Northwest Power and Conservation Council

March 30, 2006

MEMORANDUM

TO: Power Committee

FROM: Jeff King

SUBJECT: Briefing regarding an assessment of power system marginal CO2 production

An estimate of the avoided carbon dioxide (CO2) production resulting from addition of a marginal increment of conservation or low-carbon generation to the power system is needed to estimate the cost-effectiveness of these resources. As described in the December 2005 briefing to the Power Committee, staff has been conducting an assessment of this factor using the AURORA^{xmp} Electricity Market Model. The purpose of this briefing is to describe and discuss the results of the completed assessment.

With implementation of the resource portfolio recommendations of the 5th Power Plan, staff estimates that addition of one megawatt-hour of flat conservation to the system in 2010 under average conditions will avoid 0.83 lbCO2/kWh from system operation. Equivalent savings would result from addition of a zero carbon resource such as wind to the system. Following a period of stability, CO2 savings from addition of a carbon-free resource increase to 1.02 lbCO2/kWh in 2025 as new resource acquisitions shift from conservation and wind to fossil resources.

A comparative analysis, assuming that the conservation levels recommended in the 5th Plan are not achieved ("Status Quo" portfolio), as expected, results in higher avoided levels of CO2. For example, avoided CO2 under average conditions in 2010 with the Status Quo resource mix is 1.28 lbCO2/kWh, compared to the 0.83 lbCO2/kWh with the recommended portfolio. The increase in the Status Quo case is attributable to greater levels of fossil fuel development required in the earlier years of the planning period to compensate for reduced levels of conservation development.

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

The results of this assessment will be proposed for adoption by the RTF for its assessments of conservation measure cost-effectiveness. These results, expressed as change in system thermal generating efficiency (MMBtu/kWh), may be used by the Oregon Energy Trust for assessing the cost-effectiveness of cogeneration projects. The Oregon Carbon Allocation Task Force (CATF) may also use these findings for developing a CO2 cap and trade system for Oregon.

The draft PowerPoint for this briefing is attached, pending results of sensitivity analyses of the effects of higher fuel prices and of assumptions regarding out-of-region and must-run resources.

---

q:\tm\council mtgs\apr 06\mem p4 co2 033006.doc

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

Power System CO2 Production Factors
Draft

Jeff King

Northwest Power and Conservation Council

Power Committee

Whitefish, MT

April 11, 2006

System CO2 Production Factor

- The amount of carbon dioxide (lbCO2/kWh) produced by the marginal resource required to meet load.
- Typically assessed as an average over some period, e.g., a year, and therefore an average of the CO2 production of many different resources that may be on the margin during the period.

Applications

- Impact of energy efficiency measures on systemwide CO_2 production & resulting cost-effectiveness.
- Systemwide reduction in fuel consumption from CHP development
- Impact of modified hydro operation on CO_2 production.

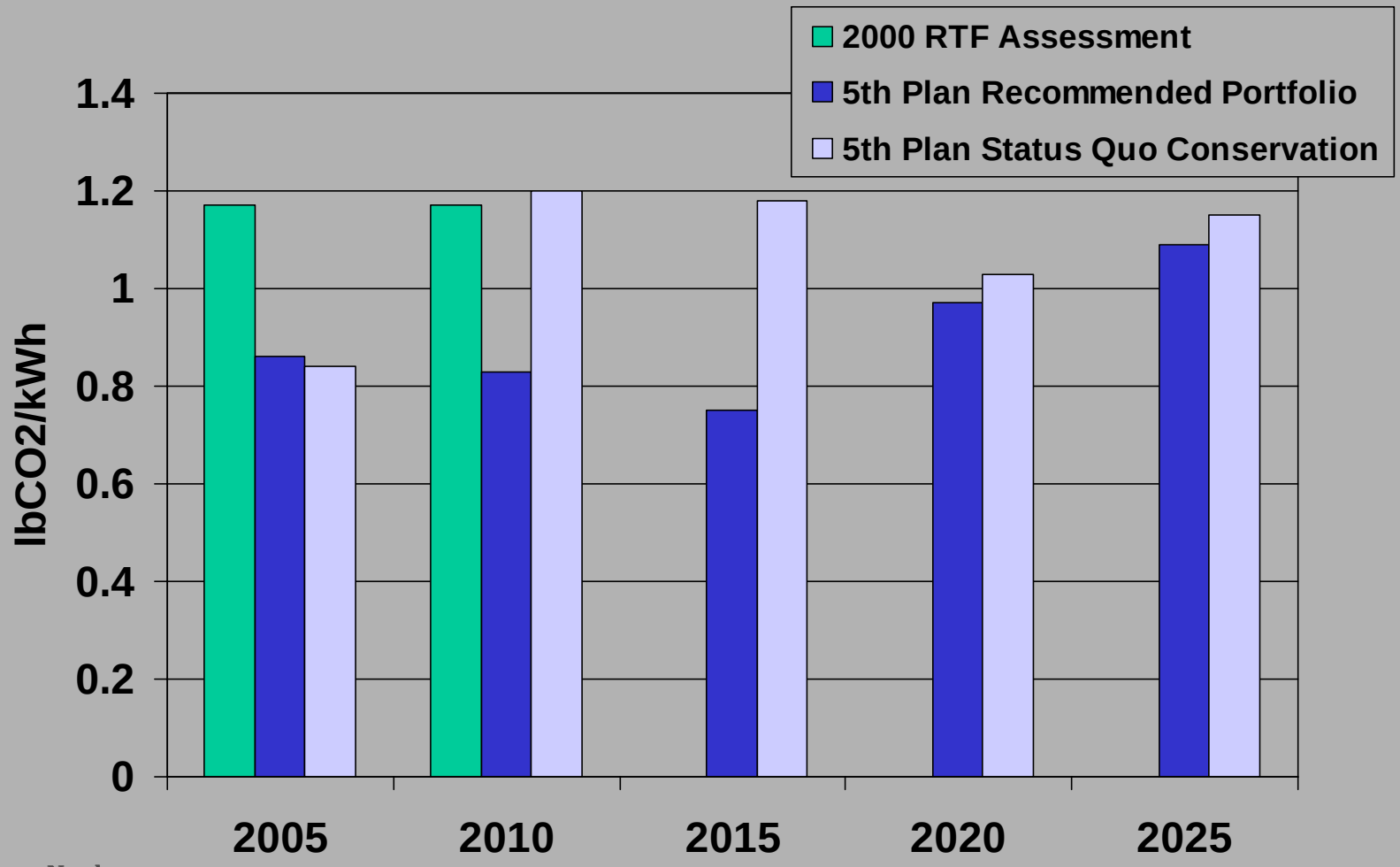
Approach

- Identify hourly marginal (highest-cost dispatched) Northwest resource using AURORA$^{xmp®}$ model
- Calculate resulting hourly and annual average CO2 production.
- These resources (and their resulting effects, such as CO2 production) will (generally) be displaced by new resource additions.

Large resources may affect future resource mix

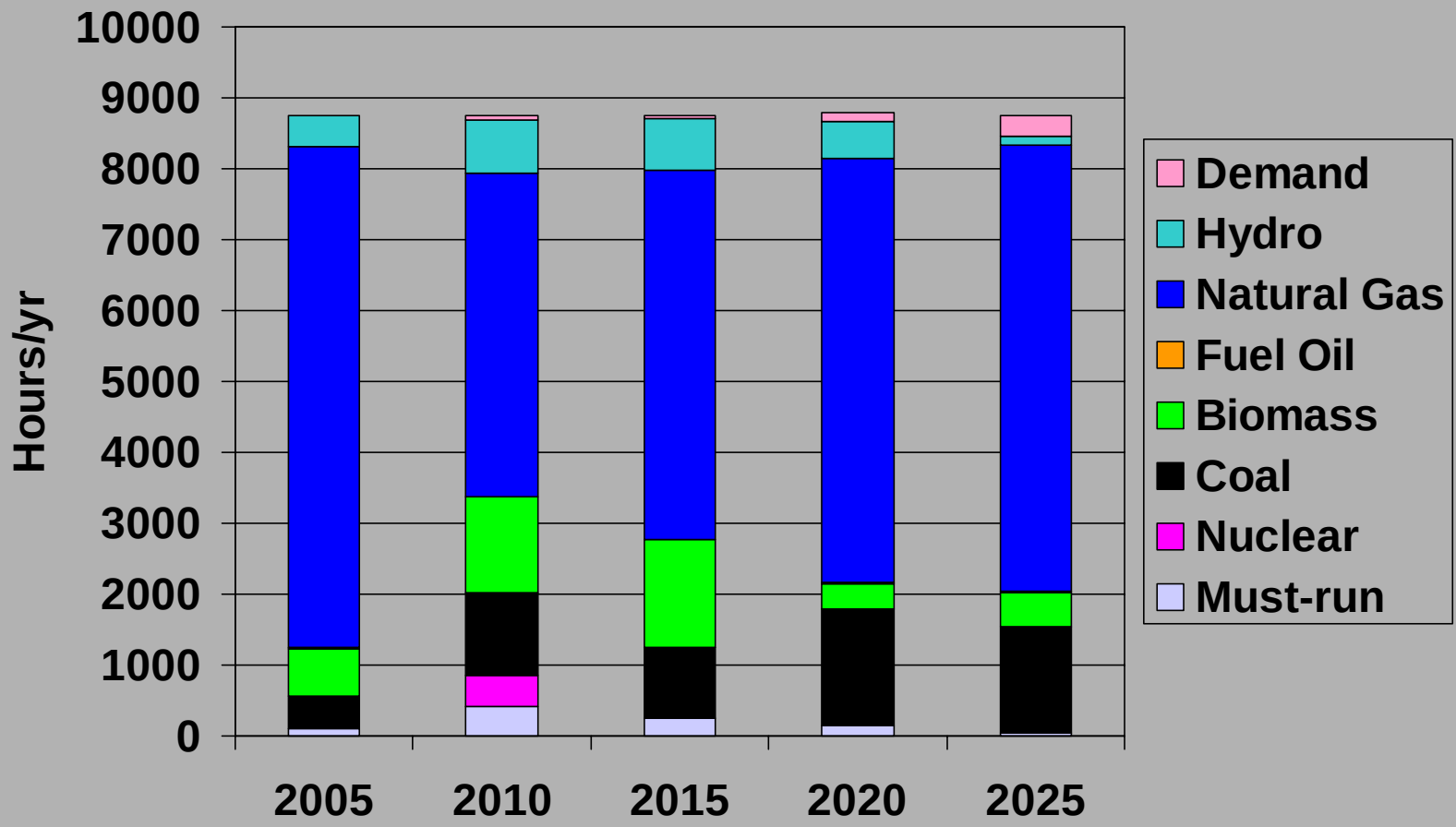
- Run comparative hourly dispaches as using alternative future resource portfolios
- Has been difficult to achieve consistent results using AURORA's capacity expansion mode.
- So, have compiled alternative resource portfolios based on the results of the portfolio risk studies.

Estimated system CO2 production factors



Northwest Power and Conservation Council

Northwest resources on the margin – LCLR Portfolio



Northwest Power and Conservation Council

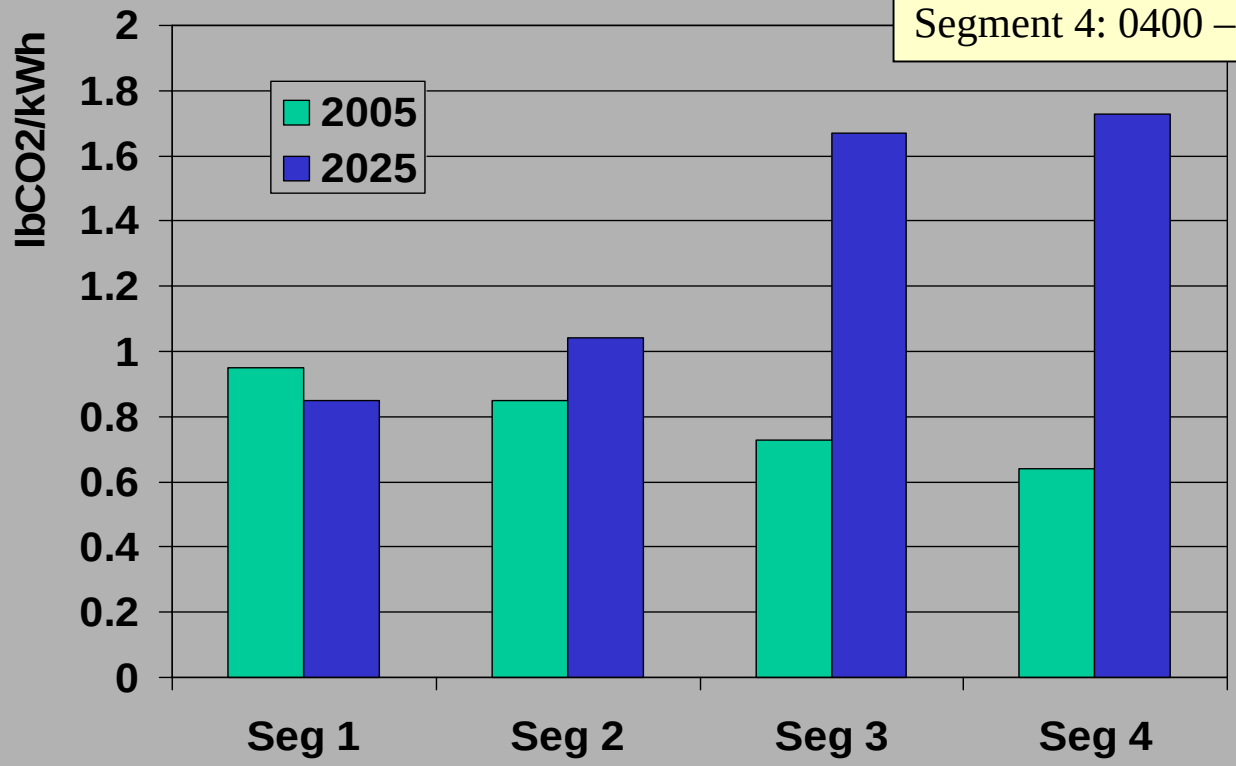
Sensitivity to load sector – LCLR portfolio

Segment 1: 0800 – 1800 M-F

Segment 2: 0400 - 0800/1800-2200 M-F;
0400 – 2200 S&S

Segment 3: 2200 - 0400 M-F

Segment 4: 0400 – 2200 S&S



Northwest Power and Conservation Council