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

June 5th, 2018

MEMORANDUM

TO: **Power Committee**

FROM: **Massoud Jourabchi, Tina Jayaweera, and Kevin Smit**

SUBJECT: **Examination of Recent Economic Trends**

BACKGROUND:

Presenter: Massoud Jourabchi, Manager Economic Analysis
Tina Jayaweera and Kevin Smit, Senior Energy Analysts

Summary: Council staff has estimated the change in efficiency of energy use in the Northwest. Examining economic trends in residential and business sectors shows that if the regional economy had held the same level of efficiency in energy usage, regional electricity loads would have been at about 14,000 aMW higher than they were in 2015. Approximately 58% of this reduction is due to structural change in the economy and 42% is from energy efficiency programs and impacts of codes and standards.

Relevance: Assessment of impact of efficiency trends in the economy

Workplan: NA

Background: Council staff is often asked if the impacts of energy efficiency in the economy are real and are they sustainable in the long run. This study took a long-term view by going back to 1990 and estimating what the energy demand in the region would have been in 2015 if the efficiency was kept at 1990 levels. Study shows that demand for all sectors and all forms of energy would have been higher. The Northwest region has been producing more goods and services with lower demand for energy. A companion paper is prepared, should the Council want to review and release it for public comment.

851 S.W. Sixth Avenue, Suite 1100
Portland, Oregon 97204-1348
www.nwcouncil.org

Steve Crow
Executive Director

503-222-5161
800-452-5161
Fax: 503-820-2370

Recent Trends in Energy Consumption and Its Relationship to the Regional Economy

Massoud Jourabchi, Tina Jayaweera,
Kevin Smit

June 12, 2018

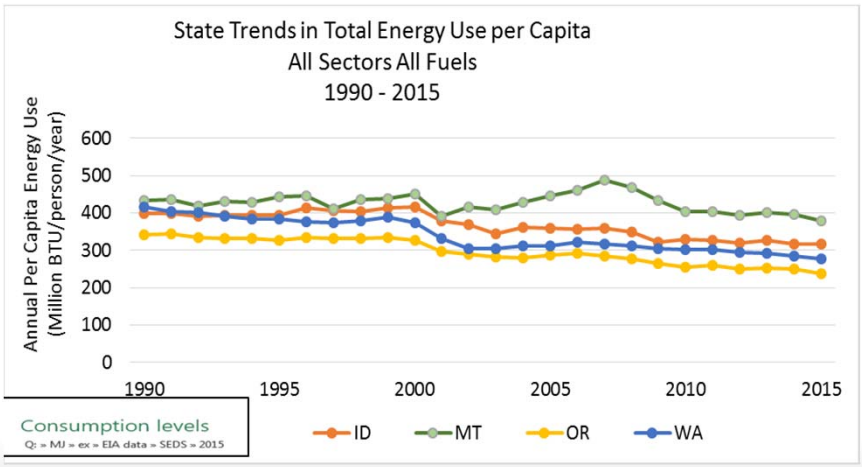
Northwest Power and Conservation Council

In Today's Discussion

- Measuring counterfactuals through observation of their impact
- Change in how we use energy
  - At homes
  - At businesses
- Structural change
- Energy efficiency

Northwest Power and Conservation Council

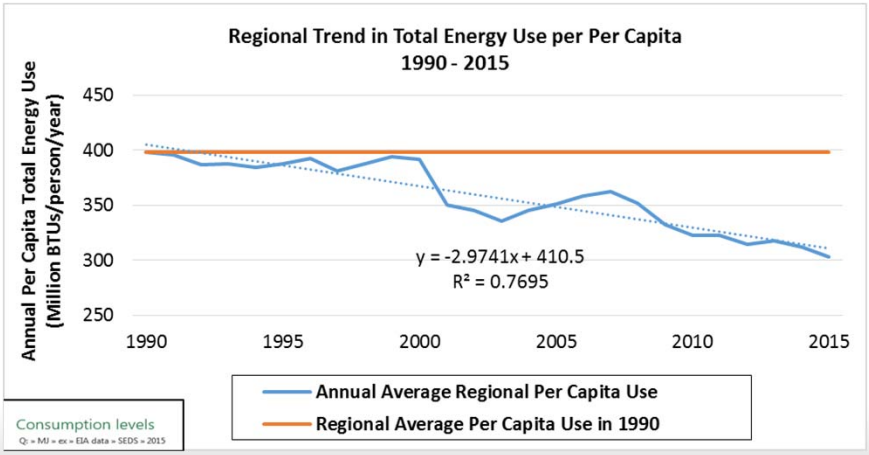
Since 1990 there has been a gradual decline in per capita total energy use across all four Northwest states



Northwest Power and Conservation Council

3

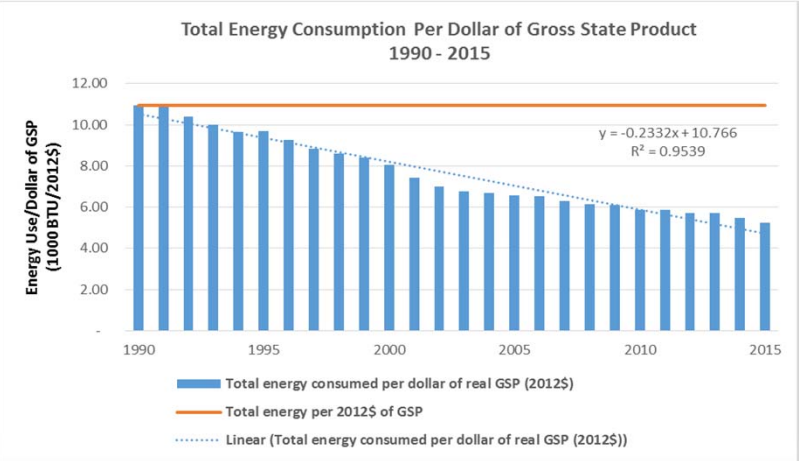
A 25% decrease in per capita energy consumption



Northwest Power and Conservation Council

4

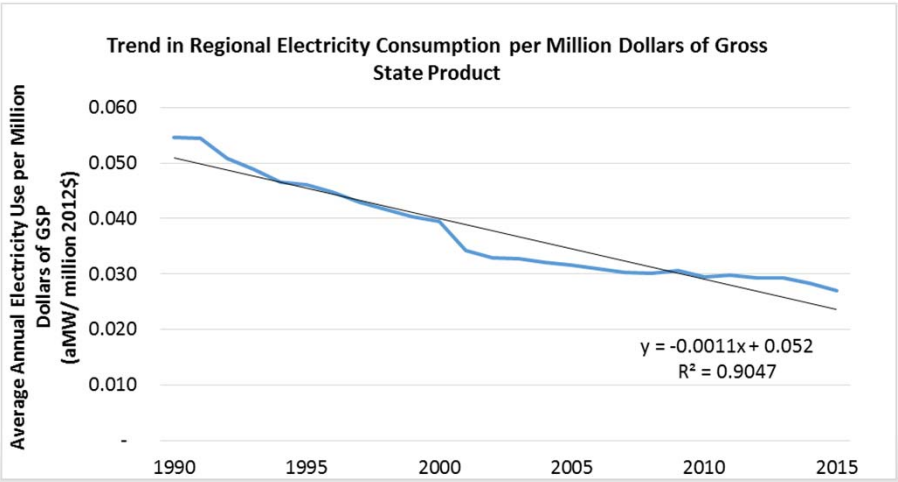
A 53% reduction per dollar of output



Northwest Power and Conservation Council

5

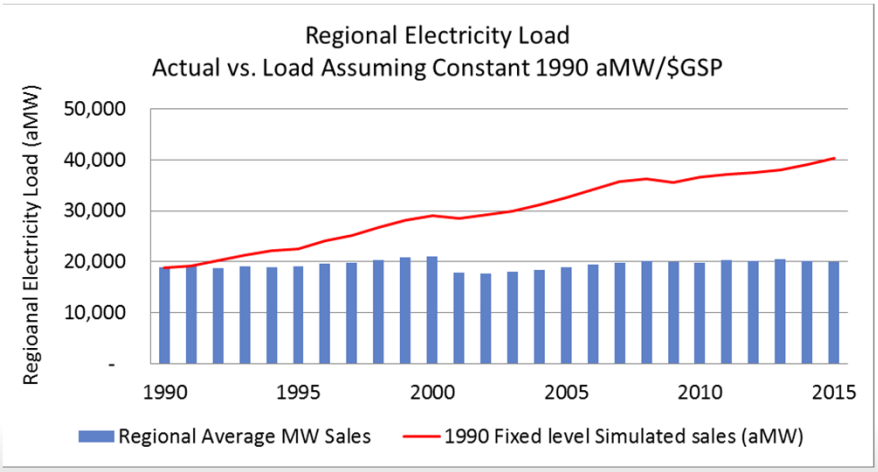
Efficient Use of Electricity



Northwest Power and Conservation Council

6

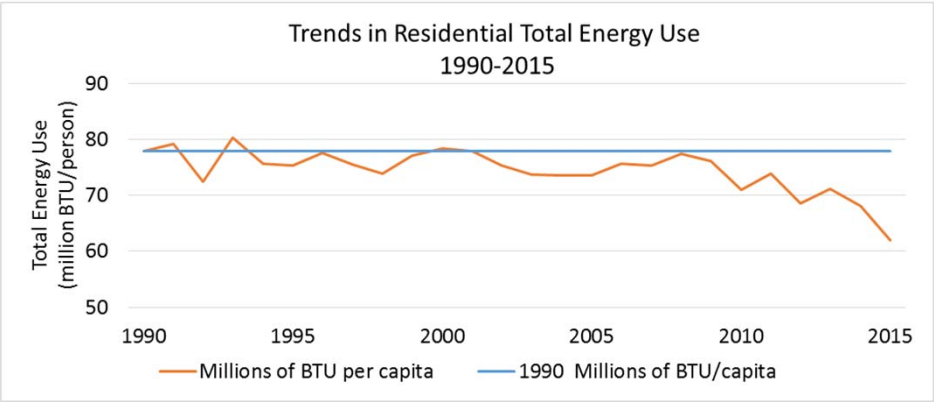
Demand for Electricity could have been 100% higher than it actually was



Northwest Power and Conservation Council

7

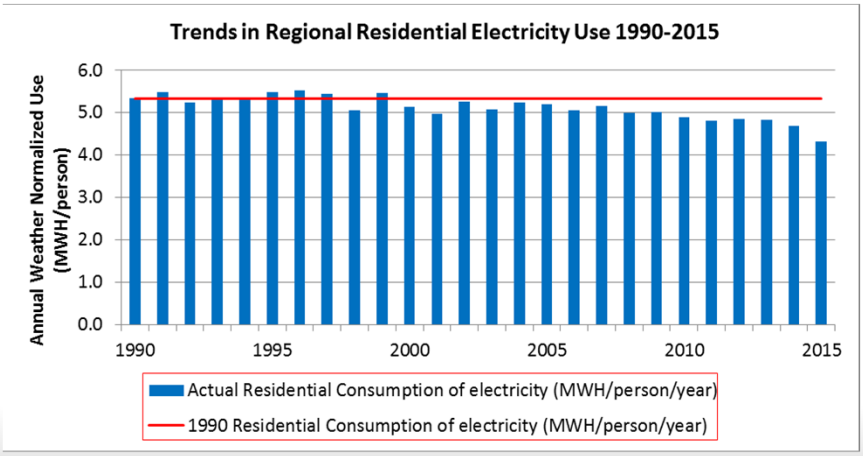
Residential Sector Total Energy Consumption would have been 25% higher



Northwest Power and Conservation Council

8

Electricity consumption dropped by 1 MWH per capita



Northwest Power and Conservation Council

9

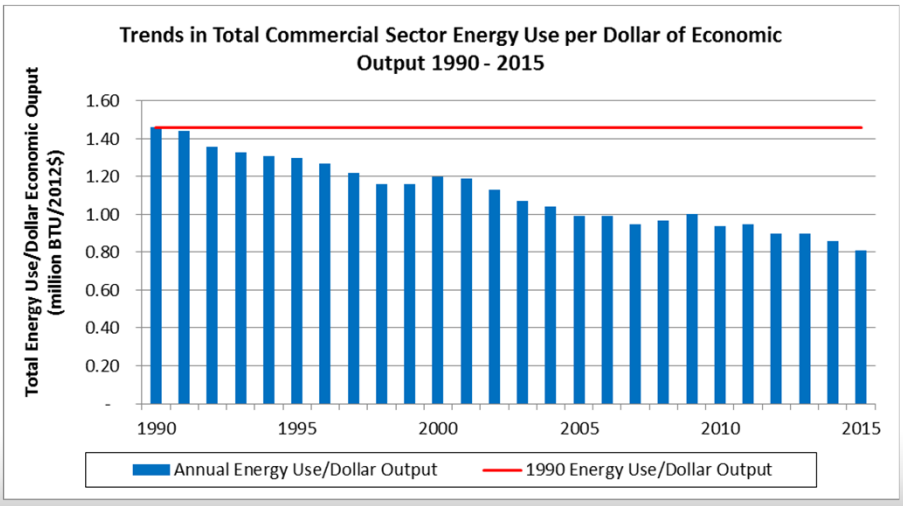
Drivers for Changes in Residential Demand

Increasing Consumption	Decreasing Consumption
Increasing size of home	Increased use of natural gas for space and water heating
Expansion of electricity-using appliances/devices	Increasing electricity prices
Increased air conditioning	
Increasing appliance size (e.g. refrigerators)	

Northwest Power and Conservation Council

10

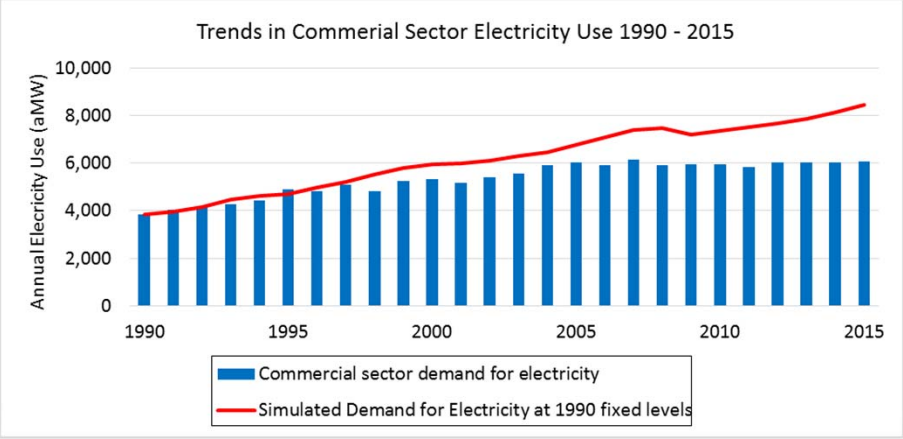
Commercial Sector demand per unit of output declined by over 80%



Northwest Power and Conservation Council

11

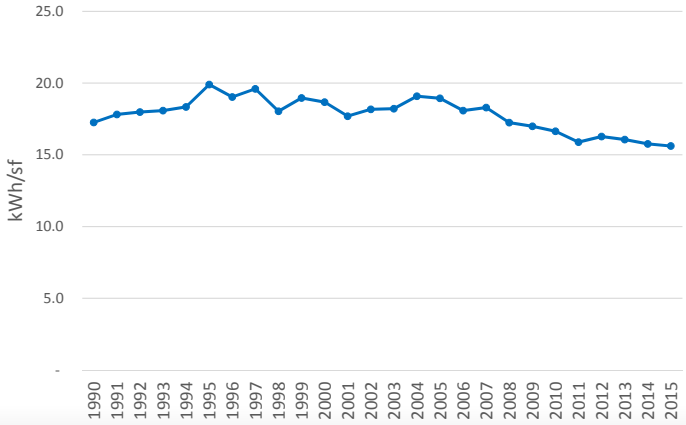
Commercial sector had a 38% drop in electricity usage



Northwest Power and Conservation Council

12

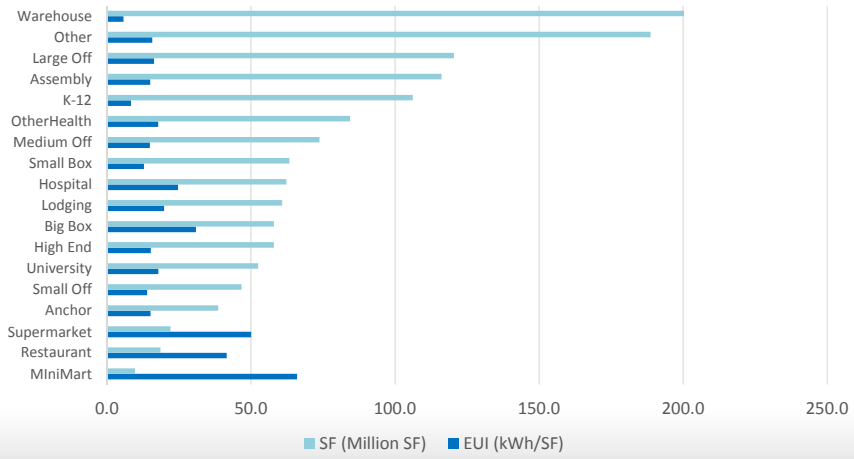
Commercial Consumption per Square Foot over Time



Northwest Power and Conservation Council

13

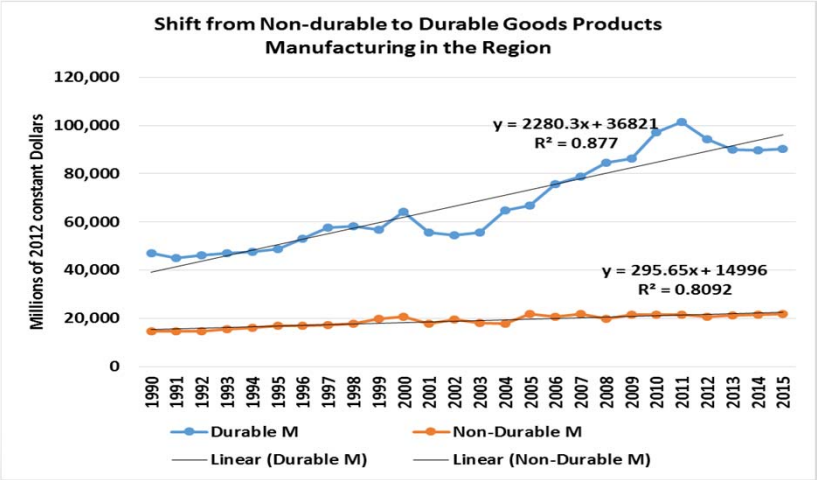
New Com Floorspace (1990-2015) and Electric Intensity



Northwest Power and Conservation Council

14

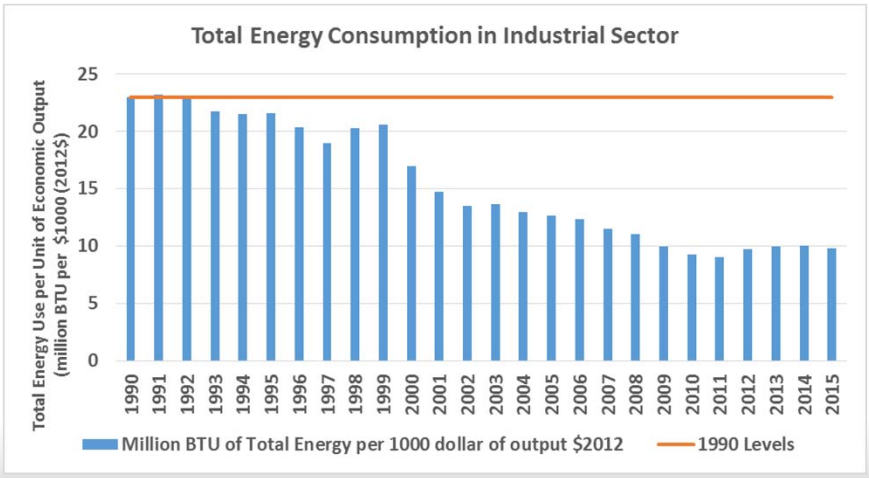
Trends in Regional Manufacturing shows a move away from non-durable goods



Northwest Power and Conservation Council

15

57% drop in Industrial Sector Energy Demand



Northwest Power and Conservation Council

16

Ratio of Durable Goods* Industry Electricity Intensity and Average Annual Growth Rate (AAGR)

1997-2015 AAGR	Durable Goods Industries	Ratio of Electricity Use per Employee to Regional Average Electricity Use per Employee
3.4%	Hi Tech chip fab	0.24
2.9%	Elect Manufacturing	1.24
2.6%	Machines & Computer	1.24
2.4%	Foundries	1.00
2.4%	Transportation, Equip	0.22
2.0%	Electric Equipment	1.24
2.0%	SGC	0.44
1.7%	Cement	0.54
1.3%	Metal Fab	0.63
1.0%	Light Manufacturing	1.90
0.1%	Furniture	0.03
-0.2%	Wood lumber	0.77
-0.7%	Wood Panel	2.32
-0.7%	Hi Tech Silicon	2.14

Excludes aluminum smelting

Northwest Power and Conservation Council

17

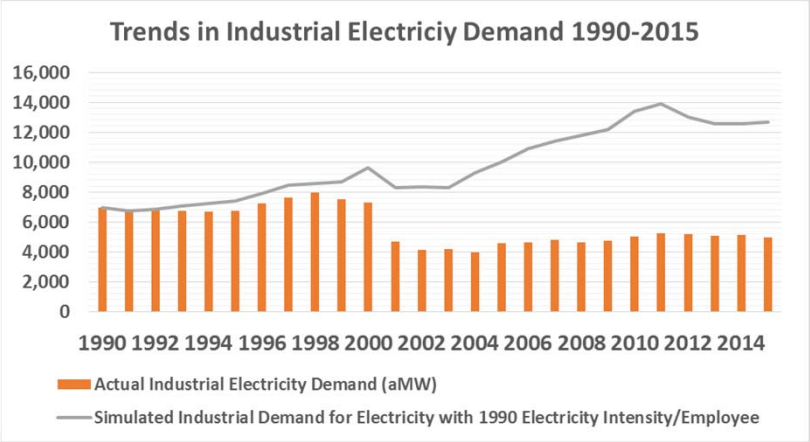
Ratio of Non-Durable Goods Industry Electricity Intensity and Average Annual Growth Rate (AAGR)

1997-2015 AAGR	Non-Durable Goods Industries	Ratio of Electricity Use per Employee to Regional Average Electricity Use per Employee
1.8%	Sugar	2.22
1.4%	Other Food	0.59
1.2%	Chemical	3.65
0.7%	Rubber, plastic	0.95
0.6%	Refinery	5.62
-0.1%	Frozen Food	0.82
-0.2%	Fruit Storage	0.83
-0.3%	Kraft Pulp	5.60
-0.5%	Mechanical Pulp	8.10
-0.8%	Textiles	3.10
-1.1%	Apparel	0.01
-1.1%	Leather	0.10
-1.7%	Printing	0.22
-2.0%	Pulp and Paper	6.85
-3.1%	Cold Storage	0.76

Northwest Power and Conservation Council

18

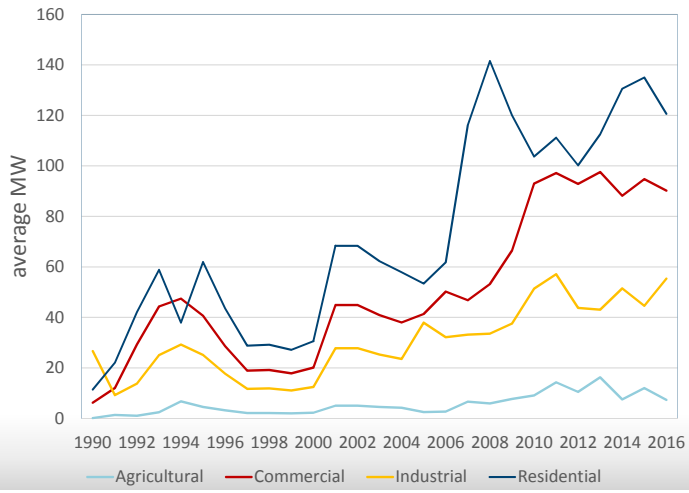
Industrial Demand for Electricity could have been 7700 aMW higher by 2015



Impact on Regional Electricity Demand Due to Changes in the Region's Economy and Efficiency Improvements (aMW)

	Actual 2015 Electricity Demand	2015 Electricity Demand with 1990 Energy intensities	Difference in Demand
Residential (WN)	6,862	8,308	1,613
Commercial (WN)	6,071	8,452	2,375
Industrial	4,934	12,668	8,376
Aggregated	17,867	29,428	12,364

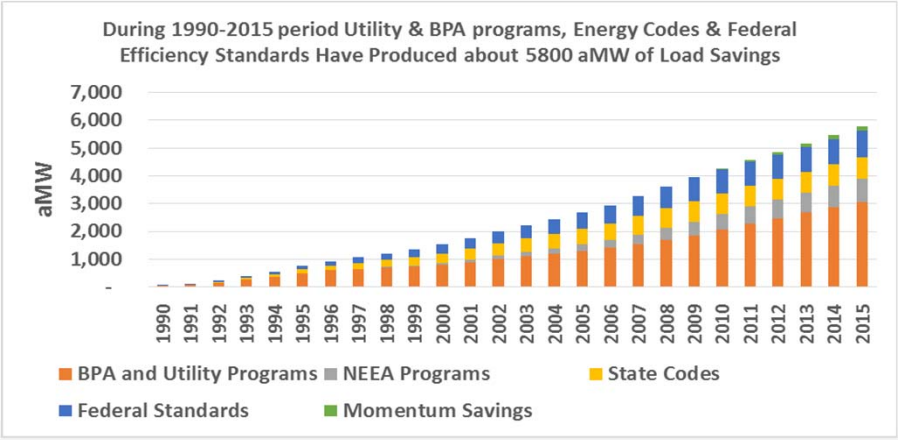
EE Achievements by Sector (incremental by year)



Northwest Power and Conservation Council

21

Cumulative Energy Efficiency 1990-2015



Northwest Power and Conservation Council

22

Summary

As a *very* rough approximation, it would appear that about 42 percent of the 13,600 aMW of load difference can be attributed to improvements in energy efficiency and about 58 percent due to the impact of ongoing changes in regional economic mix and efficiency improvements occurring independent of utility programs and codes & standards