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Energy System Reliability July 2023 Diablo Canyon

See pdf file below.

Additional submitted attachment is included below.

EXTENSION OF

DIABLO CANYON REACTORS PER SB 846

DOCKET 21-ESR-

01 Energy System Reliability

17 July 2023

California Energy Commission

Sacramento CA

Thank you for providing another opportunity for the public to submit comments. You consider many important variables in your conceptual overview of the issues. However, further consideration of scientific research and quantitative analysis is needed to evaluate these issues.

NUCLEAR REACTOR ISSUES

Many of the following issues have been covered in comments I have previously submitted. Links to such are linked below. To be concise, only the highlights will be recapped.

Reactors are not a “carbon-free” energy source. This is well-proven by all methodologically-sound research on the lifecycle carbon intensity of reactors. To minimize confusion, use of the adjective should be discontinued when referring to reactors. There are significant GHG emissions in each of the three Scopes of a reactor lifecycle. A fourth Scope, remediation and recycling, should be included when contrasting reactors and clean energy technologies. For reactors, Scope four continues for thousands of Millenia and include substantial annual costs while generating zero energy.

In addition to carbon emissions in each of the four Scopes, there are continuous water vapor emissions during reactor operation. Water vapor has significant GHG effects. Reactors are inefficient because they disperse massive amounts of waste heat.

Because toxic ionizing radiation is emitted during each of the four Scopes, there are public health damages and costs. Any exposure to ionizing radiation is harmful and there is no effective treatment for sub-atomic damage. Due to toxic emissions in all four Scopes, it is inaccurate to refer to reactor energy as clean. Uranium and other fuels for reactors have a finite useful life for electricity generation. The global supply of high-grade uranium is diminishing annually. So, it is not accurate to refer to reactors as renewable.

The Warren-Ahlquist Act prohibits new reactors in CA until there is a permanent repository for fissile trash. Reactor extensions should not be permitted until a permanent repository is established.

The operation of a one GW reactor requires about 500 workers. Since the nameplate capacity of the Diablo twins totals 2.2 GW, the number of workers is probably 1,000. Contrast this with the operation of a utility-scale solar farm, which requires fewer than 100 workers. The hundreds of workers, exceeding 100 for a reactor, could contribute more to our energy goals by working in the efficient clean energy industry.

Your estimate of the Diablo twin reactors generating 18,000 GWh annually should be decreased to incorporate the following factors. Reactors require replacement of all fuel rods about once every five years. About 30% of rods are replaced every 20 months. Each time some are replaced takes several weeks, requiring shutdown. Reactors are a poor choice during an era of accelerating climate change. They require proximity to bodies of water in order to provide cooling. However, when the water source is an ocean, this poses risk of damage by storms and tsunamis. The NRC requires reactors to shut down when the ambient temperature exceeds 99F. Following shut-down, ramping up the power output of a reactor to nameplate capacity levels requires several weeks. Reactors have numerous risks that clean energy technologies are free from.

REACTORSzeroC.pdf

CEC_DER_Diablo Canyon_02152023.pdf

CLEAN ENERGY OPTIONS

Only options that have lower lifecycle GHG emissions than reactors and no toxic emissions should be contrasted with reactors. The major commercially-available generation options are geothermal, tidal, solar, and wind. CA has plentiful amounts of these natural resources. In contrast, CA has negligible quantities of high-grade uranium resources.

https://web.stanford.edu/group/efmh/jacobson/WWSBook/WWSBook.html

https://www.cambridge.org/core/books/no-miracles-needed/8D183E65462B8DC43397C19D7B6518E3

COST TO BENEFIT ANALYSES

A thorough cost to benefit analysis contrasting reactors with clean alternatives should include the costs of

mining, refining, construction/renovation, operation, and remediation

public health damages

acceleration of climate change (by failing to power the grid with clean energy that has a lower lifecycle carbon intensity)

cost of electricity

The net cost of clean energy generation and storage, and efficiency, is to be used, after federal and state incentives for clean energy are factored in. The power source with the highest LCOE and TDC (total delivered cost) per kWh is reactors. Most research contrasting the cost of reactor electricity with wind and solar electricity shows that the cost of reactor electricity is 3 to 10 times the cost of solar and wind-generated electricity. This excludes many kinds of costs and liability coverage for reactors. Costs increase annually for reactors that are more than 40 years old. DOE has not committed to funding an extension of the Diablo twins. In contrast, numerous federal and CA incentives totaling hundreds of $billions have been passed by law.

ENERGY PLANNING

Please collaborate with CAISO, CPUC, CARB, and other agencies to accomplish the following. Devise a series of five-year plans that will enable the CA economy to be powered by 100% clean energy ahead of target dates established in legislation. These dates are the latest deadlines. However, meeting targets by earlier dates would provide greater annual benefits because the costs of adaptation, mitigation, and public health problems would be less. All published research on the issue of decarbonization shows greater economic benefits of achieving targets by earlier dates. Specifically, double build-out rates for new clean generation than are currently proposed by CAISO. Create policies that facilitate grid expansion and interconnection of DER and utility-scale clean energy generation. Legislation is in progress in CA to establish such policies.

Establish demand-response policies that increase resiliency. This includes software that enables load-balancing. More peak demand conservation incentives are needed, though utilities have made a valuable start in offering such programs. Both DER and utility-scale generation needs to be scaled up. Virtual power plants may be interfaced with microgrids to enhance resiliency and diminish peak loads. Net energy metering credits should be set at the same rates that utilities charge for utility-scale energy. Community Choice Aggregators and other LSEs that involve citizen ownership and control should be encouraged. This intensifies competitive, driving down costs of clean electricity.

CEC is tasked with setting energy codes for buildings. It would require little labor or cost on the part of CEC to set all-electric codes for new buildings – government, industrial, commercial, and residential. This would include insulation and efficiency standards that are cost-effective and technically feasible. An example is replacing inefficient methane HVAC and water heating with heat pump options. Efficient electric retrofits of existing buildings would complement this and programs should be established by CEC. This would significantly decrease energy demand.

Require the externalized costs of reactor and fossil energy to be incorporated into the cost of electricity. This will clean up our grid and drive down the cost of clean energy. To encourage conservation, require LSEs to charge tiered rates. For example, use something like the following table. The usage rate is kWh per month per individual customer.

>300 kWh	$7/kWh
200 – 299 kWh	$3/kWh
100 – 199 kWh	$1.5/kWh
< 100 kWh	$0.7/kWh

Utilities increase their profit by building new energy infrastructure. Request them to submit plans for increasing their build-out rates for new generation and storage.

Promulgate policies that scale up use of bidirectional EV charging of buildings. A model policy, SB 233, has passed the Senate and is progressing through the Assembly.

https://news.stanford.edu/2023/07/14/advancing-electrification-grid-coordination/

Sincerely,

David Bezanson

David Bezanson, Ph.D.

CA voter