Northwest Power and Conservation Council

January 29, 2009

MEMORANDUM

TO: Power Committee

FROM: John Fazio, Senior Power Systems Analyst

SUBJECT: Carbon policy impacts and proposed assumptions for the 6th Power Plan

The discussion at today's Power Committee meeting will focus on three topics:

1. How climate change policies can affect resource acquisition strategies
2. Proposed assumptions for CO_2 prices and tax credits
3. Possible analyses for the 6th Power Plan

Carbon allowance prices, tax credits, and renewable energy credits present major uncertainties in the development of the 6th Power Plan. They affect the cost of resources, electricity prices, electricity demand, and levels of cost-effective conservation. For the plan, assumptions regarding expected average CO_2 prices over time are needed to forecast future electricity prices. A wide range of CO_2 prices over time, along with a probability distribution for that range, is required for the portfolio model in order to develop viable resource strategies.

Staff is asking for approval of the proposed assumptions to move forward in the development of the 6th Plan. Based on staff analysis[1], current assumptions include:

- Likelihood of a mandated CO_2 price by Sep 2009 is 4%
- Likelihood of a mandated CO_2 price by 2030 is 95%
- Average price by 2030 is just under $50/ton
- Highest price by 2030 is $100/ton

Assumptions regarding renewable resource financing incentives are still under development. The fundamental approach to developing the power plan must consider the impact of state renewable portfolio standards (RPS) and the least-cost approach to achieving various levels of power system carbon dioxide production. To accomplish this, a three-phase study approach is proposed:

- Least-cost plan given state RPS mandates
- Least-cost plan achieving similar CO_2 production (without the RPS)
- Multiple studies to assess the least-cost plans to achieving lower levels of CO_2 production

[1] See Michael Schilmoeller's November 2008 presentation to the Power Committee.

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

Outline

- Objective
- How CO_2 price affects the power plan
- Proposed CO_2 price assumptions (and a review of assumptions in the 5th plan)
- Supporting analysis (EcoSecurities report)
- Assumptions for Production Tax Credits and Renewable Energy Credits
- Physical Impacts of climate change
- Possible analyses for the 6th plan

Northwest Power and Conservation Council

Objectives

1. Provide background information to the Power Committee
2. Seek approval to move forward with proposed assumptions

CO_2 Price Effect on the Plan

- Is a major uncertainty and risk factor
- Affects many plan components:
  - Cost of resources
  - Electricity price estimates
  - Load estimates
  - Value of conservation

Needed for the Plan

- Central tendency CO_2 price for electricity price forecasts
- High and low range and probability distribution of CO_2 prices for the Portfolio Model
- Assumptions regarding renewable energy credits and tax credits

Northwest Power and Conservation Council

Proposed CO_2 Price Modeling

- Proposed for the Sixth Power Plan
  - Likelihood of seeing a penalty: 95%
  - Likelihood of penalty in Sept 2009: 4%
  - Max: 2006$ 100/ton
  - Average: 2006$ 47.72/ton CO_2 by 9/2029
- Fifth Power Plan Assumptions
  - Likelihood of seeing a penalty: 67%
  - Max before 9/2008: 2004$ 0/ton
  - Max before 9/2016 : 2004$ 15/ton
  - Max before 9/2023 : 2004$ 30/ton
  - Average 2004$ 7.85/ton CO_2 by 9/2023

Northwest Power and Conservation Council

EcoSecurities Report

- Independent assessment of potential future CO_2 price
- Summary includes:
  - Literature review
  - Carbon reduction supply curves
  - Discussion of sequestration options
  - High-level estimate of carbon cost for three general scenarios

Northwest Power and Conservation Council

Cases Assessed by EcoSecurities

- Case 1: WCI only, no national or global policies
- Case 2: National and international policies target emissions to 1990 levels by 2030
- Case 3: Aggressive national and global policies target CO_2 concentrations at 550 PPM by 2100

Northwest Power and Conservation Council

Carbon Reduction Targets

- Case 1: WCI
  - 15% below 2005 levels by 2020
  - 125 million tons reduction
- Case 2: National
  - 15% below 2005 levels by 2030
  - Estimated 2030 emissions 8.5 billion tons
  - 2.3 billion tons reduction
- Case 3: Global
  - Limit concentrations to 550 PPM
  - 30 billion tons reduction by 2100 globally from current emissions (40 billion tons)

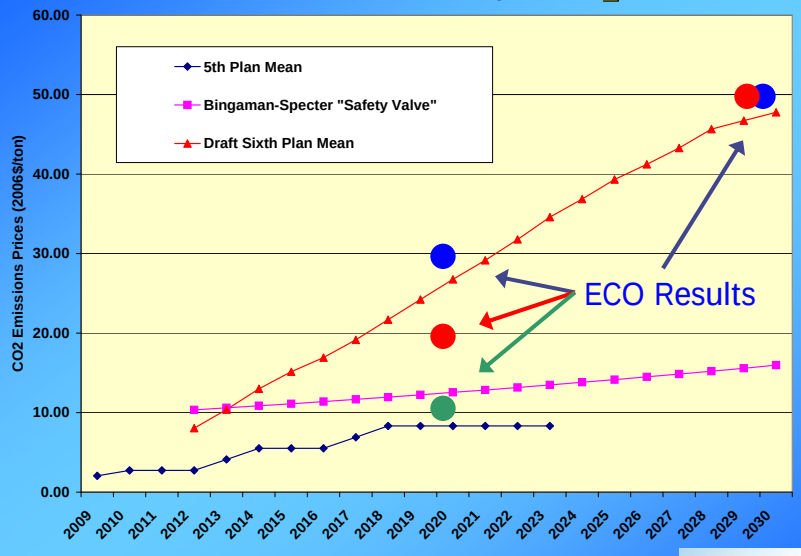
Northwest Power and Conservation Council

ECOSecurities Estimated CO_2 Prices

- Case 1: (WCI)
  - $10 to $20 per ton
- Case 2: (national)
  - $20 to $50 per ton
- Case 3: (global)
  - $30 in 2020 and $50 in 2030

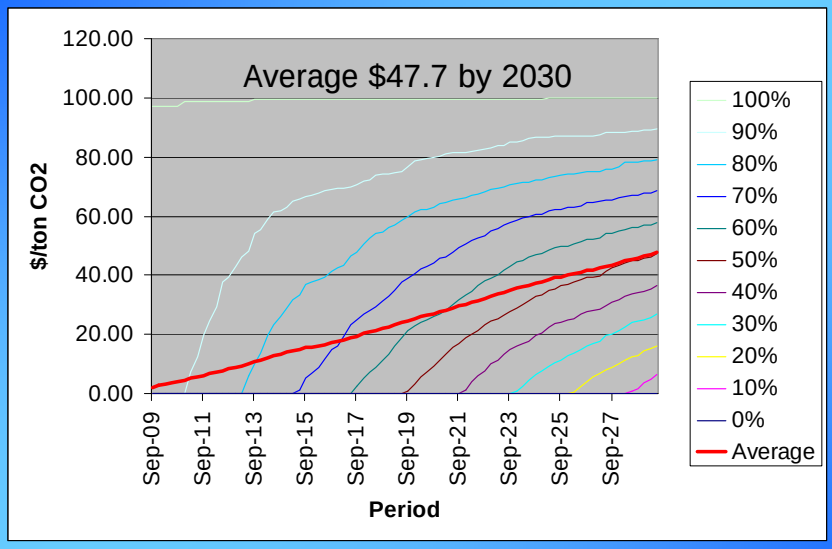
Northwest Power and Conservation Council

Central Tendency CO_2 Price



Northwest Power and Conservation Council

CO_2 Price Probabilities



Source: L804b illustrated.xls

Northwest Power and Conservation Council

5th Plan CO_2 Price Probabilities

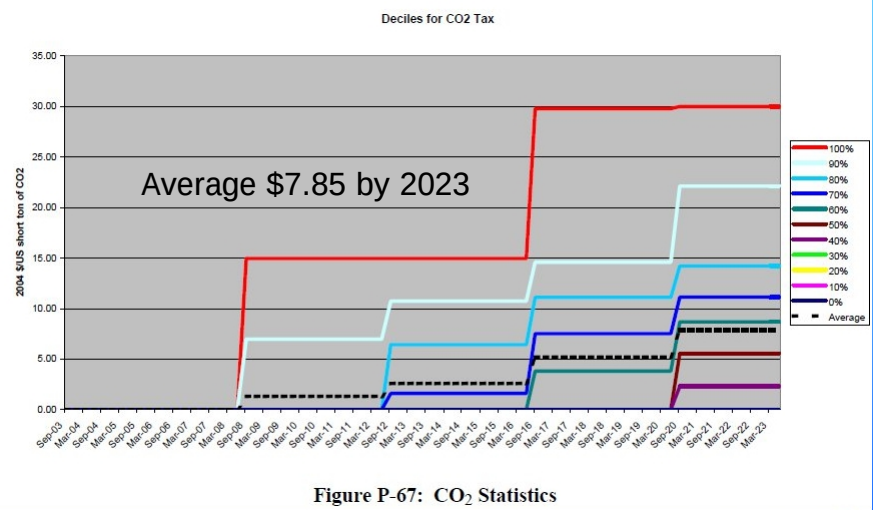


Figure P-67: CO_2 Statistics

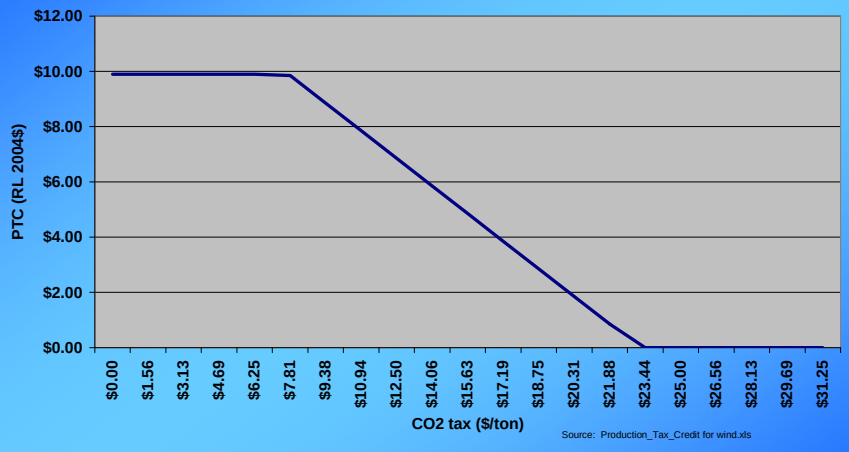
Northwest Power and Conservation Council

Tax Credits vs. CO_2 Price

- $9.90/MWh (2004$) with a CO_2 price of up to $7.81/ton
- $0.00/MWh when the CO_2 price is over $23.44/ton
- In terms of support for wind generation, the PTC corresponds to a $15.47/ton CO_2 price. If the CO_2 price that arises is less than half of this, the PTC remains in place; if the tax is 50% higher than this, it disappears entirely. Between these values, it declines dollar for dollar with the CO_2 price (see slide 15).

Northwest Power and Conservation Council

PTC vs. CO_2 Price



Northwest Power and Conservation Council

Renewable Energy Credits (Green Tags Value)

- REC values are decoupled from PTC because of world market
- Resources acquired by utilities to meet RPS have to retain their RECs
- REC value would therefore apply only to new, discretionary wind development, beyond that required for RPS requirements
- Staff still reviewing how to best treat RECs

Northwest Power and Conservation Council

Impact to Load Forecasting

- Average CO_2 price will be used to assess new electricity prices
- New load forecast is then developed using the new electricity prices
- Fuels prices are adjusted to see impact on all sectors including transportation
- Examine CO_2 production to see if desired reductions are achieved

Impact to Conservation

- Average CO_2 price will be used to assess new electricity prices
- New amount of cost-effective conservation is assessed using new electricity prices
- Can change generating resource dispatch order and/or amounts, likely reducing CO_2 production

Physical Impacts of Climate Change

- Use results from global climate models (Climate Impacts Group, UW)
  - Changes in long-term NW temperatures
  - Changes in NW river flows
  - (Data may not be available for draft plan)
- Staff analysis on cooling and heating degree day trends
- Assess changes to:
  - Electricity demand
  - Hydroelectric generation
  - Generating resource dispatch
  - CO_2 production

Northwest Power and Conservation Council

Issues for the Plan

- Do RPS mandates achieve carbon reduction targets?
- What portion of reduction targets should the electricity sector bear?
- What are costs of various methods to reduce carbon in the electricity sector?
- What is the least cost approach to carbon reduction in the electricity sector?

Northwest Power and Conservation Council

Possible 6th Plan Analyses

1. **Least-cost plan given state RPS mandates:** Use proposed CO_2 price forecast and probability distribution – assess resulting CO_2 emission total.
2. **Least-cost plan achieving similar CO_2 production:** Remove NW RPS, change CO_2 prices until CO_2 production approximates the total in Case 1 – compare cost.
3. **Least-cost path to achieve lower CO_2 production:** Run multiple cases with increasing CO_2 prices to identify the least-cost path for the NW power system to achieve lower levels of CO_2 production, if needed.

Northwest Power and Conservation Council