



# BPA Technology Innovation

A disciplined approach to research portfolio management that leads to BPA applications that deliver value, reduce costs or increase revenues, and maintain low rates and reliable power for the region.

# Agenda

- Results
- R&D Fundamentals
- Technology Innovation Structure
- Portfolio & Project Management
- Conclusion

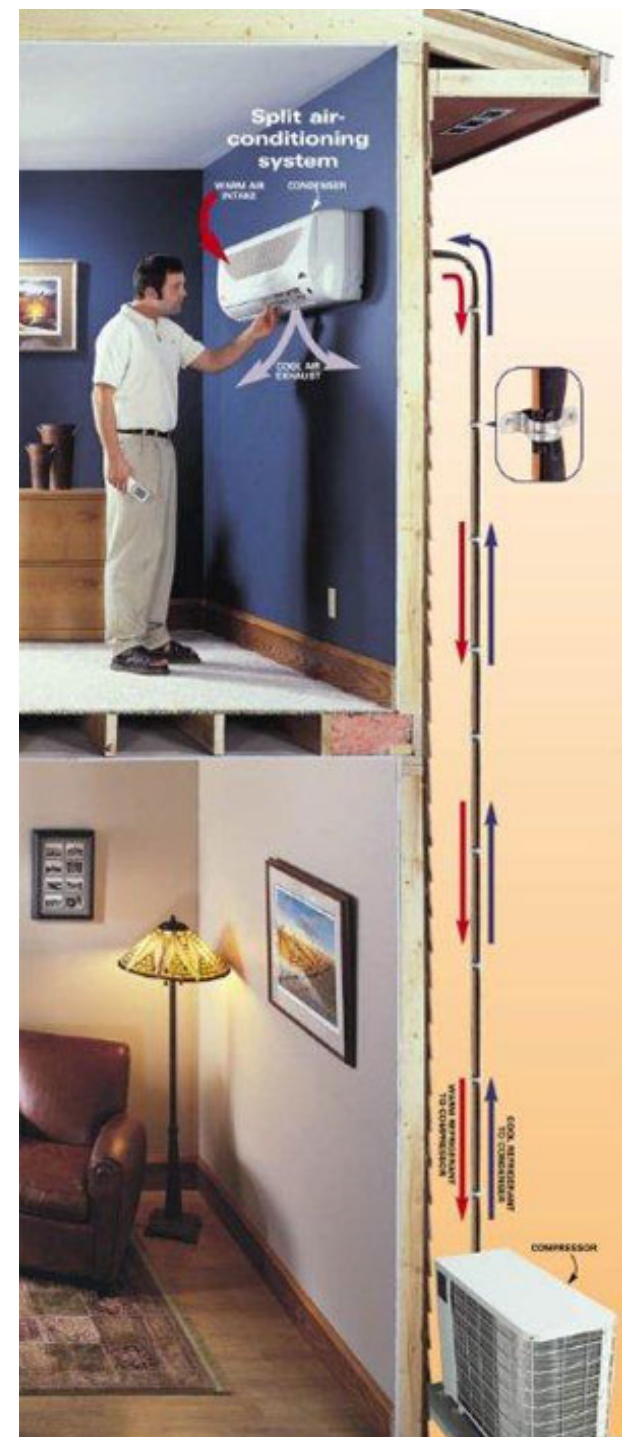
# BPA Results



# Ductless Heat Pumps

- Heat Pump technology assessment capability
- Installed more than 4,800 ductless heat pumps into homes in the Pacific Northwest
- Success resulted in expansion of program for small business applications
- Provides future savings to BPA

Value Delivered =  
\$Millions in Least Cost Energy



# Seismic

- Reduce the seismic acceleration by: 50% for 500 kV equipment; 30% for 230 kV and 115 kV equipment & 10% for 69 kV equipment
- Created tools for equipment designers to validate models of seismic mechanics & perform representative analysis and design approach



**Value Delivered = \$ Hundreds of Millions  
Faster System Restoration**

# Conductor Shunt



- 20 mile Ross-Lexington upgrade
- Increased capacity with “splice shunts” instead of new wire
- Half outage time
- One BPA crew vs. multiple
- \$4 million direct savings first application
- Multiple applications in progress and pending

**Value Delivered = \$Millions in First Cost Savings**

# Synchrophasors

- SCADA @ BPA = 2 seconds
- Synchrophasors = 60 / second (120 times faster)
- Now - sleuth grid issues (looking backward)
- Soon - control functions for reliability
- Mid-term - oscillation damping
- Long-term - additional Pacific Intertie throughput

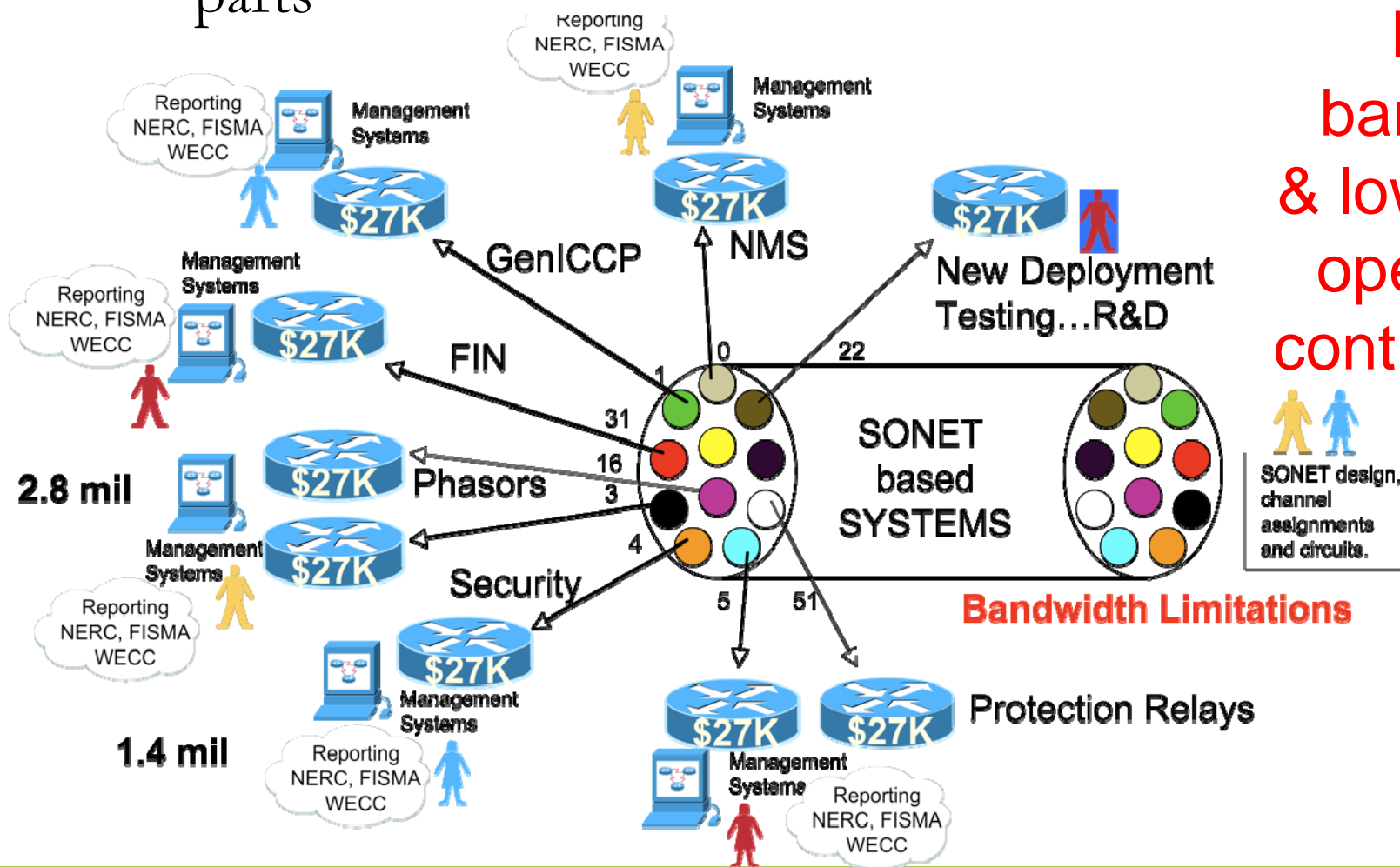
**Value Potential = \$Hundreds of Millions  
Additional Revenue**



# Operations Telecommunications

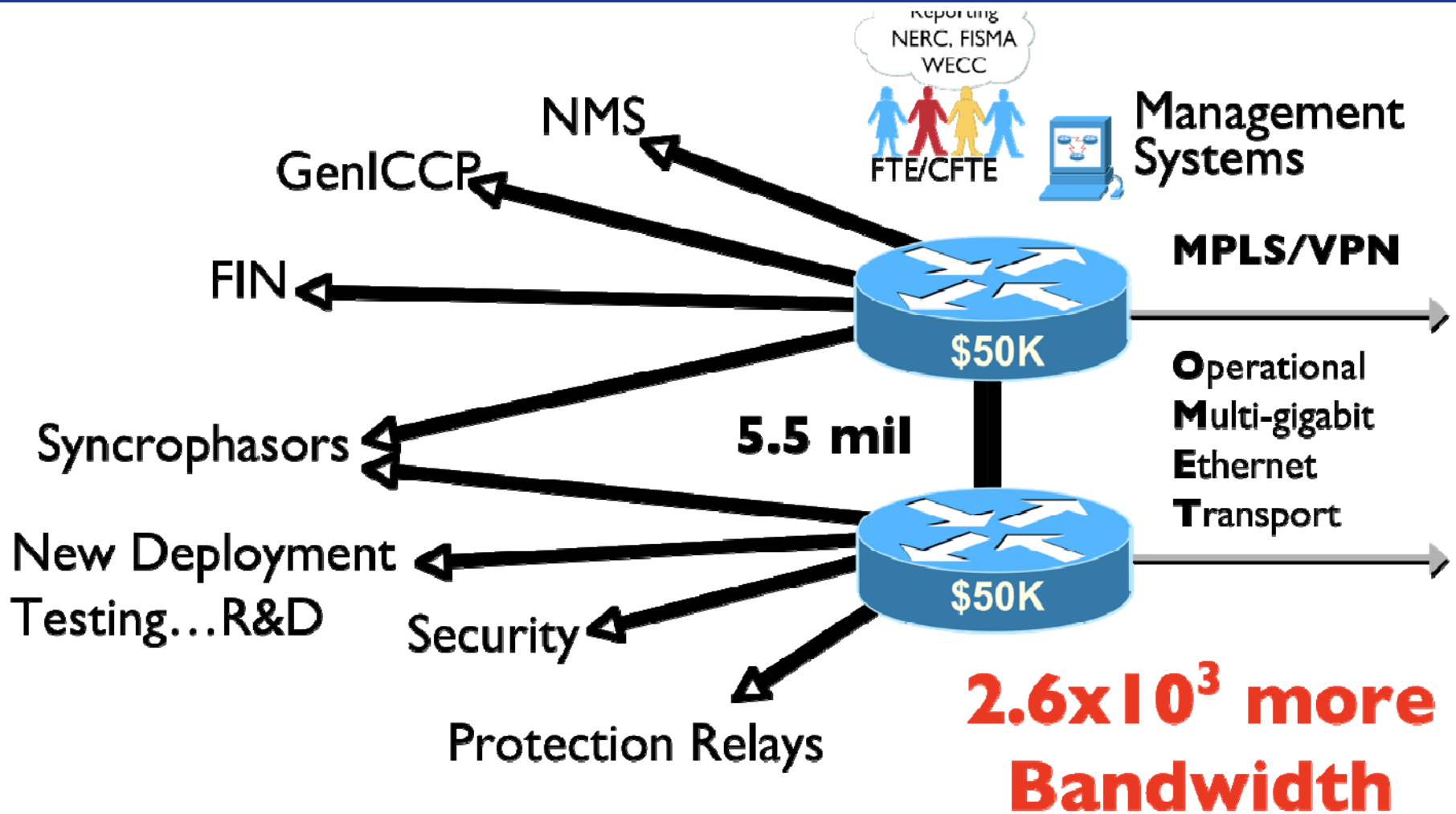
- Used for SCADA, etc
- Needs to be used for smart grid, synchrophasors, etc
- Current technology reliable but low bandwidth and many parts

Huge bandwidth & low latency operations control needs





# Multi-Gigabit Ethernet Transport for Operations



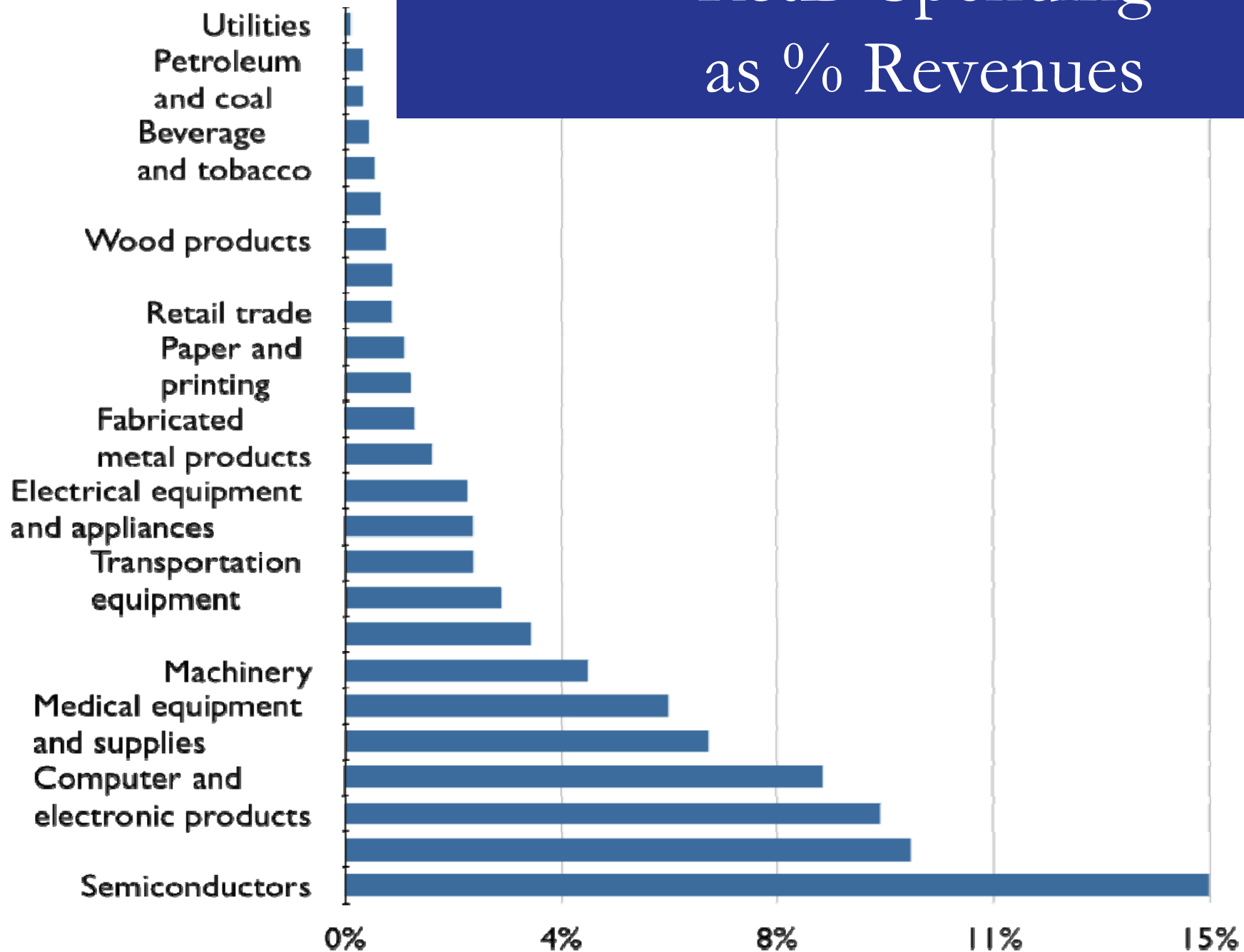
Value Delivered = \$Millions in First Cost;  
multiples of that for operations savings

Plus critical bandwidth

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# R&D Spending as % Revenues



# What's Wrong with Spending 0.01%?

- Power sector “owns” about 40% of climate change issues
  - **R&D needs:** CO<sup>2</sup> sequestration, energy efficiency, effective renewables and storage integration, & smart grid
- Power sector could “own” another 30% related to transportation (electric vehicles)
- Utterly new and more complicated grid operations coming – Wind + Smart Grid

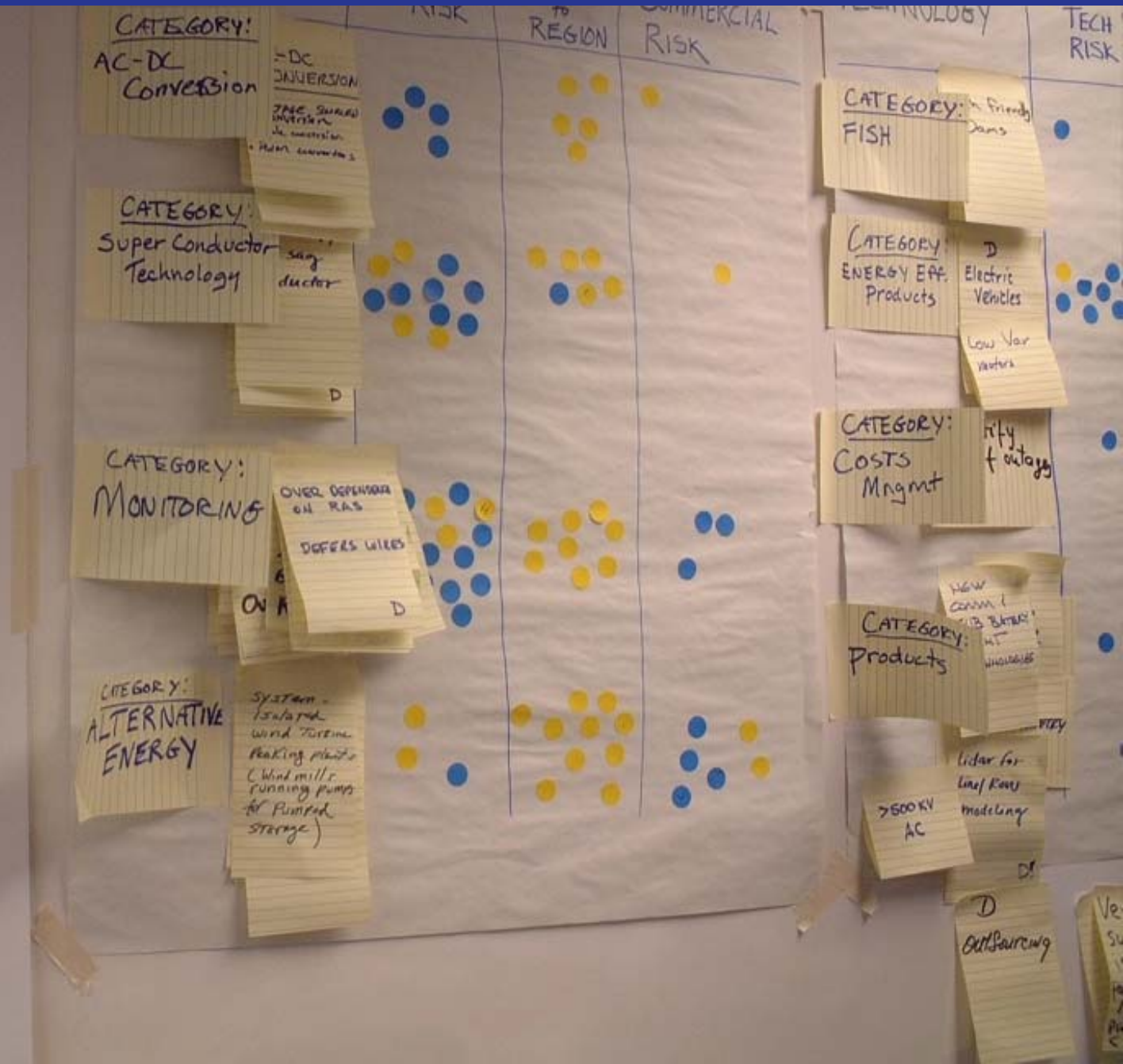
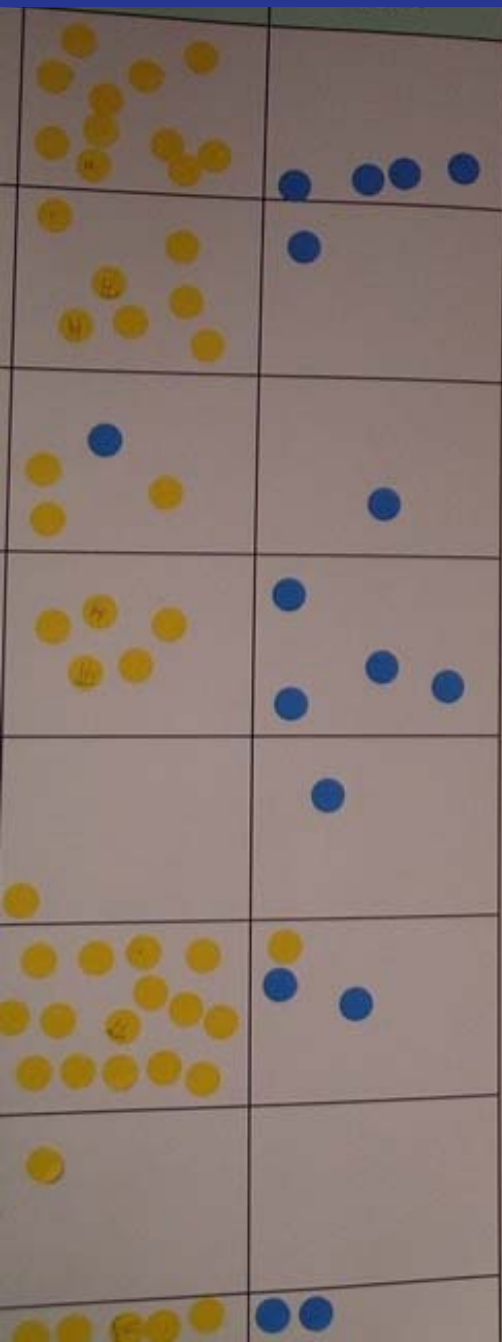
# Good R&D Practices

- Publicly articulated research interests and agenda ([www.bpa.gov/ti](http://www.bpa.gov/ti))
- Portfolio concept across key dimensions
- Great project management including built-in kill decision points
- In-company integration addressing business needs

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# BPA's Version



# Strategically Driven

B O N N E V I L L E P O W E R A D M I N I S T R A T I O N





# Agency Strategy I5

## Technology Innovation

### **Agency Strategy Map Technology Innovation-I5**

BPA solves business challenges and enables breakthroughs using a program of disciplined research and technology innovation that is recognized to deliver high value to the region

# Direct Linkages

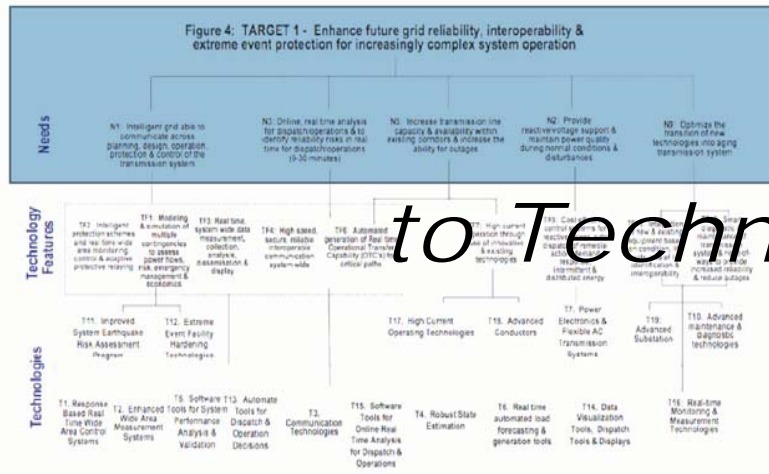
*BPA Strategy*



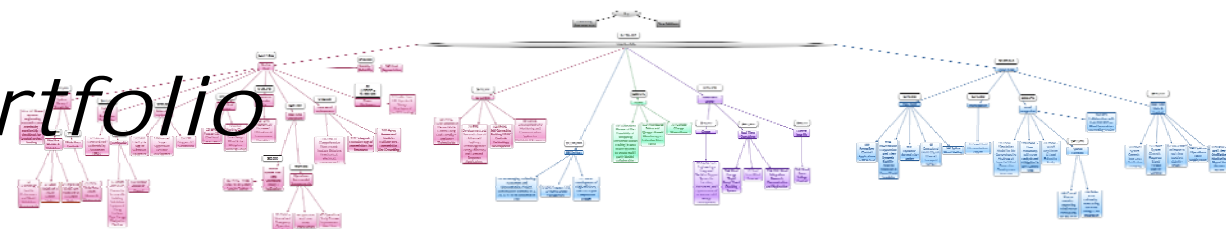
*to Business Challenges*



*to Technologies*

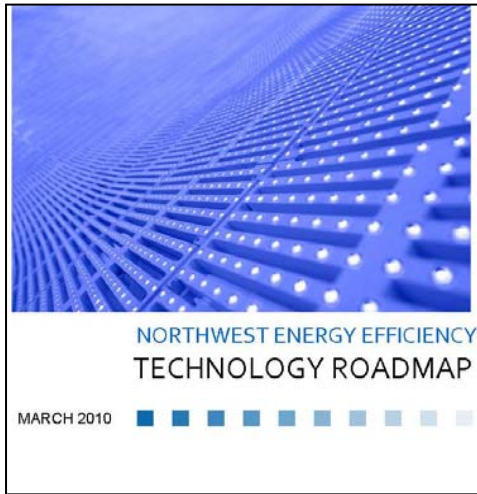


*to Research Portfolio*

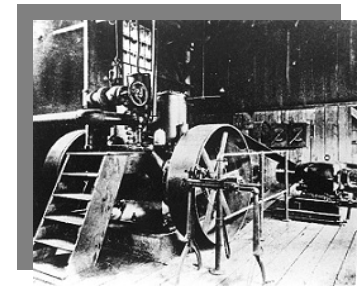


# Technology Roadmaps Guide the Initiative

Explicit Linkages to Business Challenges



TRANSMISSION  
TECHNOLOGY ROAD MAP  
September 2006



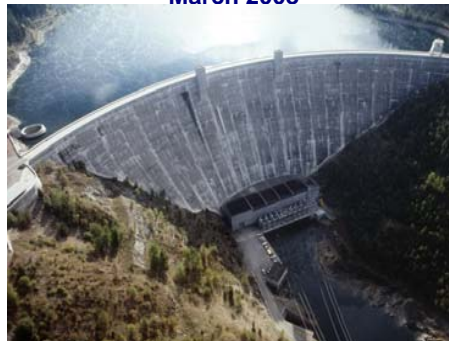
1885 Generator  
At first glance one may think,  
"My how things have changed,"  
But at second glance one may admit,  
"Things haven't changed much at all."

Physical Security  
Technology Road Map  
February 2007



*The Enigma was a portable cipher machine used to encrypt and decrypt secret messages*

POWER SERVICES  
TECHNOLOGY ROAD MAP  
March 2008



Hungry Horse Dam

Research is to see what everybody else has seen, and to think what nobody else has thought.  
- Albert Szent-Gyorgyi

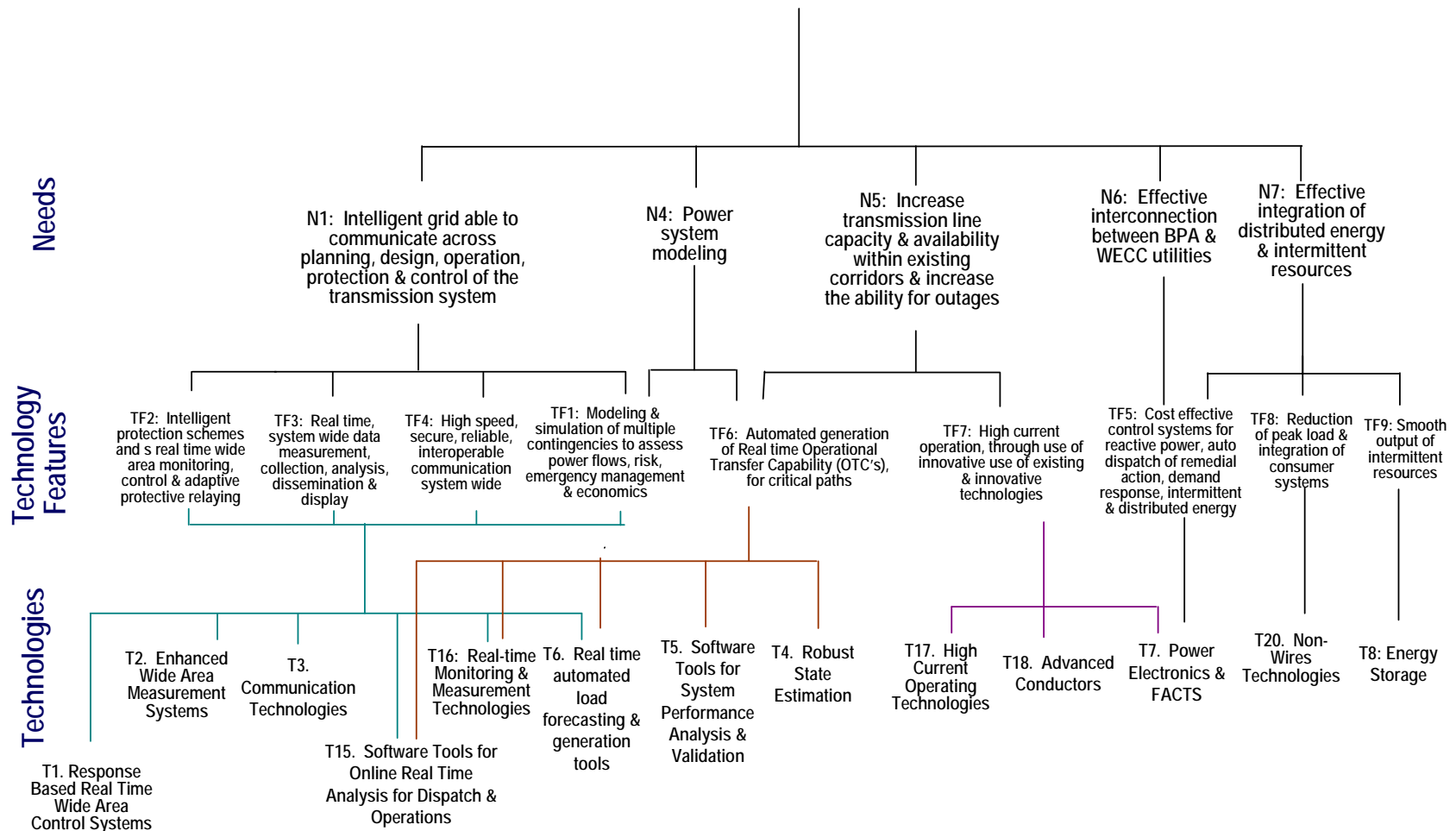
Renewable Energy  
Technology Road Map  
(Wind, Ocean Wave, In-Stream Tidal & Solar Photovoltaic)



September 2006

# Transmission Roadmap Target

Figure 5: TARGET 2 - Increase transmission transfer capabilities & control of power flows



# Technology Innovation Council

**Larry Bekkedahl, VP Tx Eng**

**Kathy Black, Legal Counsel**

**Larry Buttress, VP IT, CIO**

**Joshua Binus, Energy Efficiency**

**Ryan Fedie, Energy Efficiency**

**Mark Gendron, VP NW Req Marketing**

**Randi Thomas, Manager System Ops**

**Jeff Hildreth, Labs**

**Mark Jones, Hydro**

**Steve Kerns, Power Schedule Planning**

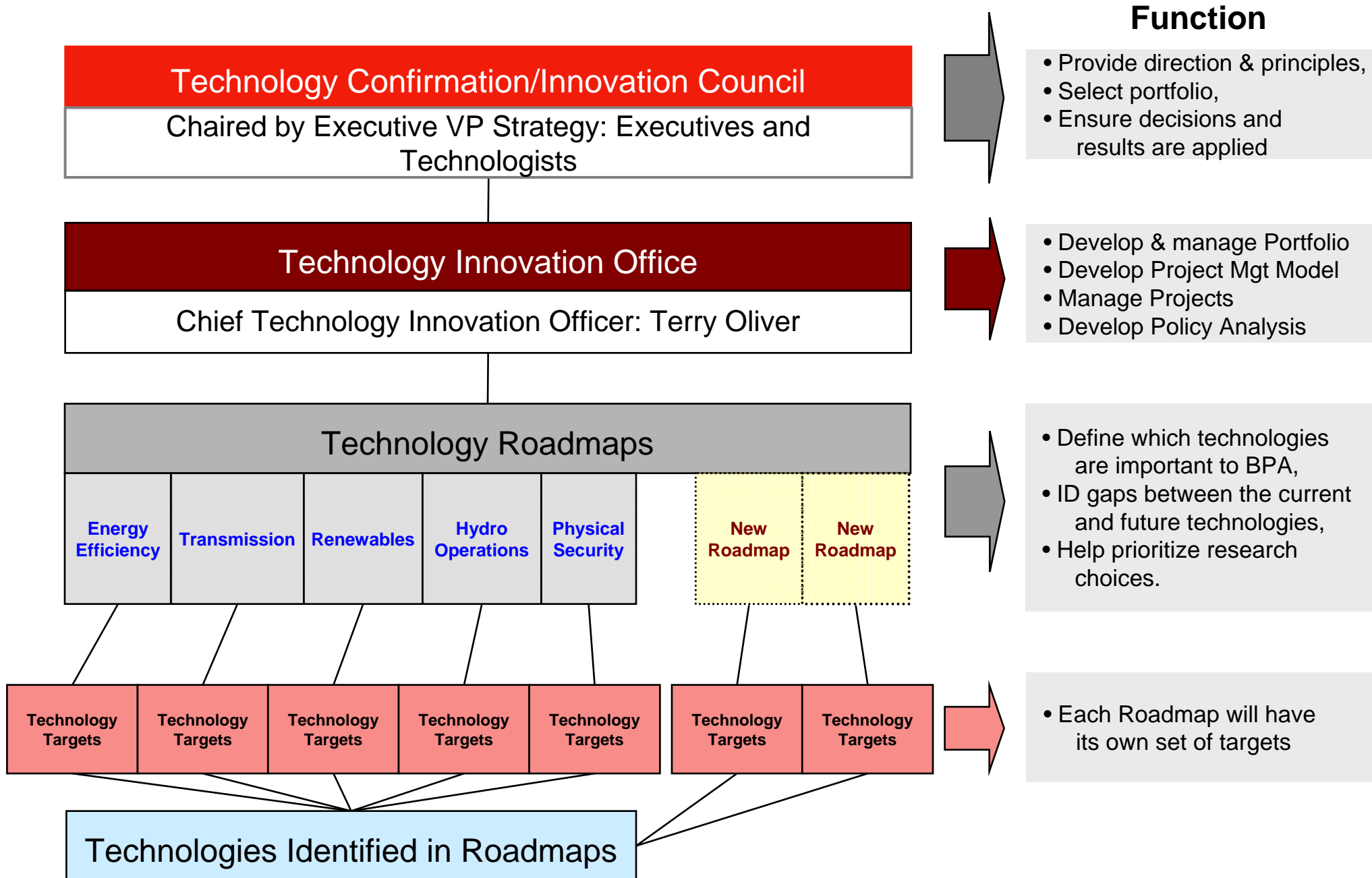
**Elliot Mainzer, EVP Strategy**

**Terry Oliver, Chief TI Officer**

**Don Watkins, Tx WECC NERC**

*Executives & Experts – Paneled as Peers*

# Technology Innovation Council



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# Buckets

BPA Role in  
Technology  
Development



Balancing  
Portfolio  
Issues

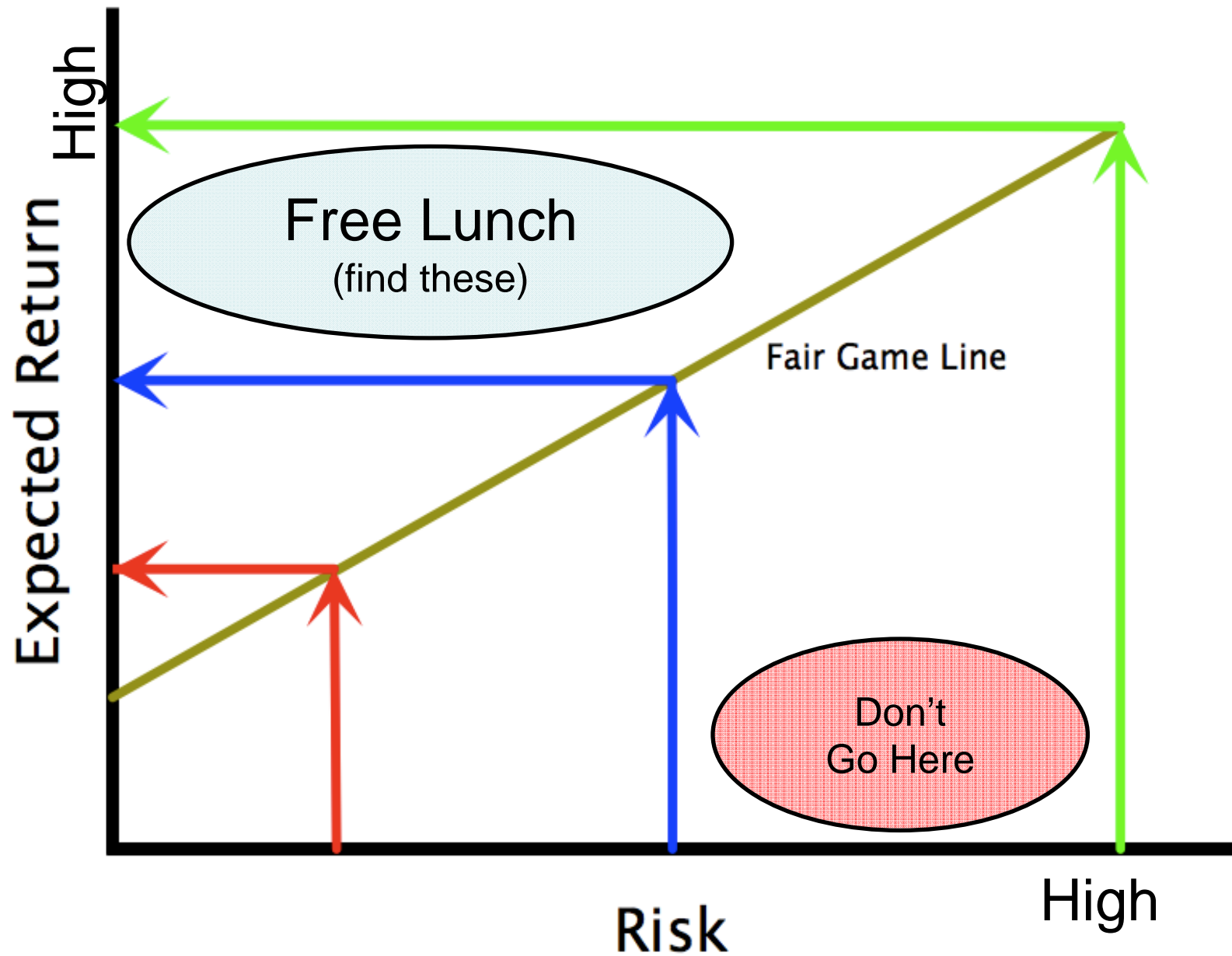


R&D Investment  
Effectiveness

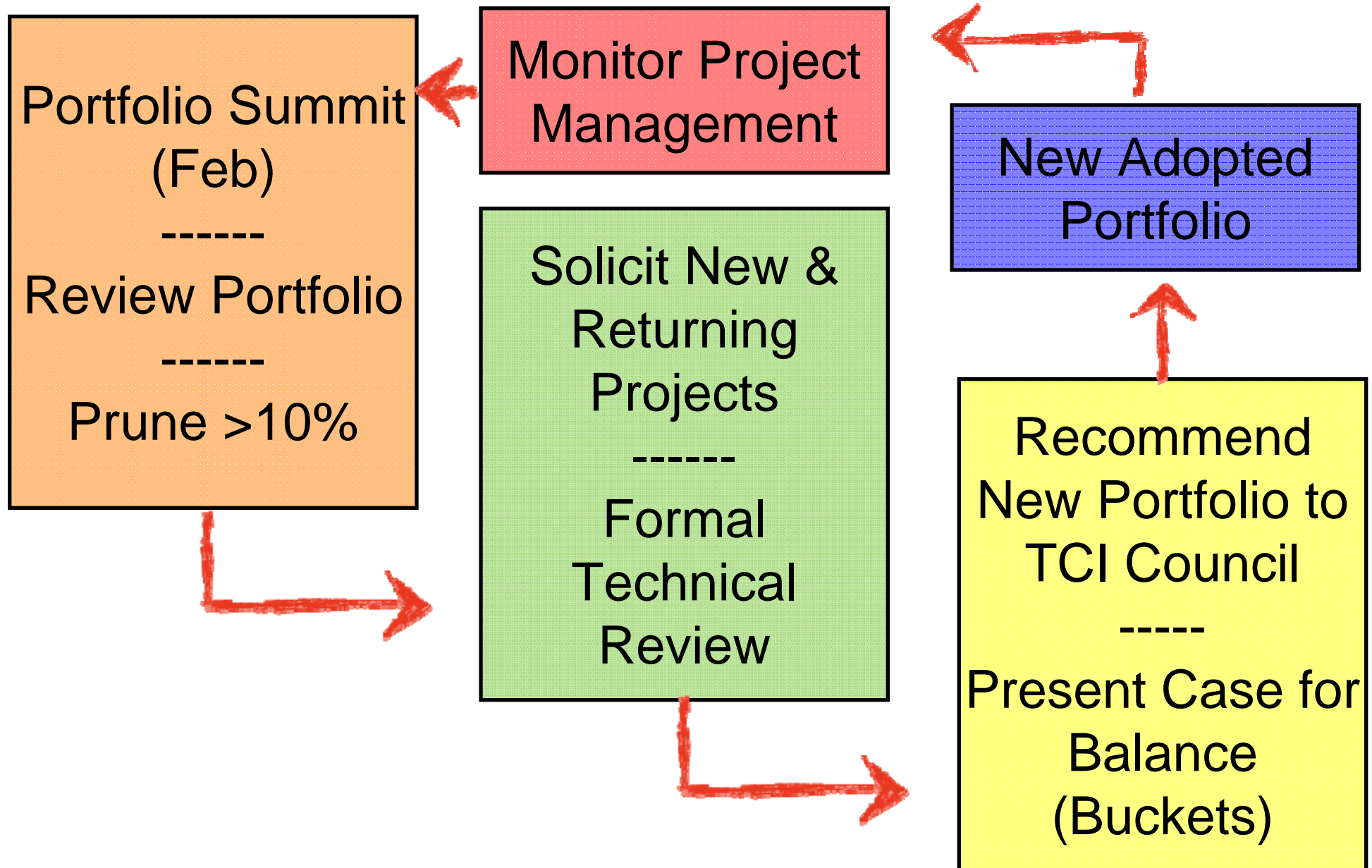




# Risk v Reward



# Cycles



# Project Management

**RESEARCH PROJECTS WILL FAIL**



# Provisions for Great Project Management

- Project Management
  - TI Project Management Officer – 1 of 3 in BPA
  - Requirements, training, maturity model, best practices
- Stage Gates – predetermined kill decision points
- Annual Portfolio Review

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# Conclusions

- Threshold for essential R&D activity varies by industry - but is universally closer to 1% of revenues than 0.01% of revenues
- Money is not enough -

**Purpose Clarity** - What are we trying to accomplish must be known

**Choice Clarity** - Good choices require metrics - why is B more important than A?

**Systems Clarity** - “Management” requires systems - Brownian motion does not good research make

**Disciplined R&D = \$000 Millions in Value**

# Emulated by Industry Peers

- Southern California Edison



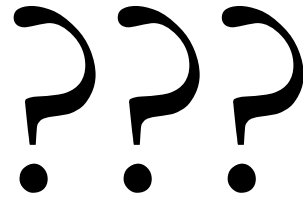
- First Energy



- Ameren



# Questions



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