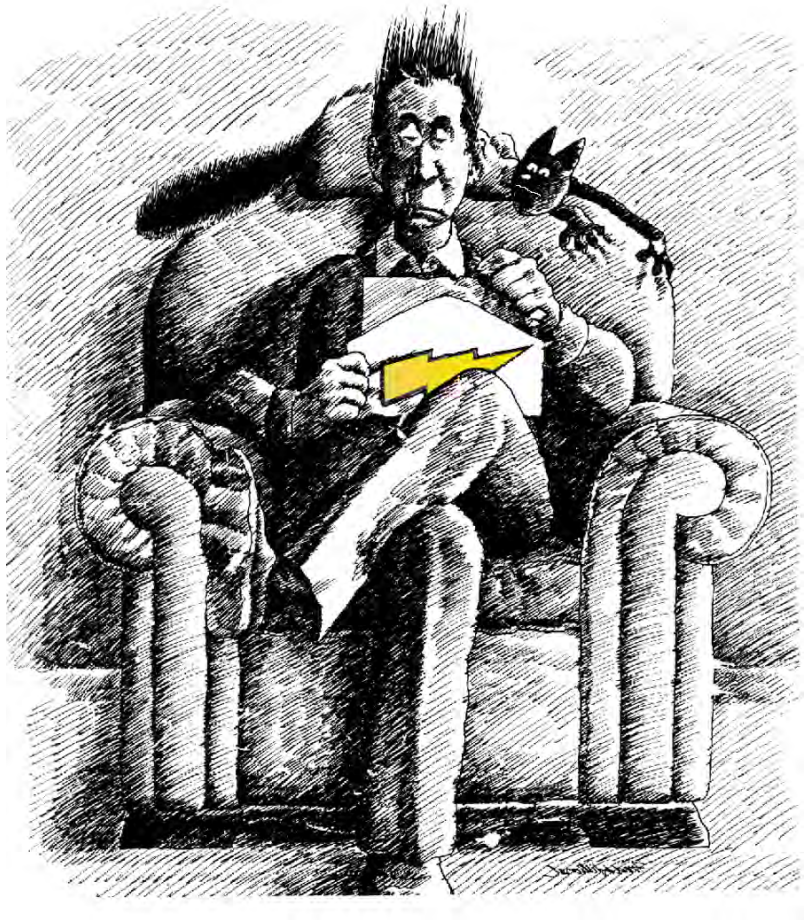
Forecast vs. Actual Use 1960 to 1985



BPA's Wholesale Rate Increases Translated in Dramatic Changes in PNW Retail Electric Rates

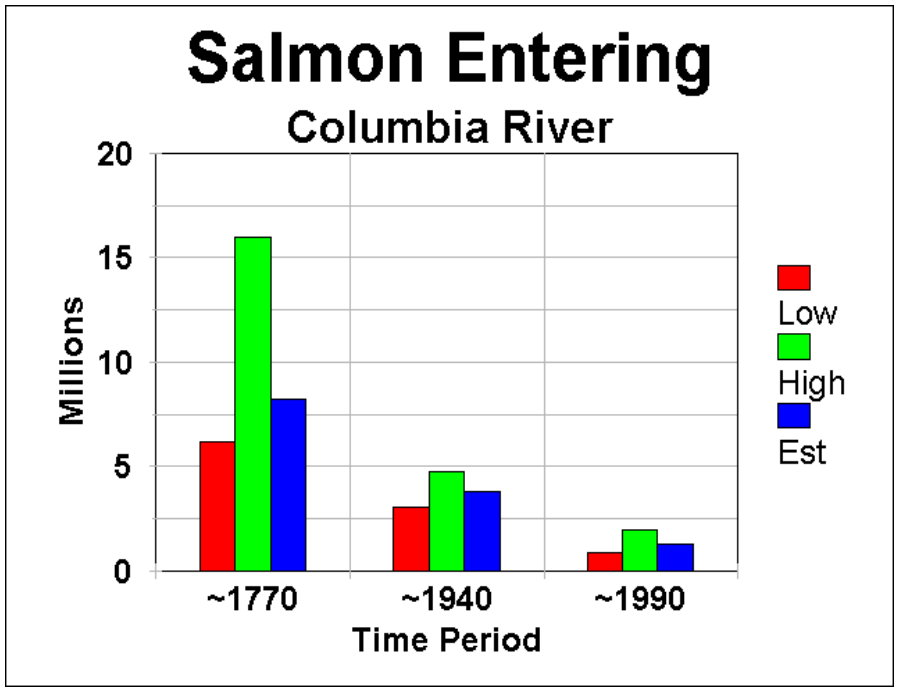


Consumer Reaction Created Political Action



- Terminate or mothball:
  - 9 nuclear plants
  - 5 coal plants
  - $7 billion wasted
- The bailout creates Northwest Power Planning and Conservation Act of 1980

..and Recover Columbia Basin Fish &Wildlife



The Tenants 1980 Regional Act

- Adequate, Efficient, Reliable Power System
  - Least-Cost – considering all costs & environment
  - Conservation considered a resource (10% advantage)

- Protect, mitigate & enhance fish & wildlife
  - Affected by hydro in the Columbia River Basin

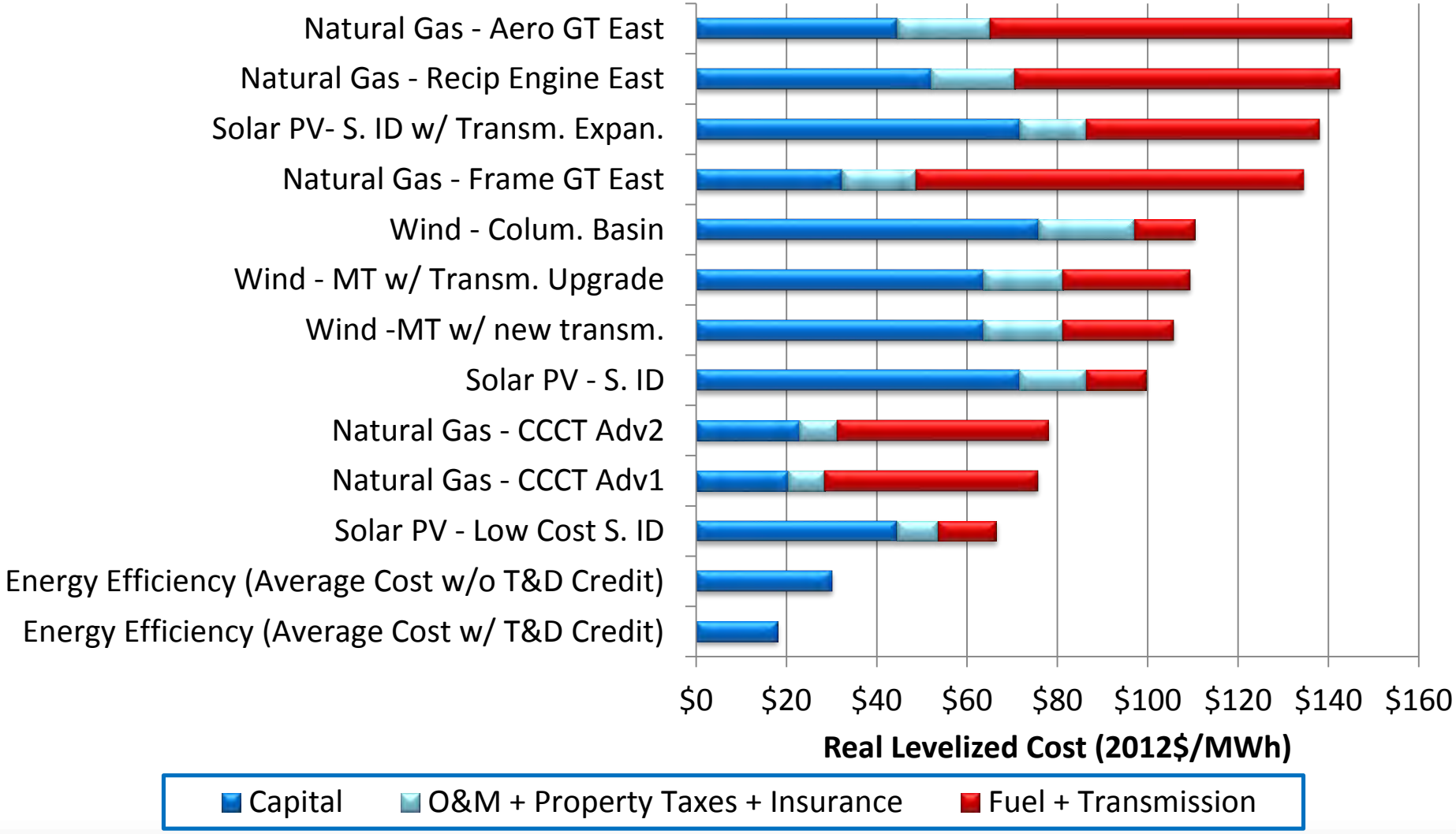
- Open Public Process
  - Giving the people a voice

THE DAWN OF INTEGRATED RESOURCE PLANNING

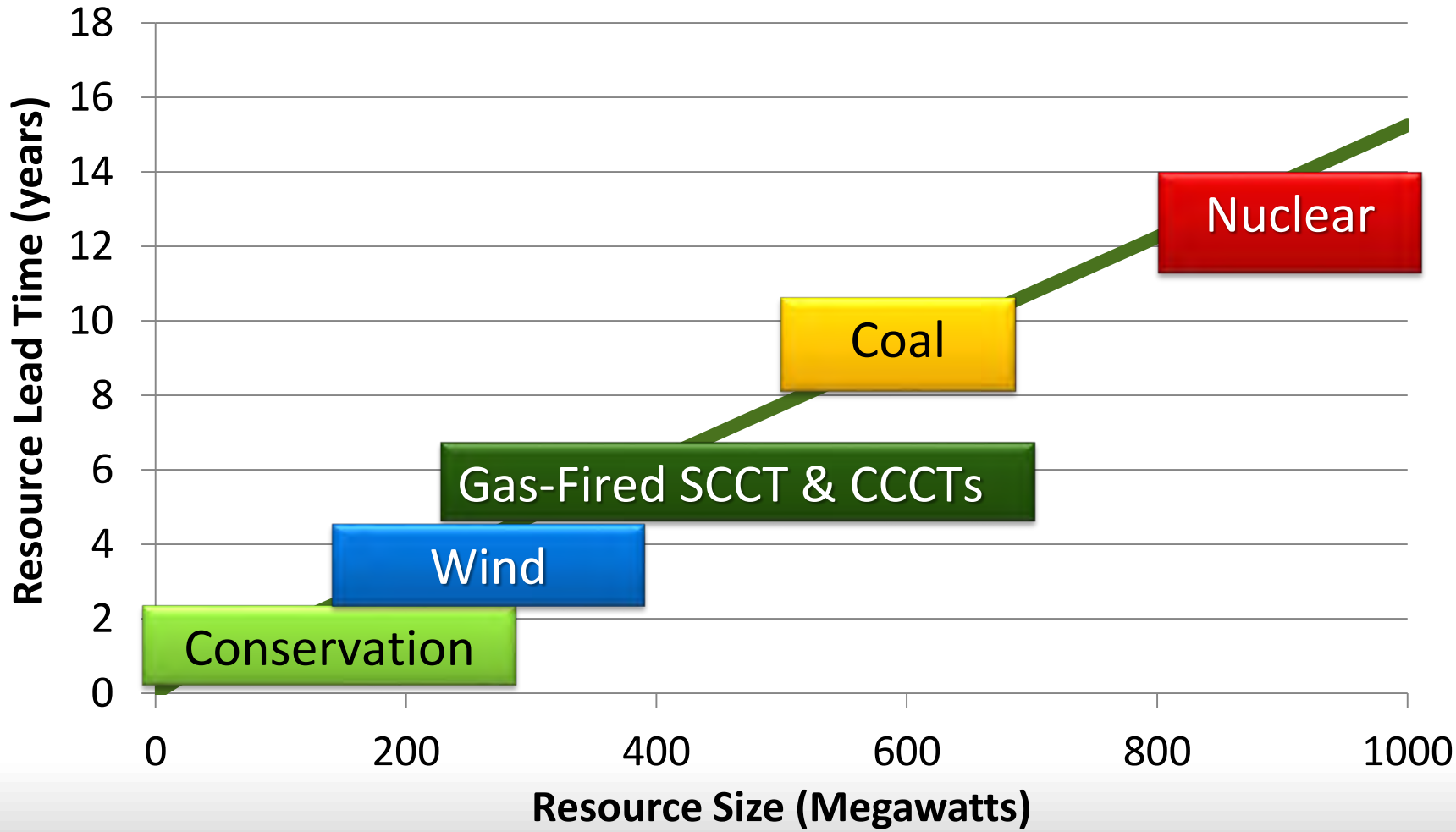
What is Integrated Resource Planning?

- Maintain adequate, efficient, reliable system
- Integrate customer-side resources
  - Energy efficiency & demand response
- Apples to apples resource comparisons
  - Include all costs of each resource – regardless of who pays
  - Include quantifiable environmental costs
- Incorporate uncertainty
- Find least-cost solution
  - Total cost – not just rates

Cost Factors – Energy



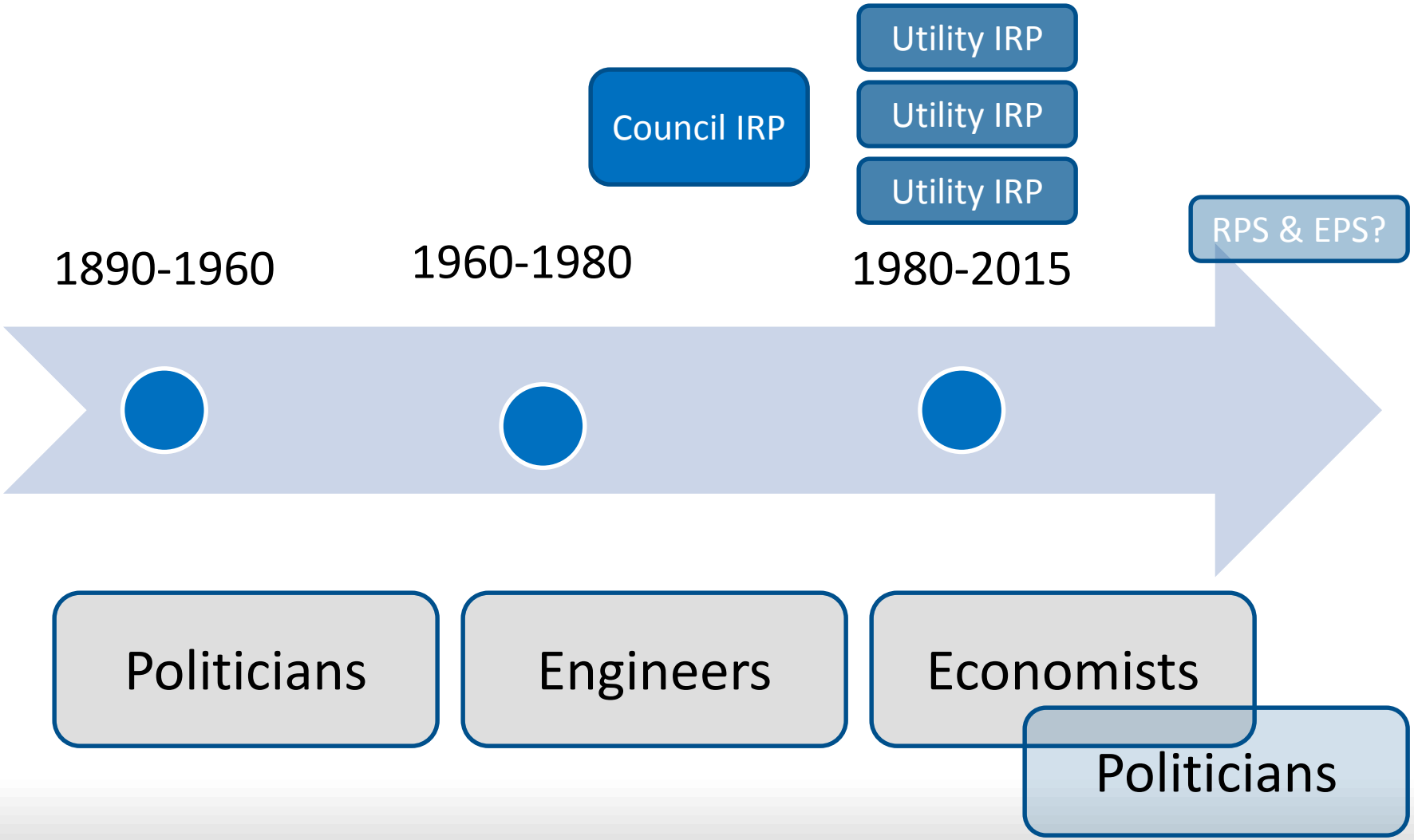
Resource Lead Time Factor



Utility Reaction to First Plan was Mixed

EVOLUTION OF ELECTRIC INDUSTRY PLANNING

IRPs Establish Conservation Goals



Council Contributions to IRP

- Energy Efficiency as a "Resource"
- Jaws of Uncertainty
- Development of "Options" to shorten lead time
- Planning Under Uncertainty
- Quantifying Risk
- Refining System Adequacy

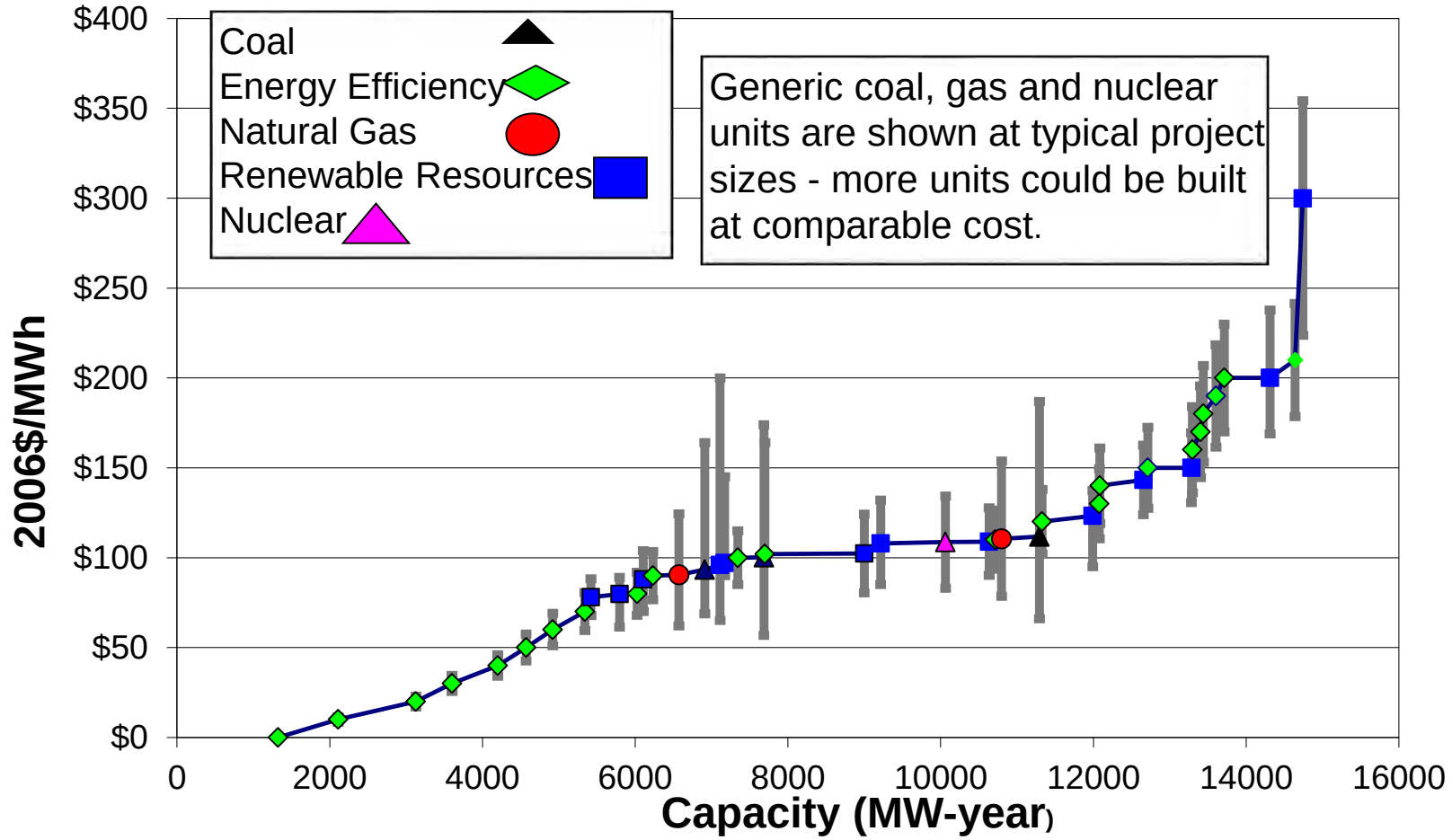
So How Does The Council Answer Those Simple Questions?

1. *When Will We Need Resources?*
2. *How Much Will We Need?*
3. *What Should We Build/Buy?*
4. *How Much Will It Cost?*
5. *What's the Risk?*
6. *Who Can We Blame if We Get it Wrong?*

The *lowest cost*, *lowest risks* resources first.

The Staff

Almost Resource Portfolio Analysis on One Slide



While the "All Resource Supply Curve" tells use what to acquire,
it doesn't tell us *how much, when or the costs and risks* of acquisition!

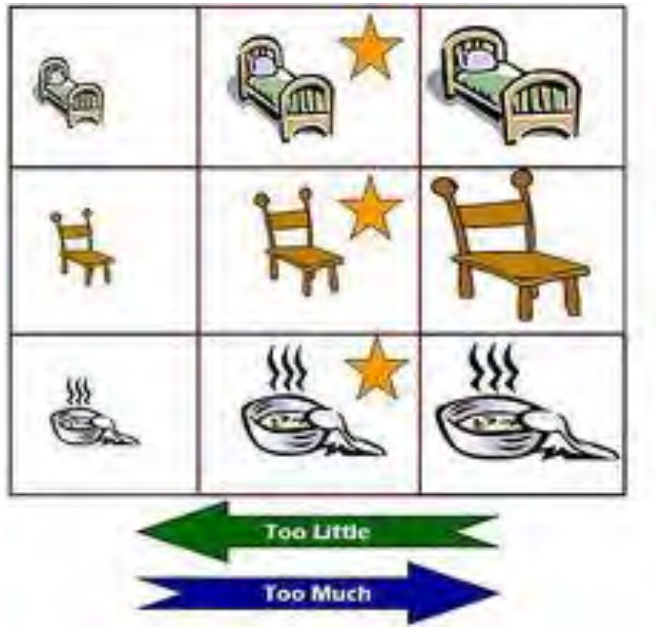
Insights From Prior Plans
Preferred Resource Characteristics

Resource Type	Low Cost	Short Lead Time	Small Increment	No or Low Fuel Price Risk	Low Carbon Policy Risk
Energy Efficiency	★	★	★	★	★
Wind		★	★	★	★
Solar PV		★	★	★	★
Gas SCCT/CCCT	☆	★	★		
Coal				☆	
Nuclear					★

★ = Resource exhibits desired characteristic
☆ = Resource partially exhibits desired characteristics

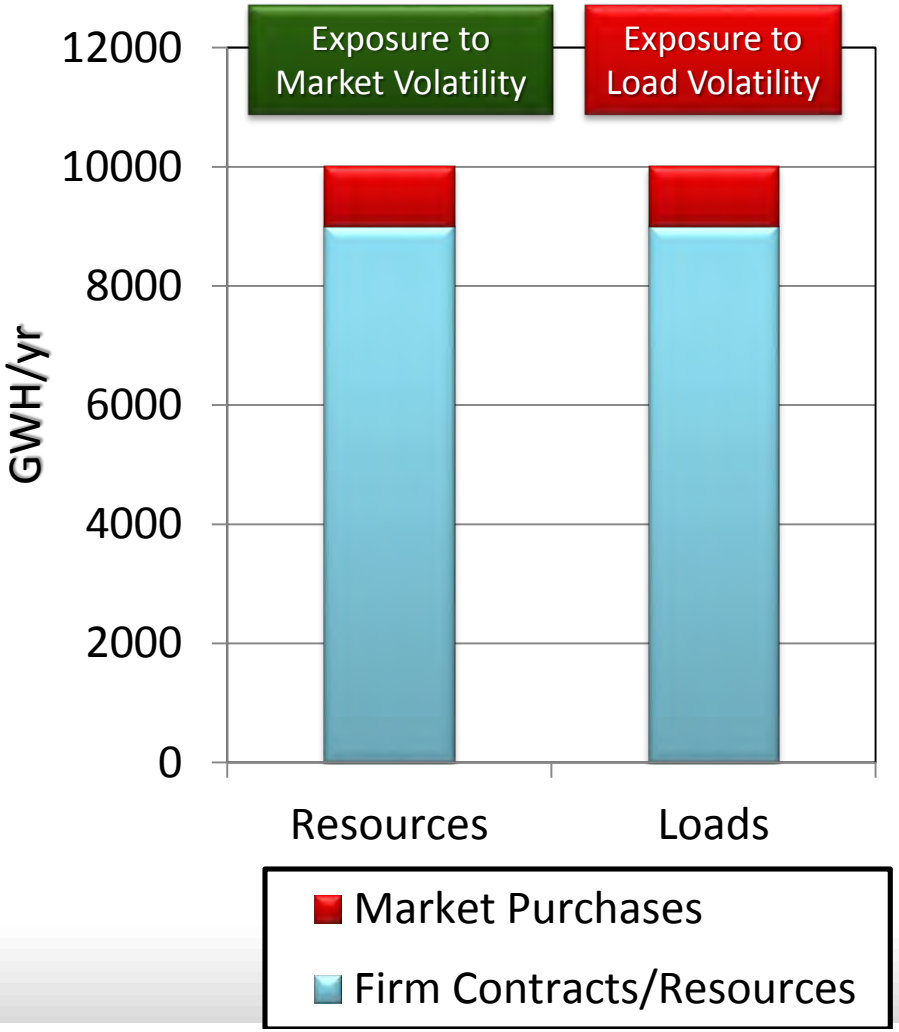
The Resource Planner's Problem

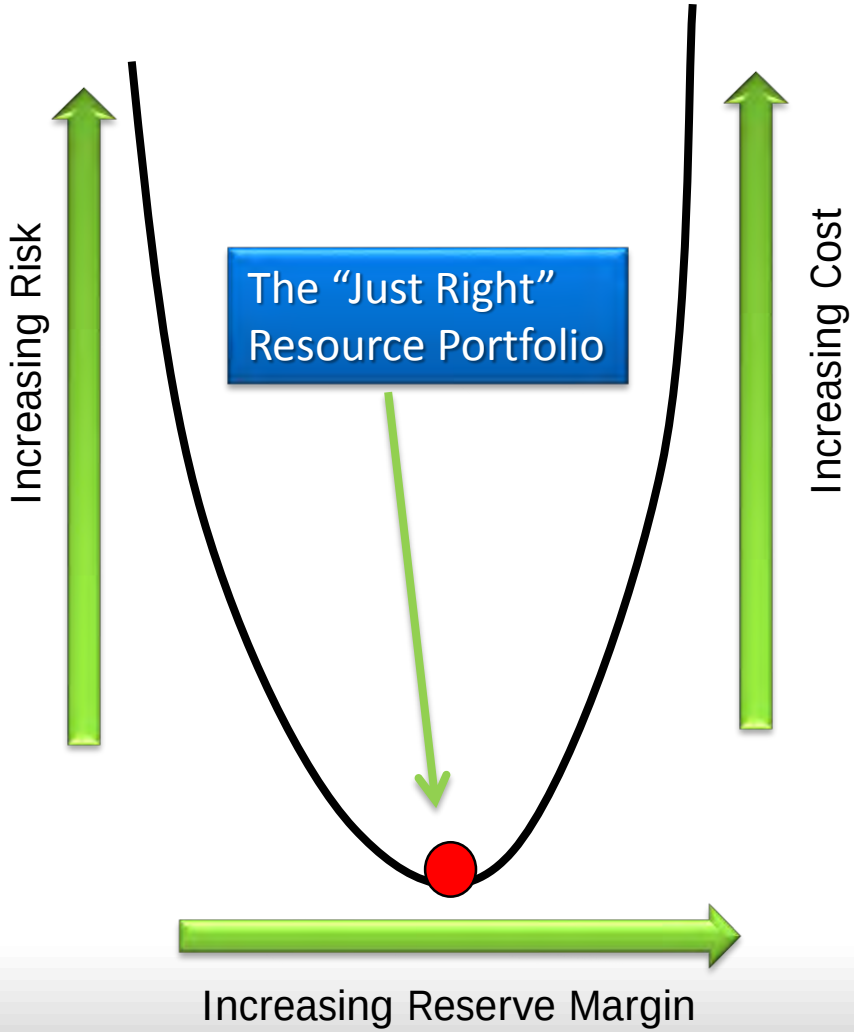
- Don't have too many resources
- Don't have too few resources
- Have "just the right amount" of resources*



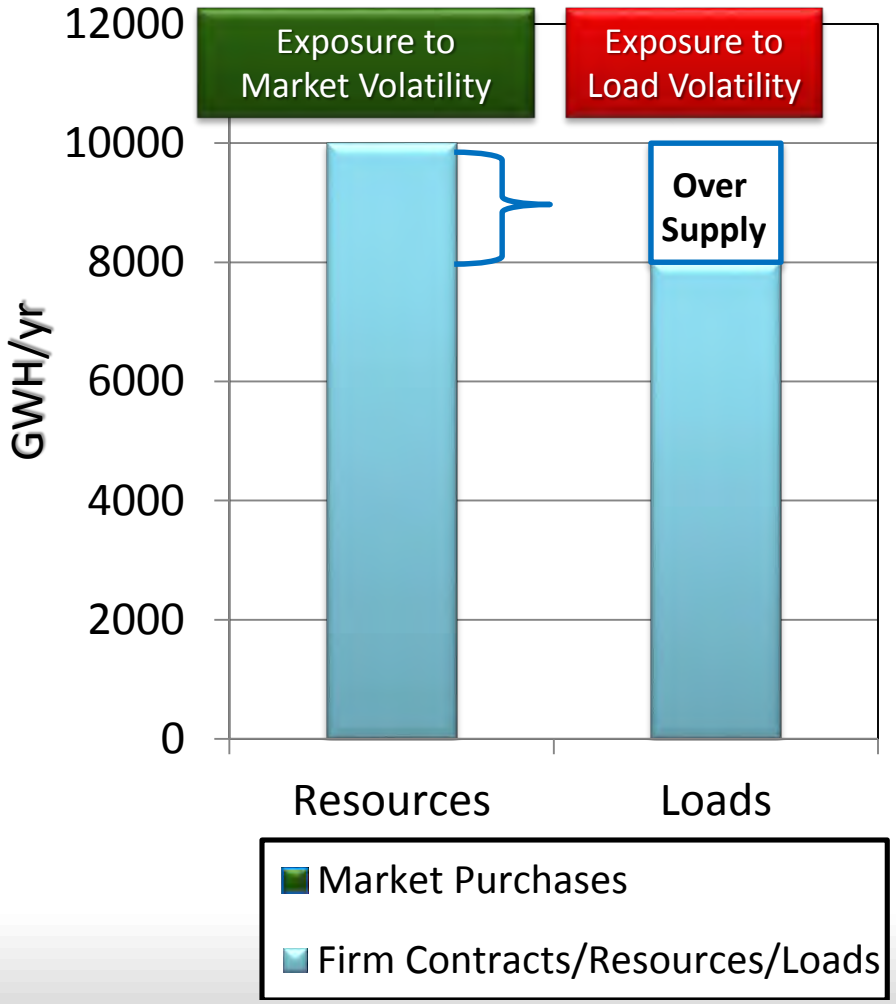
*Resources include energy, capacity, flexibility & other ancillary services needed for system reliability

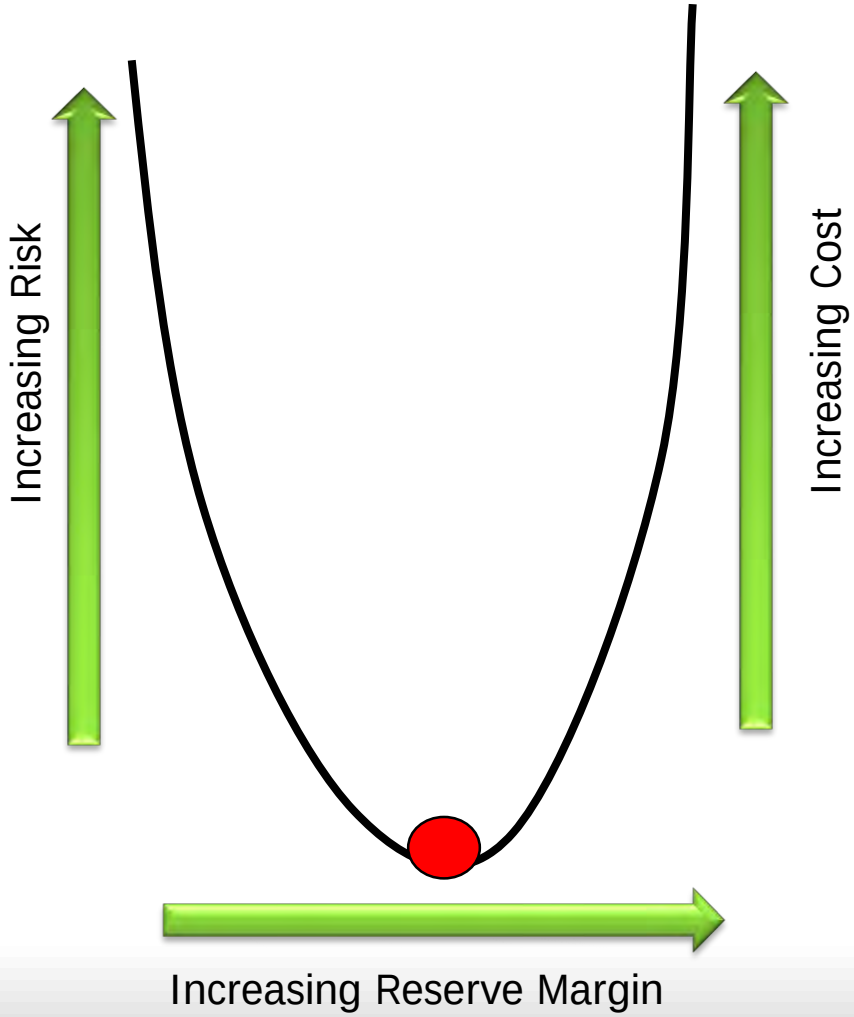
As A Utility's Resource Mix Changes So Does Its Cost and Risk



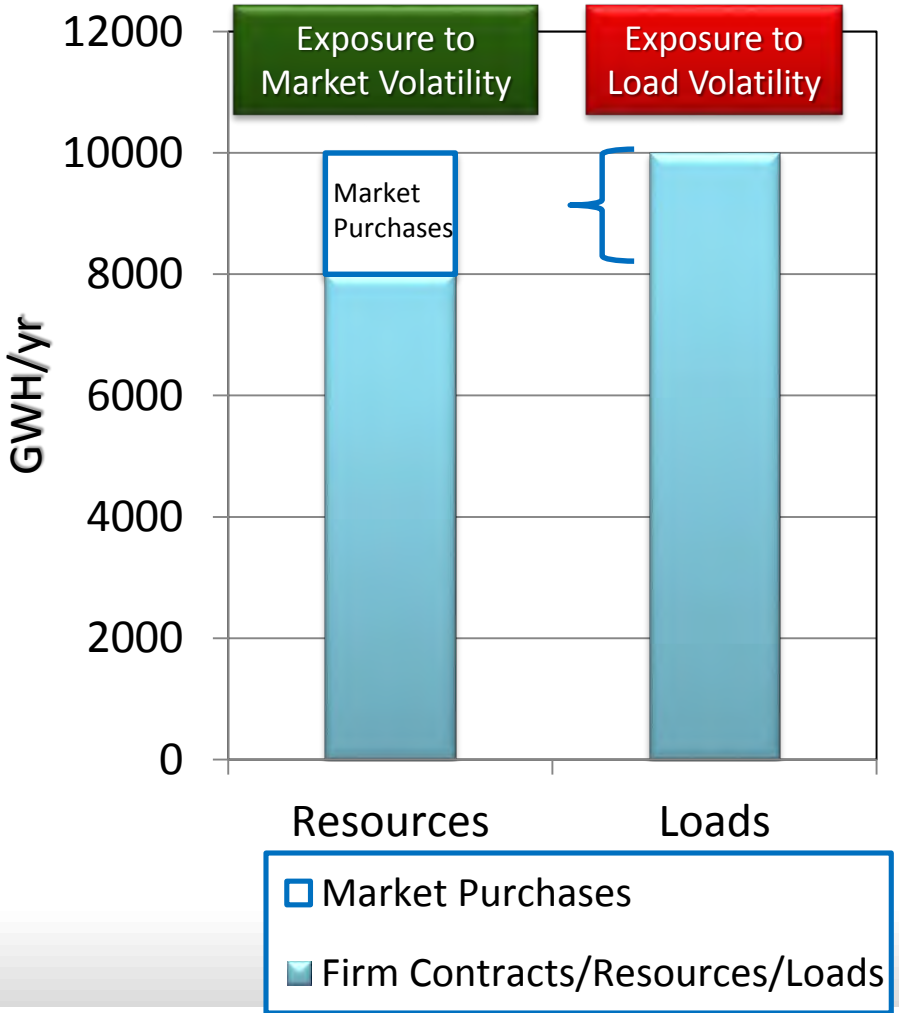


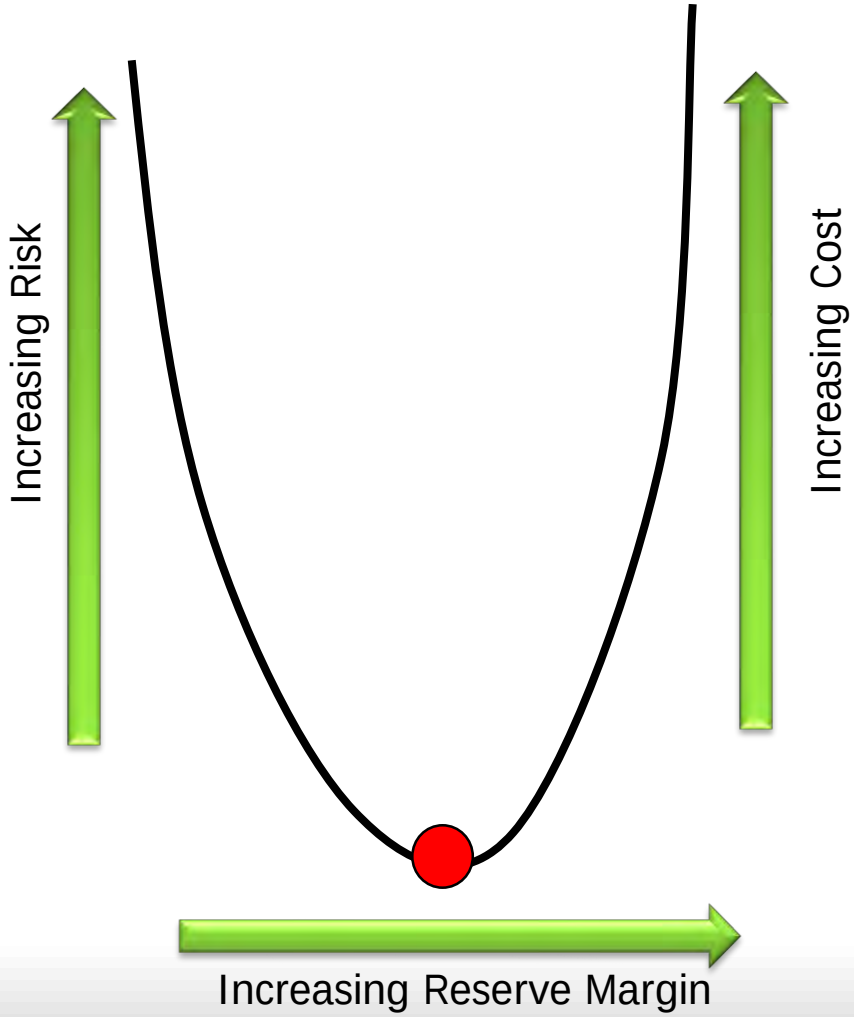
Increasing Firm Contracts/Resources Increases Load Volatility Risk



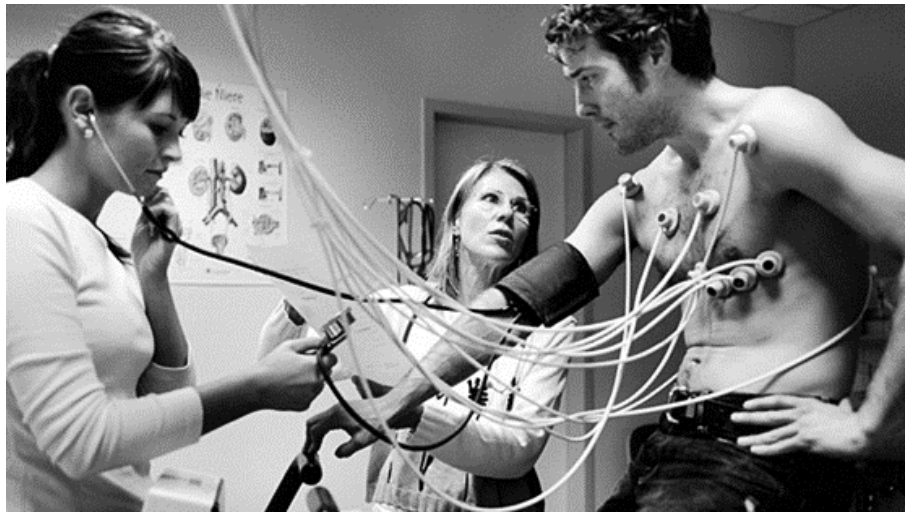


Decreasing Firm Contracts/Resources Increases Market Risk…





How Does Council Find Right Spot?



- Stress Testing!
- Test resource strategies against many futures
- Look at distribution of NPV forward-looking costs
- Find resource strategies that have low-cost & low risk

MR. TOADS WILD RIDE

Major Power Generation Technology in PNW



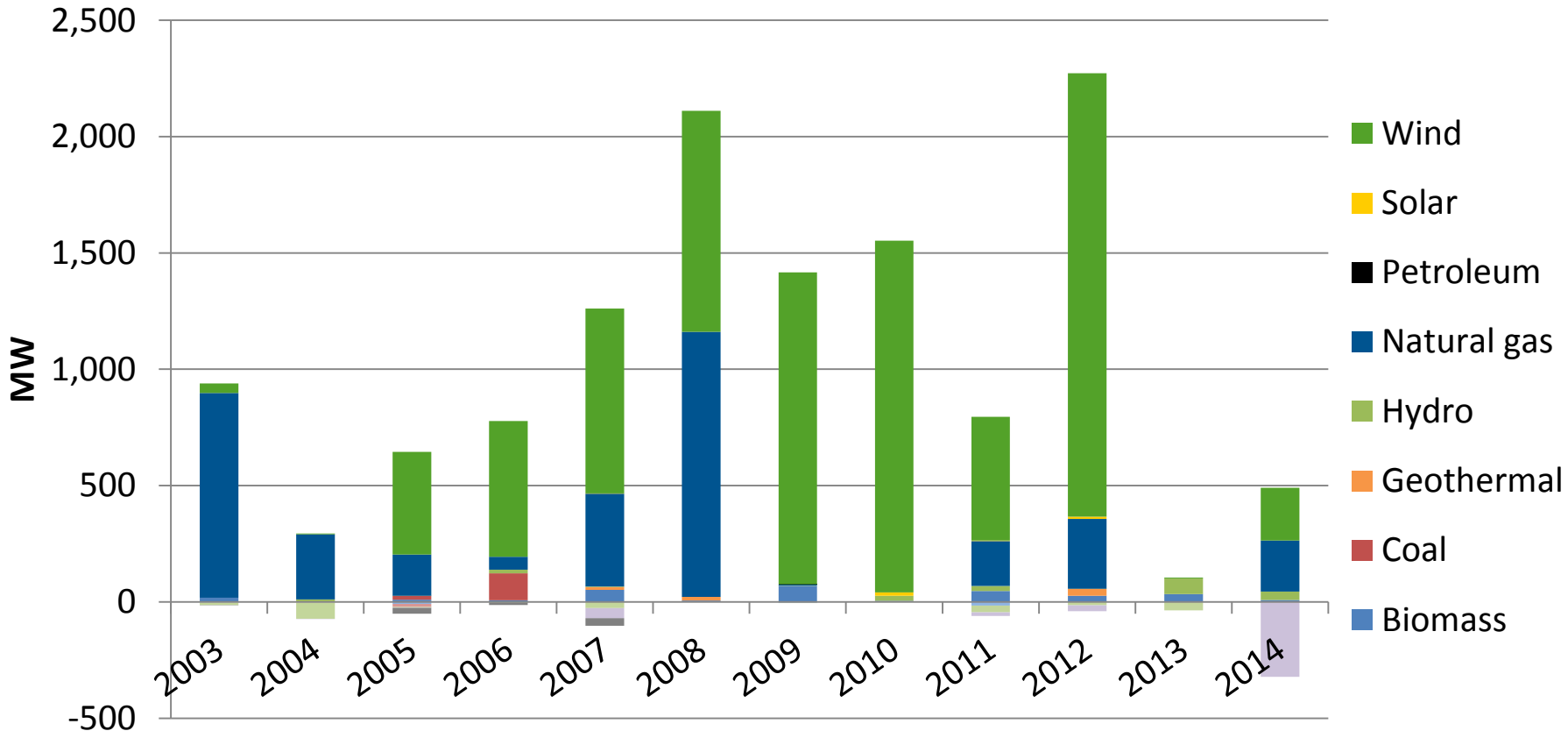

1890-1960 1960-1980 1980-2015

Natural Resources

Economy of Scale

Environmental Impact

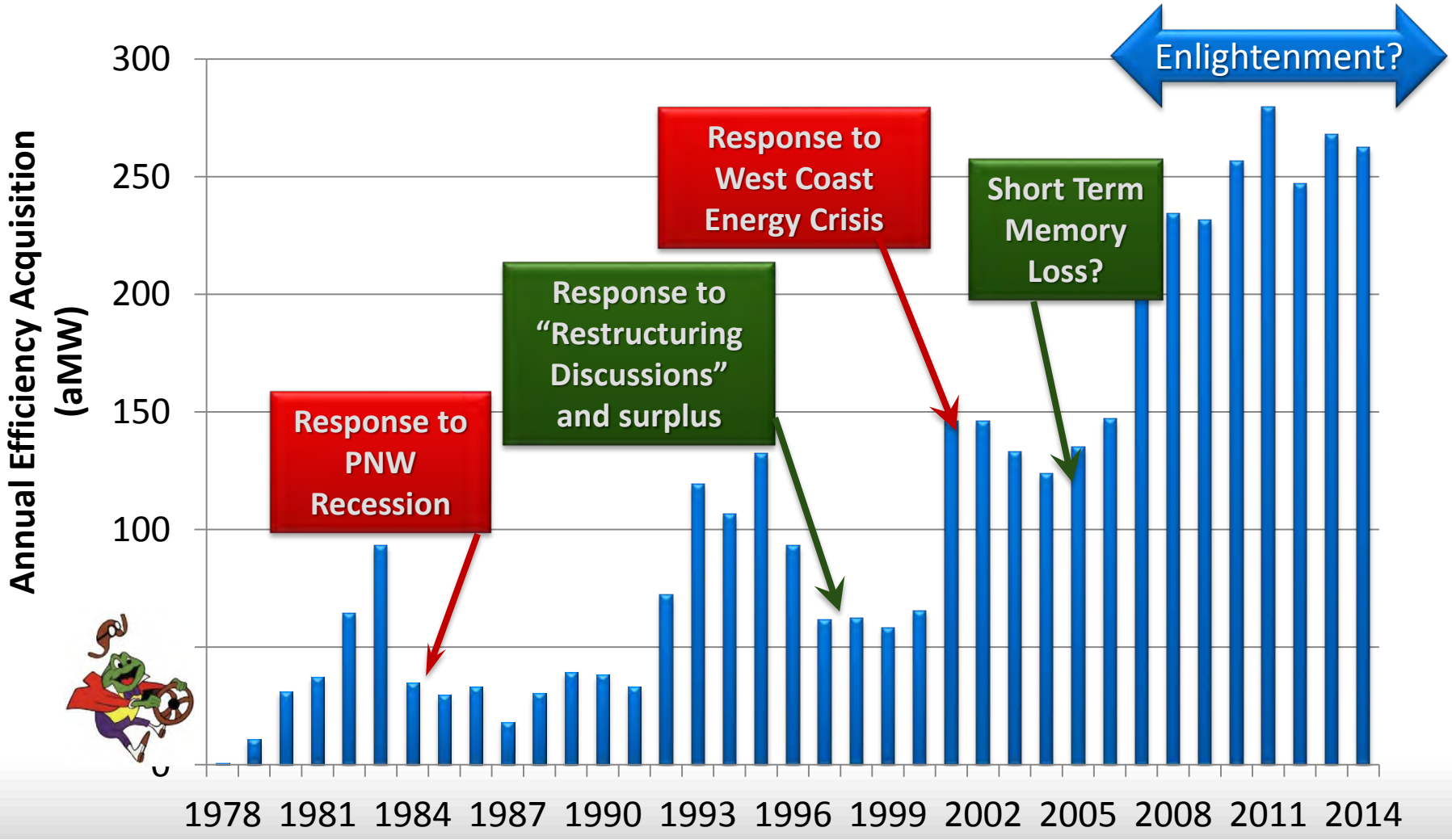
Generation Built Since 2003



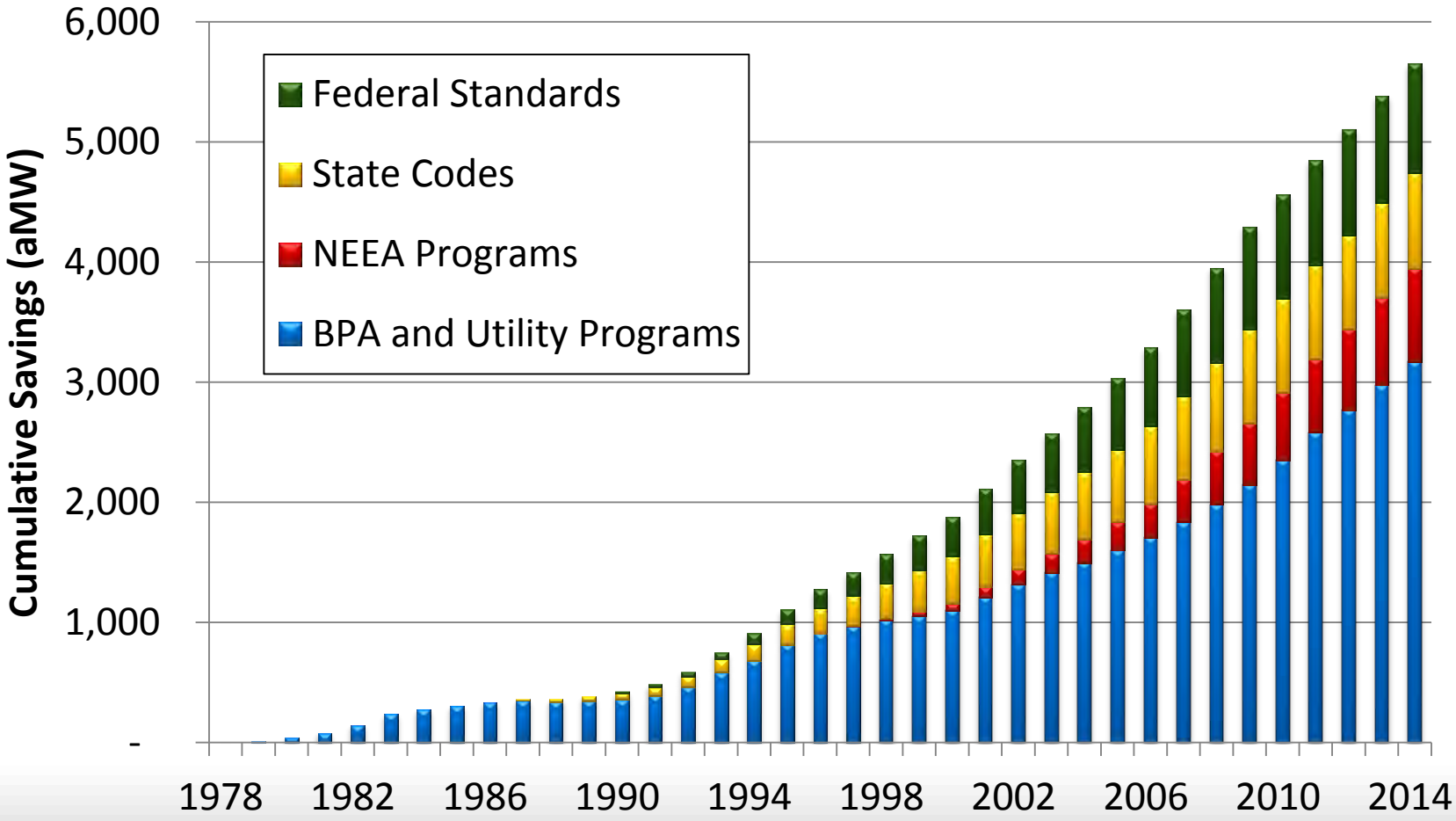
* Projects considered additions if in service or construction is near complete. Retirements do not include plants that have been idled for potential future use.

Northwest Efficiency Development Has Historically Been Tied To Current Market Conditions

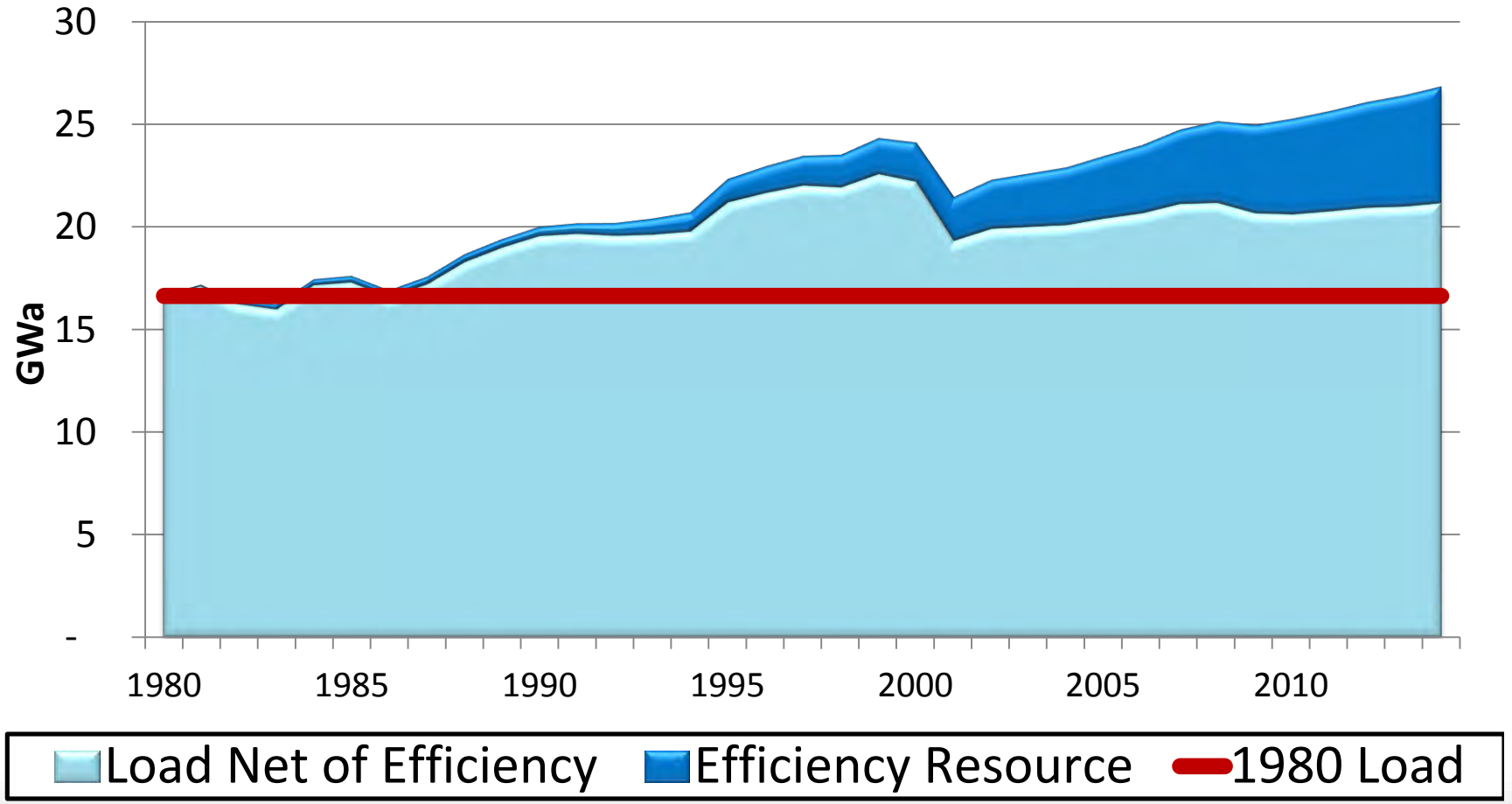
The Result Has Been Mr. Toad's Wild Ride!



Since 1978 Utility & BPA Programs, Energy Codes & Federal Efficiency Standards Have Produced Almost 5700 MWa of Savings



Efficiency Has Met Nearly 55% of PNW Load Growth Since 1980

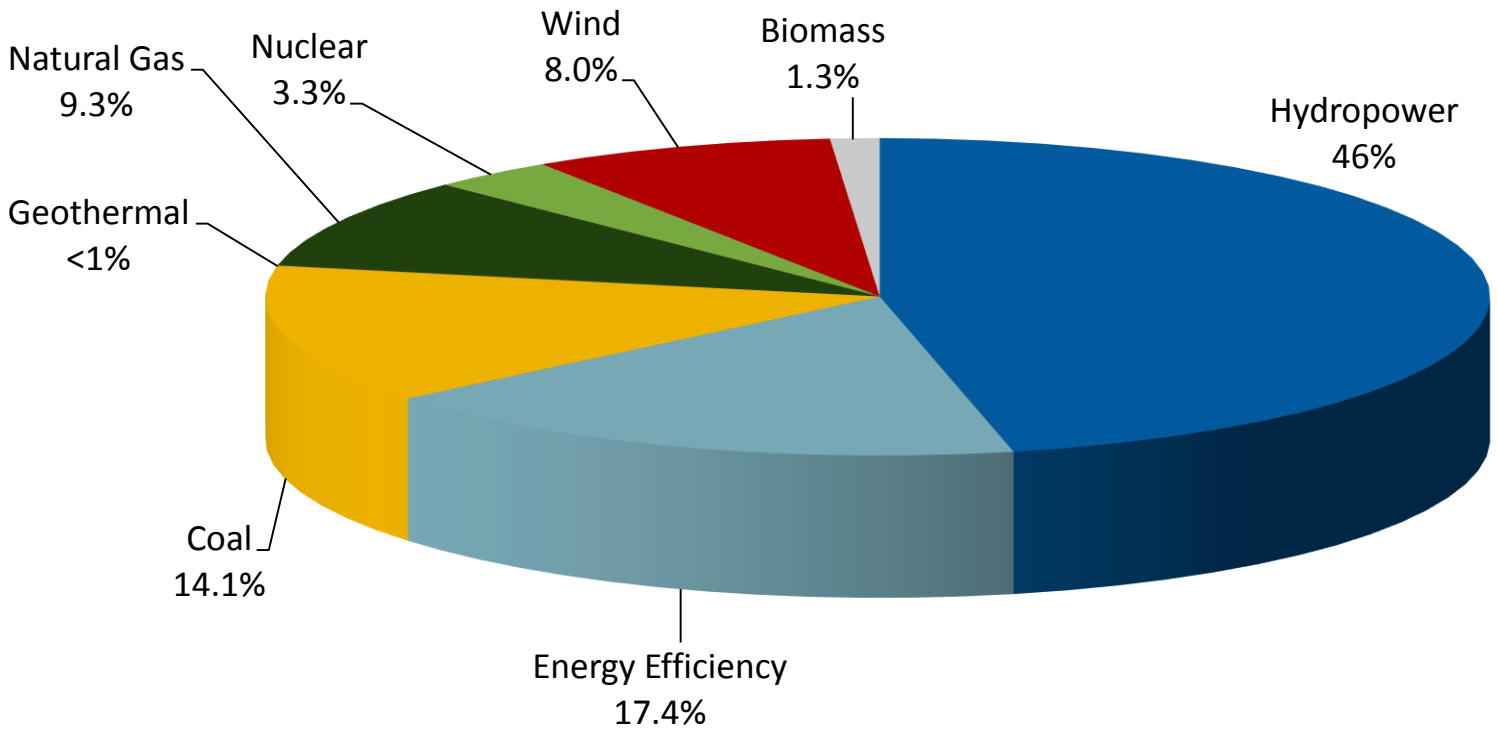


What's the Value of 5800 aMW?

- It's represents enough energy savings to save the region's electricity consumers nearly $3.73 billion in 2014

- It lowered carbon emissions in the Pacific Northwest by an estimated *22.2 million* MTE

Energy Efficiency Was The Region's Second Largest Resource in 2014



Based on 2014 Actual Dispatch and Hydro Resource Output from EIA

FROM PLANNING TO IMPLEMENTATION

Power Generation Implementation

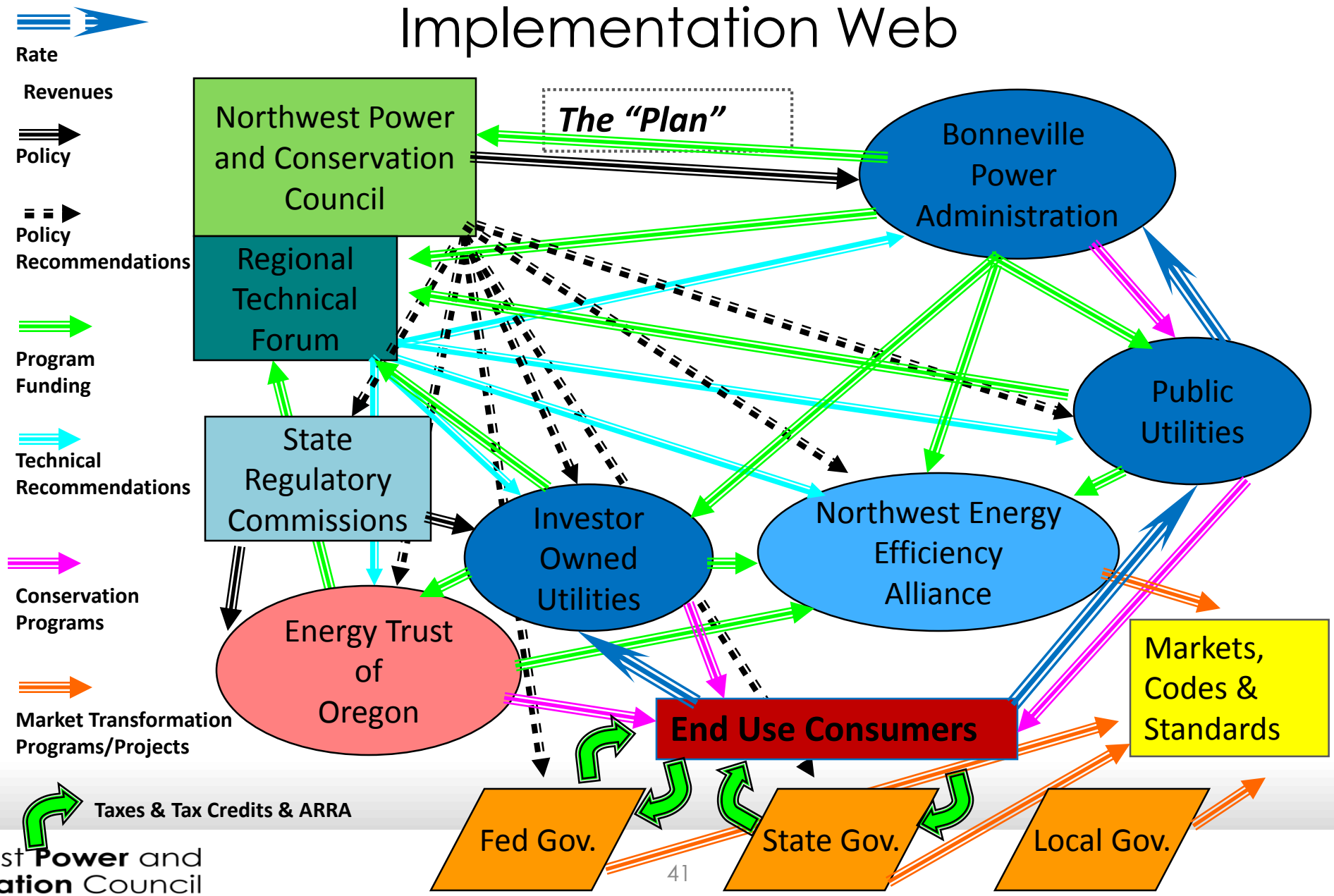
- Bonneville Power Administration
- Electric Utilities
- PURPA Resources
- Emergence of Independent Power Producers IPPs
- Legislation: Renewable Portfolio Standards
- Mechanisms
  - Primarily contracts with load serving entities
  - Some self-generation
  - Emerging direct application (net-metered solar PV)

Conservation Implementation

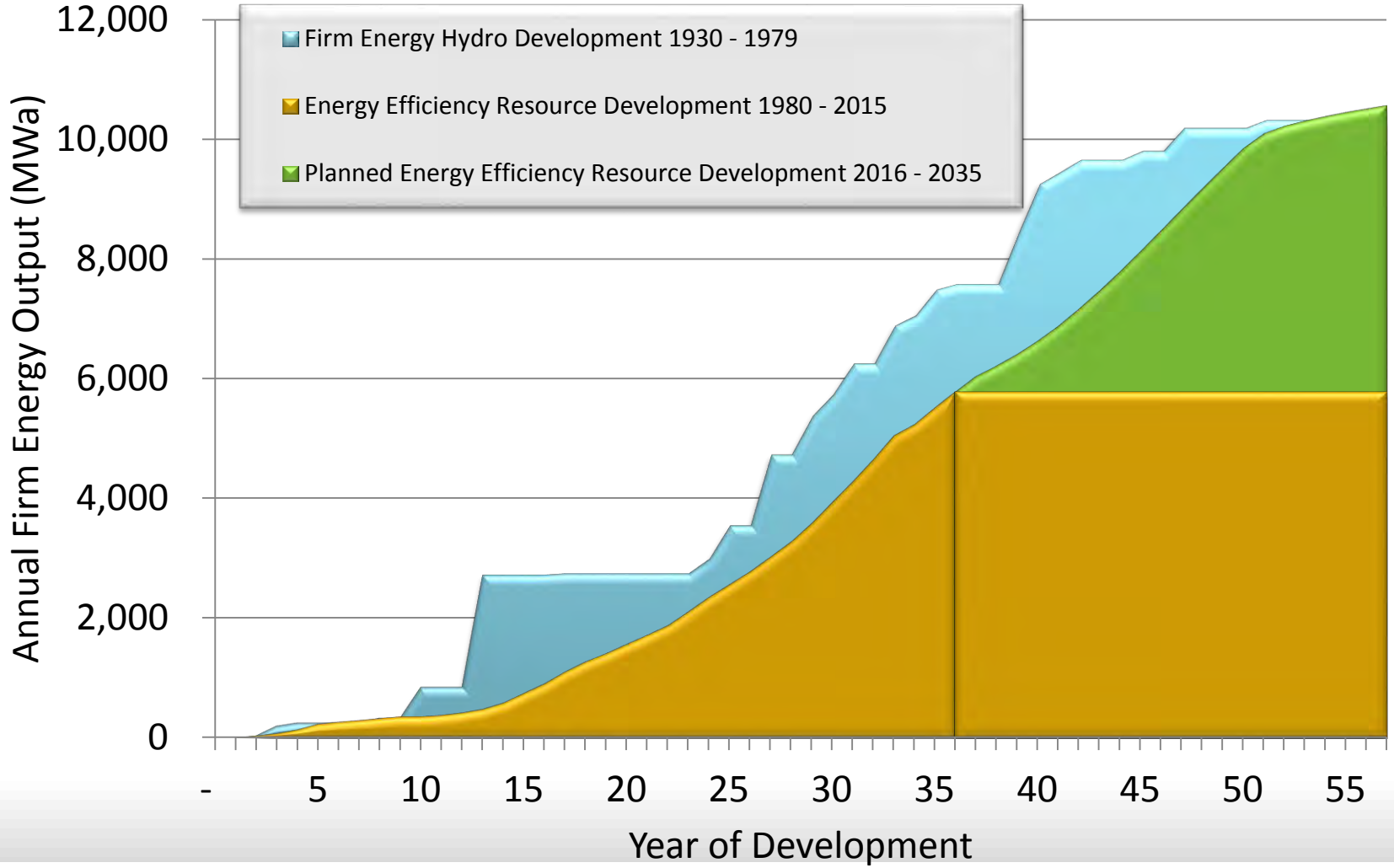
- Bonneville & Utility Programs
- State Building Codes
- Federal Appliance Standards
- The Invention of Market Transformation
- Evolution of Evaluation
- The Regional Technical Forum

The Plumping: How Efficiency As A Resource Turns Into Conservation Programs

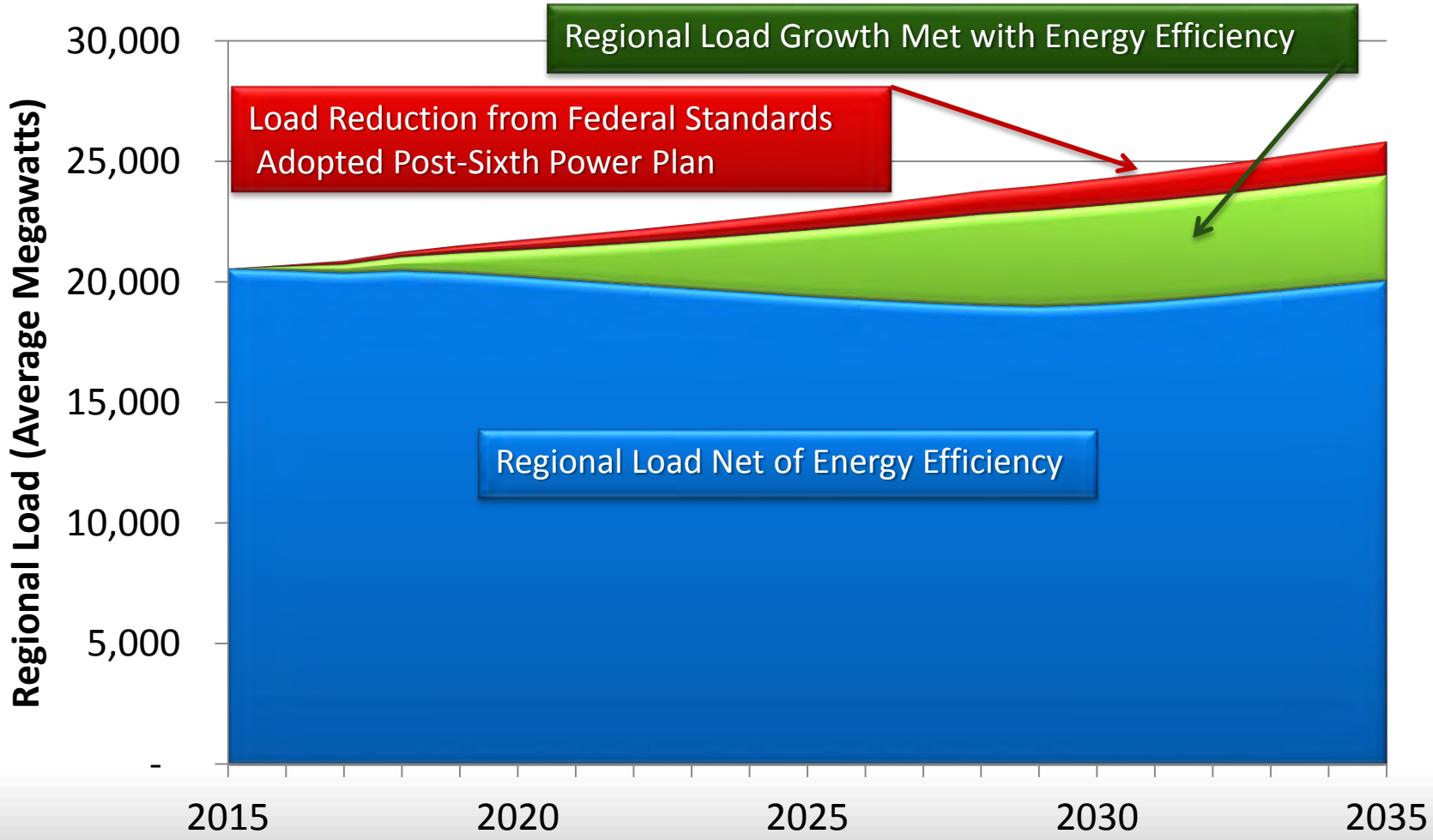
Northwest Energy Efficiency Implementation Web



50 Years to Develop the PNW Hydro-System Energy Efficiency Can Extend That Legacy



A Peak Into the Future:
Seventh Plan Findings



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