ALLIANCE FOR NUCLEAR RESPONSIBILITY
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Comments and Recommendations filed by the Alliance for Nuclear Responsibility On the AB 1632 ASSESSMENT OF CALIFORNIA'S OPERATING NUCLEAR PLANTS

Oct 2, 2008

The Alliance for Nuclear Responsibility has reviewed the CEC Draft Assessment to the best of our ability since its release on September 12, 2008. We reached out to other organizations and attempted to provide comments and recommendations on as many chapters as possible. Sadly, one of the most important challenges to understanding the economic impacts of continued reliance on aging reactors –seismic vulnerability—has no comments or recommendations attached. This is NOT due to any lack of interest on this issue, but a lack of time to provide the comments and recommendations these Chapters deserve.

A4NR has provided comments and recommendations for:

Chapter 4—Seismic (a cursory review only – explained above)
Chapter 5 – Plant aging
Chapter 7 – Nuclear Waste Accumulation at Diablo and SONGS
Chapter 8—Land Use and Economic Implications of onsite waste
Chapter 9—Power Generation Options (specifically Once-through-cooling)
Chapter 10—State considerations for license renewal

We have also addressed decommissioning and emergency planning.

Due to severe time constraints for comments and recommendations, A4NR requests additional time to address Seismic concerns and/or leave to provide these comments on Oct 22nd after the Oct 20th workshop.

Sincerely,

Rochelle Becker, Executive Director
Alliance for Nuclear Responsibility
Vice-Chair, Sierra Club Radiation Committee

ALLIANCE FOR NUCLEAR RESPONSIBILITY, ET AL*, COMMENTS ON AB 1632 DRAFT ASSESSMENT

Chapter 4: Seismic and Other Vulnerabilities of Spent Fuel Storage Facilities, Transmission Systems, and Access Roadways

Local and State Emergency Preparedness Plans

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There are aging reactors located in regions subject to hurricane and cyclone threats, and although these facilities are “designed” to withstand the most extreme forces, they are, nevertheless, often been removed from operation in advance of these events as a “precaution.” Unfortunately, the sudden and “invisible” nature of an earthquake does not allow this precautionary action. There exists the potential for a large quake, and possibly Tsunami—beyond the design criteria—that could result in a radioactive release at Diablo Canyon or San Onofre, and it remains an unsettling scenario for those who live in the shadow of these aging reactors.

For years, community residents tried in vain to convince the Nuclear Regulatory Commission that they should consider a seismic event that could damage the reactor in combination with damage to evacuation routes, emergency equipment and facilities. In the past five years, earthquakes near both reactors, or natural disasters near reactors in several other states, have produced communication failures, siren failures, loss of and cellular and line communication systems. In June 2008, the Union of Concerned Scientists filed comments on behalf of the Alliance for Nuclear Responsibility and organizations from other reactor states and nationwide NGO’s on the Nuclear Regulatory Commission’s draft preliminary rule language regarding emergency preparedness regulations. We ask these comments be considered in the CEC’s final 1632 Report.

No community can plan for all contingencies in an emergency, but consideration should be given for the costs of possible scenarios that are foreseeable when aging nuclear reactors that represent terrorism security targets are located in fragile and earthquake-active coastal zones. Furthermore, a comprehensive review of all assumptions in current emergency plans must be upgraded with current information needed to meet California’s standards, including factoring in population growth and proposed waste transport routes in order to ensure that California’s local, state and federal emergency planners are prepared to protect all citizens. While the NRC does not find updated emergency planning to be a criteria for license renewal, this point of view is was not shared by NRC

Commissioner Jaczko in a recent filing by intervenors near the Three Mile Island Nuclear Plant:

> "I disagree with the decision to deny this petition for rulemaking. Instead, I believe the review of a license renewal application authorizing, if granted, an additional twenty-years of operation, provides the opportune time at which the agency should reevaluate emergency preparedness issues. Currently, the only time the NRC issues a comprehensive affirmative finding that both onsite and offsite emergency plans are in place around a nuclear power plant, and that they can be implemented, is at the time it grants an initial operating license. Although there are regular assessments of these plans through exercises and reviews, we do not periodically reassess that initial reasonable assurance of adequate protection of the public-- even if it was made decades ago--unless and until we find a serious deficiency in a biennial exercise. I believe considering emergency preparedness during the license renewal process would provide an opportunity to improve public confidence in the licensees and in all levels of government."[1]

The Alliance has linked the document--*Emergency Evacuation Aspects for SONGS Relicensing*--sent to us by Dr. Sheldon Plotkin on June 25, 2008, which we request the draft assessment's consultants to consider in their analysis. We have also linked the comments filed by the Union of Concerned Scientists, the Alliance for Nuclear Responsibility and seven other reactor oversight organizations on the NRC's newest emergency planning rulemaking (http://a4nr.org/library/07.2007-cechearings/09.2008-draftreportmtgs/09.2008-ucscomments)There are dozens of issues still unresolved on emergency planning by the NRC. One such example can be found on pages 157-158 of the draft assessment:

> In the Emergency Planning Zone, an approximate ten-mile radius around the plants defined for the plume exposure pathway, plans are in place to protect people, property, and the environment in that zone from the effects of radioactive contamination. These plans are reviewed and approved by the NRC and periodic exercises are conducted as described below.
>
> In the Ingestion Pathway Zone, an approximate 50 mile radius around that plant, plans are in place to mitigate the effects on agriculture, and food processing and distribution. These plans are also reviewed and approved by the NRC.

In fact, the Protective Action Guidelines (PAG) for radioactive contamination of drinking water, which are promulgated by the EPA—and used by the NRC—have not been updated or "finalized" since issued in draft form nearly a quarter of a century ago. EPA is currently proposing to formalize a dramatic relaxation of the Protective Action Guidelines, particularly for drinking water, that would allow people to drink water with radioactive contamination thousands of times higher than current permissible drinking water standards.

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[1] April 18, 2008 COMMISSION VOTING RECORD DECISION ITEM: SECY-07-0225 TITLE: REVISION OF NUREG-0654, SUPPLEMENT 3, "CRITERIA FOR PROTECTIVE ACTION RECOMMENDATIONS FOR SEVERE ACCIDENTS"

The Alliance, representing the public stakeholders, is closely reviewing new NRC regulations/rulemaking/policies and evaluating how these decisions consider and respond to our communities. We also attempt to identify those NRC decisions resulting in costs that will be paid by taxpayers and/or ratepayers. Consideration should be given to the increasing costs of updating and maintaining emergency response equipment, as well as training and personnel for the state's aging reactors if they are allowed to file to extend licenses for twenty years beyond current license terms.

It would be valuable for California residents and/or ratepayers to understand the full costs of emergency preparedness (cradle to grave – including waste transport) to assure that responsible energy planning incorporates ***all*** costs of dependence on aging reactor facilities. This would include payments to FEMA, county emergency services, first responder training and equipment along waste transport routes, and safely sequestering radioactive waste onsite, en-route and at the eventual permanent disposal site.

Seismic Vulnerability Assessment -- questions

1. Buried pipes & Tanks?

"12. The non-safety related systems, structures, and components (SSCs) of the plants are the greatest sources of seismic-related vulnerability for SONGS and Diablo Canyon" but need to include safety related buried components

Q. What is the age and materials of the buried components?

Especially interested in the intake coolant pipe, although the outflow is important is if breaks, clogs and results in back-up do that the critical reactor coolant system is interrupted.

Q. What about the fire water distribution piping?

Q. What about nack up diesel oil tanks and piping – in light "The switchyards of the plants could be particularly vulnerable to earthquake damage because the equipment configuration and the dispersed and interconnected nature of the switchyard facilities make them vulnerable to ground motion. In part, the degree of damage that could be sustained will depend on the extent to which SCE and PG&E have upgraded their plants' switchyard equipment to meet the newest seismic design standards. Failure of a switchyard could result in a loss of power from the plants even if the reactor units remain safe and undamaged."

At 17, "Ground movement near the support pads for the tanks could cause underground pipes to burst and damage the tanks."

Comment: Pilgrim Watch mentioned this issue in our re-licensing adjudication – it is also a contention in Indian Point's license renewal litigation by NY AGO.

2. S**pent Fuel Pools & Dry Cask Storage Facilities**
15. The spent fuel pools and dry cask storage facilities at Diablo Canyon and SONGS have been designed to sustain a design basis ("safe shutdown") earthquake at the plants, and they are unlikely to fail due to an earthquake.

Q. How is "unlikely" defined; basis conclusion – studies other than LTSP or in-house studies by PG&E that were reviewed?

Seismic Hazards at SONGS

"…possibility that the safety margin is shrinking suggests that further study is necessary to characterize the seismic hazard at the site, especially since much less is known about the seismic setting of SONGS than the seismic setting of Diablo Canyon." Has an independent analysts reviewed the studies?

Vulnerability of Power Plant Buildings and Structures

The safety-related systems, structures, and components of Diablo Canyon and SONGS are designed to remain safe during safe-shutdown earthquakes of magnitude 7.5

Q. Based on condition components in a 40 year life or what? How original design has been adjusted for aging components?

Vulnerability of Spent Fuel Storage Facilities

Correction "The design of spent fuel storage pools reduces the possibility of drainage leading to water levels lower than the stored fuel; nevertheless, loss of any amount of water is undesirable."

Correct to lower than the tops of the spent fuel assemblies – the NRC's denial of MA and CA petition rulemaking agreed in the Rulemaking Petition Decision the Commission confirmed the following three conclusions of NUREG-1738: partial drainage of a spent fuel pool is a more serious condition than complete drainage, aged fuel can burn, and spent fuel fires will propagate

Chapter 5: Plant Aging Vulnerability Assessment Plant Staffing and Training

Executive Summary Pages 19-23

Plant Aging and Reliability Assessment

> 2. Effective maintenance and a strong safety culture are critical to keeping Diablo Canyon and SONGS operating safely and reliably. The NRC has raised concerns about the safety culture at SONGS and has required SCE to create a plan to improve safety culture at the plant. Diablo Canyon appears to have a relatively effective safety culture and benefits from the oversight of the Diablo Canyon Independent Safety Committee.

Long before the creation of the DCISC, Diablo Canyon benefited from the close scrutiny of local citizen groups, and it is due to the early and effective diligence of those groups that there is a DCISC. In addition, the DCISC also benefits from ongoing community participation, and costs ratepayers over a million dollars a year. There is no similar independent safety oversight committee for SONGS.

> 4. Simulations find that no electricity supply shortages would occur as the result of either Diablo Canyon or SONGS being unexpectedly shut down for an extended period in the near term, nor would remedial action, such as additional demand response, energy efficiency, or additional capacity be needed for reliability purposes.6

Consideration should be given to defining “extended period” in point 4, as the time frame referenced as “extended” does not adequately set a parameter that would trigger a need for permanent replacement for Diablo Canyon or SONGS.

> 5. The simulations did not assess local reliability impacts of an extended outage at either of the nuclear plants or the availability of adequate generation resources after 2012.

Consideration should be given to initiating additional studies and periodically updated modeling to reassess the availability of replacement power at a system and local level as supply and demand conditions evolve and local transmission constraints change.

> 6. A prolonged shutdown of Diablo Canyon would not pose reliability concerns. However, a prolonged plant shutdown at SONGS could result in serious grid reliability shortfalls unless transmission infrastructure improvements are completed. Replacement power for SONGS would be available.

It is not clear what data was relied upon to assess prolonged shutdowns at Diablo Canyon and SONGS. Consideration should be given to studying the costs of upgraded and replaced transmission for SONGS and alternative green generation at Diablo Canyon in order to make informed decisions about reliable and cost-effective generation planning and reducing the radioactive waste footprint on California’s seismic coast.

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Vulnerability to Plant Aging-Related Degradation

> The state’s nuclear plants are now approaching their fourth decade of operation. As they age, their systems, structures, and components are all subject to age-related degradation, which, if unchecked could lead to a loss of function and impaired safety.

Many reactors have exhibited “loss of function and impaired safety,” yet few utilities, if any, have admitted that the age-related degradation remains “unchecked.” With resident inspectors at every reactor site, if this degradation is unchecked, who is to be held responsible? Consideration should be given to studying whether the rising shortage of experienced workers will exacerbate age-related issues at California’s reactors.

> Capacity factors at Diablo Canyon and SONGS have increased significantly since the early years of plant operation, and both plants achieved five-year average capacity factors of approximately 90 percent. This does not necessarily indicate the absence of plant degradation, but it suggests that, up to now, operational improvements and reductions in down time for plant maintenance and refueling have more than compensated for degradation related operational losses.

Virtually all major component replacements at these reactors were made after ratepayers were forced under deregulation to pay for replacement components. At the time Diablo was charged out to ratepayers in 1988, it was the *shareholders* that were designated to be pay these expenses. Diablo Canyon is now in cost-of-service ratemaking, without ever undergoing a reasonableness review.

> Researchers generally agree that age-related degradation is of greater concern for passive rather than active components. In the 1990s, NRC-sponsored research found that piping, steam generators, and passive components of the reactor pressure vessel comprised over half of nearly 500 reported degradation occurrences at nuclear plants in the U.S. Problems with reactor coolant systems and reactor vessels/internals have contributed to the greatest losses in energy production at nuclear plants nationwide. Careful monitoring of these components is crucial. In addition, EPRI’s groundwater protection guidelines should be followed to prevent inadvertent releases of tritium on account of degraded materials or operational failures.

The NRC has virtually stopped the kind of big picture research that it sponsored in the 1990s report. NRC researches specific aging problems, but stopped doing the "connect-the-dots" reviews and put the results from their specific aging programs in broader context. The NRC has admitted that they do not track “trends” for problems. The fact that 1990 is the most current NRC-sponsored research is puzzling and has little relevance to historical degradation at Diablo Canyon and SONGS; both had been online for less than a decade. The state should require updated research. We also concur wholeheartedly with the recommendation that, “Consideration should be given to requiring EPRI groundwater protection guidelines be followed to prevent inadvertent releases of tritium on account of degraded material or operational failures.”

> Plant component aging problems have surfaced at some U.S. nuclear plants. Davis-Besse, Vermont Yankee, Oyster Creek, and Indian Point have all received scrutiny by the NRC, government agencies, and/or watchdog groups concerned that different types of age-related degradation are eroding plant safety.

The preceding list is highly abridged. Every nuclear power plant has aging equipment and every nuclear power plant has aging equipment problems. Hope Creek had a steam line rupture in 2004. Farley had problems with aging electrical breakers. SONGS had the protracted outage in 2000 caused by a 25-year old electrical breaker scheduled for overhaul the following year. Fitzpatrick had a hole in its torus caused by aging degradation.

> The implications for Diablo Canyon and SONGS are twofold. First, the same unanticipated age-related degradation of some plant components or systems could be occurring at the California plants. Second, a serious incident or the identification of a safety hazard at one plant could result in a regulatory requirement for more extensive inspections, repairs, and even outages at similar plants nationwide. Maintenance plays a central role in mitigating age-related degradation and component failure.

Therefore, costs of resolving these aging problems at other nuclear plants should be given consideration for inclusion in the AB 1632 analysis, especially as there was no degradation in the Reactor Vessel Heads that were replaced at DC (at ratepayer expense), but were replaced because inspection relating to the Davis-Besse incident required additional and costly inspections, which increased the time necessary for refueling outages.

> A key element of an effective maintenance program is the plant's safety culture (a strong "safety-first" dedication and accountability among plant workers). However, the NRC has raised concerns about the safety culture at SONGS and has required SCE to create a plan to improve safety culture at the plant. The Institute for Nuclear Power Operations, an industry-funded oversight agency, has also identified safety concerns at SONGS, including an unusually high rate of employee injury. A strong safety culture is a key element of an effective maintenance program, and problems with safety culture have been linked to the high profile operational difficulties at the Palo Verde Nuclear Generating Station and the extensive degradation uncovered at Davis-Besse.

Two days before the September 25, 2008 CEC AB 1632 Assessment workshop, the NRC met with SCE officials at San Onofre to discuss several notices of violations and employee mishaps that point to a possible reduction in commitment to safety culture at SONGS. Safety culture concerns, the need to cut 28' by 28' holes in reactors to replace aging generations, once-through-cooling impacts, and onsite waste storage all have related cost impacts; consideration should be given to better understanding these costs in next years IEPR.

> Diablo Canyon, which has had no NRC violations since 1995, appears to have a relatively effective safety culture. In this regard, Diablo Canyon benefits from the oversight of the Diablo Canyon Independent Safety Committee, which investigates concerns that do arise. SONGS may benefit from a similar independent safety oversight committee.

Again A4NR finds it necessary to acknowledge the continual and informed oversight of community residents as partially responsible for a relatively effective safety culture at Diablo and for the DCISC's creation.

Impacts of a Major Disruption at Diablo Canyon and SONGS

> If an earthquake, age-related plant or equipment failure, or other event leads to an outage at one or both of the nuclear plants, the power from the impaired units would need to be replaced with power from other sources. Actions at other plants not directly related to the in-state nuclear plants could also result in a shutdown. For example, a major safety-related event at a nuclear power plant elsewhere in the country could lead to a general shutdown of other nuclear plants for an indefinite period of time. The reliability, cost, and environmental implications of an extended outage would depend on what time of the year the outage occurred and what replacement power was available.

Consideration should given to determining costs of age-related plant or equipment failures or other events that lead to outages and/or expensive retrofits at nuclear plants across the nation. This information would give California a greater understanding of the economic impacts of continued reliance on aging and dangerously sited nuclear facilities.

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> Unplanned outages can occur at anytime. The experiences of nuclear plants nationwide indicate that most unplanned outages last just a few days, although many plants have experienced significant operational disruptions lasting a year or longer, mostly from component degradation. (emphasis added)

To date ratepayers are being charged to replace Steam Generators, Reactor Vessel Heads, Turbine rotors, and other projects over $50 million (2008 dollars). Therefore, before California permits license renewal applications to be filed consideration should be given to prudently analyze cost projections for potentially replacing these components one to two additional times if License Renewals are allowed.

> The simulations suggest that no electricity supply shortages would occur as the result of either Diablo Canyon or SONGS being unexpectedly shut down for an extended period in 2012, nor would remedial action, such as additional demand response, energy efficiency, or additional capacity be needed for reliability purposes.

It would be useful for the AB 1632 analysis to define the assumed length for an “extended period” in 2012 as indicated in the previous sentence.

> Based on simulations, replacement power in the event of a year-long outage at either Diablo Canyon or SONGS in 2012 would be supplied mostly by combined cycle natural gas-fired plants.

Consideration should be given to a running a simulation in the event of a year-long outage in 2012 that would take into account the implementation of new renewable energy technology and efficiency that is coming on line. This would be valuable information for state planning purposes, and this may be better placed in “alternatives” section.

> For a year-long loss of either nuclear plant, the simulations found that these costs would be $470 million higher than the cost to generate power from the nuclear plant. The added cost would increase average rates for customers of either PG&E or SCE/SDG&E by approximately half a cent per kilowatt-hour (kWh) while the outage continued. Plant repair costs likely would further increase rates. .

Again consideration should be given to simulating the costs of replacing Steam Generators, Reactor Vessel Heads and Turbine Rotors now and possibly again if license renewal applications are allowed to be filed. This simulation appears necessary for responsible energy planning. We can't afford to get this wrong or go forward without adequate information.

> The 2012 simulation finding regarding available replacement power in the event of an outage at either nuclear plant is similar to current assessments of the California Independent System Operator that show sufficient reserve margins to accommodate the loss of either or both nuclear plants. This assessment of near term replacement power options is not applicable to the post-2012 period and does not consider local transmission constraints that may restrict the deliverability of power to certain areas.

Consideration should be given to initiating more complete studies needed periodically to reassess the availability of replacement power at a system and local level given updated supply and demand conditions and local transmission constraints.

> SONGS, on the other hand, appears to be a more integral part of the Southern California transmission system, and when it is shut down, imported power flows are also restricted. The extent of the transmission system changes would depend on the transmission configuration in place at the time of the SONGS shutdown.

Consideration should be given to initiating a study on the reliability and infrastructure improvements needed to supply transmission capability equal to SONGS capacity, including the possibility of phasing out SONGS operation by 2022.

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On page 187 of the CEC's consultant assessment it states that,

> "According to the NRC, tens of thousands of professionals and skilled craft workers will be needed in coming years to replace retiring workers and to assist in the construction of new plants.462 The NRC forecasts that 90,000 new workers will be needed by 2011 to continue operating current plants.463

On September 14, 2008, NRC Chairman Klein stated that, "…thirty reactor applications expect to be received by 2009 and the Nuclear Energy Institute (NEI) estimated last year that the industry could lose almost 20,000 workers, 35% of its workforce, to retirement by 2012 and another 6,000 to attrition."

While the NRC recently handed out $20 million in grants for faculty development and scholarships, consideration should be given to whether the efforts of the

nuclear industry will be adequate to fulfill the needs of the nuclear industry in providing qualified staff, both to regulate and monitor aging reactors, review license renewal applications and possible prepare for new license applications.

According to the Department of Energy Oak Ridge Institute for Science and Education, 729 people earned undergraduate degrees in nuclear engineering in 2007…almost double the 366 who did so in 2000. At that rate California should be considering the importance of quantifying how the industry will meet their forecast of 90,000 new workers by 2011, as well as differentiating how many of those will be working on aging reactors versus proposed new reactors, and ultimately, what this effort will cost both taxpayers and ratepayers.

With a nationwide call for 2 million new "green" jobs by 2010, replacing nuclear workers at aging reactor facilities will be a significant challenge. On September 15, 2008, Navigant Consulting, Inc., reported that more that 1.2 million employment opportunities, including 440,000 permanent jobs and $232 billion in investment would be supported in the U.S. solar energy sector alone through 2016 if Congress extends the solar investment tax credit for 8 years.[2] Consideration should be given to evaluating Navigant's research in calling for extension of the Federal Investment Tax Credit (ITC), which would redistribute the future workforce from nuclear to "green" energy and could have attendant consequences on the future labor supply at California's current and aging reactors.

In these times of financial uncertainty it is imperative that California learn from history and consider that if another TMI, Chernobyl or Kashiwazaki seismic event should occur, taxpayers will see their forced investment in aging nuclear-specific jobs squandered. Consideration should be given as to whether our state or our country can afford another large industry bailout. Of course, qualified nuclear workers will continue to be vital for operating reactors to end of current licenses and safe shutdown once these licenses expire.

California taxpayers and California's ratepayers should invest in renewable and efficiency job programs (as mandated by AB 32); yet for another few decades ratepayers must also be responsible for ensuring utilities are able to find and train those who will be able to safely operate the state's aging reactors until current licenses expire.

The CEC's consultant assessment continues:

> A 2001 study by NEI estimated that demand for nuclear engineering graduates would be about 150 percent of supply by 2010.464 Great need similarly exists in other employment categories such as qualified radiation protection professionals. According to NEI, demand for these workers is currently 130 percent of supply and is expected to reach 160 percent in the next five years.465 These projected shortages are driven by the demographics of an aging workforce: NEI estimates that only 8 percent of nuclear industry employees are

[2] http://seia.org/galleries/pdf/Navigant%20Consulting%20Report%209.15.08.pdf

> younger than 32 and that one-third to one-half of industry workers will be eligible to retire by 2015.466, 467 The workforce demographics at Diablo Canyon and SONGS roughly match the national trend.
>
> With aging workforces between 47.6 at Diablo Canyon and 53 years old at SONGS, PG&E and SCE have intensified their recruiting and training efforts in recent years at an annual cost of roughly $1 million to $3 million per year.470

Both utilities use ratepayer funding for their recruiting and training efforts, yet there is no assurance that these workers, once trained, will remain at California's reactors rather than transfer to another state where they can both live close to their worksite *and* afford the cost of living. Coastal areas, where California's reactors are located, have some of the most expensive housing in the nation. The need to staff California's and nationwide aging reactors and the call for new workers for the industry's dream of new reactors and a worker shortage at oversight agencies, aging workers are nearing a dire situation.

The Alliance fails to understand why the draft assessment, on page 188, should consider the assertion that "recruiting and training expenses" would be "short-term" expenses. Would these expenses not continue and even increase if new reactors are actually constructed and operate?

On page 188, the draft assessment states,

> A recent study by the American Public Power Association found that loss of critical knowledge would be the biggest challenge facing public power utilities as a result of upcoming retirements.471

The assessment continues by citing a 2005 survey,

> "whereby 62 percent of respondents reported that the inability to find replacements with utility-specific skills was also a challenge.472 Successful recruiting and effective training and knowledge transfer are critical for ensuring that the plants continue to operate safely and reliably."

Training a new workforce that may have difficulty understanding the aging and unforgiving technology they will be employed to keep safe could, as reactor facilities age, become a economic nightmare for our state and its citizens. The Alliance for Nuclear Responsibility requests that the CEC consider the probability of creating and maintaining a well-trained workforce through end of current licenses and also through license renewal, and the estimated costs to ratepayers for both these ongoing training programs.

The draft assessment continues on page 189,

> In response to potential labor availability issues, PG&E and SONGS are implementing new recruitment tactics. PG&E is currently seeking to hire 50-75 engineers, but anticipates that it will be difficult to recruit them.474 PG&E has also launched a new program to collaborate with community colleges, community-based organizations, workforce investment boards and labor unions in order to recruit new employees.475

> SCE has supplemented its recruitment processes by offering sign-on bonuses, relocation benefits, enhanced housing allowances, and loan repayment plans.476

The Alliance is unclear whether these recruitment programs and sign on bonuses include a requirement for a minimum period of dedicated local employment after training, as well as housing allowances and additional benefits.

Consideration should be given as to the costs:

1. of nuclear training programs in comparison to other alternative energy generation training programs and jobs within California;
2. the risks and benefits to California's taxpayers and ratepayers by the internationally recognized shortage of qualified workers for aging nuclear reactors and proposed nuclear facilities.;
3. of other generation facilities (PG&E, SCE or others) required from ratepayers to fund "signing bonuses" and the "relocation benefits", "housing allowances" and "loan repayments". The costs of these programs are not delineated in the draft analysis, but are necessary to make responsible energy choices for California and the nation.

Comments on conclusions of Chapter 5, draft assessment:

On page 190, it is stated:

> Effective maintenance and oversight can forestall, yet not prevent outages or the safety hazards that could arise as a result of age-related degradation. A key element of an effective maintenance program is the plant's safety culture. Problems with safety culture have been linked to high profile near-misses and operational issues, such as the incident at Davis-Besse.

While the AB 1632 assessment study was being drafted, several headlines drew the public's attention to questionable oversight at SCE's San Onofre reactor site. In fact two days before the CEC held its first workshop to review the draft, a headline in the North County Times announced, "Federal regulators, Edison officials agree safety culture at plant must change."[3] The draft assessment discusses aging components at aging reactor sites, with aging workforces and increased stockpiles of highly radioactive waste. Consideration should be given to the potential costs of these age-related risks. The study team should also be wary of using such phrases as "near-miss" when describing potentially devastating nuclear mishaps. The phrase chosen by the Nuclear Regulatory Commission for such events—and clearly more comprehendible to the public—is "accident precursor sequence."

Finally, page 190 states,

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[3] Nctimes.com By Paul Sisson - Staff Writer | Tuesday, September 23, 2008 10:43 PM PDT ∞

> "In this regard, Diablo Canyon benefits from the oversight of the DCISC, which investigates concerns that do arise."

As stated in the Alliance oral presentation before the CEC on Sept 25, 2008, it is vital that the CEC recognize that Diablo Canyon benefits from an involved community who is responsible for increased earthquake standards, better oversight and the very existence of the DCISC—which in return also benefits from active community oversight. While there is no analogous independent safety committee that oversees SONGS, there seems to be a historical lack of community participants living near the SONGS reactor site that are willing to find the support needed to participate as intervenors in proceedings before the NRC, CEC, CPUC, state and federal legislators. This is slowly beginning to change—again by increasing public oversight.

Consideration should be given to a public oversight commission—and any funding necessary to support it—in order to ensure all information relevant to continued operation of aging nuclear plants, workers shortages, seismic impacts, security and other national reports are provided to appropriate state oversight boards**.**

Chapter 7: Nuclear Waste Accumulation at Diablo Canyon and SONGS

Pages 216-239

> Nuclear reactors produce radioactive waste during the process of electricity generation and plant maintenance. Both spent fuel and low-level waste are stored at Diablo Canyon Power Plant (Diablo Canyon) and at San Onofre Nuclear Generating Station (SONGS). Spent nuclear fuel is a byproduct of electricity generation. Approximately every 18 to 24 months, a portion of the fuel rods in a reactor are removed and replaced with fresh fuel rods. Already, Southern California Edison (SCE) and Pacific Gas & Electric (PG&E) have accumulated over 2,200 metric tons of spent fuel at the plant sites.

It is fairly clear from California law established over three decades ago that the state did not anticipate storing several thousand metric tons of highly radioactive waste stockpiles on our fragile coast over twenty years after commercial operation of San Onofre and Diablo Canyon began. Citation after citation from both nuclear proponents and opponents reveal the country's frustration with the absence of a safe permanent repository for the nation's radioactive waste.

> The federal government is responsible for the ultimate disposal of this spent fuel. Storing nuclear waste at the plants imposes financial costs and also exposes nearby populations and the environment to risks of radiological contamination. Ratepayers bear some of the costs for storing nuclear waste at the plants, and taxpayers will bear the remaining costs. The taxpayer obligation arises from damage payments that the federal government is making to utilities for failing to take on-time delivery of spent fuel for disposal at a geologic repository. This obligation is increasing with time and with the amount of nuclear waste stored at plant sites throughout the country.

The Assessment goes on to discuss the DOE's pursuit of licensing the Yucca Mountain facility. However, it is important for the CEC to recognize that the NRC, DOE and many in Congress have proposed leaving all grades of radioactive waste onsite:

1) With the perspective of these expert studies and this regulatory background, how will the waste storage problem be resolved? First (and second, and third…) we need to involve the public. Without that public involvement, any suggested improvements to LLW disposal will be like a train without an engine, it will go nowhere.

On April 30 [2008], the ACNW issued their report and it raised additional items that will need to be addressed to move forward, such as land ownership and institutional controls, human intrusion mitigation measures, financial assurance requirements, and predictive performance assessments. [4]

2) It's [DOE] considering 10 disposal options in the study, including deep geological repositories in New Mexico and Nevada.[5]

3) Under a plan backed by U.S. Sens. Harry Reid and Pete Domenici, states with nuclear power plants could be responsible for storage of their own nuclear waste for 25 years.[6]

> The U.S. Department of Energy (DOE) is pursuing a permanent geologic repository for spent fuel at Yucca Mountain, Nevada. The license application for Yucca Mountain was filed with the NRC on June 3, 2008. If the license is granted, Yucca Mountain will begin operations sometime after 2020.528 The history and current status of Yucca Mountain and other federal spent fuel initiatives are discussed in Appendix A.
>
> > If Yucca Mountain or another geologic repository is opened in the future, spent fuel will be shipped from the plant sites to the repository. Similarly, if an off-site spent fuel storage facility is opened, PG&E and SCE could choose to ship the waste from their nuclear plants to this facility. As many as 390 shipments could be needed to move off site all of the spent fuel generated by Diablo Canyon and SONGS during the current operating period. Each shipment creates risks for the state and its residents. The state will also incur costs for training and emergency preparedness that may not be fully reimbursed by the federal government.

Consideration should be given to the costs of safe radioactive waste removal and transport to one or more offsite repositories, if Yucca misses yet more deadlines in the future. These costs should be analyzed in 2009 dollars and then estimates should be extrapolated for the costs, that ratepayers and/or taxpayers will incur in

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4 **"**The Key to Future Low-Level Waste Disposal Solutions – Public Involvement" Prepared Remarks for The Honorable Gregory B. Jaczko Commissioner U.S. Nuclear Regulatory Commission at the Second Annual RadWaste Summit Las Vegas, Nevada Sept. 3, 2008

5 4/28/08 Decision on nuclear waste disposal delayed By Annette Cary, Herald staff writer

6 http://www.lasvegassun.com/sunbin/stories/sun/2006/jun/29/566653026.html Nuclear Gamesmanship 8/17/06

California allows license renewals to be granted for current aging reactor power plants.

Characteristics of Radioactive Waste

> There are two major categories of radioactive waste from commercial nuclear reactors: spent fuel and low-level radioactive waste.529 Spent fuel is composed of uranium, plutonium, and fission byproducts that remain after the fuel has been used for electricity generation.530 Low-level waste is radioactive waste that does not meet the classifications of spent fuel and other high-level waste categories. It includes items that have been contaminated with radioactive material or have become radioactive through exposure to neutron radiation. These items include everything from protective clothing and cleaning supplies to water treatment residues and discarded reactor parts.531

The AB 1632 Draft Assessment included information on the hazards of both low-level and highly radioactive waste that is valuable; however the safety and health impacts of radioactive exposure are not within the purview of California legislators or oversight agencies. Therefore consideration should be given to quantifying the economic risks of these radiological impacts of increasing stockpiles of all levels of radioactive waste on the state's fragile coast. There is little doubt there are large cost components to the risks from exposure from radioactive waste; without analyzing these costs the AB 1632 analysis remains incomplete.

> Unlike Class A-C low-level waste, GTCC low-level waste may not be disposed of in a surface or near-surface level facility and may require disposal in a deep geologic repository.541 State governments are responsible for the disposal of Class A, B, and C waste. The federal government is responsible for the disposal of GTCC waste and spent fuel.542 There are no facilities currently licensed by the NRC for the disposal of GTCC low-level waste or spent fuel.

Consideration should be given to all cost impacts due to the absence of disposal sites for A, B, C and GTCC radioactive waste. Both ratepayers and taxpayers have contributed to finding solutions for safe radioactive waste disposal; yet while the costs have increased, the results remain far from a reality.

Waste Volumes

> Through the end of 2007, Diablo Canyon and SONGS operations had generated 2,300 metric tons of uranium (MTU) in spent fuel, 44,000 ft3 of Class A low-level waste, and 1,700 ft3 of Class B and C low-level waste.543 Operations at the facilities will continue to generate spent fuel until the plants cease operating and will continue to generate low-level waste through decommissioning.

While Table 12 provides a summary of the waste that has been and will be generated at these plants under the current license period, during a possible 20-year license extension, and during decommissioning, consideration should be given to assigning costs to the storage of radioactive waste unanticipated by

ratepayers and state agencies when Diablo Canyon and San Onofre were granted Certificates of Public Convenience and Necessity in the late 1960's.

On-Site Spent Fuel Storage

The Alliance for Nuclear Responsibility full supports comments submitted by the San Luis Obispo Mothers for Peace on issues of radioactive fuel storage.

> The spent fuel pools at Diablo Canyon and at SONGS Units 2 and 3 have capacities of 2,948 and 3,084 spent fuel assemblies…respectively.554 The pool racks at San Onofre were modified in 1990 (SONGS Unit 2) and 1991 (SONGS Unit 3) to increase the capacity of each spent fuel pool from 800 to 1,542 spent fuel assemblies. According to a PG&E response to an A4NR data request, "When PG&E received its license to operate Diablo Canyon Units 1 & 2, each unit was allowed 270 fuel assemblies in its respective low-density racks.

While there may be room in the pools "sufficient to store the spent fuel from roughly 25 years of operations" there is conflicting information on whether the tightly packed radioactive fuel pools could increase the probability of an uncontrollable fuel pool fire in the event of water loss or damage due to an earthquake, worker error, or an attack or act of malice and/or insanity. The AB 1632 draft Assessment appears to have omitted this invaluable study and A4NR would ask that it be considered in the final analysis and the upcoming IEPR. A4NR has linked an article describing the NAS study, but urge the CEC to review the full NAS Report before issuance of the final AB 1632 assessment. (http://a4nr.org/old_news/2.nationalacademyscience/?searchterm=National%20Academy%20of%20Sciences)

> Since the spent fuel pools are approaching capacity, PG&E and SCE have been constructing on-site dry cask storage facilities, also known as independent spent fuel storage installations (ISFSIs), to provide additional storage space.555

Consideration should be given to using terms the public and legislators will understand when reviewing this important report. Therefore, A4NR requests that the CEC and its consultants refer to onsite storage of radioactive waste (either in pools or casks) as just that and not "ISFSI's" as this acronym (used thought the draft Assessment) and even its full name obscure the safety, security, and economic impacts of storage of radioactive waste on the state's fragile coast.

ISFSI Construction Schedules

A4NR suggests that the CEC update these schedules each year to track costs of these projects. Without current information on what onsite storage will cost ratepayers through the end of current licenses; it is virtually impossible to understand the full impacts of increasing stockpiles of highly radioactive waste if the state's aging reactors are allow to apply to the NRC for continued operation, beyond current license terms.

Neither utility appears to have adequate storage at their recently licensed onsite storage pads to store radioactive waste created if a license renewal is applied for and granted. While PG&E had been candid during its licensing proceeding that another large pad would be required for waste produced during a license renewal, SCE was not. A4NR's statement and documents relied upon were presented at the CEC workshop on September 25, 2008.

> PG&E plans to build an ISFSI that is large enough to store all of the spent fuel that will be generated during Diablo Canyon's current license period (Table 14). With this ISFSI, PG&E would have sufficient room in the spent fuel pool to continue operating the reactors for 25 years past their current operating licenses, even if no off-site storage space is available.

PG&E's scenario appears to continue to keep radioactive fuel assemblies tightly packed and, therefore, according to the above referenced National Academy of Sciences study, increasingly vulnerable to an uncontrollable radioactive fuel pool fire. The costs of reducing the number of fuel assemblies to the original license design should be considered in the final Assessment for AB 1632.

> PG&E would also be able to move all of Diablo Canyon's spent fuel to the ISFSI and fully decommission the spent fuel pools should the reactors' licenses not be extended.

A4NR fully supports the above scenario.

> SCE plans to build an ISFSI with capacity for less than 40 percent of the spent fuel to be generated during SONGS' current license period, relying on the spent fuel pool to store the remaining spent fuel.
>
> This means that additional storage space would be required if SONGS were to continue operating past its current license or if SCE wished to decommission the SONGS spent fuel pools prior to the availability of off-site spent fuel storage.

Consideration should be given to conflicting information presented by SCE to A4NR in the current SCE GRC, and to CEC analysts relating to adequacy of onsite radioactive fuel storage.

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Mothers for Peace Challenges Diablo Canyon ISFSI License

Again, A4NR fully supports comments and recommendations filed by the San Luis Obispo Mothers for Peace on storage of highly radioactive waste onsite at Diablo Canyon.

> Moreover, SCE may need to expand its storage capacity further during the current SONGS license period. Due to a change in SCE's plans for operating SONGS, the SONGS spent fuel pool and ISFSI are now expected to have sufficient combined storage capacity for only 98 percent of the spent fuel that will generated during this period (Table 14).557 In order to accommodate the remaining spent fuel, SCE will need to secure offsite storage or develop additional capacity. SCE has not yet determined how it will manage the extra spent fuel.558

As for SCE's onsite radioactive storage facility, we reiterate our distrust of all information provided by SCE to the CEC on issues that do not have independent verification. SCE should be required to determine how it will manage radioactive fuel waste that may be required if a license renewal is applied for and granted. Included in this determination should be the estimated costs for this additional onsite storage. Utility dry cask storage is an interim solution for waste disposal.

The NRC has no definition for the term "interim solution for waste disposal." Without confirmation of what "temporary" means before a license renewal application can be filed, it would be premature for the state to decide whether an additional twenty years of increased radioactive stockpiles on California's fragile coast is in the state's best interest.

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> NRC licenses for ISFSIs are valid for 20 years but may be renewed. PG&E's ISFSI has a design life of 50 years, and SCE's ISFSI has a design life of 100 years with canisters rated for 40 years.563

Consideration should be given to the fact that none of these radioactive waste canisters have been in operation for their full design-life. Given the fact that ratepayers are currently being charged to replace steam generators, reactor vessel heads, turbine rotors and other large and expensive components "designed" to last the full license terms for Diablo Canyon and San Onofre, consideration should be given to additional costs that might arise from premature cask failure.

> If the spent fuel is not transported off-site within the design lives of the ISFSI components, the spent fuel may need to be repackaged on-site and transferred into new storage canisters, or the current canisters or other ISFSI components may need to be bolstered. At this time there are no estimates as to how long the spent fuel will remain in interim dry-cask storage, and no additional off-site or on-site interim fuel storage facilities are being considered by either PG&E or SCE.564

Consideration should be given to analyzing costs of repackaging, transferring into new storage canisters, bolstering of components or increased security requirements. This information would benefit California, as well as other reactor states, struggling with the same economic challenges of continued reliance on aging reactors in areas of seismic danger or along major water supplies.

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Spent Fuel Storage Costs

> Based on data provided by PG&E and SCE, constructing and filling the Diablo Canyon and SONGS ISFSIs will cost roughly $160 million and $300 million (present value), respectively.565

A4NR asks that the CEC consider independently review the data provided by SCE on the costs of their onsite radioactive waste storage facilities.

> Notably, the planned SONGS ISFSI will be both smaller and more expensive than the Diablo Canyon ISFSI. On a per assembly basis, the SONGS ISFSI will cost more than three times the Diablo Canyon ISFSI (Table 15)

Consideration should be given to requiring SCE and PG&E to supply updated and final costs for their onsite radioactive waste storage facilities thereby providing the CEC with current cost information on which to update the AB 1632 analysis and the Commission's IEPR and to estimate the additional costs should the state allow a license renewal application to be filed.

> Delays in shipment to offsite storage of up to 25 years might incur $1.5 million (2008$) per year in operations, maintenance, and security costs.570 Additional delays could require that the spent fuel be removed from the ISFSI and repackaged in new canisters on account of 50–year ISFSI design life.

No one appears to know whether highly radioactive waste currently stored on California's fragile coast will remain for years, decades, centuries, or in perpetuity. No one knows the economic impacts of leaving highly radioactive waste on California's fragile coast for years, decades, centuries, or in perpetuity. No one in the world has successfully sited a safe and permanent deep geologic repository. Safety, security and costs impacts of proposed routes to transport highly radioactive waste to "somewhere else" are unknown. When California passed the Warren/Alquist Act creating PRC 25524, the centerpiece of concern was highly radioactive waste produced daily through the operation of nuclear reactors stored near seismically active areas in our state. The state had the foresight to say no more reactors can be build in California until a safe, permanent storage facility is in place and has been approved by the state's legislature. When PRC 25524 was codified the NRC had not considered rules, policies, regulations that would allow additional decades of operation beyond original licenses.

Nuclear Waste Fund Litigation

It is "Litigation" that drives up the costs of addressing utility actions and participating in the NRC oversight process, thereby greatly reducing or eliminating public, local and state participation. Challenging PG&E's plan to store waste and appealing NRC inaction regarding security concerns in a post 9/11/01 world was extremely costly. While ratepayers pay for expensive outside council for the utilities, the public determinedly raised close to $100,000 to appeal the NRC's decision to disallow security contentions in federal court. Although San Luis Obispo County, Senator Dianne Feinstein, and the California Energy Commission supported hearings on security, none provided resources for the federal appeal. A4NR is aware that that the draft was not referring to "litigation" in general, but to utilities suing the DOE to recoup costs paid by their ratepayers

into the Fund. This statement will be repeated in the Assessment's Chapters on aging components and security. Providing a clear path for utilities and ratepayers and governmental bodies to the true costs of continuing to rely on aging reactors versus investing our resources in phasing out reactor sites and limiting the production of highly radioactive waste on California's coast.

> These payments notwithstanding, ten years after the federal statutory and contractual deadline for accepting commercial spent nuclear fuel, DOE has not yet begun to receive spent fuel from the utilities nor has it licensed a federal repository for the waste.578

Consideration should be given to the possibility that radioactive waste will remain on California's coast indefinitely. What should be done to limit the stockpiles of waste? Has the state addressed all issues of security and seismic upgrades at coastal reactor sites? What are the costs of storing radioactive waste in perpetuity on California's coast? How long will ratepayers be responsible for the waste after the last KWh is produced at reactor sites? Consideration should be given to knowing these unknowns.

> PG&E and SCE, along with many other utilities, have sued DOE for breach of contract because DOE did not begin to receive spent fuel at a federal repository by the 1998 statutory and contractual deadline. The utilities' lawsuits are ongoing. The U.S. Court of Appeals ruled in 2005 that utilities suing DOE on this account may claim only damages that have already been incurred unless they are willing to release DOE of all contractual obligations to receive the spent fuel.579 Therefore, claim amounts represent only partial damages, and future lawsuits will likely be necessary to supplement damage claims.

Consideration should be given to requiring that SCE and PG&E file for compensation for additional damages from the lack of a federal repository to take radioactive waste produced and stored at reactor sites since their last GRC or similar CEC proceeding.

Spent Fuel Packaging and Transport Issues

> Diablo Canyon and SONGS spent fuel will remain at the power plants until a federal repository or offsite interim storage facility is opened. Under DOE's current plan, shipments of commercial spent fuel would contain one to five casks per train or a single cask per overweight truck.589

> > Based on the expected volume of waste to be generated at Diablo Canyon and SONGS, it would require between 70 and 340 shipments to transport all of the spent fuel to be generated during the current operating periods and an additional 40 to 190 shipments to transport the spent fuel that would be generated over 20-year license extensions.590

A4NR believes it is premature for California to allow license renewal applications to be filed by SCE or PG&E. Waste is the Achilles heel of the nuclear industry; California recognized this weakness in the nuclear promise and placed a hold on siting new reactors until a permanent solution is in place and approved by the California legislature. A4NR filed comments and reviewed comments filed by the

California Energy Commission and Attorney General on the impacts of proposed transport routes and other California impacts from Yucca Mountain.

A few of the costs that should be considered relating to packaging and transport:

1) Training and equipping of first responders along proposed transport routes
2) Location of vital services (schools, hospitals, emergency services) to proposed transport routes;
3) Property value depletion for homes and businesses along radioactive waste transport routes;
4) Securing each slow moving shipment
5) Delay of freight trains and passenger trains to allow passage of radioactive waste rail shipments

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> Spent fuel must be packaged in special transportation-safe canisters in order to be shipped offsite. These canisters—called "casks"—are designed to remain intact and withstand high-speed crashes, long-lasting fires, and submersion in water even under extreme accident conditions. It remains highly uncertain what would be involved in packaging the spent fuel for shipment and transporting it to an off-site repository, particularly since this will likely not occur for at least another decade.

The unknowns portrayed in the previous paragraph should give even the most ardent nuclear advocate pause. Consideration must be given to requiring federal oversight agencies and committees to reduce the uncertainties of packaging and transport and to holding all applications for license renewal until these uncertainties which could have enormous impacts to the state's economy have been addressed.

Packaging Requirements

> DOE plans to use a Transportation, Aging and Disposal (TAD) canister system for shipments from reactors to the proposed repository at Yucca Mountain. With this system, spent fuel could be moved directly from a spent fuel pool into a TAD canister and then remain in the same canister (with different overpacks) for above-ground dry storage, transportation to Yucca Mountain, and disposal at Yucca Mountain. However, spent fuel that is packaged in canisters that are not TAD-compatible may need to be repackaged either at Yucca Mountain or prior to shipment. Repackaging would likely result in additional costs to the utility, though these costs may be recoverable through the Nuclear Waste Fund (NWF) litigation discussed above….
>
> To date, DOE has specified only preliminary performance specifications for the proposed TAD system, and no TAD canisters have yet been developed.596, 597 In the absence of final regulations, the utilities have adopted their own canister systems. PG&E's spent fuel canister system is not compatible with DOE's proposed TAD system.598 SCE states that at this point it is unclear whether its storage system will comply with DOE's final TAD requirements.599

Consideration should be given to resolving the uncertainties of canister systems life expectancies and transport issues before applications for license renewals are allowed to be filed by SCE or PG&E.

Spent Fuel Transport Costs

> If, instead of a permanent repository, DOE or another entity builds an off-site interim storage facility, and PG&E or SCE opt to store spent fuel at the facility, the utility could be responsible for the costs of transporting spent fuel to that site.602 Since no such facility exists today, it is not known how many shipments, what distances, or what transport methods would be involved.

Consideration should be given to resolving the uncertainties of costs and infrastructure needed to transport radioactive waste to Yucca Mountain (in the unlikelihood that it ever opens) or “an off-site interim storage facility” before California allows SCE or PG&E to apply a license renewal application.

Accident Prevention and Emergency Preparedness Costs

PG&E and SCE fund the Nuclear Planning Assessment Special Account, which is administered by the California Office of Emergency Services and used to fund local planning authorities for nuclear power plant-related emergency response planning. Funds are distributed to the counties of San Luis Obispo, San Diego, and Orange and to the cities of Dana Point, San Juan Capistrano, and San Clemente. These cities and counties distribute the funds to local governments within the 10-mile emergency planning zone surrounding the two sites. In FY 2009/2010, the Nuclear Planning Assessment Special Account will provide $1.7 million for Diablo Canyon-related emergency response and $1.6 million for SONGS-related emergency response.604 Legislation passed in October 2007 extended this funding mechanism through
2019.605

Emergency planning costs reflect the risks of reactor operations and of on-site spent fuel
storage. In a study on the Indian Point nuclear power plant in NY, the authors presumed that emergency planning costs would not materially change if the reactors ceased operating as long as spent fuel remained on site.606 However, the authors did not provide supporting information for this assumption, and there is some evidence to the contrary. For example, after the Rancho Seco nuclear plant was shut down and its operating license terminated, state and local governments stopped receiving funding because of the reduced hazard.607

Under the Nuclear Waste Policy Act (NWPA) Section 180(c), DOE is required to provide technical and financial assistance for emergency response preparation for repository shipments. DOE has proposed a grant program for safe routine transportation and emergency response training.608 DOE proposes to make two grants available to states: 1) a one-time assessment and planning grant of up to

$200,000, and 2) an annual training grant with a base amount of $100,000 and a state-specific variable amount.609 The assessment and planning grant is to be made available no sooner than four years prior to the first shipment, and the annual training grants are to begin three years prior to the first shipment and to continue for each year of shipments. According to DOE's current schedule, shipments will begin sometime after 2017 and likely after 2020.610
Many parties submitted comments on DOE's proposed grant program. Among them, the Western Interstate Energy Board (WIEB) noted that DOE has not yet established a national transportation plan for repository shipments.611 WIEB commented that states would require at least three years after shipment routes had been identified and funding dispersed to adequately prepare for the shipments.[612]

Commissioner James Boyd of the California Energy Commission also submitted comments on DOE's proposed 180(c) funding policy. Commissioner Boyd described California's unique transportation situation. California has multiple waste generator sites and several large metropolitan areas potentially impacted by spent fuel shipments. The State will need significant time and resources to ensure the safe transport of spent nuclear fuel and to prepare for emergency response along shipment corridors in California.613 Commissioner Boyd stressed that the grant timeline should be flexible to accommodate large, populous states like California.

He estimated that California will need a minimum of 4-5 years prior to shipments for grant application, funding, initial needs assessments, plan development, and emergency response training.614 He also characterized DOE's proposed funding levels as "seriously insufficient" for California.615 Commissioner Boyd estimated that it would cost over $712,000 per year for training and equipment for shipments originating from the four commercial reactor sites in California.616 Additional costs associated with the routing of other states' shipments through California are not included in that figure. Table 19 below summarizes DOE's proposed policy and Commissioner Boyd's recommendations.

DOE has not yet clarified the extent to which state accident prevention and emergency preparation costs related to the shipment of spent fuel will be reimbursable from DOE through the Nuclear Waste Fund. In February 2005, WIEB, the Midwestern Council of State Governments, the Southern States Energy Board, and the Eastern Regional Conference of the Council of State Governments created the "Principles of Agreement among States on Expectations Regarding Preparations for OCRWM Shipments."617 Among these principles, the state governments asked that DOE define transportation-related activities for which funding from the Nuclear Waste Fund will be provided. The parties are still awaiting clarification from DOE.

Low-Level Waste Disposal

The Low-Level Radioactive Waste Policy Amendments Act of 1985 encourages states to enter into compacts with one another to arrange for disposal of low-level waste at common facilities. Currently there are only three low-level waste disposal facilities operating in the U.S. Of those facilities, only two recently accepted low-level waste from California: the EnergySolutions facility in Clive, Utah, which accepts only Class A waste, and the EnergySolutions facility in Barnwell, South Carolina, which closed to California and all other states not part of the Atlantic Compact on June 30, 2008.619

PG&E disposed of all the Class A, B, and C waste generated at Diablo Canyon prior to 2007 except for activated metal in the spent fuel pools, which is being accumulated until a sufficient quantity is available for packaging. Since the Barnwell facility closed to California generators in July 2008, remaining Class B and C waste will be stored in a shielded storage building on site.620

These on-site facilities have sufficient capacity to store all of the Class B and C waste to be generated through the end of the current operating license and through an extended operating license.621 PG&E reports that it will review other options for the disposal of Class B and C low-level waste if they become available.622 PG&E also plans to store large reactor components onsite until decommissioning in order to minimize low-level waste shipments and costs.623 (This includes the soon-to-be replaced steam generators.) A summary of PG&E's low-level waste disposal activities at Diablo Canyon since 2002 is shown in Table 20.

Faced with the Barnwell closure, SCE will also store all Class B and C waste at SONGS pending development of additional disposal options.625 SCE will continue to ship Class A waste to the Clive, UT facility and will evaluate any treatment and disposal options that become available. SCE also plans to prepare the SONGS steam generators for transportation and disposal off-site once the new steam generators are installed.626

However, the steam generators are large components and may be difficult to transport. In 2003 SCE attempted to ship the Unit 1 reactor vessel to Barnwell but was unable to find a suitable means of transportation given the size and weight of the vessel.627

As a result of the Barnwell facility closure, there is no Class B or Class C off-site disposal facility available for over 80 percent of the country's reactors.628 In addition, large quantities of low-level waste will be created when the oldest reactors running today begin decommissioning.629

In October 2007 the NRC issued an assessment of its low-level waste regulatory program in order to address upcoming challenges regarding low-level waste disposal.630 The NRC determined that its regulations are outdated and do not address the current large amounts of on-site low-level waste at the nation's reactors. The assessment identified seven high-priority near-term tasks that

could improve low-level waste regulation. The first task is to update guidance on extended storage of low-level waste for materials and fuel cycle licensees, to review industry guidance for reactors, and to identify whether there are any gaps in safety or security considerations.[631] The NRC expects to complete this task by the end of 2008.[632]

Costs related to the transportation and disposal of low-level waste are the generators' responsibility. Between 2002 and 2006, PG&E spent roughly $6 million on the storage and disposal of low-level waste.[633] A summary of PG&E's present and estimated future low-level waste transportation and disposal costs is provided in Table 21.

SCE reports that costs to transport low-level waste vary by the type of material, mode of transportation, and destination. For example, it costs SCE roughly $5 per cubic foot by rail and $10 per cubic foot by truck to ship Class A low-level waste from SONGS to the Clive, Utah facility and $400 per cubic foot to ship Class B and C wastes to Barnwell, South Carolina by truck.634 SCE declined to provide the Energy Commission information on SONGS low-level waste disposal costs.

Low-level waste disposal costs have risen significantly in recent years. A 2004 GAO report noted that over the prior 25 years disposal costs had risen from $1 per cubic foot to over $400 per cubic foot and that costs were expected to exceed $1,000 per cubic foot in the future.636 These cost increases will have the biggest impact when the plants are decommissioned. For example, PG&E estimated in 2006 that waste disposal costs during Diablo Canyon decommissioning would total $242 million (2004$).637 However, these estimates were based on a waste disposal cost of $248 per cubic foot, well below the cost of Class A waste disposal today. Total waste disposal costs would increase to $438 million (2004$) at $450 per cubic foot, and $974 million (2004$) at $1,000 per cubic foot.[638]

Conclusions

Diablo Canyon and SONGS produce significant quantities of radioactive waste in the form of spent fuel and other radioactively contaminated materials. These wastes must be carefully handled, stored, transported, and disposed of in order to protect humans and the environment from exposure to radioactive materials. In the case of spent fuel, which is extremely radioactive, it is necessary to store the fuel assemblies in a water-filled pool for a minimum of five years following removal from the reactor core to shield against high levels of radiation.

Both Diablo Canyon and SONGS lack sufficient spent-fuel pool capacity to store the quantity of spent fuel to be produced over the period of their operating licenses. The proposed federal repository at Yucca Mountain, which was to

accept this spent fuel for disposal, has experienced repeated delays and is not expected to begin accepting waste before 2020, if at all. As a result, both Diablo Canyon and SONGS have been forced to increase their on-site storage capacity for spent fuel through the construction of ISFSIs.

PG&E and SCE have taken different approaches for the design and use of ISFSIs at Diablo Canyon and SONGS, respectively. In the case of Diablo Canyon, PG&E has designed and permitted an ISFSI that will allow PG&E to transfer and store 100 percent of the spent fuel produced during the period of the current operating license. This approach would allow PG&E to decommission its spent fuel pool at the end of the current license if needed. SCE has designed an ISFSI with a capacity to store 36 percent of the spent fuel generated during the current license period. SCE intends to rely on its spent fuel pool to store the remaining spent fuel.

However, the total combined spent fuel pool and ISFSI storage capacity at SONGS is sufficient to contain just 98 percent of the total spent fuel expected to be produced. SCE has not yet determined how it will manage the additional spent fuel.

The costs for constructing and loading the ISFSIs are substantial. On a present value basis, the total cost is $160 million for Diablo Canyon and $300 million for SONGS. Since the ISFSI at SONGS is just 40 percent the size of the Diablo Canyon facility and nearly twice as expensive, the SONGS ISFSI is three to four times as expensive per fuel assembly.

Both PG&E and SCE have sued DOE for reimbursement of their ISFSI costs interim dry-cask storage, and no additional off-site or on-site interim fuel storage facilities are being considered by either PG&E or SCE.

If a federal repository is established, spent fuel will need to be packaged for transport, aging, and disposal (TAD). DOE has not yet established federal TAD packaging requirements, forcing PG&E and SCE to move forward with dry cask storage cask designs that may not be compatible with the TAD requirements. The costs for transport of spent fuel to off-site storage or disposal facilities will be substantial, including costs for security, accident prevention, and emergency preparedness. Policies are being developed to federally fund state and county emergency response preparation; however, California has claimed that the proposed federal program may be insufficient, both in the planned timing of the grant program and the amount of the proposed grants for state planning and for training emergency response personnel to respond to potential accidents involving California’s spent fuel shipments., claiming that DOE has breached the contract requiring the federal government to begin accepting waste for permanent disposal by 1998. PG&E received a favorable judgment that provides for reimbursement of certain ISFSI costs while denying other claims. PG&E is currently appealing the decision. A trial date to hear SCE’s claim has not been

set.Utility dry cask storage is an interim solution for waste disposal. PG&E's ISFSI is designed for a lifetime of 50 years, and the canisters used in SCE's ISFSI are designed for a lifetime of 40 years.

If the spent fuel is not transported off-site within the design lives of the ISFSI components, the spent fuel may need to be repackaged on site and transferred into new storage canisters, or the current canisters or other ISFSI components may need to be bolstered. At this time there are no estimates as to how long the spent fuel will remain in

Low-level radioactive waste also requires care in handling, transport, and disposal. There are only three facilities in the U.S. that accept low-level waste for disposal and, as of June 30, 2008, only the Energy Solutions facility in Clive, Utah, accepts low-level waste from Diablo Canyon and SONGS. This facility accepts only Class A waste. PG&E and SCE expect to continue to ship Class A waste to Clive and to store Class B and C wastes at the reactor sites until an alternate facility is available. The NRC is currently reviewing its policies regarding on-site low-level waste storage and expects to complete this task by the end of 2008.

Low-level waste disposal costs are relatively modest during ongoing plant operations. However, a substantial quantity of low-level waste will need to be disposed of when the plants are decommissioned, and the cost to transport and dispose of this waste, presuming a disposal facility is available, is expected to be hundreds of millions of dollars or more. Low-level waste disposal costs have been rising in recent years, and current estimates of disposal costs during decommissioning are based on outdated cost information. Costs could be substantially higher than estimated during the most recent California regulatory proceeding on decommissioning costs in 2005.

Consideration should be given to ensuring that an offsite high-level radioactive waste storage facility is in operation and that proposed transport routes are safe and secure before California allows SCE or PG&E to file license renewal applications for SONGS or Diablo Canyon.

CHAPTER 8: Land Use and Economic Implications of On-Site Waste Storage

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> The considerable uncertainty as to when and if a geologic repository or other interim waste storage facility will allow the removal of spent fuel from the plant sites requires policymakers to consider the land use and local economic implications of extended on-site storage, and even the possibility of nuclear waste remaining at the plant sites after the reactors have been decommissioned.

See A4NR Comments on decommissioning

Land Use Implications of On-Site Waste Storage

> SONGS is located within 60 miles of Orange County and the San Diego metropolitan area.

San Clemente is two miles from SONGS and is located in Orange County – therefore the "within 60 miles of Orange County" statement is potentially misleading.

Future Land Uses

> However, if a federal repository is not prepared to accept the spent fuel from the plant at the time of decommissioning, spent fuel could remain in an independent spent fuel storage installation (ISFSIs) at the site after the rest of the site has been decommissioned (see Chapter 7). When this occurs, plant owners can release most of the land for alternate uses; only a parcel containing the ISFSI surrounded by a 100-meter security zone must remain under NRC license.654
>
> Future land uses of the Diablo Canyon and SONGS sites and surrounding areas will depend on many factors.
>
> As is discussed below, the citizens of San Luis Obispo County have already expressed a strong preference for reserving the Diablo Canyon lands for public access and public use spaces, habitat preservation, and sustainable agriculture.

Consideration should also be given to creation of a "green" energy park, incorporating wind, sun, wave, tidal technology – the subject of constant PG&E advertisements on the future of energy generation and a possible technology center for the creation of energy efficient and appliances and programs.

> In the case of SONGS, future land uses are less certain at this time.

Consideration should be given to replacing the impacted transmission lines located near SONGS to another site that could bring "green" energy sources to SCE customers.

Experiences with Land Use Following Decommissioning

> The Maine Yankee nuclear plant occupied 820 acres during its years of operation. After the plant was shut down in 1996 and decommissioning activities were completed, the operator of the plant received approval from the NRC to release the majority of the plant site from NRC oversight. Remaining under NRC oversight is the ISFSI, which is located on 8.5 acres with a surrounding security zone of 300 meters in all directions. The remainder of the land is divided among the former plant owner, which retains between 100 and 150 acres of the original land; a 400 acre mixed-use development that incorporates a clean technology park; and a non-profit organization that will maintain the remaining area as open space with public access.

Consideration should be given to using the Maine Yankee example of a clean energy park to provide jobs, generation and economic benefits to San Luis

Obispo County should the state decide it's in California's best interest to phase out Diablo Canyon's aging reactors.

> Another New England power plant, the Connecticut Yankee plant at Haddam Neck, has also completed the decommissioning process. The plant's owner, Connecticut Yankee Atomic Power Company, recently issued a request for Expressions of Interest for development at the old plant site. More than 580 acres once occupied by the nuclear plant may ultimately be made available for development. Within this tract of land, the plant's ISFSI occupies 5 acres with an additional 70 acre security zone to remain under NRC regulation as long as the ISFSI remains.
>
> The Sacramento Municipal Utility District's (SMUD) Rancho Seco nuclear facility was shut down in 1989. Since that time, SMUD has built a 500 MW natural-gas fired power plant less than one mile from the former nuclear plant and a solar photovoltaic plant less than one-half mile from the former nuclear plant. Approximately 1,200 acres were set aside in 2006 for a nature preserve to the east and south of the former plant location. The Rancho Seco Recreational Area located approximately 1.5 miles to the west includes a 160-acre lake and 400-acre park. A separate wildlife refuge adjoins the park on the southwest.

Again consideration should be given to following the example of Rancho Seco in replacing aging reactors and limiting the production of highly radioactive waste and replacing with clean energy sources, innovative efficiency technology and open space – all of which will benefit San Luis Obispo County.

Diablo Canyon

> A ballot initiative in 2000 asked the citizens of San Luis Obispo County about their land use priorities for the "post-Diablo Canyon" period. Nearly three-quarters of voters responded that the county should "recognize the Diablo Canyon Lands as an exceptionally precious coastal resource by adopting policies that promote habitat preservation, sustainable agricultural activities, and public use and enjoyment consistent with public safety and property rights once the lands are no longer needed as an emergency buffer for the Diablo Canyon Nuclear Plant after its remaining operating life."655
>
> The experiences of other communities where nuclear plants have been decommissioned while spent fuel has remained on-site, though limited, indicate that extended on-site waste storage need not interfere significantly with plans to maintain the lands surrounding Diablo Canyon for habitat preservation, sustainable agricultural activities, and public use and enjoyment.

Nor should the decommissioned reactors at Diablo Canyon prevent citing "green" energy sources and innovative efficiency technology center to replace generation, jobs loss or economic impacts from phasing out aging nuclear reactors.

> This land is all part of the larger land parcel, known as Parcel P, of 585 acres on which the power plant sits. In response to an information request from the California Energy Commission (Energy Commission), PG&E stated it would likely retain Parcel P even after the power plant is decommissioned.658 PG&E stated it is too early to speculate about any other plans for land around this parcel.

It appears “Parcel P” could be used for “green” energy generation after nuclear reactors are decommissioned.

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Economic Implications of On-Site Waste Storage

Communities near nuclear power plants are concerned about living near a long-term nuclear waste storage facility. For residents, their property may be their most important financial asset. For businesses, actual and perceived risk by the public could deter customers and harm the local economy

Property Values

> Dry cask storage facilities at Diablo Canyon and SONGS are located within the footprint of the operating nuclear plants. This section examines the potential property value impacts associated only with the addition of dry-cask storage facilities to the plant sites. The impact on property values associated with the operating plants is a complex issue and is discussed in detail in Chapter 10.
>
> There is limited academic research on the impacts of long-term on-site spent fuel storage on property values in part because dry cask storage of spent fuel is a relatively recent development.666 The authors of this study were not able to identify any property value research that was conducted for an area surrounding a dry cask storage facility after the facility became operational or research regarding the impacts of long-term spent fuel storage that remained after a plant had been decommissioned. The research that is available and which was reviewed for this present study was completed in the 1990s and evaluated either perceptions about potential nuclear waste storage sites or the impact of announcements of plans to build a dry cask storage facility. Because these studies do not address the same situation as is being considered here, i.e. property value implications of an operating dry cask storage facility, the results of the studies are necessarily limited in their relevance.

Consideration should be given to initiating a study on the impacts of onsite radioactive waste storage on the property values of surrounding communities.

The AB 1632 Draft Assessment relates several studies on impacts of property taxes to onsite storage of radioactive waste. Some of the studies discussed relied on surveys and therefore were subject to bias reflecting the questions asked. Other studies rely on analytical data and appear to have differing results. Consideration should be given to whether property owners would be better or worse off if, instead of remaining on-site, the spent fuel was shipped off-site to a spent fuel disposal facility such as Yucca Mountain. In addition, consideration should also be given to including how property values could be impacted by a major accident or incident at a dry cask storage facility or elsewhere.

Business and Tourism

Business and tourism are vital to the local

> In the unlikely event of an accident at an on-site waste storage facility, adverse impacts on business and tourism would be expected in the area. In a review of literature concerning tourism impacts related to the 1979 incident at Three Mile Island, Himmelberger, et. al. found that these effects are short-lived and distance dependent.685 The researchers found that businesses within 30 miles of the accident suffered mild adverse impacts for four to six months and businesses further than 60 miles from the accident were not adversely affected.[686] economies in the areas surrounding Diablo Canyon and SONGS. Local businesses generate jobs and tax revenues, and visitor spending generates revenue for local businesses and tax revenue for local governments (see insert on "Tourism Revenues" below). Business and tourism could be directly affected if on-site waste storage is perceived by the public as posing health and safety risks.

Consideration should be given to determining the loss of tourist dollars if there was a radioactive release due to onsite storage (including overcrowded radioactive fuel pools) and/or transport accidents at or near SONGS. SONGS is located within 30 miles of both Legoland and Disneyland and about 50 miles upwind of Sea World. Finally SONGS and Diablo Canyon sit on California's irreplaceable coast.

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Consideration might be given to researching the financial loss and duration of loss to businesses and tourism from the 1994 Northridge earthquake in Southern California.

> As discussed in the section on property values, the perceptions reported in surveys do not always correlate well with actual economic actions. Since there currently is on-site spent fuel storage at both power plants, local business and tourism are unlikely to be further impacted unless increased media attention on waste storage or an accident at a waste storage facility increases the perception of the risk of onsite storage.

Increased media attention, accidents or attacks at waste storage facilities may appear unlikely at present, but are certainly not unforeseeable.

Pages 258
Conclusions

> A federal spent fuel repository will likely not be ready to accept spent fuel from Diablo Canyon and SONGS at the end of the plants' current operating licenses, and spent fuel may remain at the plant sites for an indeterminate period of time. NRC regulations allow the majority of a plant site to be decommissioned and redeveloped for other uses while spent fuel remains at the former plant site surrounded by a 100-meter security zone.
>
> The Connecticut Yankee nuclear plant site may also soon be developed. Accordingly, the presence of dry cask storage facilities at Diablo Canyon and SONGS after the plants are decommissioned should not prevent alternate uses from being established. In the case of Diablo Canyon, the plant site will likely be converted to primarily recreational use. In the case of SONGS, the plant site, which is located on military land, will presumably remain

> under the control of the U.S. Navy. The Navy will have the option to use the land for military purposes, to lease or sell it to another party, or to open it for recreational use.

Consideration should be given to establishing a state of the art “green” generation center and innovative efficiency technology center to counter the loss of jobs and economic impacts of phasing out Diablo Canyon by end of current license.

Consideration should be given to an analysis of property sales data and other economic indicators in areas where a dry cask storage facility is operating would provide a useful starting point to assess potential impacts of extended spent fuel storage at California’s nuclear plants.

Comments on: Chapter 9 Once Through Cooling

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> If the plants maintain high levels of performance and safety and do not require significant repairs, the costs could remain comparable to current levels with relatively minor increases due to higher nuclear fuel costs and potentially stricter security requirements. However, degradation of major components or extended outages could result in much higher costs.

Consideration should be given to the need to again replace large and costly components currently being replaced decades before their expected design life (steam generators, turbine rotors, reactor vessel heads). These costs are known, or will soon be known and values can be assigned as to economic risks if there is a need to replace again.

> In addition, the plants may be required to retrofit their once-through cooling systems prior to a license renewal. In a study for the Ocean Protection Council, Tetra Tech estimated that the retrofit and outage would cost a net present value of $2.6 billion at SONGS and $3.0 billion at Diablo Canyon.
>
> In addition, it is important to consider the environmental impacts from plant operations over an extended 20-year license period, including once-through cooling ocean impacts and impacts from continuing waste accumulation at these plants. The extent of the impacts will depend on the outcomes of state and federal policies and requirements for once-through cooling and on whether a long-term solution to the waste disposal problem is found.

Consideration should be given to what will it cost California to store waste onsite for an various scenarios…an additional ten years? To the end of current licenses? To the end of license renewal? Forever? These costs can be estimated by looking at historical costs of onsite storage and forecasting future costs and would enhance the state’s energy policy planning to incorporate these anticipated costs in future IEPRs.

Pages275-278

Once-Through Cooling (con't)

> The SWRCB estimates that Diablo Canyon entrains over 1.8 billion fish but impinges relatively few biological specimens (around 400 pounds, plus 1 large marine animal) on a yearly basis.745 Thermal impacts from Diablo Canyon, which discharges into a natural rocky cove, have resulted in significant changes to 150 species of marine algae and invertebrates and have greatly altered 1.4 miles of shoreline intertidal and subtidal communities.747

Consideration should be given to the Cease and Desist order that the California Regional Water Board prepared that stated the 1.4 mile sited above is closer to 2 miles.

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> The role of the State in the license renewal decision is limited by the NRC's regulatory authority over all radiological aspects of nuclear power. However, state agencies retain authority to issue certain operating permits, such as the National Pollutant Discharge Elimination System (NPDES) permit, which is required for the continued operation of the plants' once-through cooling systems.

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> One factor that could complicate reliability planning is a proposal by the State Water Resources Control Board to restrict the use of once-through cooling at California's coastal power plants.793 A recent study by the California Independent System Operator (CAISO) found that the coastal plants that use once-through cooling technology provide important near-term reliability benefits to the state.794 Over the past 5 years these plants have produced between 20 and 35 percent California's power.795

Consideration should be given to "near-term reliability benefits" of allowing once-through-cooling systems versus long-term phasing out and planning for "green" replacement generation.

> The Energy Commission and the CAISO have initiated an aging plant study to determine which of the coastal plants using once-through cooling are essential
> for grid reliability.796 If new regulation resulted in the early retirement of some of those plants, the reliability benefits provided by the nuclear plants could increase, which would make it more difficult to replace the nuclear plants without eroding reliability.797

Consideration should be given to initiating an aging plant study to determine how the state would replace generation for aging nuclear reactor sites that use once-through-cooling. In addition, incentives could be provided to allow operation until the end of current licenses in return for a concrete commitment to design future energy portfolios without using radioactive sources.

Pages 302-309

Once-Through Cooling Retrofit Costs

> Diablo Canyon and SONGS currently use once-through cooling to cool their reactors. As discussed in Chapter 9, once-through cooling systems can have significant and negative impacts on the marine life near the cooling system intake and outfall pipes. Due to these impacts, both federal and state governments have proposed regulations that limit the use of once-through cooling at new and existing power plants. While the regulations are still being finalized, it appears possible that Diablo Canyon and SONGS will be required to replace their cooling systems or to retrofit them in a manner that significantly reduces marine impacts.[827]
>
> The Energy Commission's 2007 Environmental Performance Report produced recommendations to retire or repower numerous aging once-through cooling power plants by 2012. However, it recognized that California's nuclear power plants present special circumstances due to their size, costs, and unique contribution to grid stability, fuel diversity, and resource adequacy, and therefore "should be evaluated carefully before new regulations on once-through cooling are finalized in California."[837]

As an estimated million gallons a minute of water travel through reactors, impinging and entraining marine life and increasing thermal impact upon discharge, it appears responsible to consider operation of California's aging nuclear reactors only through current license contracts, fully reliant on SCE and PG&E's commitment to planning a "green" generation portfolio and innovative efficiency program to replace 4000 MW of generation by 2022 -2025.

Electric Power Research Institute

> The Electric Power Research Institute (EPRI) conducted a study to document the costs of wet closed-cycle cooling retrofits compared to new facility installations, assess the feasibility of dry cooling at certain facilities, and discuss the environmental impacts of wet closed-cycle cooling.
>
> EPRI determined that retrofitting the nuclear plants would be very difficult and that the capital cost for retrofitting would be $750 million - $1.2 billion for Diablo Canyon and greater than $650 million for SONGS. These estimates do not include costs for replacement power while the plants are shut down during construction.
>
> The EPRI report also noted that environmental impacts associated with retrofitting nuclear power plants to wet closed-cycle cooling technology include increased air emissions due to decreased plant efficiency, drift and visible plume, 839 water and wastewater discharge and/or disposal, increased noise, visual impacts from taller cooling towers, temporary construction-related impacts, intake losses,840 solid waste from accumulation of suspended solids in cooling tower makeup water, and impacts to terrestrial ecology. Both Diablo Canyon and SONGS pose site-specific siting constraints because of their proximity to sensitive coastal habitat.

Consideration should be given to the *benefits* from retrofitting versus the full costs of continued operation after current licenses expire. Examples of benefits include:

1) The value of marine life saved.

2) The reduction of impacts from entrainment and impingement on marine life which are cumulative.
3) Reductions in fish stocks currently depleted each year with less and less recruitment of young occurring;
4) Reduction in the loss to California that is measured in loss in fish stocks and resulting loss of the fishing industry, cascading into loss to the tourism industry.
5) Reduction in the damage from the thermal plume at the outfall to bring California's reactors into compliance with the state's thermal plan.

Though it is unclear if the draft assessment includes fish eggs and larvae for both of California's reactor sites making the findings somewhat confusing and possibly misleading because, entrainment of larvae are by far the most significant element of OTC impacts. If it is the case that fish eggs and larvae were not included in the finding, consideration should be given to inclusion of these impacts.

A study released in 2005, "California's Ocean Economy" is an exhaustive update to the California Resources Agency and states: "California has the largest Ocean Economy in the United States, ranking number one overall for both employment and for gross state product (GSP), an impressive position, because California was the 5th largest economy in the world in 2000." Regarding Coastal Tourism and Recreation it advises that …"California must continue its leadership efforts to protect and enhance the natural resources, which draw visitors from all over the world." (Executive Summary)

A4NR recognizes that there has already been mitigation for some of these issues; however, mitigation for past impacts of cooling and thermal impacts should not be considered adequate to allow continued degradation for any marine life impacts if license renewals are sought.

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> In addition, it is important to consider the environmental impacts from plant operations over an extended 20-year license period, including once-through cooling ocean impacts and impacts from continuing waste accumulation at these plants. The extent of the impacts will depend on the outcomes of state and federal policies and requirements for once-through cooling and on whether a long-term solution to the waste disposal problem is found.

A4NR reiterates its call for consideration of allowing Diablo Canyon and SONGS to operate until the end of current license contracts without addressing once-through-cooling impacts, dependent on firm commitments to phase out operations of California's nuclear reactors by end of current license contracts.

CHAPTER 10: State Considerations for License Renewal

Draft Assessment pages 290-312

> The U.S. Nuclear Regulatory Commission's (NRC) license renewal process consists of a safety review, environmental review, plant inspections, and a separate review by the Advisory Committee on Reactor Safeguards.782 The safety review focuses on identifying and managing the detrimental effects of plant aging. The environmental review considers plant-specific impacts from license renewal, such as once-through cooling impacts.783 Other issues, including examination of seismic hazards, operational issues, environmental review of the existing operations or independent spent fuel storage installations, and analysis of spent fuel storage options are outside the scope of license renewal. The NRC Office of the Inspector General completed an audit of the license renewal process in 2007 and concluded that improvements were needed in reporting.784 (Emphasis added)
>
> The role of the State in the license renewal decision is limited by the NRC's regulatory authority over all radiological aspects of nuclear power.
> (Pages 290-219)

A4NR does not believe the state is as limited as the previous sentence suggests. State's can limit storage of waste; states can close down nuclear plants due to costs of operation; state's can close nuclear plants if they are unreliable; state's may be able to prohibit license renewal applications from being filed due to unmet promises from original license criteria (eg. Waste removal, Once-Through-Cooling). Examples of this state authority can be found from the upper Midwest to New England. California must not limit itself in exerting state control if the impacts of continued operation could jeopardize the economy of the state or cause "rate shock" to its ratepayers. Responsible energy planning is under state, not NRC authority. Consideration should be given to the state investigating its powers to address the economic impacts of California's continued reliance on aging nuclear reactors and growing onsite radioactive waste storage facilities before license renewal applications can be filed by utilities—at ratepayer or state expense.

> The role of the State in the license renewal decision is limited by the NRC's regulatory authority over all radiological aspects of nuclear power. However, state agencies retain authority to issue certain operating permits, such as the National Pollutant Discharge Elimination System (NPDES) permit, which is required for the continued operation of the plants' once-through cooling systems. Consequently, the NRC confers with state agencies as part of the environmental review and defers to agencies with appropriate regulatory authority. In addition, the limited role of the State within the license renewal proceeding is counterbalanced by the State's much broader authority to set electricity generation priorities based on economic, reliability, and environmental concerns. (Page 291)

Even though the Vermont Yankee nuclear plant provides one-third of electric generation in that state, their legislature is considering several alternatives to allowing license renewal for its nuclear plant, whose license expires in 2012. It appears that, in Vermont, the utility believes it can file for and attain a license renewal in under four years. In the past year, however, several aging issues—including the collapse of cooling towers—have reduced public confidence in the

continued operation of the state's nuclear plant. Californians deserve the most recent information on status of aging reactors, and the costs of continuing to operate them for an additional 20 years. Any such costs estimates prepared today (based on relicensing applications filed in the 2010-2012 time frame) based on current data must be extrapolated out to the years 2022 and 2025—when the existing California licenses expire—if the estimates are to have any meaning.

Consideration should be given to discovering why Vermont residents and ratepayers are not forced to pay for and pursue license renewal 14-16 years in advance of current licenses expiration, as the California utilities have expressed interest in so doing.

> The California Public Utilities Commission (CPUC) relied on this authority in establishing a framework for considering the cost-effectiveness of the Diablo Canyon license renewal (see "CPUC Framework for Evaluating Cost Effectiveness of License Renewal"). Should the CPUC determine that a license renewal is not cost-effective, the CPUC could use its rate authority to effectively restrict the operation of the plant through an extended license period, even if a license renewal is granted. Such an action would not conflict with the NRC's regulatory authority over the radiological aspects of nuclear power. (Page 291)

The CPUC cited testimony, exhibits and cross-examination by A4NR/SC [Sierra Club] and TURN, noting AB 1632 requires the CEC to assess key policy and planning issues affecting the future role of nuclear power plants in the State. As a result the CPUC required "PG&E to submit by no later than June 30, 2011, an application on whether to pursue license renewal. The application shall include PG&E's license renewal study and shall address (1) whether renewal of the licenses is cost effective and in the best interests of PG&E's ratepayers, (2) the CEC's AB 1632 assessment, and (3) any legislative framework that may be established for reviewing the costs and benefits of license renewal.[7]

> This chapter presents some of the major policy questions from the state's perspective that could arise in considering license renewals for the nuclear plants. It begins with an analysis of how much power the plants might generate over the license extension period and how important the plants are for local and system reliability. It continues with an assessment of state and local impacts from the nuclear plants. Finally, it concludes with a discussion of the impacts of once-through-cooling retrofit costs and potentially higher costs for labor, fuel, and security on the overall cost of nuclear power. (Page 291)

The last sentence of the above paragraph mentions "costs" three times (emphasis added); yet missing in this analysis are the **costs** of all issues but cooling tower estimates.

Estimated Electricity Production

> The largest potential benefit from license extensions would accrue from power generated by the nuclear plants…However, it is difficult to predict plant performance after an

[7] http://docs.cpuc.ca.gov/WORD_PDF/FINAL_DECISION/65852.PDF pg 102-103

> additional 20 or 30 years of use. No U.S. commercial reactor has yet operated for a 60-year period, and it is unclear how plant aging processes will affect plant reliability and electricity production. Annual electricity generation from Diablo Canyon and SONGS has fluctuated since startup. (Pages 295-296)

Consideration should be given to studies of annual electricity generation characteristics from aging reactors, which document fluctuations in performance from a period near the end of their current licenses, and during extended operations after license renewals are approved. Costs incurred due to the absence of planning for replacement generation projects—in light of potential unreliability of extended reactor life—should be included as well.

CPUC Framework for Evaluating Cost-Effectiveness of License Renewal

> The CPUC established a framework for evaluating a possible Diablo Canyon license renewal in response to a PG&E December 2005 request for $16.8 million for a license renewal feasibility study. The CPUC approved the requested funds and ruled that PG&E must submit the study to the CPUC by June 30, 2011, along with an application that addresses the results of the Energy Commission AB 1632 study, the cost-effectiveness of license renewal, and any legislative framework that may be established for reviewing the costs and benefits of license renewal. The study is to include a scoping analysis to review the structures, systems, and components at Diablo Canyon that would be reviewed under the NRC license renewal process; an aging analysis of the identified components; and a draft environmental assessment, which is required by the NRC application. The CPUC plans to review the study and the application and make a determination regarding license renewal by 2013. (Page 292)

The NRC license renewal process does not require costs estimates for increased maintenance, large component replacements, extended downtime, or enhanced security or seismic retrofits that be necessary to continue safe operation of nuclear reactors twenty years beyond current license terms. Therefore even a review of PG&E's in-house study in support of license renewal submitted in 2013 will likely have little relevance to the costs that may be required by ratepayers to continue to operate aging reactors. Consideration should be given to analyzing the costs related to NRC requirements to achieve license renewal or required to safely operate after license renewals are granted.

> SCE requested $17 million for a license renewal feasibility study for SONGS as part of its 2009 General Rate Case. The proposed study has the same scope as the Diablo Canyon feasibility study. SCE proposed to submit the study to the CPUC in 2011 together with an application that includes a cost-effectiveness analysis. Following CPUC approval, SCE would then submit a license renewal application to the NRC. The CPUC is expected to rule on SCE's General Rate Case including funding for the proposed study in late 2008. (Page 292)

A4NR filed in the SCE GRC as an co-intervenor with the Sierra Club, CALPIRG, Environment California Research and Policy Center and Cal Church IMPACT. A4NR was filed in both the PG&E and SCE GRCs on the issue of license renewal. In our opinion, SCE did not provide in-depth documentation to justify its $17 million request for its in house license renewal study. SCE refused to

disclose whether its stream generator replacement project was on schedule and within budget, even though it could conceivably file for a license renewal before this project is complete. The number of unknowns relating to the state's reliance on license renewal appears to be much greater for SCE at SONGS, than for PG&E at Diablo Canyon.

Assessment of Future Electricity Production

> Under the three scenarios, Diablo Canyon would generate 120,000-360,000 GWh over the course of an extended operating license period, and SONGS would generate 100,000-310,000 GWh.
>
> These results illustrate uncertainty regarding future output from Diablo Canyon and SONGS. They do not represent the full range of possible outputs, and they do not indicate the likelihood of each scenario. Since the amount of expected production from the nuclear plants is one of the most critical factors in determining the cost-effectiveness of a license renewal, this is an area that merits further investigation.
>
> The performance of commercial reactors in the U.S. older than Diablo Canyon and SONGS should shed light on the impacts of plant aging on performance in the years ahead. However, by 2013, the date the CPUC has targeted for making a decision on the Diablo Canyon license renewal, only 14 currently operating reactors will have operated for more than 40 years and none will have operated for more than 43 years.791 Without historical experience illuminating the aging process of reactors through year 60, significant uncertainty will remain regarding plant performance at Diablo Canyon and SONGS during an extended license period. (Pages 294-296)

Consideration should be given to further investigation into determining the amount of expected losses in production from nuclear plants in order to determine the cost-effectiveness of a license renewal. Furthermore, consideration should be given to encouraging the legislature and the CPUC to delay the acceptance date for license renewal applications until 2016 to allow for the inclusion of historical experience from the process of operating reactors as they approach their fortieth year.

Reliability Benefits

> The importance of Diablo Canyon and SONGS to the reliability of California's electricity grid over an extended license period will depend on the rate at which electricity demand in California increases, how much new generation and transmission capacity is built, how much old capacity is retired, and the location of each of these capacity changes. With proper planning, both plants could likely be replaced without eroding the electricity system's reliability.792 (Page 296)

Consideration should also be given to new innovative energy efficiency and conservation programs that could greatly benefit in reduced demand and creation of new technology within our state.

> The CPUC proposal to consider license renewal issues (that fall within the state's purview) approximately 10 years prior to potential plant retirements should provide sufficient opportunity for this planning. (Page 296)

Vermont appears unalarmed about planning for its energy future in a short time frame, and deciding whether or not to relicense Vermont Yankee—whose license expires in 2012—even though Vermont Yankee provides one-third of the state's electric generation. Surely California, with its abundance sun, wind and creativity, can plan to meet its future energy needs in the time remaining years before its current nuclear plants (and the approximately one-tenth of the state's energy they produce) expire.

> One factor that could complicate reliability planning is a proposal by the State Water Resources Control Board to restrict the use of once-through cooling at California's coastal power plants.793
>
> A recent study by the California Independent System Operator (CAISO) found that the coastal plants that use once-through cooling technology provide important near-term reliability benefits to the state.794 Over the past 5 years these plants have produced between 20 and 35 percent California's power.795 The Energy Commission and the CAISO have initiated an aging plant study to determine which of the coastal plants using once-through cooling are essential for grid reliability.796 If new regulation resulted in the early retirement of some of those plants, the reliability benefits provided by the nuclear plants could increase, which would make it more difficult to replace the nuclear plants without eroding reliability.797 (Page 296)

A4NR recommended to the State Water Board that nuclear reactors be allowed to operate outside of the requirements of the Clean Water Act provide that the utilities prepare to phase out the operation of their nuclear reactors by the end of current licenses. While CAISO is tasked with ensuring adequate generation, it has been our experience that the agency has little faith in Californians to reduce our demand and purchase energy efficient appliances.

> Another factor in the reliability benefits of the nuclear plants is how well they will operate over an extended license period. As discussed above, there is considerable uncertainty regarding the operations of aging nuclear plants. One possibility is that the plants will not provide the same level of reliability benefits over some or all of the extended license period, even if they continue to operate. (Page 296)

The statement above reinforces the recommendation of A4NR for consideration of a delay in state permission to allow filing a license renewal for aging reactors until closer to end of the current license term, when the state has a fuller understanding of economic and reliability impacts.

Local Economic Impacts

> Diablo Canyon and SONGS are integral components of their respective local economies and the state economy. The local economic benefits these plants provide include the contribution of tax dollars to the local economy, provision of employment opportunities in the local area, and direct purchases of goods and services. In addition, the plants provide significant indirect, or secondary, economic benefits.798 Closing either of the nuclear plants could thus have significant financial repercussions for their respective regions due to loss of plant-related jobs, reduced property tax payments, and foregone local purchases of products and services. (As discussed in Chapter 9, a comparable level of economic benefit would likely be transferred to the areas where replacement power was developed.) Property value implications of plant closure are less certain. (Page 297)

As discussed in Chapter 9, consideration should be given to replacement jobs in the energy sector in the areas most heavily impacted by a possible phase out of nuclear reactors by the end of current licenses. At the Diablo Canyon site, a state of the art "green generation" facility could be built (combining wind, sun, wave, tidal) providing new jobs, while maintaining many jobs at the nuclear facility to safely shutdown, decommission, secure and perhaps eventually transport the radioactive waste.

The grid system at San Onofre needs a major overhaul. Consideration should be given to the timing of that overhaul to coincide with the phasing out of SONGS generation by 2022.

Property Values

> Several academic studies have addressed the question of whether proximity of a nuclear plant has an effect on property values. Public opinion surveys have consistently shown aversion to a nearby facility and an expected decrease in property values. However, empirical results are less clear because the presence of a nuclear facility is associated with economic benefits, such as employment and property tax income, in addition to the negative effects associated with public risk perception.
>
> Folland and Hough examined the effect of nuclear facilities on the value of farmland across the United States from 1945-1992.813 Their study examined whether the presence of a nuclear facility within 60 miles would have an effect on property values. This distance was chosen as the result of a survey that asked laymen to state the distance from a nuclear reactor that they would accept when choosing a residence location.814 By including data from years prior to the installation of any nuclear reactors, the study corrected for the fact that nuclear facilities were often sited in less prosperous areas with lower population densities and that such locations may have had historically depressed property values. Folland and Hough's analysis concluded that the presence of a nuclear facility within 60 miles decreased the value of farmland by approximately 10 percent.815 Their results also showed that the older the reactor, the larger the negative impact on property values.816 (Pages 298-299)

A4NR finds neither the Folland nor the Clark studies applicable to today's perception of nuclear power and property values. Their conclusions need to be updated to included public perceptions and consequences of allowing aging reactors to apply to operate for an additional twenty years with no known offsite waste repository, unresolved proposed transport route issues, and increasing discoveries of offsite contamination of radioisotopes emanating from aging reactor sites, as experienced at facilities from San Onofre to Illinois.

As the property near Diablo Canyon is some of the most pristine and beautiful in the state, and no homes in San Luis Obispo county have a view of the twin reactors domes, high property values are not surprising. We have no opinion as to why property values near Rancho Seco may have increased, but we do notice the study was done after the reactors were shutdown.

> In the context of California's nuclear facilities, these studies show that the presence of Diablo Canyon and SONGS may have decreased property values surrounding the plants to some extent. However, Diablo Canyon and SONGS are large employers that offer relatively high salaries. These benefits must also be considered when examining the overall economic impact of the plants. Indeed, Clark and Nieves found that nuclear facilities are associated with higher than average income.823 In the case of Diablo Canyon, which is situated in largely rural San Luis Obispo County, the plant may provide proportionately larger positive economic benefits for the surrounding communities than SONGS, which is located in a broadly urban area between Orange and San Diego counties.
> (Page 301)

A4NR believes that consideration should be given to ensuring communities most heavily impacts by phase-out of aging reactor facilities be given first priority in provide innovative efficiency technologies and/or renewable generation to maintain the economic benefits to local communities and contribute to adequate green energy supplies to the state.

Economic Implications of Plant Closures

> Closure of the two nuclear plants would have complex economic implications for their local communities. Plant closures would inevitably lead to a loss of jobs and property taxes. However, these adverse impacts may not materialize immediately upon plant closure but would more likely materialize over several years as decommissioning activities progressed. At the same time, property value increases may partially offset this loss of income. If nuclear waste remains on-site, property value implications would be even less certain. (Page 301)

Consideration should be given to the number of efficiency-related or clean generation producing jobs and resultant economic implications in replacement of aging nuclear reactors.

> Economic impacts would also depend on how the plant sites are used once the plants are decommissioned. As discussed in Chapter 8, according to current plans, the Diablo Canyon property will not be redeveloped as a commercial or industrial facility but will be used for habitat preservation, sustainable agriculture, and public use. (Page 301)

Current plans discussed in Chapter 8, could be altered (as current plans often do) to allow PG&E to use the Diablo Canyon property to create a state of the art efficiency/green technology facility incorporating "habitat preservation, sustainable agriculture and public use."

> Closing SONGS would likely have a much less significant impact on the San Diego and Orange County economies. SONGS provides just one-tenth of one percent of San Diego County's annual property tax revenue, and SONGS employees are spread throughout a large region. In addition, there are many alternate sources of employment and other areas of economic activity in the vicinity of the plant.

> In order to quantify the net impacts to local economies from plant closure, area-specific studies would be needed. Property value impacts would need to be assessed through comparison with similar communities that did not have nuclear plants or by comparing property values in the vicinity of the plants over an extended period of time. Employment and income benefits would also need to be quantified and put into context of other economic activity in the region. Absent such an analysis, the net impact of Diablo Canyon and SONGS closures on their local economies remains uncertain. (Page 302)

Consideration should be given to quantifying net impacts to local economies from plant closure, area-specific studies, including assessing property value impacts, employment and income benefits.

Potential Increases to the Cost of Nuclear Power

> (SCE declined to provide information on the cost of power from SONGS) (Page 302)

Consideration should be given to requiring SCE to provide all information necessary to determine the full costs, benefits and risks of continued reliance on the aging SONGS reactors. If the required information is not forthcoming the state should have the power to deny the filing of license renewal applications for SONGS.

Once-Through Cooling Retrofit Costs

> While the regulations are still being finalized, it appears possible that Diablo Canyon and SONGS will be required to replace their cooling systems or to retrofit them in a manner that significantly reduces marine impacts.827 (Page 303)

Proposed Regulations

> [is defined as a reduction in both the] U.S. Court of Appeals for the Second Circuit ruled that the EPA regulations did not comply with the Clean Water Act. In particular, the court found that the Clean Water Act does not allow for a cost-benefit analysis to guide technology selection and ruled that the best technology available or an alternative technology that achieves that same level of results must be used. The court also remanded provisions for compliance through restoration measures.829 The EPA subsequently suspended its regulations and directed regional offices to exercise their Best Professional Judgment in considering NPDES permit applications.
>
> In June 2006, the State Water Resources Control Board (SWRCB) presented a proposed statewide policy that would require once-through cooling facilities to achieve the upper end of the impingement and entrainment reduction ranges provided by EPA's Phase II regulation (i.e. 95 percent reduction in impingement and 90 percent reduction in entrainment). If this is not feasible, "the power plant must reduce the level of adverse environmental impacts from the cooling water intake structure to a comparable level to that which would be achieved under Track 1, using operational or structural controls, or both." A "comparable level" impingement and entrainment mortality to at least 90 percent of the reduction that would be achieved under Track 1 with closed-cycle cooling technology.833

> The compliance date for nuclear power plants would be no later than January 1, 2021, which is near the end of the plants' current operating licenses.834 (Page 304)

Consideration should be given to waiving compliance if, and only if, SCE and PG&E agree to fully phase out their nuclear reactors by the end of current license terms and replace the power with less water-intensive generation.

Retrofit Feasibility and Cost

> With regard to nuclear power plants, converting to wet cycle closed-cooling has received the most study, because dry-cooling is not considered a commercially viable option. The general consensus from the studies is that retrofitting California's nuclear power plants with wet cycle closed-cooling technology is technically feasible (although challenging due to siting constraints), but the costs would be very high in comparison to retrofitting natural-gas fired power plants. Pertinent studies are described below. (Page 305)

Consideration by all state oversight agencies (CEC, COPC, CCC, others) should be given to waiving compliance if, and only if, SCE and PG&E agree to fully phase out their nuclear reactors by the end of current license terms and replace the power with less water-intensive generation.

Others

> PG&E commissioned a study of the economic benefits of reductions in entrainment losses from installing cooling towers at Diablo Canyon. The study found that the cost to retrofit the once-through-cooling technology at Diablo Canyon substantially outweighed the benefits.856 (Page 308)

It is not surprising PG&E's in-house study of actions that the utility would rather not adopt result in conclusions that support the utility-controlled study.

Implications for California's Reactors

> A restriction on the use of once-through cooling in California is likely to be implemented in the future. If the SWRCB preliminary draft policy is adopted, Diablo Canyon and SONGS would need to either adopt closed-cycle cooling systems or reduce the negative effects of their once-through-cooling systems to a level comparable to the effects of a closed-cycle system. (Page 308)

Consideration should be given to waiving compliance if, and only if, SCE and PG&E agree to fully phase out their nuclear reactors by the end of current license terms and replace the power with less water-intensive generation. This would save ratepayers $2.62-$3.02 billion and reduce the impacts from retrofitting the reactor facility's cooling systems.

Labor Availability

Addressed by A4NR under "workforce" issues

Nuclear Fuel Prices

> PG&E and SCE both anticipate that their nuclear fuel costs will increase in the coming years and be 70 percent higher in 2014 than they were in 2007. 861
> (Page 309)

Nuclear fuel is another unknown and rapidly changing commodity. The volatility of uranium prices in the past few years, combined with the "hoarding" of large uranium supplies, as well as the location of large uranium supplies in relation to U.S. reactors should all be given consideration in the final AB 1632 assessment and future IEPR's.

Consideration should be given to the anticipated growth in demand for nuclear fuel supplies and the possible reduction in costs for green generation facilities. Scare and shrinking ratepayer dollars must be invested in energy sources that will bring generation independence, reliability and reduction in climate impacts from electric supplies.

Security Requirements

A4NR fully support any comments filed by the Union of Concerned Scientists and/or the San Luis Obispo Mothers for Peace on issues relating to security.

> Following the attacks of September 11, 2001, the NRC began to review nuclear power plant security requirements. Following this review, the NRC updated the design basis threat for the plants, increased requirements for security personnel, and enhanced force-on-force exercises.865
>
> The NRC also proposed a rulemaking to amend 10 CFR Part 73 requirements for physical protection of the nation's nuclear plants.866
>
> The proposed physical protection rules would enhance requirements for access controls, event reporting, security personnel training, safety and security activity coordination, contingency planning, and radiological sabotage protection. They would also impose additional requirements related to background checks for firearms users and to authorization for enhanced weapons.867 The NRC received 48 comments on the proposed rules during the comment period, attack.869 No date for the final ruling has been released, though the ruling is expected by the end of 2008.870 Comprehensive security requirements in line with the intervenor request to require protection against an air-based suicide attack could result in significant capital expenditures to build steel shields around the plants. However, the NRC is not likely to impose such requirements. The NRC rejected a proposal to protect against air attack when it was raised in the 2007 design basis threat review, and the NRC continues to maintain that the likelihood of an air attack is low and that it is the responsibility of the federal government and the military, not nuclear plant operators, to protect against any such attack.871 (Pages 310-311)

As recently as September 29, 2008, the Massachusetts Attorney General's Office filed a Petition for Review of the Nuclear Regulatory Commission Decision to deny Petitions for Rulemaking PRM 51-10 and PRM 51-12 with the First Circuit

Court of Appeals. The issues: spent fuel pools potential accidents, terrorism and license renewal. Attorneys General of New York, Washington, California, Utah and others have also questioned the NRC's refusal to address issues that could have severe economic implications for their citizenry.

Consideration should be given to recommending that Congress investigate and hold hearing on the implications for requiring—or not requiring—"defense in depth" at existing reactor facilities. What would be the economic impacts of a major release at a reactor site due to breach of containment or radioactive storage pools or casks?

Conclusions

> The decision whether or not to renew the Diablo Canyon and SONGS operating licenses will have a significant impact on the state's power supply portfolio and on the communities located near the reactors. Unfortunately, the full implications of this decision are unknown. Even the most straightforward question of how much power would be impacted by this decision cannot be answered with any certainty. While current production levels from the plants are known, it is unclear how performance will change as the plants age—no commercial reactor has yet
> operated for a full 60 years. (Page 311)

Consideration should be given to withholding state permission to file for license renewal applications to extend the life of aging reactors for an additional twenty years until there is historical data on which to rely for accurate costs and reliability estimates.

It is clear that the costs of operating aging nuclear plants beyond current license terms would be better understood if the state waited for the resolution of many unknown issues cited in the draft assessment. It is clear that ratepayer, utility and state risks would be greatly reduced if we wait to see how issues of once-through-cooling impacts, security enhancements, aging component failure rates and nuclear fuel prices are played out. Consideration should be given to withholding permission for SCE and PG&E to file for license renewal applications for their aging nuclear reactors.

> In addition, it is important to consider the environmental impacts from plant operations over an extended 20-year license period, including once-through cooling ocean impacts and impacts from continuing waste accumulation at these plants. The extent of the impacts will depend on the outcomes of state and federal policies and requirements for once-through cooling and on whether a long-term solution to the waste disposal problem is found.
>
> The impact that shutting down one or both of the plants would have on the reliability of California's electricity grid is unclear at this time. The impact will depend on what other generating and transmission resources are built or retired over the next two decades and on the pattern of population growth in the regions near the plants. This is an area that needs to be investigated further prior to any decision on license renewal.
>
> The loss of the plants would mean the loss of high-paying jobs and tax revenues for the communities located near the reactors. Given current economic conditions, this loss

would be felt more strongly in San Luis Obispo County following the closure of Diablo Canyon than it would be in the much larger San Diego and Orange Counties following the closure of SONGS.

Some or all of the loss could be recouped over time by the use of the reclaimed land for other income-generating enterprises or by the development of renewable energy projects elsewhere in the county to replace the nuclear plants. It is also possible that some of the loss could by offset by a rise in property values, if current property values are depressed by the presence of the plants. However, additional study is required to assess whether this is the case and whether the closure of the plants would reverse this impact, especially if nuclear waste remains on-site. (Page 312)

Comments on Decommissioning Costs of Aging Reactors.

Draft Assessment page 24

However, the plants cannot be fully decommissioned until the waste is removed from the plant sites. In addition, given the scarcity of disposal options for low-evel waste, the cost to dispose of the waste during plant decommissioning could be higher than currently anticipated. Indeed, low-level waste disposal costs have risen significantly in recent years, and estimates of disposal costs that were established in the most recent regulatory proceeding on decommissioning costs in 2005 are outdated.

Consideration should be given to the state of decommissioning investments in the current financial market. The present status of available decommissioning funds for both Diablo Canyon and San Onofre should be presented. The study needs to calculate anticipated costs and expenses that could result from:

a) Financial market downturns;
b) Absence or limitation of disposal sites for low-level radioactive waste
c) Delay and/or loss of Yucca Mountain as the proposed permanent site for safe storage of highly radioactive waste.
d) Impacts of the proposed transport routes of radioactive waste from the operation of California's closed or aging reactor facilities, as well as from the operation of reactors in other states.

Draft Assessment Page 26

"…a substantial quantity of low-level waste will need to be disposed of when the plants are decommissioned, and the cost to transport and dispose of this waste, presuming a disposal facility is available, is expected to be hundreds of millions of dollars or more. Low-level waste disposal costs have been rising in recent years, and current estimates of disposal costs during decommissioning are based on outdated cost information. Costs could be substantially higher than estimated during the most recent California regulatory proceeding on decommissioning costs in 2005.

Consideration should be given to updating decommissioning costs which include impacts of closed and/or limited low-level radioactive waste storage facilities,

recent market impacts to decommissioning trust funds, and costs to ratepayers to store low-level radioactive waste onsite at aging reactor facilities. A4NR has provided a recent decommissioning table of costs for Vermont Yankee below.

Table 4 - 2012 Shutdown, inflated costs at 2.5%
2012 Shutdown 2006 Costs Inflated Net Value of fund @ 5.5% Net Value of Fund @ 6.8% Year (TLG Scenario 1) at the % rate below Using Inflated costs Using Inflated Costs Costs in 2006 Dollars 2.5 No interest after B'ruptcy No Interest after B'ruptcy

2006 1 $0 $0 $416,715,821 $416,715,821
2007 2 $0 $0 $439,718,534 $445,052,497
2008 3 $0 $0 $463,990,997 $475,316,067
2009 4 $0 $0 $489,603,300 $507,637,559
2010 5 $0 $0 $516,629,403 $542,156,913
2011 6 $0 $0 $545,147,346 $579,023,583
2012 7 $51,451,000 $59,667,386 $575,239,479 $618,397,187
2013 8 $109,896,000 $130,631,810 $544,031,673 $596,723,427
2014 9 $126,397,000 $154,002,471 $436,219,535 $497,785,848
2015 10 $88,521,000 $110,550,599 $297,795,446 $367,160,646
2016 11 $85,114,000 $108,953,116 $197,580,763 $274,059,531
2017 12 $75,186,000 $98,650,547 $93,519,893 $176,333,651
2018 13 $39,576,000 $53,225,320 -$5,130,654 $82,965,554
2019 14 $29,886,000 $41,198,181 -$58,355,974 $31,762,570
2020 15 $16,080,000 $22,720,619 -$99,554,155 -$9,435,611
2021 16 $4,428,000 $6,413,064 -$122,274,774 -$32,156,230
2022 17 $4,428,000 $6,573,391 -$128,687,839 -$38,569,294
2023 18 $4,352,000 $6,622,083 -$135,261,230 -$45,142,685
2024 19 $4,287,000 $6,686,257 -$141,883,312 -$51,764,768
2025 20 $4,276,000 $6,835,828 -$148,569,569 -$58,451,025
2026 21 $4,276,000 $7,006,724 -$155,405,397 -$65,286,853
2027 22 $4,276,000 $7,181,892 -$162,412,121 -$72,293,577
2028 23 $4,287,000 $7,380,377 -$169,594,013 -$79,475,469
2029 24 $4,200,000 $7,411,365 -$176,974,390 -$86,855,845
2030 25 $4,276,000 $7,734,112 -$184,385,755 -$94,267,210
2031 26 $4,276,000 $7,927,465 -$192,119,867 -$102,001,322
2032 27 $4,135,000 $7,857,710 -$200,047,332 -$109,928,787
2033 28 $4,200,000 $8,180,760 -$207,905,042 -$117,786,498
2034 29 $4,200,000 $8,385,279 -$216,085,802 -$125,967,258
2035 30 $4,352,000 $8,905,965 -$224,471,081 -$134,352,537
2036 31 $4,211,000 $8,832,857 -$233,377,046 -$143,258,502
2037 32 $4,276,000 $9,193,429 -$242,209,903 -$152,091,359
2038 33 $4,276,000 $9,423,265 -$251,403,332 -$161,284,788
2039 34 $4,276,000 $9,658,846 -$260,826,597 -$170,708,052
2040 35 $4,287,000 $9,925,786 -$270,485,443 -$180,366,899
2041 36 $4,200,000 $9,967,462 -$280,411,229 -$190,292,685
2042 37 $11,316,000 $27,526,570 -$290,378,691 -$200,260,146
2043 38 $4,947,429 $12,335,666 -$317,905,261 -$227,786,716

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> PG&E reports that it will review other options for the disposal of Class B and C lowlevel waste if they become available.622 PG&E also plans to store large reactor components onsite until decommissioning in order to minimize low-level waste shipments and costs.[623]

A 2004 GAO report noted that over the prior 25 years disposal costs had risen from $1 per cubic foot to over $400 per cubic foot and that costs were expected to exceed $1,000 per cubic foot in the future.[636] These cost increases will have the biggest impact when the plants are decommissioned. For example, PG&E estimated in 2006 that waste disposal costs during Diablo Canyon decommissioning would total $242 million (2004$).[637] However, these estimates were based on a waste disposal cost of $248 per cubic foot, well below the cost of Class A waste disposal today. Total waste disposal costs would increase to $438 million (2004$) at $450 per cubic foot, and $974 million (2004$) at $1,000 per cubic foot.[638]

Consideration should be given to updating decommissioning estimates to current cost estimates, including the financial impacts of recent market "corrections." In addition, moving radioactive waste off site sooner, rather than waiting for a permanent solution, may be necessary (in the event of seismic or security impacts) and these costs should be considered before California allows license renewal applications to be filed with the NRC.

Draft Assessment Page 239

> Low-level waste disposal costs are relatively modest during ongoing plant operations. However, a substantial quantity of low-level waste will need to be disposed of when the plants are decommissioned, and the cost to transport and dispose of this waste, presuming a disposal facility is available, is expected to be hundreds of millions of dollars or more. Low-level waste disposal costs have been rising in recent years, and current estimates of disposal costs during decommissioning are based on outdated cost information. Costs could be substantially higher than estimated during the most recent California regulatory proceeding on decommissioning costs in 2005.

Consideration should be given to updating cost estimates for decommissioning and disposal.

Future Land Uses

Draft Assessment Page 247

> After a nuclear plant is permanently shut down, the plant site is decommissioned. The decommissioning process includes removal and cleanup of all contaminated materials from a site, including spent fuel.653 However, if a federal repository is not prepared to accept the spent fuel from the plant at the time of decommissioning, spent fuel could remain in an independent spent fuel storage installation (ISFSIs) at the site after the rest of the site has been decommissioned (see Chapter 7). When this occurs, plant owners can release most of the land for alternate uses; only a parcel containing the ISFSI surrounded by a 100-meter security zone must remain under NRC license.654 This has occurred at several decommissioned plants in the U.S. (see "Experiences with Land Use Following Decommissioning").

This section highlights the state's historical concern manifested in the passage of PRC 25524 over three decades ago. The highly radioactive waste produced at both Diablo Canyon and San Onofre was not only anticipated, it was promised to be removed by the federal government long before the enactment of AB 1632. Now California finds itself in a quandary over whether to allow radioactive waste to be produced until the end of current license terms, or possibly allow another twenty years beyond current license terms. Consideration should be given to the foreseeable costs, benefits and risks of producing an additional twenty years of radioactive waste on the state's fragile coast. These costs may be unknown, but are not unknowable and should be studied.

Experiences with Land Use Following Decommissioning

Draft Assessment Page 249

> The Maine Yankee nuclear plant occupied 820 acres during its years of operation. After the plant was shut down in 1996 and decommissioning activities were completed, the operator of the plant received approval from the NRC to release the majority of the plant site from NRC oversight. Remaining under NRC oversight is the ISFSI, which is located on 8.5 acres with a surrounding security zone of 300 meters in all directions. (The security zone was increased to 300 meters due to design basis threat regulations and conditions specific to Maine Yankee.) The remainder of the land is divided among the former plant owner, which retains between 100 and 150 acres of the original land; a 400 acre mixed-use development that incorporates a clean technology park; and a non-profit organization that will maintain the remaining area as open space with public access.

The incorporation of the costs of decommissioning activities at Maine Yankee would provide valuable information for comparison purposes in the AB 1632 analysis,and consideration should be given to including these costs.

Also from Draft Assessment Page 249

> Another New England power plant, the Connecticut Yankee plant at Haddam Neck, has also completed the decommissioning process. The plant's owner, Connecticut Yankee Atomic Power Company, recently issued a request for Expressions of Interest for development at the old plant site. More than 580 acres once occupied by the nuclear plant may ultimately be made available for development. Within this tract of land, the plant's ISFSI occupies 5 acres
> with an additional 70 acre security zone to remain under NRC regulation as long as the ISFSI remains.

The incorporation of the costs of decommissioning activities at Connecticut Yankee would provide valuable information for comparison purposes in the AB 1632 analysis, and consideration should be given to including both known and anticipated costs.

Also from Draft Assessment Page 249

> The Sacramento Municipal Utility District's (SMUD) Rancho Seco nuclear facility was shutdown in 1989. Since that time, SMUD has built a 500 MW natural-gas fired power plant less than one mile from the former nuclear plant and a solar photovoltaic plant less than one-half mile from the former nuclear plant. Approximately 1,200 acres were set aside in 2006 for a nature preserve to the east and south of the former plant location. The Rancho Seco Recreational Area located approximately 1.5 miles to the west includes a 160-acre lake and 400-acre park. A separate wildlife refuge adjoins the park on the southwest.

The incorporation of the costs of decommissioning activities at Rancho Seco would provide valuable information for comparison purposes in the AB 1632 analysis and consideration should be given to including both known and anticipated costs.

Much additional information on current nuclear decommissioning can be obtained from the NRC website devoted to this issue:
http://www.nrc.gov/info-finder/decommissioning/

Comparison of Life Cycle Environmental Impacts
Draft Assessment Page 270

> Environmental impacts can occur throughout the power production "life cycle." The life cycle begins with mining or processing raw materials and includes construction, operations, waste management and disposal, and decommissioning. In the case of nuclear energy, radioactive waste management, health, safety and security issues are also concerns. The life cycles impacts of nuclear power and alternate power sources are discussed in Appendix B and summarized in Table25.

On page A-38 of the AB 1632 Assessment Appendices it states "…emissions from decommissioning and from disposing of high-level waste are difficult to estimate and may be considered speculative because there is limited experience with these components of the nuclear life cycle. The first definition for "emit" in the American Heritage Dictionary is "to send out matter or energy: isotopes that emit radioactive particles…" Therefore, an understanding of all emissions and cost estimates of energy generation it is vital to responsible energy planning in order to consider creating an updated analysis for issues that can impact the economy, generation resources, safety and security of California.

> Comparing life cycle analyses of different technologies is limited by analytical and information constraints: data availability varies considerably for different energy sources, and investigators define life cycle impacts differently, making the consideration of environmental impacts more or less comprehensive. These constraints make it difficult to ascertain the total environmental impact of any one technology.

While "constraints may make it difficult to ascertain the total environmental impact of any one technology," they do not make it impossible. Therefore, consideration should be given to analyzing the most current information available

on life cycle analyses of different technologies in order for California to use its limited generation resources wisely.

Economic Implications of Plant Closures
Draft Assessment Page 301

> Closure of the two nuclear plants would have complex economic implications for their local communities. Plant closures would inevitably lead to a loss of jobs and property taxes.

Consideration should be given to the opportunities that will likely arise with plant closures. Jobs will still be required to safely phase-out, shutdown, decommission, safely store and/or transport radioactive waste. In addition, jobs in energy technology, generation, construction and maintenance should be given priority in the areas most impacted from phasing out aging reactors. Studies of jobs related to energy efficiency, alternative technology, construction and maintenance of alternative energy sources should be instituted by all agencies with oversight over achieving a clean and affordable energy future for California.

> However, these adverse impacts may not materialize immediately upon plant closure but would more likely materialize over several years as decommissioning activities progressed. At the same time, property value increases may partially offset this loss of income. If nuclear waste remains on-site, property value implications would be even less certain.

Consideration should be given as to a cost comparison of housing values with and without an aging radioactive waste storage facility on a fragile and seismically active coast.

FINAL CONCLUSION

The CEC DRAFT Assessment has done an excellent job of highlighting benefits and risks of continued reliance on aging nuclear reactors on California's coast. However, absent are the costs for virtually all risks, with the possible exception of once-through-cooling mitigation and value of reactors to local communities and state. We applaud the monumental work that went into this draft analysis and view it as a path to better understanding of the economics benefits of phasing out aging reactors at the end of current licenses and repowering with "green" energy sources and innovative efficiency technology vs. continuing to rely on aging reactors and the accompanying unknowns in this reliance.

These comments have been endorsed by state and national organizations, many who reside outside of California, but have an vested interested in California's leading example on responsible energy plan for the future.

Respectfully Submitted

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*Co-signers are national organizations or reactor community organizations and are greatly interested in the CEC AB 1632 Assessment.

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