

## **Nuclear Power in California: 2007 Status Report**

California Energy Commission: Oct. 2007 (Prepared for the 2007 Integrated Energy Policy Report)

This consultant report examines four broad subjects:

1. Nuclear waste issues include: a) the status of a federal repository at Yucca Mountain, B) the proposed federal reprocessing program, and c) issues related to the transportation of nuclear waste.
2. The costs of nuclear power are addressed from three angles: a) the costs of operation California's current nuclear power plants, b) the costs of building and operating new nuclear power plants, and c) the cost implications of a "nuclear renaissance."
3. Environmental and societal impacts of nuclear power include: a) the environmental implications of nuclear power, b) the role of nuclear power in climate change policy, and c) the security implications of nuclear power generation.
4. The future of nuclear power in the U.S. must consider: a) the safety and reliability of the aging U.S. nuclear fleet, b) license extensions that could keep the current fleet operating for an additional 20 years, and c) the development of new nuclear power plants.

From the "Abstract," page iii.

The report notes "the renewed interest in nuclear power (since 2005)...driven in part by considerable federal subsidies offered for new nuclear power plants, concerns about the impacts of greenhouse gas emissions, and volatility in fossil fuel prices." However, the 2007 report does not find a basis for changing long-standing state policy on nuclear power development: "existing plants can continue to operate, but development of new nuclear plants is contingent on the demonstration and approval of the technologies needed to reprocess or dispose of the spent fuel generated in nuclear reactors." (Executive Summary: pg. 1)

Major conclusions: From the Introduction, pg. 23-25

1. **Yucca Mountain.** A repository at Yucca Mountain is at least a decade from being opened, and the opening date continues to slip. Alternatives to Yucca Mountain are being considered because of concerns about the viability of the repository. California utilities should therefore continue to plan for indefinite storage of spent fuel at power plant sites, and should continue to move spent fuel to on-site dry cask storage facilities.
2. **Reprocessing.** Even with higher uranium prices, reprocessing of spent fuel is more expensive than a "once through" fuel cycle. Current reprocessing technologies do not provide substantial waste management benefits, nor do they address nuclear weapons proliferation concerns. The federal Global Nuclear Energy Partnership remains poorly defined, and new technologies that might result from that program could either exacerbate or alleviate waste management and nonproliferation concerns.
3. **Nuclear waste transport.** Nuclear waste can be transported safely with manageable risks to the public if shipments are conducted in strict compliance with existing regulations, but constant vigilance is required. Although extreme accidents are unlikely, their probability can be reduced through route-specific analyses to identify and diminish potential hazards. Greater information sharing by DOE regarding spent fuel transport routes and plans is needed to allow state and local input and to gain public confidence in these shipments.

4. **Cost of power: currently operating plants.** The cost of power from California's currently operating nuclear plants will be driven largely by the cost of the Diablo Canyon and San Onofre steam generator replacement projects and any other large capital projects that are required as the plants age, and by plant overall performance. Unexpected long-term outages, additional security requirements, and new once-through cooling regulations could also affect nuclear costs.
5. **Cost of new nuclear plants.** Cost estimates for new nuclear plants range widely and appear to have increased significantly in recent years. Federal incentives have fueled interest in new reactors; however, it remains to be seen to what extent that interest will translate into actual new development. A key issue will be the allocation of costs and risk for proposed new nuclear projects.
6. **Nuclear renaissance implications.** Increases in the prices for nuclear fuel, reactor materials, and skilled labor are likely if many new reactors are built, either in the U.S. or abroad. Supply constraints could limit the development rate and increase the costs of new reactors.
7. **Greenhouse gas emissions.** Nuclear power generates greenhouse gas emissions throughout its life cycle at a scale comparable to renewable power. However, nuclear power poses specific environmental risks, including aquatic impacts from once-through cooling; radiation hazards associated with mining, milling, and waste disposal; and potentially severe impacts from accidents or terrorism. Because of these concerns, as well as the uncertain costs and long development time for new nuclear plants, the proper role for nuclear power in a greenhouse gas reduction plan is the subject of heated debate, whose resolution will depend on the costs and development rate for all low-carbon resources.
8. **Malevolent acts.** Malevolent acts against nuclear power plants or HLW shipments are a major concern. NRC consideration of security issues for nuclear power plants and spent fuel transport has taken place with limited public scrutiny.<sup>1</sup> The National Academies recommended that an independent examination of security risks be conducted. (See recommendation #2: pg. 8-9.) Improved information sharing, without compromising public safety, would strengthen public confidence in NRC security regulation and oversight.
9. **Palo Verde.** The decline in performance at the Palo Verde plant<sup>2</sup>, if continued, could have a significant effect on the availability of power in Southern California. The difficulty in identifying and resolving the root causes of this decline suggests that regulators need a more effective means to monitor plant performance and safety culture issues at aging nuclear plants.
10. **License renewals.** PG&E and SCE are evaluating license renewals for their nuclear plants. The scope of issues considered in NRC license renewal proceedings is extremely limited, and focuses primarily on plant hardware and plant aging considerations. As a result, the state will have a limited opportunity to address concerns in these proceedings. However, state regulators will separately evaluate the need and alternatives for these facilities, and the impacts of cooling water requirements. State regulators may also undertake a reexamination of seismic requirements and land-use issues.

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<sup>1</sup> The NRC failed to publicly support its conclusion that current U.S. reactors would withstand an aircraft attack with a very low probability of radiation release, while some professional studies appear to have come to very different conclusions. (pg. 15)

<sup>2</sup> The plant's capacity factor fell unexpectedly from 94% in 2002 to 77% in 2005. (pg. 15)