The Fifth Plan's Draft Conservation Resource Assessment

Summary of Results To Date

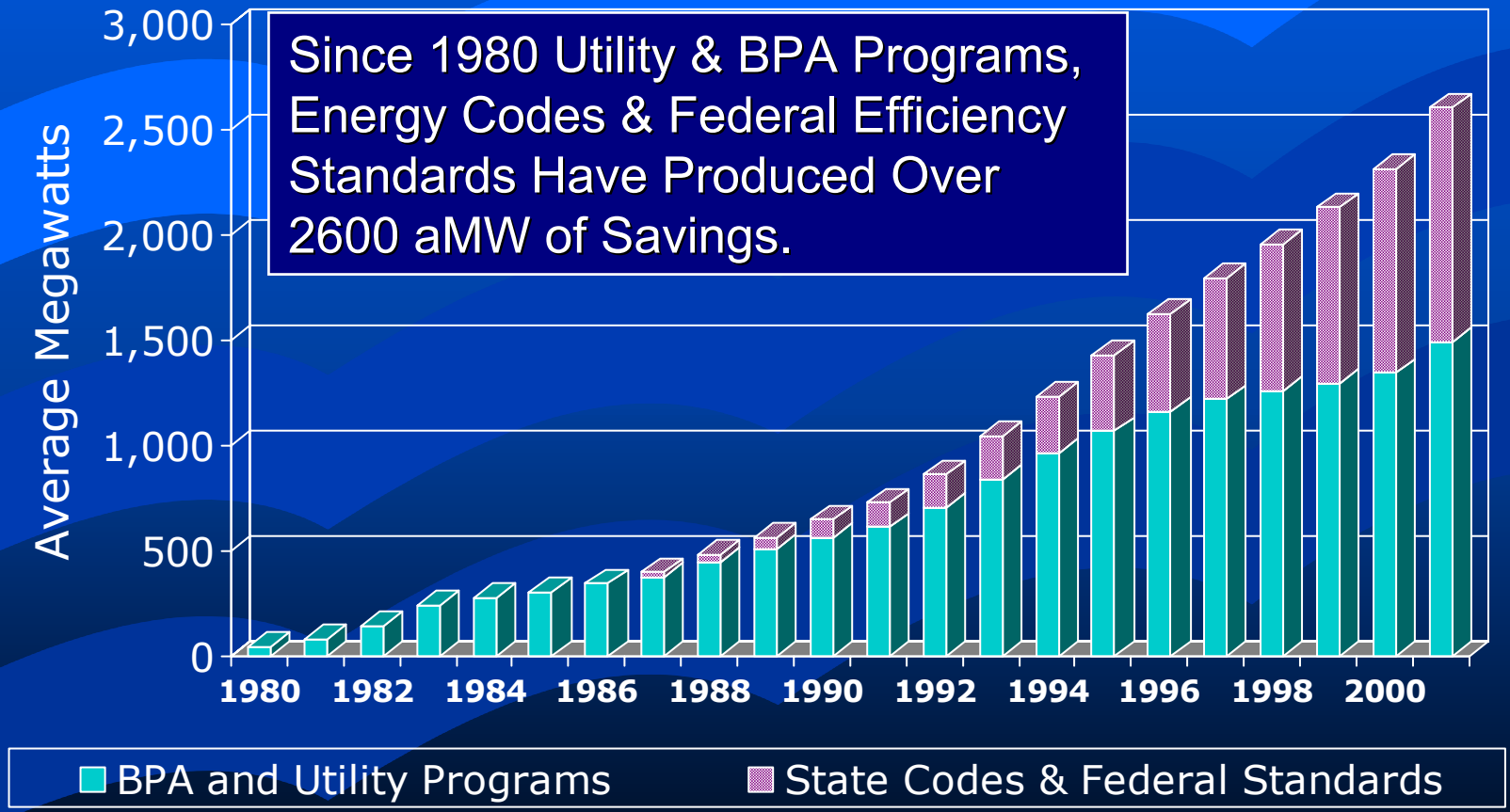
April 8, 2003

Northwest Power Planning Council

Council's First Power Plan Was Adopted 20 Years Ago This Month

- First Action Plan
  - Called upon Bonneville and Region's Utilities to Develop and Implement Wide Array of Conservation Programs
  - Called upon the State and Local Governments to Adopt More Energy Efficient Building Codes
  - Called upon the Federal Government to Adopt Energy Efficiency Standards for Appliances and New Manufactured Homes

20 Years of Progress – Total PNW Conservation Savings



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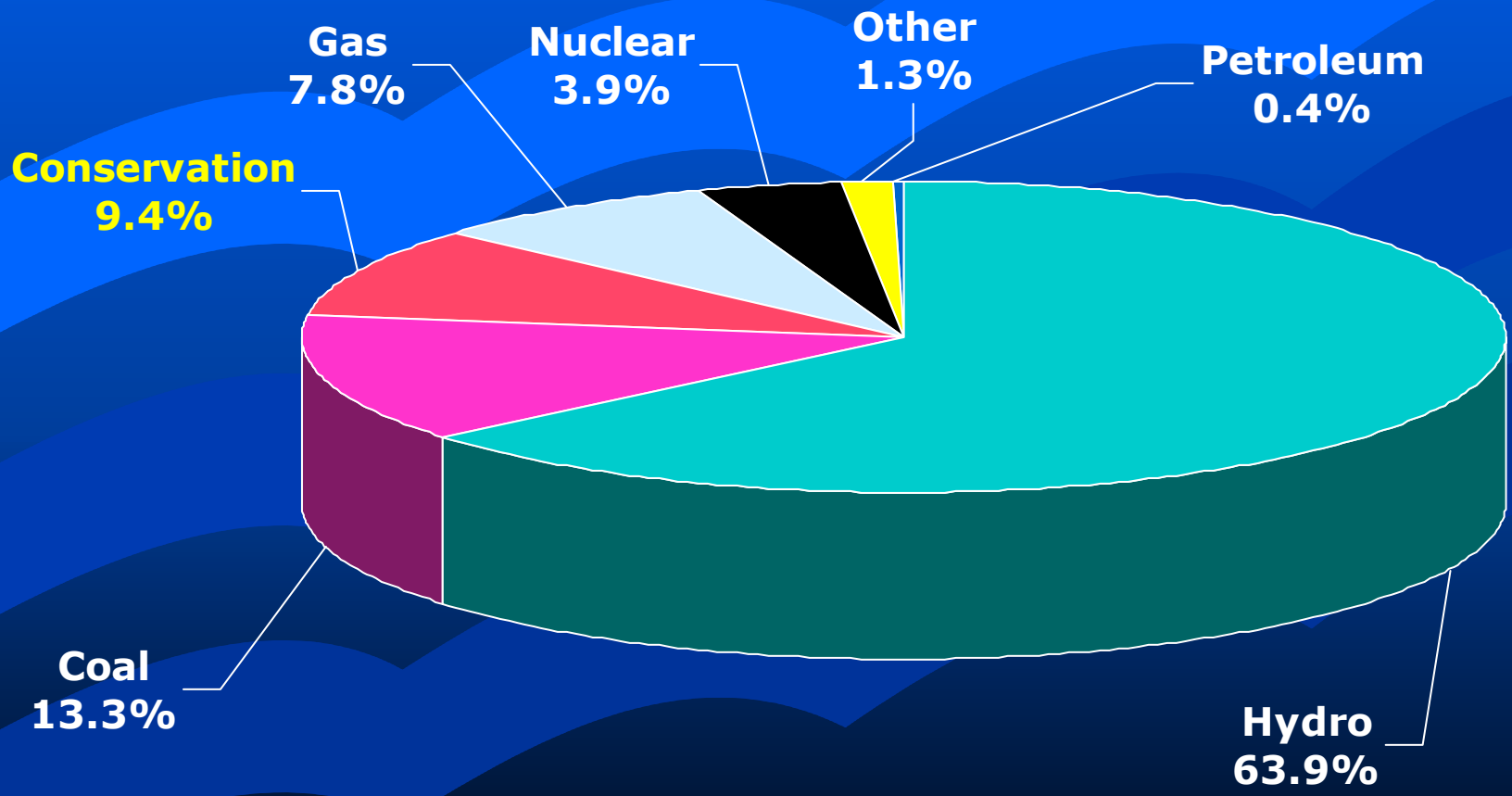
PNW Electricity Supply Resource Mix in 2000



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But we haven't done it all…

- Changing electricity market and changing technology keep raising the bar
- Task for the 5th Power Plan
  - Identify the cost-effective conservation potential
  - Figure out how to make sure it gets implemented

Status of Conservation Assessment for 5th Plan

- Residential Sector
  - "Economic Potential" Completed
- Commercial Sectors
  - Non-Interactive Measures Completed
  - Preliminary Assessment of Potential Lighting Efficiency Improvements Completed
  - HVAC & Building "Shell" Assessment Underway
  - Assessment will be revised when Commercial Building Stock Assessment research is completed
- Industrial & Agriculture Sectors
  - Data Collection Underway
  - Results Expected by June 1

Scope of Residential Assessment

- Three Building Types
  - Single Family (up to & including 4-plex)
  - Multifamily (5-plex & above)
  - Manufactured/Mobile Homes
- Three Vintages
  - Pre-1980
  - 1980 – 1992
  - Post-1992 (= 1983 MCS level construction)

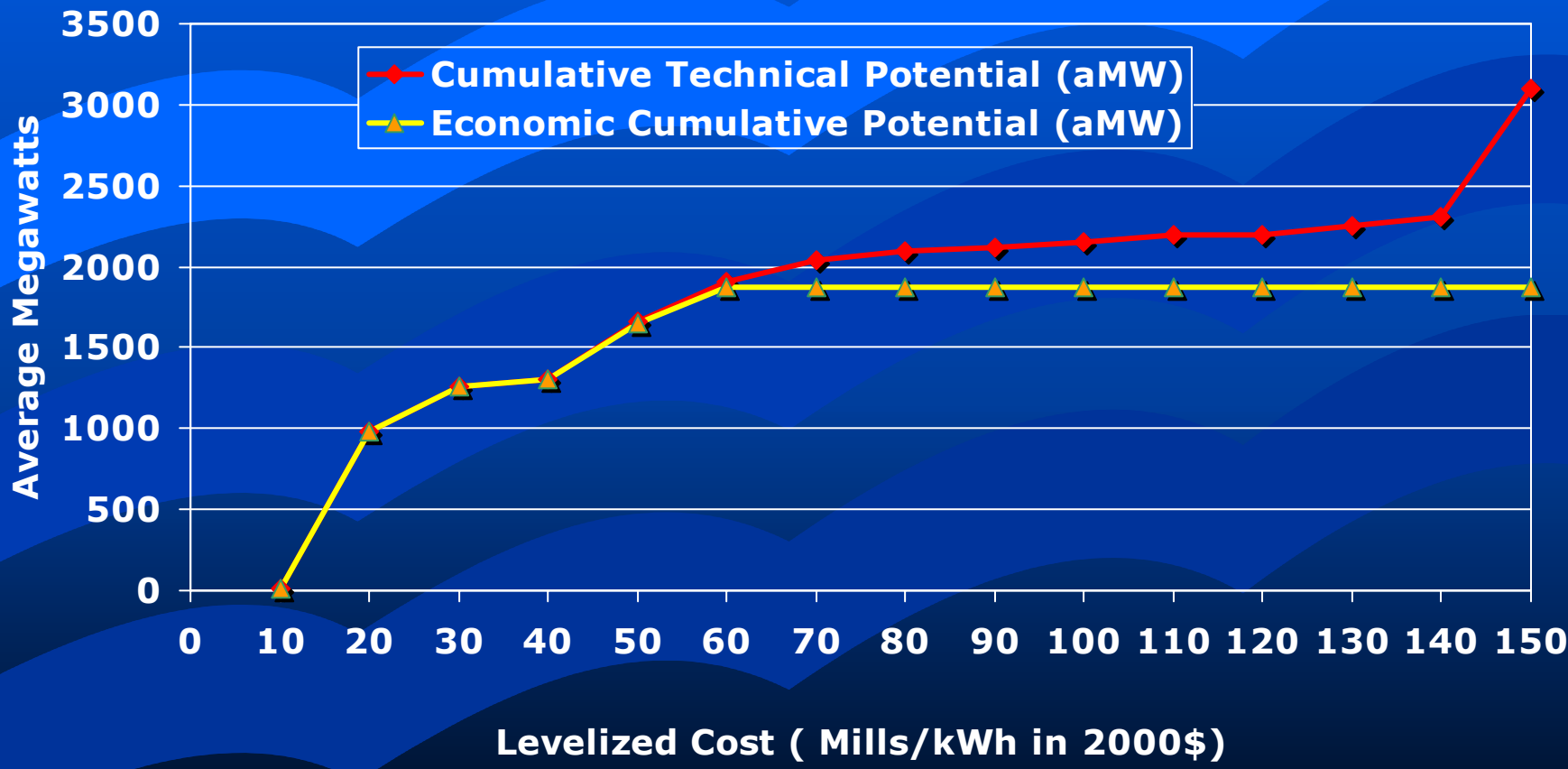
Space Conditioning Measures/Technologies & Practices

- Thermal Shell Improvements
- Duct Sealing
- Heating System Conversions to Air-Source Heat Pumps
- Heat Pump and Central Air Conditioning System Efficiency Upgrades

Non-Space Conditioning Measures/Technologies & Practices

- Water Heating
  - Heat Pump & Solar Water Heaters
  - Efficient Tanks
  - Waste Water Heat Recovery
- Lighting
- Major Appliances
  - Dishwashers
  - Clothes Washers
  - Refrigerators
  - Room Air Conditioners

Residential Sector Conservation Supply Curve



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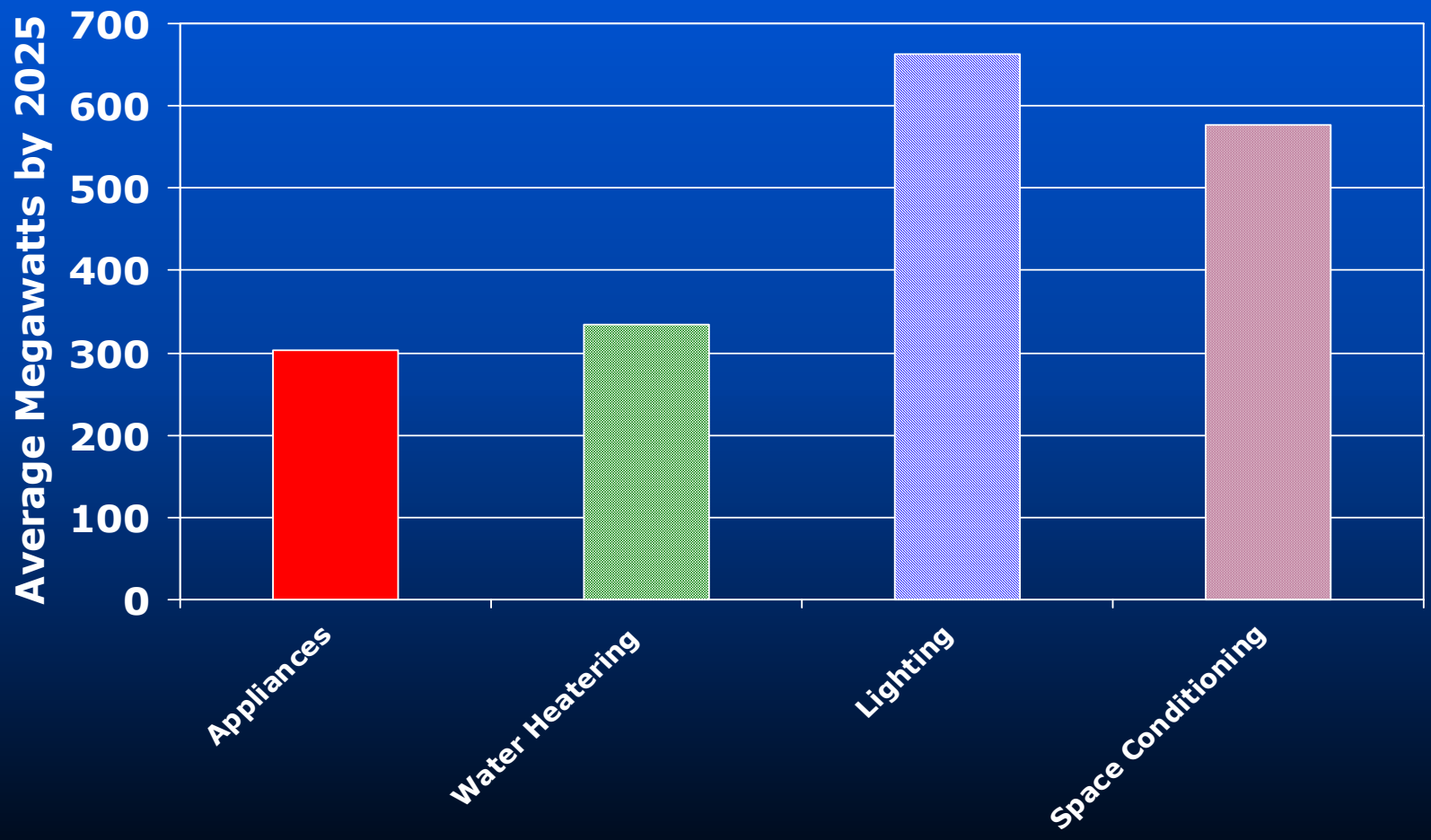
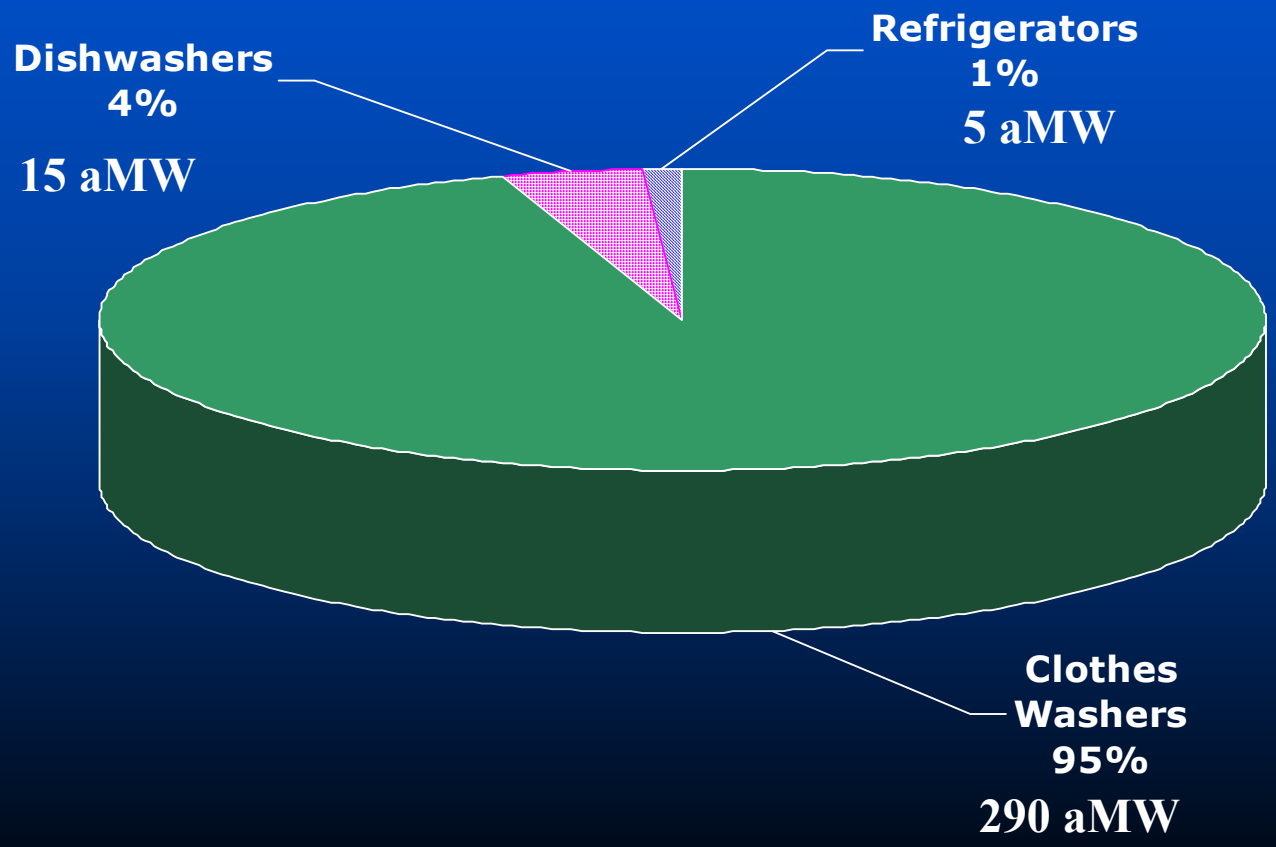
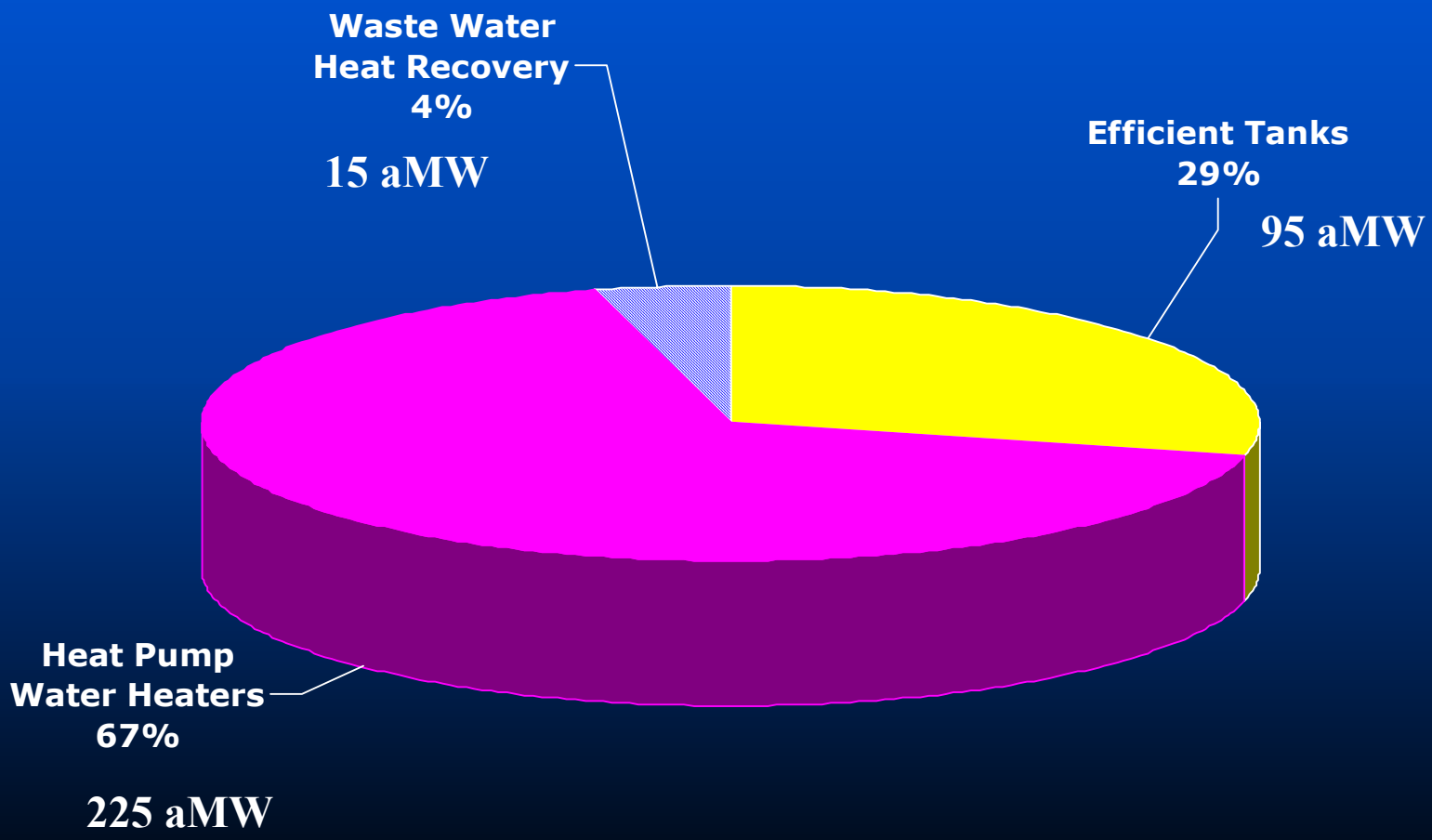
Summary of Residential Sector Conservation Resource Potential by Major End Use



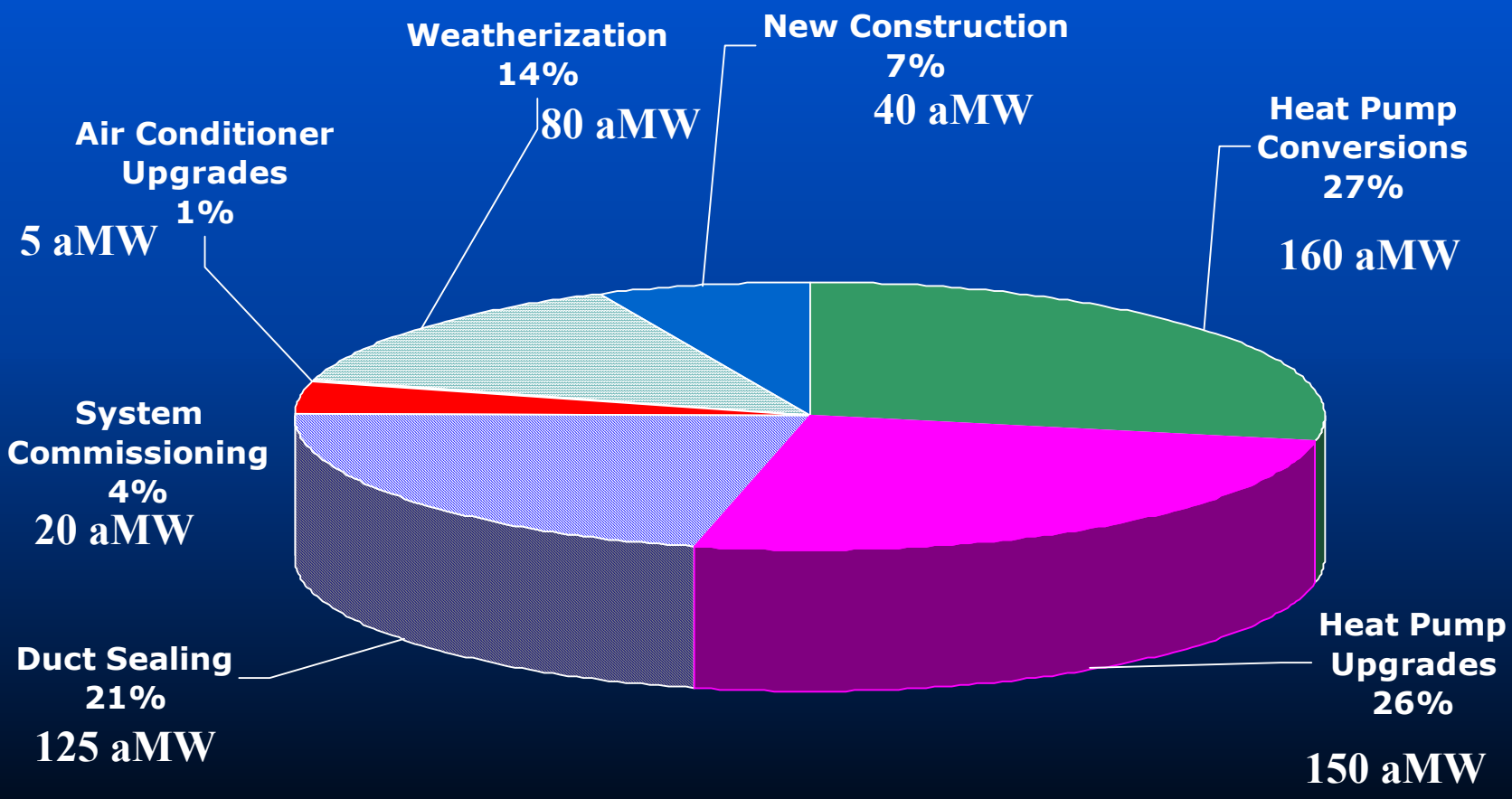
Summary of Residential Sector Conservation Resource Potential for Appliances



Summary of Residential Sector Conservation Resource Potential for Water Heating



Summary of Residential Sector Conservation Resource Potential for Space Conditioning



Scope of Commercial Assessment

- Twelve building types:
  - Office (2), Retail (2), Restaurant, Grocery, School (2), Hospital, Warehouse, Lodging, Other
- Four vintages corresponding to building code changes pre-1980, 1989, 1995, and 2001
- Ten non-building activities:
  - Water, wastewater, refrigeration, computers, street lighting, traffic signals, power supplies, transformers …

Commercial Buildings
Measures/Technologies & Practices

- Lighting
  - Continued improvement in efficacy of fluorescent, incandescent and HID systems
  - Daylighting & Controls
- Heating, Ventilating & Air Conditioning (HVAC)
  - Equipment efficiency improves
  - Commissioning
  - Controls
  - Better Design
- Envelope
  - Better windows

New Commercial Buildings
Measures/Technologies & Practices

- Strong energy codes exist in OR & WA, but potential beyond code is significant
  - Integrated Building Design 20-30% better than code possible & cost-effective
  - Standard practice can be improved
    - » Example: Lighting power density 30% less than code possible and cost-effective (1.1 to 0.8 w/sf)

Commercial Sector Non-Building Conservation

- 340 MWa in the 20-30 mills/kWh range
  - Sewage treatment 74 MWa at 22 mills
  - LED traffic lights 14 MWa at 30 mills
  - Exit signs 52 MWa at 27 mills
  - Water supply 30 MWa at 20 mills
  - Network PC management 73 MWa at 27 mills
  - Packaged refrigeration 100 MWa ~30 mills

Commercial Sector
Conservation Supply Curve

- Still under construction
- Lighting
  - 250 MWa @ 20-30 mills in 2025, existing buildings
  - Another 150MWa retrofit in near term at <20 mills
  - New buildings not estimated yet (first cut ~200MWa)
- Non-Building
  - 340 MWa in the 20-30 mill range 2025
- HVAC & Windows
  - Pending and significant
  - Similar to last plan ~ 350MWa 10 to 60 mills

Industrial Sector Assessment

- Historically, analysis of potential for efficiency improvements in this sector have been far less detailed than other sectors
- Fifth Plan's Estimate may be even more so
  - Resource potential contingent upon future regional industrial mix and processes
  - Given "globalization" of many PNW electricity intensive industries, the region's future industrial mix is highly uncertain

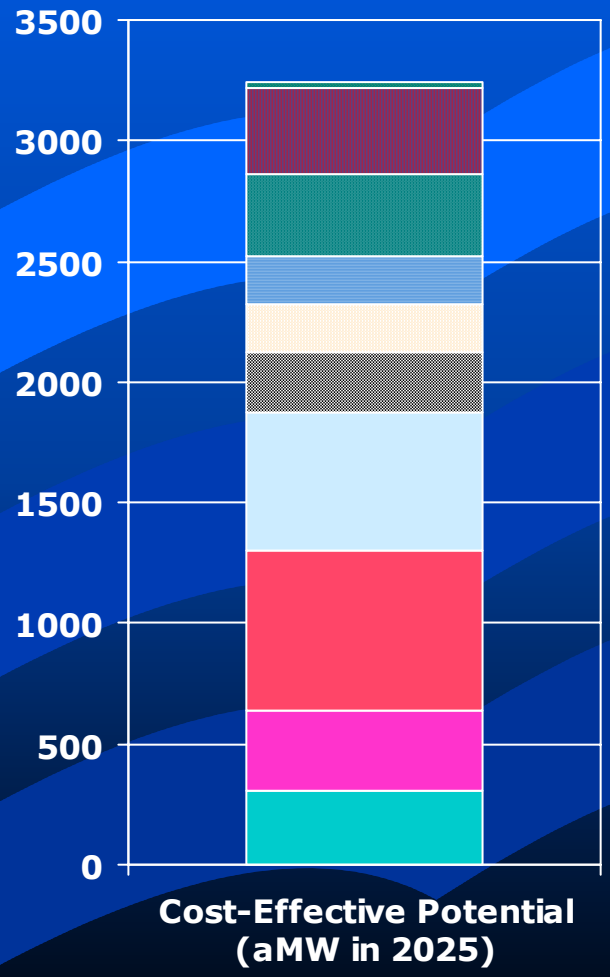
Industrial Sector Assessment Process

- Interview "Facility/Energy" Managers identified by ICNU as representative of major PNW industrial electricity users to assess:
  - Current and planned levels of investment in efficiency improvements
  - Potential impact of "globalization" and other factors on future capital investments in NW facilities
  - Ability to respond to utility assistance to improve efficiency
- Use results to estimate potential "share" of industrial electricity use that could cost-effectively be made more efficient
- Fourth Plan's Estimate = 8% savings (670 aMW)

Agricultural Sector

- Past Plan's Focused Exclusively on Irrigated Agriculture Efficiency Potential
  - System Efficiency Improvements (i.e., more efficient "pumps and plumbing")
  - Improved Water Management (i.e., "just enough and just in time")
- Fifth Plan will also include "on farm" agricultural processes, such as milking and milk processing
- Fourth Plan's Estimate = 40 aMW

PRELIMINARY *Assessment* of Cost-Effective Conservation Potential



- Agricultural Sector - 25 aMW
- Non-DSI Industrial Sector - 350 aMW
- Commercial Sector Non-Building Measures - 300 aMW
- HVAC & Window Efficiency Improvements - 200 aMW
- New Commercial Building Lighting - 200 aMW
- Existing Commercial Buildings Lighting - 250 aMW
- Residential Space Conditioning - 575 aMW
- Residential Lighting - 660 aMW
- Residential Water Heating - 335 aMW
- Residential Appliances - 305 aMW