From: Brad Warren
To: UTC DL Records Center
Subject: comment on PSE IRP
Date: Thursday, February 22, 2018 8:49:28 AM
Attachments: Brad Warren comment on PSE IRP 2.21.18.docx

Brad Warren Testimony to Washington UTC on Puget Sound Energy's IRP

Docket: UE-160918
February 21, 2018

Thank you for the opportunity to offer comments. My name is Brad Warren, and I direct the Global Ocean health program at the National Fisheries Conservation Center in Seattle. We help fisheries, tribes, coastal communities, and scientists deal with marine consequences of carbon pollution. We proposed and served on Washington's Blue Ribbon Panel on Ocean Acidification, which became a model emulated by multiple coastal states, and we have worked closely on both adaptation and mitigation strategies.

Adjusting Puget Sound Energy's IRP and the state's utility regulations to accelerate phase-out of fossil fuels would help protect fisheries jobs and communities in Washington. Rising carbon dioxide emissions threaten our fisheries industry, where I worked for several decades as an editor and publisher of trade journals and a consultant on conservation and resource management. Seafood in Washington generates nearly 61,000 jobs and $7.5 billion in total sales impacts, according to NOAA[i].

If we want the ocean to keep making abundant, healthy fish and shellfish, decarbonizing energy supplies is necessary.

The Northwest is considered the world's "front line" for ocean acidification. That's because carbon emissions are piling on top of carbon that naturally occurs in our region's waters. Throughout history the West Coast oceanic upwelling system has fueled strong fisheries here with naturally occurring carbon and other nutrients. Now, we are choking the region's marine waters and fisheries with extra CO_2 from burning fossil fuel. About 28% of that CO_2 mixes into the ocean every year. The consequences are already severe, and they are accelerating. The ocean is becoming "hot, sour, and breathless," as a consortium of multilateral research agencies recently put it[ii], and conditions are especially acute in our region.

A few examples:

- The Northwest's shellfish farming industry nearly collapsed due to ocean acidification starting in the mid-2000s, jeopardizing about 3,000 jobs. Hatcheries and scientists were able to develop adaptation methods that are keeping them in business today, but these methods are costly, limited, and provisional. They work in a hatchery tank. They can't protect animals in the ocean.
- Overheated river water killed half the adult sockeye salmon returning to the Columbia River in 2015. Similar losses occurred in rivers across the region. While hot-water fish kills have occurred before, but hotter, longer summers are now driving up mortality in the Columbia[iii] and elsewhere.
- Closures in shellfish harvesting to avoid toxic algae —rare in the past—are now commonplace. Amplified toxic algal blooms make many species unsafe to eat. Toxic algae grow faster and produce more toxin per cell in warm, high- CO_2 waters. The coastwide Dungeness crab fishery and the Northwest razor clam fishery were shut down to avoid such toxins in 2015.
- Dr. Richard Feely, a leading ocean acidification scientist at NOAA, reports that West Coast acidification impacts will accelerate sharply if emissions keep growing at current rates. In layman's terms, impacts of acidification are speeding up because we've burned the brakes off the bus: pollution has nearly exhausted the primary buffering system in our region's seawater. Buckle up. Feely and co-authors note that if emissions follow an RCP 8.5 trajectory, we can expect a 233% increase in H+ (i.e.

the root of acidity) in NW waters. That means "grave threats to numerous groups of organisms and commercial fisheries."[iv]

- In red king crab (an Alaska fishery with big fleet based in Puget Sound) NOAA researchers found ~95% of juveniles die within 150 days when exposed to very slightly acidified water (pH 7.8) + warming (4C).[v]
- Marine foodwebs are already being eroded. NOAA scientists found 53% of the West Coast's nearshore pteropods show "severe dissolution damage." These important planktonic food for fish, The extent of acidified waters causing this damage have "increased over sixfold" since pre-Industrial times.[vi]

As an organization, much of our work at GOH has focused on helping people learn to adapt and survive consequences of a high-carbon world. The accelerating effects of carbon emissions now require more than adaptation. Rapid decarbonization of energy supplies is necessary to reduce growing dangers to fisheries and marine ecosystems. This is especially urgent at a time when these dangers, as Dr. Feely's work suggests, are veering toward proportions that may exceed the limits of adaptation.

Thank you.

Brad Warren
Director, Global Ocean Health Program, NFCC
7744 14th Ave SW
Seattle WA 98106

References

[i] NOAA, Interactive Fisheries Economics Tool, 2012 data
https://www.st.nmfs.noaa.gov/apex/f?p=160:7:8141721484680330

[ii] Turley et al 2012, Hot, Sour, and Breathless: Ocean Under Stress, PML, OAICC/IAEA, Scripps, Oceana, UK OARP, EPOCA, MedSea, BIOACID, 2012.
https://www.iaea.org/ocean-acidification/download/Resources/Audience/PML-UNLeaflet-Oct2013.pdf

[iii] Michele DeHart, M, 2015, Memorandum on requested data summaries and actions regarding sockeye adult fish passage and water temperatures in the Columbia and Snake Rivers, Fish Passage Center, Oct 28, 2015.
http://www.fpc.org/documents/memos/159-15.pdf

[iv] Feely et al 2018. The combined effects of acidification and hypoxia on pH and aragonite saturation in the coastal waters of the California current ecosystem and the northern Gulf of Mexico. Continental Shelf Research 152 (2018) 50-60.
[v] Swiney et al 2016. Ocean acidification and increased temperatures reduce young of year red king crab, ICES Journal Marine Science
[vi] Bednarsek et al 2014. *Limacina helicina* shell dissolution as an indicator of declining habitat suitability owing to ocean acidification in the California Current Ecosystem. Proceedings of the Royal Society B: Biological Sciences