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Author

Hanemann, W. Michael

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**DEPARTMENT OF AGRICULTURAL AND RESOURCE ECONOMICS AND POLICY
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UNIVERSITY OF CALIFORNIA AT BERKELEY**

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**How California Came to Pass AB 32,
the Global Warming Solutions Act of 2006**

by

W. M. Hanemann

**California Agricultural Experiment Station
Giannini Foundation of Agricultural Economics
March 2007**

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Act of 2006**

W. Michael Hanemann

**Department of Agricultural & Resource Economics, and
California Climate Change Center
Goldman School of Public Policy**

University of California, Berkeley

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1. Introduction

On August 31 2006, the last day of the legislative session, the California Legislature passed AB 32, the California Global Warming Solutions Act of 2006. AB 32 requires that California's statewide greenhouse gas (GHG) emissions be reduced to the 1990 level by 2020. Based on the current understanding, this is a reduction of about 25%.¹

AB 32 is noteworthy because it legislates a more comprehensive and stringent control on GHG emissions than exists in any other state. Eleven other states have set GHG emission reduction targets, nine of them with more stringent targets for 2020 than that set by Governor Schwarzenegger. But, in the other states, the target is either not legally binding or it has a narrower focus and is less stringent. The only existing binding cap on GHG emissions outside California is the Regional Greenhouse Gas Initiative (RGGI), a coalition of seven east coast states (CT, DE, ME, NH, NJ, NY and VT). But, RGGI focuses solely on emissions from electric power generation, which account for only about 30% of those states' total GHG emissions. Moreover, the RGGI cap is less stringent than AB32: under RGGI, power plant emissions will be capped at approximately current (2006) levels in 2009, and will have to be reduced 10% below the 2006 level by 2019.

The purpose of this paper is to explain how AB 32 came to be enacted, focusing particular attention on the political and legal background in California.

The passage of AB 32 came about partly through an accidental concatenation of circumstances and partly through the momentum created by previous policy actions in California. Chance events explain why the legislation happened to occur at this particular time, but the context for the legislation and the reason why it was widely supported come from California's previous experience of using state legislation to regulate automobile air pollution and promote energy efficiency. One needs to know this regulatory history in order to understand how AB 32 came to be passed. This history is summarized in Section 2. Section 3 covers the period between 1988 and 2002 when California took the first actions to control its GHG emissions. Section 4 covers the key period -- roughly between the summers of 2004 and 2005 -- when California became committed to reducing its GHG emissions. Section 5 describes the events between the summers of 2005 and 2006 when this commitment was turned in state law. Section 6 offers some concluding observations.

2. Californian Exceptionalism in Air Pollution and Energy Efficiency Regulation

California first came to take an interest in air pollution because of smog in Los Angeles in the early 1940s. The population of Los Angeles had grown from 170,000 in 1900 to 2.8 million in 1940, and over 1.2 million motor vehicles were registered in the county, one vehicle for every 2.3 people. In 1941, Los Angeles first experienced a heavy, acrid haze. This recurred in

¹ On June 1, 2005, as explained below, Governor Schwarzenegger had signed Executive Order S-3-05 setting statewide GHG emission reduction targets for 2010, 2020, and 2050. AB 32 takes the Governor's 2020 target and makes it legally binding, with a specified procedure and timetable for implementation.

1943, reducing visibility to three city blocks. In 1945, the city passed an ordinance setting limits on industrial smoke emissions (which were thought to be the cause) and established an air pollution control unit within the municipal Health Department. In 1947, the state passed a law authorizing the creation of county-level Air Pollution Control Districts (APCD) and the Los Angeles County APCD was formed, the first of its kind in the nation.

In 1950, research by Professor A. J. Haagen-Smit at Cal Tech finally identified the problem as a photochemical reaction converting certain pollutants – primarily from refineries and motor vehicles – into smog. By 1955, after some controversy fueled by industry opponents, this finding had been confirmed and motor vehicle emissions were established as the primary factor. That year, LAAPCD formed a Motor Vehicle Pollution Control Laboratory.² In 1959, California passed a law requiring the State Department of Public Health to establish air quality standards and controls for motor vehicles. In 1960, the Motor Vehicle Pollution Control Board was established to test and certify devices for installation on cars sold in California. In 1961 the Department of Public Health mandated positive crankcase ventilation on new vehicles sold in California starting in 1963, the first emission controls in the nation.³ In 1966, the Motor Vehicle Board adopted tailpipe emission standards for hydrocarbons and carbon monoxide, and the California Highway Patrol began random inspections of vehicle smog control devices. In 1967, a unified regulatory agency, the California Air Resources Board, was created combining the Motor Vehicle Board along with units from the State Department of Health; the Board's founding chair was Professor Haagen-Smit.

1967 is when the federal government finally began to deal with emissions from motor vehicles. In 1965, faced with the prospect of state emissions controls in Pennsylvania and New York, in addition to California, the automobile industry agreed to support national standards for automobile emissions. That year, Congress passed the Motor Vehicles Air Pollution Control Act which called on the Department of Health, Education and Welfare (HEW) to develop emissions standards for new vehicles, taking into consideration the technological feasibility and economic cost of compliance. In 1967, HEW responded with a proposal for a Clean Air law covering both motor vehicles and stationary source. A major issue was whether California should be allowed to impose controls more stringent than the national standard, as California's representatives urged. After a fierce battle, California got its way: the final legislation granted California alone a special waiver in deference to its "unique problems and pioneering efforts." The Administrator overseeing implementation of air pollution standards is to waive federal preemption upon application by California for such a waiver provided that the application is not arbitrary and capricious, it is at least as stringent as the national standard, and it is needed to meet California's "compelling and extraordinary conditions." The 1977 Amendments to the Clean Air Act reinforced California's independence by creating a similar waiver from federal emission standards for non-road vehicles, and by permitting California to prescribe fuel or fuel additive requirements without needing EPA approval. The Amendments also established a "piggyback" provision allowing other states, if they so chose, to adopt the California standards once these have received the formal EPA approval.

² A highly informative history of the discovery and measurement of ozone is provided by Farrell (2005).

³ The automobile industry voluntarily decided to implement the crankcase controls nationally.

Congress' willingness to grant California this degree of latitude despite fierce industry opposition reflects its appreciation of California's role as "a kind of laboratory for innovation" in emission control technology and regulation.⁴ Since 1967, California has made use of its federal exemption on at least 14 occasions to pioneer innovations in the regulation of motor vehicle emissions, including the first introduction of NOx standards for cars and light trucks (1971), heavy-duty diesel truck standards (1973), two-way catalytic converters (1975) "unleaded" gasoline (1976), low-emission vehicles (LEV) program (1994 and 1998), zero emission vehicles (1990) and evaporative emissions standards and test procedures (1999). The LEV program is the primary California emissions standard adopted by other states. It originated from the California Clean Air Act of 1988 which instructed CARB to "achieve the maximum degree of emission reduction possible from vehicular and other mobile sources." In response, CARB approved an ambitious new program in 1990 that would substantially reduce emissions from light- and medium-duty vehicles starting in model-year 1994. Rather than requiring every vehicle to meet the same emission standard, the LEV program introduced a fleet-based approach.

The key to California's independent role in emission regulation is the California Air Resources Board (CARB). Although the eleven members of the Board serve at the pleasure of the Governor, the Board has a reputation for political independence, and its staff have a reputation for scientific and technical competence. CARB sponsors peer-reviewed research and its regulatory actions are typically preceded by a carefully organized program of scientific and engineering research as well as a transparent public process. It is widely regarded as a model of an aggressive, independent, science-based regulatory agency.

California's involvement in energy efficiency regulation began in the early 1970's. At that time, the state's electric utilities were projecting an unending growth in demand; to meet this, they were planning to construct a large number of new nuclear power plants. This was opposed by environmentalists who felt that the demand forecasts were overblown, conservation was deliberately being ignored, and nuclear power was both more expensive and less environmentally benign than the utilities had represented. They felt, also, that the California Public Utility Commission (CPUC), which focused narrowly on rate regulation, was not doing an adequate job of dealing with the larger issues of energy supply and demand in California. To remedy this, the Democrat-controlled legislature passed a bill in 1973 to create an Energy Commission that would forecast energy demand, assess efforts to reduce this demand through conservation and efficiency, and provide a consolidated approval process for the siting of new power plants. The legislation was vetoed by then Governor Reagan. Within a few months, however, the OPEC oil embargo occurred, creating an energy shortage and raising energy prices. At Governor Reagan's request, a nearly identical bill to the one he had vetoed was passed by the legislature, the Warren-Alquist Act, and this time he signed it into law in May 1974.

⁴ The quotation is from the DC Circuit Court's ruling in *Motor and Equipment Manufacturers Association, Inc. v. EPA*, 627 F.2d (1979).

The resulting California Energy Commission (CEC) has four main mandates:⁵ (1) Facility siting and environmental protection: CEC has exclusive power to certify thermal power plants of 50 MWh or larger to meet statewide energy needs; (2) Energy forecasting and planning: CEC is required to forecast future statewide energy needs, evaluate supply options for meeting those needs, and more generally develop and implement an energy policy for California; (3) Energy efficiency and conservation: CEC is empowered to establish building and appliance efficiency standards, and is required to promote conservation through research and public education programs and grant and loan programs; and (4) Technology development: CEC funds research, development and demonstration programs for technologies using renewable, alternative, and cleaner energy, including transportation fuels.⁶

A separate development occurring at that time, stimulated by the same forces that had led to the formation of the CEC, was the rise of energy efficiency as a subject of academic and scientific study. In 1971, UC Berkeley had created an interdisciplinary graduate program, the Energy and Resources Group (ERG). Two years later, the oil embargo stimulated a number of physicists to start thinking about the physics of energy use and energy efficiency. The American Physical Society sponsored a study of energy efficiency for the summer of 1974, which led to the production of a landmark text, *Efficient Use of Energy* (1975). Several of the authors were at Berkeley, in the Physics Department, ERG, or the adjacent Lawrence Berkeley National Laboratory (LBNL); one of leaders, Art Rosenfeld, was a physics professor at Berkeley working in the particle physics program at LBNL. He decided to sponsor a summer study in 1975 at the Berkeley School of Architecture on energy-efficient buildings covering lighting, windows, and heating, ventilation and air-conditioning equipment.⁷ Meanwhile, one of CEC's first actions in 1975 was to draft building energy-efficiency performance standards; however, the draft regulations were based on crude and oversimplified model of heat flow within a building. The two groups decided to join forces. Rosenfeld and his colleagues used their research to develop an improved software program which CEC took as the basis for reformulating what became known as "Title 24" building standards issued in 1977. This established a symbiotic relationship between CEC and the research community which has flourished for 30 years. CEC funds research by academic scientists and engineers which establishes a rigorous foundation for energy efficiency regulations that CEC subsequently promulgates.

In the case of appliances, how CEC came to issue the first energy efficiency standards is described by Rosenfeld (1999): "In 1976 Governor Jerry Brown was looking for a way to

⁵ The CEC's authority covers not just investor-owned but also municipal utilities within California.

⁶ A somewhat similar agency was created in New York in 1975: the New York State Energy Research and Development Authority (NYSERDA) has mandates corresponding to the CEC's mandates (3) and (4), but not to (1) or (2).

⁷ This account is based on Rosenfeld (1999). What became the Center for Building Science and the Energy & Environment Division at LBL, and the UC California Institute for Energy Efficiency, are outgrowths of this research effort. Rosenfeld co-founded the California Institute for Energy Efficiency and also the American Council for an Energy Efficient Economy, and he founded and directed the Center for Building Science until 1994. In 2000 he was appointed one of the five California Energy Commissioners by Governor Davis, and his appointment was renewed for another five years by Governor Schwarzenegger in 2005.

disapprove Sundesert, the only still pending application for a 1-GW nuclear power plant. The Title 24 standard for buildings was an accepted idea, but somehow standards for appliances seemed more like a federal responsibility, so appliance standards were still controversial. David Goldstein and I [Rosenfeld] then discovered that there was absolutely no correlation between refrigerator retail price and efficiency, although we controlled for every feature we could imagine. ... I pointed out to Governor Brown that California refrigerators were already using the output of 5 Sundeserts, and that even minimal standards would avoid the need for 1.5 Sundeserts, at no additional cost. Brown promptly called Energy Commissioner Gene Varanini, who corroborated our claim. After that, standards for new refrigerators and freezers were developed quickly and put into effect in 1977.” Over the next seven years, CEC followed up with appliance efficiency standards for fluorescent lamp ballasts, various air conditioning products, heat pumps, furnaces, boilers, wall heaters, and showerheads, and faucets.

Throughout this period, the federal government was relatively inactive with regard to appliance standards.⁸ The initial federal response to the oil embargo had been to call for voluntary targets for appliance efficiency. This was soon overtaken by the mandatory appliance efficiency standards being imposed by California, New York and some other states. The Carter Administration subsequently proposed mandatory federal standards and Congress ultimately agreed; the 1978 National Energy Conservation and Policy Act directed the US Department of Energy (DOE) to formulate mandatory efficiency standards for appliances. However, this was opposed by the Reagan Administration which instead proposed a “no standard” standard. The Reagan standard was overturned by the federal courts in 1985. By 1986, six states had adopted standards on one or more products and appliance manufacturers were coming around to the notion that a pre-emptive federal standard would better serve their interests than the expanding patchwork of individual state standards. A compromise was reached, embodied in the 1987 National Appliance Energy Conservation Act (NAECA), whereby Congress would adopt specific standards on many major appliances, with the provision that these federal standards would then preempt any state standards. However, the states are left free to adopt efficiency standards for products *not* covered by federal standards. Subsequent moves by states to adopt standards for products not covered by NAECA led to the passage of federal legislation in 1988 establishing efficiency standards for fluorescent lamp ballasts, and in 1992 to standards on a variety of lamps, electric motors, and commercial heating and cooling products.

The 1988 federal standard for fluorescent lamp ballasts merely replicated the standard that California had set in 1978, and something similar was true of most of the other federal appliance efficiency standards. Under NAECA, DOE is required to periodically review and revise its efficiency standards, but this has generally occurred at a rather sluggish pace. Meanwhile, states including California have continued to innovate with efficiency standards for products not subject to DOE standards. In December 2004, for example, CEC set new energy efficiency standards for 17 different products ranging from light bulbs to swimming pool pumps to small power supplies for electronics; it is estimated that the new standards will save approximately 100

⁸ The account that follows is drawn from Nadel (2002).

MW of new generating capacity in California every year.⁹ More generally, the CEC's activism in promoting energy conservation has had a significant impact on electricity use in California over the past three decades. Since 1975, electricity use per capita in California has not increased at all, whereas it has increased *nationally* by about fifty percent. This is widely seen as a consequence of CEC's effectiveness in regulating energy efficiency.

California's willingness to act unilaterally in regulating motor vehicle emissions and energy efficiency, and the contrast between what it sees as the regulatory diligence and effectiveness of CARB and CEC compared to sluggish national efforts by EPA and DOE, are a crucial backdrop to the recent legislation on global warming.

3. Climate Change Policy Comes to California

Climate change first surfaced as a policy issue in California in 1988, when the legislature passed AB 4420, introduced by Assemblyman Byron Sher. This called for the compilation of an inventory of GHG emissions from all sources in California. It also requested an assessment of how global warming trends may affect the state's energy supply and demand, economy, environment, agriculture and water supplies. In addition to the assessment, it requested recommendations for policies to avoid, reduce, and address the impacts. The CEC was designated as the lead state agency for performing these tasks. In response, CEC prepared a series of reports, including a report on the impacts of global warming on California (CEC, 1989), *1988 Inventory of California Greenhouse Gas Emissions* (CEC, 1990) and *Global Climate Change: Potential Impacts and Policy Recommendations* (CEC, 1991). Recommendations included: promoting renewable electricity generation and biomass-based fuels, promoting energy efficiency, reducing vehicle miles traveled and expanding land use planning to manage transportation demand, and improving forestry, solid waste and recycling, and livestock management. In 1997, with funding from US EPA, CEC updated both the emissions inventory and the report on emission reduction strategies for California. (CEC, 1998).

At this time California was restructuring and partially deregulating its electricity industry. One of the Legislature's concerns was that deregulation would undercut the strong energy-efficiency programs that investor-owned utilities had conducted at the behest of the CPUC. To counteract this, the restructuring law, AB 1890, included a proviso for the assessment of a "public good" surcharge on electric utility bills in California for the specific purpose of funding energy efficiency programs (to be administered by CPUC), renewable energy (to be administered

⁹ CEC press release, 12/15/04. In addition, CEC had issued new building efficiency standards in 2001 and 2003, and other appliance efficiency standards in 2002. The following is an example of how things work. DOE issues energy efficiency standards for consumer products, but not for commercial products, and not water efficiency standards. In 2001, DOE issued new energy efficiency standards for residential clothes washers. In 2002, CEC adopted more stringent energy *and water* efficiency standards for *commercial* clothes washers (not federally regulated). Later that year, the legislature passed AB 1561 requiring CEC to establish water efficiency standards for residential clothes washers at least equal to those for commercial clothes washers. CEC adopted the water efficiency standards for residential clothes washers in September 2004.

by CEC), and “public interest energy research” (PIER) to be administered by a new division within the CEC. The PIER fund, about \$62 million/yr, is spent on six program areas, one of which -- energy-related environmental research -- includes climate change. In 1999, CEC’s PIER program sponsored a workshop on Global Climate Change Science. The following year, PIER contracted with the Electric Power Research Institute (EPRI) to conduct a coordinated suite of studies on the potential impacts of climate change on California, including individual studies of impacts on terrestrial vegetation, ecosystems, water resources, agriculture, energy, timber, coastal resources and human health (Wilson et al., 2003).

Meanwhile in 1998, then Senator Byron Sher introduced a bill, SB 1941, which required the CEC to establish an inventory of GHG emissions in California; to provide information to state, regional and local agencies on cost-effective and technically feasible methods for reducing those emissions; and to convene an interagency task force to ensure that policies affecting climate change are coordinated at the state level. The bill was passed by the legislature but was vetoed by Governor Wilson as unnecessary because the CEC had recently updated the inventory of GHG emissions in California. In addition, the Governor found: “[T]he bill’s requirement that the CEC provide information to state, regional, and local agencies on cost-effective and technologically feasible options to reduce greenhouse gases is infeasible. Because uncertainty exists about the effects that reducing greenhouse gas emissions in California would have on global warming trends, there is no way to determine how one particular measure implemented in California would have a more positive or negative consequence than any other measure.”¹⁰

In 1999, Sher re-introduced a similar bill, SB 1253; but it was not passed. At one of the hearings, business representatives suggested that he consider non-regulatory methods by which businesses could be encouraged to reduce GHG emissions voluntarily. Sher incorporated this recommendation in a subsequent bill, SB 1771, which was passed and signed into law in 2000. SB 1771 establishes an independent organization, the California Climate Action Registry, as a public benefit nonprofit corporation to record and register voluntary GHG emission reductions that have been achieved since 1990. The Climate Registry is required to adopt standards for verifying emission reductions, adopt a list of approved auditors to verify emission reductions, establish emission reduction goals, maintain a record of all emission baselines and reductions, and recognize, publicize and promote entities that participate in the Registry.¹¹

Besides the Registry, SB 1771 contains the provisions pertaining to the CEC that were in Sher’s previous unsuccessful bills. The CEC is directed to update, by January 2002, the inventory of GHG emissions from all sources in California, and to update this every five years thereafter. It is also directed to acquire and develop information on global climate change and to provide information to state, regional and local agencies on the costs, technical feasibility and

¹⁰ The same argument was commonly made by opponents of AB 32 during the summer of 2006.

¹¹ In addition to SB 1771, there were two subsequent laws relating to the Climate Registry, both authored by Sher. In October 2001, SB 527 was a cleanup bill clarifying some details of SB 1771. In September 2002, SB 812 instructed the Registry to include forest management practices as a mechanism for emission reduction and directed it to adopt procedures and protocols for the reporting and certification of carbon stocks and carbon emission reductions associated with forest sequestration and reforestation.

demonstrated effectiveness of methods for reducing GHG emissions from in-state sources. Finally, it is directed to convene a interagency task force of state agencies to ensure policy coordination, and to establish a Climate Change Advisory Committee with representatives of business, agriculture, local government and environmental groups, to be chaired by a CEC Commissioner.

Another climate-related law authored by Sher, SB 1170, passed in 2001, required CEC, CARB and the California Department of General Services to develop and adopt fuel-efficiency specifications governing the state's purchase of motor vehicles and replacement tires, including ultra-low and zero emission vehicles, with the goal of reducing the state fleet's fuel consumption by 10% by 2005. Also, enacted that year was AB 2076; reflecting public concerns about the volatility of the price of gasoline, supply shortages and the frequency of refinery outages, this required the CEC and CARB to prepare a report on how California might in future reduce its petroleum dependence.

By 2002, the situation was as follows. During 2001, the Registry had developed its reporting and certification protocols, gathered charter members, and built its on-line reporting software.¹² It opened for business with 23 charter members in October 2002 (California Climate Registry, 2003). The CEC, as the lead state agency for climate change, had issued an updated inventory of GHG emissions (CEC 2002), the PIER-EPRI integrated climate impact assessment study was being wrapped up, and PIER was developing roadmap documents for future follow-up impact assessment analysis (CEC, 2003). In addition, PIER was actively funding research on carbon sequestration and other climate change topics. But, while there was substantial activity on climate change in California, the focus was predominantly on the generation of information, advice and guidance – not on regulation.

This changed significantly with the enactment of AB 1493, requiring CARB to adopt regulations to reduce GHG emissions by new motor vehicles sold in California. The bill was introduced originally as AB 1058 at the beginning of the legislative session in February 2001 by a freshman legislator, Fran Pavley, from Southern California. The initial text of the bill was extremely terse: "No later than January 1, 2003, [CARB] shall develop and adopt regulations that achieve the maximum feasible reduction of carbon dioxide emitted by passenger vehicles and light-duty trucks in the state." It immediately drew opposition from General Motors, the Alliance of Automobile Manufacturers and the California Chamber of Commerce, who argued that it was equivalent to the regulation of fuel economy, which is preempted by the federal law; that, since CO₂ does not create localized pollution problems, it cannot be eligible for state regulation; and that it would be better to encourage consumers to embrace more fuel-efficient technologies through incentives rather than through command-and-control (Posner, 2001). As industry opposition intensified, the bill was modified and fleshed out, and the deadline for implementation was pushed back. By May 2002, for example, CARB was to issue regulations by January 2005 that would apply only to model year 2009 or later vehicles; CARB was to consider technological feasibility and economic impact; the regulations were to provide flexibility in the

¹² The Registry's protocols are widely considered the gold standard by other registries in the US and abroad.

means by which compliance was to be achieved; and the regulations were prohibited from including mandatory trip reductions, land use restrictions, or bans on any specific category of vehicle. The latter is explained by the fact that industry opponents were characterizing this as an “anti-SUV, anti-minivan” bill. But, in the face of a fierce media blitz by automobile industry opponents, the bill was stalled.¹³

The bill was revived through a parliamentary maneuver on Saturday June 29, when the Senate was meeting in a special session on the state budget. An existing, unrelated bill, AB 1493, was gutted by the Democratic leadership and amended to bear the content of AB 1058. This was passed by the Assembly with a bare majority on a mostly party-line vote. It was passed by the Senate that same day, and Governor Davis signed it into law a few weeks later. The final text included language to prevent CARB from adopting regulations that impose additional fees and taxes on motor vehicles, on fuels, or on vehicle miles traveled; that impose reductions in vehicle weights or speed limit reductions or limitations; or that impose vehicle-miles-traveled restrictions or limitations. The specific standards that would achieve “the maximum feasible and cost-effective reduction” of GHG emissions from motor vehicles, and how much reduction this was, were to be worked out by CARB subject to the constraints embodied in law. The draft regulations were to be promulgated in June 2004, and the final regulations were to be adopted by CARB by the end of 2004. The regulations would not take effect before January 1, 2006, in order to give the legislature sufficient time to review them and amend them if it so chose.

A few months later, in September 2002, the legislature passed SB 1078, introduced by Senator Sher, which requires California to generate 20% of its electricity from renewable energy no later than 2017, the most stringent renewable portfolio standard in the nation. California was already generating about 10% of its electricity by renewables; the new law requires retail sellers of electricity to increase their use of renewable energy by 1% per year. It also requires the CPUC to adopt rules for establishing a process for determining market prices of electricity from renewable generators, and it requires CEC to certify eligible renewable energy resources.

4. 2004-5: Annus Mirabilis for Climate Change Policy

The immediate precursor of California’s 2006 GHG law is a series of events that were set in motion in 2003, and that crystallized between June 2004 and May 2005. The single most important event was the election of Governor Schwarzenegger in a special, recall election against Governor Davis, held in October 2003, but there were some other influential developments earlier that year.

In April 2003 the CEC and CPUC jointly issued a report, *Energy Action Plan for the State of California*. In the aftermath of the 2000-2001 electricity crisis, the state’s principal

¹³ Among the opposition’s arguments was: “[C]arbon dioxide is not a pollutant, and California’s contribution to global CO₂ is minimal. There is as yet no technology to reduce CO₂ emissions. All that can be done is to restrict driving or mandate lighter vehicles.” (Billingsley, 2002)

energy agencies had come together to prepare a plan with specific goals and actions that would eliminate future energy outages and excessive price spikes in electricity or natural gas. The plan identified increased energy efficiency and price-based demand response as the state's preferred future energy resource. It called for reduced per capita electricity use both to save energy and to minimize emission of pollutants including greenhouse gasses, and it recommended accelerating the 20% renewable resource goal from 2017 to 2010. The same theme was echoed in two other reports that year. In August, CEC and CARB produced a joint report *Reducing California's Petroleum Dependence*, as required by AB 2076, which stressed the need to reduce the growth in demand for petroleum by raising new vehicle fuel economy standards and, also, increasing the use of alternative fuels and advanced vehicle technologies. In November, the CEC issued its *2003 Integrated Energy Policy Report* which stressed the seriousness of climate change as a risk to California and made several recommendations for climate policy, including requiring the reporting of GHG emissions as a condition of state licensing of new electric generating facilities; accounting for the cost of GHG reductions in utility resource procurement decisions; using sustainable energy and environmental designs in all state buildings; and requiring all state agencies to incorporate climate change mitigation and adaptation strategies in planning and policy documents.¹⁴

These CEC reports had been produced by staff from its Energy, Transportation, and Policy Divisions. In addition, its PIER Division was moving into high gear on climate change. Following the publication of the impact assessment study with EPRI (Wilson et al., 2003), and the issuance of a series of roadmap documents (CEC 2003), PIER created the California Climate Change Center in June 2003 as a "virtual" institution with sites at both the Scripps Institution of Oceanography at UC San Diego and at UC Berkeley. The Scripps Center, directed by Dr. Dan Cayan, a noted oceanographer and also director of Scripps' Climate Research Division, focuses on meteorology, physical climate modeling, and climate impacts on streamflow and fire.¹⁵ The Berkeley Center, directed by Hanemann, focuses on economic and policy analysis, including climate impacts on the California water system. Working in close collaboration, the two centers initiated a new five-year comprehensive assessment of climate change impacts on California, including both physical and economic impacts, with a broad group of research collaborators.¹⁶

During his first term as Governor, from 1999 through 2002, Gray Davis had pursued an extremely cautious and middle-of-the-road approach to environmental policy, emphasizing the enforcement of existing programs instead of introducing new programs that would expand the

¹⁴ There was also an accompanying report on *Climate Change and California*. The *2003 Integrated Energy Policy Report* had been mandated by SB 1389, passed in August 2002, which consolidated previous biennial reporting mandates going back to the 1974 Warren-Alquist Act, including requirements for an overall Report and individual reports on Electricity, Fuels, Energy Efficiency, and Energy Development. There was now to be a single biennial Integrated Energy Policy Report; its coverage was expanded to cover municipal as well as investor-owned utilities in California.

¹⁵ In 1999, NOAA had created the California Applications Program (CAP) at Scripps to study climate variability and climate change impacts on water resources, wildfire and human health, which Dan Cayan has directed. For further background on the scientific research effort on climate change in California and the western region, see Franco et al. (forthcoming).

¹⁶ The Berkeley core research included the development of a new computable general equilibrium (CGE) model of the California economy (Roland-Holst, 2004).

scope or stringency of regulation (Lucks, 2001). He had not instigated any major environmental legislation, but he did sign AB 1493 and SB 1078 into law, which benefited his environmental image when running for re-election in the fall of 2002. The crucial event of his first term was the California electricity crisis of 2000-2001, when a combination of inept deregulation and market manipulation by energy suppliers caused wholesale electricity prices to rise ten-fold and drove state's largest electric utility, Pacific Gas & Electric (PG&E) into bankruptcy, since retail prices were regulated and frozen. For better or worse, Davis' leadership during the crisis was seen as weak and relatively ineffectual. Davis won re-election in November 2002 against a lackluster Republican opponent in an election marked by a record low turnout.

Davis ran into trouble just a month after his re-election. In the aftermath of the dot-com boom, California's state budget had been sinking into a deficit. In December 2002, Davis announced that the deficit might reach \$35 billion, almost \$14 billion higher than the forecast a month earlier, larger than all 49 other states' deficits combined.¹⁷ By February 2003, a petition drive was being planned to recall him; in July, the petition was certified and the recall election was scheduled for October 7.¹⁸ Davis lost his fight against recall through a combination of popular dissatisfaction triggered by the budget crisis and the electricity crisis, his political isolation, what was seen as a colorless but calculating political style, and the personable manner and fame of his leading opponent, Arnold Schwarzenegger.

Schwarzenegger had enjoyed a successful career as a bodybuilder and movie star, but had no previous political experience when he announced his candidacy for governor of California on the Tonight Show with Jay Leno on August 6, 2003. As a moderate Republican, he would have had no chance of earning his party's nomination in a regular gubernatorial election, but this was something different and he vaulted over his Republican rivals.¹⁹ On the advice of his brother-in-law Robert F. Kennedy Jr., Schwarzenegger had selected as environmental adviser for his campaign a man of many parts, with great energy and persuasiveness, who was then running a Santa Monica-based foundation Environment Now, Terry Tamminen. During the campaign, Schwarzenegger stressed his commitment to environmental protection and promised to support the effective implementation of AB 1493, but did not highlight climate change specifically.²⁰ After Schwarzenegger took office in November, 2003 he appointed Tamminen as Secretary of

¹⁷ Ultimately, the state's deficit exceeded \$38 billion.

¹⁸ Davis had hoped to rely on environmental support in staving off the recall. As a result, "the unusual circumstances surrounding the 2003 legislative session resulted in a banner year of legislative environmental policy, with Governor Davis signing some of the most environmentally friendly and progressive legislation of his five year tenure" (Lucks, 2002). However, none of this legislation dealt with climate change. Besides promising to defend the implementation of AB 1493, Davis' only climate-related action during 2003 was an agreement in September with the governors of Oregon and Washington for the West Coast Governor's Global Warming Initiative. The governors pledged to cooperate in reducing GHG emissions, and they directed their staffs to prepare a joint report by September 2004 focused on improving energy efficiency standards, encouraging renewable energy, reducing emissions from truck stops and ports, using their combined purchasing power to obtain more fuel-efficient vehicles, and developing consistent and coordinated inventories and reporting protocols for GHG emissions.

¹⁹ Gerston and Christensen (2004).

²⁰ His "Action Plan for California's Environment" called for reducing California's dependence on imported oil by investing in hydrogen highways and expediting clean fuel transportation, and for accelerating the target of a 20% renewable portfolio in electricity generation from 2017 to 2010, with a new target of 33% by 2020.

CalEPA, the umbrella environmental agency to which CARB was formally subordinate. For Tamminen, ending the dependence on imported oil and promoting ocean protection were his personal passions; through his influence with the governor, these would become the Schwarzenegger Administration's chief environmental priorities. But, this evolved slowly at first.

An influential development involved the Union of Concerned Scientists (UCS), an NGO that has been active in promoting scientific research on climate change and communicating the results to the general public. In 1999, UCS had co-sponsored with the Ecological Society of America an assessment of the potential impacts of climate change on California's ecosystems which received wide attention (Field et al., 1999). In the fall of 2003, UCS decided to initiate a new study in California, partly to update the earlier study and partly to generate scientific information that could be informative when the implementation AB 1493 came up for consideration in the summer and fall of 2004. The study, Hayhoe et al. (2004), was conducted by 18 scientists, including the principal researchers associated with the California Climate Change Center. Unlike the 1999 study, the new study developed specific, quantitative estimates of how California might be affected by climate change, using the projections of global circulation models (GCMs) and downscaling them to a relatively fine spatial scale in California. Moreover, instead of taking a single global emissions scenario and comparing the findings across a set of GCMs, as had been done in previous studies including the previous Assessment Reports of the Intergovernmental Panel on Climate Change (IPCC), the new study focused on a comparison of two emissions scenarios with different policy implications, a business-as-usual (BAU) emission scenario and an emission scenario that yielded a global atmospheric CO₂ concentration by the end of the century just twice the pre-industrial level. Two GCMs were used for this analysis which had just been released for use by the upcoming fourth IPCC Assessment Report. It turned out that the new GCM model results differed significantly from previous results with regard to the predictions of temperature change in California. The previous versions of the models showed a significant increase in temperature during the winter, combined with a summertime temperature increase of about the same magnitude; the new versions showed about the same degree of wintertime warming as previously, but a sharply greater warming in the summer.²¹ It appeared that, under the BAU scenario, summertime temperature in California might rise by as much as 18° F towards the end of this century, with serious implications for heat waves and fires, and water supply and demand. Also, under the BAU scenario, it appeared that California might lose about 89% of the April 1 snowpack in the Sierras, a major natural form of water storage whose loss would significantly deplete California's water supply (Hayhoe et al., 2004).

The study's results were published in the Proceedings of the National Academy of Sciences in August 2004. This was followed up by a less technical version intended for public outreach, *Choosing our Future: Climate Change in California*. Both documents received very wide attention, both in the general media and in scientific circles, and the results were cited in rulemaking by CARB to implement AB 1493. There was also a series of presentations by the

²¹ The change is believed due to improvements in modeling the linkage between surface temperature and ambient air temperature.

researchers to high-level officials in various state agencies, including to Secretary Tamminen, and also to the Governor's office.

By this time, the Administration was clearly gearing up for a major policy initiative on climate change in California, although most of this was still happening behind the scenes. In April 2004, Schwarzenegger had announced his "Hydrogen Highway" initiative for California, creating a public and private partnership "that will create hydrogen highways all over the state of California by the year 2010." In addition, during the summer of 2004 Tamminen and his staff were beginning to consider a specific GHG emission reduction target for California, using information developed from a study by the Tellus Institute commissioned by the Energy Foundation in support of the West Coast Governor's Initiative and subsequently refined for use by the Schwarzenegger Administration.^{22 23} An indication of Tamminen's standing with the governor is that he was promoted from Secretary of CalEPA to Cabinet Secretary in November 2004.²⁴

A landmark event was the publication of the CARB staff recommendations for the implementation of AB 1493 in June 2004, and their adoption by the CARB Board in September 2004. The CARB staff had performed an evaluation of vehicular GHG emissions and the technologies available to reduce them, focusing only on technologies that were currently in use on some vehicle models or have been demonstrated by auto companies and/or vehicle component suppliers in at least prototype form. As promising near-term technologies, they pointed to cylinder deactivation, improved transmissions, variable valve timing and lift, turbocharging, gasoline direct injection, and more efficient, low-leak air condition.²⁵ They did *not* consider hybrid gas-electric vehicles. The technologies they considered all met the feasibility criteria specified by AB 1493. There are two phases of standards based on these technologies spread over the period 2009-2016 and designed to allow auto manufacturers to incorporate the changes as part of their normal product improvement cycle. Near term (2009-2012) standards, when fully phased in, will result in about a 22% reduction in GHG emissions as compared to the 2002 fleet, and the mid-term (2013-2016) standards will result in a 30% reduction. The staff estimated that the fully phased in mid-term standards will result in an average cost increase of \$1,064 for passenger cars and small trucks/SUVs, and \$1,029 for large trucks/SUV, but this will be more than offset by operating cost savings over the lifetime of the vehicle; the net savings to vehicle operators would provide an overall benefit to the California economy.²⁶ The automobile

²² Baillie et al. (2004); Bailie and Lazarus (2005). The findings were fairly optimistic, but the economic analysis was somewhat simplified and did not allow for the full, general-equilibrium effects on the California economy.

²³ In November 2004, the Western Governors approved a series of detailed staff recommendations along the lines indicated in their September 2003 agreement. They also identified as an item for future consideration the notion of a regional, market-based carbon allowance program.

²⁴ Tamminen was succeeded in January 2005 by Dr. Alan Lloyd, the longtime Chair of CARB who ushered through the implementation of AB 1493 described below. In addition, Tamminen continued to work closely with the Deputy Secretary for External Affairs at CalEPA who functioned as his ally and surrogate in bringing his climate change policy objectives to fruition.

²⁵ The last item is significant because it demonstrates that CARB is focusing not on fuel efficiency but on overall tailpipe emissions of GHGs from motor vehicles.

²⁶ The staff analysis used an assumed fuel price of \$1.74 per gallon, noting that the savings would be larger if gas prices were higher, as they have been (California Air Resources Board, 2004).

industry strongly criticized both the staff's technology analysis and its cost estimates, arguing that the up-front vehicle costs would be larger than estimated by staff and the operating savings smaller, leading to a net loss for vehicle operators. Nevertheless, at CARB hearing on September 23, 2004, the Board – almost all of whom had been appointed or reappointed by Governor Schwarzenegger the previous month – voted unanimously to adopt the staff recommendations. The Board sent the regulation to the state legislature in December 2004, as required by AB 1493, and it became law on January 1, 2006.^{27 28}

During the summer of 2004, the CPUC was also expanding its activities relating to climate change. In May 2003 it had issued the joint *Energy Action Plan* with the CEC. In June 2004, it requested that the regulated investor-owned utilities (IOUs) address key issues pertaining to climate change as part of their long-term energy procurement planning. Building on information developed by the utilities and other stakeholders, in December 2004 the CPUC issued Procurement Order D 04-12-048 which requires IOUs to employ a “greenhouse gas adder” when evaluating competitive bids to supply energy. The adder, intended to reflect the financial risk to ratepayers of emitting GHGs given the likelihood that these emissions will be limited by regulation in the future, was to be determined subsequently by CPUC.²⁹ Secondly, CPUC announced its intention to investigate, as part of a general framework of incentives to promote the selection of environmentally sensitive resources, the creation of a “carbon cap” to be applied to each regulated utility's resource portfolio.

Meanwhile, there was a growing anticipation among the environmental community of a significant announcement from the Governor's office on climate change policy. It was first thought this might occur when the West Coast Governors met in the fall of 2004; then, it was expected to be part of the Governor's State of the State speech in January 2005. But, nothing materialized at either event. The likely reason was caution and politics within the Governor's

²⁷ In December 2004, the automobile industry filed a suit against CARB claiming that forcing them to reduce GHG emissions is akin to setting fuel economy standards, which is preempted by the federal government under the 1975 Energy Policy and Conservation Act. The Schwarzenegger administration, which is vigorously defending the suit, has responded that carbon dioxide is a pollutant that CARB can regulate under 1967 Air Quality Act, that climate change creates compelling and extraordinary conditions for California according to scientific studies including Hayhoe et al. (2004), and that the state is considering other methods of reducing GHG emissions from vehicles. As of June 2006, ten states, representing a third of the US auto market, have expressed their intention to adopt California's AB 1493 GHG vehicle emissions standards. In Canada, which was thinking of mandating similar standards, the automobile industry agreed in December 2005 to adopt similar reductions voluntarily.

²⁸ It is worth noting that the automobile industry (unlike the petroleum industry) has never been politically very powerful in California, probably because there is only one manufacturing plant with relatively few jobs in the state. A statewide public opinion poll by the Public Policy Institute of California in July 2004 found that 73% of state residents believe automakers should be required to significantly improve fuel efficiency in new vehicles, even if it increases consumers' costs. 81% of residents said they would back a state law requiring automakers to reduce GHG emissions from new cars by 2009, including 77% of SUV owners, 71% of Republicans, and 88% of Democrats (Baldassare, 2004)

²⁹ In April 2005, brushing aside the opposition from the southern California utility SCE, the CPUC adopted \$8/ton as a reasonable proxy for the future cost of carbon constraint in 2005, to rise 5% annually thereafter. In February 2005, the CPUC held an en banc public meeting on climate change for the purpose of moving “beyond energy procurement” and beginning to identify ways reduce GHG emissions from *all* CPUC regulated companies, including natural gas, telecommunications, water and transportation as well as electricity.

private office. The Governor's major policy focus, making good on his campaign promise to "blow up the boxes," was the California Performance Review, released in August 2004, which offered over a thousand recommendations for re-organizing and streamlining state government agencies in California. In addition, Schwarzenegger was adopting a conservative political stance during 2004, testing his strength against the democratically-controlled legislature. When the legislature passed SB 1478, authored by Sher, to accelerate the 2017 deadline for a 20% renewable portfolio to 2010, Schwarzenegger vetoed the legislation because he disagreed with some of the details.³⁰ With climate change there was an additional complication. On the one hand, if the Governor were to set a GHG reduction target for California, he wanted it to be bolder than what other states were doing. On the other hand, California already had lower GHG emissions per capita than almost any other state. Moreover, the Governor's private office is a mixture of Republicans and Democrats reflecting the different facets of the Governor's persona – it has been described a "specially designed tension between politically opposed elements" – and the Republican members were hardly keen to embrace something that the California Chamber of Commerce would oppose.

The internal dilemma within the Administration was eventually resolved, and it became known in April 2005 that the Governor would unveil his climate change policy in San Francisco on June 1, at the United Nations World Environment Day conference in celebration of the 50th anniversary of the founding of the United Nations.³¹ At that ceremony, the Governor stated: "I say the debate is over. We know the science. We see the threat. And we know the time for action is now." Coming from a republican politician, this was a striking statement. The Governor then signed Executive Order S-3-05, establishing the following GHG reductions targets for California: by 2010, reduce emissions to the level in 2000; by 2020, reduce emissions to the level in 1990; and by 2050, reduce emissions to 80% below the level in 1990. He also made an administrative change: CalEPA was now designated the state's lead agency for climate affairs, and the Joint Agency Climate Team chaired by a CEC Commissioner gave way to a Climate Action Team chaired by the Secretary of CalEPA.³²

5. Forging a Climate Change Policy for California

The Executive Order set targets, but it did not specify how the targets were to be met. Instead, it directed the Secretary of CalEPA to report to the Governor and the Legislature by

³⁰ Looking back at the 2004 legislative session, Lucks (2004) observed that "on the whole, the Governor's environmental agenda took a back seat this session. The Legislature filled the void by serving up scores of bills – most of which failed. The Governor vetoed all of the bills addressing environment, health, and consumer protection that were targeted by the California Chamber of Commerce as "job killer" legislation."

³¹ There is little doubt that, once the decision had been made, the Governor was personally engaged with the issue. He interrupted an oral briefing meeting with senior staff to put on his glasses, take the supporting documents from their hands, read them himself, and ask detailed questions about them, turning what had been scheduled as short meeting into a lengthy one.

³² CEC's Climate Advisory Committee was also ended. There was also talk at this time that, as part of the reorganization of state agencies triggered by the California Performance Review, the CEC's climate related activities would be moved over to CalEPA. In the end, however, virtually none of the reorganization proposals has been implemented because of the Legislature's opposition.

January 2006, and biennially thereafter, on the progress in meeting the targets. The Secretary of CalEPA was also directed to report to the Governor and the Legislature by January 2006, and biennially thereafter, on the impacts to California of global warming.

The latter report was intended to be an extension and expansion of the study by Hayhoe et al. (2004), using projections from two GCMs downscaled to a relatively fine spatial scale in California and analyzing the implications of two alternative emissions scenarios.³³ Between June and December 2005, an unusually broad research effort was conducted by 70 researchers from multiple institutions and scientific disciplines, leading to the publication of 20 technical reports covering climate impacts in California on water supply, agriculture, forestry, vegetation, coastal resources, wildland fires, hydropower, energy demand, air pollution and human health.³⁴

The report on implementation of the Governor's emission targets focused primarily on the 2020 target, and did not look beyond this. The analysis was conducted by staff associated with the Climate Action Team (CAT) energetically directed on a day-to-day basis by the Deputy Secretary of CalEPA. The main approach taken was to identify specific regulatory policies within the purview of state agencies that, in aggregate, could yield the 2020 target for emission reduction – in effect, demonstrating the feasibility of this target. CAT came up with a laundry list of 38 regulatory actions by CEC, CARB, CPUC and other state agencies. Some were large, including implementation of AB 1493 plus additional measures that could be implemented after 2016, the reduction of HFC emissions from vehicular and commercial refrigeration systems, forest management and afforestation, and additional energy conservation by investor-owned and (unregulated) municipal utilities; others were small, such as regulations to control the handling of wet manure at animal facilities in California.

Implicit in this approach was an emphasis on “cap” rather than “cap and trade.” There were two reasons for this emphasis. First, it was a logical extension of the regulatory approach traditionally used with air pollution and energy efficiency in California: to agency staff, it seemed the natural thing to do. Second, strong opposition to emission trading was expressed by certain groups which CAT consulted, especially the environmental justice community. They argued that the virtues of the market had been oversold by economists in the case of electricity regulation and the RECLAIM emission trading program in Los Angeles, and these should be viewed with skepticism now. There was also concern at the possibility of “hot spots” for conventional criteria air pollutants as an incidental by-product of allowing trading in GHG emissions.³⁵

³³ For technical reasons, one of the GCMs and one of the emissions scenarios were different from those used in Hayhoe et al. (2004).

³⁴ Luers et al. (2006) provides a summary of the findings intended for the general public. A subset of the technical studies will appear in a forthcoming special issue of the journal *Climatic Change*.

³⁵ It was also suggested that a cap and trade program could not be designed until after mandatory emission reporting had been instituted, which presumably would require a legislative mandate. However, the CAT Report did not specifically request any legislative mandate; besides, there is no reason why the Report could not have provided some specific recommendations for the design of an emission trading system if agency staff had been interested in this.

In addition to the pushback on emission trading, there was a distinct reluctance to engage in economic analysis until near the end of the CAT process, when it was decided there did need to be some analysis of the economic impact of the regulatory actions listed in the CAT report.³⁶ Two economic analyses were performed, one by the CARB staff of the full set of 38 regulatory actions and the other by an economics professor at UC Berkeley focusing on eight regulations for which more substantial documentation was available, accounting for about half the targeted emission reduction. The CARB staff used a computable general equilibrium (CGE) model of the California economy that had been developed for the state in the 1990s; the Berkeley study used a new CGE model funded by CEC which was an extension and refinement of the CARB model. Both studies reached a similar conclusion: the regulatory actions to reduce GHG emissions in California would lead to a small increase in Gross State Product by 2020, and a small increase in statewide employment. This finding attracted widespread attention, including skepticism from industry sources, but there are specific economic reasons why the outcome can occur. First, a significant portion of the programs by which the emission reduction would be effectuated involve regulations to promote fuel and energy efficiency; these can save money for fuel and energy users by lowering their cost of doing business, and this stimulates economic growth. Second, it turns out that, of the goods and services consumed in California that are relatively GHG-intensive, a significant fraction are produced out of state, whereas a significant fraction of the goods and services that are relatively GHG-unintensive are produced in-state; hence, a limit that raises the relative price of GHG emissions redirects consumption away from imported production and towards domestic production, boosting the domestic economy.³⁷

While the CAT Report was being prepared, CPUC was moving energetically to regulate GHG emissions from new power plants used by IOU electric utilities. In October 2005, it issued a Policy Statement on Greenhouse Gas Performance Standards directing staff to investigate the adoption of a GHG emissions performance standard for IOU procurement that is “no higher than the GHG emissions levels of a combined-cycle natural gas turbine” for all procurement contracts that exceed three years in length and for all new IOU owned generation.³⁸ In February 2006, the CPUC announced that it will develop a cap on all GHG emissions from IOU utilities and other load-serving entities, including emissions associated with energy imported from out of state. The baseline for the cap was to be determined, but would probably be 1990. The Commission also set the foundation for a process that will explore a range of flexible compliance options in order to

³⁶ The original intention was not to have an economic analysis. However, in early September, the President of the California Chamber of Commerce stopped by CalEPA and mentioned that he had engaged a well-known national economic consulting company to analyze the impact of the Governor’s 2020 emission target, and they had found that it would cause a loss of over 300,000 jobs. This report was to be released shortly at a press conference in Sacramento. This caused some consternation within CalEPA. However, the crisis soon passed: the press conference never was held, and the economic report never materialized. The reason may have been that the Chamber was very closely allied with the Governor in supporting the “reform package” of ballot propositions in the November special election – see below. This was probably not a good time to pick a fight with the Governor. The following January, when the draft CAT Report was released, it was vigorously opposed by the Chamber, as was the version of AB 32 released in April 2006.

³⁷ See Roland-Holst (2006,a)

³⁸ In February 2006, SB 1368 was introduced by Senator Perata, Democratic President Pro Tem of the Senate, to give legislative force to the CPUC’s performance standard and extend it to municipal utilities in California.

minimize the cost of meeting the cap. A rulemaking process to implement the new plant performance standard and the emission cap was initiated in April 2006.

In the fall of 2005, while the CAT report was being prepared, the Governor was continuing to spar with the Democrats in the Legislature, leading to deadlock in the passage of environmental legislation (Lucks, 2005). One casualty was the Governor's "Million Solar Homes" initiative. In August 2004, the Governor had proposed a 10-year subsidy to stimulate solar purchases on residential buildings; a Democratic state senator incorporated the subsidy proposal into his own bill, SB1, requiring a fixed percentage of all new California homes to have on-site solar power. But, the combined package failed to pass out of committee, largely because of objections to the mandate and the cost of the subsidy. The bill was revised in February 2005 so that it contained no compulsory mandate and applied to commercial and municipal buildings as well as residential buildings. It was passed by the Senate in June, 2005, but it then stalled in the Assembly where the Democratic leadership amended it with a pro-union provision requiring payment of prevailing wages for technicians installing the solar panels which the Governor found unacceptable. The political divide increased in the fall of 2005 when the Governor called a special election for November 8, 2005 to allow voters to decide on eight ballot propositions, including his own "reform package" of four propositions concerning teacher tenure requirements, the use of union dues for political campaigns contributions, state budgetary spending limits, and redistricting. What was the most expensive ballot election in California history pitted the Governor and his business allies against teachers, nurses, correctional officers and other unions. The outcome was a landslide defeat for the Governor – all eight propositions were resoundingly rejected. This had two important consequences. The Governor moved quickly and sharply to the political center. On December 1, he named as his new chief of staff a Democrat who had been deputy chief of staff to Gray Davis, to the immense consternation of conservative Republicans.³⁹ At the same time, since the Governor had lost his vaunted hold over the electorate, the Democrats were now emboldened to confront him head-on. Climate change was one area where the confrontation would occur.

The CAT Report to the Governor and Legislature, released in draft form in December 2005, revised after hearings and submitted to the Governor's office on February 1, 2006, was a cautious document with regard to the policy recommendations. A cap and trade system was discussed, but was not made a primary recommendation. Instead, the two key policy recommendations were to require mandatory reporting of GHG emissions by major industrial sources such as cement manufacturing, oil refining, and electricity generation, and to add a "public goods" surcharge to gasoline, analogous to the existing surcharges on electricity and natural gas, to fund research on strategies to reduce dependence on petroleum and lower GHG emissions. Both were strongly opposed by industry groups including the California Chamber of Commerce. When the final Report finally emerged from the Governor's office, the public goods

³⁹ However, conservative Republicans were appeased shortly thereafter when Terry Tamminen was fired as Cabinet Secretary. While introducing former Vice President Al Gore at an event at Stanford University on December 7, he joked that President Bush is "switching the power on Vice President Dick Cheney's pacemaker to nuclear power" and he ended with the punch line: "Wait two years. President Al Gore will fix it." These remarks drew widespread attention from conservative Republicans and within three days Tamminen was ousted from his position. He was appointed special assistant to the Governor for energy and environmental technologies.

surcharge was eliminated, but the mandatory reporting of emissions was retained. In addition, language was added to the CAT Report calling for "a multi-sector, market-based system" using economic incentives, and the CAT was directed to develop a plan for such a trading program by January 2008.

After reviewing the agencies' draft for almost 9 weeks, the Governor's office released the final CAT Report on Sunday April 2, 2006. The reason for the timing was that the Democrats had scheduled a press conference for April 3 to unveil new legislation to make mandatory the voluntary emission reduction target for 2020 set by the Governor the previous June. In effect, the Democrats were now entering into a competition with the Governor on climate change policy. Their vehicle was AB 32, a bill originally introduced in December 2004 by Fran Pavley to revise some of the functions and duties of California Climate Action Registry. Now, the bill was being amended to direct CARB to adopt regulations by January 2008 (1) for the mandatory monitoring and reporting of GHG emissions from major sources, and (2) for reducing statewide GHG emissions to their level in 1990 by 2020. Moreover, Pavley had obtained the support of Speaker Nunez, the Governor's opponent in the partisan wars of 2004-5, who now became a co-sponsor of the bill. The Governor's office stopped short of endorsing AB 32 but said that the Governor looked forward to working with the Legislature to curb GHG emissions in California. The Governor's continuing caution, or ambivalence, was visible at a "global warming summit" he held the next week in San Francisco. At this event, he called for California to become a national leader in combating global warming, saying "Let's work together to create the world's best market-based system to limit and slash emissions." But, he went on to say that the state should move slowly in imposing controls on industries that emit GHG gasses because "we could really scare the business community ... we don't [want to] have businesses leaving the state." He concluded: "I think we should start out without the caps and ... really shoot for certain goals." Some observers were said to be "perplexed" by these remarks.⁴⁰

As the Legislature considered AB 32 during the summer of 2006, there were two major sets of disagreement. One was between supporters and business opponents of the bill, including the Chamber of Commerce and the Western State's Petroleum Association. Industry critics argued that global warming is not a local problem and should be regulated by the federal government, that by itself California could accomplish little since it accounts for a small fraction of global GHG emissions of GHG, and that emission regulation would destroy many jobs in California. Supporters of AB 32 responded that California, by itself, is the 12th largest source of GHG emissions and it has been highly influential in setting standards for the regulation of air pollution and energy efficiency not only nationally but also internationally; that acting now can help California become a leader in the emerging global market for GHG control technologies, and that a well-designed strategy to limit emissions in California can yield net economic growth in California.⁴¹

⁴⁰ Speaker Nunez commented that the Governor "needs to walk the walk, not just talk the talk" on climate change. The quotations are taken from news stories that ran on April 12 in the *Los Angeles Times*, the Associated Press, and the *San Francisco Chronicle*.

⁴¹ A revised economic analysis with the Berkeley CGE model was released in August which assumed that there would be a cap-and-trade program to supplement the eight regulatory programs considered in Roland Holst (2006a),

The second skirmish was between the Administration and the Legislature. In June the Administration indicated that it wanted several provisions to be inserted in AB 32, and the Governor would not sign the bill if it lacked them.⁴² Nunez, in turn, rejected the provisions, leading to a stalemate. The dispute centered on three specific issues: which agency would be in charge of implementing the emissions cap set by AB 32; the role of emission trading in this implementation; and the question of a “safety valve.”

The structure of AB 32 was similar to that of AB 1493: it set a goal, in this case reducing statewide GHG emissions to their 1990 level by 2020, but it left the details of how the goal was to be achieved to be determined by an entity in the Executive Branch within a set period of time and subject to some specific restrictions. The Governor wanted this entity to be the Climate Action Team led by CalEPA. The Democrats wanted it to be CARB, the agency that had implemented AB 1493; they had more confidence in CARB and they considered it to be more independent.

With regard to emission trading, as noted earlier there was strong opposition to trading from some groups who were influential with both CalEPA and the Democrats. Thus, the draft CAT Report did not make emission trading a primary recommendation. The Governor’s office overrode this and changed the Report so that it called for the development of plan for “multi-sector market-based system” by January 2008. A similar issue arose now with AB 32; the Democrats were willing to state that the implementing agency “may include” the use of market-based mechanisms, provided it took certain prior steps including examining the possibility that this could exacerbate localized “hot spots” and designing a mechanism to rule out any increase in the emissions of toxic air contaminants or criteria air pollutants. The Governor wanted the bill to state that CARB “shall include” market mechanisms.

The Governor’s office was sensitive to the drumbeat of criticism from the Chamber of Commerce and other business groups that a cap on GHG emissions would cause a calamitous increase in energy prices in California, causing businesses to leave the state and creating job losses. To deal with this, the Governor’s office wanted a “safety valve” to be written into AB 32 whereby the emission cap could be relaxed if there were going to be harmful economic consequences. The Democrats resisted this because they saw the business arguments as greatly overblown.

in order to achieve the full emission reduction target for 2020. It was found that there would be a net stimulus to the economy and a net growth in jobs in California. The positive economic impact would be even larger if the revenues earned from emission trading were plowed back to finance technology innovation (Roland-Holst, 2006b).

⁴² By then, a new Secretary of CalEPA was representing the Administration in these negotiations. Dr. Alan Lloyd had stepped down in February 2006 after shepherding the CAT Report to completion. He was succeeded as Secretary in May by Linda Adams who had formerly been Gray Davis’ Director of the California Department of Water Resources. Also, in March 2006, a senior staffer from the Governor’s office with a background in energy issues, Dan Skopec, was appointed Undersecretary of CalEPA, the number two position in the agency.

The stalemate between the Governor and Democrats continued until the very last minute. The 2005-2006 Legislative Session ended on August 31: any bill not passed by then would lapse. A week before this deadline, the *Sacramento Bee* and the *Los Angeles Times* ran editorials urging the Governor and the Legislature to resolve their differences rather than losing the opportunity of passing landmark legislation to reduce GHG emissions in California. An agreement was finally reached on August 30. The Democrats got their way on CARB as the implementing agency and on “may” rather than “shall” with regard to the considering emission trading. The Governor got his way on the safety valve.⁴³ With that, the Legislature bill passed the bill within the last 30 hours of the session, and the Governor signed it into law on September 27.⁴⁴

As enacted, AB 32 sets up the following timetable for implementing the reduction in GHG emissions. By June 30, 2007, CARB must develop a list of “early action measures,” to be adopted by January 2010, that can reduce emissions in the short term. By January 2008, CARB must determine what California’s GHG emissions were in 1990; this level will become the cap that must be met by 2020. By January 2008, too, CARB must adopt regulations creating a statewide GHG emissions reporting and monitoring system. By January 2009, CARB must prepare a plan for public comment for achieving the maximum technologically feasible and cost effective reductions in GHG emissions by 2020. CARB shall update this plan at least once every five years. By January 2011, CARB must officially put into place specific regulations to achieve the required reduction in emissions. These regulations must be operative by January 2012.⁴⁵

There was another, climate related bill that was caught up in the stalemate between Governor and the Legislature. This was SB 1368 which, as noted earlier, gave legislative force to the CPUC’s new source GHG emission standard and extended it to municipal as well as IOU utilities in California. This was opposed by business groups who argued that it would end up raising the cost of electricity in California. Because of this concern, it was thought that the Governor would veto the bill. On the day before he signed AB 32 into law, it became known that he would also endorse SB 1368, which he did two days later.

⁴³ The specific language states “In the event of extraordinary circumstances, catastrophic events, or threat of significant economic harm, the Governor may adjust the applicable deadlines for individual regulations, or for the state in aggregate, to the earliest feasible date. The adjustment period may not exceed one year unless the Governor makes an additional adjustment.” This is a potentially large loophole.

⁴⁴ Another happy ending involved SB 1, the solar subsidy bill that had been stalled in 2005. The Governor and the Democrats reached an agreement at the beginning of August 2006, and the Governor signed the bill into law on August 21.

⁴⁵ AB 32 specifies the following restrictions on how the reduction in emissions is to be achieved. The regulations developed by CARB should: not disproportionately impact low-income communities; complement, and not interfere with, efforts to achieve and maintain federal and state air quality standards and to reduce toxic air pollution emissions; consider cost-effectiveness of these regulations; consider overall societal benefits, including reductions in air pollutants, diversification of energy sources, and other benefits to the economy, environment, and public health; minimize the administrative burden of implementing and complying with these regulations; minimize leakage (whereby reductions in emissions within California are made possible by increased emissions outside the state); ensure that emission reductions are real, permanent, quantifiable, and verifiable, and enforceable by CARB; and count only emission reductions that are new – not those that would occur otherwise.

The following month there was an unexpected coda to this flurry of activity. The Governor issued Executive Order S-17-06 on October 10, 2006 reaffirming the primacy of the Secretary of CalEPA as “statewide leader for California’s GHG emission reduction programs.” The Order directs CARB to “work with” the Secretary CalEPA in developing measures to implement AB 32 and, in particular, to collaborate with him “to develop a comprehensive market-based compliance program with the goal of creating a program that permits trading with the European Union, the Regional Greenhouse Gas Initiative and other jurisdictions.” It also states that the CalEPA Secretary will “facilitate and coordinate” CARB and CPUC as they develop regulations that affect electricity and natural gas providers in order to avoid duplicative or inconsistent requirements. In effect, the Governor was having the last word – for now -- in the confrontation with the Democrats regarding the terms of AB 32.⁴⁶

6. Concluding Observations

Looking over the events leading up to the present, three specific issues stand out that have a broader relevance beyond the vagaries of political maneuvering in California.

One issue is the breadth of GHG emission regulation relative to conventional environmental policies. Underlying the recent tussles between CEC, CARB and CalEPA, there is a larger problem: no single state agency seems fully adequate for the task of managing GHG emissions across the breadth of the California economy. CARB has experience in managing GHG emissions from motor vehicles, but these account for 41% of GHG emissions in California.⁴⁷ CPUC regulates IOU electric utilities, while CEC has some planning authority over municipal utilities, but GHG emissions from electricity used in California, including electricity generated out of state, account for only 20% of California’s GHG emissions. 23% of California’s GHG emissions come from industrial facilities including petroleum refining and cement production, over which no existing agency has specific regulatory oversight. The remaining emissions come mainly from agriculture and waste facilities (landfills); these are under the purview, respectively, of the California Department of Food and Agriculture and the Integrated waste Management Board of California -- but neither of those agencies has had any significant involvement with issues relating to climate change. The only existing agency which covers the full scope of GHG emissions is the Climate Registry, but this is the newest and smallest of agencies, and it has no regulatory power beyond the reporting of emissions.⁴⁸

Moreover, designing a market for a valuable economic asset – which is what cap-and-trade entails – requires a sophisticated understanding of economics and finance, but most existing state agencies have limited institutional capacity with respect to these topics. CARB has a modest in-house economics capacity; CARB aside, CalEPA has none. While the CPUC and

⁴⁶ However, the force of AB 32, a statute, ultimately supersedes that of an Executive Order.

⁴⁷ It should be noted that, so far, CARB has tackled only GHG emissions from light duty vehicles, which are just over 25% of the state’s emissions. CARB has not yet addressed heavy duty vehicles; nor has it tackled emissions from aviation.

⁴⁸ Indeed, the Registry is technically not an agency; it is a nonprofit organization created by legislation.

CEC have very small economics staffs, they have used outside economic consultants to inform and advise them. The CPUC is probably the only state agency with something approaching the degree of sophistication in the use of economics for making policy that is likely to be required for the implementation of AB 32. However, its authority is limited to the GHG emissions associated with investor-owned utilities.

The other two issues concern emission trading. First, there may be some potential inconsistency between the Administration's advocacy of emission trading and both its desire to retain political control over the design of the market (via the Secretary of CalEPA's oversight of the rulemaking process) and the safety valve it has formulated (which operates at the Governor's discretion). As formulated, the emissions cap can be waived by the Governor for a year at a time if he perceives a "threat of significant economic harm." But copious claims of significant economic harm were made during the course of the debate this summer by some of the industrial sectors likely to be affected by AB 32, but these were generally discounted (correctly, in my view) at the time. Unless the safety valve is defined more artfully, it could severely undermine the effectiveness of an emission trading system. After all, why should a firm invest in technologies to reduce its GHG emissions, or even purchase the permits required to cover its emissions, if it knows that another firm may approach the Governor's office and successfully induce him to waive the cap because of the potential for significant economic harm?⁴⁹ For a market to function successfully, there needs to be transparency and a high degree of certainty that the market rules will not be changed in mid-course. Balancing this against the political considerations that may animate the Governor's office will be a delicate task that is not helped by the current language regarding the safety valve.

Second, the persistent ambivalence within Administration circles about "cap" versus "cap and trade" should not be allowed to obscure the fact that there is a genuine policy dilemma regarding the weight to be placed on regulatory policies versus emission trading in reducing GHGs. In the case of SO₂ emissions by electric utilities, the approach to reducing these emissions adopted by Title IV of the 1990 Amendments to the Clean Air Act relied exclusively, and successfully, on emission trading. But it would be wrong to assume that the same approach should automatically be applied to CO₂ or the other GHGs. First, electricity generation accounts for a smaller fraction of CO₂ emissions – only about one third nationally, compared to two-thirds in the case of SO₂. Hence, other – and quite diverse – sectors of the economy have to be brought into the picture for GHG reduction. Second, there is not the same scope for reducing CO₂ emissions from electricity generation as for SO₂ emissions. To reduce SO₂ emissions, electricity generators relied on two main strategies: fuel switching, primarily from high- to low-sulfur coal, and installing scrubbers to remove emissions after combustion. Neither strategy has a good analog in the context of CO₂ control.⁵⁰ A better prospect for the removal of CO₂ in the combustion of coal is to promote investment in new boilers using combustion technologies that

⁴⁹ It has been pointed out that making the Governor responsible for invoking the waiver rather than the Climate Action Team, which was the Administration's original preference, does increase the political cost of waiving the cap. However, there is limited comfort in this.

⁵⁰ There is relatively limited variation in the carbon content of coal, so that fuel switching is not a real option for coal-fired plants; and, there is no analog of a scrubber that can be added to an existing coal-fired boiler to remove CO₂ post-combustion.

have a high thermal efficiency and/or are equipped for carbon capture and sequestration. Otherwise, one needs to increase the share of renewables in electricity generation and/or to reduce the demand for electricity by lowering the energy intensity of manufacturing processes and promoting energy conservation. In this context, some types of regulation – whether energy efficiency regulation, a renewable portfolio standard, a new source performance standard for electricity procurement, or a cap on aggregate fleet emissions (as in AB 1493) – can be a necessary complement to emission trading. Hence, a key challenge for GHG reduction policy is likely to be designing the right blend of regulatory and market-incentive programs. This does not mean specifying an exhaustive set of regulatory policies such as the 38 programs listed in the CAT Report. Rather, it means identifying a subset of the most promising and cost-effective regulatory policies and then designing a trading system that will go the rest of the way to implementing the emissions cap. This is what CARB will have to figure out if AB 32 is to be implemented successfully.

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