LC 47 CERTIFICATE OF SERVICE

I hereby certify that I served the foregoing **Reply Comments of the NW Energy Coalition on PacifiCorp's IRP (LC 47)** on the following persons appearing on the attached service list on January 7, 2010 by e-mailing (if paper service has been waived), or mailing, to each a copy thereof, and if mailed, contained in a sealed envelope, with postage paid, addressed to said person at the last known address of each shown below and deposited in the post office on said day at Salem, Oregon.

DATED this 7th day of January, 2010.

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for a clean and affordable energy future

Reply Comments of the NW Energy Coalition on LC 47: PacifiCorp's 2008 Integrated Resource Plan

January 7, 2010 – Steven Weiss

The NW Energy Coalition (NWEC or "Coalition") appreciates this opportunity to reply to staff's final comments (12/8) and the company's response to Oregon Party comments on PacifiCorp's 2008 Integrated Resource Plan ("IRP" or "Plan").

Both the Staff's final comments and PacifiCorp's response should lead to some minor improvements in the Plan that are all well and good. In "normal" times the Coalition would be actively involved in the back and forth and suggest our own minor tweaks. But these are not normal times, and we urge the Commission to recognize that fact by demanding a Plan based on current climate reality.

"We start with the most conservative of ideas, that you might want to preserve a planet like the one you were born onto."[1]

We all know that a plan that nibbles around the central fact that PacifiCorp's 26(!) existing coal fired plants (Table 5.7) should continue to spew the vast amounts of global warming pollution into our overburdened atmosphere that they do today for the next 20 years in the face of catastrophic climate risk is essentially irrelevant to the times.

We would hope that the Commission, staff and all the others involved in this exercise at least recognize the absurdity of arguing about the timing of building a couple of more gas plants, or about rate differences of less than one mill/kWhr (Table 8.10), in face of the basic facts about what continued business-as-usual PacifiCorp operations mean for our planet.

We need a Plan that recognizes that carbon matters

Using table 5.2 for the company's loads and approximate numbers for carbon dioxide intensity for the preferred portfolio from Figure 8.27, one can estimate the actual CO2 output of this Plan. By 2018 emissions will have increased about 2% from 2009 levels (going from about 48 to 49 million tons/year *assuming a currently nonexistent* $45/ton CO2 tax starting in 2013—and without such a policy we can be sure emissions

[1] Bill McKibben blog 12/22/09 -- *Copenhagen: Things Fall Apart and an Uncertain Future Looms.*

will be much higher. By 2028, even assuming this tax, emissions will be reduced by only 7.7%, down to "only" 44 million tons/year.

This is a plan for planet disaster. By no stretch of the word can it be called prudent, given the risk we face.

Clearly the elephant in the room is climate change. It is difficult to talk about this issue in the usual boundaries of an IRP, because the risks of climate change are so severe that our traditional treatment of risk is completely inadequate. Because each utility is so small in the scheme of things, it cannot measurably affect global climate change much. Thus the only "rational" planning response is to *position* the utility *in case* someone enacts a climate policy, which has been traditionally modeled as a tax per ton. This is fundamentally a reactive policy whereby everyone waits for someone else to "go first." Ultimately this perspective leads to a serious delay or even failure to actually reduce emissions. It is a perfect Tragedy of the Commons.

Instead, we urge Oregon to take more of a leadership role to get this process moving. This does not require, we believe, that PacifiCorp's ratepayers bear a large cost to do so. For all the flaws in this IRP—detailed below—it provides us with one hugely useful lesson: the many portfolios tested in the IRP turn out to have almost negligible—often statistically insignificant—cost differences. But the portfolios also produce very large CO2 emission differences. This allows the utility and Commission to choose a preferred portfolio based more upon recognizing the elephant, but at a reasonable, even minimal, cost impact to ratepayers.

What would a prudent plan look like that took climate change seriously? We can get little help from this IRP, because PacifiCorp doesn't ask the question: What's the least-cost, least risk (for the planet) plan? No proposed portfolio results in serious CO2 reductions—perhaps because that can only occur if those 26 coal plants are ramped down—even retired—soon. The closest thing to such a plan, the System-Wide Hard Cap (case #40) was quickly eliminated and subject to little analysis. Of the other plans analyzed, cases 24 through 29 which were optimized based on a $100/ton CO2 price only reduce emissions about 15-20% below the preferred plan (Table 8.25 and Figure 8.23), depending upon the assumed CO2 tax level. (Probably the Hard Cap portfolio, #40, would also produce roughly the same amount of CO2—see Table 8.5.) Obviously, *deep* emissions cuts were never on the table.

So we have no idea whether a plan to cut emissions deeply would cost Pacific's ratepayers a trivial amount, or subject them to serious pain. However, we are not without resources to give us some approximate numbers. The NW Power and Conservation Council estimated in its Draft 6th Plan that to *close all of the coal plants serving the region by 2020* would actually be fairly affordable. Tables P-3 and P-4 of the Draft Plan estimate a levelized bill impact to residential consumers of about the price of a latté, or $3.25 per month.

The Council's modeling of the coal-retirement option was relatively simplistic (the final 6th Plan will provide many more details) but is still quite instructive. The Council hardwired a phased shutdown of all the coal plants serving the region by 2020 and allowed its model to redispatch existing resources and build new resources in response.

So what results did the Council find from this radical proposal? Did the grid collapse from widespread outages? Did costs skyrocket (we already answered that above)? Did the region have to go on a gas-turbine building binge? And, did CO2 pollution actually go down significantly regardless of whether Congress passed a carbon tax?

The questions answered:

> (a) No, there were no widespread outages, as the model is designed to build resources to meet capacity needs, just as PacifiCorp's model does.
>
> (b) No, cost increases were quite small—especially given the benefits (see (d). Compared to the Council's preferred plan which allows coal plants to run, bills would rise about $3.25/month for residential households if the CO2 tax revenues assumed were not returned to customers; and, $5.24/month if tax revenues were returned 100% to customers. We understand that this estimate will actually be lowered in the Council's final draft once the new lower long-term gas price forecast is incorporated.
>
> (c) No, the region is expected to be quite surplus in the next couple of decades, due to the aggressive energy efficiency identified in the Plan and state RPS requirements, so the main result was that existing gas-fired resources are dispatched more often. This surplus is confirmed by Table 8.3 of PacifiCorp's IRP that shows no portfolio tested has average utilization factors for the company's gas units greater than 55%, and many were below 20%. The Council's analysis showed that the region has so much excess gas-fired generating resources available that the region would only need to build a few extra gas plants—1,032 MWs of combined cycle turbines and 252 MWs of single-cycle turbines[2]—and even those new ones would not have to run full out, except during droughts or very hot or cold weather.
>
> (d) Yes, this was the *only* option that showed marked CO2 pollution reductions *regardless of Congressional climate policy*. This strategy reduced emissions <u>80%</u> from 2005 levels by 2030.

As Rachel Shimshak of RNP might say, "What's not to like?" That's the debate we should be having in this docket. Perhaps the Council's modeling has flaws, or its results are not very comparable for PacifiCorp's particular situation. Perhaps a more sophisticated scheduling of coal plant phase-out would be more cost-effective. Perhaps customers would not be willing to pay $3-5 more each month in order to reduce their electricity footprint 80%.

But unfortunately, we are instead engaged in a debate over the trivial details of a plan which, at best—assuming a significant CO2 tax imposed by 2013—stabilizes emissions at today's planet-damaging levels. In the next section we investigate why this debate is so limited.

[2] Results from "Spinner Graphs" downloaded from Council's dropbox.

The Fallacy of Precision, or, Making Mountains of Molehills

When I taught physics, I used to tell my students, "Just because a calculator has a lot of decimal points doesn't mean they are real." The precision of a result can only be as good as the precision and consistency of the factors used to compute it.[3] Any calculation that uses inputs with very uncertain expected values and large stochastic variations—gas price forecasts, load growth forecasts, power prices, hydro and new resource availability—cannot be expected to be much more precise than those inputs.

To illustrate where this fallacy leads the IRP, one can look to the two most heavily weighted scoring measures, both of which reflect the average impact on customers' wallets, of the various portfolios: Risk-adjusted PVRR and Customer Rate Impact, which are given weights of 45% and 20%, respectively.[4]

The margin of error of the PVRR metric can be determined from the standard deviation (SD) of the 100 stochastic observations according to the formula for the standard deviation of the mean = SD/[square root of the number of observations used to calculate the mean]. The standard deviations for the cases are given in Table B.9 and B.2 for the various CO2 tax levels. While they range from something like $7-15 million, for illustrative purposes we can use $10 billion as a typical value. Since the PVRR was computed using 100 stochastic observations, we can conclude that the SD of each PVRR is about $1 billion.

For statistical significance, one usually asks for a result with a 95% confidence interval, that is, we want to know the range of PVRRs in which there is a 95% probability that the actual PVRR is within that range. To produce a 95% confidence interval, we use ± 2 SD of the mean. Therefore, for a typical PVRR (from Table 8.6) of around $40 billion, we are only safely able to report the result as $40 billion ± $2 billion.

A quick look at Table 8.6 shows that most of the average PVRRs—which are later used with a false precision of two decimal places as the basis for scoring the portfolios—are close to, or within that range. For example, the difference between the highest ranking portfolio and the 14th ranked portfolio is only about $2 billion.

How big a difference between two PVRRs would be statistically significant? To answer this question, one uses the statistical formula for comparing the difference between two means when their SDs are known. $SD_{(mean1 - mean2)}$ = square root $[SD_1^2 + SD_2^2]$. Again, for illustrative purposes we assume SD_1 and SD_2 equal $1 billion each. Therefore, the standard deviation of the difference between two PVRRs is roughly $1.4 billion. Using a confidence interval of 95%, or two standard deviations, gives the result that unless two PVRRs are separated by at least $2.8 billion, we cannot have much confidence that the difference is real, rather than just an illusion of accuracy that cannot be justified.

But even this ± $2.8 billion error band is too precise, for two reasons. First, the calculation is based on using 100 "observations" that are each considered accurate given the stochastic

[3] Error analysis, of course, is much more sophisticated than this, but this "rule" isn't a bad place to start.
[4] Risk-adjusted PVRR is not completely a cost metric, because it counts the highest 5% of the PVRR runs twice, but comparing this metric, Table 8.9, with Table 8.6, the PVRR scores that do not add the extra 5% in twice, shows there is little difference. The two metrics are almost exactly correlated with r = .996.

draws. However, the stochastic draws are actually based on forecasts, not real observations. This would make little difference if one knew that the forecast errors were all symmetrical around "true" values, but there is no way to know this. More likely, the forecasts of one or more of the inputs (gas prices, load growth, etc.) are skewed and thus the stochastic draws are not symmetrical about the true future value. Second, several important factors that have great uncertainty were not included in the stochastic tests. These include uncertainty in capital costs, and the pace of technological development. This fact makes it likely that the margin of error is larger than the ± $2.8 billion. However, using that more conservative test, we find that the first 16 ranked portfolios in Table 8.6 are all within this margin of error, meaning their "ranking" is completely unjustifiable and should not be used for scoring purposes.

It is not necessary to rely upon statistical analysis to illustrate the fallacy of precision in this IRP. The Customer Rate Impact metric is an intuitive and straightforward estimate of what the different portfolios would be expected to cost customers. Although the preceding statistical analysis could be done on the customer rate metric, most people can get the feel for what is a meaningful difference between two portfolios' costs by seeing how it would affect their bills. PVRR does not translate directly into customer costs due to the fact that it does not include the fixed costs of the current system—PVRR only includes a fraction of the costs that customers actually pay. Thus PVRR differences of 6 or 7 percent seem larger than they really are, from a customer perspective.

That said, it is important to note that it is the difference in PVRR that causes the difference in customers' rates. The two metrics really measure the same thing! In fact, the two cost measures, Risk Adjusted PVRR and Rate Impact, have an almost exactly 1 to 1 correlation of r = .965 (r=1 is perfect correlation).[5] The sum of two metrics that have high correlations contains no information than either metric alone provides. (See Attachment A for some simple examples.) Because the large amount of fixed costs included in customers rates are not in the PVRR, it *appears* that the different portfolios' PVRRs have significant differences, and thus can safely be used to score the portfolios. But that is not actually the case.

Looking at the PVRR results in Table 8.6, for example, it looks like the scores for case 5, the preferred portfolio (although slightly modified in subsequent analysis to become 5B_CCCT_WET), and case 27, one of the poorest scoring portfolios—but the one with the lowest average CO2 emissions—have large differences in costs ($3.5 billion, or 7%). But, the actual cost difference between Case 5 and 27 results in a rate difference of only about 1 mill/kWhr (Table 8.10), or roughly a 1.4% difference based on a retail rate of 7 cents per kWhr, abut $1 per month for the average Oregon residential customer. Does that small difference warrant a portfolio that emits 20% more CO2?

How much are the very small differences in PVRRs and rates between Case 5 and 27 used in Pacific's scoring system? Together these two cost metrics (Rate-adjusted PVRR and Customer Rate Impact) are weighted 65%. As explained above, the difference between the two cases amounts to about 1.4%, or 1 mill/kWhr. (It is also interesting to note the response to NWEC's DR 2 that asked for the rate impact of the Hard Cap portfolio #40.

[5] The reason the correlation is not exactly 1 is that the Risk-adjusted PVRR metric is not just PVRR, which does correlate exactly with rates. Instead, it also has a small amount of a risk metric added in.

The answer was $6.60, or only about *one-half mill*/kWhr more than Case #5. As noted earlier, #40 also produced fairly low CO2 emissions comparable to #27.)

Unfortunately, the tiny difference in rate impact is accompanied by emissions differences of over 150 million tons of CO2 emissions, or about 20% of the total emitted between 2009 and 2028 (Table 8.25). An overly-precise rate increase estimate of about 1 mill/kWhr (or even half that in the case of portfolio #40) should not be used for 65% of the scoring influence in the Plan…or to justify adding 20% more CO2 emissions to the atmosphere.

Metrics designed to fail

Besides giving an inordinate weight in the scoring system to overly-precise and statistically insignificant differences in costs, the other metrics used in PacifiCorp's scoring system also have serious methodological errors.

- **Risk-adjusted PVRR** – In addition to the major problem with this metric discussed above—the differences in PVRRs are rarely statistically significant—there is a secondary problem. This metric is the sum of a cost metric, PVRR, and a risk metric, the expected value of the 95th percentile of the PVRR. However, in general, cost and risk tend to be inversely related. Generally speaking, portfolios with a higher cost have a lower risk compared to lower cost plans that have higher risks. This assumption can be tested by calculating the correlation between the Risk-adjusted PVRR score to the sum of the three non-CO2 risk measures (Production Cost Standard Deviation, Ave. Annual Energy not served, and LOLP; the CO2 risk measure is discussed separately below) from Table 8.28. Doing so gives a strong negative correlation of r = -.74.

  Any metric that sums two highly correlated metrics (even if that correlation is negative) will provide little new information or discrimination in scoring. (See Attachment A for some simple examples.) This is one reason why the Council never makes this error. It treats risk and cost as separate factors and does not try to choose between high and low cost (and thus low and high risk) plans by adding cost and risk together. Instead the trade-off between cost and risk must be a subjective one, not a decision to be made in a scoring matrix.[6]

  Since PacifiCorp's risk metrics are highly correlated with its cost metrics (which are extremely highly correlated to each other), summing their scores provides little additional information. So, while the plethora of graphs and tables looks impressive, we are basically relying on one cost metric to make all the decisions.

[6] A simple example is that of fire insurance. On an *expected value*, there is no real cost difference between insuring or not insuring one's house against fire. In addition, the cost of the insurance is highly correlated to the expected value of the damage to ones house over time. Imagine two plans. Plan A is to not purchase insurance and absorb the loss. Plan B is to purchase insurance and have no loss if there is a fire. If we add the cost of insurance plus the expected cost of the fire loss together, then Plan A has an equal score with Plan B, proving that this "scoring system" has no utility to a homeowner. But saying this does not help much for deciding how much insurance to buy. Instead the homeowner must develop another criterion to use to determine a risk/cost tradeoff value that he or she can feel comfortable with.

And since the different portfolios score so closely on that metric as to not be significantly different, we are left with no decision-criterion at all.

But risk *is* an important factor of concern. Just because summing risk and cost metrics together is unproductive should not mean that the risk/cost trade-off is not important. Unfortunately, PacifiCorp does not discuss this trade-off nor propose a fair value for the trade-off: i.e., whether it's worth X dollars to secure Y reduction in risk. Instead, by adding the risk and cost scores, we lose this discussion that is very important to customers.

- Including transfer payments as a cost -- Another problem with the Company's use of PVRR is that it counts carbon taxes as a cost to customers, when such a tax is more likely to be a price signal. Except for the actual cost of redispatch and any cost differences between resources built with and without a carbon tax, much of the cost of the tax is a transfer payment not a cost. Because of this, the costs under CO2 tax assumptions are exaggerated. It would be helpful to know what it really costs to reduce emissions through changes in resource types and in dispatch, even in a future without a carbon tax. In future IRPs, Pacific should subtract out all transfer payments in its analysis—or provide two sets of numbers, as the Council does in its 6th Plan.

- CO2 Cost Exposure – If PacifiCorp had proposed to use a metric that rewarded increases in CO2 emissions—that is, the higher the emissions, the better the score—there undoubtedly would have been protests from the parties in this proceeding. We believe that the Commission would be quite skeptical about the value of such a metric. In fact, several parties have urged that the IRP should include a direct measure of emissions that would *penalize* high-emissions portfolios, not score them highly. PacifiCorp's Response to Oregon Party Comments (p. 12) even notes that this recommendation "has merit," though the Company would defer that discussion for the next IRP.

  So, what is shocking about the CO2 Cost Exposure metric that Pacific uses for 15% of its scoring is that it is basically a measure of CO2 emissions that gives better scores proportionate to the emissions of each portfolio!

  This can easily be seen by calculating the correlation between each portfolio's emissions (Table 8.25) with its "CO2 Cost Exposure" score in Table 8.28. Doing so produces a coefficient of correlation r = -.76. What this means is that the higher the emissions, the better the score (better scores are low scores in the scoring system, so that is why r is negative). r^2 is actually a more intuitive measure of the relation between two sets of data, because it is a measure of the strength of the correlation. r^2 can be interpreted as how much of the variation in one variable can be used to predict the other. In this case, $r^2 = .59$. In other words, 59% of the score for the CO2 Cost Exposure metric can be determined by the amount of emissions each portfolio produces. Basically, the CO2 Cost Exposure metric is mostly a measure of emissions, with *the higher the emissions, the better the score.*

PacifiCorp's CO2 Cost Exposure metric has a number of other problems, chief of which is the implicit assumption that the "risk" of customers facing a carbon tax fairly reflects the risks that Oregonians' future generations may suffer under the impacts of global warming—and that that risk is roughly comparable to the risk that the utility will invest in emission reduction measures but end up with no carbon tax. We believe this assumption is fundamentally flawed. These two risks are not symmetrical.[7]

The risk of not taking action to control greenhouse emissions is not simply that someone will impose a tax on the utility. It is also the risk to society of suffering the environmental damage that will result. This risk is not symmetrically equal to the risk that PacifiCorp will over-invest in energy efficiency and renewables, or not emit an unlimited amount of CO2 into the atmosphere when it could have done so without "penalty."

Therefore a metric that simply equates the "cost" under different carbon tax scenarios of over-emitting or under-emitting "optimum" amounts cannot under any sense of the word be used to measure the risk of CO2 emissions exposure of the utility. Without a direct measure of CO2 emissions being used in the scoring, we end up with the absurd result that the plan that emits the least emissions, Case 27, has one of the worst CO2 Cost Exposure scores of all portfolios tested! A metric that produces better scores for higher emissions should not be used.

- LOLP and Average Energy Not Served – These two measures supposedly assess reliability, but really assess the utility's exposure to the market during low water years and severe weather. It is interesting to note that in PGE's IRP, Figure 11-23, p. 283, this type of metric can be reduced significantly by simply adding a small amount of incremental capacity. This is also the case for PacifiCorp, as is demonstrated by comparing portfolios with 12% and 15% planning margins. In every case, a small increase in PVRR causes a reduced LOLP and ENS. It should not be surprising that we find that cost and risk are inversely related.

  Our problem with PacifiCorp's scoring is that they have added LOLP and Energy Not Served scores into their general scoring matrix. This is problematic for several reasons. First, as explained above in the bullet discussing the Risk-adjusted PVRR in this section, adding measures of risks to measures of cost, when they are highly correlated, provides little additional information.

  Second, these reliability metrics are pretty much a function of the planning reserve margin. Therefore there should be a separate, independent determination of how much to invest in additional reserves in return for increased reliability, that determination can be made regardless of which portfolio is chosen. Thus these two measures should not be used to score the portfolios themselves.

[7] See Table 8.29 in which Pacific symmetrically scores low and high CO2 taxes. Note also, that this table stops at $70/ton, not the $100/ton used in Table 8.11. Stopping at $70/ton arbitrarily penalizes the portfolios that were optimized for $100/ton futures. Those portfolios must "compete" with portfolios optimized for $45/ton, but never subjected to the future for which they score best. This treatment is biased against portfolios that do well under the highest carbon cost futures.

A different planning paradigm

It is evident from the above discussion that PacifiCorp's scoring system is faulty, if not meaningless. It is certainly easy to criticize the IRP (and we should note that PGE's has many of the same problems), but what is a better alternative? To design such an alternative, we start by listing the basic flaws of the IRP. The fundamental problem is that the metrics calculated for the portfolios tested have values so close together—way within the margin of error considering the uncertainty in the inputs—that it is not useful to make any meaningful comparisons between them. This is due to three factors:

1. The tested portfolios aren't very different—they represent merely nibbles around the edges of the possibilities, because the existing generation fleet and a portion of all of the other portfolios are the same for every case (see, for example, the footnote on p. 181 that states, "All portfolios include 1,520 MW of firm planned resources….") Another reason for their cost similarity is that the two major resource choices examined, wind and gas, have nearly equal levelized costs. Most of the actual cost differences between the plans come from how the resources are dispatched, and that is determined mainly by the CO2 price assumed, not by the choice of resources built. In fact, the rate impact between the best and worst portfolios is on the order of about 1 mill/kWhr (Table 8.10) for any CO2 tax level, but about 4 mills/kWhr *between* CO2 tax levels. In general, most differences in the metrics used to choose between portfolios are not even statistically significant.

2. The scores are the result of *summing* cost and risk. Since cost and risk are generally correlated (negatively), summing them provides little additional information. Meanwhile, this treatment means we never have the cost/risk trade-off discussion that is important to customers.

3. The only real major difference between the portfolios—their emissions level—is given no weight in the scoring, even though emissions are without doubt the most important factor to consider, especially given how trivial the other differences are. In fact, the scoring system penalizes portfolios with lower emissions.

What is needed is a plan that responds to those three factors. First, it needs to test portfolios that have real differences in outcomes. Second, someone needs to make a subjective decision regarding the trade-off between cost and risk—or else use a meaningful risk metric (such as CO2 emissions) that shows wide differences at little additional cost. Third, the only factor in the analysis done so far that can really be used to choose between otherwise similar-cost portfolios must be CO2 emissions, because the differences resulting from all the other metrics have little or no statistical significance. (And it should go without saying, that higher emissions should get worse scores, unlike PacifiCorp's methodology which rewards dirtier portfolios.)

We suggest a possible paradigm based on the negotiations over SB 838, the state's Renewable Energy Standard (RES). In those negotiations it was clear that everyone's *aspirational* goal was for very high amounts of renewables to be developed. But when it came down to the real negotiation, it was based on what level of rate impact would be acceptable to ratepayers in achieving that goal. Eventually it was agreed that by 2025, the

state should attempt to meet a very high aspirational goal of 25% renewables, but that was to be constrained by a cost cap of 4%.

Similarly, we would suggest for this IRP that we all agree on a high aspirational goal of reducing our CO2 emissions as much as possible, so long as it doesn't cost ratepayers too much. We can disagree on what "too much" means, but that is a valuable discussion. That is because it is presently impossible to really quantify a risk/cost tradeoff value, since we do not yet have a handle on how damaging global warming will be to the planet. PacifiCorp's analysis also confounds real costs (new resource choices and dispatch choices) of reducing emissions with transfer payments. Finally, we cannot know the value of early reductions, both to the environment, but also as a spur to political action that could increase how fast reductions are made by others. After all, if Oregon could show that it could make deep emissions reductions for very small rate impact, the idea might catch on.

The IRP analysis exercise would then be to come up with portfolios that would produce maximum levels of CO2 reduction for a given rate impact. That is, how much reduction can we get for a 1% increase, a 2% increase, etc., and what would the portfolios look like that would get us there, including changes in dispatch. In essence, the exercise would be to develop a trade-off value between rate impact and CO2 reduction. Then a plan would be chosen that seems to give a large CO2 reduction bang for the buck while avoiding great ratepayer harm. We can certainly justify this added cost in the IRP as the price of insurance against the risk of global warming.

If the Commission is unwilling to take this somewhat bold approach at this time, especially at this stage in the IRP, it should at least take the following action. When presented with portfolios that have statistically similar costs but large differences in CO2 emissions, the Commission should only acknowledge the portfolio with lower emissions. In this IRP that would mean choosing portfolio 27, or one similar to it,.

Regulatory (and other) questions

Are there regulatory barriers to the development and implementation of an IRP that cuts CO2 pollution deeply? Questions might be raised regarding the ability of the Oregon Commission to either not acknowledge a Plan that does not do so, or to condition acknowledgment on such a Plan. Some might raise other questions such as, why should Pacificorp's ratepayers want to run coal plants less and gas plants more, as well as build "extra" wind resources and energy efficiency, if that raises rates, unless someone makes it mandatory? Or, why should Pacific go "first" if no one else has to? Shouldn't we wait until everyone else acts?

These are all relevant questions, but unfortunately they were not addressed in the IRP, because the focus of this process has been to nibble around the edges by evaluating portfolios using metrics that are nearly indistinguishable without stretching the scoring system way beyond statistical relevance, all the while ignoring the one factor that is different between the portfolios: CO2 emissions.

Staff's recommendations

NWEC supports the particular recommendations of staff related to the following items:

- Requirement to provide a wind integration study that has been vetted by key stakeholders. Staff, however, proposes that PacifiCorp be allowed a full year to fix the many errors identified in the current version. We believe the most egregious errors can be fixed within 3 months time, and the Commission should condition acknowledgment on achieving this more aggressive timeline.
- More evaluation of the intermediate-term market.
- The need for PacifiCorp to demonstrate the need and timing before adding another resource, including the value of deferral.
- Need for the next IRP to develop a modeling approach that can show portfolio performance is not unduly influenced by decisions not relevant to the Action Plan.
- Better analysis of the Oregon Hard Cap emission standard, including the evaluation of the effect of the closure of coal facilities.
- More transmission related analysis.
- A service-wide assessment of energy efficiency benchmarked against the Council's studies.
- An assessment of the costs and savings of implementing distribution efficiency measures.

- In addition we support the statement in PacifiCorp's Response to Oregon Party Comments (p. 12) to include consideration of the need for a measure of total CO2 emissions as a scoring criteria in future IRPs.

However, in general we are disappointed that staff did not go very far towards meeting our concerns expressed above. Staff studiously avoids recognizing the global warming elephant in the room, and thus seems content to offer up minor tweaks to the process while the Company continues to emit huge amounts of CO2 with no sign of change in the future. Staff has also not provided any statistical justification for approving the Company's preferred portfolio over any other portfolio, nor weighed in on the appropriate amount of risk customers should be willing to forego in exchange for an increase in costs.

Conclusion

The analysis in this IRP is fundamentally unsound for several reasons, chief among them, the lack of any statistical analysis or understanding that is needed to make sense of large amounts of complex data.

1. PacifiCorp's scoring system artificially amplifies statistically insignificant differences in costs, and then relies upon those meaningless differences to choose a preferred portfolio. Statistically insignificant rate impact differences of less than 1 mill per kWhr are given heavy weight in the scoring, even though most, if not all of the differences are likely due to random factors. But that does not mean that the portfolios are "equal." In fact, they produce quite different CO2 emissions of 10-20%, regardless of the level of CO2 tax assumed.

2. PacifiCorp improperly combines (sums) cost and risk measures. This step makes little sense, because the costs and risk metrics used are strongly, albeit negatively, correlated. Summing them provides little additional scoring discriminatory power.

What is needed instead but is lacking is a discussion and determination of the appropriate risk/cost tradeoffs that customers should bear.

3. 15% of the scoring weight is given for *increases* in CO2 emissions, because better scores for the CO2 Cost Exposure metric are strongly correlated to higher emissions. Given the priorities of the State, and the requirement that environmental costs and risks be incorporated into a utility's IRP, a "CO2" metric that produces higher scores for higher emissions is backwards and inappropriate.

For these reasons, NWEC urges the Commission to not acknowledge this IRP and to direct PacifiCorp to work with the parties to develop scoring criteria that do not depend upon statistically insignificant results and that instead reflect the true risks faced by ratepayers. In future IRPs, the utility should also be required to include the needed statistical analysis to justify relying upon small differences in scoring metrics.

Since the Company needs immediate direction, and lacking more meaningful analysis, the Commission should recognize that the portfolios tested will not result in significantly different costs to ratepayers, but *could produce significantly different greenhouse gas emissions.* Faced with such a "tie" in costs, the Commission should acknowledge a portfolio such as #27 that will result in significantly lower emissions.

Thank you,

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Attachment A

Simple examples of the affects on scoring when using correlated and non-correlated metrics[8]

The purpose of a scoring system is to clearly differentiate portfolios so one can choose the "best" portfolio. It is important to understand how adding two metrics that are or are not correlated affects the sum, and most important, how that sum's "choosing power," or ability to discriminate between portfolios, is affected.

Assume that four portfolios, A, B, C and D, are tested against a cost metric (like PVRR) producing four different costs: $2 Billion, $4B, $6B, and $8B. Portfolio A is the least expensive. Also important to note is that the difference between each portfolio's cost is $2B, equal to one-third of the total range of scores ($6B). The size of this difference is important for justifying choosing one portfolio over another. Of course further statistical

[8] These examples are very simplistic. They assume either perfect correlation or zero correlation. The numbers also do not have standard deviations so it is not possible to know if the different plan costs are significantly different or not.

testing would be needed to know whether the difference between the costs was statistically significant.

Now, in the table below, we show what happens to the scores if one adds another metric that is either correlated, inversely correlated, or uncorrelated to the original scores.

Col. 1	2	3	4	5	6	7	8
	Cost Metric $Bs	Correlated cost metric (e.g. rate)	Sum of columns 2+3	Inversely correlated metric (e.g. most risk metrics)	Sum of columns 2+5	Uncorrelated metric	Sum of columns 2+7
Plan A	2	1	3	4	6	1	3
Plan B	4	2	6	3	7	3	7
Plan C	6	3	9	2	8	1	7
Plan D	8	4	12	1	9	3	11

Column 4 illustrates what happens when two correlated metrics are summed. It *seems at first* that the sum improves the choosing power compared to either of the separate metrics because it spreads out the scores. But note that although the range of column 4 is now 12 – 3 = 9, the difference between each plan still only represents one-third of that range. Plan A still scores best, and is the same relative difference away from the other plans. What is important to recognize is that if the scores separately were not significantly different, the sum of the scores will not be either. The conclusion is that adding two correlated metrics give us no new information.

Column 6 illustrates what happens when two inversely correlated metrics are summed. Now, it *seems* like the sum provides less information, because the scores are so much closer together. The range is now only 9 – 6 = 3. However, the differences between the plans are still one third of the range. Again, the same conclusion holds: summing two inversely correlated metrics also gives us no new information. Whether a negative or positive correlation, adding two correlated metrics provides no added value.

Turning to column 8, we finally see a real difference emerging from the summation. In this case adding two uncorrelated metrics both increases the range to 11 – 3 = 8, and makes some plans much more different than the others. This result adds "choosing power." Now one can see that scores of Plans B and C are obviously not different, where before they were, and that the difference between Plans A and B (or C) is a larger portion of the total range, and more likely to be significantly different. Summing uncorrelated metrics does provide additional information. It should be noted that all of PacifiCorp's metrics are strongly correlated to PVRR either positively or negatively, so this example is not really applicable to this IRP.

In this IRP, as in most things in real life, the different metrics are not completely correlated. Thus there is some amount of uncorrelated relationship between the different metrics used which could, theoretically, add some new information. However, it is a minor amount in PacifiCorp's metrics, since they are all correlated fairly significantly.

How *should* risk be incorporated into a scoring system?

We should make it clear that the point is *not* that trying to use two or more correlated metrics such as cost and risk to evaluate portfolios is unimportant or impossible to do; only that *summing* two correlated metrics is not the way to analyze them. Risk of occasional bad outcomes and other non-directly quantifiable factors such as CO2 emissions are very important to customers, even though they are correlated, negatively or positively, with cost. So instead of summing them without much thought, it is necessary to first decide a cost/risk tradeoff.

Once, for example, it is decided subjectively that X dollars of cost is worth Y amount of risk or Z amount of CO2, one can then meaningfully choose a portfolio. Thus, in the above middle example, if we decide that it is worth $2 billion of added cost to reduce risk by 1 unit, then it would be worth it to choose the most expensive Plan D, because for the added $6 billion in cost, risk was reduced 3 units. But if it was decided that it is only worth $1 billion to cut risk by 1 unit, than Plan A is best, because the other plans waste money to achieve too small risk reductions.

It is this discussion of the cost/risk tradeoff value that is missing in this IRP.

LC 47
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