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DOCKET
07-AB 1632
DATE ______
RECD. MAR 2 1 2008

Subject: PG&E's Response to Data Requests
AB 1632 Study Report

Dear Ms. Byron:

Attached are Pacific Gas and Electric Company's (PG&E) Responses to Staff Data Requests dated February 27, 2008 relating to your assessment currently being conducted pursuant to AB 1632 (Stats. 2006, Ch. 722 Section 1). PG&E has attempted to provide thorough responses to all of the data requests. However, given the short time frame for responses, PG&E will be supplementing some of these responses when more data can be collected and provided. At this time, PG&E anticipates being able to file supplemental responses by April 21, 2008.

PG&E looks forward to participating in a data response workshop to provide further clarity to these responses and to engage in discussions about the use of the data. While we understand that Staff issued the data requests to fill in gaps with information that we may possess, the broader subject areas of the requests have been previously reviewed by PG&E and a substantial amount of information is contained in many of the technical studies we previously provided to Staff. We urge the Staff to consider those technical studies as directed by AB 1632 to ensure that the "whole picture" is assessed and not just the information provided in these responses. For this reason, our responses attempt to provide the specific data being requested and to assist in directing Staff to additional data contained in previously submitted technical studies.

Again, we believe an informal data response workshop would be helpful to discuss the relationship of the data provided in our responses with these existing studies. We look forward to continuing to work with you on this important effort.

Sincerely,

Patrick W. Mullen

AB 1632 Nuclear Power Plant Assessment:
Data Request for Diablo Canyon

A. Operations

1. What was the capacity factor and the total amount of power generated from each unit (Diablo Canyon 1 and 2) in 2007?

Response to Data Request A.1.

2007 DCPP "Capacity Factors"

Unit 1 = 90.39%	Unit 2 = 99.77%	Total Plant = 95.07%

2007 DCPP Net Generation

Unit 1 = 8,866,094 Mwh	Unit 2 = 9,722,279 Mwh	Total Plant = 18,588,373 Mwh

As noted in PG&E's response to data requests for the 2007 IEPR Update, the capacity factors have been steadily increasing at Diablo Canyon since the beginning of operations. Capacity factors for both the industry and Diablo Canyon Units have improved over the last 20 years from a nominal 80-85% to current performance levels in the 95-98% range. DCPP is in the top quartile for the industry in this performance area. This increased and consistent improved performance in the capacity factor and other key performance areas can be attributed to:

- Common industry performance measures allowing plants to compare to others in the US
- Use and sharing of industry operating experience and lessons learned among utilities
- Strong self assessment and benchmarking programs to improve and sustain top quartile performance

B. Nuclear Waste Generated

1. Please complete the following table, identifying the amount of nuclear waste that has been generated and that will be generated from the operation and decommissioning of both units:

Response to Data Request B.1.

Table 1a: Used Fuel Generated from the Nuclear Plant

	Waste Generated through 2007	Waste to be generated from Jan. 2008 through the end of the operating license	Waste that would be generated during a 20-year license extension	Waste to be generated from decommissioning	Incremental decommissioning waste from a 20-year license extension
Spent Fuel, MTU	1136*	717	908	None	None
Spent Fuel, # of assemblies	2642*	1668	2112	None	None

*Spent fuel assembly data as of 12/31/07 (includes 193 fuel assemblies in the Unit 1 Cycle 15 reactor core and 193 fuel assemblies Unit 2 Cycle 14 reactor core). Assumes 0.43 MTU/assembly.

Nuclear Waste is a legal term that excludes low level radioactive waste.

Low Level Radioactive Waste (Disposal Volume[1]) Generated from the Nuclear Plant.

[1]Waste cannot be classified (e.g., A, B or C) until the disposal volume is known. Therefore the amount of LLRW disposed will be provided below.

Table 1b: Waste Generated from the Nuclear Plant

	Waste Generated through 2007	Waste to be generated from Jan. 2008 through the end of the operating license	Waste that would be generated during a 20-year license extension	Waste to be generated from decommissioning	Incremental decommissioning waste from a 20-year license extension
Low-Level: Class A, ft^3	*	22,406 **	17,480	240,752***	0
Low-Level: Class B, ft^3	*	2,546	2,680	23,308	0
Low-Level: Class C, ft^3	*	1,786	1,880	1,148	0
Greater than Class C, ft^3	Not packaged	Not packaged	Not packaged	866	0

*** Includes 17,342 ft3 for both sets of Steam Generators old and in-service (16 total)

** Includes 3,000 ft3 for removal of first set of Steam Generators and 2,800 ft3 for two Reactor heads removed 2009 and 2010.

* Historical LLRW disposal volumes not readily available broken down by Waste Class. The NRC Annual Radiological Effluent Reports required LLRW reporting to broken down by waste stream (e.g., resin & filters, Dry active waste).

These are available for Diablo Canyon from 1985 on from the NRC.

The State of California has only required LLRW disposal data from Diablo Canyon to be broken down by Waste Class since 2002. That data is provided below.

Year	Waste Class	Disposal Volume (ft3)	Disposal Activity (Ci)	Burial Site
2002	Class C	162.82	147	Barnwell, SC
	Class B	195	176.54	Barnwell, SC
	Class A	267	1.4	Clive, Ut
2003	Class C	87.0	63.72	Barnwell, SC
	Class B	87.9	112.94	Barnwell, SC
	Class A	919	4.4	Clive, Ut
2004	Class C	186	140.86	Barnwell, SC
	Class B	98	61.82	Barnwell, SC
	Class A	1,388	1.2	Clive, Ut
2005	Class C	23.44	23.38	Barnwell, SC
	Class B	98	203.09	Barnwell, SC
	Class A	3,760	17.1	Clive, Ut
2006	Class C	88	48.96	Barnwell, SC
	Class B	227.2	229.79	Barnwell, SC
	Class A	843.55	4.3	Clive, Ut
2007	Class C	15.4	2.0	Barnwell, SC
	Class B	98	129.8	Barnwell, SC
	Class A	952	8.9	Clive, Ut
6-yr Av	Class C	94	71	Store On-site
6-yr Av	Class B	134	152	Store On-site
5-yr Av	Class A*	874	4	Clive, Ut

* excludes 2005 data, Steam Generator Chemical Cleaning.

Amount of future LLRW disposal volume estimated by Waste Class follows:

Class C: 94 ft3/yr x 19 years = 1,786 ft3
Class B: 134 ft3/yr x 19 years = 2,546 ft3
Class A: 874 ft3/yr x 19 years = 16,606 ft3
Plus 3,000 ft3 from Steam Generator replacement and 2 reactor vessel heads at 1,400 ft3 each.

Decommissioning estimated waste volumes:

Amount of LLRW for Decommissioning disposal from August 2005 TLG Services Cost Estimate for DCPP, Appendix C.

Class C: 1,148 ft3
Class B: 23,308 ft3
Class A: 240,752 ft3

2. Please complete the following table, identifying the average composition of the plant's spent fuel and the composition of the most recent spent fuel extracted from the plant.

Response to Data Request B.2.

Table 2: Composition of Spent Fuel

	Isotope	All Extracted Spent Fuel (mass percent)	Most Recently Extracted Spent Fuel (mass percent)
Uranium	U-238	93.10%	92.2%
	U-235	0.90%	0.98%
	Other uranium isotopes	*	*
Transuranic Elements	Pu-239	0.51%	0.55%
	Pu-240	0.24%	0.26%
	Pu-241	0.09%	0.15%
	Other transuranic isotopes	*	*
Fission Products	Nd-144	*	*
	Ce-142	*	*
	Cs-137	*	*
	Other fission products	*	*

Tabulated data for "All Extracted Spent Fuel" based on average isotopics for those assemblies in the Unit 1 Spent Fuel Pool. Percentages with respect to mass of initial uranium metal.

*Data for fission products and other transuranic and uranium isotopes not readily available and would require substantial analysis effort.

3. Please describe and quantify the amount of spent fuel that is damaged and whether this damaged fuel will need to be handled or packaged differently than other spent fuel.

Response to Data Request B.3.

Diablo Canyon's goal is to experience zero fuel defects. In the over 20 years of operation and more than 695,000 fuel rods extracted to date, sixteen fuel rods (less than ½ percent) experienced fuel rod cladding failure. This percentage reflects a better than industry average. PG&E and the industry have developed action plans to achieve zero fuel defects by 2010. These sixteen fuel rods reside in the Unit 2 spent fuel pool within a fuel rod storage canister and will require special handling/packaging.

C. Spent Fuel Storage Plans

1. Please complete the following table on the current location of the spent fuel assemblies that have been removed from the nuclear plant.

Response to Data Request C.1.

Table 3: Amount of Spent Fuel in Each Storage Site

	MTU	# of Assemblies
Spent Fuel Pool	1053	2449
ISFSI	0	0
Off-Site	0	0

Data is for the combined Unit 1 and 2 spent fuel pool inventory as of 3/1/08. Excludes 193 assemblies currently in the Unit 1, Cycle 15 core and 84 feed (i.e., new) assemblies currently in the Unit 2 spent fuel pool. Unit 2 is presently in a refueling outage. Assumes 0.43 MTU/assembly.

2. What is the current status of the ISFSI licensing proceeding at the NRC? How long can PG&E continue to operate Diablo Canyon without an operational ISFSI? What is the current schedule for placing fuel assemblies into the ISFSI?

Response to Data Request C.2.

Diablo Canyon has been granted a site specific license by the NRC to construct, operate and decommission an ISFSI. Although there are ongoing legal challenges, PG&E is not precluded from placing the facility into operation.

PG&E can continue to operate without moving fuel into dry storage at the ISFSI until refueling outage 1R16 in October 2010. Prior to the outage, fuel must be removed from the pool.

PG&E is currently scheduled to move fuel into dry storage in fall 2008.

3. Is PG&E considering any off-site or on-site interim storage options in addition to (or in place of) the spent fuel pool and ISFSI? If so, please describe the options being considered.

Response to Data Request C.3.

PG&E is not considering other storage options for spent fuel at this time.

4. Please complete the following table on ISFSI operations:

Response to Data Request C.4.

Table 4: ISFSI Operations

Construction Completion Date	Spring 2008
Operation Date	Fall 2008
Capacity, No. of Assemblies	Initial – 40 cask
Planned Capacity Expansions: Yes or No? If Yes, When and How Much?	Yes. Licensed and permitted for 138 cask When TBD
ISFSI License Period, years	20 years – renewable
ISFSI Design Life, years	Capable of storing 40 years of fuel from both units

D. Spent Fuel Storage Costs

1. Please complete the following table identifying the projected costs to build and operate the ISFSI and the costs that would be incurred were the ISFSI expanded to have enough capacity for all the spent fuel that will (would) be generated through the end of the current license or an extended license:

Response to Data Request D.1.

Table 5: ISFSI Costs

	Current ISFSI	**Expansion for current license**	**Expansion for extended license**
Capacity, No. of Assemblies	1280	3136	None planned
Construction/Expansion Costs, $	$26.7 million	$5-10 million	None planned
Of this, costs already incurred	$26.4 million	0	
Spent Fuel Packaging and Loading Costs, $ Per Assembly	$55,000	Not Available	
Of these costs are already incurred	$40,000 each for 256 assemblies	Not Available	
O&M Costs, $/year (Excluding Security)	$600,000 est.	Not Available	
Security Costs, $/year	$900,000 est	Not Available	

2. What are the annual spent fuel pool operating costs? Are any major capital investment projects anticipated for the spent fuel pools? If so, what are the anticipated costs of these projects?

Response to Data Request D.2.

Annual spent fuel pool operating costs which consist of routine water additions, chemistry evaluations, chemical additions, operator and engineering surveillances, cooling water system maintenance and security requirements are not reported on an individualized basis. However, these O&M expenses can be estimated at approximately $200,000 annually per Unit. PG&E has not identified any major capital improvement projects or costs for the DCPP spent fuel pools in foreseeable future.

3. Spent fuel pools were reported to spill water over the sides of the spent fuel storage pools at the Kashiwazaki-Kariwa plant following the July 16, 2007 earthquake in Japan. Please describe the potential safety and environmental impacts from water spillage from the spent fuel pools after a major seismic event and what magnitude of earthquake could cause such spillage.

Response to Data Request D.3.

KKNPS Spent Fuel Pools Sloshing and Leakage to Uncontrolled Area

Sloshing

Attachment D.3, Figure 1 shows the sectional layout of unit 3 at Kashiwazaki-Kariwa power station. As can be seen from this figure, the spent fuel pool is located on the top level of the reactor buildings and this configuration is typical to all units. Attachment D.3, Figure 2 shows a photo of unit 3 spent fuel pool taken during PG&E site visit.

During the July 12, 2007 Niigataken Chuetsu-Oki earthquake, all spent fuel pools at Kashiwazaki-Kariwa Nuclear Power Station (KKNPS) experienced sloshing as shown in Attachment D.4, Figure 3. Water was reported to have splashed onto the spent fuel pool floors.

Leakage

While most of the spent fuel pools at KKNPS experienced sloshing and spillage, the spilled contaminated water were all successfully contained inside the controlled area for all but one unit, unit 6. In unit 6, an uncontrolled release of contaminated water to the Japan Sea was reported. This was due to spilled water escaping through improperly sealed electrical conduit penetrations between a controlled area and a non-controlled area as schematically shown in Attachment D.3, Figure 4. The radioactive water flowed through the drainage system in the non-controlled area to the sump area and was immediately discharged into the Sea of Japan.

DCPP Spent Fuel Pools

Description

The Spent Fuel Pools (SFP) are stainless steel lined concrete pools (one per unit), approximately 35 feet x 35 feet and 41 feet deep. The concrete floor of each SFP (elevation 99 feet) is supported directly on bedrock.

The SFP water depth during normal operation is between 39 feet and 40 feet, providing at least 23 feet of water above the spent fuel storage racks[1] and resulting in a freeboard of between 1 foot and 2 feet from the water surface to the concrete floor of the fuel handling area (elevation 140 feet).

[1] The depth of water above the spent fuel storage racks is based on the requirement of 9 feet of water above a spend fuel assembly (for radiation shielding), the length of a fuel assembly, and the need for an individual fuel assembly to be withdrawn from the spent fuel storage racks during refueling operations.

The edge of the SFP is surrounded by a 2 inch high metal curb to keep contamination out of the SFP. The outer perimeter of the fuel handling area floor is surrounded by a 12 inch high concrete curb, forming a impound area to contain any spilled water. The floor is sloped to a series of floor drains, which collect spilled water and route it to the Auxiliary Building Sump. The water collected in the sump is monitored and processed through the liquid radioactive waste system as required.

Consideration of Sloshing of Water from the SFP

The quantitative evaluations of the effects of sloshing of water from the SFP at DCPP are focused on the loads on the concrete SFP walls. The structural analysis of the concrete SFP walls and floors consider dead weight, thermal loads, hydrostatic loads, seismic inertial loads, seismically induced hydrodynamic loading, and impact loads from the spent fuel storage racks. The hydrodynamic loads include the effects of sloshing.

The potential for spilling of water from the SFP due to sloshing is limited by the freeboard of the SFP walls which will contain moderate-height waves (1-2 ft). If the sloshing exceeds the freeboard, there is a 12" high concrete curb to retain any spillage on the elev. 140' floor and the fuel handling area. The 12 inch high concrete curb around the perimeter of the floor acts as an impound area for water that may overflow the SFP. The floor drains system is designed to collect this water and route it to the Auxiliary Building Sump for processing by the Liquid Radwaste System. If the floor drain flow capacity is inadequate and the depth exceeds 2" (height of metal curb around SFP), the water will flow back into the SFP. The DCPP design configuration requires that the conduits in the floor in the impound area around the SFP are water tight. PG&E is currently verifying that the conduits have remained water tight to avoid possible leaks as was seen at the TEPCO KKNPS. PG&E will supplement this response when the evaluation is completed.

The magnitude of earthquake required to cause sloshing that would exceed the freeboard has not been determined, but during the 2003 San Simeon earthquake (M6.5 at distance of 35 km), the sloshing exceeded the free-board. This demonstrates that sloshing over the free-board is expected to occur during large earthquakes even with moderate ground motion. However, the floor drains system collects sloshed water and route it to the Auxiliary Building Sump for processing by the Liquid Radwaste System. If the floor drain flow capacity is inadequate, the water will flow back into the SFP.

In order to satisfy radiation shielding requirements, a minimum of 9 feet of water is required above the top of the spent fuel assemblies. PG&E maintains 23 feet of water above the top of the spent fuel assemblies which allows a loss of up to 14 feet of water without resulting in unacceptable radiological consequences. The loss of more than 14 feet of water due to sloshing during an earthquake is not credible.

E. Waste Transport and Disposal

1. Please describe the status of litigation associated with DOE's non-performance under the Standard Contracts. Please provide a copy of any briefs (DOE's and the PG&E's) and any substantive court rulings filed in the suit specific to the power plant since January 2007.

Response to Data Request E.1.

PG&E and other nuclear power plant owners have sued the DOE for breach of contract. The Utility seeks to recover its costs to develop on-site storage at Diablo Canyon and Humboldt Bay Unit 3. In October 2006, the U.S. Court of Federal Claims found the DOE had breached its contract and awarded the Utility approximately $42.8 million of the $92 million incurred by the Utility through 2004. The Utility appealed to the U.S. Court of Appeals for the Federal Circuit seeking to increase the amount of the award and challenged the U.S. Court of Federal Claims' finding that the Utility would have incurred some of the costs for the on-site storage facilities even if the DOE had complied with the contract. A decision on the appeal is expected by the end of 2008.

PG&E will seek to recover costs incurred after 2004 in future lawsuits against the DOE. Any amounts recovered from the DOE will be credited to customers through rates. PG&E Corporation and the Utility are unable to predict the outcome of this appeal or the amount of any additional awards the Utility may receive. If the U.S. Court of Federal Claims' decision is not overturned or modified on appeal, it is likely that the Utility will be unable to recover all of its future costs for on-site storage facilities from the DOE. However, reasonably incurred costs related to the on-site storage facilities are, in the case of Diablo Canyon, recoverable through rates and, in the case of Humboldt Bay Unit 3, recoverable through its decommissioning trust fund

PG&E is currently gathering the documents responsive to this request and will submit under a supplemental filing.

2. What is the total amount (in dollars) that your ratepayers (or the utility) contributed (or will contribute) to the Nuclear Waste Fund for electricity generated by the nuclear power plant in 2007?

Response to Data Request E.2.

The total amount of PG&E payments to the DOE Nuclear Waste Fund in 2007 was $17,504,302.07.

3. Please complete the following table on waste transport and disposal costs. Spent fuel transport and storage costs apply only if the utility intends on pursuing off-site interim storage.

Response to Data Request E.3.

Table 6: Waste Transport and Disposal Costs

	Through 2006*	Through the End of the Current License	Through an Extended License	%age Transported by mode (e.g., rail, truck, or barge) through 2007	%age Transported by mode through end of current license: through extended license
Low-Level Waste (Class A) Transport, $/ft3	See Disposal below	See Disposal below	See Disposal below	5% rail 95% truck	10% rail 90% truck
Low-Level Waste Disposal (Class A) $/ft3	Resin $\$450/ft^3$ Trash & Debris $\$50/ft^3$	Resin $\$500/ft^3$ Trash & Debris $\$150/ft^3$	Resin $\$500/ft^3$ Trash & Debris $\$150/ft^3$	N/A	N/A
LLW Class B & C Transport Cost	See Disposal below	See Disposal below	See Disposal below	100% truck	100% truck
LLW Disposal Class B $/ft3	$\$2,500/ft^3$	Unknown	Unknown	N/A	N/A
LLW Disposal Class C $/ft3	$\$3,200/ft^3$	Unknown	Unknown	N/A	N/A
Total Disposal Cost	$1,000,000/yr	$1,100,000/yr	$1,100,000/yr	N/A	N/A
Spent Fuel Transport, $/MTU					
Spent Fuel Offsite Interim Storage, $/MTU					

2007 Information not available, therefore PG&E has provided data from 2006

4. Please describe what type of storage and/or transport container is being used and will be used for spent fuel stored onsite or stored and transported off-site. Are the containers compatible with DOE's proposed transportation, aging and disposal (TAD) system?

Response to Data Request E.4.

PG&E's Diablo Canyon Power Plant has licensed, for site specific use, the Holtec Hi-Storm S storage system. This system utilizes a steel and concrete storage overpack and a multi-purpose canister (MPC). Spent fuel is stored in the MPC portion of the package.

For transportation purposes, the MPC can be loaded in to the Holtec Hi-Star transportation package. Loading would take place at the existing cask transfer facility located just outside the Independent Spent Fuel Storage Installation (ISFSI).

The Holtec MPC, although design for transportation, is not compatible with DOE's proposed TAD system

5. Describe the existing onsite infrastructure capabilities and any infrastructure improvements needed (for example, additional cranes or facilities) in order to load and/or transport spent fuel offsite by truck, rail and/or barge. Describe any improvements needed before shipments offsite can begin.

Response to Data Request E.5

The DCPP ISFSI utilizes a cask transfer facility to move the MPC from a transfer cask, used to load fuel within the fuel handling building, into the Hi-Storm storage overpack. This same facility would be used to move a MPC from the Hi-Storm overpack into a Hi-Star transportation package. PG&E has not purchased the Hi-Star transportation package.

Arrangements for crane support to load a truck or barge would be required to support placement of the transportation package onto a transportation vehicle. PG&E has an existing contract with several crane companies. Crane support is required to offload the storage equipment when it arrives at DCPP from Holtec for storage of spent fuel. Any required transportation vehicle would be provided by DOE.

It is the responsibility of the DOE to collect spent fuel at the DCPP site. All facilities required to facilitate transfer to DOE are in place if the Holtec Hi-Star transportation system is utilized. If DOE elects to utilize a transportation package other than that provided by Holtec, modification to the existing site facilities may be required.

6. What are PG&E's plans for transporting offsite large reactor components that have been or are soon to be replaced, e.g., reactor vessel, steam generators, etc.

Response to Data Request E.6.

PG&E is storing large components on-site until decommissioning, thereby minimizing LLRW shipments and cost.

7. What are PG&E's plans for low-level waste transport and disposal following the closure of the Barnwell facility to California utilities?

Response to Data Request E.7.

As LLRW is generated on site, it is packaged and stored in either the Solid Radwaste Storage Facility or the Radwaste Storage Building until transportation for off-site processing or disposal can be arranged. Should the Barnwell, SC burial site close to California generators in July 2008, all Class B and C waste could be stored in the Radwaste Storage Building. At the current Class B and C generation rate of 2 to 4 containers a year, storage space through end of current operating license and a 20-year license extension is available. PG&E will review options to on-site storage of Class B and C waste should they become available.

8. What are PG&E's costs for accident prevention and emergency preparedness related to low-level and spent fuel waste transport offsite?

Response to Data Request E.8.

There are no added PG&E costs for accident prevention and emergency preparedness relating to LLW transport. Accident prevention and emergency preparedness are embedded in the fees of the limited number of carriers qualified to transport LLW.

There are also no added PG&E costs for accident prevention and emergency preparedness related to spent fuel waste transport offsite. Like all other nuclear facilities, these costs are embedded in the Nuclear Waste Fund, which PG&E contributes to based on generation from its nuclear power operations.

F. Nuclear Fuel Costs

1. What was PG&E's 2007 revenue requirement for nuclear power overall and for nuclear fuel specifically? Please also provide a forecast of nuclear fuel revenue requirements and PG&E's unit cost for nuclear fuel through the end of the plants' current operating licenses.

Response to Data Request F.1.

Year	2007 GRC Revenue Requirement (b)	Fuel	
		Revenue Requirement (c)	Mills/kWh
2007	636	103	5.52
2008		103	5.95
2009		107	6.49
2010		118	6.40
2011		137	7.40
2012		157	8.46
2013		180	9.71
2014		188	10.63
2015		195	10.54

2016		196	10.57
2017		199	10.76
2018		201	10.82
2019		201	11.37
2020		203	10.97
2021		204	11.01
2022		206	11.11
2023		207	11.17
2024		208	11.74

G. Future Upgrades and Operating License

1. Describe PG&E's efforts to date and current plans to apply for an extended operating license from the NRC.

Response to Data Request G.1.

As part of the 2007 General Rate Case (GRC), PG&E requested $ 16.8 million funding for a license renewal feasibility study for the 2007-2009 period. The purpose of the study is to analyze Diablo Canyon equipment and operations to determine whether to apply to the Nuclear Regulatory Commission for a 20-year extension of the Diablo Canyon licenses for Units 1 and 2. The scope of the feasibility study includes (1) screening of Diablo Canyon's structures, systems and components to determine whether they are within the scope of a renewed license; (2) performing an aging analysis of the in-scope systems and components to determine the need for additional monitoring programs, and (3) preparing a draft environmental impact report. The purpose of the feasibility study is to determine whether or not to pursue license renewal at Diablo Canyon. The feasibility study will be completed by the end of 2009 at which time a decision will be made whether or not to pursue license renewal. In accordance with the 2007 GRC, the feasibility study will consider the findings and recommendations from the California Energy's (CEC) assessment of Diablo Canyon conducted by the CEC pursuant to Assembly Bill 1632. PG&E is required by the 2007 GRC to submit by June 30, 2011, an application on whether to renew the Diablo Canyon Operating licenses.

2. What is the anticipated cost and timeframe needed to conduct a feasibility study and to complete an application to the NRC for an extended operating license?

parts of the country, there will no doubt be an increased demand for nuclear engineers in particular. Colleges should adequately ramp up their production. Currently, PG&E is looking to hire 50-75 engineers (industrial, power, electrical, mechanical, energy efficiency) and expects some difficulty in sourcing them. Over the next 10 years, the Californian higher education system is on track to produce 32% of Californians with some sort of higher education, while industry demands 40%. We generally expect that educated workers will be in demand given the current and projected supply. However, PG&E believes that it has an advantage over other utilities in its ability to attract professionals and skilled labor to work at Diablo Canyon because of its location in a highly desirable area to live. According to a recent survey conducted by the North American Young Generation in Nuclear (NA-YGN), 91 percent of the young professionals surveyed ranked location as the number one job deciding factor. ("Location Tops Salary", by Teresa Hansen, February 2008 Power Engineer). PG&E believes that the Diablo Canyon location in San Luis Obispo County offers one the premier locations to live and work.

With respect to the skilled crafts, we find a general lack of awareness for the careers in the trades because of the country's reduced focus on vocational education. Some of the strategies we are beginning to put in place now should help build awareness so that more will consider careers in the trades over the next 10 years. PG&E has begun to focus on building in-state capacity to produce the types of skilled workers we require, like the formation of PowerPathway and our support of career technical education.

d) Does PG&E anticipate an increase in labor costs as a result of a tight supply for skilled labor? If so, how large of an increase is anticipated?

Because our labor rates are dictated by union agreements, those rates are less volatile. However, contracted rates are likely to escalate due to a tight supply of skilled labor.

e) If PG&E anticipates hiring new employees to replace retiring workers, please indicate to what extent the PG&E believes new workers would live within the immediate vicinity of the nuclear plant.

Of the current base of approximately 20,000 system wide PG&E workers, approximately 1400 live within the immediate vicinity (50 mile radius) of the nuclear plant. We do not anticipate an overall growth in workers associated with the plant. Rather, the new workers will be replacement workersand PG&E estimates that over 98 percent of these replacement workers will live within a 50 mile radius of the nuclear plant.

I. Planning Reserve Margin

1. Please provide a table showing PG&E's forecasted monthly electricity demand, electricity resources, and planning reserves for the next 10 years in the same format as the annual average regional need tables in CPUC decision D.07-12-052, which adopted utility long-term procurement plans (see pages 116-118).

Response to Data Request I.1.

PG&E's most recent monthly forecast of load resources and planning reserves was prepared for its bundled load and was filed with the CEC as part of the 2007 IEPR. PG&E can refile if necessary.

J. Security Costs

1. What are the estimated annual costs for meeting security requirements at the plant? What would be the incremental cost to comply with the additional security requirements that are being considered by the Nuclear Regulatory Commission for operating nuclear power plants?

Response to Data Request J.1.

The estimated annual operations and maintenance expense to meet security requirements at the plant is $28 million. PG&E does not have an estimate of the incremental costs, if any, of the additional security requirements being considered by the Nuclear Regulatory Commission.

K. State and Local Revenues

1. Please provide the amount of property tax paid in 2006 and 2007 to municipal jurisdictions within the county on account of the nuclear facility. Please provide an estimate of any additional fees, taxes, and payments (e.g., electric utility property taxes) made to local or state governments on account of the nuclear facility.

Response to Data Request K.1.

Calendar year 2006 - 2007 total property taxes paid to San Luis Obispo County by PG&E was $23,110,483. Of that amount the estimated property taxes resulting from Diablo Canyon PP facilities is $20,746,908.

Calendar year 2007 - 2008 total property taxes paid to San Luis Obispo County by PG&E was $23,028,262. Of that amount the estimated property taxes resulting from Diablo Canyon PP facilities is $20,423,735.

In response to the tax breakdown by municipality, PG&E typically receives one tax bill from the San Luis Obispo County Tax Collector's office for all of PG&E properties in the county. PG&E tax payment is distributed to the various taxing jurisdictions withinthe County by the County Auditor.

Due to additional capital investments in the Diablo Canyon PP by PG&E, estimated property tax forecasts are:

Calendar year 2008 = $21.2million
Calendar year 2009 = $22.9million

Calendar year 2010 = $24.9million

2. Please provide the number of full-time and part-time employees at the nuclear plant. How many of these employees live in the county where the plant is located? Please also provide the estimated costs and number of contract employees hired for plant operations, refueling outages, and plant maintenance and repair.

Response to Data Request K.2.

The number of full time employees at Daiblo Canyon is approximately 1250.

The number of part time employees at Diablo Canyon is between 25 and 50 during non-outage operations.

The number of employees living in San Luis Obispo County is approximately 1175.

There are between 100 and 150 contract and temporary additional employees for normal plant operations and maintenance.

There are approximately 200 to 300 contractor and temporary additional employees on any given day during a refueling outage, but due to the skills of various crafts associated with specific tasks, the total number of contractor and temporary additional employees over the course of a typical outage is between 900 and 1000.

Attachment K.2 provides estimated costs and a breakdown for contract employees for 2006 and 2007.

3. What was the total compensation paid to employees living in the county? What was the total compensation paid to all employees? Please provide average salary information for full-time employees.

Response to Data Request K.3.

The total annual compensation paid to all DCPP employees as of 12/31/07 was $114,063,727

The average salary for full-time DCPP employees as of 12/31/07 was $88,148.

4. Please provide the total dollars (excluding employee compensation) spent in 2006 and 2007 in the county and the total economic impact (dollars) of the plant in 2006 and 2007 to the county and to the state.

Response to Data Request K.4.

As shown in Attachment K.4, Diablo Canyon Power Plant provides approximately $650 million in local economic annual benefit to San Luis Obispo County[2]. Section 3.5 of the report includes the economic impacts by geographic area. The analysis is currently being updated and when completed will be provided to CEC Staff under separate cover.

L. Aging of Equipment and Structures

1. Please provide a summary of the historical replacement of major reactor components (e.g., steam generators, reactor vessel, turbine blade), repair, and refurbishment/modifications of major structures. Please include the date that the project began and the date that it was completed. Please indicate if such activities were conducted as part of an unrelated scheduled outage and did not impact outage time.

---

[2] Estimate in 2002 dollars.

Response to Data Request L.1.

Project Description	Completion Date
DC1-REPL AUX TRANSFORMER 1-1	3/18/1996
DC2 Replace Start Up Transformer 2-1	11/23/1998
U1:Instl Side stream Filtration SCW	10/12/2006
DCPP Replacement skid N2 Compressor	5/8/2003
DCPP-2 Replace Aux Transformer 2-1	3/10/1998
DC1 Replace Startup Transformer 1-1	5/20/1997
DCPP RVLIS / TMS Replacement Project U-1	2/12/2003
Replace Seismic Instruments	11/28/2006
Main Feedwater speed control unit 2	10/28/1999
Construct RCA Storage Bldg	10/7/2004
DCPP-2 Circulating Water Pump Motor Rewind 2B8	4/1/1998
DC2 REPL BATTERY 22	4/25/1996
DCPP-1 Circulating Water Pump Motor Rewind	6/1/1997
U1:Upgrd Lube Oil Heating System	5/29/2007
U2:Upgrd Lube Oil Heating System	3/2/2007

D2 Replace GSU Transformers	10/12/1999
main feedwater speed control unit 1	11/7/2000
Replace DFO Tanks - design	3/24/1997
DCPP P-2000 Main Turbine Control U-1	5/26/2004
DCPP- Replace 12Kv Magna Breakers - Unit1	12/17/2004
DCPP - Consolidated Seismic Monitoring	11/29/2004
U2:Repl P-2000 Main Turbine Control System	12/17/2004
DCPP Replace Vital Battery chargers	9/3/2004
U1-U2:Instl Cask Pit Fuel Storage Rack	12/19/2006
DC1-Fuel Oil Storag Tanks	3/24/1997
U1:Generator Rotor Replacement/Rewind	6/4/2004
U1:Replace Positive Displacement Pump	5/29/2007
U1:Repl RHR Sump Screen	5/22/2007
U2:Replace Low Pressure Turbine Rotors	5/26/2006
U1:Replace Low Pressure Turbine Rotors	12/6/2005

Note: This is the project listing from PG&E's new data system that goes back to 1996. Records earlier than this are more difficult to obtain. However, these initial years from 1985 - 1996 the plant was relatively new and few substantial replacements were necessary and most of the project work was regulatory driven or plant enhancements to improve future reliability.

See above for project completion dates. Start dates are not readily available. The only capital projects that caused significant outage delays were the replacement of the AUX Transformer in 1998 and the replacement of the Unit 1 generator rotor. The AUX transformer replacement extended the unit 1 refueling outage by approximately 20 days and the Unit 1 generator rotor replacement outage necessitated a 52 days forced/unscheduled outage. All other capital projects were completed on-line or during a scheduled refueling outage

2. Please provide a description of any programs in place to address repair and maintenance of aging equipment and structures.

Response to Data Request L.2.

PG&E undertakes a formal **Equipment Reliability Process** which integrates a broad range of activities into one process. Using this process, personnel can evaluate important plant equipment, develop and implement long-term equipment health plans, monitor equipment performance and condition, and make adjustments to preventive maintenance tasks and frequencies based on equipment operating experience. This process includes activities such as:

- Reliability-centered maintenance
- Preventive maintenance (periodic, predictive, and planned) assessment
- Maintenance Rule evaluation
- Surveillance and post-maintenance testing
- Life-cycle management planning
- Equipment performance and condition monitoring
- Internal and external operating experience assessment

This integrated process supports the following policy of **zero tolerance for critical component failures** stated in PD ER1, "Equipment Reliability."

"Nuclear generation shall have zero tolerance for critical equipment failures. Cost-effective preventive and predictive techniques shall be used with a mind-set that corrective maintenance on critical equipment is a failure of the equipment reliability process. Zero tolerance does not mean no equipment failures. Run-to-failure is an acceptable end point, provided the consequences are evaluated before hand and the failure will not affect nuclear safety, plant reliability, or power generation."

Key Elements of the Equipment reliability process include:

1. SYSTEM AND COMPONENT PERFORMANCE MONITORING

1) Capture the relevant data from:

- Equipment history for completed corrective maintenance activities
- Equipment condition data from completed PM and surveillance activities
- Completed post-maintenance test activities

- Predictive maintenance (such as, vibration, oil analysis, infrared scans)
- Program test results (such as, Motor Operated Valve(MOV), Air Operated Valve (AOV), relief valve, pump performance)
- System engineering walk-downs
- Trends from process computer data
- Operator rounds
- Any other sources of performance data

2) At regular intervals, compare and trend actual plant data used to determine system/component /train performance against established performance criteria.

3) Perform cross-system component failure and problem trending using maintenance history, work package feedback, and industry operating experience such as EPIX (Institute for Nuclear Power Operations database).

4) Perform long term equipment reliability improvement activities.

5) System and component performance monitoring also includes the following:

   - Active and passive component damage mechanisms, effects, and indicators.
   - Using equipment history and the corrective action database to trend equipment failure for components used across several systems.
   - Trending as-found equipment condition codes to identify patterns of degradation by component type and the need to adjust PM tasks or frequencies.
     - Trends of as-found equipment condition codes should also be used to update PM strategies based on plant equipment operating experience.
   - As-found equipment condition codes are also be used to identify PM outliers for additional evaluation. Using EPIX data to identify component trends being experienced by other plants, and take proactive measures to avoid similar failures.
   - Identifying aging or obsolescence issues.
   - Sharing component trend results with system engineers. Coordinate with the system engineer to evaluate the relationship between component performance and effect on system functional performance.
   - Trending key data collected on operator round sheets.
   - Consulting non-nuclear sources of component failure information and trending parameters/strategies.

- Evaluating predictive maintenance and in-service inspection results for indications of equipment degradation.

6) There is also a connection between actual reliability data and data updates for PRA applications.

2. **PREVENTIVE MAINTENANCE (PM)**

   Actions that detect, preclude, or mitigate degradation of functional structures, systems, and components to sustain or extend their useful life by controlling degradation and failures to an acceptable level. There are three types of preventive maintenance:

   - Periodic
   - Predictive
   - Planned

3. **PLANNED MAINTENANCE**

   A form of preventive maintenance consisting of refurbishment or replacement that is scheduled and performed to preclude failure of a structure, system, and component.

4. **PM STRATEGY**

   A documented maintenance strategy for a particular component that lists recommended condition-based or time-based PMs.

5. **PM BASIS**

   A collection of pertinent information related to a component, from various sources, that supports the basis for the current PM strategy.

6. **PREDICTIVE MAINTENANCE (PDM)**

   A form of preventive maintenance performed continuously or at intervals governed by observed condition to monitor, diagnose, or trend structure, system, and component functional or condition indicators. Results indicate current and future functional ability or the nature of and schedule for planned maintenance.

7. **PREVENTIVE MAINTENANCE OPTIMIZATION (PMO)**

   Establishes a documented PM basis and a suite of PM tasks deemed most effective for the scope of equipment under consideration.

8. **RELIABILITY CENTERED MAINTENANCE (RCM)**

   A systematic evaluation approach for developing or optimizing a maintenance program. RCM utilizes a decision logic tree to identify equipment maintenance requirements according to the safety and operational consequences of each failure and the degradation mechanism causing the failures.

- Identify obsolescence of critical and non-critical components
- Analyze the aggregate effect of various failures and trends of system performance, prioritize candidate improvement activities, and update the long-term maintenance strategy.
- Identify any system or component design vulnerabilities. Both active and passive vulnerabilities should be included. An example of a design vulnerability is a single-failure-sensitive component that can cause a scram, down-power, or significant operations challenge. Appropriate priorities are assigned for these vulnerabilities for design improvement and ensure adequate progress toward resolution is being made.

11. AGING OR OBSOLESCENCE STRATEGY

Key elements of an aging or obsolescence strategy include:

- Passive components and passive parts of active components.
- Ensure that current and potential future plant operating life cycles are considered.
- Perform economic evaluation of alternatives to ensure that the business plan reflects optimum long-term equipment reliability plan.
- Strategies to manage age-related failure include the following:
    - Any change from normal is an opportunity to advance age-related degradation and needs to be investigated.
    - Keep stressors and mitigators balanced to slow the rate of degradation.
    - Trend/predict the progression of aging degradation and refurbish before failure occurs (PM or replacement).
    - Components initially fail at a very localized level. Reliance on a "trend and replace" aging management strategy requires the use of very localized and specific trending indicators.
    - Manage spare parts inventories.
    - Manage the number of qualified maintenance personnel.
- Ensure the procurement process has defined priorities based on such factors as whether the component is critical, the plant need is current or planned, and the current inventory is adequate.
- Involve maintenance and system engineers in decisions for inventory reduction and stocking, and provide feedback to initiators regarding stocking requests.
- Ensure the equivalent item replacement process is sufficiently well defined to promptly disposition routine replacements.

- Include a flag or field in the inventory database that identifies parts with potential or known obsolescence.
- Query vendors and suppliers for known or potential solutions for aging and obsolescence problems.
- Integrate strategies for digital equipment replacement.
- Reverse engineering capabilities.

12. Long Term Maintenance Strategy

This process is implemented to establish the optimal maintenance methods for each potential failure, and define the frequency for long-term condition-based maintenance, planned refurbishment, and replacement. When appropriate, develop plans for implementing long term strategies. Long-term strategies for component types that exist in multiple systems are included in each applicable system strategy for consistency. The Long Term Maintenance Strategy considers or implements the following:

- Integrate the various maintenance and program tasks that have been established for each component type to group similar activities and avoid duplication of effort.
  - Look for opportunities to consolidate and integrate tasks, tests, and inspections.
  - Group predictive maintenance tasks to obtain total health perspective (for example, perform vibration, oil analysis, and thermography at the same time).
  - Adjust PM and surveillance frequencies for optimal grouping.
  - Align tasks for redundant components with the respective A/B train.
- Lay out major planned outage activities for multiple operating cycles.
  - Specify frequency for recurring activities that cannot be performed on-line.
  - Specify periodic requirements for infrequent activities (such as 10-year ISI,
5-year overhauls of major equipment, major PMs).
- Ensure major modification plans are included in the long-term schedule.
- Use cross-discipline teams to help develop the plan; operations and maintenance personnel have important perspective and experience to contribute.
- Lay out the time line and milestones for major activities.
- Manage obsolescence of critical and non-critical components.
- Estimate resource and budget requirements.

13. LONG TERM RELIABILITY PLAN

Key elements of the Long term Reliability Plan include:

Prioritize and integrate the individual system long-term reliability plans and reconcile with the plant business plan.

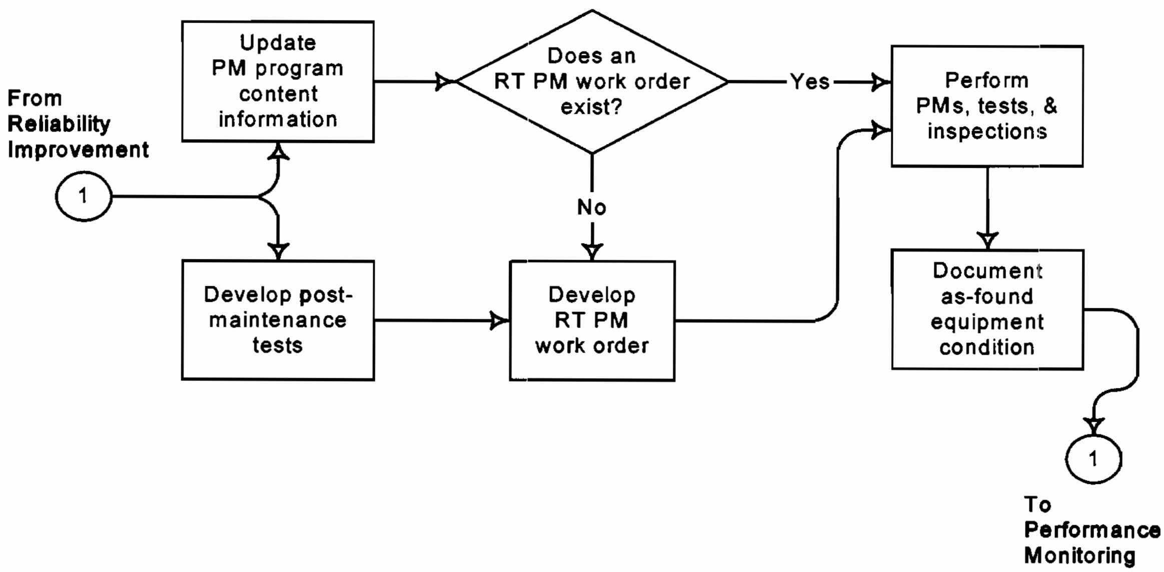
- Prioritize individual long term plans using risk ranking and the plant priority scheme.
- Prioritize all long term plans and other major activities and reconcile them with the business plan to ensure the plant budget supports major equipment reliability plan activities.
- Integrate the long-term equipment reliability plans with the plant long-term outage and business planning processes.

Enter activities into the appropriate outage or on-line schedule. Activities should be scheduled for the life of the plant. Include all known major PMs, modifications, surveillances, and tests for both active and passive structures, systems, and components.

14. PREVENTIVE MAINTENANCE IMPLEMENTATION

The following flowchart shows the process for implementing preventive maintenance.

Figure 2: Flowchart for PM Implementation



PM program implementation is controlled by plant procedures. New or revised information concerning PM tasks or performance frequency are entered into the PM program and other inter-related procedures covering areas such as:

a) Perform PM tasks.

b) Document the as-found equipment condition

c) Plan and perform post-maintenance testing (PMT)

Receipt inspections are performed on items purchased for use on critical equipment to ensure that items meet purchase specifications before release for use in the plant. Plant staff specify any additional receipt inspection attributes deemed appropriate

3. Please provide a description of how implementation of the Maintenance Rule is used to track the reliability of equipment important to safety. In addition, please describe any programs in place that monitor the reliability of equipment important to normal plant operation.

Response to Data Request L. 3.

The DCPP Maintenance Rule implementing procedures MA1.ID17, "Maintenance Rule Monitoring Program," and MA1.NE1, "Maintenance Rule Monitoring Program – Civil Implementation," specify data collection, tracking of Structures, Systems and Components (SSC's) performance, require monthly status reports, and tracking of SSCs in goal setting. The Maintenance Rule program is tightly integrated into the Equipment Reliability process at DCPP

Diablo Canyon procedure AD13.DC1, "Control of Surveillance Testing Program," describes the routine surveillance test including, but not limited to, tests which are required by the Technical Specifications (Tech Specs), licenses, and other documents regulating the operation and maintenance of the plant.

4. Please provide industry cost estimates to repair/replace major equipment.

Response to Data Request L.4.

PG&E does not understand what information is being requested and therefore is unable to provide a response at this time. PG&E will provide a response in its supplemental filing after discussions with CEC Staff.

5. Please describe any problems in obtaining replacement equipment that is manufactured outside the U.S. or any problems with quality control for replacement equipment and parts.

Response to Data Request L.5.

Equipment lead-times are moving out considerably due to the nuclear renaissance in the US, increased global demand for low carbon emissions electrical power and competition from replacement markets. The primary issues or challenges are:

1. Certain sub-components' (e.g.; heavy forgings) demand exceed current supply. This applies especially to heavy forgings due to specifications requiring a lot more forged-in nozzles for Steam Generator's and Reactor Pressure Vessel's to avoid welded-in failures. For new-builds, the Nuclear Steam Supply systems now require 50-75 heavy forgings as opposed to current designs that have 20-30 heavy forgings. Also, world-wide power demands for turbine rotor forgings are also competing for the same capacity, and

2. Most US suppliers have dropped their ASME "N" stamp qualification requiring more off-shore manufacturing which has lengthen lead-times due to import/export licenses and shipping (both sub-suppliers to prime suppliers; and primes to owners) considerations

It has been our experience that proper planning and strategic sourcing practices can greatly reduce any exposure to equipment and manufacturing shortages. In terms of quality control in US and foreign suppliers for replacement parts and equipment, continued oversight and surveillance/audits are necessary to ensure that the 10CFR Nuclear Quality Assurance requirements are clearly understood by the primary vendor staff, down the ranks to the individual workers. This understanding requires constant reinforcement in both US and foreign suppliers. A decrease in understanding and rigor to these standards could result in a decrease in compliance by the workers. This challenge also applies to each of the sub-vendors and therefore requires similar oversight, training and surveillance by qualified QA representatives. Receipt inspections are performed on all items purchased for use on critical equipment[3] to ensure they meet all purchase specifications and requirements before they are released for use in the plant. Plant Engineering staff specify all receipt inspection attributes deemed appropriate for each item based on its intended use, functional and design requirements and all other applicable codes and standards.

M. Extreme External Hazards

1. Please provide copies of existing external flood and tsunami hazard assessments and vulnerability studies. Of interest are major events that might impact plant operation, access to the plant, evacuations, or the safety of the plant.

Response to Data Request M.1.

Flood hazard assessments are given in the FSAR, Section 2.4.2 and tsunami hazard assessments are given in the FSAR, Section 2.4.6. PG&E is currently updating the tsunami hazard based on a probabilistic approach. This updated tsunami hazard report is expected to be completed in mid 2008.

An evaluation of the landslide hazard along the access road during heavy precipitation and due to seismic events following heavy precipitation are described in the following reports:

PG&E (1997). Assessment of slope stability near the Diablo Canyon Power Plant, Response to NRC request of January 31, 1997. Report dated April 1997.

NRC (1998). Safety evaluation of the assessment of slope stability near Diablo Canyon Power Plant (TAC Nos. M98939 and M98940). Letter dated October 15, 1998.

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[3] Critical equipment is equipment that is categorized as important to the production of electrical power and/or safety/quality related.

PG&E (2004). Setback requirements for the Diablo Canyon Drive Patton Cove Landslide, Diablo Canyon ISFSI, Report dated October 8, 2004.

These hazard reports are provided as Attachment M.1.

2. Please provide any contingency plans for evacuations, plant access, maintaining plant safety systems, and equipment recovery in the event of a seismic, flood or tsunami event.

Response to Data Request M.2.

PG&E has a number of contingency planning documents that provide detailed procedures for responding to emergencies for seismic, flood or tsunami events. These planning documents may contain sensitive or confidential information. PG&E is currently reviewing these documents in order to compile a thorough description of procedures that does not contain confidential or sensitive information and will file it in a supplemental response to this data request.

ATTACHMENT D.3.

Plant Layout (unit No.3)

The following picture indicates the cross-section view of unit No.3. Because the solid ground is very deep, unit No.3 has the semi underground type in due consideration of resistance against earthquakes. The reactor building has three floors above and five under the ground, and its foundation is 45m deep below ground level.

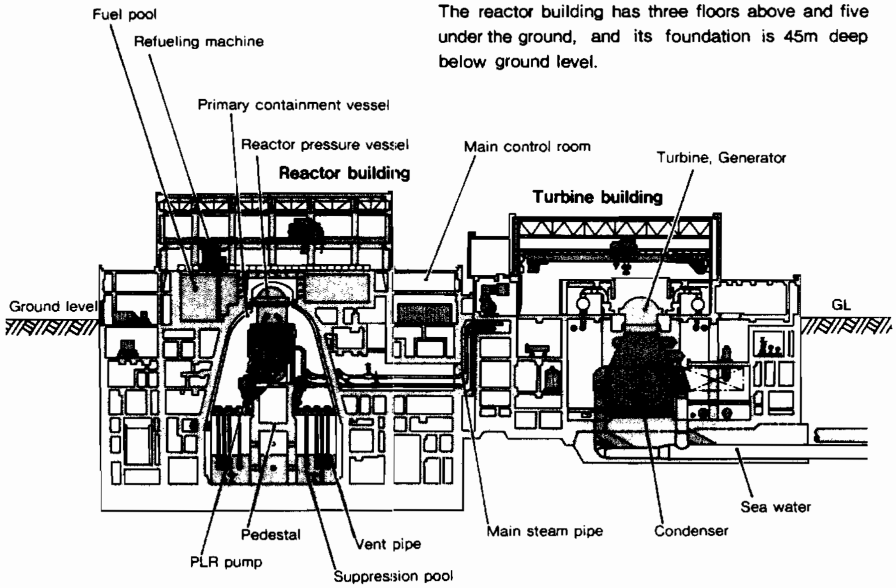


Figure 1 BWR Mark II Modified Reactor and Turbine Structures at Unit 3

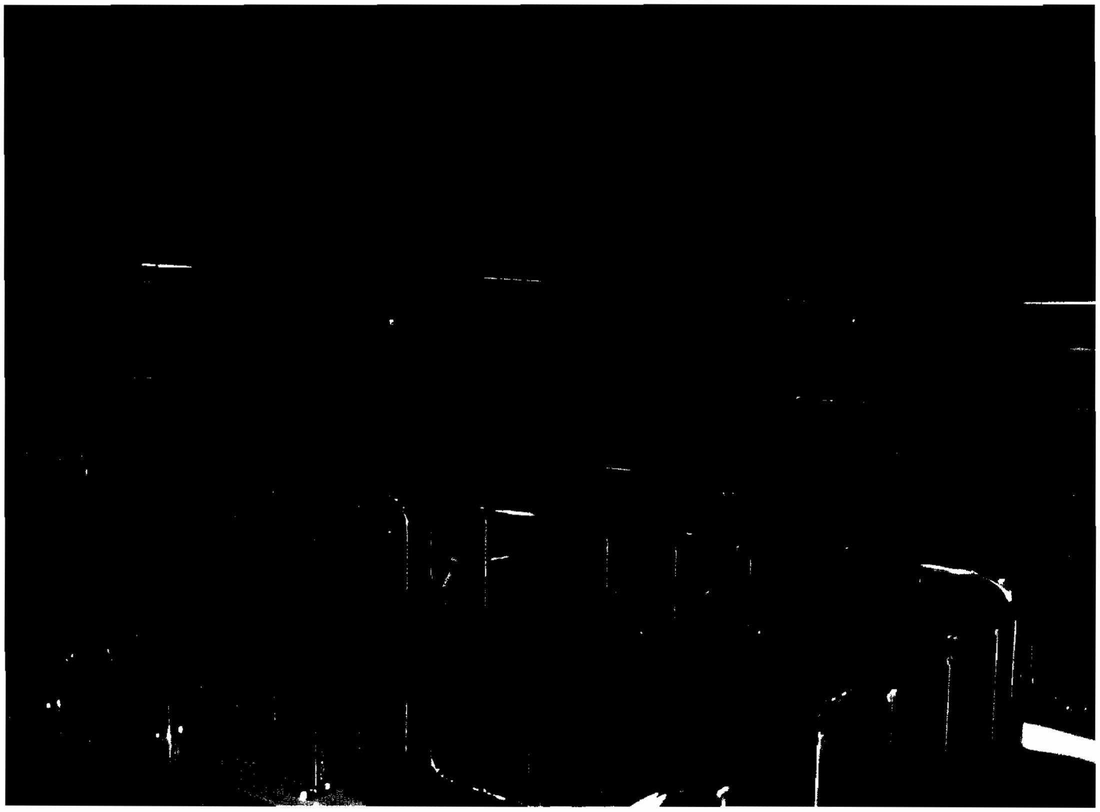


Figure 2 KKNPS Unit 3 Spent Fuel Pool

Figure3 Sloshing at K-6 Spent Fuel Pool

2. Earthquake-related Issues (2)

[Release of Radioactive Material into the Sea from Water Leakage at Unit 6]

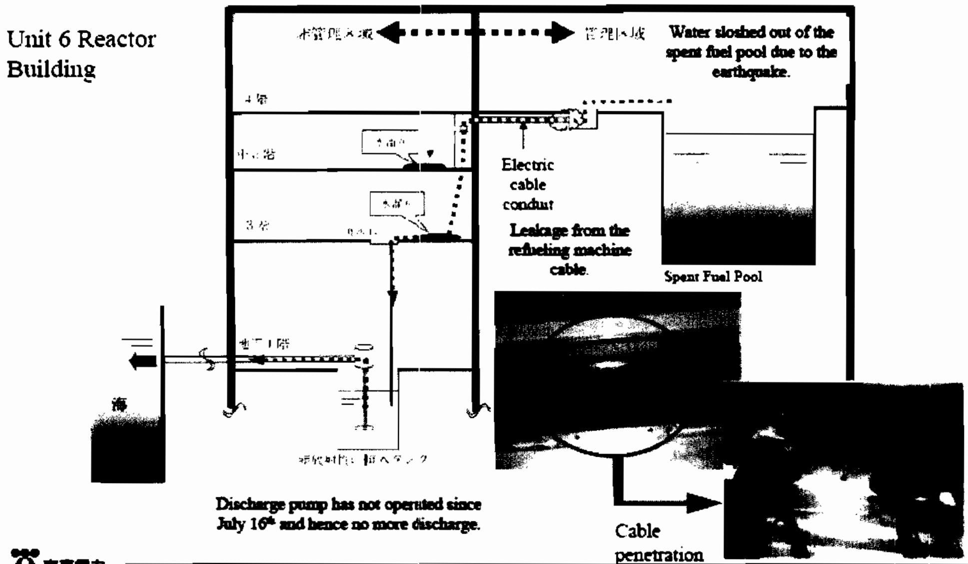


Figure 4 Leakage of Radioactive Water from Unit 6 Spent Fuel Pool

ATTACHMENT K.2.

DCPP -2006 Contracts

Sum of Value COCurr						[redacted]	
Accounting Type	Strategic Order	MWC Type	Major Work Category	MWC Description	Total		
Capital	Other	Maintenance	03	Purchase Office Equipment	$11,375		
			05	Purchase Capital Tools	$2,441		
			20	Capital Projects - Core Plant Work	$43,248,136		72
		Maintenance Total			$43,261,952		
	Other Total				$43,261,952		
	Reactor Vessel Head Repl	Maintenance	20	Capital Projects - Core Plant Work	$4,263,792		
		Maintenance Total			$4,263,792		
	Reactor Vessel Head Repl Total				$4,263,792	200	
	St Generator Repl	Maintenance	20	Capital Projects - Core Plant Work	$68,416,005		
		Maintenance Total			$68,416,005		
	St Generator Repl Total				$68,416,005		
Capital Total					$115,941,749	[redacted]	
Expense	Other	Maintenance	BS	Maintain DCPP Plant Assets	$29,113,376	40	215
			BV	Maintain DCPP Plant Configuration	$23,420,078	50	
		Maintenance Total			$52,533,454	[redacted]	
		Operational	AK	Manage Environmental Operations	$561,393		
			BP	Manage DCPP Business	$4,255,609	6	
			BQ	DCPP Support Services	$2,130,059		
			BR	Operate DCPP Plant	$4,353,202	2	
			BT	Enhance DCPP Personnel Performance	$2,274,579		
			BU	Procure DCPP Material & Services	$9,147		
			CR	Manage Waste Disposal & Transportation	$10,385		
			EO	Provide Nuclear Support	$516,337		
			IG	Other	$2,050,579		
		Operational Total			$16,161,290	[redacted]	
	Other Total				$68,694,745		
Expense Total					$68,694,745	[redacted]	
Grand Total					$184,636,494	298	286

DCPP -2007 Contracts

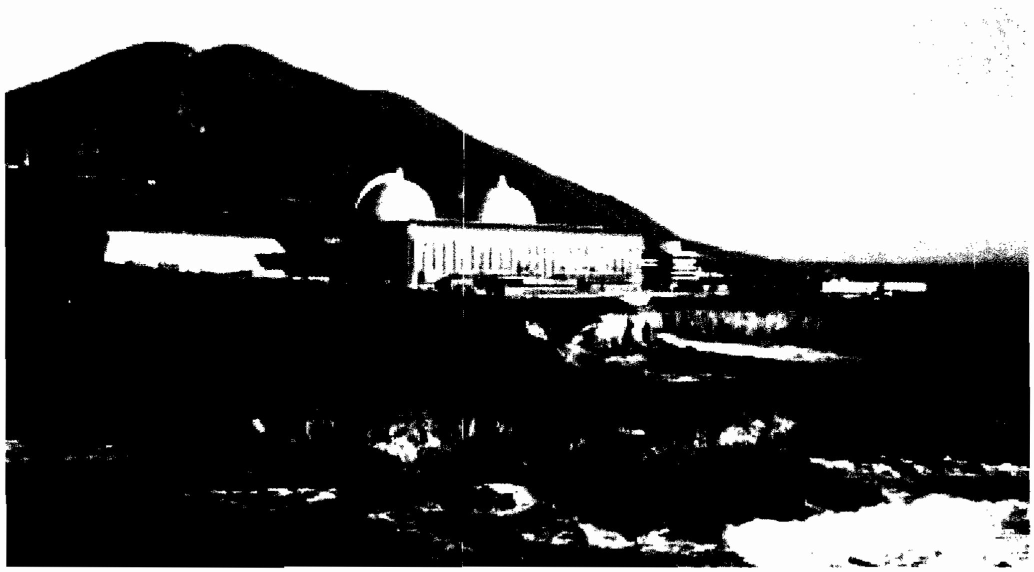
Sum of Value COCurr						[redacted]	
Accounting Type	Strategic Order	MWC Type	Major Work Category	MWC Description	Total		
Capital	Other	Maintenance	05	Purchase Capital Tools	$2,190		
			20	Capital Projects - Core Plant Work	$42,885,708		72
		Maintenance Total			$42,887,898		
	Other Total				$42,887,898		
	Reactor Vessel Head Repl	Maintenance	20	Capital Projects - Core Plant Work	$11,790,636		
		Maintenance Total			$11,790,636		
	Reactor Vessel Head Repl Total				$11,790,636	238	
	St Generator Repl	Maintenance	20	Capital Projects - Core Plant Work	$87,413,085		
		Maintenance Total			$87,413,085		
	St Generator Repl Total				$87,413,085		
Capital Total					$142,091,619	[redacted]	
Expense	Other	Maintenance	BS	Maintain DCPP Plant Assets	$26,318,000	40	215
			BV	Maintain DCPP Plant Configuration	$18,068,001	44	
		Maintenance Total			$44,386,001	[redacted]	
		Operational	AK	Manage Environmental Operations	$587,325		
			BP	Manage DCPP Business	$2,303,658		
			BQ	DCPP Support Services	$110,977	6	
			BR	Operate DCPP Plant	$5,048,527		
			BT	Enhance DCPP Personnel Performance	$1,920,133	2	
			BU	Procure DCPP Material & Services	$4,969		
			CR	Manage Waste Disposal & Transportation	$19,587		
			EO	Provide Nuclear Support	$227,533		
			IG	Other	$313,847		
		Operational Total			$10,536,556	[redacted]	
	Other Total				$54,922,557		
Expense Total					$54,922,557		
Grand Total					$197,014,176	330	286

ATTACHMENT K.4.

Economic Benefits of Diablo Canyon Power Station

An Economic Impact Study by the Nuclear Energy Institute

NUCLEAR ENERGY INSTITUTE



Economic Benefits of Diablo Canyon Power Station

An Economic Impact Study by the Nuclear Energy Institute

December 2003

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ENERGY
INSTITUTE

Contents

Forward

The Diablo Canyon power plant is an important component of San Luis Obispo County's economy. The authors of this study estimate that the total economic impact of the plant is about $642 million. For perspective, this is 7 percent of the county's economy. The plant directly employs 1,405 county residents and is responsible for a total of 2,287 jobs. The jobs at the plant are among the best-paying jobs in the county.

As the most valuable single piece of privately owned improved capital in the county, the Diablo Canyon plant also generates large amounts of tax revenue for governments. Our records indicate that because of the plant, Pacific Gas and Electric Co. is the largest San Luis Obispo County property taxpayer, with over 9 percent of the county's total assessed value.

The Diablo Canyon plant also serves as an important California asset. The state has chronic energy supply issues, and Diablo Canyon is a significant source of low-cost electricity to the state. The cost of this energy is less volatile than is the cost of energy from carbon-based technology, and the supply is less volatile than that from hydraulic technology.

The study documents that the Diablo Canyon power plant is a major component, and stabilizer, of San Luis Obispo County. Thus, the plant has significant positive economic impacts on the county's economy.

At the request of PG&E, I have reviewed the attached report entitled "Economic Benefits of Diablo Canyon Power Plant." I concentrated on Section 3, which includes the results of an economic impact study. The study appears to have been conducted in a manner consistent with industry standards, and the assumptions seem reasonable.

William Watkins, Ph.D.
Executive Director
Economic Forecast Project
University of California, Santa Barbara

Executive Summary

Diablo Canyon nuclear power plant in San Luis Obispo County, Calif., is an integral part of the local economy. The plant provides jobs and makes purchases that stimulate the local economy directly and indirectly. The benefits to the area include jobs, tax revenues, economic output, labor income and contributions to the local community. And there are other intangible benefits, such as clean air, environmental stewardship and low, stable electricity prices. Diablo Canyon's economic impact reaches beyond the local community to the state and even the national level.

The total economic impact of the Diablo Canyon plant on San Luis Obispo County for 2002 was $641.9 million. Diablo Canyon's total impact on the California economy for the same period was $723.7 million and $1 billion for the U.S. economy. The plant's total economic impact includes direct effects, which comprise the value of electricity produced at the plant, as well as secondary effects resulting from plant operation.

The Diablo Canyon plant employs 1,707 people, of which 73 percent live in San Luis Obispo County. An estimated 963 full-time employees live in the cities of Arroyo Grande, Atascadero, Grover Beach, Nipomo, Paso Robles and San Luis Obispo. Approximately two of every 100 working people in these cities and one of every 100 in San Luis Obispo County are employed at the Diablo Canyon nuclear power plant. In addition, these jobs pay 60 percent above the average salary for San Luis Obispo County. Additionally, the economic activity generated by Diablo Canyon creates another 882 jobs in the county. Given the combination of employees at the plant and secondary jobs created by Diablo Canyon's economic activity, the plant is responsible for 2,287 jobs in San Luis Obispo County.

The primary expenditure of the Diablo Canyon plant in San Luis Obispo County is employee compensation. During the study period, Diablo Canyon paid $109 million in compensation to employees living in the county and an additional $123 million to employees who lived elsewhere in California. Additionally, the economic activity created by Diablo Canyon accounted for $21 million in employee compensation in San Luis Obispo County and an additional $29 million in other areas of the state. Together, the direct and indirect compensation from the plant accounts for $128 million in labor income in the county and an additional $173 million in other areas of California.

Diablo Canyon makes substantial purchases in San Luis Obispo County. In 2002, the plant made $161 million in purchases, $49 million of which was in California and $4.3 million in San Luis Obispo County. Economic activity generated by the Diablo Canyon plant also leads to $68 million in increased output in the county and $81 million in the rest of California.

Diablo Canyon pays an estimated $27 million in state and local taxes annually. Additionally, the economic activity generated by Diablo Canyon contributes another $11.5 million in state and local taxes, through increased property, sales and income taxes. By combining direct and indirect taxes, the Diablo Canyon plant accounts for $38 million in state and local tax payments.

In addition to the economic benefits provided by Diablo Canyon, the plant generated 16 billion kilowatt-hours (kWh) of electricity in 2002, approximately 10 percent of California's electricity needs. This low-cost electricity helped keep energy prices in California down. In 2001, the Diablo Canyon plant had a production cost of 1.57 cents/kWh compared to an average production cost of 3.61 cents/kWh for the rest of the California market. Diablo Canyon did all of this without producing air pollution typical of some other power generation sources.

Diablo Canyon also is an integral part of the local community, as seen in charitable giving by Pacific Gas and Electric (PG&E) and its employees. Over the past five years, PG&E and its employees made about $120,000 per year in contributions to the local community.

Section 1: Introduction

This economic impact study by the Nuclear Energy Institute[1] (NEI) examines the economic, fiscal and other benefits provided to the community by the Diablo Canyon nuclear power plant, owned by PG&E. This study also estimates the economic and other benefits Diablo Canyon provides to San Luis Obispo County, where the plant is located, as well as to the state of California and the United States. The study uses detailed data from the Diablo Canyon plant to assess the benefits to the community.

Although this study focuses primarily on the benefits to the local community, state and national benefits are also calculated. These include direct impacts—such as people employed by the plant, plant expenditures within the community and plant tax payments—as well as indirect impacts, such as jobs created indirectly by plant expenditures in the local economy. The study also includes other benefits provided by the plant, such as reliable, low-cost electricity, the benefits of a clean-air source of electricity, and land stewardship.

PG&E and NEI cooperated in developing this study. PG&E and Diablo Canyon provided data on employment, operating expenditures and tax payments, as well as guidance on particular details specific to San Luis Obispo County and the plant. NEI coordinated the project and applied a nationally recognized model to estimate the direct and indirect impacts of the plant on the local community. The methodology employed in this study was developed by RTI International, a nonprofit research organization in Research Triangle Park, N.C.

The remainder of this report is presented in five sections. Section 2 provides background on the Diablo Canyon plant, including plant history, performance, cost, employment, taxes and local area details, such as total employment and earnings, and regional electricity prices. Section 3 examines the economic and fiscal impacts of the plant on the local, state and national levels. Section 4 provides data on benefits not captured by the model, such as the contributions to the community and land stewardship. Section 5 outlines recent trends in the nuclear industry as a whole, including cost, performance and safety. The final section discusses the methodology used to complete the study and Impact Analysis for Planning (IMPLAN), the economic modeling software employed as part of this effort.

[1] The Nuclear Energy Institute is the policy organization of the nuclear energy and technologies industry and participates in both the national and global policymaking process.

Section 2: The Diablo Canyon Power Plant

This section provides background information on the Diablo Canyon plant and San Luis Obispo County, in order to frame the results of subsequent sections. The section includes a brief history of the Diablo Canyon plant, as well as information on its performance, cost, employment and taxes. This section also includes information on local area details of San Luis Obispo County, its major cities and the state of California, including total employment, earnings, local tax collections and regional electricity cost.

2.1 History and Information

The Diablo Canyon nuclear plant site, located along the Pacific coast of Central California, is about halfway between Los Angeles and San Francisco. The plant lies in San Luis Obispo County, which has a population of about 247,000. Most of the surrounding countryside has been used for cattle ranching, and the plant lies between the Pecho and Marre Ranches, now both controlled by PG&E. In 1966, PG&E leased 585 acres for the power plant site and 420 acres for a transmission corridor from the Marre Ranch. By the late 1980s, PG&E had acquired the 9,500 acres of ranchland surrounding the plant. The ranches continue to be used for cattle grazing and agriculture under PG&E-managed leases.

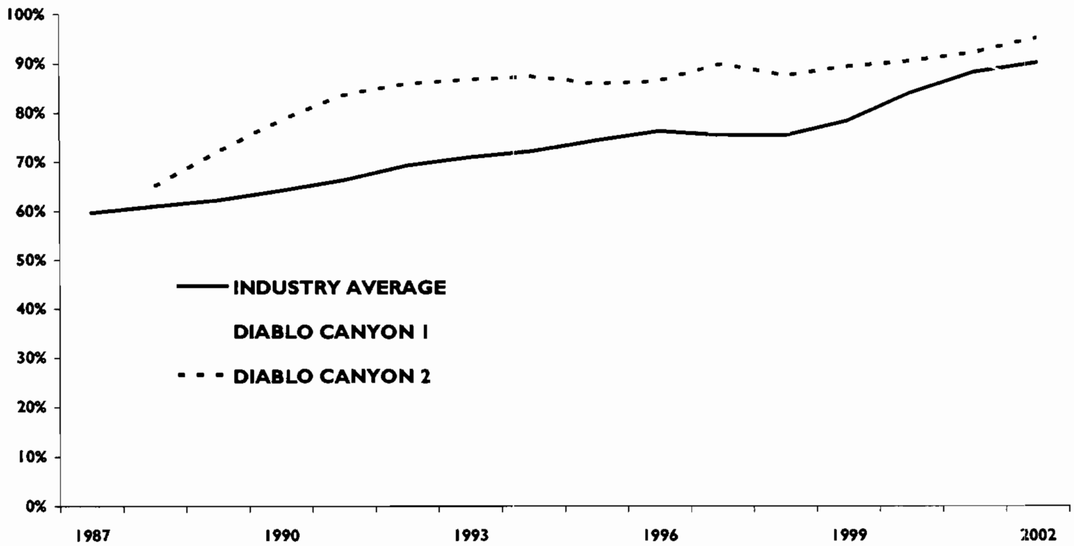
Table 2-1. The Diablo Canyon Power Plant at a Glance

Reactor	Capacity	Commercial Operation Year	License Expiration Year	Reactor Type
1	1,100 MW	1985	2021	PWR
2	1,100 MW	1986	2025	PWR

MW = megawatts PWR = pressurized water reactor

In 1968, construction began on Diablo Canyon 1, a 1,100-megawatt (MW) pressurized water reactor (PWR). Construction on the second reactor, another 1,100 MW PWR, began two years later in 1970. However, the plants did not begin commercial operation until 1985 and 1986, respectively, as a result of regulatory and legal delays.

Figure 2-1. Three-Year Average Capacity Factors

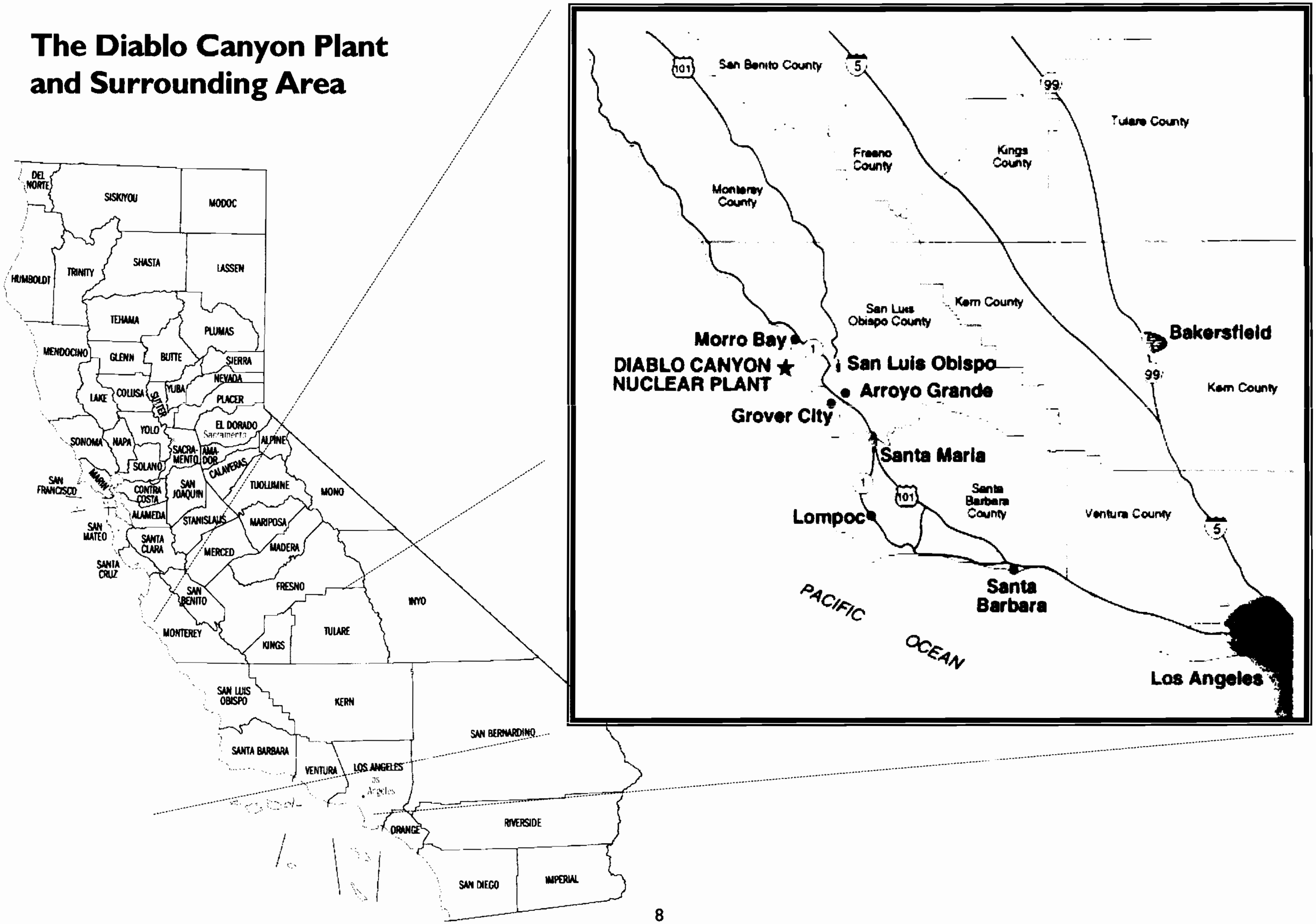


Source: Utility Data Institute

Throughout its operation, the Diablo Canyon plant has been a leader in the nuclear energy industry. Diablo Canyon has consistently maintained capacity factors[2] well above the industry average. (Capacity factor measures the percent of the year that a plant produces electricity.) In 2001, Diablo Canyon 1 had its best year, with a capacity factor of 100 percent. Diablo Canyon 2 had its best year in 2002, with a capacity factor of 97 percent.

[2] Capacity factor is the ratio of actual electricity generated to the maximum possible generation if the plant were to operate at full capacity for one year.

The Diablo Canyon Plant and Surrounding Area



2.2 Generation

Diablo Canyon generated more than 18 million megawatt-hours (MWh) of electricity in 2001 and more than 16 million MWh in 2002, enough to serve approximately 4 million California households. The plant provides about 10 percent of the electricity generated in California each year. Plant output was driven by a high capacity factor for each reactor. Diablo Canyon 1 operated at a 100 percent capacity factor in 2001 and a 74 percent capacity factor in 2002; Diablo Canyon 2 had a capacity factor of 90 percent in 2001 and 97 percent in 2002.

Diablo Canyon provides power for the California/Mexico (CAMX) Power Area. Efficient performance has made the Diablo Canyon power plant very cost-competitive in the CAMX region. Diablo Canyon had a three-year average production cost from 1999 to 2001 of 1.57 cents/kWh. By comparison, the three-year average production cost was 3.61 cents/kWh for electricity generators in the CAMX region. Production costs represent the operations, maintenance and fuel cost of the plant. They do not include depreciation, interest or ongoing capital cost. Contributions to the Nuclear Waste Fund are contained within fuel cost.

Table 2-2. CAMX Power Area Production Cost and Generation

	Three-Year Average Production Cost (1999-2001) in cents/kilowatt-hour	Generation (2001) in million megawatt-hours
Diablo Canyon	1.57	18.08
Coal	1.72	24.99
Natural gas	6.16	98.67
Oil	12.39	0.35
Nuclear	1.84	33.22
CAMX average	3.61	206.16
CAMX average without Diablo Canyon power plant	4.00	188.08

Diablo Canyon's low production costs help keep wholesale electricity prices down in California. Although Diablo Canyon's exact contribution is difficult to measure, it can be estimated by determining how much three-year average production costs (1999-2001) in the CAMX region would increase if Diablo Canyon were replaced by a combined-cycle natural gas plant (the plant of choice for new generation). Substituting combined-cycle natural gas plants for Diablo Canyon would have resulted in an increase in three-year average generation costs for the CAMX region from 3.61 cents/kWh to 4 cents/kWh.

2.3 Employment

In addition to providing inexpensive electricity to central California, Diablo Canyon is the largest private employer in San Luis Obispo County, employing more than twice the number of the next largest employer. The plant employs 1,707 workers; 1,510 full time and 191 temporary or part time. Of the full-time employees, 1,260 reside within the county. Full-time employees include 244 people from San Luis Obispo City, 229 from Arroyo Grande, 193 from Atascadero, 110 from Grover Beach and 94 from Paso Robles. Another 93 are from Nipomo, 66 from Pismo Beach, 58 from Los Osos, 37 from Templeton and 20 from Morro Bay. In fact, the Diablo Canyon plant employs almost 2 percent of all working people in these 10 localities, and 1 percent of all people working in San Luis Obispo County.

The jobs provided by the Diablo Canyon plant are also typically higher paying than most jobs in the area. Full-time Diablo Canyon employees who live in San Luis Obispo County earned on average about $85,500 in 2001. This was more than 60 percent higher than the average earnings of workers in the county, about $52,400 a year.

Besides being the largest employer in the county, the Diablo Canyon plant also spends a large amount of money in the local community. In the one-year period of this study, the Diablo Canyon plant made $4.3 million worth of purchases in San Luis Obispo County.

Table 2-3. Employee and Salary Information by Location

	Diablo Canyon		City/County Total*		
Location	**Permanent Employees**	**Average Earnings**	**Employed Work Force (Full-time)**	**Average Earnings**	**Average Earnings Less Diablo Canyon**
San Luis Obispo	244	$87,594	25,630	$43,529	$43,105
Arroyo Grande	229	$94,351	7,810	$62,089	$61,114
Atascadero	193	$85,053	14,060	$52,673	$52,222
Grover Beach	110	$82,607	6,820	$45,305	$44,693
Paso Robles	94	$73,246	9,510	$48,470	$48,223
Nipomo	93	$86,571	3,580	$56,164	$55,353
Pismo Beach	66	$76,884	4,640	$57,710	$57,433
Los Osos	58	$85,074	8,530	$55,321	$55,117
Templeton	37	$77,610	1,460	$61,810	$61,399
Morro Bay	20	$70,098	5,500	$40,196	$40,087
San Luis Obispo County	1,260	$85,222	118,500	$52,444	$52,092

** Source: Census 2000*

2.4 Plant and Local Area Taxes

In addition to the benefits Diablo Canyon provides to the area in terms of employment and direct purchases, it also makes large tax payments. Due to the recent changes in California electricity markets and the subsequent increase in electricity prices, the tax payments made by the Diablo Canyon plant have varied substantially over the past several years. As a result, past tax payments are likely not an accurate reflection of future tax payments from the plant.

As part of the regulatory process, the Diablo Canyon plant estimates it will pay $76.9 million in taxes to state, local and federal governments, $27 million of which will be paid to state and local governments. Electric utility property taxes, which are paid to the state and then redistributed to the counties in which each plant is located, comprise approximately $20 million of these tax payments. Ninety percent of the $23 million per year that San Luis Obispo County receives from PG&E in property taxes is from the Diablo Canyon plant. In fact, property taxes paid by the Diablo Canyon plant accounted for almost one-tenth of San Luis Obispo County's $256 million property tax levy in 2002.

2.5 Summary

The performance of the Diablo Canyon plant mirrors the performance of the nuclear industry as a whole. Diablo Canyon provides low-cost electricity, high employment and a large tax base to San Luis Obispo County and California. However, these are only the direct economic benefits of the plant. As illustrated in the next section, the secondary effects on the local and regional economies are as large as the direct benefits.

Section 3: Economic and Fiscal Impacts

The economic and fiscal effects of Diablo Canyon's operation go well beyond what the plant spends on purchases, wages, salaries, employee benefits and taxes. They also reflect the strong stimulus that the plant's large wage and salary payments provide to key measures of economic activity—value of electricity production, labor income and employment—in the local and state economies.

Diablo Canyon's spending lifts economic activity throughout the local and state economies. Tax payments related to economic activity are another contributing factor. This multiplier effect is felt throughout the local and state economies—by the private sector in the form of increased sales and employment, and by the public sector through increased tax revenues to support the provision of public services.

Estimates of these effects were developed by applying the IMPLAN model to expenditure data provided by PG&E, owner of the Diablo Canyon plant. (For more information on IMPLAN and related information, see Section 6.)

3.1 Plant Expenditures in San Luis Obispo County

Diablo Canyon expenditures for products and services (including labor) in San Luis Obispo County totaled $113.4 million in 2002. Spending within the county represents approximately 40 percent of the plant's total spending of $285.4 million and approximately two-thirds of the $171.9 million of spending in California.

The expenditure totals for San Luis Obispo County were provided by PG&E and are shown in Table 3-1. The 10 sectors receiving the largest amount of Diablo Canyon spending are listed in the table according to the amount spent in San Luis Obispo County. The categories are chosen from among the 528 IMPLAN sectors and are listed largely according to the IMPLAN description for each. Total compensation, which includes wages, salaries and benefits, is listed separately.

Similar expenditure totals for the state of California and the United States are presented in Tables 3-2 and 3-3, respectively. Expenditure totals for San Luis Obispo County are included in the totals for California in Table 3-2, and for the United States in Table 3-3.

Table 3-1. Diablo Canyon Expenditures in San Luis Obispo County (2002)

Description	Amount
Repair Services	$1,273,052
Food Services	$658,869
Wholesale Trade	$636,404
Industrial Machinery	$484,720
Detective and Protective Services	$257,561
Air Transportation	$144,420
Medical and Health Services	$135,968
Management and Consulting Services	$126,833
Iron and Steel	$97,031
Services to Buildings	$76,027
Other	$424,990
Subtotal	$4,315,874
Total Compensation[a]	$109,041,073
TOTAL	$113,356,947

[a] *Total compensation includes wages, salaries and fringe benefits based on data provided by Diablo Canyon.*

Total compensation for labor was $109 million and represents approximately 96 percent of Diablo Canyon's expenditures in San Luis Obispo County. This reflects the fact that most of the plant's expenditures for labor (wages, salaries and employee benefits) stay "home" in the county. Naturally, the county's share is much larger than that of California and the United States.

The largest non-labor expenditures in the county totaled $1.27 million for repair services. This sector includes maintenance and repair services provided by general and specialized contractors serving the nuclear industry.

The next largest non-labor expenditures in San Luis Obispo County were for food services at nearly $659,000. This sector largely represents the operation of the cafeteria at the Diablo Canyon plant. Because of its remote location, most employees eat on-site during working hours.

Seven of the sectors in Table 3-1 include service expenditures. The prevalence of service sectors reflects the heavy reliance of the plant on contracted labor to perform many of the specialized services that are outsourced by the plant. The air transportation category reflects helicopter services that are purchased by the Diablo Canyon plant.

3.2 Plant Expenditures in California

In 2002, Diablo Canyon expenditures for products and services (including labor) in California totaled $171.9 million. This total includes the $113 million dispersed in San Luis Obispo County, as well as expenditures of $58.9 million spent in other areas of California. Spending within the state represents approximately 60 percent of the plant's total spending of $285 million.

Total spending in California is presented in Table 3-2. Total compensation is the largest category at $96.4 million and represents about 71 percent of the total. This is down slightly from the share of total compensation for spending in San Luis Obispo County, indicating relatively more spending on products and non-labor services in the rest of California.

Table 3-2. Diablo Canyon Expenditures in California (2002)

Description	Amount
Repair Services	$18,557,678
Management and Consulting Services	$5,562,506
Industrial Machinery	$4,395,460
Personnel Supply Services	$3,505,031
Engineering-Architectural Services	$3,288,701
Wholesale Trade	$2,065,263
State and Local Government	$1,351,887
Research and Testing Services	$1,221,040
Medical and Health Services	$922,970
Other Business Services	$905,452
Other	$7,050,119
Subtotal	$48,826,108
Total Compensation[a]	$123,129,406
TOTAL	$171,955,514

[a] *Total compensation includes wages, salaries and fringe benefits based on data provided by Diablo Canyon.*

The repair services sector remains the largest non-labor expenditure category for California at $18.6 million, 11 percent of total California spending. Management and consulting services is the second largest category, with $5.6 million.

Industrial machinery occupies third place on the California Top 10 list. Many of the sectors with the highest spending in the state are the same as those in the county. Expenditures that make the Top 10 in California, but are not as important for San Luis Obispo County, include engineering and architectural services, state and local government, and research and testing services. The state and local government category represents payments made by the plant for emergency preparedness. The research and testing services category represents advanced engineering, environmental and safety tests performed by outside consultants.

Expenditures in California are concentrated in the services category. These services typically employ the expertise of specialized and skilled labor.

3.3 Plant Expenditures in the United States

Diablo Canyon expenditures for products and services (including labor) purchased in the United States in 2002 totaled $285.4 million. Apart from expenditures of $171.9 million in California, $113.5 million was spent elsewhere in the United States. Much of that amount was for specialized products and services unique to the nuclear industry.

U.S. expenditures are detailed in Table 3-3. Total compensation ($124.7 million) remains the largest category and represents 43 percent of the total. Total compensation as a share of the U.S. total is lower because plant employees live mostly in California (and particularly in San Luis Obispo County), whereas spending on products and non-labor services is concentrated outside the state.

The largest spending for products and non-labor services was in Inorganic Chemicals NEC ($64.4 million). NEC, or "not elsewhere classified," is a broad category for products related to inorganic chemicals. In the case of Diablo Canyon, this category primarily involves the purchase of nuclear fuel. This category represents roughly 22 percent of total Diablo Canyon spending nationwide.

Repair services ($29 million) remains one of the largest expenditures in the national data. This is not unique to Diablo Canyon, as specialized maintenance and repair spending is typically the largest expenditure at other nuclear plants, reflecting the strong emphasis on maintenance to ensure safe operations, high availability rates and capacity factors. Much of this is spent on preventive maintenance.

Table 3-3. Diablo Canyon Expenditures in the United States (2002)

Description	Amount
Inorganic Chemicals NEC (Nuclear Fuel)	$64,360,473
Repair Services	$28,973,191
Personnel Supply Services	$15,795,701
Management and Consulting Services	$9,656,725
Industrial Machinery	$9,027,370
Research and Testing Services	$7,115,297
Engineering-Architectural Services	$4,748,295
Wholesale Trade	$2,583,861
Water Supply and Sewerage Systems	$2,105,840
State and Local Government	$1,577,720
Other	$14,827,953
Subtotal	$160,772,426
Total Compensation[a]	$124,671,152
TOTAL	$285,443,578

[a] *Total compensation includes wages, salaries and fringe benefits based on data provided by Diablo Canyon.*

The remaining sectors on this Top 10 list are the same as in Table 3-2, with one exception—water supply. Purchases in this sector were primarily for pure water (free of minerals and ions) for use in the primary loops of the core cooling systems of reactors, such as those at Diablo Canyon. These services are typically provided by suppliers based outside California.

3.4 Taxes Paid and Accrued

The plant's tax payments have varied substantially in the past several years as a result of changes in the state's electricity market structure and the steep increase in electricity prices. Consequently, past tax payments may not adequately predict the plant's future tax payments.

Estimated future tax payments as part of the regulatory process indicate that the Diablo Canyon plant will pay $76.9 million in taxes to local, state and federal governments. Of that, $27 million will be paid to local and state governments, including approximately $20 million in property taxes.

In California, electric utility property taxes are paid to the state and then redistributed to the counties where each plant is located. San Luis Obispo County receives $23 million per year in property taxes from PG&E; 90 percent of that amount is paid for the Diablo Canyon plant.

Table 3-4. Taxes Paid by Diablo Canyon Nuclear Plant

Federal Government	
Payroll Tax	$9,910,000
Other Federal Taxes	$40,000,000
Total Federal Taxes	$49,910,000
State and Local Government	
Property Tax	$20,000,000
Other State Taxes	$7,000,000
Total State and Local Taxes	$27,000,000
Total Taxes Paid	$76,910,000

3.5 Economic Impacts by Geographic Area

Summary economic impacts for each of the three geographic areas—San Luis Obispo County, California and the United States—are presented in Table 3-5. The three economic impact variables are:

- output—the value of production of goods and services, measured in 2002 dollars
- labor income—the earnings of labor, measured in 2002 dollars
- employment—measured in jobs provided.

Table 3-5. Impact of Diablo Canyon Plant on Local, State and National Economies

	Direct	Indirect[a]	Induced[b]	Total
San Luis Obispo County				
Output	$574,700,032	$3,469,319	$63,828,991	$641,998,360
Labor Income	$109,030,000	$1,063,285	$18,029,874	$128,123,162
Employment	1,405	48.7	833.6	2,287
California				
Output	$574,758,016	$42,574,599	$106,326,947	$723,659,563
Labor Income	$123,129,008	$16,135,506	$34,612,361	$173,876,877
Employment	1,638	477.7	1,138	3,254
United States				
Output	$574,758,016	$180,541,284	$281,418,536	$1,036,717,816
Labor Income	$124,671,000	$58,795,386	$87,140,832	$270,607,214
Employment	1,707	1,709	2,948	6,364

[a] *Indirect impacts measure the effect of input suppliers on expenditures by Diablo Canyon.*

[b] *Induced impacts measure the effects produced by the change in household income that results from Diablo Canyon expenditures.*

These economic impacts are divided into direct and secondary effects. The direct, or "first round," effects reflect the industry sector and geographical distribution of Diablo Canyon spending without any subsequent spending effects. The secondary, or "ripple," effects include subsequent spending effects, which can be further divided into two types: indirect and induced. Indirect effects reflect how the plant's spending patterns affect subsequent spending patterns among suppliers. Induced effects reflect how changes in labor income affect the final demand for goods and services, which then has an effect on all sectors producing basic, intermediate and final goods and services.

The direct effects in this table are based on the estimated value of the power production from the Diablo Canyon plant of $574.7 million for fiscal 2002. This output value is based on 2003 wholesale market values for the electricity from Diablo Canyon[3]. The wholesale rate used was $31/MWh. The output value is divided among salaries, taxes, plant purchases, investor returns and consumer benefits. It reflects the total output of products and services associated directly with Diablo Canyon. This total includes the expenditures for products and services (including labor) itemized in Tables 3-1, 3-2 and 3-3.

The direct employment entry (1,707 jobs) for the United States is the Diablo Canyon employment level over this period. The majority of these jobs (about 82 percent) are filled by workers in San Luis Obispo County. Of the remaining 302 jobs, 233 are filled by residents of California outside the county, and the other 69 are filled by residents of other states. The direct labor income entries reflect the geographic distribution pattern of Diablo Canyon employment.

[3] Table 3-5 uses 2003 wholesale prices in order to provide a more reasonable estimate of power prices in the near future. The use of 2003 prices avoids using prices during and after the California energy crisis.

As Table 3-5 indicates, direct effects are typically the largest contributor to total effects for each of the measures of economic impact and for San Luis Obispo County and California. Ripple effects are the largest contributor to total effects in the United States.

Within the ripple effects, induced effects are larger than indirect effects for San Luis Obispo County and California, both because the direct effects on labor income are large and because the final demand changes affect more sectors than are included in the indirect (supply chain) effects. The induced effects represent the increased local output due to the large additions that Diablo Canyon makes to the local employment base.

These results reveal the multiplier effects of Diablo Canyon spending. Multipliers show the ratio of the plant's "total economic impact" to its "direct economic impact" and can be measured for each geographical region. The most interesting multipliers are for the total effects, which is the ratio between the total and direct effects.

The total output multiplier reveals how much spending results for a geographic area of interest for each dollar of direct spending. The total output multiplier for San Luis Obispo County is 1.12 (or $641.9 million divided by $574.7 million). This indicates that for every dollar of output from the Diablo Canyon plant, the San Luis Obispo County economy produces $1.12. Using the same formula, the output multiplier is 1.25 for California, and 1.8 for the United States.

3.6 Economic Impacts by Local Industry

Diablo Canyon's economic impacts are spread over virtually every sector in the economy. The direct effects are concentrated in a few sectors, but the ripple effects—and especially the induced effects—increase the dispersion of total effects across other sectors. The sectors most affected vary by geographic area. Table 3-6 presents the 10 sectors most affected by the plant in San Luis Obispo County, based on total output.

The sector most affected in terms of total output is the electric services sector because this includes electricity produced by the plant. Thus, all direct effects are included in this sector. It is also the largest sector, based on total output, in the California and U.S. economies, as shown in Tables 3-7 and 3-8, respectively.

The second most affected sector is housing values. This is not a traditional business/industry sector. Thus, there are no impacts on labor income or employment. Instead, it is a special sector developed by the U.S. Department of Commerce's Bureau of Economic Analysis. It estimates what homeowners would pay in rent if they rented rather than owned their homes. In essence, it creates an industry out of owning a home. The sole product (or output) of this industry is home ownership, purchased entirely by personal consumption expenditures from household income. In effect, this sector captures increases in housing values due to increased labor in the area resulting from the plant.

The other sectors most affected by the Diablo Canyon plant are related to providing goods and services to the plant's large employment base. These include enterprises such as doctor and dentist practices, restaurants, retail stores, and automotive dealerships. Spending by plant employees indirectly boosts the sales and employment of these industries, which are typically run by local small business owners.

Table 3-6. Impact of Diablo Canyon on the Most Affected Industries in San Luis Obispo County

Industry Description	Output	Labor Income	Employment
Electric Services (Diablo Canyon)	$576,406,080	$109,353,664	1,409
Housing Values (rental rate per year)	$6,926,350	$0	0
Doctors and Dentists	$4,440,394	$2,075,044	47
Restaurants	$4,209,793	$1,379,088	112
Real Estate	$3,793,558	$180,352	21
Hospitals	$3,286,618	$1,585,046	47
Retail Stores	$2,568,107	$797,113	64
Banking	$2,547,890	$459,108	13
Wholesale Trade	$2,421,129	$914,945	31
Automotive Dealers and Service Stations	$2,120,150	$820,796	27
Other	$33,278,287	$10,557,965	516

3.7 Economic Impacts by State Industry

Table 3-7 uses the same sectors applied in Table 3-6 to illustrate effects on the state of California. Again, the electric services sector is most affected, in terms of total output. The second largest industry affected is repair services. This category captures many of the specialized repairs performed by contractors for Diablo Canyon.

The entries in Table 3-7 for the most affected industries in California are similar to those in San Luis Obispo County. The primary exception is the inclusion of management and consulting services in the top 10 sectors affected in California. These services tend to be highly specialized and have their offices congregated in the larger cities of most states.

Table 3-7. Impact of Diablo Canyon Power Plant on the Most Affected Industries in California

Industry Description	Output	Labor Income	Employment
Electric Services (Diablo Canyon)	$574,814,848	$123,141,184	1,638
Repair Services	$11,510,549	$2,694,692	147
Housing Values (rental rate per year)	$9,473,834	$0	0
Wholesale Trade	$8,714,490	$3,464,453	66
Doctors and Dentists	$5,872,421	$2,794,832	61
Real Estate	$5,577,494	$353,004	25
Eating and Drinking	$5,545,129	$1,950,893	132
Management and Consulting Services	$4,870,729	$2,125,605	52
Banking	$4,722,013	$870,504	17
Hospitals	$4,411,385	$2,237,923	56
Other	$88,146,671	$34,243,787	1,059

3.8 Economic Impacts by U.S. Industry

Table 3-8, similar to Tables 3-6 and 3-7, illustrates the impact on the United States. Again, the most affected sector is electric services, in terms of total output.

The second largest sector is industrial inorganic chemicals and cyclic crudes, which includes inorganic and organic chemicals. This sector is important in this study because it includes nuclear fuel processing services. These services are performed at only a few locations in the United States and the world.

The 10 most affected sectors (on the basis of output) in the United States are very similar to the 10 most affected sectors in San Luis Obispo County and California. The main difference, aside from the industrial inorganic chemicals and cyclic crudes sector, is research and testing services. Like management and consulting services, research and testing are highly specialized services that are typically done by a few U.S. companies.

Table 3-8. Impact of Diablo Canyon Plant on the Most Affected Industries in the United States

Industry Description	Output	Labor Income	Employment
Electric Services	$574,772,544	$124,674,152	1,707
Industrial Inorganic Chemicals and Cyclic Crudes	$27,522,586	$2,939,440	36
Research and Testing Services	$22,226,078	$11,743,893	295
Housing Values (rental rate per year)	$21,913,098	0	0
Wholesale Trade	$21,458,268	$8,638,426	169
Repair Services	$18,457,414	$4,849,753	266
Real Estate	$18,111,816	$1,291,037	95
Banking	$14,150,990	$2,657,252	56
Personnel Supply Services	$11,492,298	$9,153,836	467
Communications	$11,089,572	$2,271,833	34
Other	$295,523,152	$102,387,592	3,238

3.9 Tax Impacts

Diablo Canyon spending has effects on tax payments that extend beyond the taxes paid directly on the plant. This spending has direct impacts on income and value creation, which affects taxes paid on that income and value. Similarly, the ripple effects of Diablo Canyon spending on other spending and economic activity leads to additional income and value creation, which leads to additional taxes paid.

These additional or "induced" effects on tax payments are much larger than the taxes paid directly. These results are presented in Table 3-9. Diablo Canyon is responsible for almost $38.6 million in state and local tax revenue either directly or indirectly. Much of the indirect expenditures come through additional property tax revenue created by the large number of employees at the Diablo Canyon plant.

These results can be used to compute tax multipliers, but not for each line item. Line-item tax multipliers cannot be computed because some taxes are not paid by Diablo Canyon. Table 3-9 does not include taxes accrued by Diablo Canyon.

Table 3-9. Tax Impacts of Economic Activity Induced by Diablo Canyon

	Taxes Paid by Diablo Canyon	Taxes Induced by Diablo Canyon Expenditures	Total Tax Impact[a]
Federal Government			
Payroll Tax	$9,910,000	$22,522,319	$32,432,319
Personal Taxes		$32,262,031	$32,262,031
Other Federal Taxes	$40,000,000	$270,399	$40,270,399
Total Federal Government	$49,910,000	$55,054,749	$104,964,749
State and Local Government			
Personal Taxes		$6,316,785	$6,316,785
Other State and Local Taxes	$27,000,000	$4,847,056	$31,847,056
Total State and Local Government	$27,000,000	$11,558,789	$38,558,789
Total Taxes	$76,910,000	$66,613,538	$143,523,538

[a] *The total tax impact includes taxes paid by Diablo Canyon and other entities as a result of the economic activity created by Diablo Canyon expenditures.*

3.10 Summary

The economic and fiscal impacts of Diablo Canyon are substantial. These impacts are greater in absolute terms at the national level than at the state level and greater at the state level than at the county level. When compared with their respective economies, relative impacts are reversed: relative impacts are highest for San Luis Obispo County, next highest for California and lowest for the United States. The Diablo Canyon job creation impact (direct and indirect) of 2,287 jobs in San Luis Obispo County represents almost 2 percent of the employed work force of 118,500 in the county. This is a significant number of jobs deriving from a single enterprise.

As is the case with other nuclear plants, Diablo Canyon buys many specialized products and services not available in local and state economies. It typically buys from national and international markets. The state and local economic and fiscal effects are great, in large part because of the buying power that is created by Diablo Canyon's high wages, salaries and benefits, which are spent on goods and services provided locally and in nearby areas. This spending supports many small businesses in the area.

Section 4: Additional Benefits Provided by Diablo Canyon

Besides the economic benefits generated by the Diablo Canyon plant in San Luis Obispo County, the plant also provides additional benefits to the community that are difficult to calculate in economic terms. These benefits include land stewardship, natural resource and cultural preservation, community involvement, and clean-air benefits.

4.1 Land Stewardship

PG&E and the Diablo Canyon plant serve as a caretaker for conserving and protecting the natural and cultural resources of California's central coast. The Diablo Canyon plant is situated on a 14-mile stretch of the Pacific coast. The plant itself, however, only takes up a small fraction of this land area—535 of the 9,500 acres of PG&E property.

The plant site is located between the Pecho and Marre Ranches, which are both owned by PG&E. The plant's buildings occupy even less space. The plant has 1 million square feet of building space, a parking lot for 1,500 cars and a seven-mile service road. The large area controlled by PG&E and the relatively small amount needed for plant activities allow PG&E to serve as an environmental steward for a large and diverse area of the California coast.

The Diablo Canyon property stretches from the San Luis Mountain uplands to the Pacific Ocean. The property's variety of elevations and soils allow for diverse vegetation and wildlife. The land supports several types of vegetation, such as coastal scrub, chaparral, and oak and pine trees. It also includes grasslands, freshwater marshes, as well as coastal marine and riparian habitats surrounding creeks and streams. The land supports a wide variety of species, some of which are threatened, endangered or protected. These species include badgers, bobcats, coyotes, mountain lions, owls, peregrine falcons, rainbow trout, sea otters and seals.

The land also represents a historical resource. Prehistoric peoples inhabited the land on and around the Diablo Canyon site for more than 9,000 years. The first inhabitants of the region were the Chumash people, who lived on small settlements up and down the central California coast and subsisted on marine resources, as well as some of the terrestrial resources near the coast. The lands around Diablo Canyon later became part of Mexico and were given in land grants to settlers, who largely used the land for cattle grazing.

Because of the rich natural and historical value of the Diablo Canyon lands, PG&E has a strong commitment to be a good steward of the land by studying and protecting plant and vegetation species. The company also allows managed access to the land and agricultural and grazing access, while ensuring that these activities do not disturb the local environment.

Since the 1960s, PG&E has worked to preserve the site's natural resources. Biologists developed a pre-operational history of the environment and have continued to monitor the natural environment. These studies include observing local species, such as peregrine falcons and sea otters, and monitoring local water quality. To conduct these studies, PG&E constructed a marine biological laboratory on the Diablo Canyon site. Hunting and fishing are prohibited on the Diablo Canyon site, and native habitat protection areas are being developed that will safeguard native species, as well as endangered species.

In addition to preserving the natural resources at the Diablo Canyon site, PG&E also takes steps to preserve the cultural and historical resources at the site. Archaeologists and historians are allowed to excavate and study artifacts left from past human activity on the land. One program conducted an archeological survey of 370 acres of the Pecho Ranch, identifying 23 sites of cultural significance with historic and prehistoric artifacts on five sites.

To protect these and other cultural resources, PG&E takes steps to ensure that cultural resources are not disturbed. Land management activities are conducted so as not to disturb known cultural resources. When unknown artifacts are discovered, land activities are halted in order to consult with archaeologists and American Indian representatives.

Farming and ranching have been practiced for more than 100 years on the Diablo Canyon lands, and PG&E continues to allow such activities. Approximately 200 acres of the Diablo Canyon land is currently under cultivation. The primary crops are barley, Sudan grass and sugar peas. Between 60 and 140 head of cattle graze on 2,500 acres at Diablo Canyon. Agricultural and grazing activities are performed on the land in a manner that limits environmental impact. Agricultural practices must maintain erosion control, provide soil stability and fertility, and minimize pesticide use. Cattle grazing is practiced in a way that lessens degradation of sensitive biological resources.

To allow the public to enjoy the natural beauty and unique environment of the Diablo Canyon lands, managed access is allowed through several programs. A marine science education program was developed for the students of San Luis Obispo County on the Diablo Canyon lands. This program allows students to study the plant's unique marine environment.

Through a partnership between PG&E and the California Coastal Commission, the Pecho Coast trail was developed. This trail provides access to Point San Luis in the southern portion of the Diablo Canyon lands. The trail, managed by the Nature Conservancy, offers seven-mile hikes crossing wooded canyons and chaparral areas and glimpses of coastal bluffs and marine environments.

4.2 Community Involvement

The Diablo Canyon plant and its employees take an active role in civic activities in San Luis Obispo County. In a typical year, PG&E and Diablo Canyon employees contribute $120,000 to community groups. These programs are primarily concentrated in the areas of civic activities, human services, education and community development.

PG&E focuses its largest donations on programs that help the community's needy. The company and its employees donated $140,000 to the United Way in 2002 and $120,000 to the Food Bank Coalition of San Luis Obispo County.

In the area of civic development, PG&E gave $5,000 to the Cattleman's Western Art Show and $3,000 to the Atascadero Youth Task Force. In the area of human services, PG&E donations included $5,000 to the Economic Opportunity Commission Health Services of San Luis Obispo for health screening for seniors and $2,000 to the United Way of San Luis Obispo County.

The company's greatest involvement is in supporting education. Diablo Canyon made donations of $25,000 to the Cuesta College Foundation. Other contributions included $5,000 for a marine biologist-for-a-day program, $5,000 for the San Luis Obispo Children's Museum and $5,000 for the Allan Hancock College Foundation.

Although Diablo Canyon's greatest contribution to local economic development is through the economic activity generated by the plant and its employees, it also supports efforts to facilitate the economic development of San Luis Obispo County. One such program was a donation of $10,000 to the county's Economic Vitality Commission to support marketing the area to new businesses.

4.3 Air Quality

Diablo Canyon also provides air-quality benefits to the local area. Nuclear power plants do not emit any gases into the air during the production of electricity so they do not pollute the air. In fact, nuclear plants have the smallest environmental impact of any major electricity source, according to recent studies in Europe and Japan.

Fossil fuel plants typically emit sulfur dioxide that causes acid rain; nitrous oxides that lead to ozone pollution and haze; and carbon dioxide, which many scientists link to global warming. The Diablo Canyon plant does not emit any of these gases, except for small amounts from back up generation and car exhaust.

If a natural gas plant had been built on the current Diablo Canyon site instead of a nuclear power plant, annual sulfur dioxide emissions would have been 5,000 tons higher, and nitrous oxide, 160 tons higher. Carbon dioxide emissions would have been more than 9 million tons higher. This is equivalent to the carbon dioxide produced by almost 2 million cars[4].

[4] Source: EPA data for California

Section 5: Nuclear Industry Trends

U.S. nuclear power plant performance reached an all-time high in 2002, the fifth consecutive record-setting year. The nuclear energy industry has steadily improved performance and cost, while also improving plant safety. The nuclear energy industry is a model of industrial safety.

Power plant performance is commonly measured by capacity factor, which expresses the amount of electricity actually produced by a plant compared with the maximum achievable. U.S. nuclear power plants achieved a capacity factor of 91.9 percent in 2002. Total electricity production for U.S. nuclear power plants also reached new heights in 2002. At the same time, production costs for those plants have been among the lowest of any baseload fuel source.

5.1 Nuclear Industry Performance

U.S. nuclear power plants have increased their output and improved their performance significantly over the past 10 years. Nuclear energy represents about 20 percent of all electricity generated in the United States. In 2002, nuclear energy generated 780 billion kWh of electricity. Since 1990, the industry has increased total output equivalent to 25 new, large nuclear plants. The increase in output has been accomplished without building any new nuclear plants.

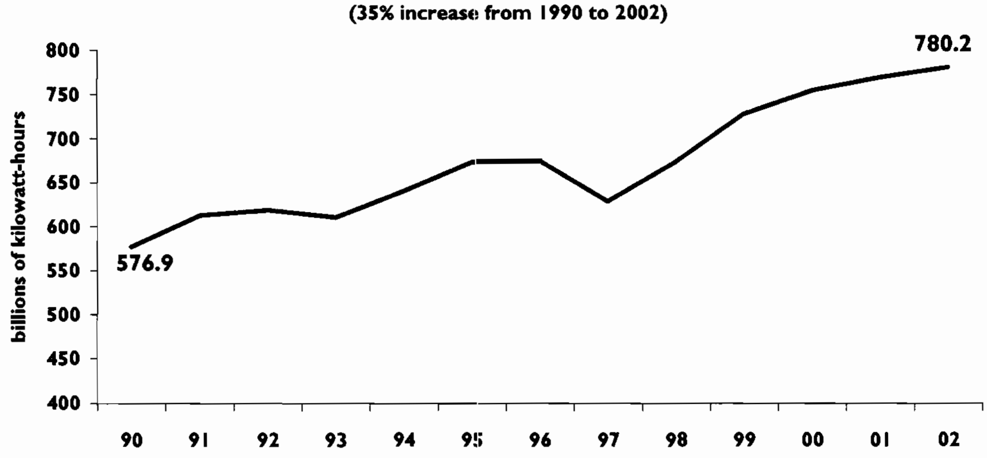
In 2002, U.S. nuclear plants operated at an average capacity factor of 91.9 percent. In fact, overall capacity factors for U.S. nuclear plants increased dramatically over the past decade. By contrast, the average industry capacity factor was 60 percent in the late 1980s.

One of the key reasons for these increased capacity factors has been the shortening of refueling outage times.

Figure 5-1.

U.S. Nuclear Industry Net Electricity Generation

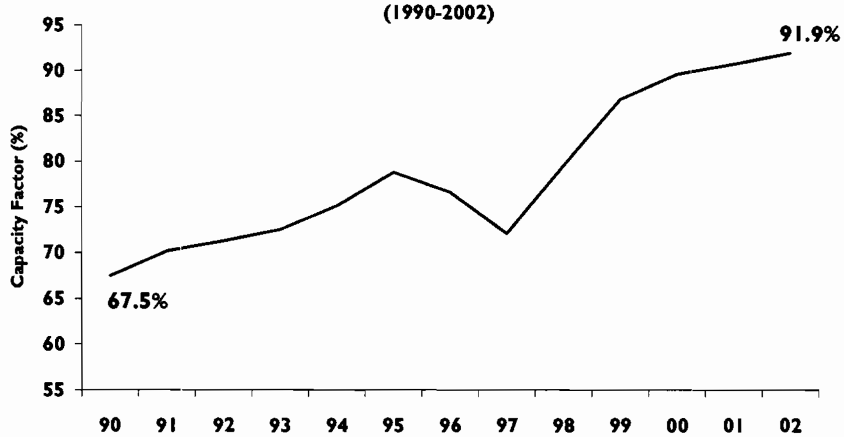
(35% increase from 1990 to 2002)



Source: Energy Information Administration

Nuclear plants need to shut down to refuel approximately every 18 to 24 months. Refueling represents one of the major determinants of nuclear plant availability. In the past 10 years, the durations of refueling outages have been declining. In 1990, the average refueling outage took 105 days to complete. By 2001, this number declined to an average of 37 days, and companies continue to apply best practices to further reduce this average. The record for the shortest refueling outage is 14.67 days for a boiling water reactor and 15.67 days for a pressurized water reactor.

Figure 5-2.
Nuclear Industry Average Capacity Factors
(1990-2002)

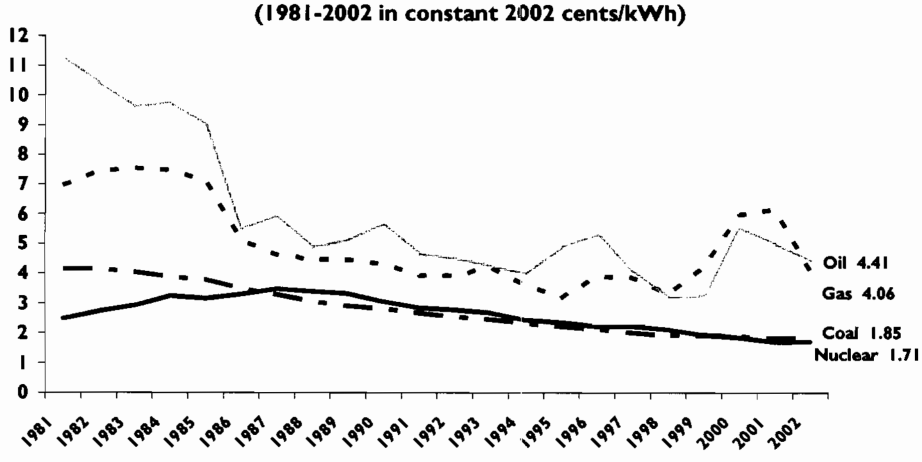


Source: Energy Information Administration

5.2 Cost Competitiveness

Along with increasing output, the U.S. nuclear industry has continued to decrease its operations costs. In 2002, nuclear power had a production cost of 1.71 cents/kWh. This was significantly lower than the production costs of electricity generated by oil and natural gas and slightly lower than coal. In the past decade, nuclear production costs have dropped by about one-third, as a result of the increased capacity factor of the U.S. plants. Since most nuclear plant costs are fixed, greater electricity production creates lower cost. However, nuclear plants have also taken steps to reduce their total cost through improved work processes.

Figure 5-3. U.S. Electricity Production Cost
(1981-2002 in constant 2002 cents/kWh)



Source: Pre-1995: Utility Data Institute (UDI) Post-1995: Resource Data International (RDI) Modeled Production Cost

Table 5-1. Wholesale Electricity Prices by Region (cents/kilowatt-hour)

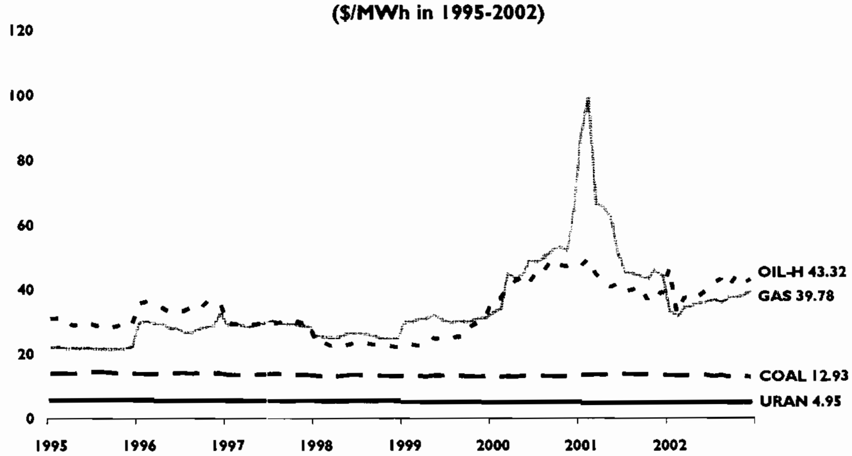
Region	2001 Average On-Peak Prices	2003 On-Peak Futures Prices
New England	4.99	3.58
New York	4.97	4.38
Mid-Atlantic	3.93	3.63
Tennessee Valley	3.58	3.03
Gulf States	3.60	3.05
Midwest	3.39	3.00
Texas	3.46	3.30
Northwest	13.00	3.48
Southwest	11.30	3.73

Because of low production costs and excellent safety performance, nuclear plants are well-positioned to compete in today's energy markets. Ultimately, the primary test of nuclear energy's competitiveness is how well it performs against market prices. In this respect, nuclear energy is highly competitive. Average production costs at the nation's 103 reactors were 1.71 cents/kWh in 2002, lower than the average price in all regional markets. Nuclear energy is also competitive with futures market prices, one of the best ways to judge what prices will be in the year ahead.

Nuclear plants also provide a unique degree of price stability not seen by other fuel sources for two reasons. First, production costs for nuclear plants are comprised of costs not associated with fuel. Fuel markets tend to be very volatile, so the production costs of generation sources tied to fuel expenses are highly volatile, as they swing with variations in fuel markets. Fuel represents only 20 percent of the production cost of nuclear energy, but it makes up between 60 percent and 80 percent of the cost of natural gas, coal and petroleum-fired generation. Second, nuclear fuel prices are much more stable than that of fossil fuels, particularly natural gas and petroleum. Because of its stable, low production cost, nuclear energy can help mitigate large electricity price swings.

Figure 5-4. Monthly Fuel Cost to Electric Generators

($/MWh in 1995-2002)



Source: RDI and UDI.

5.3 Industry Safety

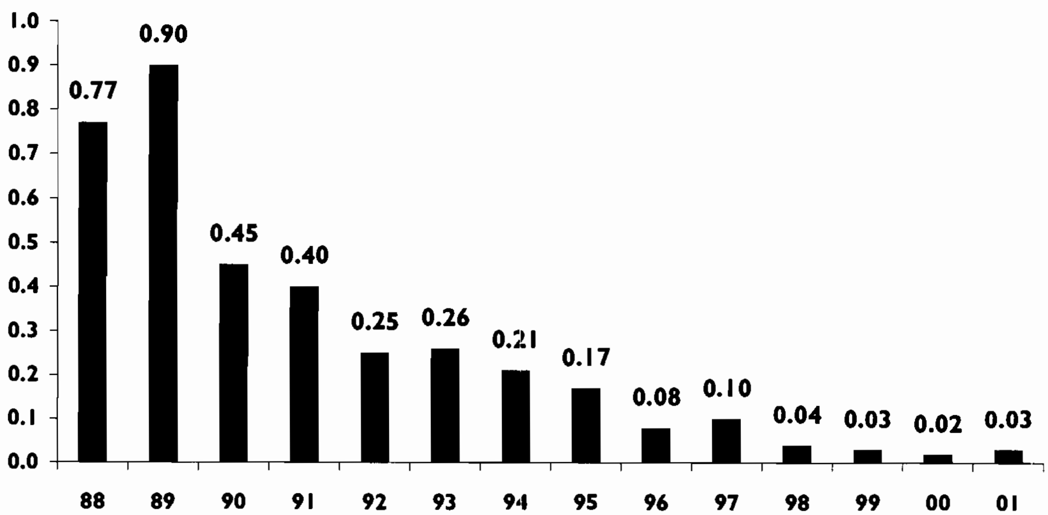
The nuclear industry's recent performance and cost achievements have been accomplished in an era of outstanding safety at U.S. nuclear plants. In 2002, the nuclear energy industry met or exceeded all safety goals set by the Institute of Nuclear Power Operations (INPO) and the World Association of Nuclear Operators (WANO). These entities track safety and performance data in 10 key areas.

One key indicator tracked by INPO and WANO is the number of unplanned automatic plant shutdowns, or "scrams." The U.S. industry has made dramatic improvements in the number of unplanned automatic shutdowns. In 1980, the U.S. nuclear industry had a median of 7.3 shutdowns per reactor. Since 1997, the median has been zero scrams per reactor, per year.

Other safety and performance indicators tracked by the Nuclear Regulatory Commission (NRC) confirm the improved safety performance of U.S. nuclear plants. The NRC tracks data on the number of "significant events" at each nuclear plant. (A significant event is broadly defined as any occurrence that challenges a plant safety system.) The average number of significant events per reactor has declined from 0.77 per year in 1988 to 0.03 in 2001.

In addition to safe operations, U.S. nuclear plants are continuing to improve already high levels of worker safety. According to NRC data, radiation exposure to workers (measured in rem) decreased from an average of about 1 rem per year in 1973 to 0.16 rem per year in 2001. Both the historical and current doses per employee are far below the regulatory limit of 5 rem per year.

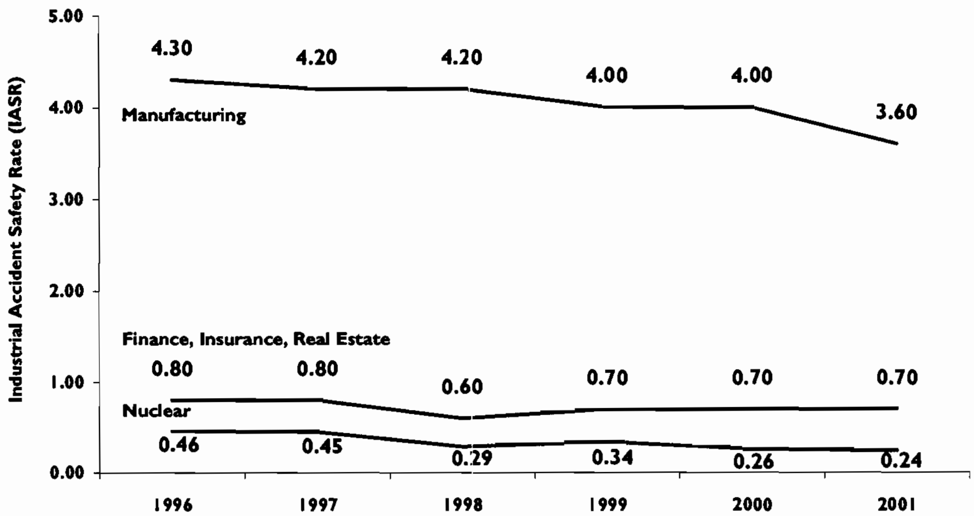
Figure 5-5. Significant Events: Annual Industry Average
(number of events per reactor 1988-2001)



Source: Nuclear Utility Service

Figure 5-6. Nuclear's Safety Record

Nuclear Industry's Industrial Accident Safety Rates Compared to Other Industries



*Number of accidents among full-time, on-site employees resulting in lost work, restricted work or fatalities per 200,000 worker hours

Sources: WANO and BLS

General worker safety also is excellent at U.S. nuclear power plants—far safer than the U.S. manufacturing sector. WANO and the Bureau of Labor Statistics (BLS) provide information on the industrial accident safety rate. This statistic measures the lost workday accidents or fatalities per 200,000 worker hours. The nuclear industry has improved its industrial accident safety rate from 0.46 in 1996 to 0.24 in 2001. By comparison, the U.S. manufacturing industry had an industrial accident safety rate of 3.6 in 2001 and the U.S. finance, insurance and real estate industries had an industrial accident safety rate of 0.7—both higher than the nuclear industry.

5.4 Current Industry Events

The excellent economic and safety performance of the U.S. nuclear power plants has increased interest in nuclear energy by the electric utility industry, the financial community and policymakers. This is evidenced by the increasing number of plants seeking license renewals from the NRC. Nuclear plants were originally licensed to operate for 40 years but can safely operate for longer periods of time. The NRC granted the first 20-year license renewal to the Calvert Cliffs plant in Maryland in 2000. As of November 2003, 19 plants have received license extensions, and 38 reactors have either submitted an application or formally announced that they will seek to renew their licenses. License renewal is an attractive alternative to building new electric capacity because of nuclear energy's low production costs and the return on investment for license renewal.

Besides relicensing current plants, interest has recently increased in building new nuclear plants. Several companies are exploring building new plants, and the Department of Energy is engaged in steps necessary to build new plants. In addition, President Bush included construction of new nuclear plants as an essential part of the National Energy Strategy announced in May 2001.

Section 6: Economic Impact Analysis Methodology

The methodology used to estimate the economic and fiscal impacts of the Diablo Canyon power plant is commonly referred to as input/output methodology. Several operational input/output models are available in the marketplace—the market leaders are IMPLAN, REMI and RIMS-II. The Impact Analysis for Planning (IMPLAN) model was selected for use in this study, primarily because of the availability of the model and data sets, the relevance of IMPLAN to the particular application, and its transparency and ease of use.

This report section presents typical applications of the input/output methodology and explains the methodology and its underpinnings. It also describes how Diablo Canyon data and the IMPLAN model were used to estimate local, state and national economic and fiscal impacts of recent plant operation.

6.1 Use of Input/Output Models

Input/output models capture input—or demand—and output—or supply—interrelationships for detailed business, industry and government sectors in a geographic region. They also capture the consumption of goods and services for final demand by these sectors and by the household sector. The basic geographic region is a county, and model results can be developed at the county, multi-county, state, multi-state and national levels. They are particularly useful in examining the total effects of an economic activity or of a change in the level of that activity.

These models are typically used when the following key questions need to be addressed:

- How much spending does an economic activity (such as a power plant) bring to a region or local area?
- How much of this spending results in sales growth by local businesses?
- How much income is generated for local businesses and households?
- How many jobs does this activity support?
- How much tax revenue is generated by this activity?

These models are also useful in addressing related questions, such as the geographic and industry distribution of economic and fiscal impacts. Typical applications of these models include:

- facility or military base openings or closings
- transport or other public infrastructure investments
- industrial recruitment and relocation
- tourism.

6.2 Overview of the Input/Output Methodology

Input/output models link various sectors of the economy—agriculture, construction, government, households, manufacturing, services and trade—through their respective spending flows in a reference year. These linkages include geographic ones, primarily at the national, state and county levels.

As a result of these linkages, the impact of an economic activity in any sector or geographic area on other sectors and areas can be modeled. These impacts can extend well beyond the sector and area in which the original economic activity is located. They include not only the direct, or initial, effects of the economic activity, but also the subsequent, or "ripple," effects that flow from this activity. Direct effects are analogous to the initial "splash" made by the economic activity, and ripple effects are analogous to the subsequent "waves" of economic activity (new employment, income, production and spending) that are triggered by this splash. A full accounting of the splash's effect also must include the waves emanating from the splash itself.

The sum of the direct and ripple effects is called the total effect, and the ratio of the total effect to the direct effect is called the "total effect multiplier," or simply the multiplier effect. Multipliers can be developed for any of the model outputs, such as earned income, employment, industry output and total income (which includes the effect of transfers between institutions).

Multipliers can also be developed for any industry/business sector or geographic area in the model. Multipliers for a county are smaller than for a larger area (such as the state in which the county is located), because some of the spending associated with an economic activity "leaks" from the smaller area into the larger area. At the local area level, multipliers are larger if the local area economy is more diversified and if the economic activity being modeled is a good "fit" within that economic base.

Ripple effects include two components—indirect and induced effects—that are separately modeled within input/output models. Indirect or "upstream" effects are the effects on the supply chain that feeds into the business/industry sector in which the economic activity is located. For example, when Diablo Canyon buys a hammer for $5, it contributes directly to the economy by this purchase, but the company that makes the hammer also has to increase its purchases of steel and wood to maintain its inventory, and this will increase output in the steel and wood industries. These industries will then have to purchase more inputs for their production processes, and so on. The result will be an economic impact that is greater than the $5 initially spent by Diablo Canyon for the hammer.

Induced effects are the effects on all sectors that result from changes in final demand of commodities and services that are associated with changes in income from the economic activity. They are primarily associated with changes in household spending on goods and services for final demand. These changes are the result of changes in labor income.

To illustrate, when Diablo Canyon pays $5 for the hammer, a portion of that amount goes to pay the wages of employees at the company that makes the hammer. This portion contributes to labor income, which provides an additional contribution to the economy through its effects on household spending for goods and services. There will also be a contribution from the effect of this purchase on labor income in the wood and steel industries, and the household spending on goods and services that results. Diablo Canyon's own wage and salary expenditures create induced effects too, and they occur primarily in the San Luis Obispo County economy.

As with any model, input/output models incorporate some simplifying assumptions to make them tractable. There are several key simplifying assumptions in input/output models.

Input/output models assume a fixed commodity input structure. In essence, the "recipe" for producing a product or service is fixed, and there is no substitution of inputs, either of new inputs (which were not in the mix before) for old inputs, or among inputs within the mix. Input substitution does not occur if technical improvements in some inputs make them relatively more productive. Nor does input substitution occur if there are relative price changes among inputs. Were any of these types of substitutions to be allowed, they might dampen the multiplier effects, especially for larger geographic areas.

Another key simplifying assumption is constant returns to scale. A doubling of commodity or service output requires a doubling of inputs, and a halving of commodity or service output requires a halving of inputs. There is no opportunity for input use relative to commodity or service production levels to change, as those levels expand or contract, so there are no opportunities for either economies or diseconomies of scale. This will not dramatically alter the overall results as long as the economic activity whose effects are being modeled isn't large relative to the rest of the sectors.

Input/output models assume no input supply or commodity/service production capability constraints. This simplifying assumption is related in part to the constant returns to scale assumption; for if there were supply constraints, there likely would be diseconomies of scale. As in the case of the constant returns to scale assumption, this "no supply constraints" assumption is not a major concern as long as the economic activity of interest is not large relative to the rest of the sectors.

Homogeneity is also a key simplifying assumption. Basically, firms within sectors and technologies within sectors are characterized as very similar. There is some ability to edit sector files to characterize specialized firms, but there is no ability to reflect full diversity of firms within sectors.

6.3 The IMPLAN Model and Its Application to Diablo Canyon

IMPLAN was originally developed by the U.S. Department of Agriculture's Forest Service in cooperation with the Federal Emergency Management Agency and the Department of the Interior's Bureau of Land Management to assist in land and resource management planning. IMPLAN, in use since 1979, is supported by the Minnesota IMPLAN Group Inc.

There are two components of the IMPLAN system: the software and the database. The software performs the necessary calculations, using study area data, to create the models. It also provides an interface for the user to change a region's economic description, create impact scenarios and introduce changes into the local model. The software is described in a user's guide provided by the Minnesota IMPLAN Group. The software was designed to serve three functions: data retrieval, data reduction and model development, and impact analyses.

The IMPLAN database consists of two major parts: national-level technology matrices and estimates of regional data for institutional demand and transfers, value added, industry output and employment for each county in the United States, as well as state and national totals.

The IMPLAN data and account structure closely follow the accounting conventions used in input/output studies of the U.S. economy by the Department of Commerce's Bureau of Economic Analysis. The comprehensive and detailed data coverage of the entire United States by county, and the ability to incorporate user-supplied data at each stage of the model-building process, provide a high degree of flexibility both in terms of geographic coverage and model formulation.

In applying the IMPLAN model to Diablo Canyon, three basic types of data were provided by PG&E:

- purchase order expenditures by Diablo Canyon purchase order code
- employee compensation expenditures
- tax payment data.

Purchase order expenditures were provided for a full year by PG&E for the year 2002. Employee compensation (salary data and an estimate of the value of benefits) was provided for the same time period, with a small gap at the end of 2002, when data were not available. Tax payment data were provided for calendar year 2002.

The purchase order data were mapped to IMPLAN's 528 sector codes by comparing the descriptions of the purchase order codes provided by PG&E with the Standard Industrial Classification (SIC) codes within IMPLAN's sector codes.

The purchase order and compensation data were then augmented by an estimate of output values from sales into the wholesale market over this period. This augmentation was necessary because purchase orders and compensation do not reflect all Diablo Canyon expenditures, and total expenditures (approximated by total revenues) better reflect the full economic impacts of Diablo Canyon. Plant revenues were estimated based on kilowatt-hours sold and wholesale prices paid in the California markets during this time period.

In tailoring the model to Diablo Canyon, the underlying data sets provided by IMPLAN were reviewed to see if any of the IMPLAN coefficients could be edited to better reflect local conditions. IMPLAN coefficients are based on national relationships, and in some cases may not reflect local conditions. In this report, the coefficients within the electric services sector were edited to more accurately reflect a nuclear power plant rather than a "national average power plant of all types."

The IMPLAN model only has a general category for electric services. Naturally since 50 percent of the country's electricity is produced by coal, the electric utility production function has in it large purchases of coal. This would be inappropriate for the impacts of a nuclear power plant. There are other similar problems with the generic production functions.

To correct this, the model instead used actual purchase order data from Diablo Canyon to produce a production function for the plant. This includes the location of purchases, since many purchases by a nuclear power plant are made outside the county or state. Without regional purchase coefficient editing, the estimates of local purchases would be much higher in general.

IMPLAN was then run to develop the economic and impact estimates, which were used in this report.

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NEI 50 Years
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Diablo Canyon Power Plant Economic Benefits to San Luis Obispo County

Dave Oatley, Vice President and General Manager

Diablo Canyon Power Plant

February 11, 2004

PG&E

Today's presentation will be in 4 Sections, and they are:

1. DCPP Economic Impact Study, Section 2
2. Where DCPP is headed – major investments
3. How to do business with DCPP & PG&E
4. DCPP in Perspective, Bill Watkins, Executive Director of UCSB Economic Forecast Project, Section 3 of Report

WHY DO THE STUDY?

- There was not an official estimate or calculation of the economic contribution
- Important step in PG&E's long standing policy of enhancing economic development
- Help residents know us better, and know how to do business with us

What Did the Study Examine?

- Looked at all 2002 expenditures, including: labor, taxes, charitable contributions, purchases and services provided to DCPP
- Utilized US Census and other governmental based information in combination with PG&E data
- Section 3 of the report measures all economic benefits to the local, state and national economies, including direct and induced economic benefits

WHAT ARE THE RESULTS?

- Larger than anticipated
- Single largest property taxpayer, with a significant portion of the county's assessed value in 2002
- Upward trend in investment and payroll
- Wages are significantly higher than county average

DCPP General Information

- (2) 1,100 Megawatt Reactors
- Unit 1 licensed until 2021; Unit 2, 2025
- 12 miles of coastline, 12,000 acres
- 1,707 workers: 1405 PG&E Employees, 302 Contract Employees

What do all of these people do?

- Generate safe and reliable power
- Form the largest armed law enforcement response agency in the county
- Create the largest private employer in the county
- Jobs include: Engineering, Medical, Fire, Security Force, Clerical, meteorology, health physicists, painters, communications, and purchasing agents
- Training, Training, Training – 20% of an operator's time is spent in training

DCPP Generation Background

- 1 megawatt is enough power for 1,000 California homes
- DCPP delivers 2,200 megawatts to the grid
- Approximately 2.2 million homes are powered by DCPP

Generation Background Continued

- In 2002, DCPP generated 16 million MWh.
- According to U.S. DOE Energy Information Administration, for 2002 that amount equates to an even higher number of homes served in California -- 4 million homes (due to conservation and high capacity)

Generation Size in Perspective

- 20% of power in PG&E service territory
- 10% of state's power
- CA has similar percentage of nuclear power as the nation -- 20%
- Stable pricing, high capacity levels, relatively inexpensive fuel

Very efficient method of generation

- 1.57 cents/kilowatt hour from 1999 to 2001
- 6.16 cents/kilowatt hour for natural gas generation 1999-2001 (similar Morro Bay Power Plant)
- Runs for at least 18 months between fuelings- 100% power 24 hrs/day 7 days/week

Employment

- Largest Private Employer in County
- Hired 47 new security officers in 2003
- Our hiring trend is upward and running contrary to government – other 4 largest employers in SLO County
- Average salary runs 60% higher than average county wage

Employment Continued

	Diablo Canyon		City/County Total (Source: 2000 Census)		
Location	Permanent Employees	Average Earnings	Employed Work Force (Full-time)	Average Earnings	Average Earnings Less Diablo Canyon
San Luis Obispo	244	$87,594	25,630	$43,529	$43,105
Arroyo Grande	229	$94,351	7,810	$62,089	$61,114
Atascadero	193	$85,053	14,060	$52,673	$52,222
Grover Beach	110	$82,607	6,820	$45,305	$44,693
Paso Robles	94	$73,246	9,510	$48,470	$48,223
Nipomo	93	$86,571	3,580	$56,164	$55,353
Pismo Beach	66	$76,884	4,640	$57,710	$57,433
Los Osos	58	$85,074	8,530	$55,321	$55,117
Templeton	37	$77,610	1,460	$61,810	$61,399
Morro Bay	20	$70,098	5,500	$40,196	$40,087
San Luis Obispo County	**1,260**	**$85,222**	**118,500**	**$52,444**	**$52,092**

Employment Continued

- Opportunities range from high school diploma to Ph.D.
- Opportunities for advancement and career changes with PG&E's tuition reimbursement program
- Our retirees tend to remain in the county and keep active in industry and community issues

Taxes Generated by DCPP, 2002

- $76.9 million to all forms of government (local, state, federal)
- $27 million paid to state and local governments
- $23 million in 2002 to SLO County 90% from DCPP, 10% transmission & distribution
- Total SLO County property tax levy in 2002 $256 million – 9% of total property tax

Taxes Continued

- Current upward trend
- Assessed and allocated by the California Board of Equalization on unitary tax role since the company operates in more than one county jurisdiction – not assessed locally like a home
- Future Capital Projects should continue the upward trend

Community Involvement

- Docent guided hikes on Pecho Coast Trail
- $31,000 in 2002 for Rancho El Chorro marine science education In-kind Support
- Employee workplace donations, $140,000 in 2002

Community Involvement Continued

- $120,000 to San Luis Obispo & Santa Barbara County Food Banks 2002
- $25,000 to Cuesta College Foundation 2002
- Significant employee volunteerism through both individual and workplace efforts

So what does this total mean to San Luis Obispo County?

- $642 million in 2002 in direct & induced economic activity
- 7% of the county's economy
- 9% of county's assessed property value

San Luis Obispo County

- 2,287 jobs, including:
  - 1,405 PG&E Employees
  - 302 Contract Employees
  - Economic activity creates another 580 jobs in SLO County
- Bright future with additional significant investment within the next 7 years

CONCLUSIONS

- First effort to capture all of DCPP's direct and indirect benefits to the economy
- $642 million annual impact to San Luis Obispo County economy
- DCPP is the largest private employer in San Luis Obispo County
- Salaries are among the highest in the county, 60% above the county average

CONCLUSIONS

- $27 million annually in local property taxes
- Generated approximately 10% of the state's power in 2002 – 16 billion kilowatt hours
- Cost averaged 1.57 cents/kWh vs. 3.61 cents/kWh for CA market (1999-2001)
- Nearly 10 Times lower than the state's power contracts signed during the energy crisis.

QUESTIONS?

Dave Oatley, Vice President
and General Manager

Diablo Canyon Power Plant

February 11, 2004

PG&E