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Via email

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Dear Department of Ecology GAP Rulemaking Team:

We write to provide additional input to the Department of Ecology's Greenhouse Gas Assessment for Projects (GAP) Rulemaking process. In particular, below we provide some additional information and ideas on how to select "alternative market scenarios" against which "net emissions" of a project can be analyzed.

These comments build upon those we submitted on December 15, 2020. In those comments, we suggested that, in evaluating net emissions, "the primary market scenario should be one that is as consistent as possible with the intent of the State's GHG emissions reduction limits and 'pathways to limit global warming to one and one-half degrees'." In this letter, we offer further suggestions on how to select or construct such low-carbon market scenarios.

As ever, we are grateful for the opportunity to provide these comments and would be happy to answer any questions about them.

Sincerely,

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Ideas for selecting market scenarios and baselines

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The Washington Department of Ecology (Ecology) has started a rulemaking process, as directed by Governor Inslee in 2019,[1] to set forth methods for analyzing the greenhouse gas emissions of industrial and fossil fuel projects.

As part of that process, Ecology is considering how to assess "net emissions", which are the "project emissions relative to alternative market scenarios". Net emissions can be useful to evaluate the incremental, global greenhouse gas (GHG) emissions effects of a project relative to one or more such market scenarios, sometimes. In our comments here, we will refer to such market scenarios as "baseline" scenarios. We use the term *baseline* because it can help convey the act of comparison (e.g., "compared to baseline"), as well as because there is a long history in the GHG accounting literature of using this term[2–5]. Our own research has focused on GHG emissions baselines for well over a decade[6–8].

In the comments below, we focus mainly on the process of setting a low-carbon baseline, e.g. a baseline that is as consistent as possible with the intent of the State's GHG emissions reduction limits and pathways to limit global warming to one and one-half degrees (1.5° C). Using low-carbon baselines like this would enable evaluation of whether a prospective new project is helping (or hurting) the State of Washington and nations of the world meet their agreed emission-reduction commitments. There are also other types of baselines, such as "business as usual" (BAU) baselines that instead forecast a continuation of current trends; where relevant, we will also comment on the process for developing these baselines.

Should baselines be absolute or intensity-based?

In general, an *absolute* GHG emissions baseline is the product of two factors: how much of a given activity will be undertaken (e.g., how many barrels of oil would be exported, or how much cement will be produced), and the GHG-emissions intensity of that activity (tons of CO_2e per ton of coal or cement). Multiplying these two factors leads to an absolute level of GHG emissions that can be used to compare to the foreseen emissions of a prospective industrial or fossil fuel project in Washington.

Still, it can be helpful to consider *activity* and *intensity* separately. In the transition to a low-carbon economy consistent with State and international climate limits, one or both of these two factors may need to decrease, including going to very low levels (near zero). For example, meeting a 1.5 degree limit would likely see oil use and trade (both measures of *activity*) declining steadily, as well as the GHG-intensity of that oil decreasing as more-polluting oil, such as oil sands, is phased out the fastest.

In some cases, the activity of some products or services may *increase* in a low-carbon scenario. For example, manufacturing or mining of a product or material that is necessary for producing or using low-carbon energy may need to be scaled up.

Sorting out which activities (e.g. products) should be phased out under low-carbon scenarios, and which may plausibly increase or at least maintained, could therefore be central to setting credible low-carbon baselines. For some activities, such as a facility that produces, transports, or exports coal, the answer may be relatively clear: coal production and use must decline rapidly, to near zero, for climate limits to be met[9]. For activities such as this, the Department of Ecology should consider a low-carbon baseline of zero new coal activity (and, by extension, GHG emissions), since *any* new production or export of coal would likely be increasing global net GHG emissions.

Indeed, the scientific literature indicates that coal, oil, and gas production and use must all decline steadily to meet 1.5 C limits.[9,10] Existing fossil fuel infrastructure globally has already committed enough CO_2 emissions to exhaust or nearly exhaust a 1.5 C carbon budget[11,12], and so there is little to no room left for more infrastructure that leads to more burning of fossil fuels. These considerations could therefore help underpin a low-carbon activity baseline of zero (or near zero) for most projects, including those in Washington, that would exclusively handle or burn fossil fuels. In such cases, any GHG emissions associated with the project would be considered to be in excess (net of) the low-carbon baseline.

For some activities, however, the answer may not be quite so clear. Take steel. Producing steel around the world releases considerable CO_2 emissions, both from burning fuels needed to create heat for iron and steel production, as well as from other chemical reactions inherent in the process. Meeting 1.5-degree limits will likely require lower-GHG means of making steel (perhaps including more electric-steel making, as already practiced in Washington), as well as more efficient use.[13] Overall, steel use is likely to decline.[13,14] But some steel will still be needed, for example, to build wind turbines, for electric vehicles, and for constructing tall buildings in denser, lower-carbon cities.

For products like this that plausibly need to be sustained under a low-carbon transition (e.g. steel, cement, aluminum, components of solar panels), the activity level can be a secondary consideration, and the baseline emissions determined primarily by identifying GHG intensities consistent with low carbon pathways.

For guidance on both the activity (*what*) and intensity (*how*) components of baseline setting, analysts can build from regional, national, and international research on how to align energy production and industrial activity with low-carbon limits. Considerable research is ongoing on low-carbon industrial transitions[14,15], and which can help identify what products and materials plausibly need to be sustained (even increase) in a low-carbon pathway, which need to have their production decarbonized (and by how much), and which clearly conflict with low-carbon goals. We discuss these issues next.

Identifying baseline low-carbon intensity of industry

For the many industrial products that need to be sustained under a low-carbon transition the key consideration in developing a low-carbon baseline is identifying the emissions intensity of highly efficient, best available technologies and practices.

Emissions intensity is a measure of emissions per unit of product, and so the first step is identifying what product is being made, so that appropriate comparisons can be made. For relatively homogenous industrial products like cement, the choice may be fairly simple: emissions can be compared per ton of cement produced (or perhaps per ton of clinker produced, which is the key component of cement).

By contrast, for products where there is a high degree of heterogeneity, the choice may be more complex. It may not be appropriate, for example, to compare the emissions intensity of a facility making window glass to a facility making container glass, so the product to be compared would need to be defined accordingly. (For a review of this and other key issues in defining industrial products for purposes of comparing GHG emissions intensity, see a prior paper, "Issues and Options for Benchmarking Industrial GHG Emissions," produced for the Department of Ecology by two of us.[16])

Once the relevant product has been clearly defined, the next task is identifying the emissions-intensity of low-carbon practices, and which we suggest be aligned with the 1.5 C limit referenced in Washington State law. We recommend that the source of such assumptions should, where possible, be independent, international institutions such as as the Intergovernmental Panel on Climate on Climate Change (IPCC) or International Energy Agency (IEA). The IEA, for example, regularly publishes the extensive report *Energy Technology Perspectives*, where it assesses recent trends in GHG emissions intensity of different industrial products, and identifies production technologies and practices that would help hold warming below low-carbon limits (typically 2°C, though the IEA has recently been exploring 1.5°C in more detail). The IPCC will be finalizing the emissions mitigation volume of its Sixth Assessment Report in 2021, including a chapter on reducing GHG emissions intensity of (and future demand for) industrial products[17].

A key consideration in assessing how future GHG emissions intensity may decline in a low-carbon baseline will be when (and, perhaps where in the world) low-carbon technologies and practices might be introduced, and how fast change is expected to (and has already) happened. For most industrial products, GHG-intensity has already been improving over time. Therefore, even in a business-as-usual baseline, it generally should not be acceptable to assume that future GHG-intensity is fixed, or static, at recent levels[2]. GHG intensity is likely to improve in both business-as-usual but, especially, in low-carbon scenarios. (For more discussion of these issues, see Chapter 8, "Estimating Baseline Emissions", in the Greenhouse Gas Protocol *Policy and Action Standard*.[2], or *Options and Guidance for the Development of Baselines*, written by two of us and published by the World Bank[6].)

In Figure 1, below, we use an example, drawn from IEA's *Energy Technology Perspectives*, to show two different baseline scenarios for the CO_2-intensity of cement production. The IEA has assessed what kinds of technologies and practices would be adopted over time in each scenario, and used its energy models to estimate how the emissions intensity of cement production would evolve in each. In one scenario, under current policy plans and trends (a type of "business as usual" scenario), the CO_2-intensity of cement production is expected to decline modestly, from about 0.56 t CO_2/t at present, to 0.51 t CO_2/t by 2050. In the other, low-carbon baseline, the CO_2-intensity of cement production would decline much more rapidly, to about 0.20 t CO_2/t by 2050.

In creating its GAP rule, the Department of Ecology should require project applicants to provide and justify low-carbon baselines like this, including those drawn from organizations like the IEA. For example, suppose a new cement kiln were proposed in Washington, that would begin operation in 2025 and use technology expected to emit 0.45 t CO_2 / t of cement for a 40-year lifetime. That facility, while reducing emissions modestly relative to the IEA's business-as-usual type baseline that never gets below 0.49 t CO_2/t , would clearly *increase* emissions relative to the low-carbon baseline that drops below 0.45 t CO_2/t by 2030 and decreases sharply from there.

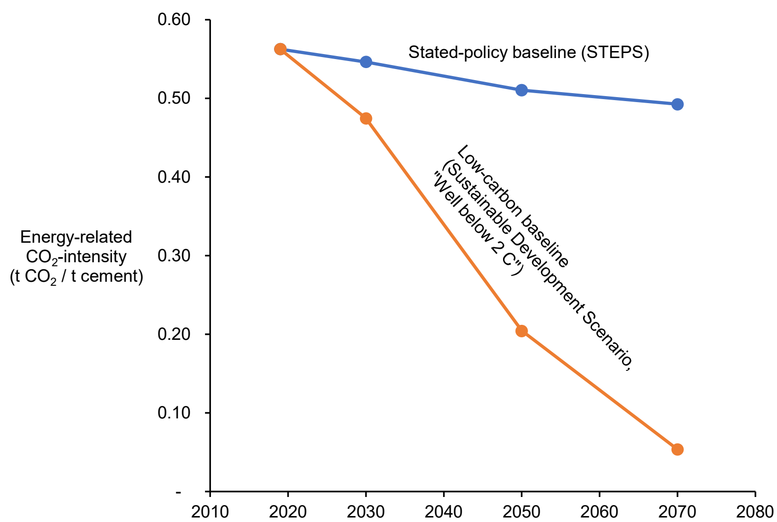

Figure 1. Two baseline scenarios for cement production. Emissions here include energy-related CO_2 emissions associated with cement production, and do not count process CO_2 emissions associated with the calcination reaction. *Source: International Energy Agency*[14]

This example for cement helps to illustrate the general principle of a low-carbon baseline, and how it differs from a "business-as-usual" type baseline that is instead based on extension of current trends.

There may be instances where further details are helpful, however. The low-carbon baseline in Figure 1 mixes new, not-yet-operating producers with older, already-producing (in some cases very old and inefficient) facilities. As a result, this low-carbon baseline may over-state the GHG intensity of the *new* facilities that are helping to push down the average intensity so dramatically over time. A baseline that mixes existing and new facilities may therefore not be sufficient for evaluating whether a new project is using the best, i.e. lowest-GHG-intensive, technology or practice available. We address the distinction between a baseline set on new versus existing facilities next.

Distinguishing new versus already-operating industrial facilities in the low-carbon baseline

As described above, emissions-intensity pathways for specific products that mix existing and new facilities may over-state the emissions intensity of new, low-carbon production technologies and practices. Since the point of Ecology's GAP rule is to evaluate new facilities, it will likely make most sense to create baselines based on other new facilities, since those are the producers that would (barring major retrofits of existing facilities) have the greatest effect on driving down the emissions intensity of the sector's products.

The most obvious way to create a baseline based on the emissions intensity of new facilities is to research and understand the new technologies for making each product. For example, continuing the cement example, one could identify the specific type (or types) of cement kiln(s), and its operating practices, that is the current, best performing technology, and set the low-carbon GHG emissions baseline at that level of GHG emissions intensity. This process would be similar to how regulatory agencies, including the Department of Ecology, conduct the New Source Review program for greenhouse gases and other pollutants under section 111 of the federal Clean Air Act, even as the scope of emissions considered both "upstream" and "downstream" is likely broader here under the GAP rule than would be considered in that setting. It may also be similar to how regulatory agencies, such as the California Air Resources Board, have set "best in class" benchmarks for allowance allocation under cap-and-trade programs[18].

A challenge in using one or more specific new technologies for determining the low-carbon baseline is evaluating the near-term viability of emerging technologies, as well as the plausibility of their adoption in Washington. For example, consider the recent case of a proposed facility in Washington that would make methanol, using natural gas (and, secondarily, electricity) as the energy source, and natural gas as the feedstock. In *Energy Technology Perspectives*, the IEA identifies that in its low-carbon scenario (the same Sustainable Development Scenario shown in Figure 1), methanol is increasingly produced via electrolysis on a large scale using hydrogen as the feedstock, that this technology has already (as of 2020) been proven at scale, and that pilot plants are already underway.[14] Since this technology has the potential to be much lower-carbon than that proposed for use in Washington, it could therefore be considered, along with other potential similarly low-carbon technologies, in the construction of a low-carbon baseline for methanol production. Any reasons why this and other lower-carbon technologies would *not* apply in Washington would need to be clearly substantiated.

An alternative to assessing specific technologies could be develop a more standardized baseline approach for new facilities, e.g. that a new facility built in a specific year should be some percent less emissions intensive than current practice. Such standardized approaches are tempting because of how they could avoid the need to consider specific new technologies, which could be a time-consuming process. In this approach, the Department of Ecology could specify that low-carbon baselines for industrial facilities would decline by some fixed percentage per year, where the percentage is aligned with either Washington State or international goals for alignment with the 1.5°C limit. The downside of this approach is that, industrial products vary so widely that it is difficult to see how such a standardized approach could be accurate enough for evaluating individual facilities.

Summary and conclusions

The State of Washington aims to help "limit global warming to one and one-half degrees"[19]. In creating the GAP rule, the Department of Ecology has the opportunity to require assessments of whether new fossil fuel and industrial projects are consistent with this goal. As we describe in this letter, one way to do these assessments would be to establish low-carbon baselines for fossil fuels and for different industrial products.

The process of setting such baselines requires expertise on the technologies and practices for making industrial products, as well as on how quickly fossil fuels need to be phased out to limit global warming to internationally agreed limits. This expertise is often accessible through the work of respected institutions such as the IPCC, the IEA, or the United Nations Environment Program, that regularly assess low-carbon transitions. Using the reports from these institutions, Ecology can assess how industrial production processes and their GHG emissions are evolving, and what technology options for decarbonization are consistent with meeting the climate limits the state has embraced.

This information is readily applicable to new project proposals in Washington State, as the research can help construct and evaluate baselines – both low-carbon and business-as-usual baselines – for a wide variety of products, including fossil fuels.

Of course, such forward-looking assessments will rarely have perfect vision into the future, and it is worth recognizing that any estimate of future baseline emissions will be subject to uncertainty. That uncertainty need not be a barrier, however. As Washington State, just like most governments of the world, endeavors to hold warming to 1.5°C, it will be much better to build new industrial facilities that are plausibly aligned with this goal, than to lock in new infrastructure that clearly is *not* aligned with (and therefore makes much more difficult) the 1.5°C limit. We believe there is enough information for Ecology to require project applicants to analyze, and hopefully in so doing help steer, industrial development that is aligned with 1.5°C.

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