CALIFORNIA

'Recall De-Reg, Not Davis': Rebuilding Energy and Economy

by Marcia Merry Baker and Richard Freeman

This is excerpted from the LaRouche in 2004 pamphlet, Return to Sanity: Make California a Pilot Project for the Nation, *released on Sept. 22 as an intervention into the battle against the Recall in California.*

Phase I: Short Term

What is immediately required in California—for the energy system, and for the economy—is to return to the status quo before California's 1996 deregulation law, with a series of emergency measures to restore the power system in the short term, bring the workforce back up to required levels, and repair the damage to the system, the state, and its budget. Although prior to 1996 there were great inadequacies in the California energy grid in terms of generation, transmission, and distribution, acting now to rapidly return to the status quo ante of 1995, will result in an interim system that can be made to work for the benefit of the state, and serve as a foundation for necessary longer-term infrastructure projects, especially advanced nuclear power. What can be done in California—the nation's leading state in population, economy, and now, political focus—will be a model for the nation, and for all the Americas.

Among the number of emergency measures called for, both in terms of the physical power base, and the financial side, there are two key areas of action in which particular measures can be grouped. In the following sections of "Phase I," we describe these areas in more detail.

1. Re-regulate the power companies—pricing of electricity and gas, location and operation of facilities, etc. This means voiding the 1996 law—"Public Utilities; Electrical Restructuring"—and taking the necessary measures to deal with the consequences of the subsequent six years of "destructuring" of the state's power system, utilizing all powers of government required, including that of eminent domain where necessary.

2. Take action to make maximum use of the existing output potential of the California power base (nuclear, fossil-fuelled, hydro, etc.); in particular, conduct a rapid re-hiring and jobs-creation program thoughout the energy sector—a spearhead for economic revival.

Re-Regulate, Restore System to Pre-1996 Level

For more than 40 years, the California and U.S. regulated energy system—electricity generation, transmission, and distribution—functioned well, and in line with the growth needs of the nation. Then, two extreme policy changes occurred, with California in the lead of both. First, in the 1970s, under an anti-infrastructure policy shift, California and the nation turned away from nuclear power, relying instead on fossil-fuel generation, and a policy of electricity usage-restriction euphemistically called "conservation."

Then, in 1996, California became the first state to enact a radical energy deregulation law—meaning *speculation* law—which, as it was implemented in successive phases, resulted, by 2000-01, in repeated rolling statewide blackouts (the first since World War II), the bankruptcy of Pacific Gas & Electric, one of the two major state utilities, hyperinflation of wholesale electricity in the state, and finally, a state obliga-

The LaRouche Youth Movement in California demonstrating against Dick Cheney's 'dirty coup'—the California recall—in Los Angeles Sept. 10. The LYM took over three campuses, and staged rallies in major cities.

tion of $43 billion incurred because of the bilking of the state by the many deregulation-era "merchant-pirate" power companies, whose crimes have been subsequently documented. The state went from a 2000 budget surplus of $12 billion, to a budget deficit today of $38 billion. The energy sector workforce has been decimated.

It is an immediate short-term priority to roll back this policy. In legal terms, state *re-regulation* can come through the kind of initiative indicated in state Sen. Joe Dunn's (D-Santa Ana) Senate Bill 888, "Repeal of Electricity Deregulation Act of 2003," introduced on Feb. 21, 2003, and backed by other legislators. On April 8, the bill was amended to spell out how the state will regain control of its electric utility industry and infrastructure. "We aren't mending it, we're ending it," was Dunn's comment about deregulation, the day he introduced the re-reg bill. But it has not passed the legislature.

The questions we take up here in a preliminary way, are related to how to restore and maintain the power supply under the immediate changeover conditions. At present, the state's installed electricity generating capacity is in the range of 55,000 megawatts. Properly utilized, there is no need for blackouts, price inflation, layoffs, or any other harm to the state's population and economy.

Electricity Supply. In March 1998, under the deregulation law, California's major utilities were required to sell off large parts of their electricity generation capacity. In 2000, once this was completed, a "wholesale" electricity market went into effect in which, on the pretext of encouraging competition and the "free market," a gang of financial interests drove electricity prices into the stratosphere, withheld supplies, and bilked in many other ways.

Under re-regulation, this will stop, and the damage be cleaned up. First, the generating capacities must be re-regulated, so that whoever operates them, they will provide for a reliable, affordable electricity flow to benefit the public good. The issue is not returning to a pre-1996 deregulation "corporate chart" per se. Rather—based on criteria related to fostering coherence in the state's generating/transmission/distribution base, decisions can be made on whether certain plants are returned to Pacific Gas & Electric and Southern Edison et al.; or remain under the post-1996 "new" ownership (but regulated); or perhaps, be mandated for transfer to state or municipal ownership and operation, such as the San Diego system. Moreover, some power plants that have been shut down, can be restored to function for a while longer.

A state board can be mandated to make the key decisions, made up of individuals of the competence and trustworthiness of, for example, Carl Wood, an industrial electrician since 1975, who was appointed California Utility Commissioner in 1999, and whose experience includes work for Kaiser Steel and for Southern California Edison at the San Onofre nuclear facility. During the 2001 crisis, Wood stressed in an interview with EIR News Service that energy is not a commodity. "It's an essential service," he said, "and it needs to be regulated as part of public policy. Now, that can take different forms. It can take the form of public ownership, municipalization, or state ownership of an energy authority, or it can take the form simply of traditional regulation over privately owned utilities."

Besides re-regulating the companies themselves, any pretense of a state "market" must be shut down. What must be restored is the traditional way power utilities have worked, by which generation, transmission, and final delivery (and billing) to a set of regional customers, are conducted.

In the recent Dunn Bill No. 888, utilities will be guaranteed a fair 10% return on investment, charging a "cost-of-service" price, (not a "free market" steal-as-much-as-you-can price), in return for making the investments to meet the needs

of their customers. Incentives would encourage utilities to invest in transmission lines, and the moratorium on companies selling their power-generating assets would be extended from 2005 to 2010. "Customer choice" will be ended.

The parameters of the 1998-2000 forced selloff of generating capacity are large. In California, the (formerly) regulated utility companies divested of 20,164 MW of capacity, which was sold off to "independent power producers"—namely, the nouveaux energy pirate companies. Once sold off, these plants, amounting to 40% of installed capacity, were reclassified as "unregulated." California ranked alongside Pennsylvania—the fourth after California to pass a deregulation act in 1996—in the amount of capacity forced to be sold off, and reclassified as "unregulated," in this deregulation process. Pennsylvania utilities were forced to sell 21,016 MW of capacity. Next in rank were Illinois (19,770 MW) and New York (15,659 MW).

The names of the buyer companies in California—Mirant, Reliant, Williams, Dynegy, AES, and others—are now infamous for how they used their newly acquired assets to bilk the state.

At the same time these companies were raping California, they were pillaging around the world. As of 2000, fully 26% of all of the electricity systems of Ibero-America (Mexico southward) were bought up by the marauders, such as AES, Enron, and Spain-based Endesa. In Mexico, 13% of its grid was taken over; in Chile, the figure was 76%; in Bolivia, 96%.

California's $43 Billion Energy Debt: Cancel Tribute to Pirates. Next comes the matter of dealing with the financial burden of the $43 billion the state now faces as a result of contingency actions which the state legislature and Gov. Gray Davis resorted to during 2000-01, instead of taking the needed course of re-regulation at that time. In short, debt and other accounts should be set aside, and selectively cancelled, and only "useful" obligations honored.

The $43 billion energy bill/debts arose when the Cheney-Bush Administration refused to stop the looting of California by the energy pirates and the state took unilateral action. The state stepped in to directly buy the wholesale electricity from the "market" sharks, and then turned around and sold the electricity at a much lower price to the utilities, which distributed it to the final users. This was done in the face of Pacific Gas & Electric and Southern California Edison having racked up $20 billion in debt by Spring 2001. PG&E declared bankruptcy in April of that year.

(Under the terms of California's deregulation, utilities were not permitted to automatically pass on to customers any high wholesale electricity costs. Had they been permitted by the 1996 law to do so, no one could have paid the mega-bills anyway.)

The state, in an attempt to make this work, endeavored to compel the energy pirates to enter into long-term contracts,

Presidential candidate Lyndon LaRouche addressed a campaign town meeting of 450 activists in Burburbank, Calif. on Sept. 11, leading a statewide mobilization to defeat the recall/deregulation assault.

at not-too-hyper price levels. The supplier companies, most of whom refused at first, eventually complied, but the resulting contracts were based on electricity prices far higher than 1999, and resulted in a cumulative $43 billion in obligations racked up by California. As of now, the state has blown out its own finances, in addition to having to operate in the context of the general economic crisis, nationally and globally. For reference, **Table 1** shows the rates of profiteering by the pirate companies, based on bilking California during just the first quarter of 2001!

The action required is straightforward, involving the following points.

- The $43 billion should be selectively frozen or cancelled, with an assessment made of the impact on who is holding, or owed, what kind of state obligations. Where the impact will not harm the owner of the obligation, the unworthy debt must be cancelled. In other cases, different terms can be worked out for the holder of state debts. Due consideration can be given to means for re-establishing the good-faith financial status of the state and its bond ratings.
- Ongoing state contracts with energy suppliers must have the prices re-set, to be based on cost of production plus a reasonable rate of profit, not a "dereg-era" rate of profiteering. In cases where payment or debts are part of the legacy of pirate tribute, and have no connection to current and future supplies, the debt must be cancelled. In cases where continued payment by the state is required to some particular electricity producer whose output depends on having the revenue stream, then the debt is useful, and can be honored.

TABLE 1

Profits Soared at Selected Energy Companies, First Quarter 2001

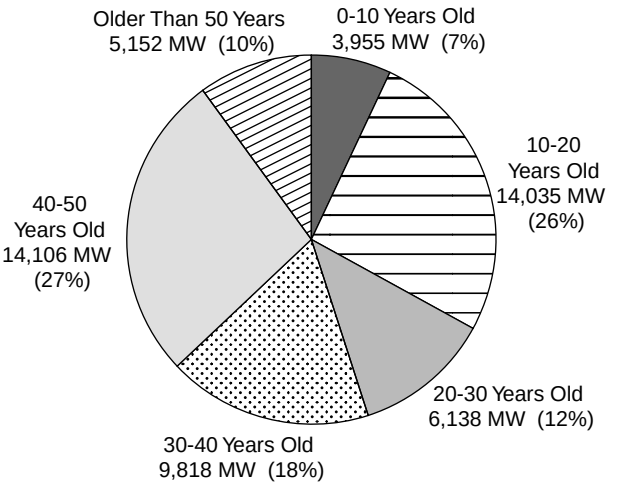
(First Quarter 2001 Compared to First Quarter 2000)

Company	Increase	Company	Increase
EOG Resources*	448%	Chevron	53%
Calpine	424%	BP plc**	52%
Williams	172%	Duke Energy	51%
Apache	158%	El Paso	46%
Unocal	122%	ExxonMobil	44%
Reliant Energy	104%	Texaco	39%
Occidental	93%	Southern	35%
Phillips	86%	Dominion	28%
Mirant	84%	Enron	26%
Kerr McGee	81%	Shell	23%
Dynegy	73%	AES	19%
Conoco	58%		

Source: Company financial reports.
* EOG Resources, formerly Enron Oil & Gas, was a spin-off of Enron Corp.
** BP had dropped the Amoco from its name, reverting to BP plc.

FIGURE 1

California's Power Plants Are Aging



Source: California Energy Commission.

Job Creation

A critical factor in assuring reliable electricity in the short term, is the restoration of needed levels of workers employed in all parts of the energy system of the state.

California's current profile of varied sources of electricity, by in-state mode of production, is:

Hydro 13%
Nuclear 16%
Natural Gas 43%
Coal 13%
Other 14%

(This last category includes geothermal, wind, small dams, biomass, etc.)

This in-state production of electricity meets about 77% of the state's current consumption level, and the remaining is imported: 10% coming from the Northwest (mostly hydro-powered), and 13% from the Southwest (mostly coal-fired).

Much of this power-generation base is aged, whether fossil fuel, hydro power, or nuclear (**Figure 1**). The California Power Authority reports, "Sixty percent of our generation fleet is over 30 years old, and much is over 40 years old. It is past the end of its expected life, and will be retiring from service voluntarily or involuntarily with increasing frequency over the next several years."

All the more reason that a skilled, adequate workforce be deployed throughout the power grid of the state as a short-term priority to "make the system work"—no matter whether the plant is vintage, or modern.

First, look at the dimensions of the job cuts during the energy deregulation catastrophe. For example, Pacific Gas & Electric and Southern California Edison: During 2000, when the state deregulated electricity "market" began, and, month by month, the wholesale electricity prices soared, the two utility companies responded by cutting workers! As of January 2001, Southern California Edison had laid off more than 400 workers, and announced another 1,450 more jobs to be eliminated; Pacific Gas & Electric laid off 520, with another 675 jobs to be cut. In March, both a court order and a directive from the California Public Utilities Commission ordered the two utilities to reinstate 1,000 jobs and block plans for 2,000 job cuts, because the maintenance of electric service to the public was in jeopardy because of the lack of workers.

Overall, between 2000 and 2001, the number of workers in the California "utilities sector" (a state statistics classification) dropped by 1,300, from 56,000 to 54,700. By 2002, the number came back to the 2000 level; today, the state reports 58,400 workers in the utilities sector, but this is far below what is required.

The number of workers at present in the "electric power generation" state classification is only 18,500, which is 400 fewer than in 2001.

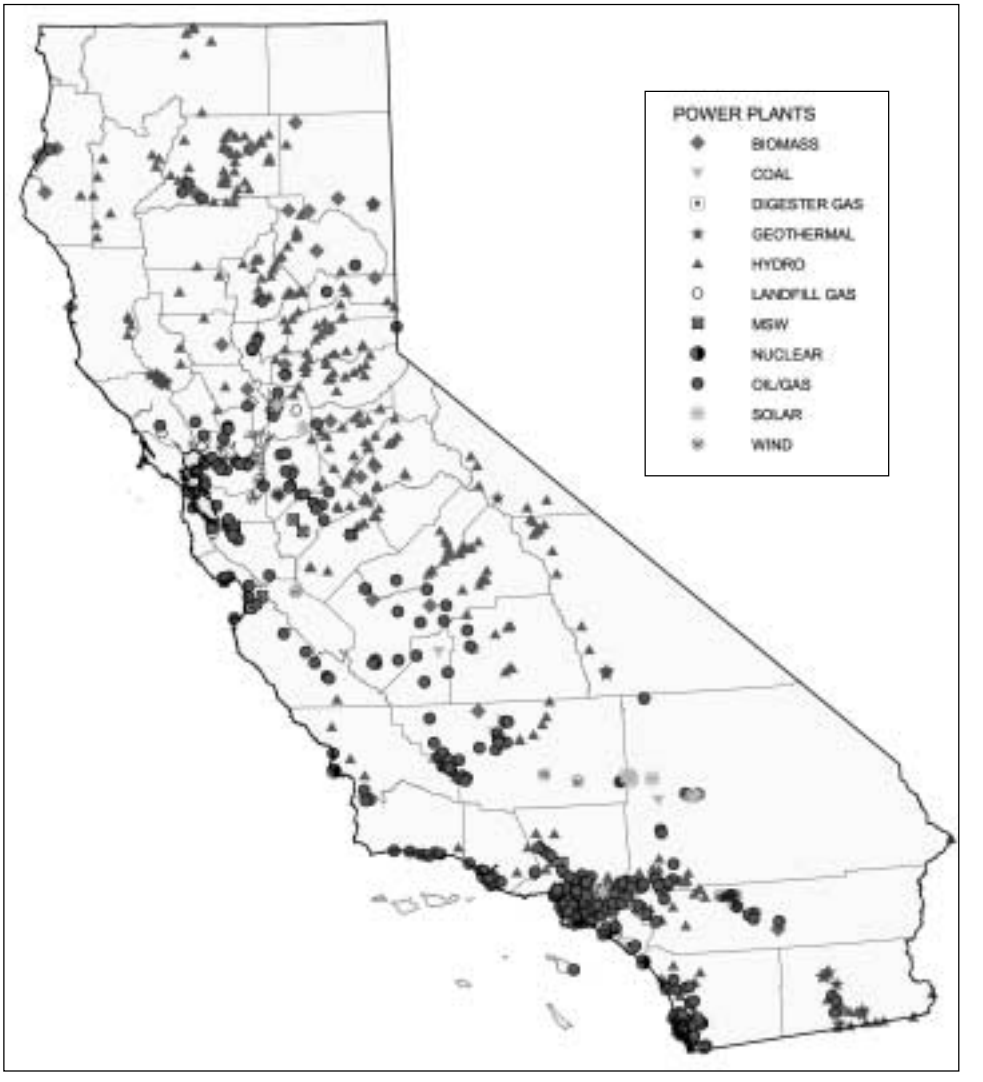
During Spring 2001, the state, facing a budget crisis because of its attempt to deal with the hyperinflated energy prices, started cutting state programs—including public works jobs in the water and power sectors.

All these job losses must be rectified immediately, sector by sector. **Figure 2** shows the current location of power plants of all kinds, and **Figure 3** shows the mainlines of the state electricity transmission grid, all of which must be manned for maximum performance.

Hydro: California depends significantly on its hydro-

power capacity, and it still has some undeveloped potential because of its topography and northern precipitation and run-off patterns. For example, the three generating units of the Keswick Dam and power plant on the Sacramento River have a total capacity of 75,000 kilowatts. The state's public works staff, the in-state workforce of the Federal Bureau of Reclamation, and the staff of the Army Corps of Engineers must be maintained to the fullest to ensure that California's numerous power and water facilities function properly.

FIGURE 2
California Statewide Power Plants
(Operational 0.1 MW and Above)



Source: California Energy Commission

Nuclear: There are two nuclear plants (four units) in the state—San Onofre and Diablo Canyon. The two units of the Diablo Canyon facility, on the seacoast in San Luis Obispo County, went operational in 1985 and '86. Maintaining a full workforce (800 or more workers, including security) at each of these complexes is critical.

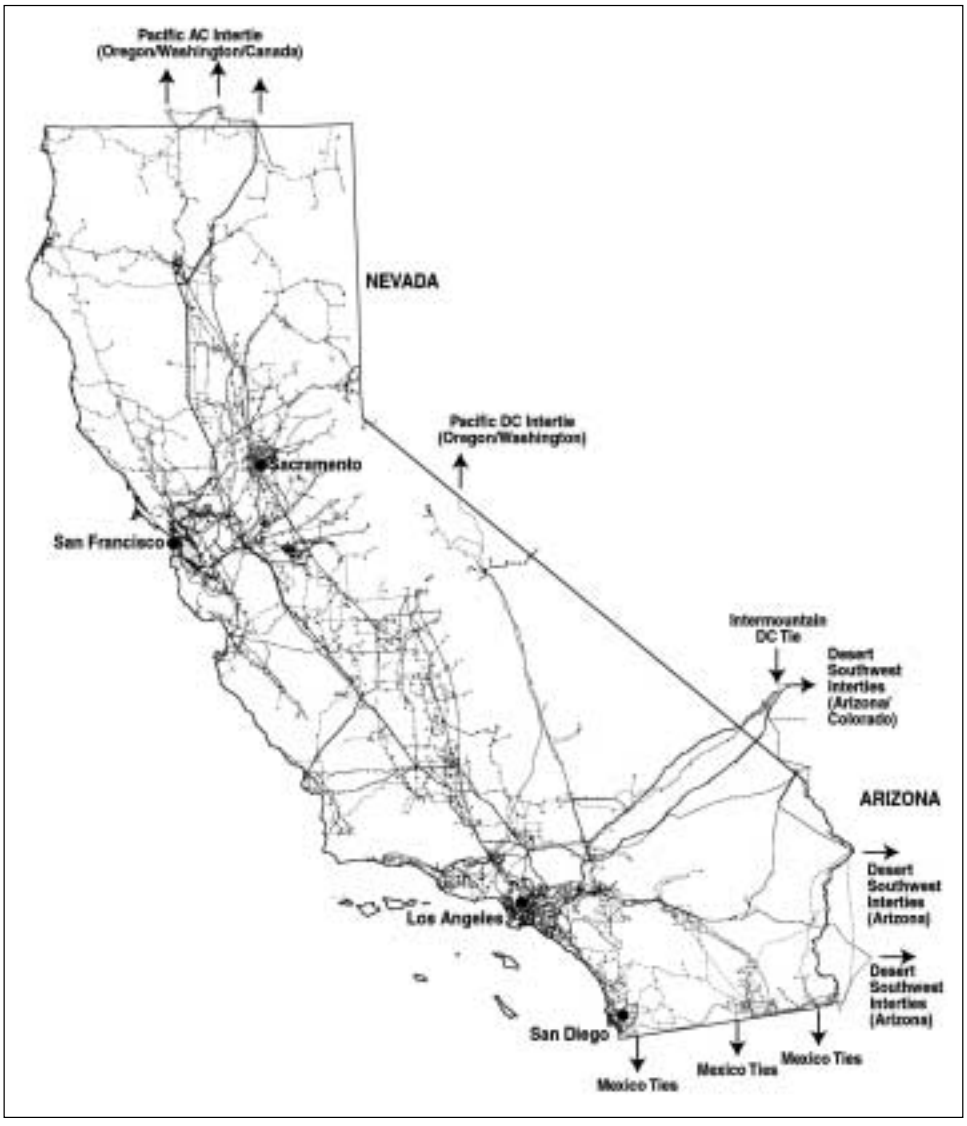
Fossil Fuel: Natural gas, coal-fired, and other generating plants are in operation throughout the state, and full complements of workers at all of them are essential to guarantee maximum utilization of existing capacity and minimum downtime. In addition, completing construction, and bringing on line all of the 21 new natural gas facilities announced during Spring 2001 by Governor Davis, is also a short-term priority—both for job creation, and for maintaining a secure power supply until advanced nuclear generators can be built over the longer term. Natural gas is not the appropriate fuel for long-term baseline electricity generation for future planning—nuclear is required. But in the interim, the natural gas generators are needed, some as "peaker" plants during periods of heavy load requirements.

Transmission Grid: Contingents of skilled workers are especially critical for the power transmission grid in California, which is inadequate at present, but must be made to serve until advanced, high-tech systems can be put into place. The main lines of the existing state electricity grid (**Figure 3**) of Pacific Gas & Electric and Southern California Edison are 26,000 miles in extent, much of that over 50 years old.

Operating Without Reserves: The level of electricity output capacity considered safe has traditionally been 15% more than peak load. California simply does not have that, and must operate at or near peak. This, again, makes it mandatory to have a full workforce in the power sector.

The California Power Authority reports, "Unlike the air-

FIGURE 3
California's Major Electricity Transmission Lines



Source: California Energy Commission

line that cancels a flight for mechanical failures, the lights must always stay on. Historically, utilities have always had 15% more capacity, either in units that they owned or purchase contracts, than high peak loads. This covered the operating reserve as well as reserves for units broken or out of service for any reason.

"The 15% reserve has disappeared as deregulation has progressed, since no private generator holds a 15% over-capacity that is seldom used. It is more critical for the state to restore these reserves because of the age of the generation fleet in California."

Where will the workers come from? To begin with, mass layoffs have been the order of the day in recent years in California, as nationally. **Figure 4** shows the dimensions of this catastrophe in the state for manufacturing workers. From 2000 to July 2003, more than 269,000 skilled jobs have been eliminated in the state. So, among the unemployed, there are significant cadres of skilled workers available to be reemployed.

But in addition, to meet requirements, the state higher education system—originally designed to be one of the most extensive in the nation, but undercut in recent years, both in content and operation—must be geared up to help meet the immediate goal of preparing workers to restore the energy system, and to prepare for launching major infrastructure projects for future expansion.

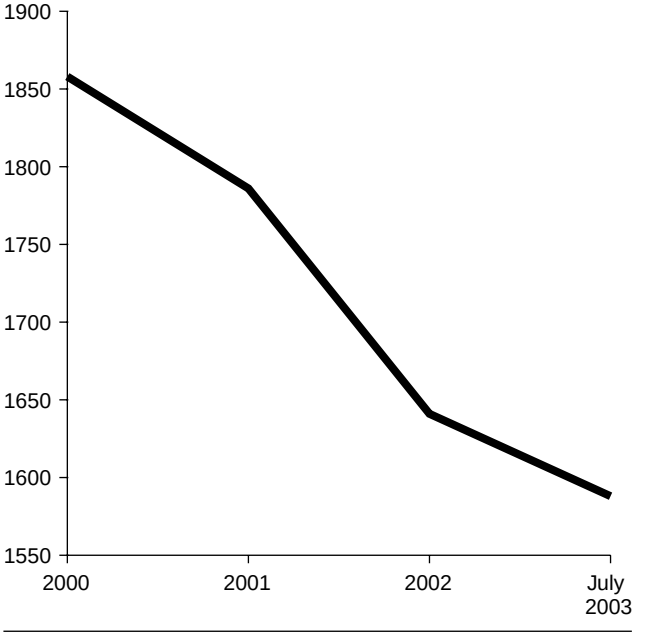
More than 1 million skilled jobs is a conservative projection for the scale of workforce needed in California for the short-term task of restoring and maintaining the pre-1996 state energy system, and also for launching, over the next three years, the new expanded energy and water infrastructure projects required for "Phase II" of longer-term economic revival.

Phase II: Long-Term Great Projects To Expand Power

The current dramatic water and power shortages in California are entirely a policy crisis, not the result of limitations of the state's physical resource base. California's 20th-Cen-

Aerial view of Keswick dam and power plant on the Sacramento River. The plant has three generating units with a total capacity of 75,000 kW (kilowatts).

FIGURE 4
California Manufacturing Workforce Cut by 269,000, 2000-2003
(Thousands)



Source: *EIR*.

tury rise to pre-eminence in population, agriculture, and manufacturing has been the result of infrastructure-building in decades past, for example, the 1930s Colorado River management projects under Franklin Delano Roosevelt. This "Great Projects" approach must be resumed today, with continental-scale and California-based projects for power and water, that have been on the drawing boards for decades, but sidelined during the era of "free market" deregulation and looting.

In the forefront must be the program to "Go Nuclear," using the most modern systems. During the next decade, California will have to engage in large-scale building of electricity-generation plants, especially nuclear power plants, to provide for future real economic growth, as well as the replacement of its aging power plants. This requires a mobilization.

The California Energy Commission (CEC), in its "2002-2012 Electricity Outlook Report," under its "most likely growth" scenario estimate of electricity use in years ahead, has projected that California electricity consumption will grow from 255,829 gigawatt-hours consumed in 2002, to 326,796 gigawatt-hours consumed in 2012, a rise of 71,000 gigawatt-hours, representing an increase of 28%. Physical electricity generation capacity will have to be expanded appropriately to provide the increased electricity that will be consumed.

While the CEC's projected 28% increase is already substantial, it significantly understates the real electricity need. The CEC's projection provides for very little per-capita real growth in electricity consumption over the decade. Its principal purpose is to keep up with projected population growth. It barely keeps the economy and the population's living standards on a steady basis. In fact, it is explicitly premised on "voluntary cuts" in electricity consumption.

But to reverse the current steep economic decline, California must engage in a vast expansion and scientific upgrade of its infrastructure, manufacturing, and agriculture. It must shift to electrified, high-speed rail, and even to a magnetic levitation (maglev) trunkline system, whose operation consumes large amounts of electricity. It must expand real manufacturing—not the "new economy" sideshow—which requires considerable amounts of electricity. To expand its agriculture (California is the nation's biggest producer of fruits and vegetables), which is very energy- and irrigation-dependent, the state must have new volumes of electricity.

Based on this prospect for economic expansion, *EIR* has projected that California would require at least an additional 100,000-150,000 gigawatt-hours in increased electricity consumption by 2012, above its 2002 level.

Build 20 to 30 New Nuclear Plants

That electricity could be provided in only a small measure by running existing power plants longer. Thus, there is no solution except to construct new capacity; meaning, principally, 80-120 new nuclear power plant units, based on a unit being that of the latest "fourth generation" design (each about 200 MW).

Nuclear experts work from the rule of thumb that a nuclear power plant will be in operation for 7,200 hours per year. Now, for California to provide an additional 100,000-150,000 gigawatt-hours of electricity for consumption by 2012, would require the construction of 14 to 21 gigawatts of additional nuclear power electricity generation capacity. And the most efficient configuration to generate nuclear power is to construct a single 800 MW nuclear module or complex, made up of four nuclear power generating units of 200 MW each.

Thus, for California to provide the necessary 14 to 21 gigawatts of new nuclear-based generating capacity requires a mobilization to construct, over the next 10 years, between 20-30 new nuclear modules of 800 MW each. This means the manufacturing of between 80 and 120 new individual 200 MW nuclear plant units. This is an exciting mission.

Phase III: Go Nuclear

It is now urgent to "re-nuclearize" California's energy grid, and the nation's. Over the past 40 years, but especially in the 1990s to the present, the United States has been "powered down" by a dramatic fall in per-capita installed electrical generating capacity (**Figure 5**), and in particular in California. In 1995-2000, for example, U.S. capacity added only 11,000 MW of electrical power from all energy sources (an abysmally low increase of 1.5%, total, over five years). In contrast, during the early 1970s, installed capacity was increasing at a rate of about 7% a year.

In California, there was no net electricity capacity increase at all during the 1990s.

The solution to this? Go nuclear. **Figure 6,** showing the location of the current nuclear plants in operation in North America, underscores the nature of the problem to be solved in California. Of the 103 plants in the United States, only four units are in California. Another three are in Arizona, and one is in operation in Washington State.

A Western plant that would have been operating today in Hanford, Washington, now stands abandoned, 75% complete—a dramatic result of the abrupt policy shift over the past 30 years. As of the 1970s, the number of new U.S. orders for nuclear plants declined, until all were cancelled, and even the number of plants in operation has begun to decline.

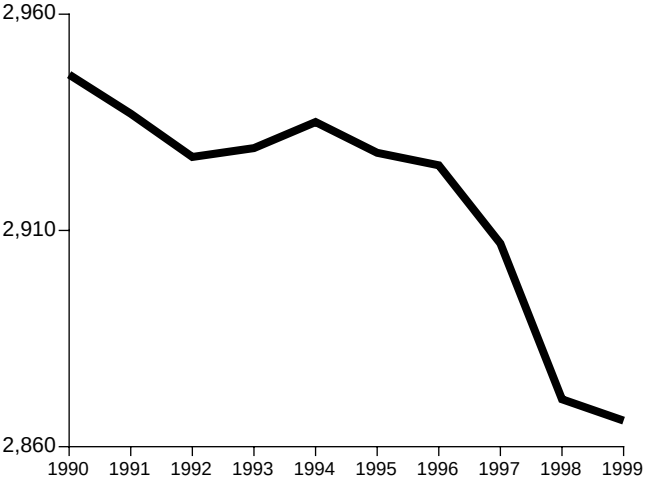
Build 'Fourth-Generation' Reactors

There is no question about the merits of nuclear, as indicated in **Table 2,** which shows how nuclear energy is the most

The Diablo Canyon nuclear plant, under construction by Westinghouse Electric in 1971. Built on a 750-acre complex in San Luis Obispo County, the plant's lead-time took over 15 years, to account for seismic activity and the Pacific Ocean site. The two units are Pressurized Light Water Reactors, with a capacity of 1,087 MW each, and went on line in 1985 and 1986, respectively.

FIGURE 5

Installed U.S. Electrical Generating Capacity, in Watts Per Capita, 1990-1999



Source: Energy Information Administration, U.S. Department of Energy; U.S. Department of Commerce.

FIGURE 6

103 Operating Nuclear Plants Produce 20% of U.S. Power

Source: Nuclear Energy Institute.

- *The cheapest, most reliable, and most efficient 20% of the U.S. electrical power grid, is nuclear.*
- *Total U.S. capacity added only 11,000 MW power from ALL energy sources (1.5%) in past five years. No capacity was added in California in a decade.*
- *5,000 MW of nuclear power was abandoned under construction—up to 75% complete—in Washington State. The Northwest region was 4,000 MW short of capacity in January 2001.*
- *Canada has 14 plants; Mexico, one.*

TABLE 2

Energy Flux Density Comparisons

Solar—biomass	0.0000001
Solar—earth surface	0.0002
Solar—near-earth orbit	0.001
Solar—near-solar orbit	1.0
Fossil	10.0
Nuclear Fission	50.0 to 200.0

Energy flux density is measured by the amount of power, in megawatts, through the surface area of various energy systems. The higher the figure, the more efficient the system in creating heat to raise the temperature of water. Today's nuclear fission reactors are between 5 and 20 times more efficient than comparable fossil-fuel plants.

power-dense form of all energy types. The important policy question is the particular design and size of the nuclear plant for the needed construction mobilization.

The most appropriate technology is what is known as the "fourth generation": very advanced high-temperature, gas-cooled nuclear reactors. Among their benefits is that they can be built in the size and power range of 200 MW. This saves on construction time and effort compared to that needed for the much bigger boiling-water reactors, for which large amounts of three-foot-thick concrete must be cured (dry-set), and very involved, extensive infrastructure (for example, plumbing) must be built.

Second, the smaller modular plants can be installed in series as needed. For example, four such units could be installed on a coastal site, for use with high-tech seawater desalination. The heat generated by these plants can also be used to make the saline seawater potable.

And most important, gearing up to assembly-line production of these plants is of urgency, not just for the United States, but for all around the Western Hemisphere. The smaller facility can be incorporated in multiples as needed, in the buildup of national energy grids throughout the Americas, and for industrial-process heat and other uses.

How would the gear-up work? Think of the principle involved in the nuclear Navy, developed under the leadership of Adm. Hyman Rickover. A model nuclear ship design was agreed on by the government. It was then put out for bids to the shipyards. All along the line, ingenuity and skilled output were fostered in the construction process.

Today, the "approved" design—call it the "California model" if you like—can be arrived at, and the bidding and building process commence. Financing through Federal low-interest credits can jump-start the manufacturing, and also other needed projects along the way. This is exactly how the 1930s grand projects of public works were undertaken, from the Hoover Dam—which launched the California-based Bechtel Corp.—to smaller-scale programs.

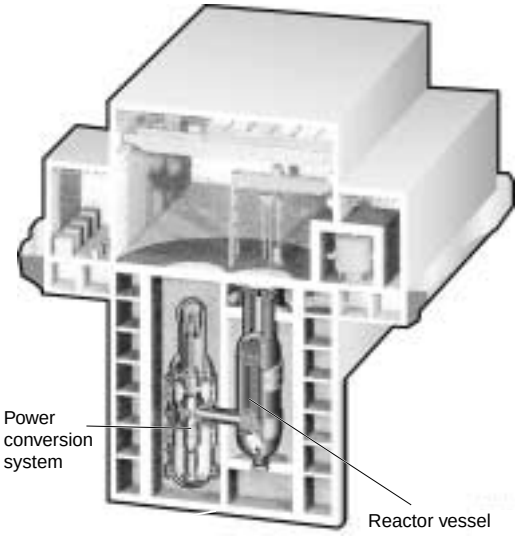
The General Atomics GT-MHR— The 'California Model'

Fourth-generation nuclear reactors are now ready for mass-scale introduction; their designs are supersafe, and almost 50% more efficient than conventional reactors. The German-developed "Pebble-Bed Modular Reactor" (using tennis-ball-sized fuel pellets) is now under construction in South Africa, with fully tested components for safety and output.

The original idea for using fuel particles was pioneered by San Diego-based General Atomics, whose design for an underground, high-temperature gas-cooled nuclear reactor—the "GT-MHR"—is shown in **Figure 7.** Its inherent features make meltdown impossible. The tiny fuel particles are encased in ceramic spheres, which serve as mini-"containment" housing for the fission products. By removing one of these

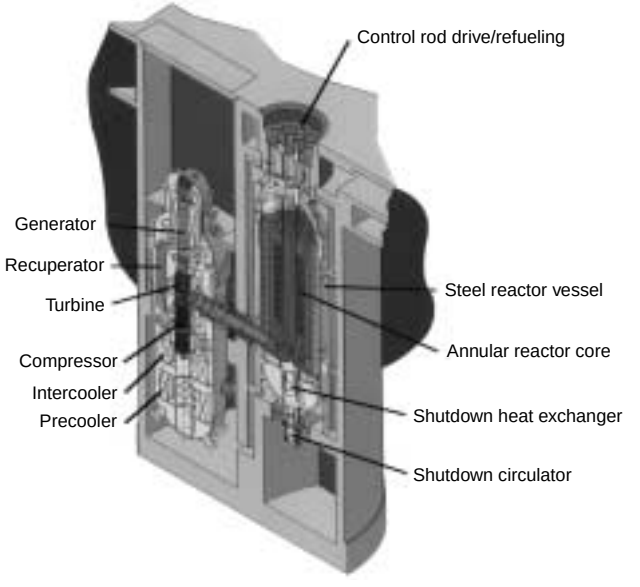
FIGURE 7

Cutaway View of the GT-MHR Reactor and Power Conversion Systems



This is the current design for a 285 MW-e power plant (600 MW-thermal), and shows how the layers of hexagonal fuel elements are stacked in the reactor core. The helium gas passes from the reactor to the gas turbine through the inside of the connecting coaxial duct, and returns via the outside.

The reactor vessel and the power conversion vessel are located below ground, and the support system for the reactor is above ground.



Source: General Atomics.

spheres stacked inside the actual containment housing, power and heat generation are stopped. In other words, the nuclear fission can be stopped that easily—making this system inherently safe and non-polluting.

The GT-MHR produces higher-temperature process heat (1,560°F), compared to the 600°F limit of conventional water-cooled nuclear reactors, allowing greater electricity-generating efficiency and a wide range of industrial applications, from making fertilizer to refining petroleum.

Cheap, plentiful electricity is the precondition for large-volume water desalination. **Figure 8** is an artist's illustration of what could be done for the arid Southern California region, by nuclear-powered desalination on the Pacific Coast.

FIGURE 8

Source: Preliminary Design Rept. 1084, Met. Water Dist. of S. Calif., 1993

Artist's depiction of a modern seawater desalination tower. It is proposed for a location on the Pacific Coast of California. The structure houses a multi-effect distillation process (vertically stacked evaporators) for large-scale output (284,000 cubic meters daily).