Northwest Power and Conservation Council

October 29, 2009

MEMORANDUM

TO: Power Committee

FROM: Terry Morlan

SUBJECT: Proposed Approach to a Carbon Constrained Scenario

In response to comments received on the draft Power Plan, the Power Committee asked staff to propose an approach to analyzing the least cost strategy to meet a specific carbon emission goal.

The attached paper is a revision of one sent to the Power Committee on Thursday, October 22nd. The only comments I have received from the Power Committee were from Tom Karier. I have included some changes in the proposal, mostly related to how the goal was chosen. In addition, I have corrected some numbers related to the contribution of conservation to carbon reductions.

The attached is intended for discussion by the Power Committee. Staff is seeking agreement to proceed along these lines or get direction for a change in approach if that is needed.

Attachment

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Addressing the Request for a Specific Carbon Emissions Limit Scenario - 10/27/09 Revised Proposal

Comments received on the draft Sixth Power Plan included requests from several sources that the Council look at a particular scenario that limits carbon emission to some representative level and looks at what actions would meet that emissions target at lowest cost and describes how the region would meet such a target.[1] This paper describes a proposed approach to addressing this request.

This is not a straightforward calculation that can be addressed by simply running another scenario. The Council's planning models are not designed to minimize the cost of meeting a specific carbon emission target; they are designed to minimize future cost and risk of the regional power system. The models do however provide information on the carbon emissions of the power system. The draft Power Plan included discussion of the carbon emissions of several scenarios.

The Council's planning model could be used to address this request more directly, but it would require substantial modifications to the model that involve perhaps more time and risk than is desirable at this time. Staff believes that there is already significant information in the Plan on different strategies for achieving carbon reductions and their effects. We propose using the available results combined with some additional analysis to address this issue.

We propose an approach that includes the following steps:

- Developing a specific carbon reduction goal that is generally consistent with the current goals of the proposed federal legislation, WCI, and state goals in the region;
- Describe the role of conservation and RPS in reducing future carbon emissions;
- Describe how the scenarios in the plan compare to the hypothetical goal;
- Develop additional scenarios that are expected to meet the goals and discuss the certainty with which the goals would be met; examine the costs associated with different approaches to achieving the goal, and recognize that the costs will not be borne equally among the region's utilities and their customers.

These steps are discussed below in terms of our current thinking.

A hypothetical target:

There are currently a variety of targets for CO2 reduction. Proposed federal legislation, WCI, Oregon, and Washington have targets expressed as reductions from various historical years by specific points in the future. The details of these targets are vague at this point; policies and procedures to achieve the goals are still under development. The general levels of carbon reduction goals in these various policies are actually quite similar. Long-term reductions by 2050 are all similar and generally consistent with IPCC calculations of reductions necessary to limit global warming by achieving specific levels of greenhouse gas in the atmosphere.

[1] See comments from PNUCC and some of their utility members, Steve Weiss, Angus Duncan and Hugh Peach.

The table below shows carbon reduction goals as stated in various policies and the carbon emissions levels implied for the Northwest power system at various points in the future assuming the power system would be required to reduce its emissions in proportion to its share of the total carbon emissions from all sectors of the economy. All of these policies state goals for 2020 and 2050. We have interpolated to estimate 2030 emissions goals. The average of the 2030 goals is to achieve emissions of 34 million tons of CO2 per year (MMtpy). 34 MMtpy compares to 57 MMtpy in 2005, or 44 MMtpy in 1990. On average the goal of 34 MMtpy represents a 40% reduction from 2005 levels.

Carbon Targets	2020 Mmtpy	2030 Interpolated	2035		2050 Mmtpy
OR 10% below 1990 by 2020	40	31		75% less than 2005 by 2050	14.3
WA at 1990 by 2020	44	37	33	50% less than 1990 by 2050	22.0
WCI 15% below 2005 by 2020	48	36		80% less than 2005 by 2050	11.4
Waxman/Markey 17% below covered	47	33			10.0
Average	45	34		Average	14.4

40%<2005
23%<1990

The staff's recommendation is that a 35 MMtpy goals in a reasonable approximation of likely carbon emission reduction requirements to meet evolving policy goals.

Role of conservation and existing policies in reducing emissions

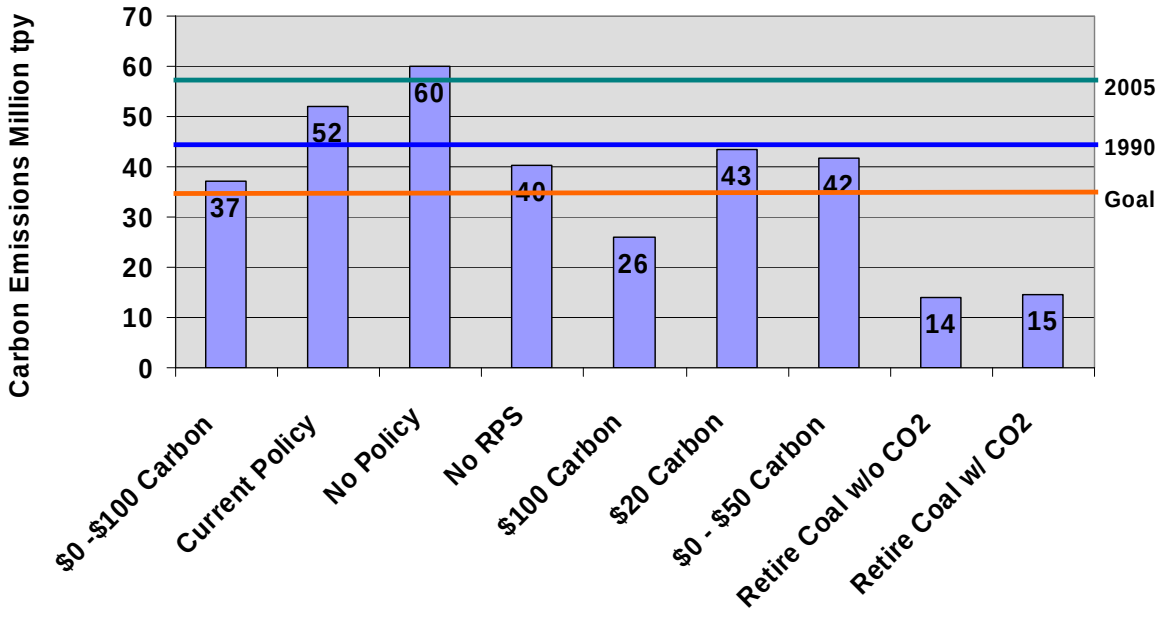
Staff will use existing scenarios, some of which were not discussed in the draft plan, to examine how the conservation and renewables in the plan contribute to reduced emissions. For example, we ran the $0 to $100 carbon price risk case with no conservation. The conservation in the $0 to $100 dollar case reduced carbon emissions by 17 MMtpy compared to the run without conservation. Further, the conservation reduced system costs by $35 billion. All of the other approaches to reducing carbon increase the power system costs. We could develop a similar calculation for the RPS resources in the $0 to $100 carbon risk case. The "No RPS" scenario in the draft plan increased carbon emissions by 3.2 MMtpy compared to the $0 to $100 carbon risk scenario that included RPS, and eliminating the RPS reduced costs by $5.8 billion.

Results of draft Plan scenarios compared to target:

Given current policies, the improved efficiency and renewables in the draft plan reduce future carbon emissions below 2005 levels; from 57 million tons per year in 2005 (normal hydro) to 52. Thus RPS, improved efficiency, and a ban on new coal plants arrest carbon emissions growth and reduce them from 2005 levels.

Additional policies to reduce carbon further are explored in the draft plan including, carbon pricing risk of varying amounts, fixed carbon taxes, and existing coal plant retirement. In general, scenarios where carbon prices reach near $50 per ton during the planning period reduce emissions to significantly below 1990 levels. Scenarios that price carbon at levels in the $20 to $30 dollar range reduce emissions to slightly below 1990 levels by 2030. The coal retirement cases have a dramatic effect on emissions as would be expected reducing emissions to about one

third of the 1990 level by 2030. These reductions are nearing the 2050 goals expressed by the WCI and IPCC. The figure below illustrates the carbon levels in the various draft plan scenarios relative to the hypothetical carbon goal and the emissions levels of 2005 and 1990.



In thinking about the emissions reductions forecast by the Council's planning model however, it is important to understand a very important factor. The numbers reported for CO2 emissions in the draft plan are averages over the 750 futures each resource plan is subjected to. The levels of emissions do vary substantially from future to future depending on CO2 prices, demand and supply conditions, and hydroelectric conditions. For example, in the $0 to $100 carbon risk scenario, the 2030 average carbon emissions are 37 million tons per year, nearly meeting the hypothetical goal. However, that could be interpreted as there being a 50 percent chance that emissions will not exceed that level, or alternatively that there is a 50 percent chance they will exceed that level.

At the same time, it is likely that the RPM results overstate the variance of emissions from a carbon pricing strategy, especially a cap and trade system. One reason is that coal plants are assumed to be operated on the margin in these cases and the long-term feasibility of such operations is questionable. There is some likelihood that the plants would voluntarily be retired for financial reasons in such cases. Further, in a cap and trade system, the emissions cap would be constraining, which we have not modeled in the analysis. When emissions increase above the cap permit prices would rise instead of staying at one level as assumed in the analysis, and emissions would be restrained from exceeding the cap. The actual emissions in the region could be somewhat more or less depending on allowance trading between the PNW and the rest of the US or world.

The certainty of meeting specific emission levels will vary among the scenarios. It is likely that the fixed carbon price scenario will have a greater confidence in reducing carbon emissions than the carbon price risk scenario. The coal plant retirement scenario would provide much greater

certainty of reductions. Regardless of approach, reduced use of coal plants is required if emissions targets are to be met. Retiring some existing coal plants provides a more certain carbon reduction.

Comparing the draft plan scenarios' average carbon emissions to the 35 MMtpy goal we find that this target is very nearly met, on average, in the $0 to $100 carbon risk scenario and is exceeded in the fixed $100 carbon price scenario and the coal retirement scenarios. However, recall that these emissions are averages and in the pricing scenarios there remains significant risk of not achieving these goals.

Additional Scenarios

Because retiring all existing coal plants between now and 2020 significantly exceeds the 35 MMtpy target by 2030, a more gradual retirement schedule would allow the region to meet the 2030 target. If coal retirement is considered an alternative to carbon pricing for power generation, about 40 percent of the region's coal-fired energy would need to be curtailed to meet the proposed reduction targets by 2030. This could be accomplished by retiring specific plants or by placing limits on the operation of coal plants. We propose to run a scenario that will retire enough coal plants to meet the 35 MMtpy goal. (We also propose to include nuclear, IGCC with carbon sequestration, Montana wind, and some other additional renewables as potential resource choices for the model.) This scenario will give us a basis to compare costs with other approaches that meet the goal, at least on an expected value basis.

The $0 to $100 carbon risk case nearly meets the goal on an expected emissions basis. We propose developing a fixed carbon price case that would meet the goal. We currently have either a $100 carbon price or a $20 carbon price. Something on the order of $40 to $50 carbon pricing is likely to be required to meet the goal on average.

This will give us three scenarios that achieve the hypothetical goal. We will describe the reliability of reductions, the costs, and the actions that the region will have to take to achieve the goals. We will also discuss how the costs of these actions may be distributed among different regional utilities. For example, maybe half of the region's utilities are partially dependent on coal-fired generation. Carbon reductions will affect these utilities far more than others. As an example, suppose that retiring coal plants was expected to increase regional power costs by 50 percent. If that increase fell entirely on half of the region, their costs would increase by a much larger percent, perhaps double. It will be important to recognize such diverse effects in our discussion, while not shying away from the regional analysis.

It would be our intent to discuss the coal retirement scenario in fairly generic terms, not reporting specific plants retired. However, there are some important considerations for specific plants that should be discussed somehow. For example, if a plant in the I-5 corridor were retired, transmission reinforcement would likely be required to replace the role of the plant in supporting the west-side transmission system. Alternatively, retiring a Montana coal plant could free up transmission to move Montana wind into the region, providing additional renewable energy and diversifying the wind resources serving the region. Such considerations are certainly relevant to policy decisions and we need to point them out for consideration.

Carbon Target Analysis

Power Committee Meeting

November 12, 2009

Goal: Illustrate How Region Could Meet a Specific Carbon Reduction Target

- Comments on the draft Power Plan requested an analysis of how a specific carbon reduction target could be met a lowest cost
- What would the region have to do to meet such a target?

Selecting a Specific Target

- A representative level for 2030 carbon emissions.

		2020	2030	2035	2050
OR	1990 minus 10% by 2020, -75% from 2005 by 2050	40	31		14
WA	1990 level by 2020, 50% below 1990 by 2050	44	37	33	22
WCI	2005 minus 15% by 2020 80% below 2005 by 2050	48	36		11
W-M	2005 minus 17% by 2020 80% below 2005 by 2050	47	33		11

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Appreciating the Draft Plan

- Did the draft plan already answer this ???
- $0 to $100 scenario reduced carbon emissions to 37 MMtpy at minimum cost and risk.
  - How did we do it?
    - Aggressive conservation
    - Meet RPS requirements
    - Reduce coal use
    - Increase natural gas use

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Proposal for Refining the Analysis

- $0 to $100 carbon risk case again
- Retire enough coal to meet target
- Calculate a fixed carbon tax that will meet target

- Analyze costs of each and compare actions taken to reduce carbon

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Complications

- Not quite straightforward
- A national cap and trade system will not impose restrictions or targets on states or regions, only on covered emitters
- Emissions will vary regardless of approach
  - Varying use of offsets
  - Varying hydro conditions
  - Varying supply and demand situations

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