TO: George W. Bush  
President of the United States

FAX NUMBER 1-202-456-2461

Pages including cover: 39

FROM: Charles Campbell

FAX NUMBER.

Subject: US Energy Crisis and Related Environmental Issues

I would appreciate your review of what I have attached and try to use these points to modify the proposed energy program.

Sincerely yours,

Charles L. Campbell

16 June 2001

9 July 2001
July 4, 2001

Dear Mr. Lipton:

On behalf of Secretary Andrew Card, Chief of Staff to the President, let me assure you that your ideas concerning solar energy were not only appreciated, but have been forwarded to the Secretary of Energy for his consideration.

Thank you for taking the time again to convey your views.

Sincerely,

Larry Lindsey

Lawrence B. Lindsey
Assistant to the President for Economic Policy

Mr. Robert D. Lipton
George W. Bush  
President of the United States  
The White House  
1600 Pennsylvania Avenue  
Washington D.C.  
20500  

Subject: US Energy Crisis and Related Environmental Issues  

Dear President Bush:  

Earlier this year I wrote to you concerning your proposed energy policy. After reading the official report, I commend your staff for identifying nuclear power and solar power as part of the overall solution; however, a return to the prior methods for developing nuclear power will lead no where. The approach to solar power is essentially more of the same minimalist attitude we have had over the last 25 years and will produce nothing in another 25 years.  

The offer of tax incentives for the purchase of hybrid high mileage automobiles is also a good intermediate step toward reduced energy demand but the proposed plan offers nothing for the ultimate development of a zero emissions vehicle. The program continues to ignore the much broader energy-environment relationship that has been mishandled by all administrations since the loss of control of oil reserves to OPEC in the mid-1970s.  

I have seen statements from your staff that this is the first real energy policy in several years. Actually, there has never been a US energy policy but there has been crisis-related legislation that generally has had a negative impact on the total energy situation. Since 1978 both political parties have elected the presidents 50% of the time so there can be no political fallout which favors Republicans or Democrats in the rush to point fingers for the current crisis. I have attached a recommended strategy that I previously sent to your office and have expanded it to provide data on the world's most successful combined energy - environment program.  

Your staff's proposed energy program does not include any attempt to resolve the most pressing problem - the cost of electric power. The power crisis in California is only a symptom of a much larger problem that has degenerated into a Tower of Babel. If nothing constructive is accomplished the problem will spread north and east. Since January the US energy situation has followed the usual pattern of accusations by consumer advocates, legislators and lobbyists of conspiracy by the power generators, gas producers, gas pipeline companies and more recently, with summer upon us, the refineries with no rational views toward solving the problem.  

The conspiracy theories and muddled legislative moves with power price caps and lawsuits are reminiscent of the oil crises in 1974 and 1980. While it is impossible to determine the total cost of deregulation of power with the limits on retail rates, bumbling state purchases of power with attendant legal penalties, and impending bond issue to continue subsidization of low retail rates it is very evident that there will never be enough future savings on lower rates in California to recover the startup costs of this flawed deregulation legislation.  

This does nothing to solve the problem which, if no handled promptly and forcibly at the federal level, will overwhelm any other programs that your administration and congress may be contemplating. No amount of new crude oil production in Alaska will affect the current and impending shortage of power plants and refining capacity. Interest rate cuts are not the answer. Japan's rates have been close to zero for the last several years and their economy is still in serious trouble even with a rational energy policy.
The staff who advised you to dismiss the Kyoto Protocol without offering any alternatives has done a serious disservice to your administration and has had a serious effect on our international relations that was unnecessary. It is obvious that they have little practical experience in energy policy and environmental management. All manner of commercial companies and prestigious technology institutions support the intent if not the letter of Kyoto. This includes Ford, BP, Shell, MIT and the National Academy of Sciences. Reducing carbon dioxide emission need not effect economic growth and if properly handled will actually enhance industrial development.

No new technology is required to solve our energy problems. Some development work is required to bring down the cost of some of our alternatives but other industrialized nations have successfully instituted extensive national energy plans over the last quarter of a century using technology that has been ignored or politically unpopular in the US.

France has instilled economic and environmental programs that have been very successful. We should seriously consider following their model which has shown these results:

1) Using a common design, France has developed a nuclear power generating base which provides 75% of the nations total electricity and has eliminated the use of fossil fuels in power generation.
2) France reprocesses their nuclear waste and minimizes the problems with storage.
3) France has developed the world’s most sophisticated high-speed electric train system and reduced the need for automobile and air travel as well as airport congestion.
4) French cities use electric vehicles for government transportation needs.
5) France has reduced the total carbon dioxide emission by 25% over the last 20 years; currently US emissions are 4 times as high per person as France and continue to grow unabated.
6) France has reduced sulfur dioxide emission 75% and nitrogen oxides emissions by 20% since 1983.

The French experience is not a hypothetical case study on how to manage an environment program and at the same time advance economic growth. The French have results from a 25 year program. All of these activities have actually advanced France’s industrial development while at the same time reducing that country’s reliance on foreign crude oil sources and the attendant foreign exchange imbalance. No matter how many high level studies are commissioned in the US to study the problems, they will never be able to refute the results of the actual French experience.

There are long term solutions to our problems that require short term and immediate decisive federal legislative action. The US had very low cost and extremely reliable electric power in the 50 year period prior to deregulation. Return electric power to a regulated format of 1980 with modifications for cogeneration and power supplied by small businesses and individuals to enter the grid.

The May 8 edition announced the USA Today’s winners of their Quality Cup awards for high standards and quality. The winner in the services and government category was the Tennessee Valley Authority (TVA), one of the 5 largest power generators of electric in the US. TVA was established by the federal government in 1933 and provides service in seven southeastern states. The TVA is protected from competition by congress, So far the flawed deregulation program has not damaged the TVA’s operations. Hopefully, the US power industry can be returned to the conditions prevailing in 1990 before TVA’s excellent record is tarnished.

In 1999 TVA residential customers paid 6.4 cents per kWh versus 10.7 in California with a national average of 8.5 cents per kWh. This year the actual California costs are several orders of magnitude higher but are not being passed on to the retail customers with the resultant power crisis and bankruptcies. Use the TVA as a model to re-regulate the power industry.
I am sure that there will be a vigorous debate concerning your energy plan. I believe that there is a much higher probability of passage of those items which you deem to be important if there is greater concern shown for environmental issues and you receive votes from the green political proponents. The attached Exhibit 1 gives a rational program to follow to meet the US future energy needs, provide an environmental model which should satisfy Kyoto and maintain a vibrant US economy. This proposal essentially follows the French model plus adds action based projects to improve on that model.

Details are provided in the attachment. I would appreciate your review of what I have attached and try to use these points to modify the proposed program and start the solution to this massive problem before we are all freezing or sweltering in the dark, unable to pay for gasoline to escape the heat (or cold) or sitting on an airport runway indefinitely trying to leave these problems behind.

Sincerely yours,

Charles L. Campbell

9 July 2001
A Rational Integrated Energy & Environmental Program

Short Term Action Required

1. The US had very low cost and extremely reliable electric power in the 50 year period prior to deregulation. Return electric power to a regulated format of 1990 with modifications for cogeneration and power supplied by small businesses and individuals to enter the grid.

2. The US had a very low cost and reliable petroleum products delivery system in the 50 years prior to the imposition of EPA and CARB regional product specifications. Return to US gasoline, heating oil and diesel fuel specifications of 1990 to allow fungible products to be delivered anywhere in the US.

3. Remove governmental restraints that impede the immediate installation of coal fired power generating facilities by individual local companies as well as new nuclear power plants and new refining capacity.

Long Term Solution

1. Set up a national company similar to the TVA to build nuclear power plants with a common plant design and plants operated by graduate nuclear engineers.

2. Set up a national company to install facilities to reprocess spent nuclear fuel.

3. Install high speed electric train service in high population density areas of the US using a common technology.

4. Set up a government purchasing program for fleets of electric cars to be used by government employees in Washington to build a critical mass for development and commercialization of a zero emissions vehicle.

5. Set up a national research program to reduce the cost of photovoltaic cells and install roof mounted systems in a specific southern California residential area to build a critical mass for development and commercialization of solar power systems.

6. Through taxation of petroleum products and/or taxation of new vehicle purchases allow markets to penalize low mile/gallon vehicles and reward high mile/gallon vehicle purchases.

7. Set up a national agency to construct and operate coal liquefaction and gasification plants in Texas and Louisiana with access to the Colonial pipeline using Western coal reserves transported to the Gulf Coast. Construct similar plants in West Virginia using local coal deposits.

8. Open government lands to oil/gas exploration and expedite the construction of a natural gas pipeline from Alaska to the contiguous 48 states through Canada.
Integrating Energy and Environment
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A) The US Inter-related Problems of Power, Refining and Transportation

1 Political Problems
2 Global Warming

B) The French Solution

1 Nuclear Power
2 Reprocessing Nuclear Waste
3 High Speed Rail Transportation
4 Environmental Results

C) Short Term US Action Required

1 Return electric power to a regulated format of 1990 with modifications for cogeneration and power supplied by small businesses and individuals to enter the grid.

2 Return to US gasoline, heating oil and diesel fuel specifications of 1990 to allow fungible products to be delivered anywhere in the US.

3 Remove governmental restraints that impede the immediate installation of coal fired power generating facilities by individual local companies as well as new nuclear power plants and new refining capacity.

D) Long Term Solution

1 Set up a national company similar to the TVA to build nuclear power plants with a common plant design and plants operated by graduate nuclear engineers.

2 Set up a national company to install facilities to reprocess spent nuclear fuel.

3 Install high speed electric train service in high population density areas of the US using a common technology.

4 Set up a government purchasing program for fleets of electric cars to be used by government employees to build a critical mass for development and commercialization.

5 Set up a national research program to reduce the cost and improve efficiency of photovoltaic cells and systems.

6 Through taxation of petroleum products and/or taxation of new vehicle purchases allow markets to penalize low mileage vehicles and reward high mileage vehicle purchases.

7 Set up a national agency to construct and operate coal liquefaction and gasification plants in Texas and Louisiana with access to the Colonial pipeline using Western coal reserves transported to the Gulf Coast. Construct similar plants in West Virginia using local coal deposits.

8 Open government lands to oil/gas exploration and expedite the construction of a natural gas pipeline from Alaska to the contiguous 48 states through Canada.
The U S Problem
A.1 Political Problems

To date there has been no attempt to review the US energy problems in their entirety. With the California power crisis the whole problem is spinning out of control whereas strong central leadership is required. The US is currently facing the following severe interrelated problems:

1) A shortage of power generation and transmission facilities
2) A shortage of refining capacity crude and product supply facilities
3) A shortage of natural gas productive capacity
4) Gridlock in the air transportation system

The brilliant former Israeli Foreign Minister, Abba Eban, once said: "History teaches us that men and nations behave wisely once they have exhausted all other alternatives." Our current energy problems serve to exemplify his thesis. Based on the decisions to date related to California at the federal and state level it would appear that there is not enough experience yet with alternatives to "behave wisely" with a rational approach.

In the 50 years prior to 1980 the US had a low cost and extremely reliable electric power system under a regulated format. The only problems were related to the entry of co-generation power from non-monopoly generators that could have easily been accommodated in a regulated environment. Since the California situation began there have only been proposals on how to make the current system more complex to save deregulation and no rational analysis of the cost of power today compared with the regulated system.

Pacific Gas and Electric (PGE) is now in bankruptcy court and Southern California Edison (SCE) should also be there. These companies were among the most prosperous power companies in the US 5 years ago. The California Power Exchange (PX), the state sanctioned electricity auction market, has also filed for bankruptcy. All manner of political actors and economic gurus with no practical experience continue to provide a set of suggestions on cause and effect and solutions which are not valid. No one has asked the rather obvious question – what is the total startup cost of deregulation and how many years are required to pay out the startup costs? The $12 billion losses which Southern California Edison (SCE) and Pacific Gas and Electric (PGE) have incurred will soon be matched by $12 billion in bonds which the state government intends to sell to subsidize low regulated retail prices and are investment costs in a flawed experiment.

While the California problem is muddled by the deregulation of wholesale power sales with the continued regulation of retail rates, the costs for this flawed experiment will never be recovered by the lower rates deemed to accrue in the future. In the Canadian province of Alberta, deregulation was forced at both the wholesale and retail level with the same results as California. Canada will probably wisely return to their prior power systems management. The California governor was quoted as saying: "If I wanted to raise rates, I could solve this problem in 20 minutes." His irrational actions have only exacerbated the problems.

Electric power is unlike any other commodity. There is no ability to store power and the only way to provide for normal daily and seasonal peaks is the construction of excess generating and transmission capacity. There is no technology available to import power except from contiguous nations. Electric power generation in its simplest form is not high technology. The basic operation is boiling water to generate steam to drive turbines. The high technology end of power generation is the forecasting of future power needs and the construction of facilities to meet both growth in power consumption and the peak load facilities that are idle a high percentage of the time. Power generation is basically a capital intensive industry. Regulated, it provided power at cost and the only inefficiency possible was the utilities' potential to have too much spare peak shaving capacity available. This is a small price to pay for reliability.
The proponents of deregulation point out Pennsylvania as a state where deregulation works. What they don’t discuss is that Pennsylvania’s demand for power is not rising nearly as rapidly as California’s and all of the peak shaving equipment built prior to deregulation is still available for the intended purpose. So long as there is 1 megawatt of previously built excess power generating capacity the system will support deregulation theory. Once the limit is breached spot prices increase to very high levels over in a matter of minutes and a power grid either faces massive total power failures or planned rolling outages. Pennsylvania’s energy situation will give the illusion of stability until the day demand exceeds peak shaving capability. Then the state will look like California.

England is also given as an example of a deregulation success. The situation is the same as Pennsylvania with a lot of excess capacity for peak shaving. Following privatization Scottish Power became the owner of a facility that had three idle 600 megawatt oil fired units. These units were built as a hedge against coal miners’ strikes in the UK and were activated only once for less than a year in the early 1980s. In 1995 Scottish Power was still maintaining two of the units in mint condition turning the rotors daily. The rotor from the third unit had been removed and installed at another location when that unit’s original rotor failed. A new rotor could quickly be installed if the units were needed for peak power generation. The point of this is that the UK has significant excess capacity which allows deregulation to work.

Sometime in the future Pennsylvania and the UK will be faced with the same problem that is now plaguing California and the question is the same — who is responsible for installing and maintaining peak shaving equipment which will only be operated a small percentage of the time? 

The national implications of the California power problems are most significant and it was very unwise for the new administration and congress to ignore this serious problem and focus on a tax reduction which at best will provide for a very small percentage of the increases in middle class power gas bills that are now sweeping the country. To recap the situation:

1) The US government approved the deregulation of electric power in 1992.

2) From 1992 with the chaos of deregulation and the restrictions of CARB and the EPA no new power plant were built in California.

3) Deregulation was approved in California in 1996; SCE and PGE were forced to sell their generating capacity and were not allowed to sign long term contracts for power supply with the companies that bought their power plants.

4) Retail prices continue to be regulated and wholesale prices were allowed to float in a free market.

5) California power requirements now outstrip generating capacity with the expected massive increases in spot prices which are paid by SCE and PGE.

6) The mathematics are rather simple. By government design SCE and PGE have bought high and sold low and are now $12 billion in debt.

7) The US government forced the wholesalers to continue selling power to SCE and PGE irrespective of their ability to pay. If the wholesalers aren’t paid there will likely be a second tier of bankrupt companies.

8) The governor of California designated the Department of Water Resources to replace SCE and PGE as the purchasing agent for power and has recommended a $12 billion bond issue to buy power — now at term rates.

29856
9) The California State government will purchase SCE, PGE and San Diego Power distribution systems.

To reiterate, under a regulated monopoly system in place in 1990, California and the rest of the nation were provided low cost and extremely reliable power. Government decisions on how the industry was structured as well as government induced environmental regulations that deterred the construction of new generation capacity are the root cause of the current situation. And now the California State government will be the solution?

After deciding that the companies which provided California with low cost and reliable power for over 50 years were incompetent to handle the problems with deregulation caused by the US and California legislators, the governor's program making a state agency the major power buyer now shows six months of results that are less than admirable. As reported in the June 19 Wall Street Journal (WSJ), the State Department of Water Resources (DWR) purchased too little power for the first five months of 2001 and as such has the potential for triggering a $1 billion fine by violating FERC rules.

The same WSJ article suggests that during the last few weeks the DWR has bought too much power and will be saddled with large take or pay contracts. The DWR has also signed a large number of long term contracts locking in rates for 20 years well in excess of what market prices are forecast to be. About half of the long term contracts are fixed price which are high risk.

The WSJ article of June 19 describes the price caps which the FERC is now going to impose on a proxy price for electricity that is reset each month and is in effect the posted price against which all wholesale energy sales are considered to be acceptable or unacceptable. This proxy or posted price will apply to the 11 state interconnected region including everything west of Kansas. Geographically the region includes about half the contiguous US and about 65 million people.

In parallel action the California governor has been continuing pressure on the FERC to force the power generators to refund past payments for "unreasonable" charges. The governor is claiming $8 billion in overcharges. So far the FERC has identified $124 million in questionable charges and the power generators have contested most of those. So far there has been no learned body which has stepped up to actually solve the problem.

There are also theories that power generators with held power to increase prices. Having been through the 1974 and 1979 oil crises and having been accused of holding oil offshore to drive up product prices, in my view, this is a very superficial analysis of the whole problem. If SCE and PGE had not been forced by the state to sell their generating facilities the question would be irrelevant. If SCE and PGE had been allowed to sign long term contracts for supply the question would also be irrelevant.

Without long term contracts there is no legal or contractual obligation from the wholesalers to provide power; they can shut down anytime they chose to do so. However, no single generator would ever assume that they could independently influence the market and no manager would violate his fiduciary responsibility by giving up high current profits speculating that his single action would provide more return in the future by providing less power. This could only be accomplished by collusion among generators and no manager is going to risk his job and possibly do time in prison for anti-trust violations.

Futurist law suites are beginning to develop concerning the power generators, the natural gas pipelines and producers and now the refiners. For refiners this is a replay of similar charges following the 1974 and 1980 international oil crises. All of these actions move the focus away from the legislature responsible for the problems and do nothing to solve the problems.

Obtained and made public by the Natural Resources Defense Council, May 2002
California is the world's 6th largest economy and that by itself is enough to mandate intensive federal concern for the entire US energy problem. The state of Washington is now seeing the fallout of the California crisis. While the end of the information technology bubble had little to do with the beginning of the current energy crisis the results feed on the energy related issues. The confluence of long ignored energy problems; OPEC's new resolve on pricing and the crash of the dot.com society have set up the potential for "The Perfect Recession". The total energy problem falls into three areas. Specifically:

1) The California problems directly and quickly spread to the entire US energy price base via alternative markets and fuels.

   a) High California power costs are related to shortages and very high prices for natural gas on the West Coast.
   b) The high West Coast gas prices translate back to high well head prices in Canada.
   c) The alternative disposition for Canadian gas via the TransCanada Pipeline Ltd. system is the US Midwest and Northeast and prices rose across the US to reflect the point of indifference from Canadian suppliers for spot sales to the US East of the Rockies versus the West Coast.
   d) Prices for Canadian gas East of the Rockies equilibrated with and drove up gas prices supplied via Henry Hub and at the well head in the US Southwest.
   e) High US produced gas prices have driven industrial consumers and power generators with multiple fuel capabilities to liquid fuels.
   f) These same liquid fuels have an alternative market as residential home heating fuels, diesel fuel and kerosene used as jet fuel; prices of these fuels rose rapidly as liquid fuels buyers chased a declining supply as these fuels were purchased for burning under boilers.
   g) To complete the cycle, the liquid fuels used for industrial consumption, power plant feed, residential heating oil and jet fuel are also evaluated as unfinished intermediate refining streams which can also be reformed or cracked to gasoline thus raising their refinery feedstock values and ultimately the price of gasoline.

Simply stated; California's energy problems cannot be isolated from the nation's total energy mix and in effect are driving the entire US economic slowdown via significant price increases for all fuels.

2) Gasoline, jet fuel, heating oil and diesel fuel prices would have risen irrespective of the electric power crisis. No new large grass roots refineries have been built in the US since 1975 and during the 1980s refining capacity in the US was reduced from 18.5 to 15.5 million barrels per day as refiners decided to shut down facilities rather than install government mandated equipment which added no value to the finished products. A combination of limited refinery capacity and increased imports of crude and products continually produces constraints and shortages in the total pipeline supply and distribution system.

As a separate issue petroleum products have greatly reduced fungibility. This means that products may no longer be easily transferred from one region of the country to another to balance supply shortages because of regional EPA and CARB regulations which give rise to a geographical patchwork of incompatible quality specifications.

Finally, imported oil has risen from 37% of US demand in 1980 to 52% in 2000 and will grow to 63% by 2020 if the current attitude toward energy continues. This is a significant drain on our economy via our balance of payments. After OPEC's two exposures to low crude prices in 1986 and 1988, it appears that they have developed a much better collective approach to sharing production and now have the capability to increase and maintain high crude prices much more successfully than in the past. This will exacerbate our high petroleum products prices and our balance of payments problems.
An inter-related problem involves national security. Not only are we exposed to an increasing outflow of funds for foreign oil imports but also our foreign supplies remain tenuous. While the global reliance on OPEC production has slowly declined with time, Saudi Arabia, Iran, Iraq, Kuwait and the Emirates make up a significant portion of the total world oil reserves and coupled with other regional producers such as Oman, Yemen and Qatar, the Middle East continues to hold well over 50% of the world’s crude oil supplies. Saudi reserves are approximately 10 times US reserves and Iran, Iraq, Kuwait and the Emirates each have reserves that are 5 times US reserves.

Revolution has been the primary method for changing governments in many of the oil producing nations. With increased reliance on foreign sourced hydrocarbons the US economy will be affected much more by international incidents today than during the last 25 years.

3) Transportation congestion has reached a critical mass and is leading to air/road rage as well as a very inefficient business environment. In addition to the frustration of long traffic delays, commuting by automobile compared to rail transportation is extremely inefficient on an energy use basis.

US air traffic control systems are outdated. There is no possibility of building new airports near major cities where gridlock is most prevalent. Only 5 new runways have been completed at existing airports in the last 15 years.

Jet fuel consumption is impacted directly by a transportation system that uses fuel sitting on the ground, circling in holding patterns and diverting passengers to the wrong locations. Hydrocarbons used as jet fuel compete directly with demand for home heating oil, diesel fuels and power plant fuel. A quarter of all flights, affecting 119 million travelers, were delayed, canceled or diverted in 1999. Customer complaints were up 18% over the prior year. As the air travel infrastructure approaches 100% of operating capacity any minor problems quickly expand exponentially to the entire US transportation grid and ultimately leads to an inefficient use of fuel.

No new technology is required to solve our energy problems. Some development work is required to bring down the cost of some of our alternatives. Other industrialized nations have successfully instituted extensive national energy plans over the last 25 years using technology that has been ignored or politically unpopular in the US.

No matter how many rocket scientists are locked in a room to solve the US energy and economic problems the answer will always come out the same. In terms of a rational energy policy technical solutions will take 5 to 10 years but political action required to implement these technical solutions is required immediately. There are some short term solutions which violate the limits imposed in a long term plan in order to protect the economy and national security but the ultimate solution must result in a reduction in the use of hydrocarbons and a reduction in foreign energy imports as well as a reduction in governmental impediments to the solution.
A.2 Global Warming

One of the administration’s misguided policies is the President’s movement away from the Kyoto Protocol without any alternative. The only rational given by his advisors is that increasing carbon dioxide equates with increased industrial activity and economic growth. This might have been true in the 1950s but the world has moved to a higher level of technology and the savings from reduced development in heavy industry may actually increase development of high technology segments of the US total industrial base. While some academics question the effect of carbon dioxide on global warming companies which will be most affected by reductions in carbon dioxide such as Ford, Shell and BP support the general aims of Kyoto. The Economist of April 7 has a very good article on global warming and discusses a study by MIT that supports the thesis that global warming will increase without changes in our consumption patterns.

Conservation in a superficial context implies restrained economic activity with restrictions on power generation. Carbon dioxide emissions can be reduced without severe restriction on industrial activity. In a rational energy policy, reduction in carbon dioxide levels will actually promote economic growth by leaving consumers additional cash to spend on products other than gasoline, heating oil, natural gas and power.

As presented by The Economist, the tons of carbon emissions per person per year are as follows:

<table>
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<tr>
<th>Country</th>
<th>Tons</th>
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<td>United States</td>
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</tr>
<tr>
<td>Britain, Germany, and Japan</td>
<td>2.5</td>
</tr>
<tr>
<td>France</td>
<td>1.5</td>
</tr>
<tr>
<td>China and India</td>
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The French have eliminated the use of fossil fuels in power generation by use of nuclear facilities and have reduced the use of gasoline and jet fuel via TGV high speed trains. Germany, Japan and Britain have rational views toward nuclear power. Most of Europe and Japan have high speed rail service which displaces automobile and air travel and consequently reduces the burning of fossil fuels.

They have all reached these levels of carbon emissions without any Draconian limits on industry such as CARB and the EPA impose. China and India with a total population 10 times that of the US emit about the same total carbon as the US so it seems rather cavalier to suggest that they are somehow given a big advantage by Kyoto.

The following are excerpts from the June 14th Economist article on a new report from America’s National Academy of Sciences which confirms the reality of global warming. Three months ago the administration’s advisers advised the President to move away from his campaign pledge to regulate emissions of carbon dioxide. He also reemphasized his long-standing opposition to the Kyoto Protocol without suggesting any alternatives.

After the fact on May 11th the administration asked that the National Academy of Sciences (NAS) to provide guidance on the matter. The results of their efforts are not surprising. They have concluded those greenhouse gases are accumulating in Earth’s atmosphere as a result of human activities, causing surface air temperatures and subsurface ocean temperatures to rise. Temperatures are, in fact, rising. The changes observed over the last several decades are likely mostly due to human activities, but we cannot rule out that some significant part of these changes are also a reflection of natural variability. Human-induced warming and associated sea level rises are expected to continue through the 21st century.
The NAS's conclusions confirm a recent report from the United Nations' Intergovernmental Panel on Climate Change (IPCC) that laid out the scientific case for taking global warming seriously. An earlier IPCC report had predicted that, if current trends continued, the temperature of the atmosphere could rise by 2 to 6°F by 2100; the latest one expanded the range of likely warming to 3 to 11°F.

The result is bad news for those who had hoped for a rejection of the IPCC's conclusions. And, though the skeptics on the NAS panel itself have rushed to make it clear that their report does not, in any way, endorse Kyoto, that is largely because the report offers no views whatsoever on any policy options. Nobody who takes this report seriously can easily argue for doing nothing.
The French Solution
B.1 French Nuclear Program

France began the development of its nuclear energy program in 1945 with the creation of the Commissariat à l'Énergie Atomique (CEA). The CEA worked with Electricité de France, the state-owned French utility, to develop and industrialize nuclear power using UNGG technology (Natural Uranium, Graphite moderated, Gas cooled). EDF began commercial operation of the first UNGG reactor in 1963 at the site of Chinon.

In the 1950s France used Westinghouse Pressurized Water Reactor – PWR – technology. This technology was improved under Framatome, with the scientific and technical support of the CEA.

In the 1970s and 1980s, a period during which the world experienced two oil crises, the French government decided to build thirty-four 900 MWe reactors using identical designs. The first program was launched in 1974; two years later it was decided to build an additional twenty 1,300 MWe reactors using identical designs.

A third program to build four additional "new generation" PWR (a 1450 MWe unit, called "N4") has been implemented. The first N4 reactor (Chooz B-1) went critical in July 1998 and the last (Chooz 2) was connected to the grid in May 2000. These are the most powerful reactors in operation today.

Due to the successful implementation of its civil nuclear program, France has succeeded in meeting the challenges that have arisen as a result of two successive oil crises in 1974 and 1979, and has now entirely replaced fossil fuel plants with nuclear units. France now has 58 pressurized water reactors with a net installed capacity of 53,000 MWe. In 2000, nuclear energy represents 75 percent of the country's electricity production, satisfying national needs and representing a growing volume of export sales.

With 103 reactors operating, the U.S. is still the world's largest producer of nuclear power in absolute terms. With 58 reactors generating 75% of its electricity, France produces the most nuclear power in relative terms.

France has little or no fossil fuel. Regardless, fossil fuels are used for 56% of primary energy sources. The same energy sources account for 88% in the U.S.

<table>
<thead>
<tr>
<th>1999 Consumption Data</th>
<th>U.S.</th>
<th>France</th>
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<tbody>
<tr>
<td></td>
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</tbody>
</table>

(1 Quad = 25.1 Mtoe)

The French consumption of energy by source has changed significantly since 1973 when fossil fuels accounted for 81.6% (oil 89.1%; coal 15.2% and gas 7.3%) and nuclear plus hydro for only 7.3%.
Caractéristiques des RFP (1) 900, 1300 et 1450 MWe en France

<table>
<thead>
<tr>
<th>Caractéristiques</th>
<th>RFP 900</th>
<th>RFP 1300</th>
<th>RFP 1450</th>
</tr>
</thead>
<tbody>
<tr>
<td>Puissance électrique brute (MWe)</td>
<td>900 à 915</td>
<td>1300 à 1315</td>
<td>1450 à 1460</td>
</tr>
<tr>
<td>Puissance nominale (MWe)</td>
<td>900 à 915</td>
<td>1300 à 1315</td>
<td>1450 à 1460</td>
</tr>
<tr>
<td>Rendement (%)</td>
<td>31.3 à 33.0</td>
<td>44.2 à 35.1</td>
<td>44.7</td>
</tr>
<tr>
<td>Nombre d'assemblages de combustible</td>
<td>16</td>
<td>193</td>
<td>206</td>
</tr>
<tr>
<td>Nombre de groupes par assemblage</td>
<td>764</td>
<td>764</td>
<td>764</td>
</tr>
<tr>
<td>Poids d'uranium par assemblage (kg)</td>
<td>463.7</td>
<td>530.5</td>
<td>538.5</td>
</tr>
<tr>
<td>Première charge / Initial loading</td>
<td>12.5</td>
<td>104</td>
<td>110.6</td>
</tr>
<tr>
<td>Masse d'uranium enrichi ( tonnes)</td>
<td>12.6</td>
<td>104</td>
<td>110.6</td>
</tr>
<tr>
<td>Enrichissement initial moyen (%)</td>
<td>3.93</td>
<td>7.79</td>
<td>7.79</td>
</tr>
<tr>
<td>Besoin en uranium naturel ( tonnes)</td>
<td>516</td>
<td>471</td>
<td>448</td>
</tr>
<tr>
<td>Besoin en enrichissement ( millions d'US$)</td>
<td>275</td>
<td>294</td>
<td>312</td>
</tr>
<tr>
<td>Recharge à l'équilibre / Equilibrium reload</td>
<td>40</td>
<td>64</td>
<td>99</td>
</tr>
<tr>
<td>Nombre d'assemblages par recharge</td>
<td>40</td>
<td>64</td>
<td>99</td>
</tr>
<tr>
<td>Masse de métal lourd ( tonnes)</td>
<td>18.8</td>
<td>44.8</td>
<td>44.8</td>
</tr>
<tr>
<td>Enrichissement (%)</td>
<td>3.4</td>
<td>4.6</td>
<td>4.4</td>
</tr>
<tr>
<td>Besoin en enrichissement ( tonnes)</td>
<td>291</td>
<td>291</td>
<td>291</td>
</tr>
<tr>
<td>Besoin en enrichissement ( millions d'US$)</td>
<td>81</td>
<td>124</td>
<td>164</td>
</tr>
<tr>
<td>Intensité maximale (MW)</td>
<td>41 240</td>
<td>63 800</td>
<td>66 800</td>
</tr>
<tr>
<td>Puissance maximale (MW)</td>
<td>48</td>
<td>67</td>
<td>70</td>
</tr>
</tbody>
</table>

(1) Recharge par quant du cœur (annual) / Recharged by fuel (annuel)
(2) Recharge par tiers de cœur (moyen) / Recharged by fuel (moyen)
(3) Recharge par tiers de cœur (total) / Recharged by fuel (total)
(4) Recharge par tiers de cœur (occasionnel) / Recharged by fuel (occasionnel)
(5) Puissance maximale / Power maximum
(6) Puissance maximale / Power maximum

 Obtained and made public by the Natural Resources Defense Council, May 2002
B.2 French Fuel Cycle

France, through COGEMA Group, is the world's largest integrated nuclear fuel cycle supplier. This activity was initiated 25 years ago as an adjunct to the French nuclear power plant construction program.

In addition to serving the needs of the French nuclear industry, COGEMA has the capability to service other countries needs. Most notable is Japan. Since 1969 there have been over 150 shipments of spent nuclear reactor fuel from Japan to Europe. Reprocessing of the Japanese spent fuel is undertaken in UK and France under contract with Japanese utilities. Recovered fissile materials are returned to Japan as reactor fuel, notably the mixed-oxide (MOX) fuel shipments in 1999 and 2001. The first shipment to Japan of immobilised high-level waste from reprocessing took place in 1995 and the sixth was in 2000.

The fuel cycle is shown as follows:

The French Nuclear Fuel Cycle

The origin of High-Level Waste in the nuclear fuel cycle

For most of the world's nuclear reactors, uranium oxide concentrate from the mine is first converted into uranium hexafluoride so that it can be enriched. Natural uranium contains only 0.7% U-235 (with 99.3% U-238), but this needs to be increased to about 3.5% U-235 for use in a nuclear reactor. After enrichment, the uranium, as an oxide, is made into fuel pellets which are assembled into rods for use in the reactor core.

The fuel stays in the reactor for three or more years during which time it is altered by the fission process. Some of the U-235 is 'burned' and produces energy as heat. This results in the formation of fission products - atoms of around half the original atomic weight and which are generally highly radioactive. Some of the U-238 captures neutrons and through a series of radioactive decay stages, isotopes including Pu-239 and Pu-241 are formed. These two isotopes...
like U-235, are fissile and much of them is ‘burned’ in the reactor to produce about one-third of the total energy. Some Pu-239 is also formed, along with other transuranic elements (elements of higher atomic number than uranium).

After three years or more these various changes in the fuel assemblies cause the efficiency of the nuclear reaction to be reduced. Consequently every year or so about one third of the fuel assemblies are removed and replaced by new ones. The spent fuel is then stored under water in ponds at the reactor site while it cools and the initially intense radioactivity starts to diminish.

A number of countries simply regard this spent fuel as waste. These countries, notably USA and Sweden, therefore aim to store spent fuel for several decades until a lot of the radioactivity has decayed. They then intend to dispose of the fuel elements in an underground repository. However, several countries, notably Japan, France, Germany and UK, currently reprocess their spent fuel so as to return the useable uranium and plutonium to the front-end of the fuel cycle. They are then left with about 3% of the quantity as high-level waste, which includes almost all of the radioactivity from the spent fuel.

**Reprocessing arrangements**

A total of ten Japanese electric utilities have contracts with the French company Cogema to reprocess their spent fuel. These Reprocessing Service Agreements date from 1977-78. Other contracts are with British Nuclear Fuels Limited - BNFL.

After the spent fuel has been in storage for some time at the reactor site, it is shipped to France for reprocessing. There have already been over 160 such shipments. All the high-level waste from reprocessing the spent fuel will eventually be returned to Rokkasho in Japan for long-term (30-50 year) storage prior to ultimate disposal.

So far one shipment of plutonium recovered from spent fuel reprocessing has been returned to Japan. This was reactor-grade material, with about 30% Pu-239 in it and therefore useable only as a reactor fuel. It is not suitable for nuclear weapons. In future the plutonium will be returned as a mixed oxide (MOX) fuel, in which the plutonium is mixed with depleted uranium and fabricated into fresh fuel elements ready for use in a power station reactor. Shipments of MOX fuel assemblies were sent in mid 1999 and early 2001. See also UIIC briefing paper on MOX.

Japan has a small (210 tonnes/year) reprocessing plant already in operation at Tokai, associated with the Monju fast neutron reactor. A much larger reprocessing plant is being built at Rokkasho.

Meanwhile Japanese spent fuel is reprocessed by Cogema in France and by BNFL in the UK. Japanese utilities have contracts with these for the reprocessing of some 7000 tonnes of spent fuel. A total of more than 3000 canisters of high-level waste will be returned to Japan, in about 110 casks. Two thirds of this will be from Cogema and the rest from BNFL.

**Vitrification of separated waste**

To enable safe storage and transport, the high-level waste is mixed with molten borosilicate glass and poured into 1.3 metre high stainless steel canisters. The waste becomes locked into the matrix of the glass as it cools, making it stable and resistant to leaching. Lids are then welded on to the canisters to seal them.

Each canister contains 150 litres of glass weighing 400 kilograms. Some 14% of the content is high-level waste derived from the reprocessing of about 1.3 tonnes of spent fuel. The thermal output of each canister as shipped is less than 1.5 kilowatts.
Transport

The half-tonne stainless steel canisters containing high-level waste are transported in specially-engineered, heavily shielded steel and resin containers called casks or flasks. Each weights about 100 tonnes. Those used for the high-level waste are very similar to those for transporting the spent fuel from Japan to Europe in the first place, and the MOX on the return voyage. A flask holds up to 28 canisters of vitrified waste.

The ships involved are 104-metre, specially designed double-hulled vessels used only for the transport of nuclear material. Three ships belonging to a British company associated with BNFL have been approved for the transport of vitrified residues, and conform to all relevant international safety standards.

Japan's Energy Policy

Nuclear power provides about one-third of Japan's electricity, and with the enhanced efficiency brought about by reprocessing spent fuel to recycle the uranium and plutonium, it represents a major part of Japan's endeavours to achieve maximum self-sufficiency in energy. Certainly plutonium is seen as a valuable energy resource, not to be spurned as a source of electricity.

The Japanese see this in both commercial and ethical terms, avoiding the depletion of fossil fuels and maximising the utilisation of uranium. More recently the policy has enabled them to commit to much greater reductions in greenhouse gas emissions than countries such as Australia.

Japan plans to have one third of its 53 reactors using some MOX by 2010, and has just approved construction of the world's first advanced reactor which will have a complete fuel loading of MOX. This large reactor will have recycled plutonium as its main energy source and is expected to enter service in 2007.
B.3 French Trains

Over the last 25 years France has developed the most modern and extensive rail transportation system in the world. The system connects all major French cities and is linked to similar but less complete systems in contiguous European countries. The beginnings of the French system were actually in Japan 50 years ago.

Over the past 50 years Japan and Europe have developed fast trains, exceeding 175 miles per hour, in part to relieve congestion on roads and at airports while minimizing the use of petroleum products and pollution. French airports do not suffer the same congestion problems as similar US facilities. Coupled with a nuclear power generation program, France has drastically reduced their reliance on imported crude and products as well as the accompanying foreign exchange drain.

The idea of the bullet train as a standard new railway between Tokyo and Shinmonoseke was conceived prior to World War II but was not actively pursued until the late 1950s when Japanese National Railways launched a massive program to increase its trunk line capacity, including construction of the Tokaido Shinkansen between Tokyo and Osaka which is 300 miles away.

Engineers knew that simply by using more power they could force some conventional trains to reach 200 mph - much faster than the 100 mph top speed of today's US long-distance trains. But the higher speeds were deemed infeasible for commercial application because the fast-moving vehicles damaged the tracks severely. High-speed trains, it seemed, would have demanded extensive, and thus prohibitively expensive track maintenance efforts.

However, Japanese designers found ways to exploit existing technology to improve speeds to about 125 mph between some cities. For instance, without major design changes to the trains, the Japanese engineers achieved gains by restructuring the track layouts to eliminate curves and steep grades. The huge popularity of their original Shinkansen, or bullet train, which began operation in 1964 between Tokyo and Osaka, sparked new interest in overcoming the technological obstacles to operating routinely at still higher speeds.
Today the Shinkansen network consists of four lines totaling 1200 miles with an average passenger load of 810,000 per day. The early trains were limited to 100 mph because of noise problems. In 1985 the Series 100 was developed with double-decked cars. In 1982 the VÁN 350 and STAR 21 were introduced with speeds of 200 mph.

Following the loss of control of oil reserves by the major international companies in 1974, France initiated a study of the Shinkansen and developed a French version that was introduced in 1981. The Train le Grande Vitesse, translated to English as the “train of big speed” with the acronym TGV used to denote this high speed service.

The first TGV traveled at 170 mph in service with a test speed of 235 mph. The Atlantique version was introduced in 1989 with a test speed of 320 mph and a speed of 165 mph in commercial use. A double decked version was introduced in 1998 with a 45% increase in capacity with only 4% greater drag than the regular TGV.

In Germany the Intercity Express (ICE) was started much later than France. The first high-speed lines were open in 1992 at 155 mph. ICE3 was introduced in 1998, it’s the first tilting train design. These trains are used between Germany and the Czech Republic. Developed with the involvement of Siemens, the train has speed of 145 mph over rough rail systems that cannot be handled by the original ICE and the TGV.

In 1999 the ICE VT diesel electric train was introduced to give high speed service to the non-electrified sections of the rail system. This diesel model will travel at 125 mph.

Other high speed trains in Europe include the Eurostar trains linking Paris and Brussels with London by way of the English Channel Tunnel ("Channel"). Other high speed trains have been developed in the Netherlands, Spain and Italy. Development is under way in France to produce the next generation of TVG trains with commercial speeds up to 225 mph.