T 206 447 1880
F 206 447 2270

1402 Third Avenue, Suite 500
Seattle, WA 98101

www.sightline.org

Sightline INSTITUTE

FORMERLY NORTHWEST ENVIRONMENT WATCH

Sightline Institute's comments on the WCI's economic modeling

Comments prepared by Peter Dorman, economist, PhD

To:	WCI partners; ICF Consulting; interested parties
From:	Sightline Institute
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Contact:	Eric de Place, senior researcher, *eric@sightline.org*

We remain very concerned with the WCI's economic modeling exercise. A more useful economic analysis of climate policy would seek, first and foremost, to address questions that affect the public interest. Instead, the economic modeling appears to be largely directed at addressing questions that affect private interests, such as industries and businesses. It is the public interest that should guide policymaking, and it is the public who should rightly be considered the WCI's primary stakeholders. So it is worrisome that the economic modeling is focused almost entirely on the effects on a handful of private stakeholders.

The output of the ENERGY 2020 model forecasts physical and value impacts of policy choices on detailed industrial and commercial energy suppliers and users, but it does not provide a corresponding level of detail for households. It fails to distinguish clearly between economic benefits, costs, and transfers, so that standard efficiency assessments cannot be applied. Finally, it is opaque about crucial aspects of its model construction, making it difficult to compare its results to those of comparable studies in other jurisdictions.

1. *Whose impacts are identified*? The model output includes energy use and expenditure information for twelve fuel categories, nine energy use sectors, four types of vehicles, etc.—but there is no breakdown of the population by any criterion that is meaningful for understanding the public interest. For example, we don't know about impacts on city-dwellers versus rural residents, by income class, or by other similar yardsticks. This absence may be the single most disturbing aspect of the entire enterprise. Among other things, it raises serious questions about who are considered to be the stakeholders in WCI. A producer or distributor of natural gas can identify his industry in the data, but urban householder at the median level of income cannot.

The closest we come to an integrated representation of public impacts is in Table B-19, where we can sum up "residential" and "passenger transportation" to arrive at an approximation. This table depicts changes in expenditure net of imputed allowance costs, which are found in Table B-18. But even this minimal documentation of public impact is incomplete.

2. *How are intermediate impacts distinguished from final impacts*? They aren't. Consider Table B-19 again, which lists a series of sectors that will be impacted by policy, including "residential" (presumably the households that comprise the WCI population). If we take the first policy case as an example, and if we combine the residential and passenger transportation sectors, households in 2020 spend about $27.4B less than in the reference case, net of their imputed allowance costs. (Incorporating these costs, and assuming they are not recycled, would bring savings down to about $7.8B.) But notice that other sectors are impacted as well: commercial buildings, freight transportation and agriculture also experience savings, while industry has added costs. At the bottom of the table is a row marked "Total" that helpfully sums up all the positive and negative entries.

From the perspective of economic evaluation, this tabulation makes no sense. (The framework for such an evaluation can be found in any textbook on policy analysis; perhaps the most popular and concise is Stokey and Zeckhauser, 1980.) The table confuses intermediate with final products. For instance, passenger transportation might be regarded as a final product, assuming that travel per se (as opposed to, say, access) is what individuals want and are willing to pay for. Freight transportation, on the other hand, is an intermediate product. It has no value to consumers in itself, but it contributes to the cost of other goods that consumers buy. Presumably the consumer has no interest in how a good was shipped, but only in its availability; therefore freight should not be viewed as a consumption item. Worse, if one adds the cost of freight to the cost of the item being shipped, the result is double-counting, since freight costs are already bundled into final costs. Logically, an adding up of various costs, some intermediate, some final, as performed in Table B-19, has no economic meaning.

The correct approach would be to employ an input-output table, as is common in this sort of work, e.g. Metcalf et al. (2008). (The detailed methodology posted on the California Air Resources Board website makes no mention of such a table, nor is any source of input-output data listed as a model input.) The costs incurred by specific industrial or commercial sectors have no particular economic interest except as they enter the final costs paid by consumers. They are interesting to those with a direct financial or managerial interest in the affected sectors. However, those effects have nothing to do with the WCI's evaluation of the public interest, which is what should guide public policy.

3. *How does the report distinguish between economic costs, benefits and transfers*? In economics, "costs" are primarily opportunity costs (i.e. what we give up by using resources for one purpose rather than another), while "benefits" derive from the value consumers place on goods and services. "Transfers" entail no economic costs or benefits but simply shift sums of money from one person's account to another. A parking ticket is a transfer -- it simply transfers money from a parker to government coffers; a car repair is a cost -- it diverts labor

and materials into a car repair.

To an extent, ENERGY 2020 makes distinction between costs, benefits, and transfers: this is how we should view the separate data reported in Tables B-18 and B-19. The first table's data are strictly a transfer and should have no bearing on economic evaluation per se. But the second table's data? Assuming that Table B-19 does not reflect any transfers elsewhere in the economy (and the documentation provided does not point to the sort of imperfect competition that might generate such transfers), then the table must represent actual benefits and costs. Unfortunately, it represents *both*, and there is no evident way to disentangle them. Specifically, it does not distinguish between less consumption of services (indicative of an economic cost) and greater efficiency in the provision of services (an economic benefit). By services, of course, one does not mean inputs like vehicle miles traveled or the amount of hot water used, but the economic benefits we use them to obtain. In the end, the most important economic question about climate policy has to do with its effect on our living standards: we should craft an approach that achieves our climate goals with the minimum necessary cost (or even maximum potential benefit) to these standards. To guide us in this, an economic analysis should first of all identify costs and benefits in standard economic terms and report its findings. So far, the WCI's economic analysis has not done this.

4. *How does the model account for the "energy efficiency gap"*? There is abundant evidence that consumers and businesses forego billions of dollars in potential savings every year by failing to take advantage of energy-saving opportunities. This is the "efficiency gap," – a gap that is made up of the investments in energy efficiency that would pay for themselves at current prices and interest rates but that, for some reason, we do not make. There are a variety of explanations for the efficiency gap, from perverse incentives to herd behavior, but the factual evidence for the existence of the gap is compelling. When actors leave money on the table in this fashion, how can their future energy demands be forecasted?

If one assumes that the current extent and pattern of energy use reflects the best possible response to current prices and technology, the only way to cut back on energy use and reduce carbon emissions is to increase prices or impose costly regulations on energy users. What if it is possible, however, to greatly increase energy efficiency with *no* additional economic cost, at least for the first several years of a GHG mitigation program? This would mean that significant costs would not materialize right away, and it would also mean that, even when the costs start to mount, they would be less in any given year. It also means that there are some sectors of the economy -- those with the biggest efficiency gaps today -- that will enjoy the longest delay before energy costs rise significantly. For instance, if new programs spur improvements in residential insulation and reduce the total cost of home ownership at current prices, many homeowners will find their heating bills going down in the near term rather than up.

In fact, numerous comprehensive analyses have demonstrated the existence of a large efficiency gap. One recent report from the IPCC considers the potential for emissions reductions across countries, energy sources, and end uses. Remarkably, the IPCC found that 31 percent of the climate emissions expected in 2030 from the OECD countries can be abated at zero or negative economic cost. The McKinsey Global Institute has made similar arguments in a recent series of reports. In a large 2007 study, conducted jointly with the Conference Board, McKinsey found that between 13 percent and 21 percent of all anticipated 2030 US emissions could be reduced at no net economic cost – and with no technological advancement. And in a recent study of studies, the American Council for an Energy Efficient Economy (ACEEE) reviewed 48 prior research reports on efficiency, and found that, on average, currently available investments can reduce energy consumption by 23 percent compared to expected future use. The average benefit-cost ratio of these investments ACEEE identified is nearly two-to-one, which means that every dollar invested in efficiency would repay two dollars.

Despite the voluminous evidence to the contrary, however, ENERGY 2020 treats all current energy demands as if they were rational. As explained in the documentation posted on the CARB website, the model estimates the effect of price changes by calculating marginal cost impacts and substitution along the user's tradeoff function. This approach implicitly assumes that the consumer is at an initial equilibrium prior to the price change, or equivalently, that all non-price considerations (the ones that give us the efficiency gap) are held constant. This approach must be viewed as pessimistic.

As rising energy prices make energy costs more visible (accessible, in behavioral jargon) to consumers, and as policy choices give the social importance of energy efficiency more weight in individual decision-making, we should expect at least a portion of the gap to close. Under the conditions of enacted climate policy, an unchanged efficiency gap should be regarded as a limiting case on one side, just as full closure of the gap would constitute a limiting case on the other.

5. *How does the model incorporate innovation*? We really have no idea from the documentation provided. Volume Two (Demand Sector Structure Overview) says only that "Technological Improvements in Devices is a .... calibrated variable that can be altered in the future as a policy variable." In fact, technological improvements that generate new devices for generating services, replacing (rather than improving) existing methods that consume more energy, are not considered at all in WCI's economic analysis. This is a mistake. New systems of teleconferencing, for example, might be able to substitute for a substantial portion of business travel. It would be a mistake for an economic analysis to cheerily assume that such innovations will be abundant, but it is also a mistake to rule them out by assumption. (The WCI Design Recommendations makes a similar observation about innovation.)

6. *How are transient price changes differentiated from permanent ones*? It appears, based on the documentation, that no such distinction is made. Past movements in energy prices have been "noisy", and rational observers would have reason to anticipate regression to the mean. That is, episodes of unusually steep price rises have been followed by episodes of price declines, and vice versa. Except for a period during the mid-1970s, when there was a widespread impression that higher energy prices were here to stay, actors had little incentive to respond to price hikes by making costly investments in efficiency or substituting other

techniques or goods. For instance, periodic increases in oil prices have not interrupted the tendency toward more dispersed housing patterns. Price increases stemming from carbon policy will be different. We are proposing to commit ourselves to a dramatic change in energy use over a period of several decades, driven in large measure by price increases created by policy itself. Under these circumstances it would be rational for private decision-makers to make long-term investments, such as moving closer to public transportation, at an early stage in the process.

This missing distinction enters into ENERGY 2020's prognostications via its equations for estimating the determinants of price elasticity of demand. The model extrapolates from past price-quantity adjustments, but most of these have been temporary price fluctuations, not the systematic changes WCI proposes to engineer.

7. *How reliable is the modeling exercise*? There are two ways to find out. One simple procedure is to estimate out-of-sample observations in its reference case. For instance, truncate the data a few years early and then forecast these same years as if they hadn't occurred yet. This is how models are routinely tested; it would be straightforward to do the same with ENERGY 2020.

Similarly, Volume Six of the documentation, Professional History, references many previous applications of this model. Since in most cases there are now actual outcomes to compare to predicted ones, a retrospective analysis of reliability would not be difficult. These types of out-of-sample tests are routinely performed in financial modeling, where clients typically have large values at risk. (And even these tests are not sufficient to remove the potential for serious error, as we have seen.)

The other way is through close comparison with other models that depend on different structure or assumptions. Strictly speaking, this is not possible insofar as this is the only model enlisted to estimate the effects of these particular policy instruments in these specific jurisdictions. Nevertheless, there is probably overlap at the level of individual WCI partners and policies, and the general structure of the results can certainly be compared even with models of other packages (like Warner-Lieberman) at other scales. The real obstacle is not output comparability but transparency. The documentation provides ample conceptual background and definitions of its variables (in the coding volume), but the precise estimation equations that would permit replication are not made available.

Incidentally, the lack of transparency pulls a veil of mystery over the output provided in this report. We are given final numbers for the various demands, prices and so on but not the reasons behind them. Why does one sector achieve greater energy savings than another? How much reduction in use represents the operation of the budget constraint (the income effect) and how much substitution, and why? Any modeling exercise should be viewed as a two-way test, as a probing of the real world by an analytical device, and a probing of the device by the reasonableness of its output. Without doing the second we have little reason to trust the first.

8. *What is the bottom line*? From the standpoint of policy design, the exercise is asking the wrong questions. We should be trying to find out how the people of our partner states and provinces will be affected by the choices we are about to make -- both our populations overall and significant portions of them. For instance, what will be the effects of our choices on our poorest citizens, those in the bottom 20 percent of the income distribution? What will be the effect on the median? How will the percentage of allowances subject to auction alter these conclusions, assuming the revenues are recycled back to households? Will predominantly rural areas be affected more severely than urban ones? If so, by how much?

Closely related is the issue of economic efficiency, minimizing the cost in the value of goods and services we can supply given a particular level of carbon emission mitigation. To address this, we would need data that clearly distinguish costs from benefits and both costs and benefits from transfers. These should be presented in terms of *final* goods and services, so that there is no double-counting when we add up the effects on particular groups. Incidentally, the interpretation of the results should also take cognizance of the primacy of costs and benefits over transfers. The Design Recommendations appear to add the transfer data of Table 18 to the cost and benefit data of Table 19; if so, this is a conceptual problem. In fact, there is no particular advantage or disadvantage that should be attached to the sums listed in Table 18. Economists generally favor auctioning allowances and using the resulting revenues to either offset taxes they view as distorting or distribute to households on a progressive (e.g. per capita) basis. From this perspective, allowance “costs” can even be economically productive -- the so-called “double dividend”.

At this stage in the process, devoting the largest share of the exercise to forecasting impacts on specific business sectors is putting the cart before the horse. At best it is irrelevant to the questions that should drive policy; at worst it is an invitation to businesses and their associations to apply pressure so that the policy cuts them a better deal. Once we have settled on the form that policy should take, of course, it is entirely appropriate for government to help businesses forecast and adapt to the impacts they will confront.

Finally, after all the foregoing concerns are put to the side, what can we infer from this report about next steps for WCI and its partners? To the extent that the savings itemized in Table B-19 reflect efficiency improvements and not simply consumption or production cutbacks, these are relevant numbers to bear in mind. They suggest that a broad policy scope that includes transportation fuels and that does not envision offsets would be the most beneficial. They also suggest that the modest goal of a 15 percent reduction in GHG emissions by 2020 is readily attainable with low or perhaps even negative cost. This is encouraging news at a time when the economy is being staggered by financial and macroeconomic disruptions: we can meet modest climate goals without making our economic problems worse. In fact, given the pessimism on several fronts (innovation, permanent versus temporary price effects), it is probable that we can set ourselves the more ambitious goals associated with stabilization at lower ppm of carbon equivalents even under current economic strains.

In light of the difficult economic period that lies ahead, WCI partners should prioritize learning about the impacts of policy design choices on households that have little slack to give. This means, on the cost side, incorporating all the price effects via an input-output methodology, and on the revenue side, modeling the effects of auctioning the allowances and recycling the revenues in alternative ways. This last piece of the analysis may prove to be the political lynchpin as well: our challenge in the immediate future will be to convince our fellow citizens that, even in the face of an economic downturn, their household budgets will not be squeezed further by climate change policy and may even show a surplus. Even with its flaws, ENERGY 2020 points in this direction, but only amid a forest of distractions. We still need an economic analysis that asks directly how -- and by how much -- we can cut carbon without cutting living standards.

References

Working Group III Report, "Technical Summary," in *Climate Change 2007: Mitigation*, Fourth Assessment Report of the Intergovernmental Panel on Climate Change (Cambridge University Press, Cambridge: 2007), *www.ipcc.ch/ipccreports/ar4-wg3.htm*.

Diana Farrell et al., "The Case for Investing in Energy Productivity," McKinsey Global Institute, McKinsey & Company, February 2008, *www.mckinsey.com/mgi/publications/Investing_Energy_Productivity*.

John A. Laitner and Vanessa McKinney, "Positive Returns: State Energy Efficiency Analyses Can Inform U.S. Energy Policy Assessments," American Council for an Energy-Efficient Economy, June 2008, *www.aceee.org/pubs/e084.htm*.

Gilbert E. Metcalf et al., "Analysis of U.S. Greenhouse Gas Tax Proposals," MIT Joint Program on the Science and Policy of Global Change, Report No. 160, April 2008, *http://mit.edu/globalchange/www/MITJPSPGC_Rpt160.pdf*.

Edith Stokey and Richard Zeckhauser, *A Primer for Policy Analysis* (New York: WW Norton, 1980).