Northwest **Power** and **Conservation** Council



July 29, 2014

# MEMORANDUM

**TO:** **Council Members**

**FROM:** Tom Eckman

**SUBJECT:** **Potential High Level Indicators for the Power Plan**

As a follow-up to the adoption of "High Level Indicators" for tracking progress on the Council's Fish and Wildlife Program, staff is proposing potential metrics for tracking progress on the Council's Power Plan. As a starting point the staff recommends that these metrics be based on the purposes for which the Northwest Power Planning and Conservation Act was enacted. With respect to the Power Plan these are:

- To encourage conservation and efficiency in the use of electric power
- To encourage the development of renewable resources within the Pacific Northwest
- To assure the Pacific Northwest of an adequate, efficient, economical and reliable power supply[1]

Staff selected the proposed metrics based on an assessment of the meaningfulness of the specific indicator, the independence of the indicator (i.e., preference was given to external data sources) and the expected long-term persistence of the data source. After reviewing a range of potential indicators staff is proposing fourteen metrics for Council consideration. These are:

[1] [Pacific Northwest Electric Power Planning and Conservation Act, (Northwest Power Act), §2(1)(A), Dec. 5, 1980, 94 Stat. 2697.]

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**For Conservation and Efficiency**

- Cumulative Savings Since Act's Passage (or Council's 1st Plan) from all mechanisms
- Annual Utility/SBC Program Savings vs. Plan Targets
- Annual Utility/SBC Program Savings As A Share of Regional Loads/Retail Sales
- Levelized Cost of Utility/SBC Savings
- Total PNW Energy Use/Capita vs. US Average
- Electricity Use per Unit of Economic Output vs. US Average
- Total Energy Use per Unit of Economic Output vs. US Average

**For Renewable Resource Development**

- Cumulative Renewable Resource Development Since Council's First Plan (or some other appropriate baseline date)
- Annual Renewable Resource Contribution to Total Load Service
- Annual Trends in Renewable Resource Costs

**For Adequate Power Supply**

- Adequacy (Loss of Load Probability < 5%)

**For Economical Power Supply**

- Average PNW Residential Electric Bills vs. US
- State Rank of PNW State Electric Bills
- Electric Revenues as a Share of GDP

Staff has not identified an appropriate metric that can be used to judge the *reliability* trends of the region's power supply. Reliability metrics typically measure the frequency and/or duration of distribution system service interruptions. However, since the Plan's focus is on ensuring regional *resource* reliability and not distribution reliability, these traditional metrics do not appear appropriate for use by the Council.

A non-technical approach to reliability might ask the question: If all the emergency purchases that could have been made have been made, then under all but the most extreme possible circumstances, can all firm loads be met without interruption to the bulk power supply system? In a reliable system the answer is "yes."

Based on the above reasoning, a potential metric for *reliability* might be the region's short-term ability to meet load. It is distinguished from "adequate" by the time dimension. "Reliable" relates to a condition in the short term when resources cannot be added (except for spot market or other short-term purchases), while "adequate" relates to the long term, when new firm resources can be added.

Generally, capacity unreliability is a different and more serious kind of problem than energy unreliability, because it is less easily remedied and the consequences (area blackouts) are more severe. Energy unreliability can usually be solved completely with purchases (thus becoming mostly an economic problem), while capacity reliability often cannot be solved merely with purchases, especially in the shortest term of a few hours to several weeks. However, because the Northwest is a hydro-

based system, it is possible under certain circumstances, such as the long-term (multi-month) loss of a large resource, like Columbia Generating Station or of an intertie, on top of poor reservoir conditions due to drought, to have energy shortages that would make the system unreliable. To remedy these situations it is possible to draft hydro-system storage below levels set for fish and other purposes.

Staff is proposing to create a System Reliability Index (SRI) that would track the probability of Grand Coulee being below designated target elevation in spring as part of the Regional Resource Adequacy assessment. The water stored behind Grand Coulee is for fish, summer power and other uses. Using some of that storage to keep lights on in winter when it cannot be replaced could be an indication of an unreliable supply.

Staff will present an overview of the proposed High Level Metrics for the Power Plan to the Power Committee at the August meeting and seek Council guidance on whether these metrics represent relevant measures of progress on the Plan's goals.

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# Proposed Potential High Level Indicators for Power

**The Council develops high level indicators to track the progress of power planning efforts in the Northwest. The collective efforts of many entities, including the Council, electricity consumers, and utilities contribute to an adequate, efficient, economical and reliable power supply in the region. These indicators cannot be interpreted as a performance measure for any single entity, but instead provide a high level overview of outcomes that reflect regional progress.**

August 5, 2014

# Basis of Power System High Level Indicators

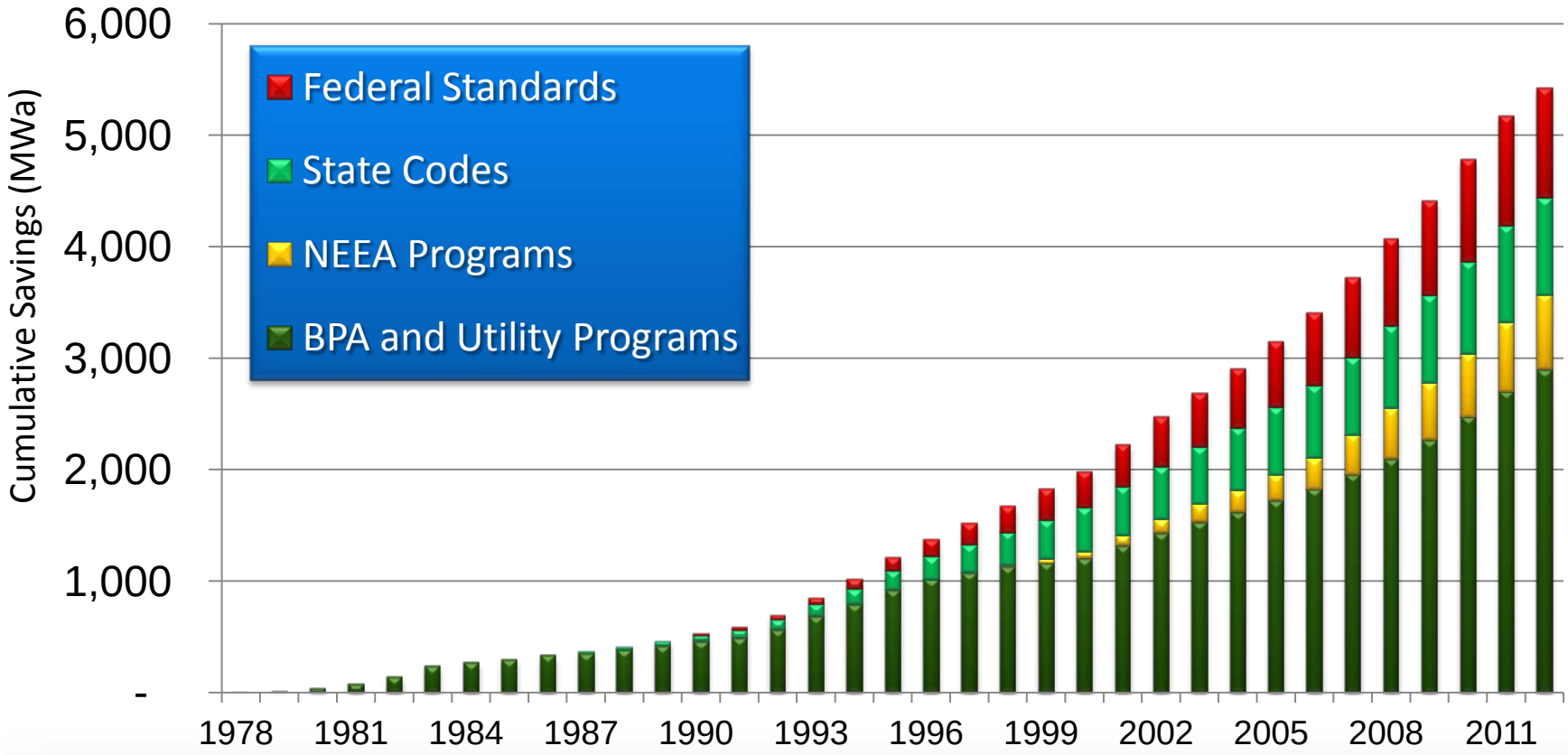
Purposes from Power Act

- Encourage *conservation and efficiency* in the use of electric power
- Encourage the development of *renewable resources* within the Pacific Northwest
- Assure the Pacific Northwest of an *adequate, efficient, economical, and reliable* power supply

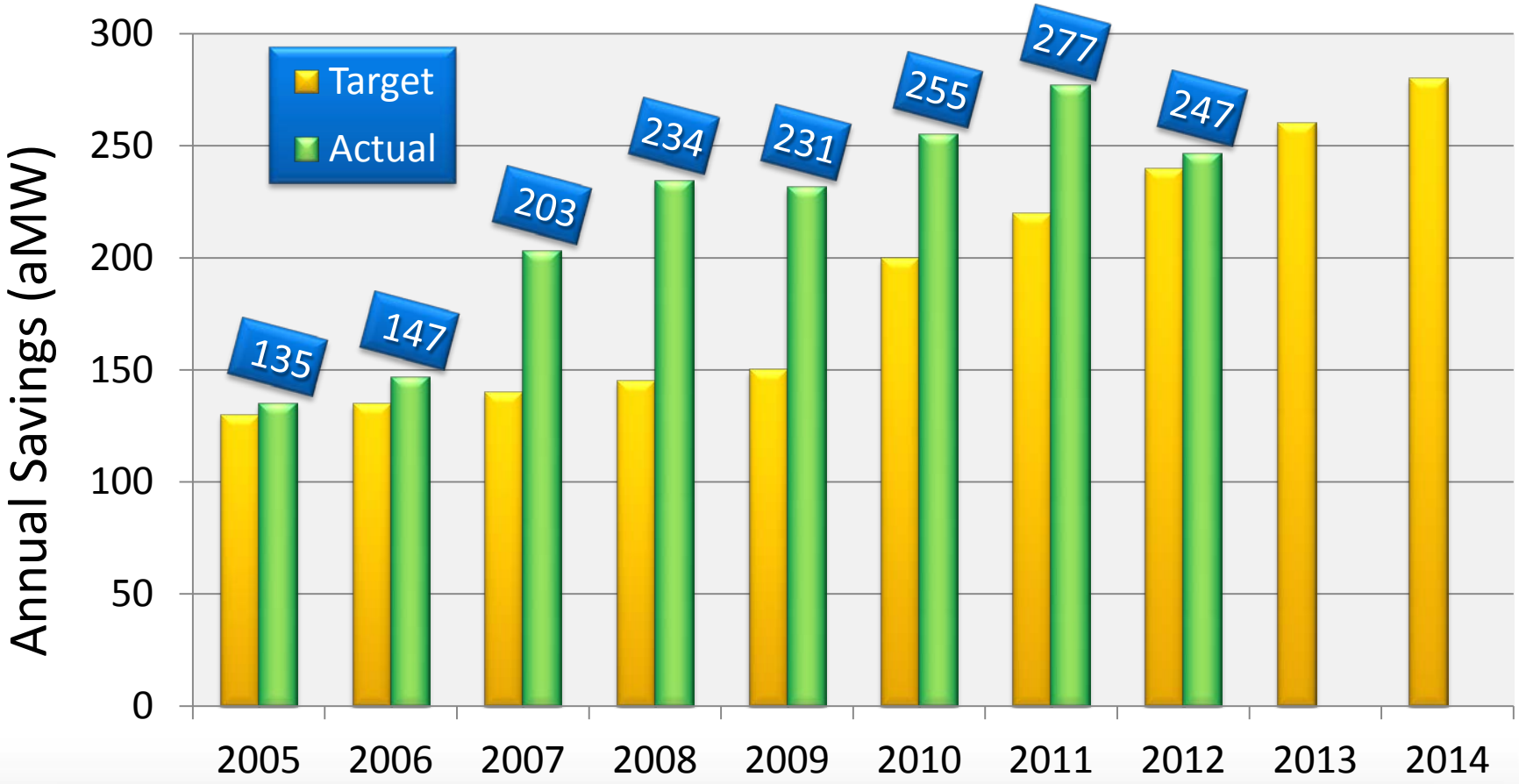
# Potential Metrics – *Conservation and Efficiency*

- Cumulative Savings Since Act's Passage (or Council's 1st Plan) from all mechanisms
- Annual Utility/SBC Program Savings vs. Plan Targets
- Annual Utility/SBC Program Savings As A Share of Regional Loads/Retail Sales
- Levelized Cost of Utility/SBC Savings
- Energy Use/Capita
- Electricity Use per Unit of Economic Output
- Total Energy Use per Unit of Economic Output

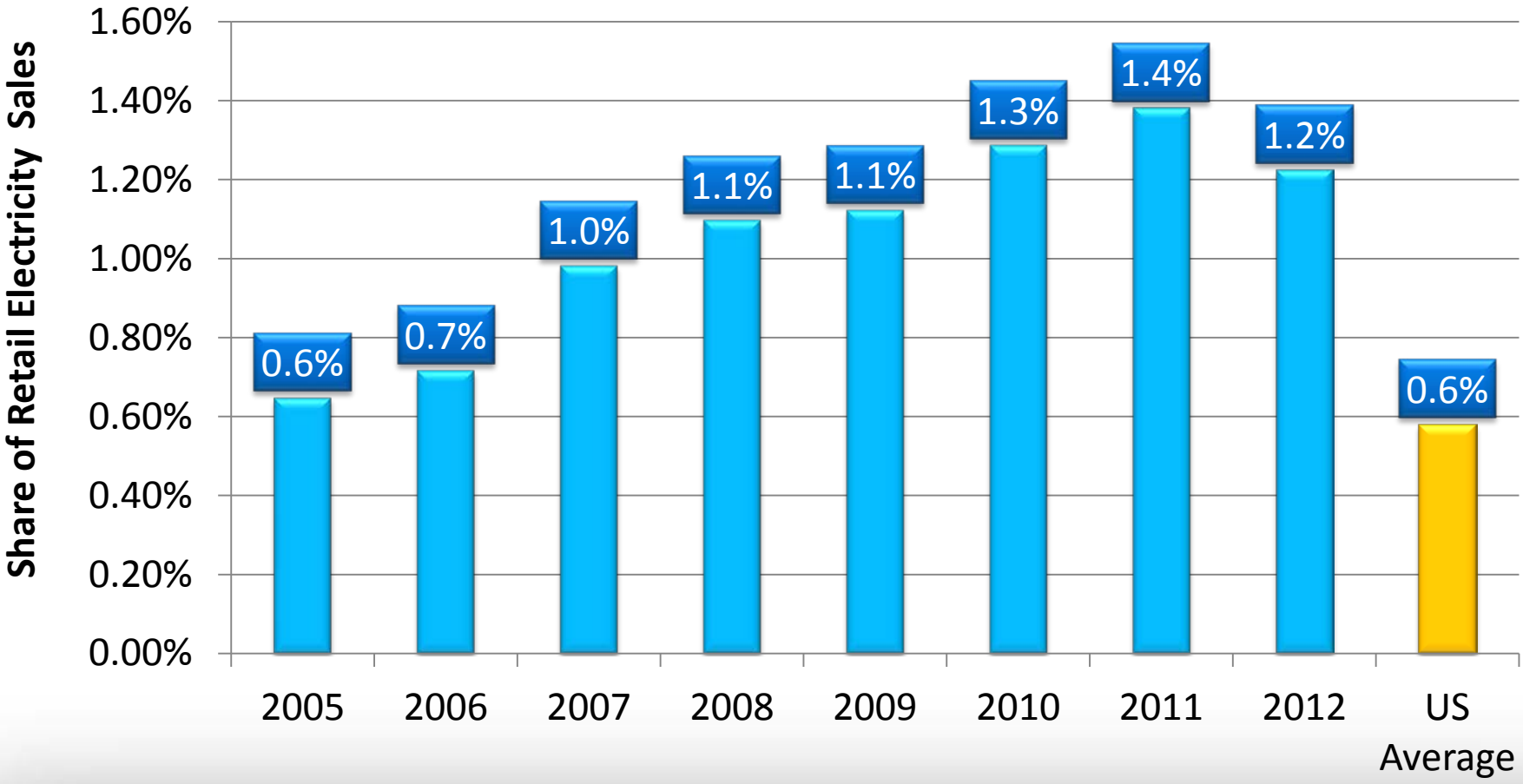
# Since 1978 Utility & BPA Programs, Energy Codes & Federal Efficiency Standards Have Produced Over 5300 MWa of Savings



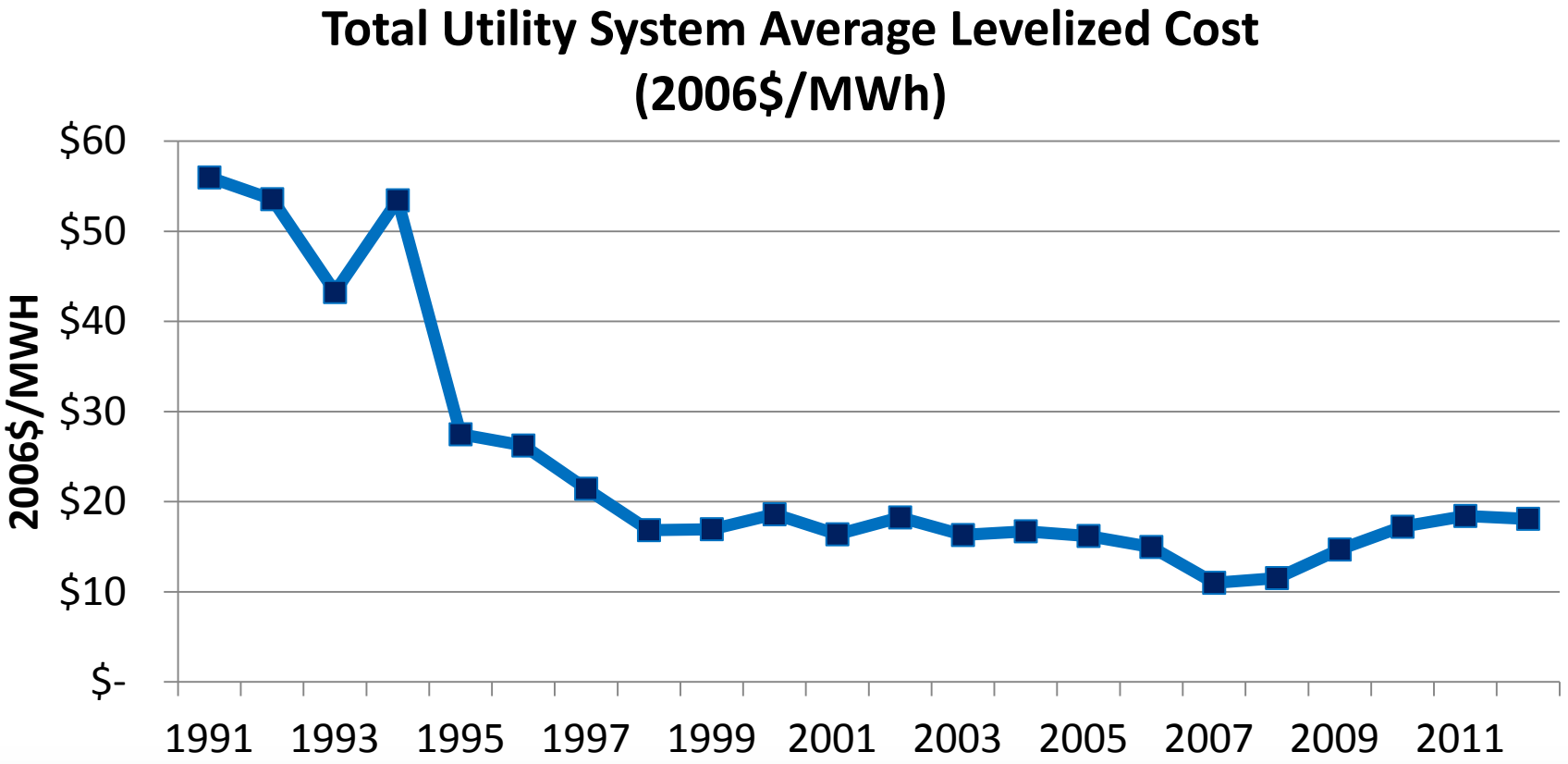
# Energy Efficiency Achievements Have Exceeded Council Plan Targets Since 2005



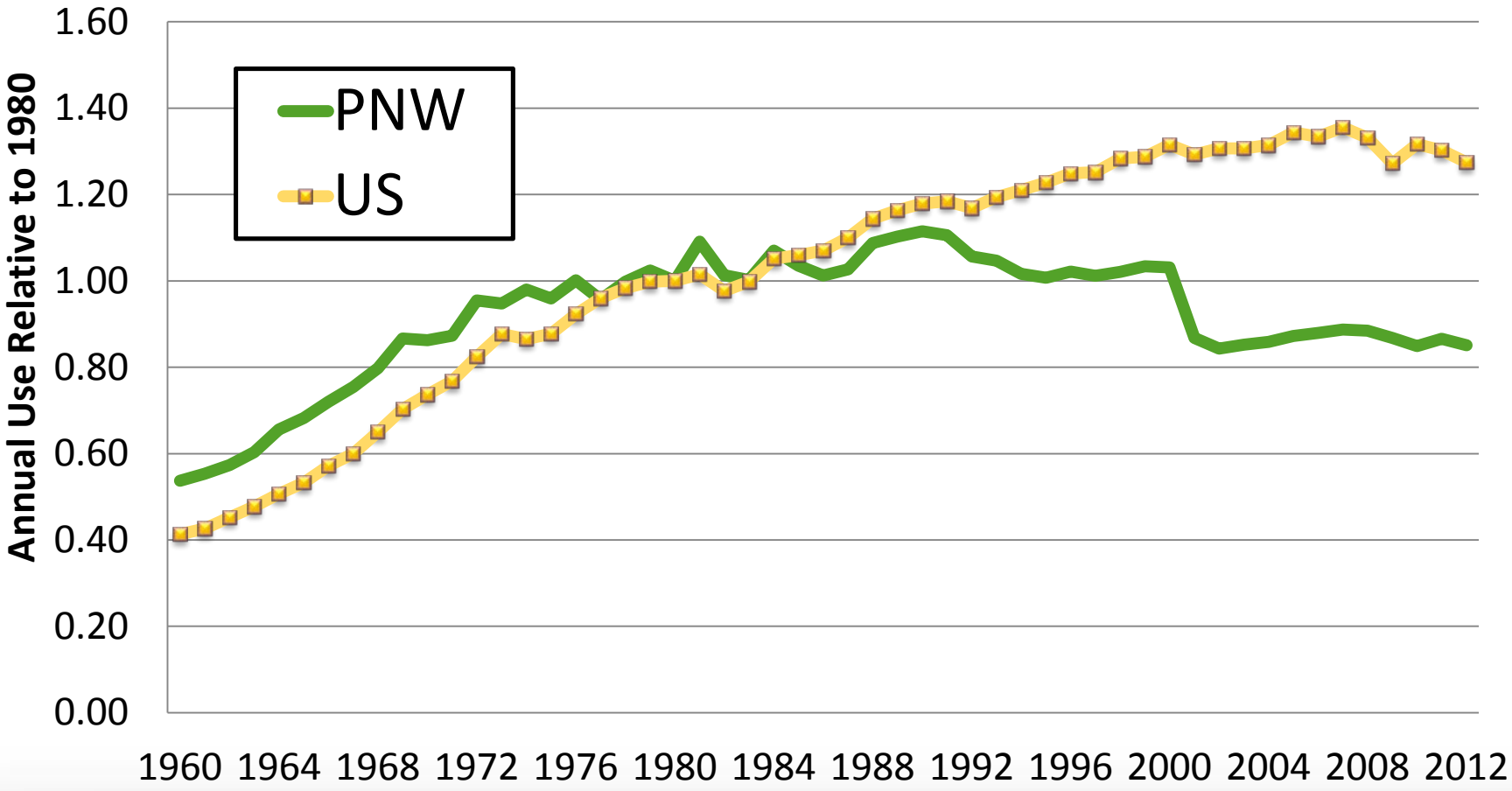
# Utility/SBC-Funded Efficiency Savings As A Share of System Loads Are More Than Double the US Average



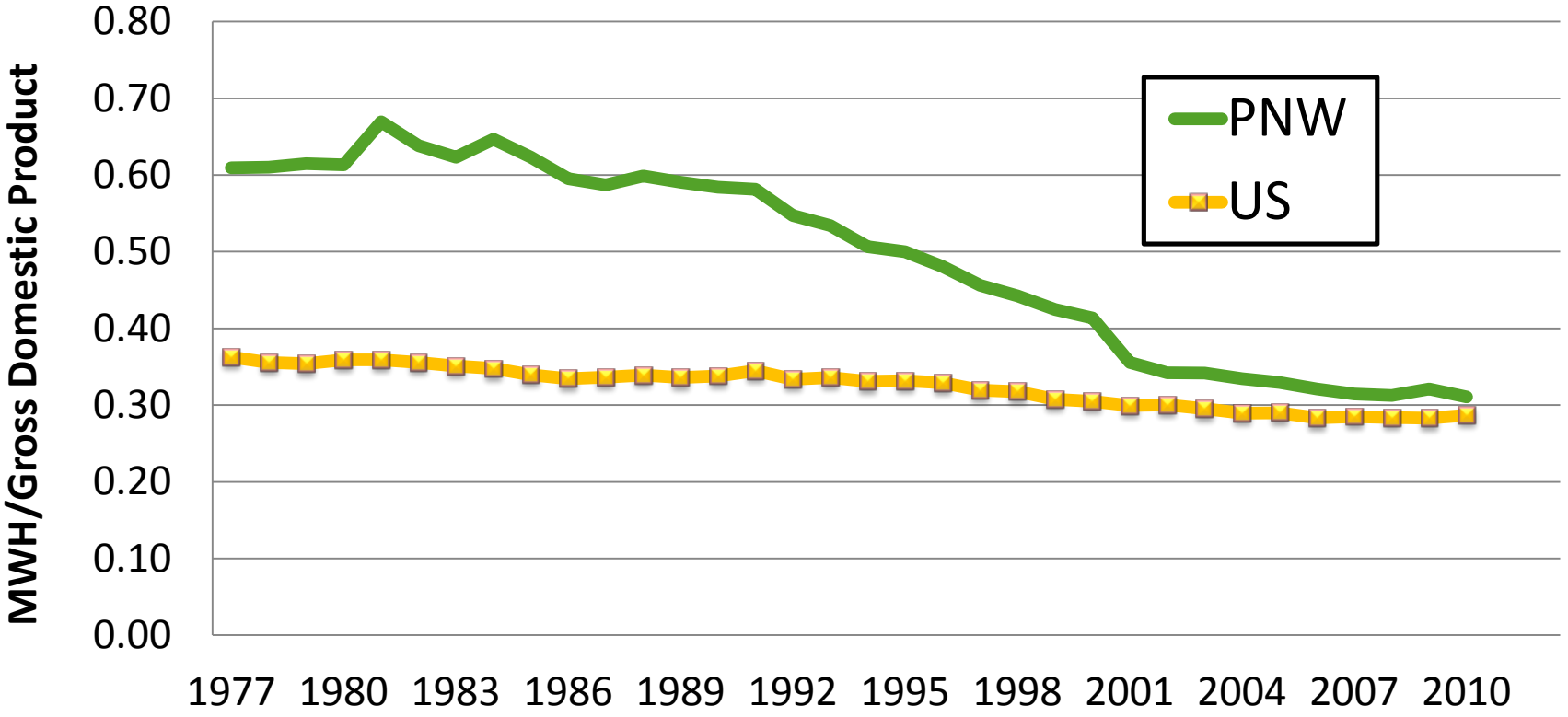
# Average Utility Levelized Cost of Energy Efficiency Remains Low



# Northwest Electricity Use Per Person Has Been Decreasing

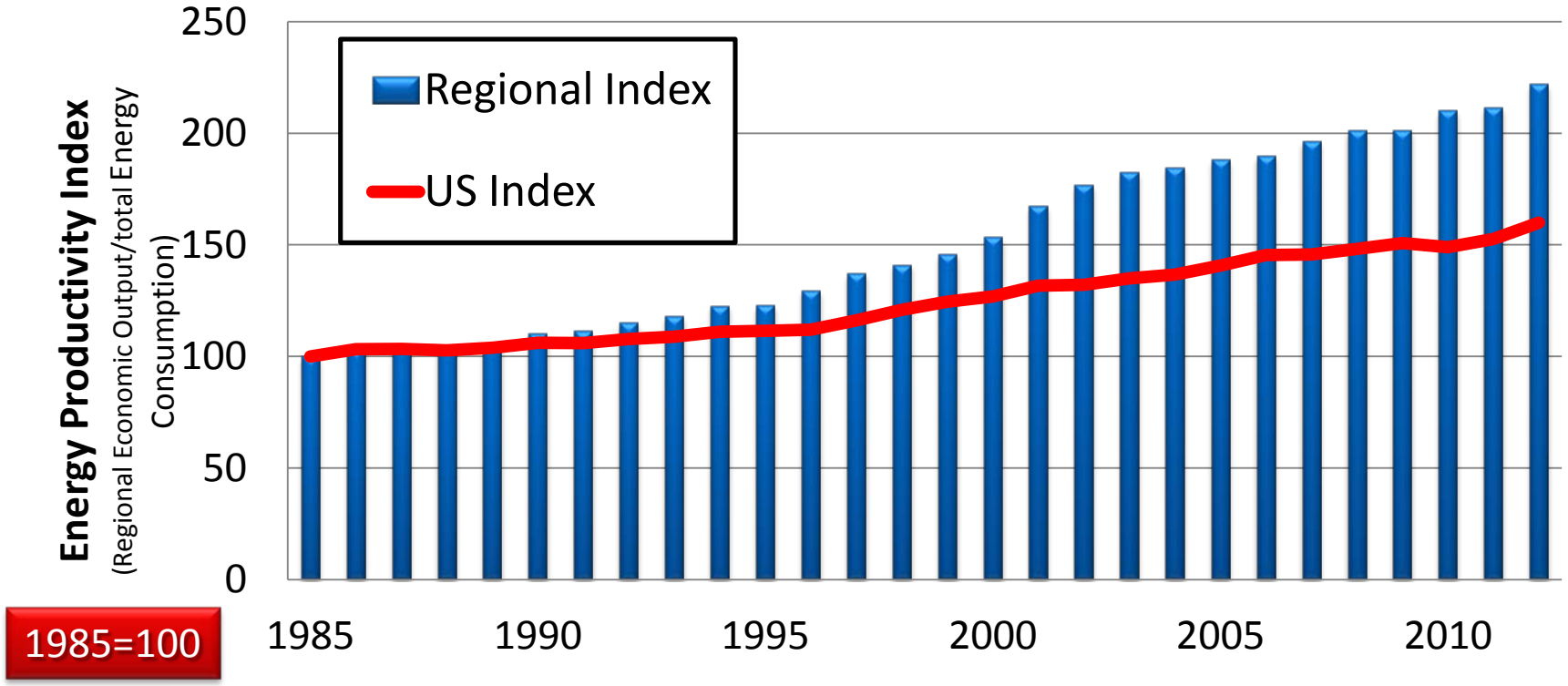


# Northwest Electricity Intensity Per Unit of Economic Output Has Been Decreasing




Gross Domestic Product : BEA- 2005 constant dollars
Energy Consumption: State Energy Data

# Northwest Total Energy Productivity Has Increased Faster Than The US Average

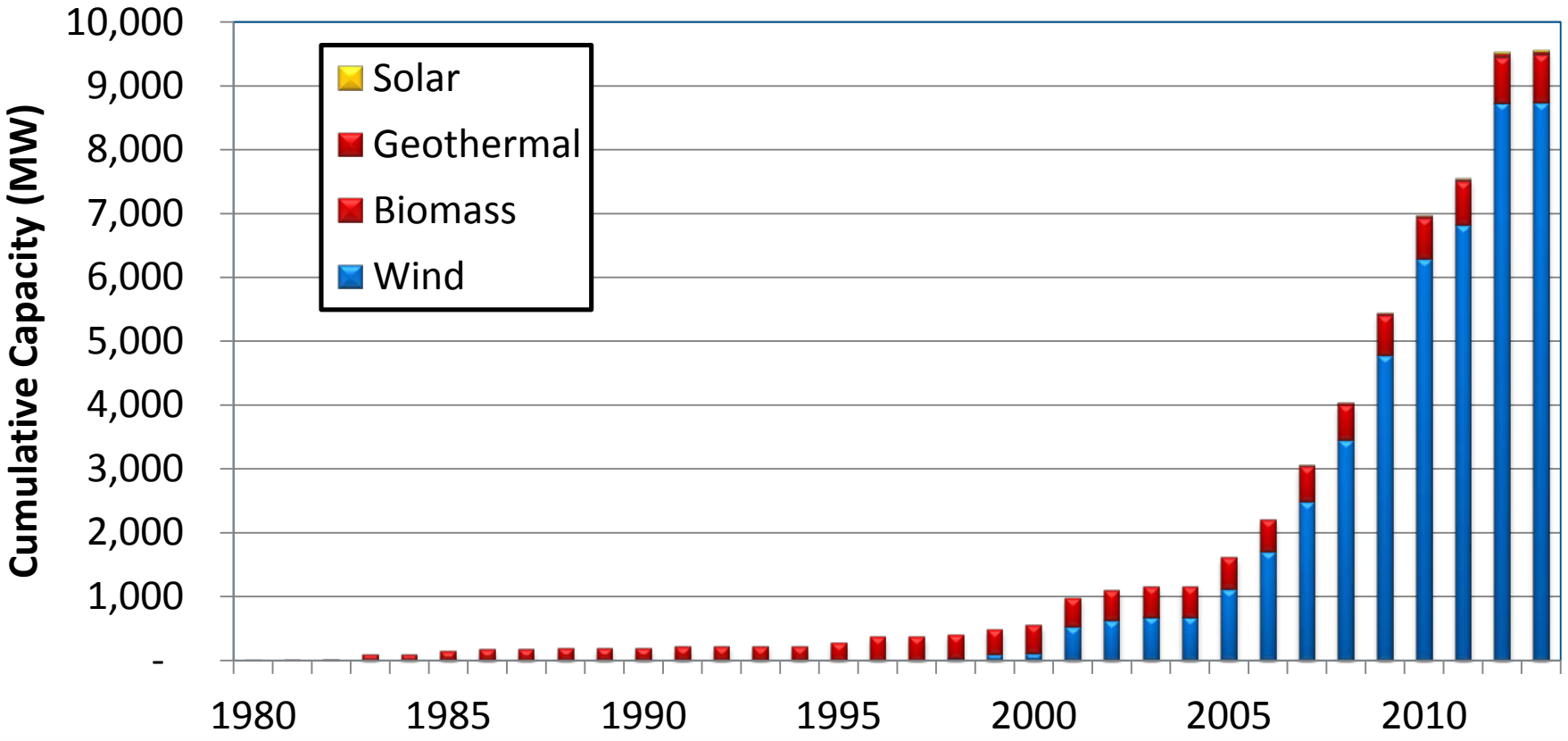



Gross Domestic Product : Based of Bureau of Economic Analysis- measured in $2005 dollars.
Energy Consumption from : State Energy Data System- includes all sectors, residential, commercial, industrial and transport and includes all energy forms, not just electricity .

# Potential Metrics – *Renewable Resources*

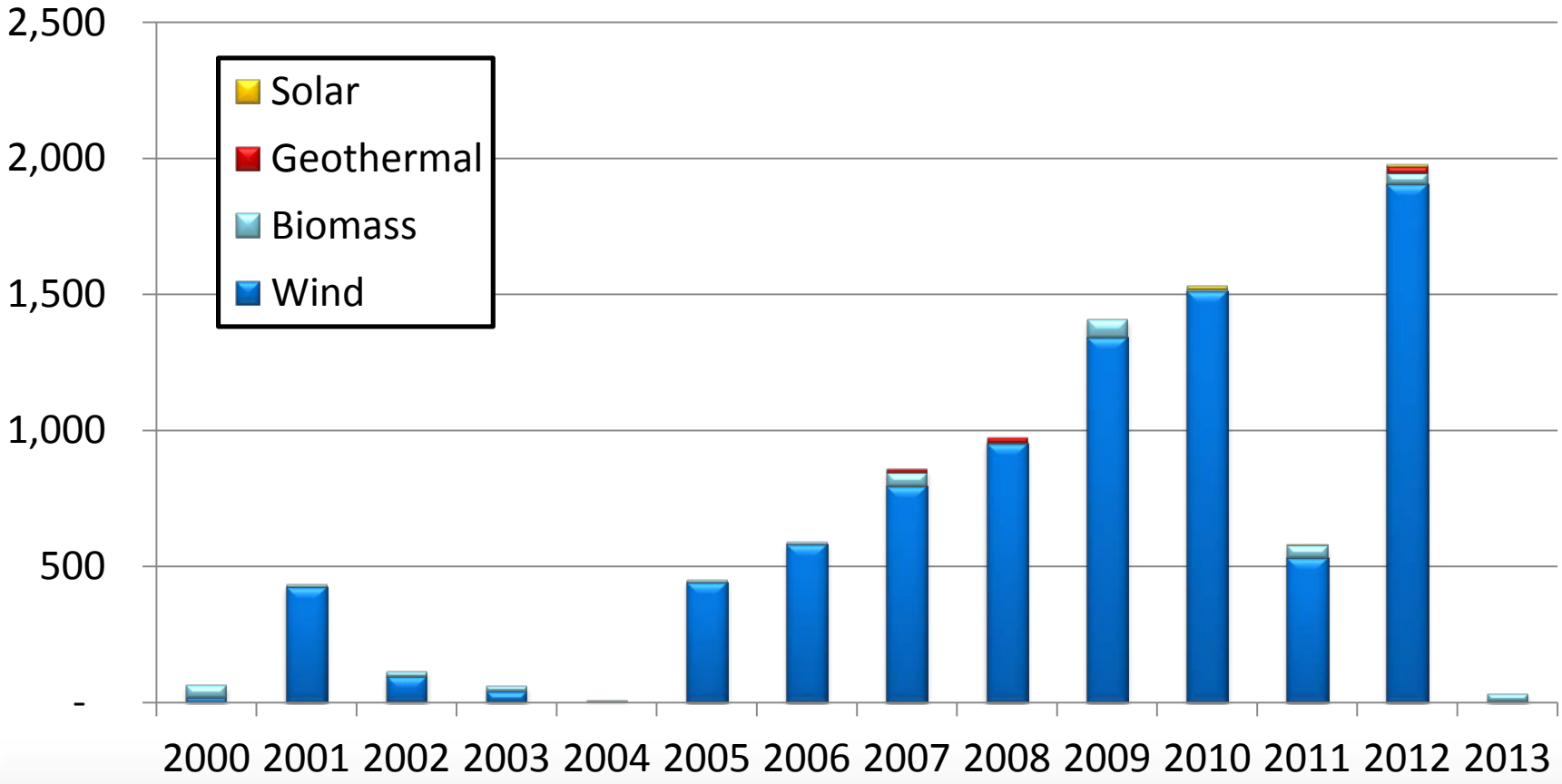
- Cumulative Renewable Resource Development Since 1980
- Annual Renewable Resource Contribution to Total Load Service
- Trends in Renewable Resource Costs
  - With and without PTC?
  - First Costs or Levelized
    - (Actual Capacity Factor or Normalized Capacity Factor?)

# Renewable Resource Development Since1980




* Includes all renewable resource development physically located in the Power Act region and PacifiCorp wind projects in WY; does not include hydropower upgrades (could potentially add this at a later date)

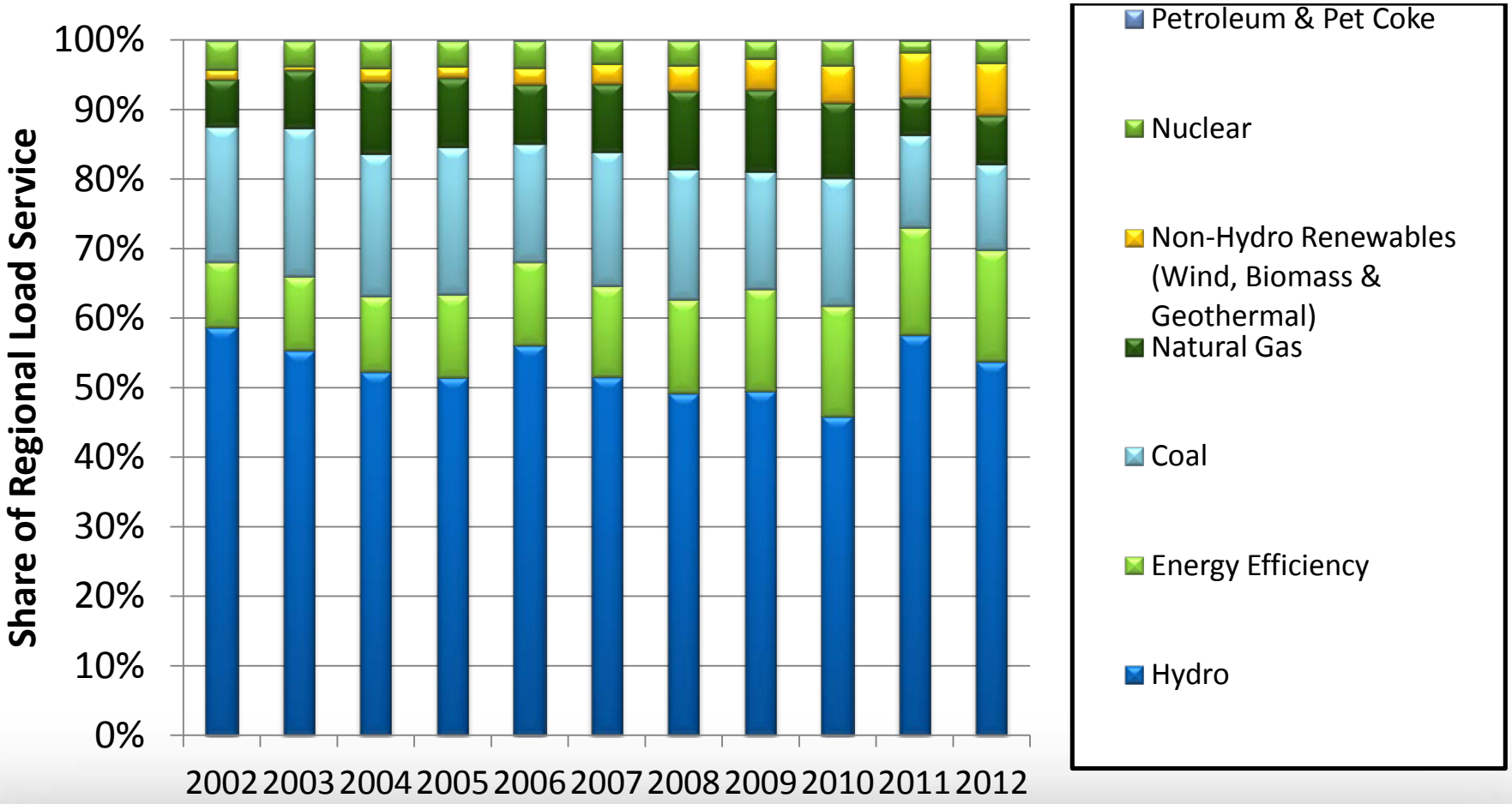
# Renewable Resource Development Since 2000



# Renewable Resource Levelized Cost Trends


Renewable Resource cost trend data is under development. It will be available at Council Committee meeting.

# Annual Renewable Resource Share of Load Service

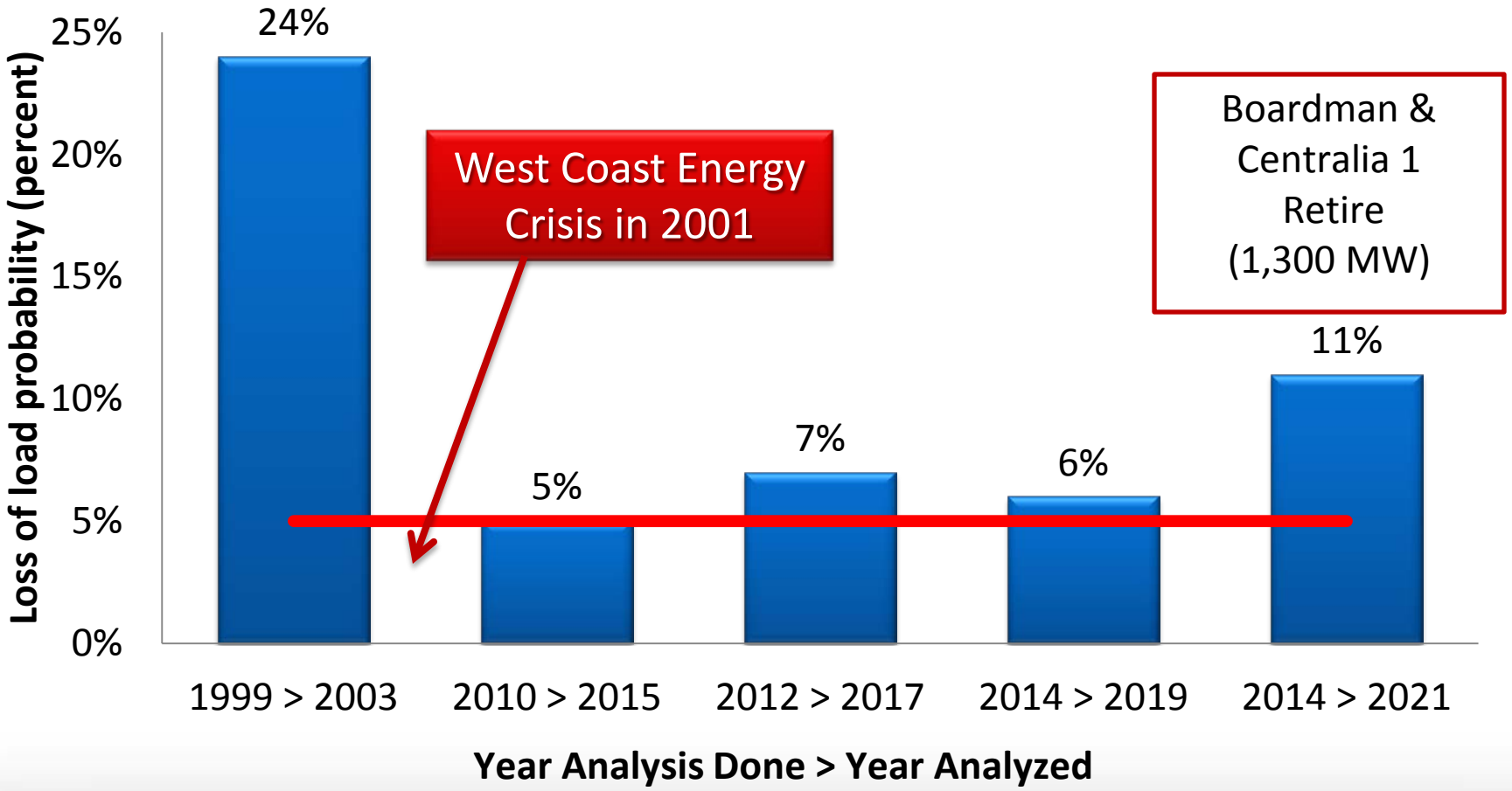


# Potential Metrics – Regional Resource Adequacy and Reliability

- Adequacy
  - Loss of load probability < 5%
- Reliability
  - No current metric
  - Potential metric – System Reliability Index (SRI)
    - Probability of Coulee being below designated target elevation in spring
    - Stored water is for fish, summer power and other uses
    - Using some of that storage to keep lights on in winter when it cannot be replaced means an unreliable supply

# Regional Resource Adequacy

## Council Standard: LOLP Maximum is 5%



# Reliability Metric

## NERC -A power system is reliable if it is:

- Adequate – the electric system can supply the aggregate demand, taking into account both scheduled and unscheduled outages

  and

- Secure – the system can withstand sudden disturbances, such as loss of a transmission line or a generating plant

# Adequacy vs. Reliability

- These metrics overlap
- Council used a time dimension to differentiate[1]
  - Reliability = short-term ability to meet load
  - Adequacy = long-term availability of resources to meet future loads

[1]1994 F&W Program, Appendix C, page C-10

# Council Definition of Reliability
## (with reference to the hydrosystem)

- "to ensure the reliability of the power supply, power system operators need the ability to draft storage projects notwithstanding fish needs in emergency circumstances"

- Thus, if fish operations are curtailed due to a power emergency, it means that the system is not reliable

# System Reliability Index (SRI)

- SRI = the probability that fish operations are curtailed due to power emergencies

- More specifically,
  the probability that storage at Coulee is not at the anticipated level for fish operations by April 10th

# LOLP vs. SRI

- LOLP = Number of simulations with at least one curtailment divided by the total number of simulations

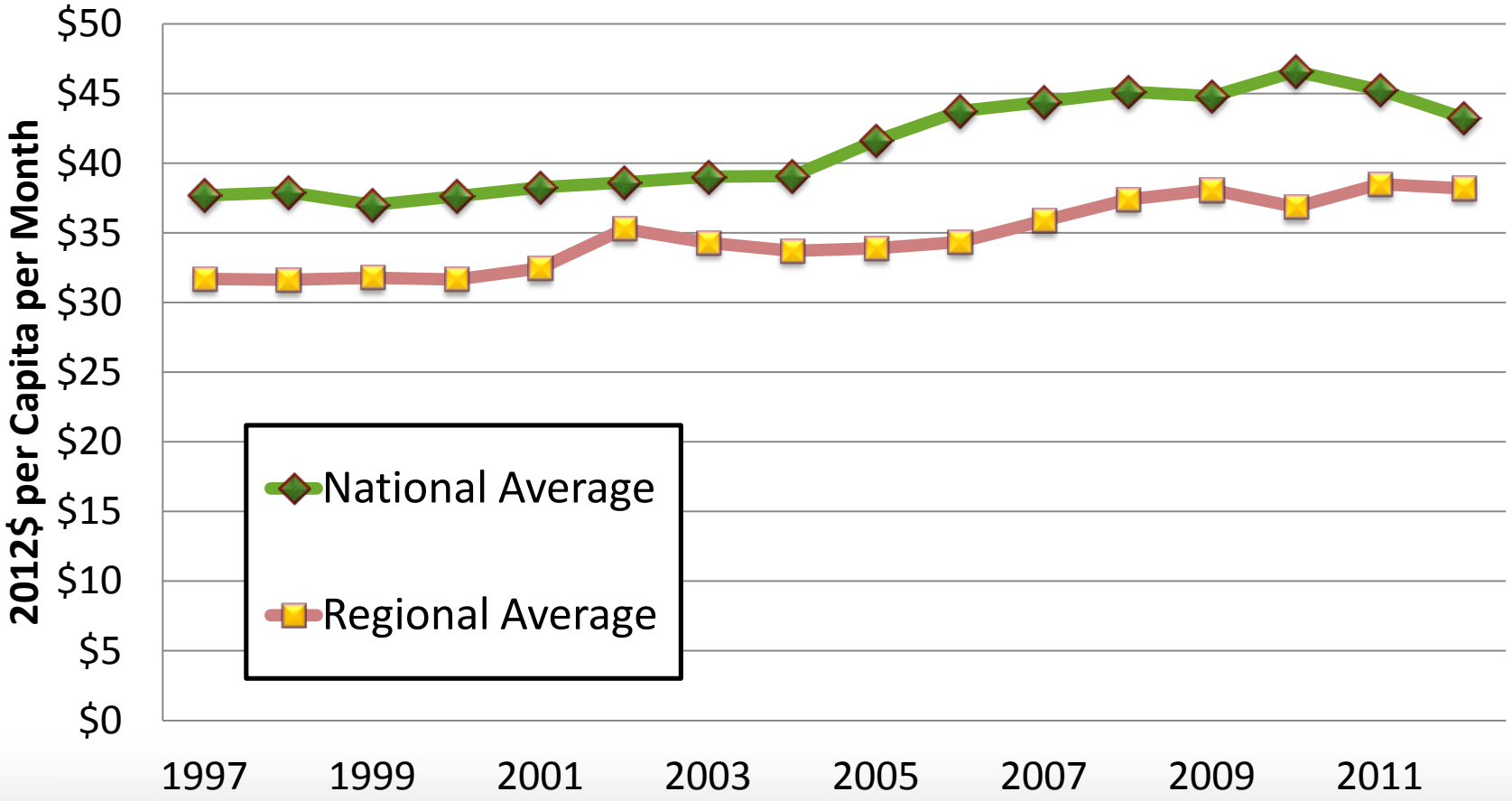
- SRI = Number of simulations in which fish operations are curtailed divided by the total number of simulations

- Preliminary SRI for 2019 is zero percent

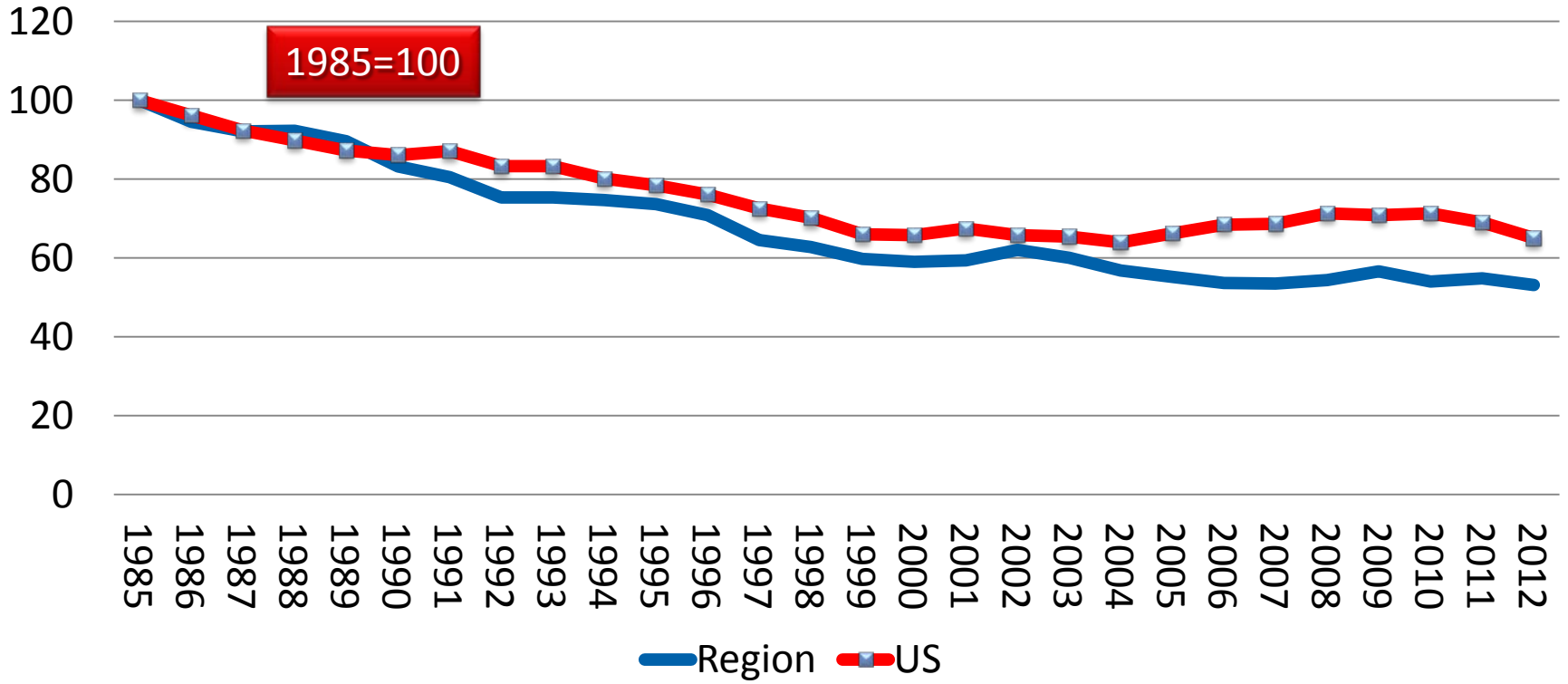
# Potential Metrics – *Economical* Power Supply

- Average PNW Residential Electric Bills vs. US
- State Rank of PNW State Electric Bills
- Electric Revenues as a Share of GDP
- Other?

# Northwest Electric Bills Are Lower Than the National Average

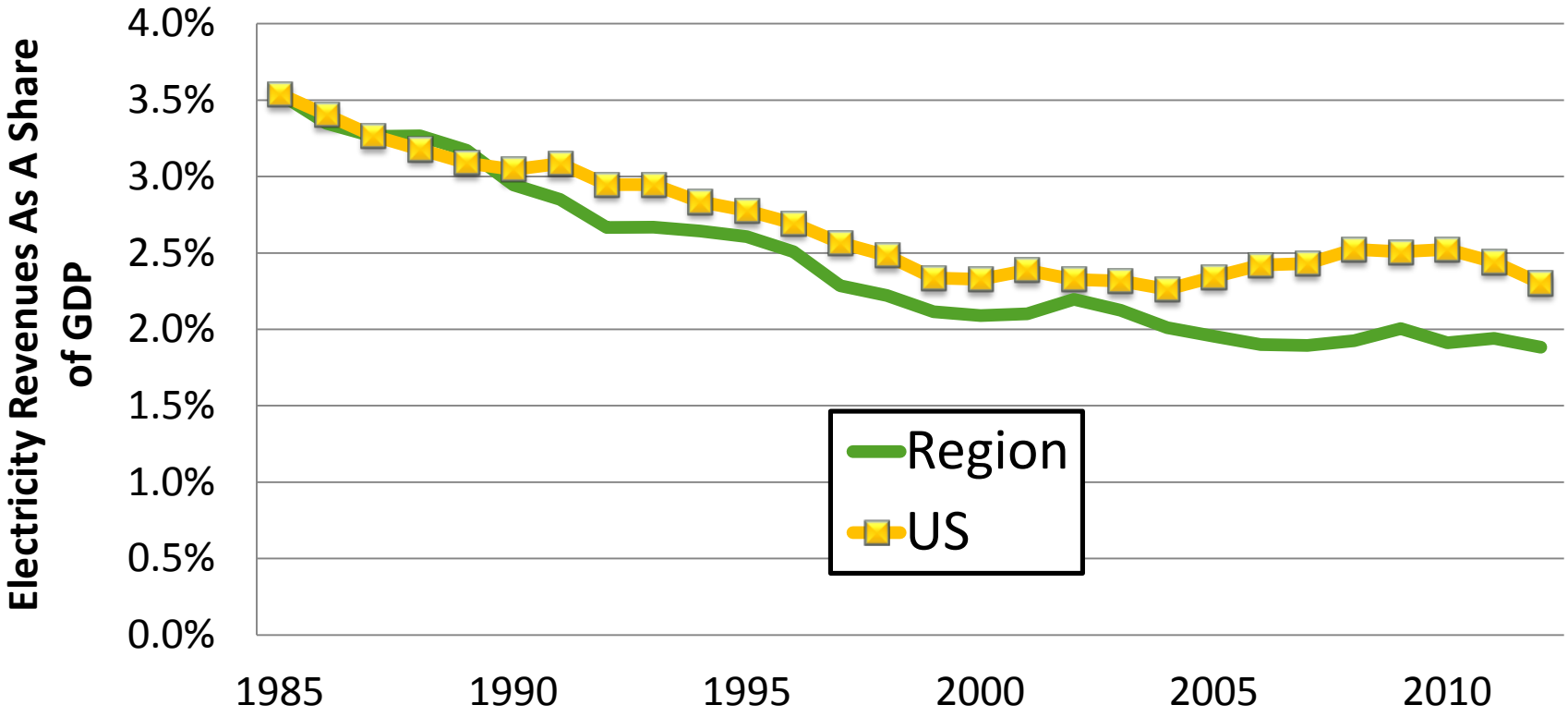


# Electric Revenue as share of GDP Northwest and USA (indexed to 1985)




Gross Domestic Product : Based of Bureau of Economic Analysis- measured in $2005 dollars.
Electric revenue from : State Energy Data System- includes all sectors, residential, commercial, industrial and transport.

# Northwest Electric Revenues Comprise A Smaller Share of GDP Than The National Average




Gross Domestic Product : Based of Bureau of Economic Analysis- measured in $2005 dollars.
Electric revenue from : State Energy Data System- includes electricity sales to all sectors (i.e., residential, commercial, industrial and transportation).

# The Northwest Has Some of the Lowest Electricity Cost In The Nation in 2012*

| State | Residential Sector Average Monthly Bill | Commercial Sector Average Monthly Bill | Industrial Sector Average Monthly Bill |
|---|---|---|---|
| Idaho | 5 | 1 | 2 |
| Montana | 9 | 3 | 5 |
| Washington | 11 | 24 | 8 |
| Oregon | 16 | 13 | 4 |

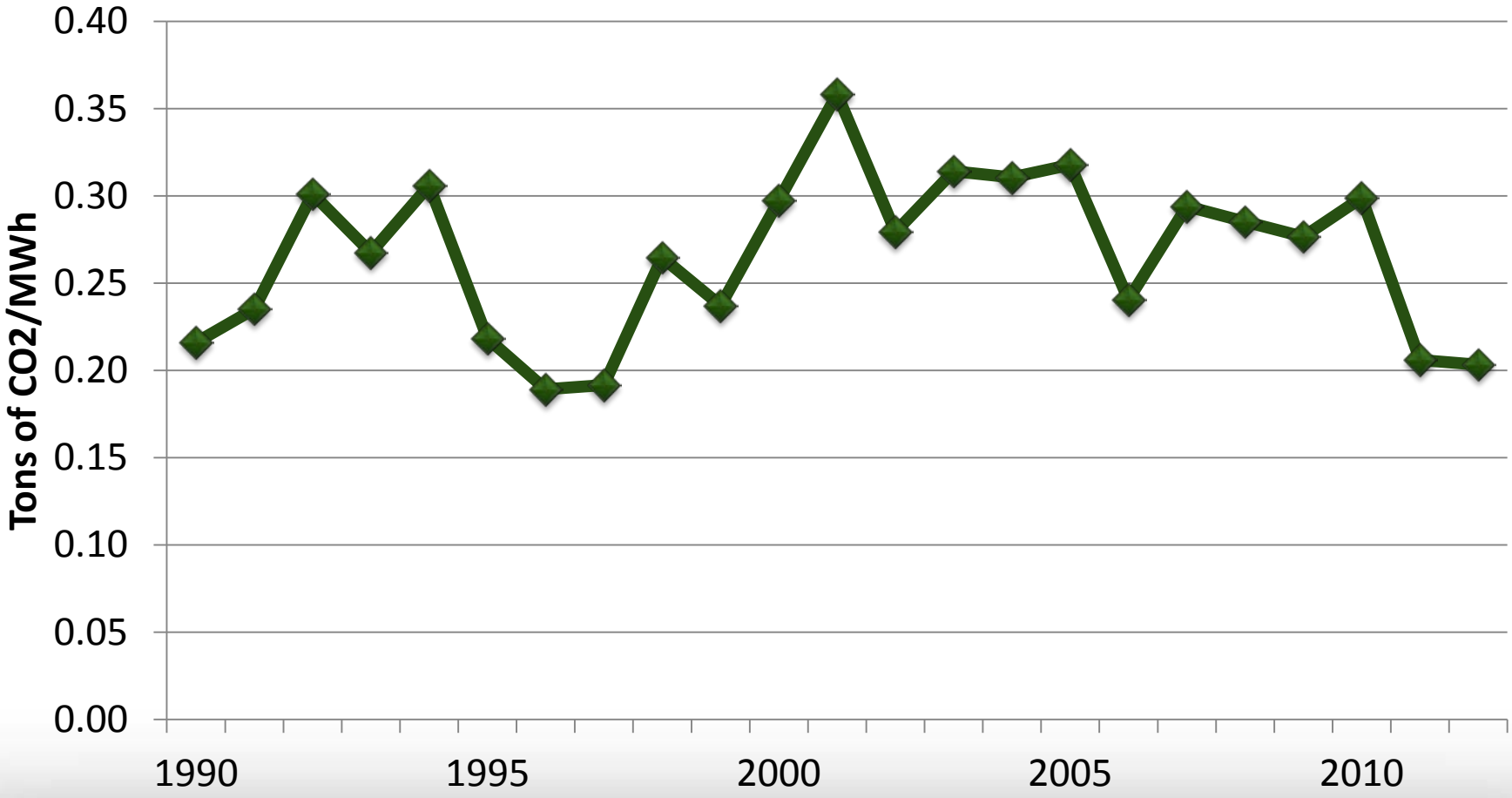
Source: http://www.eia.gov/electricity/sales_revenue_price

*State with Lowest Bill = 1

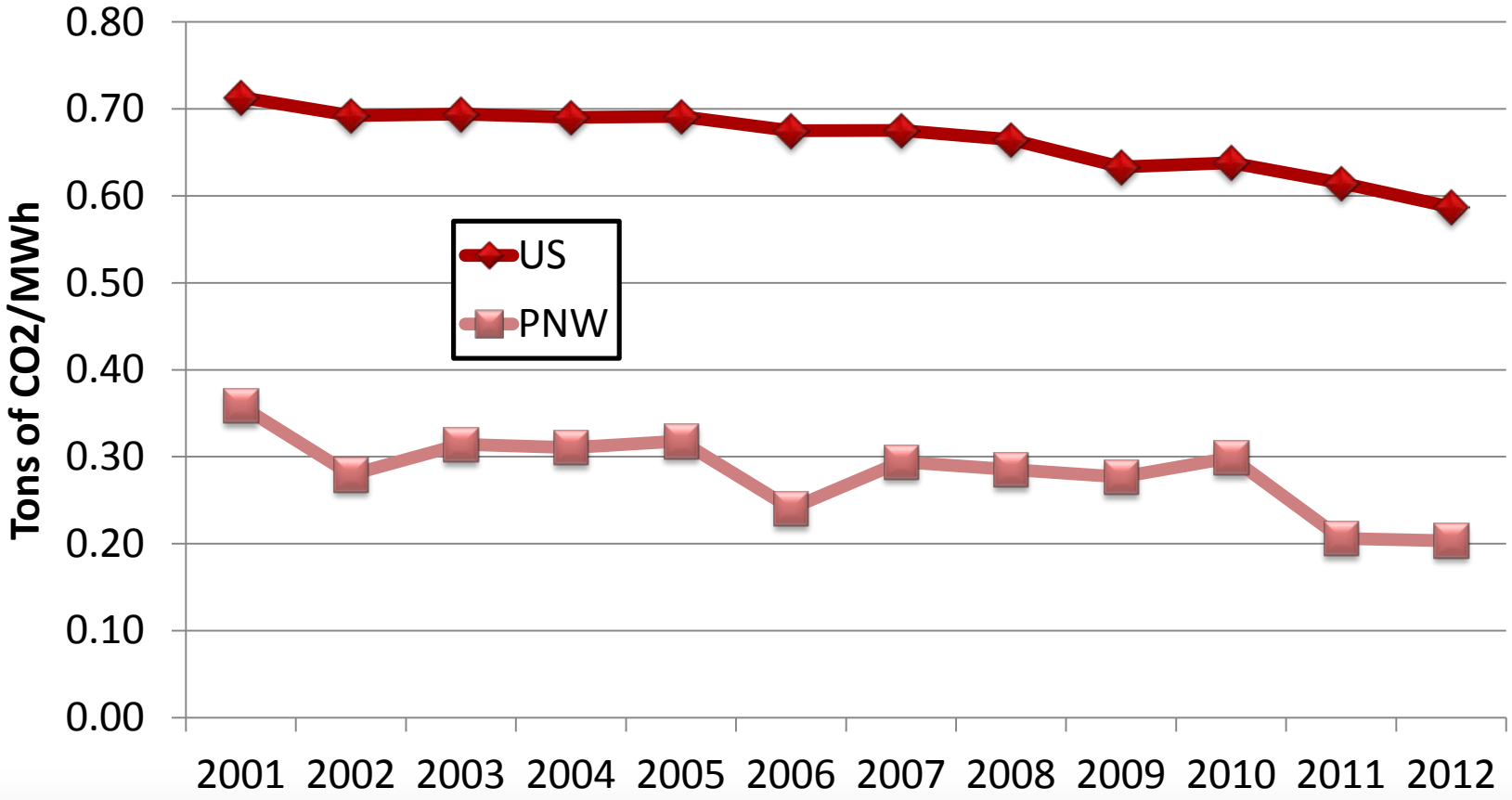
# Potential Additional Metric CO2 Emissions

- Why Add Metric
  - Power Act Requires "due consideration" be given to the environmental impacts of resource development as well as "quantification of environmental costs and benefits"
  - Recent EPA Clean Air Act Proposed Regulations Would Limit Power Sector CO2 Emissions
- Why Not Add Metric
  - None of the other proposed metric tracking compliance with regulatory requirements

# Northwest Power System CO2 Emissions Trends



# Trends in PNW and US Power Sector CO2 Emission Intensity per Unit of Electricity Production



# Summary & Observations

- Proposed Indicators Derived From *External* Data Sources
  - Pro – This makes them more independent of Council
  - Con – This means that we must rely on their continued availability and timing
- Proposed Indicators Currently Maintained by Council
  - Pro – Already track specific metrics
  - Con – May not be viewed as "independent"
- Proposed Indicators Not Now Maintained by Council
  - Pro – Can be tailored to track specific metrics
  - Con – Will require staff resources to develop and maintain
  - Con - Incremental Workload for some (e.g., Reliability, Actual Renewable Resource Costs) could be significant