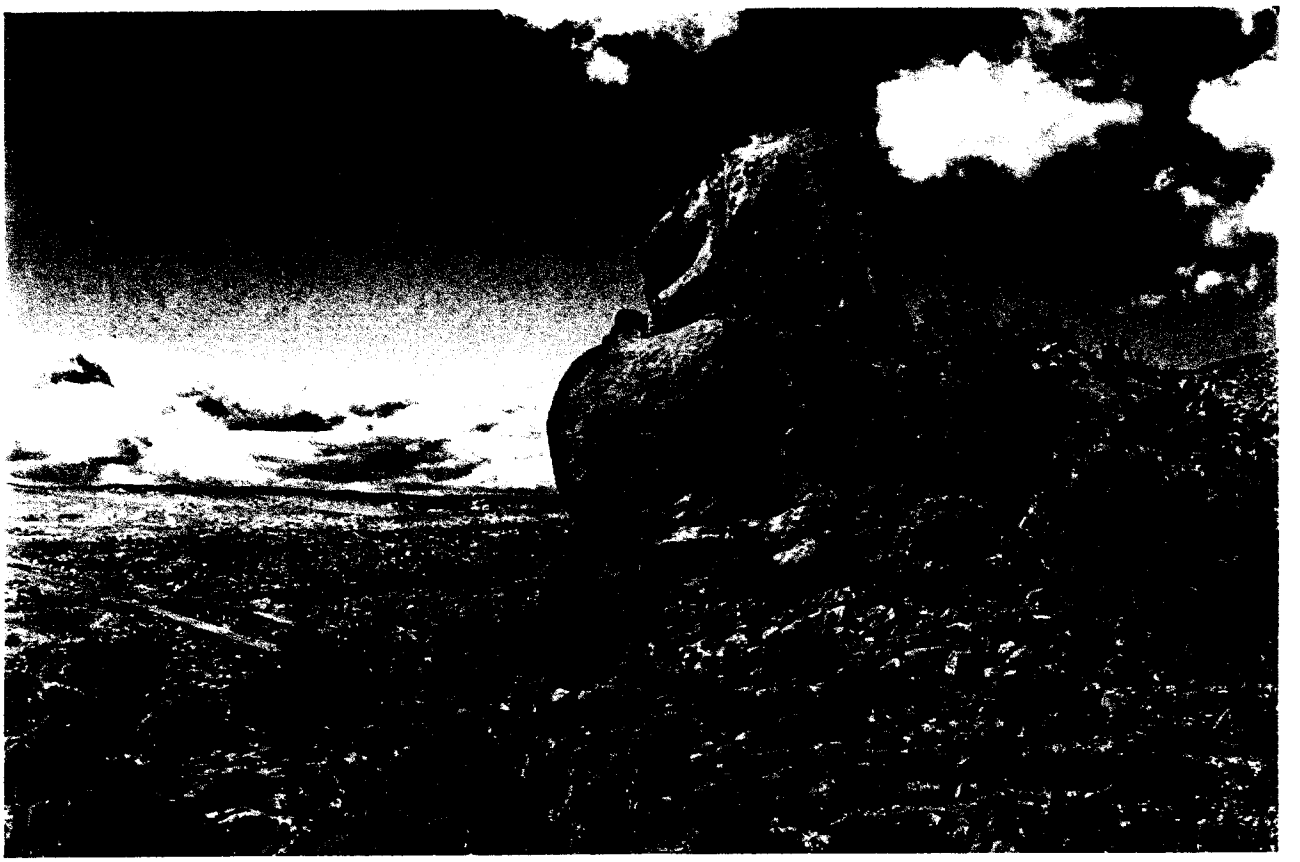
# Protecting San Diego County Wilderness Underground Power Line Alternatives



Bankhead Springs California, 3220 feet elevation, overlooking Interstate 8 west

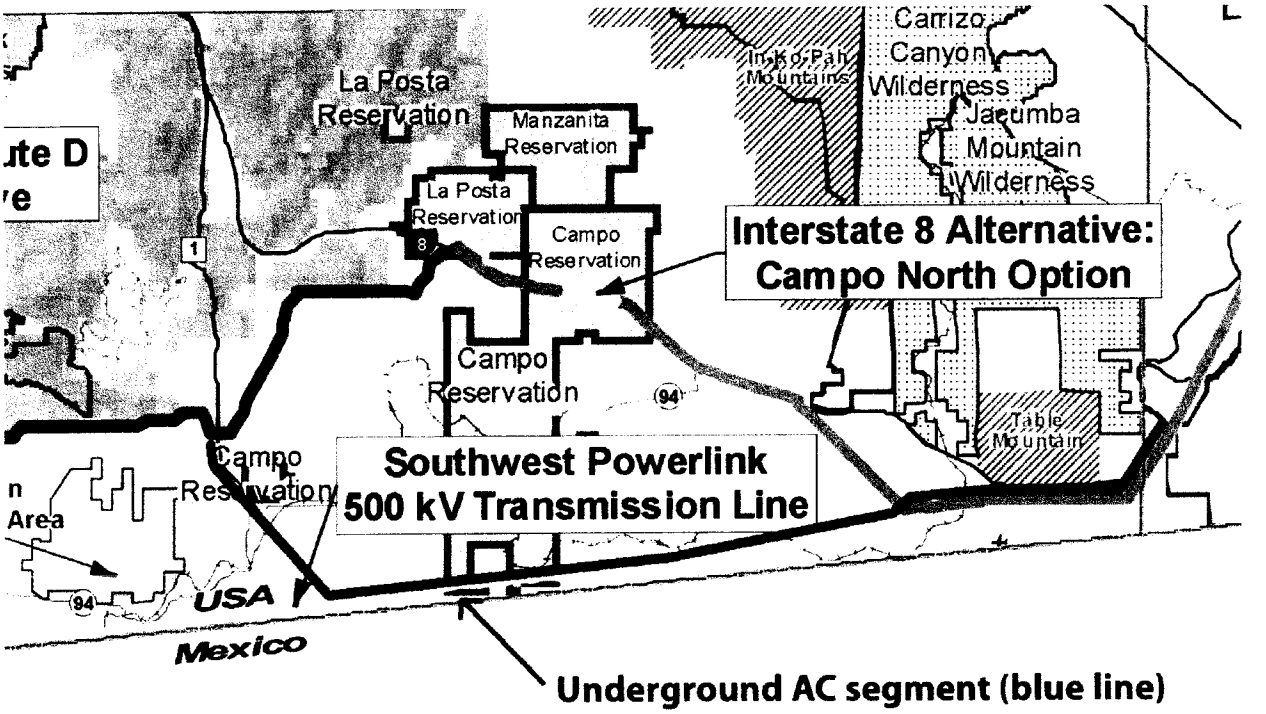
Anthropological Nature Reserve, Research Center and Campgrounds. Proposed location for 160 foot high pylons to carry 500,000 volt power lines, in spite of the fact that underground power line alternatives are available that cost less to install than the high-impact, environmentally destructive overhead high-power lines being proposed.

## Index

# I. Saving the Last 22 miles of southeast San Diego County with one underground AC segment

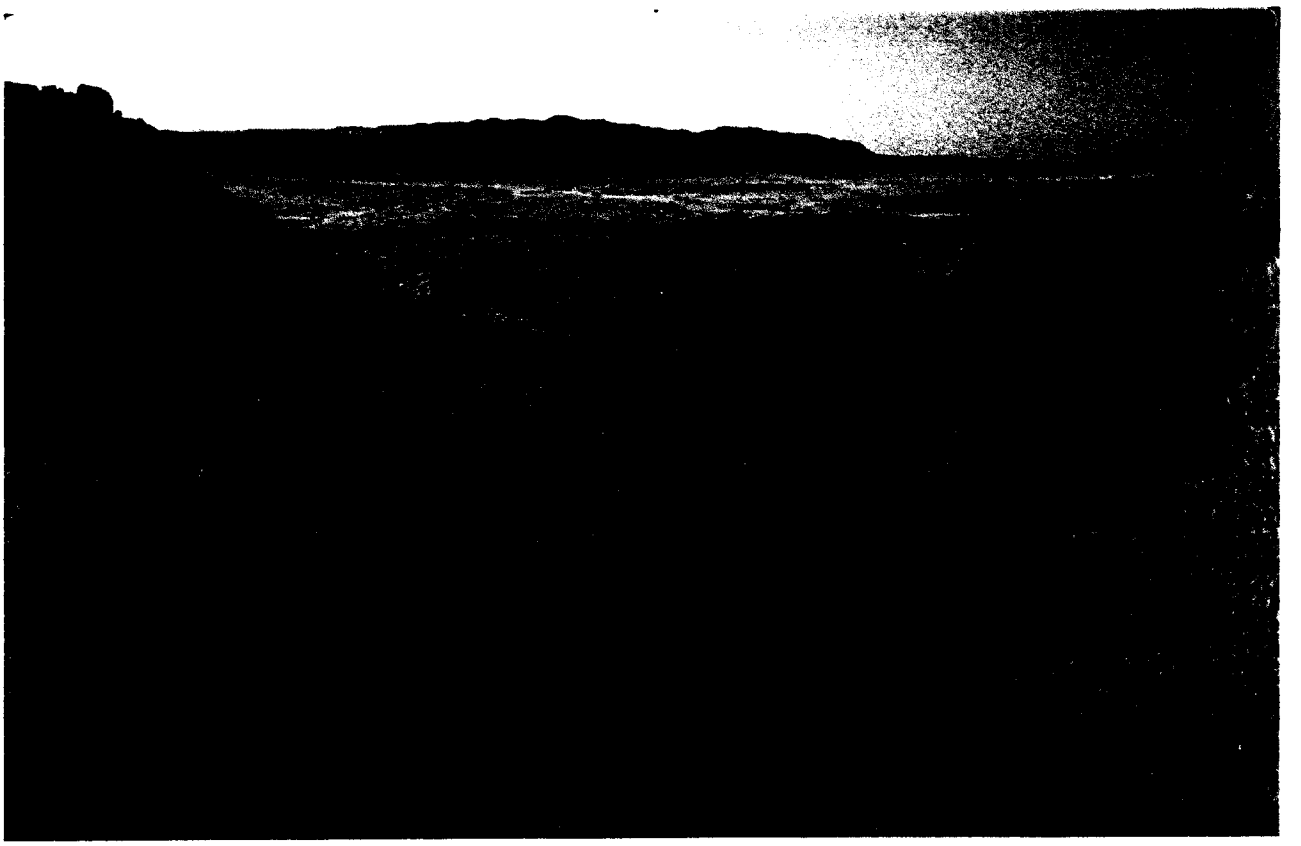
While underground DC the entire 150 mile length of Sunrise Powerlink could provide extraordinarily lower impacts at a lower overall cost, as well as allow for 4 times the capacity of the Powerlink, nevertheless if a southern route is an option then just one underground AC segment spanning the last 22 miles of San Diego County could protect the towns of Jacumba, Bankhead Springs, Boulevard, Manzanita, Tierra Del Sol, Live Oak Springs and Campo, in addition to the Campo and La Posta Reservations, the BLM's McCain Valley, Anza Borrego Desert State Park, Cleveland National Forest, and the CBH Anthropological Reserve, all of which would be otherwise damaged, made uninhabitable, bisected and permanently degraded by huge pylons supporting hot sagging 500,000 volt overhead power lines.

Fortunately there is an alternative to overhead AC power lines which are more costly to install and maintain, along with inflicting massive environmental damages and permanent losses to business, communities and property along the 150 mile route that can cost 6 to 20 billion dollars in damages for short and long term losses. The underground DC power line alternative has been proven in over 50 major projects worldwide, and with economic savings that can install the Sunrise Powerlink at considerably lower cost by placing 2 six-inch diameter cables underground in one continuously excavated trench that is 1 foot wide and 5 feet in depth. Underground DC offers extraordinary environmental, medical and property advantages, all at a lower cost than overhead AC power lines. There never a good time to sacrifice San Diego County's property and wilderness for no purpose whatsoever, and certainly not at a higher cost than the price of protecting our region. (See underground DC details in part 2)




# Plan A) Southeast San Diego County 22 mile Underground AC power line Route

This direct underground AC route could protect 7 towns, 2 Indian reservations and 5 wilderness preserves, along with approximately 20,000 acres of homes, business and wilderness recreation areas within the last 22 miles of San Diego County as a benefit that could be offered by this underground AC segment, as shown above. This underground segment would begin at San Diego County's eastern border, extend west 22 miles and connect to the Modified Route D (shown in green at the left side of the map) and continue to extend westerly on overhead AC lines. This route could minimize EMF exposures to regular highway traffic by avoiding excavation under or along any highways, as well as provide a completely fireproof underground route that eliminates wildfire threats, along with minimizing all categories of threat, and almost all security requirements over a significant portion of eastern San Diego County. Further, underground high power lines have been both encouraged and financially supported by Homeland Security funds.



**Bankhead Springs California, with the BLM's McCain Valley below extending to the distant mountains, each targeted for the destructive impacts of 500,000 volt high-power lines on numerous 160 foot tall pylons.**

**The following image on the next page is an aerial photo (rotated 90 degrees, north is left) which extends from the San Diego County line, westerly past Campo California. The proposed underground AC power line route is shown in red, naturally allowing for route variants to avoid private property and keep excavation primarily under existing unpaved roadways and within existing utility right of ways.**

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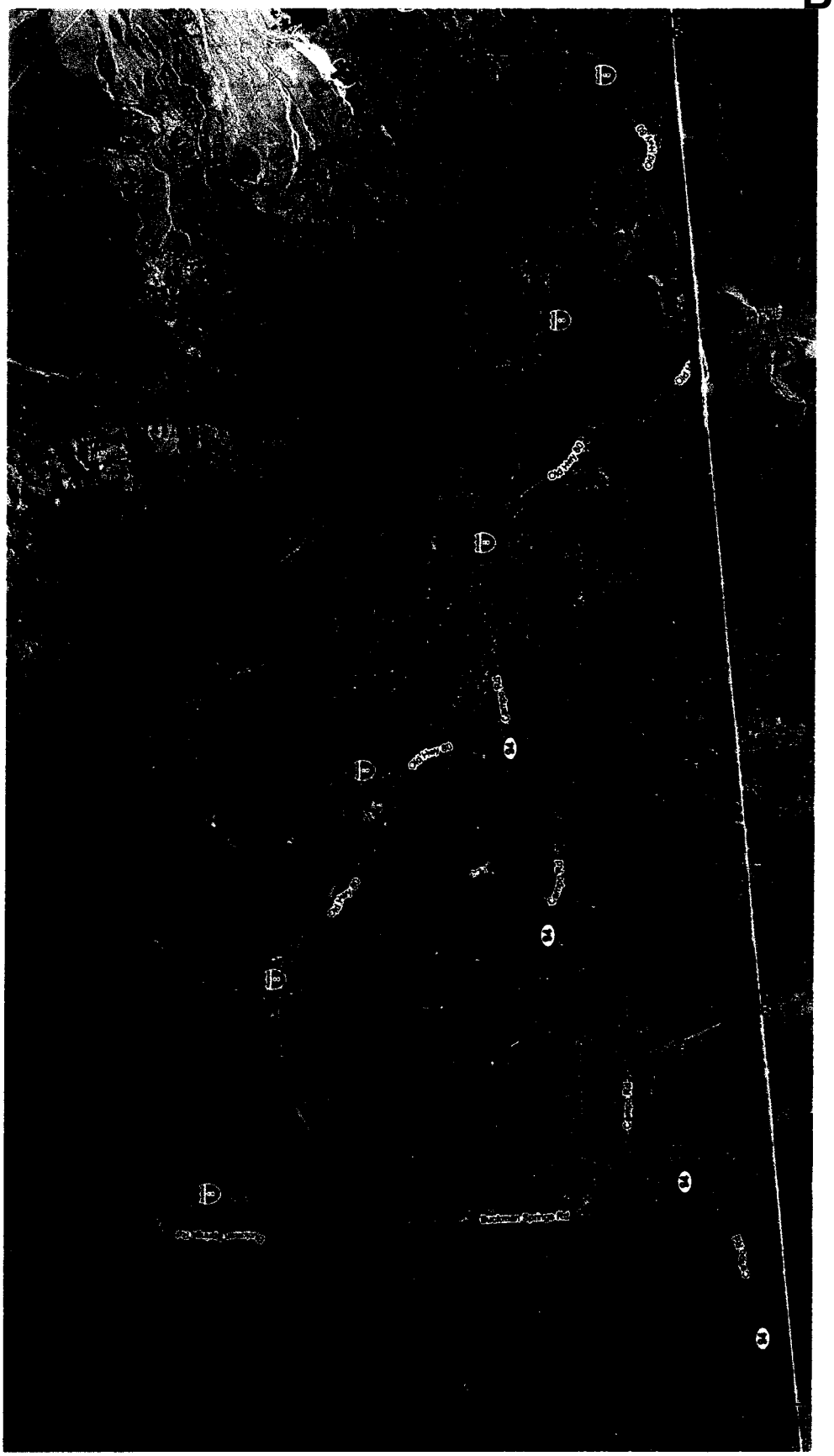

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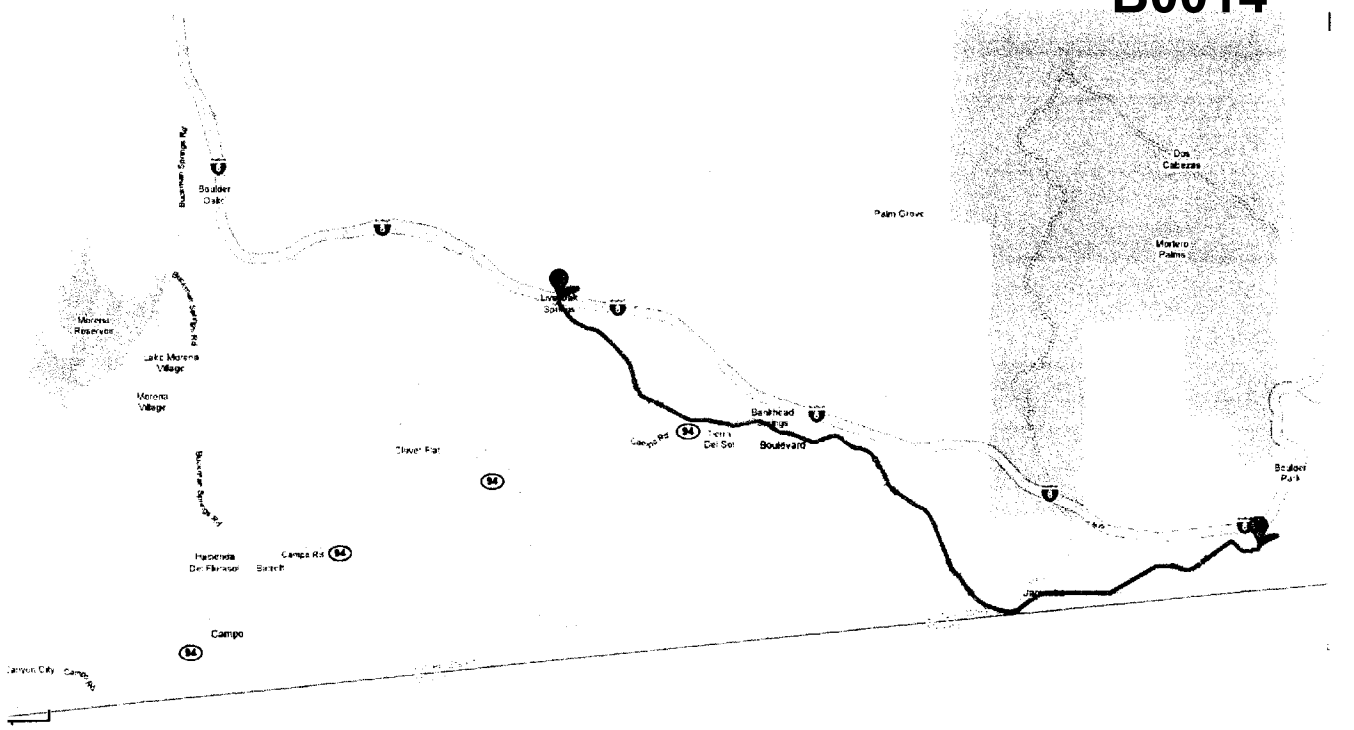
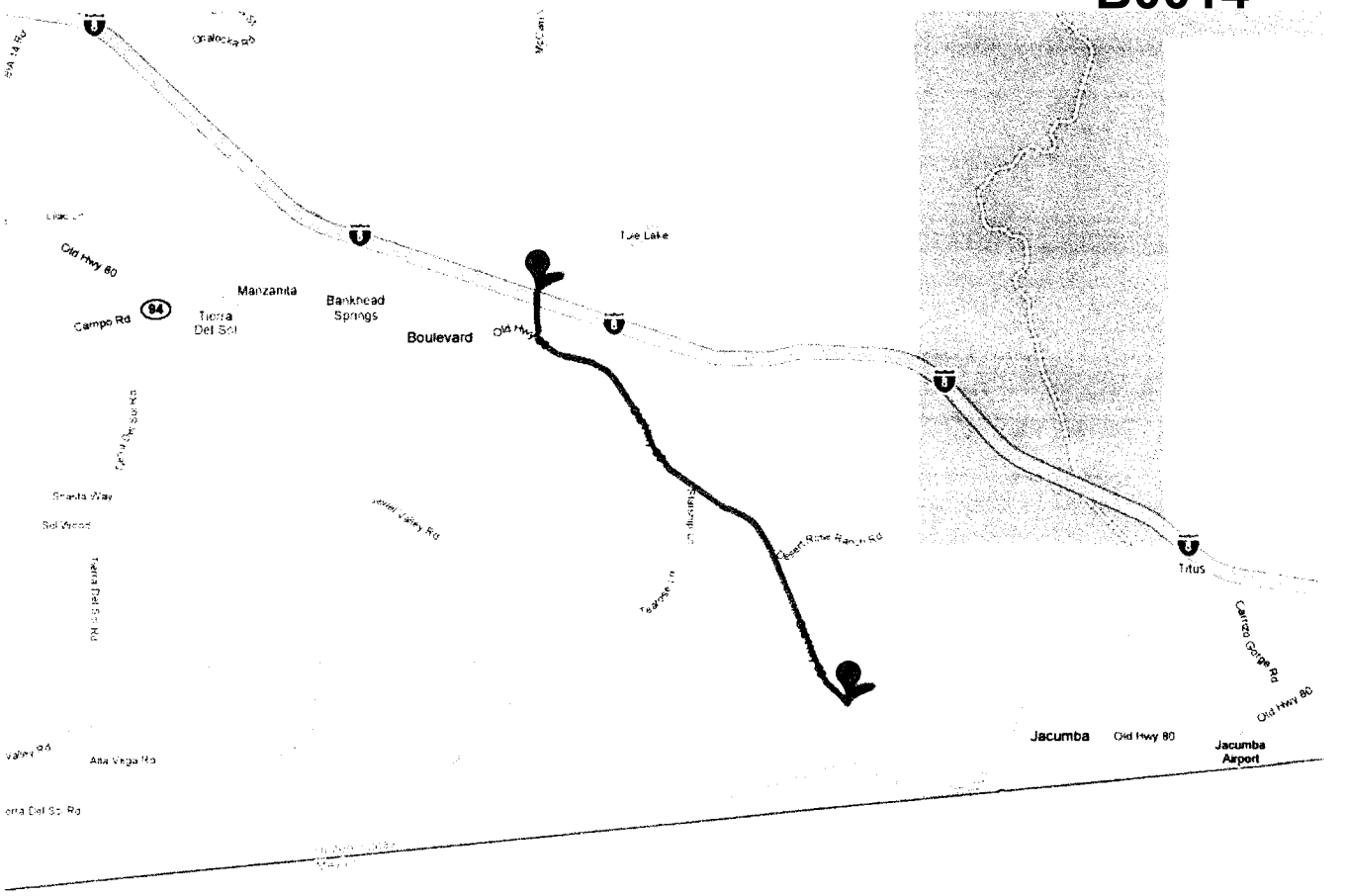



# B) Southeast San Diego County 18 mile Underground Route Alternative 2, and related problems, (not recommended)

Map of an underground AC power line (shown as a blue line between points A and B) beneath Old Highway 80, beginning at the San Diego County line and ending at Interstate 8 northwest of the Campo Acorn Casino. Unfortunately this 18 mile route would provide a potent EMF discharge to anyone driving on this section of Old Highway 80. Further the northwesterly direction and windiness of Old Highway 80 make this an inefficient route, providing inadequate or incomplete protection for the region compared to the prior described, more southerly route, which runs in a more straight line form the county line westerly past Campo.

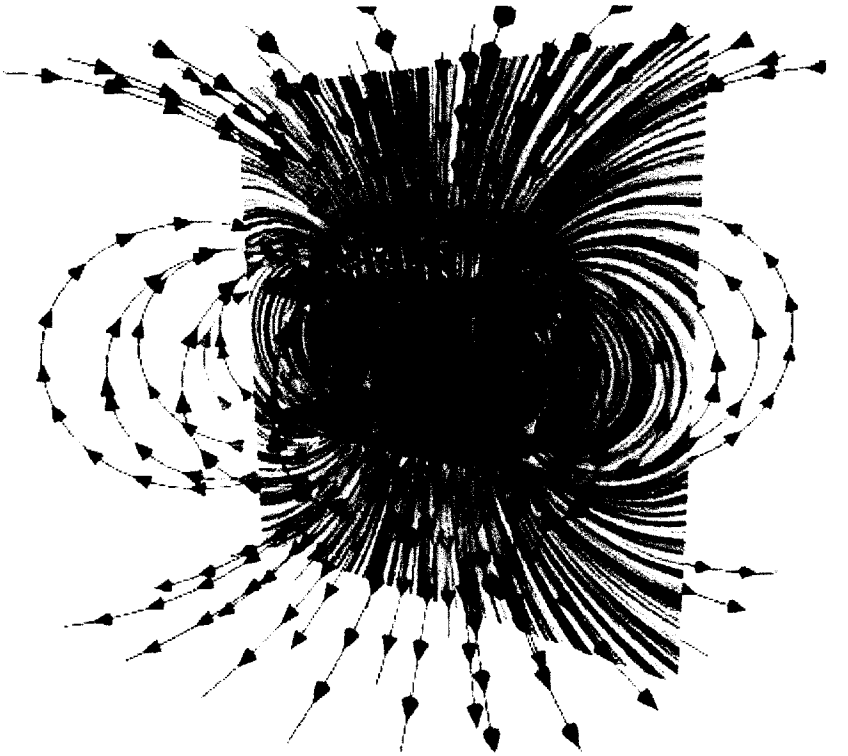



# C) Southeast San Diego County 4.3 mile Underground Route Alternative 3, and related problems, (not recommended)

Map of a limited 4.3 mile underground AC power line (shown as a blue line between points A and B) starting at the point where existing high power lines cross Old Highway 80 west of Jacumba, then northerly under Old Highway 80 to McCain Valley Road north and under Interstate to overhead power line and across the beautiful McCain Valley BLM property as shown below. While this short underground AC segment would afford some protection for the anthropological preserve and many ranches and homes in Bankhead Springs, between Jacumba and Boulevard, still a great deal of exposure and destructive impact would remain for the region, along with high EMF levels under Old Highway 80. Consequently the first and more direct route between the county line to a point northwest of Campo could provide considerable protection for the region.

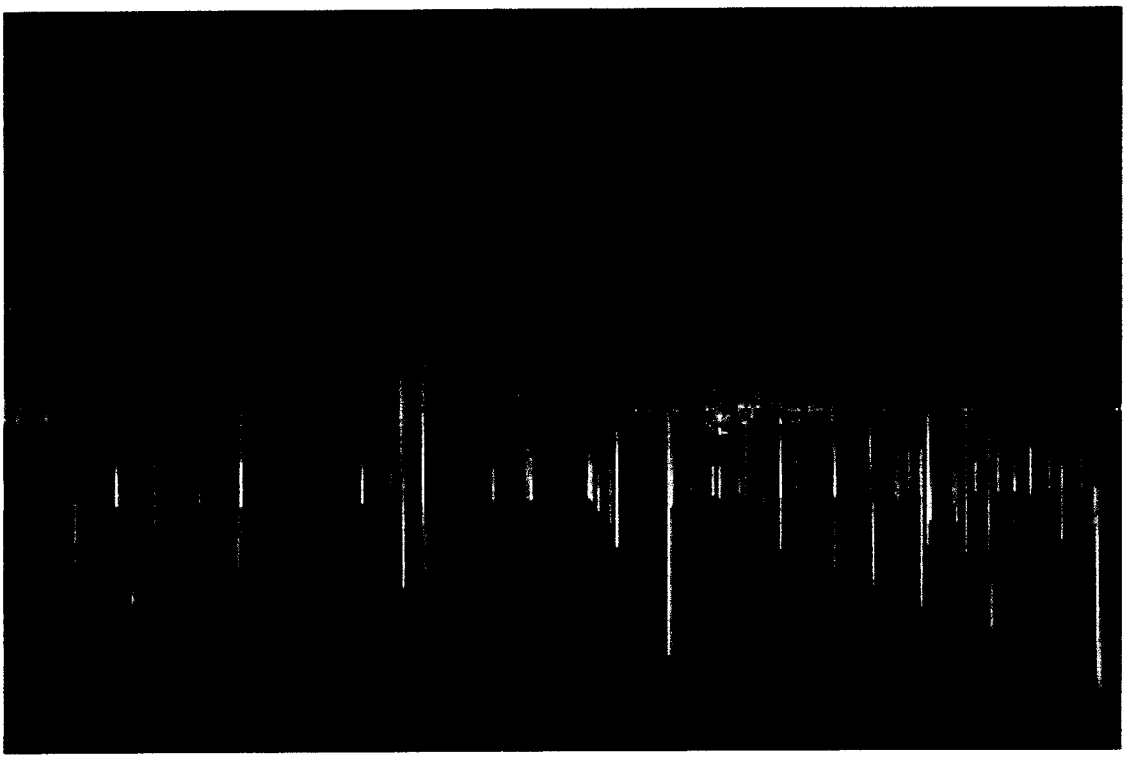
**Anthropological Nature Reserve, Research Center and Campgrounds, overlooking the BLM's McCain Valley, each targeted for the destructive impacts of 500,000 volt high-power lines on numerous 160 foot tall pylons, which would end the benefits and uses of the nature reserve, in spite of the fact that lower cost, environmentally benign alternatives are available, that have not been offered any consideration.**

## EMF and risks



Electro Magnetic Fields have been used in medicine for over 25 years to align the nucleus of the hydrogen atoms throughout our bodies, so that they will be energized and act as trillions of radio frequency transmitters so that the interior of our bodies can be observed without surgery. However, these electro-magnetic fields are delivered to a specific region of our body for just a few thousandths of a second, and all the nuclei of the atoms in our cells will continue to measurably ring for up to 2 seconds. We know that the atoms in our body respond to the effects of electro-magnetic fields or EMF, which can influence molecular processes within our cells, including growth, repair and replication. However, since nearly everybody is now exposed to EMF it becomes impossible to find a local population that would be the control group in any study, which has not been exposed to EMF. Naturally the electrical industry uses this as an excuse to declare that damages resulting from EMF exposure cannot be conclusive; much as the tobacco industry had done for over a century. Nevertheless, medical scientists in Europe, in very large studies have determined that Leukemia rates in children can increase by 50% by simply having a home which is a little closer to the EMF given off by ordinary power lines. High power lines such as the Sunrise Powerlink can provide hundreds of times greater impact, however it may take a politically influenced government agency perhaps another century to read and absorb the details of the currently available medical studies. Naturally the loss of thousands or millions of lives worldwide apparently is not relevant when economic issues are being considered.

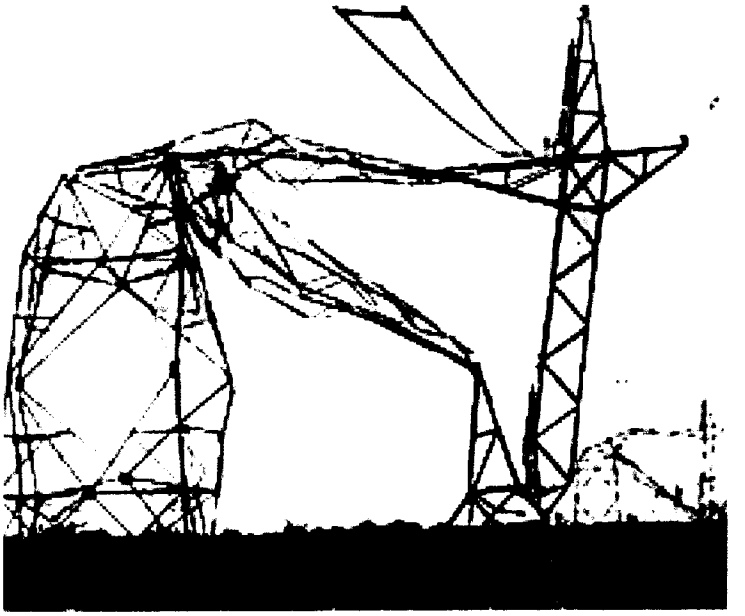
The installation of large scale underground DC power lines which do not radiate EMF in France, Australia and Sweden indicates that the difference in cost between installing underground DC and overhead AC had been less than 10%. If environmental damages, cancer deaths, business and property losses were included as a part of the cost of installing the overhead AC high-power lines, then a project such as the Sunrise Powerlink could immediately save at least $6 billion by implementing underground DC power lines instead, and the long-term savings could easily exceed $20 billion. But naturally such losses apparently have never experienced by the utility companies, because those losses were passed on to the people of California, who have been kept uninformed and submissive by a technically incompetent and corporate controlled media, while politically controlled regulatory agencies can control the review process and apparently influence the conclusions, along with impeding any form of access to a legal system that has also little or no interest in any review process nor any form of restitution.



**Hundreds of vertical fluorescent lights are electrified and illuminated, only by proximity to overhead power lines, due to large losses in power during transmission**

The small increase in hardware cost needed for underground DC has frequently been exaggerated by several hundred percent in order to discredit this option. However using underground DC has several other installation advantages, such as a significant increase in

transmission efficiency which can more than cover any cost difference between overhead AC and underground DC power lines, along with providing 300 to 400% greater transmission capacity, by eliminating the need to replicate the Sunrise Powerlink every decade, particularly since plug-in hybrid vehicles have a long term potential of requiring over 20 additional 1000 megawatt Sunrise Power links during the next few decades. No doubt Sempra Energy has not researched the cost, safety or environmental advantages of underground DC, that no doubt can deliver billions in savings and profits to Sempra Energy. If we can't review the undisclosed ambitions that are determined to inflict needless environmental damages at an even greater cost to SDG&E, then there may be little hope of ever obtaining any beneficial or a cost effective result.



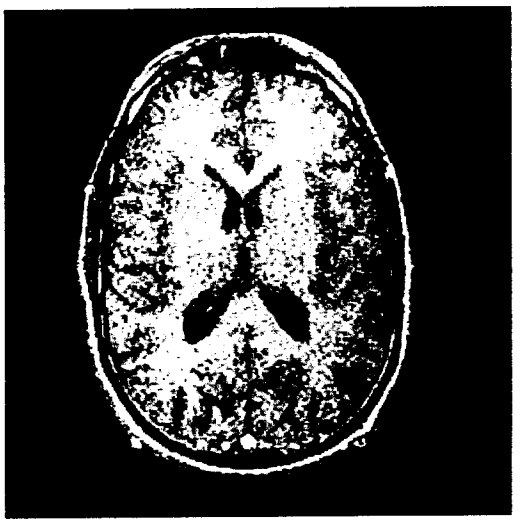
**Wind damages above. Hot sagging cables on pylons increase community dangers, accidents, fires, power outages, environmental, business, medical and insurance losses. What are the benefits? They cost more to erect and maintain than to dig a 1 foot by 5 feet deep trench with two cables. During the night of October 21-22, 2007 wind velocities in excess of 110 MPH were recorded in many parts of Southern California.**

- So why would consideration of these details be avoided, unless it was predetermined that any alternative to environmental damages, cancer deaths and property loss was of no interest?

- If that is the position, which is clearly being repeatedly demonstrated by the applicant, then what is the economic or political alternative to intentionally destructive interests?

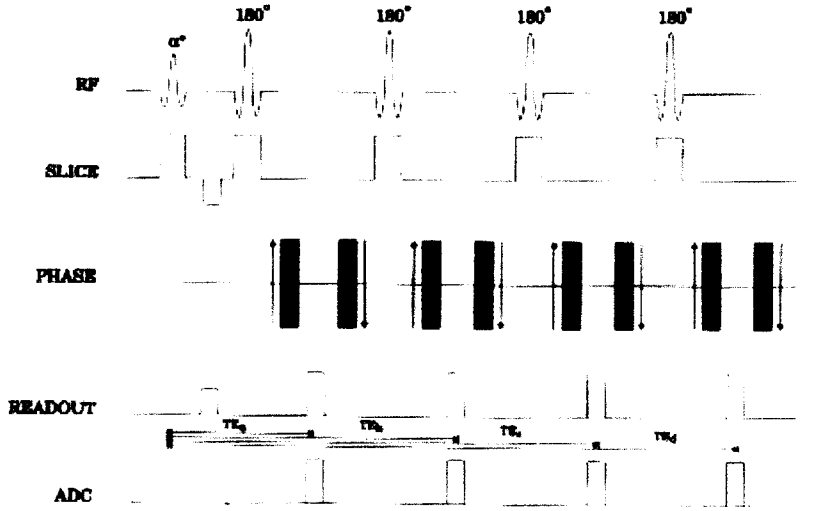
- Would the applicant's request continue to be the denial of almost all environmental, property and medical damages, as well as complete disregard of $6 billion in immediate business and real estate losses that thousands of others would incur?

- What sort of review would encourage such needless and extraordinarily high environmental and economic losses?



**20 millisecond electro-magnetic image of the brain**

The basic phenomenon of nuclear magnetic resonance has been known since the 1940s ( ), and MRI has been developed over the last 30 years ( ). Magnetic resonance can be adequately understood in terms of electromagnetic theory, as follows. All atomic nuclei spin on their axes; nuclei have a positive electronic charge; and any spinning charged particle will act as a magnet with north and south poles located on the axis of spin. In magnetic resonance studies, an object is put in a strong, externally-imposed magnetic field ("main magnetic field"); the spin-axes of all the nuclei in the object line up with the field, with the north poles of the nuclei pointing in the "southward" direction of the field. This creates an average vector of magnetization of the object that points parallel to the magnetic field (the main magnetic field is conventionally referred to as pointing along the z-axis) ( ).




As the nuclei relax, each becomes a miniature radio transmitter, giving out a characteristic pulse that changes over time, depending on the local microenvironment surrounding the proton. For example, hydrogen nuclei in fats have a different microenvironment than do those in water, and thus transmit different pulses. Due to these differences, in conjunction with the different water-to-fat ratios of different tissues, different tissues transmit different radio signals. These miniature radio transmissions can be used to form MRI images ( ).

EMF, Pulsed and oscillating electrical fields do significantly impact the fundamental structure of our biology and interfere with the molecular functioning of cells and tissues, which have been shown to be directly related to human cancer formation in large scale epidemiological studies. A large scale study including 58,000 children has shown a 70% higher incidence for childhood leukemia as a result of proximity to power lines. However, the power industry claims that, "The evidence is not conclusive yet", nevertheless they are unable to point to any other cause.

**Childhood leukemia in the advanced stage**

**Roger Ebert during 2006 after four surgeries to remove cancerous growths from his salivary gland, which has been linked to RF radiation and levels of cell phone usage. The tobacco industry spent over 100 years denying any linkage between smoking and cancer, or any increased health risks. Attorneys are still paid to protect the profitability of extreme hazards and blame the victims or deny the risks. However, perpetuating damages does not even save money or create wealth.**

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# Fires started by overhead power lines have burned thousands of homes in California, all without restitution (including our home)

After over 2000 homes were burned during the fall of 2007, once again the Los Angeles County Board of Supervisors determined that during high winds high-power lines were responsible for most losses, which burned homes up to $17 million in value and totaled $2.26 billion in insurance company losses alone, and with high power lines being the cause of over 351 fires per year in California. As a result County Supervisor Zev Yaroslavsky announced in a televised news conference that he was requiring that the Southern California Edison place all high-power lines in the Santa Monica Mountains and Malibu underground as a fire security requirement. What plans has Sempra Energy implemented to reduce risks and losses due to high speed winds which have exceed 110 miles per hour (during the night of October 21-22, 2007) and result in extreme fire hazards from high power lines, and flames commonly between 100 to 200 feet in height.

San Diego County

San Bernardino County (Green Valley Lake)

Riverside County (Lake Arrowhead mansions)

Orange County (Irvine)

The underground engineering solutions recommended here are far less costly than blindly and needlessly perpetuating massive structural and insurance losses. Utility company habits, such as preferring AC transformers, need to change to provide protection to homes and the environment, as well as save millions in installation costs, compared to overhead power line installation and maintenance costs.

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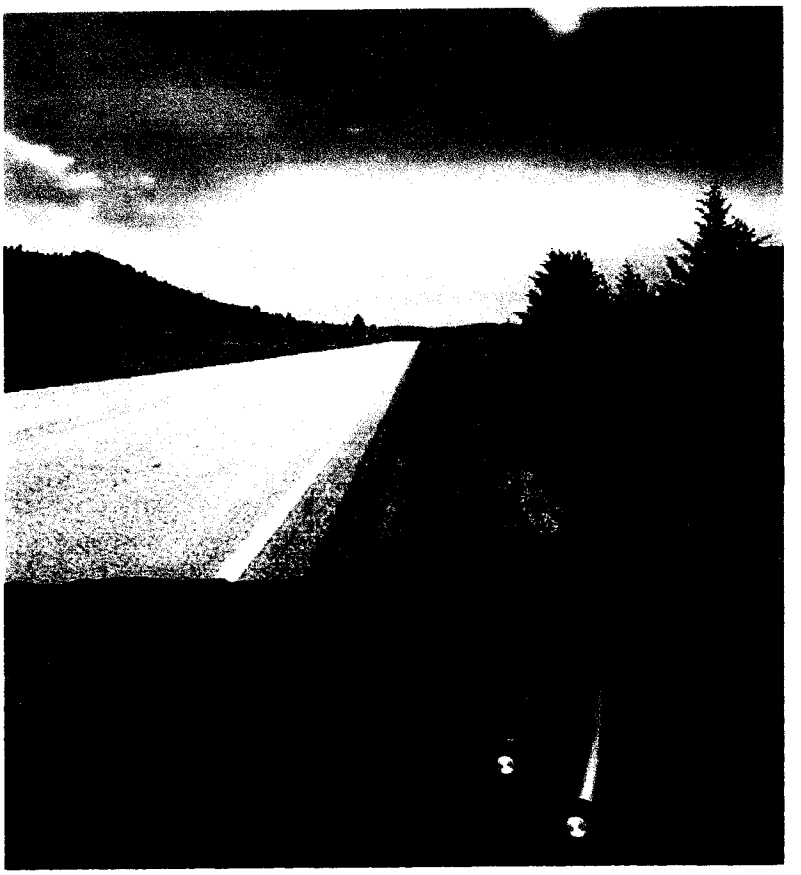
# II. An underground DC powerlink that saves 150 miles of San Diego County and the Anza Borrego Desert State Park, ***at lower cost*** than overhead AC power lines



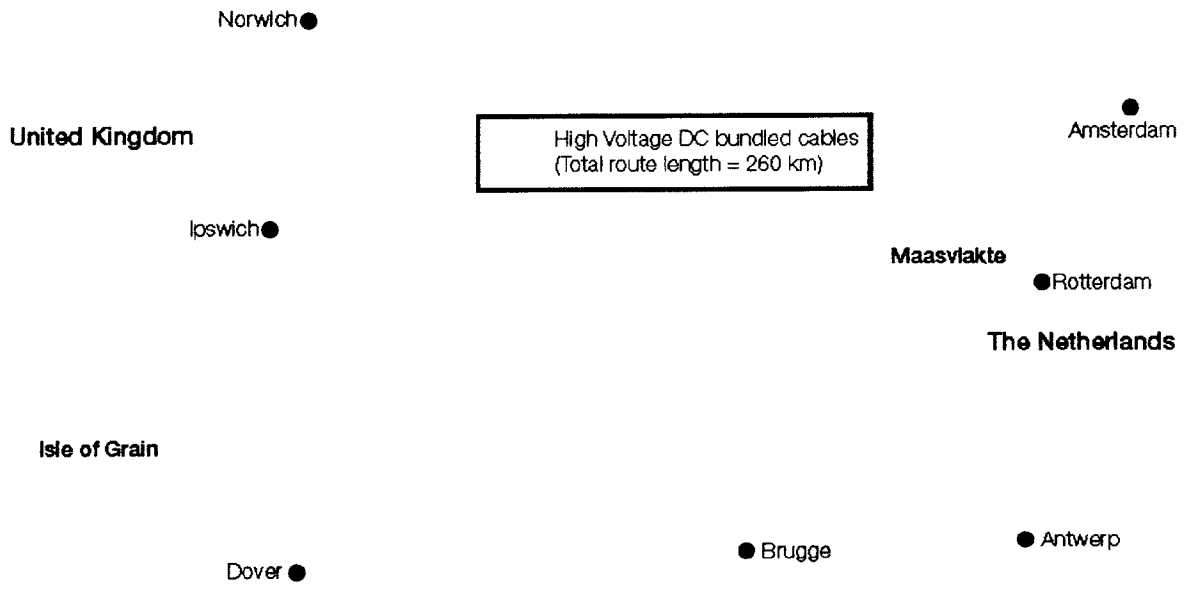
**Two 6 inch underground DC cables can provide 4 times the capacity of the overhead Sunrise Powerlink. Continuous trenching depth is typically 5 feet by 1 foot in width with a protective cap and no conduit being used for the direct burial cables.**

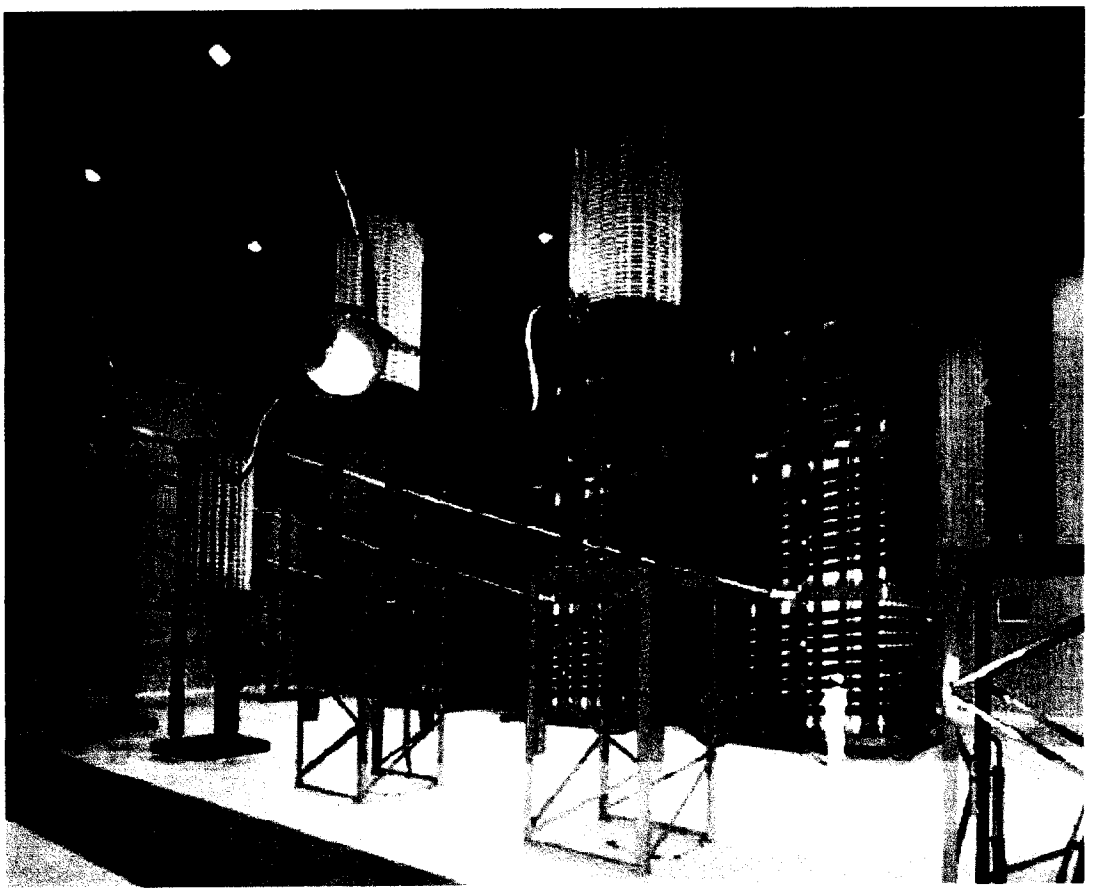
More than 50 long distance high-voltage, high-capacity underground and under ocean DC power lines have been installed worldwide, with higher capacity, greater efficiency, better safety, better reliability, vastly lower environmental impact, vastly lower property and economic damages, and at a lower cost than overhead AC power lines.

The BritNed UK-Netherlands powerlink can deliver 1300 megawatts over 161.5 miles for a cost of 600 million Euros, or $870 million, all of which is higher in capacity and longer in distance than the Sunrise Powerlink and provided at a considerably lower cost than overhead AC power lines. With a cost of $870 million for the 161.5 mile BritNed Powerlink, then the $1.4 billion Sunrise Powerlink would cost 1.6 times more or 60% more in order to build 700 pylons 160 feet in height and avoid underground DC.

Table: Selected project examples

| Project | Country | MW | Year | Main purpose |
|---|---|---|---|---|
| SwePol | Sweden-Poland | 600 | 2000 | Subsea cross-border inter-connection |
| Italy-Greece | Italy-Greece | 500 | 2001 | Subsea cross-border inter-connection |
| Murraylink | Australia | 220 | 2002 | Underground merchant grid inter-connection |
| Troll A | Norway | 84 | 2005 | Power to offshore gas platform from shore |
| Estlink | Estonia-Finland | 350 | 2006 | Underground/subsea cross-border inter-connect |
| NorNed | Norway-Netherlands | 700 | 2008 | Subsea cross-border inter-connection |
| Nord E.ON 1 | Germany | 400 | 2009 | Underground/subsea offshore wind park |
| SAPEI | Italy | 1000 | 2009 | Subsea island connection |
| BritNed | UK-Netherlands | 1300 | 2009 | Subsea cross-border inter-connection |



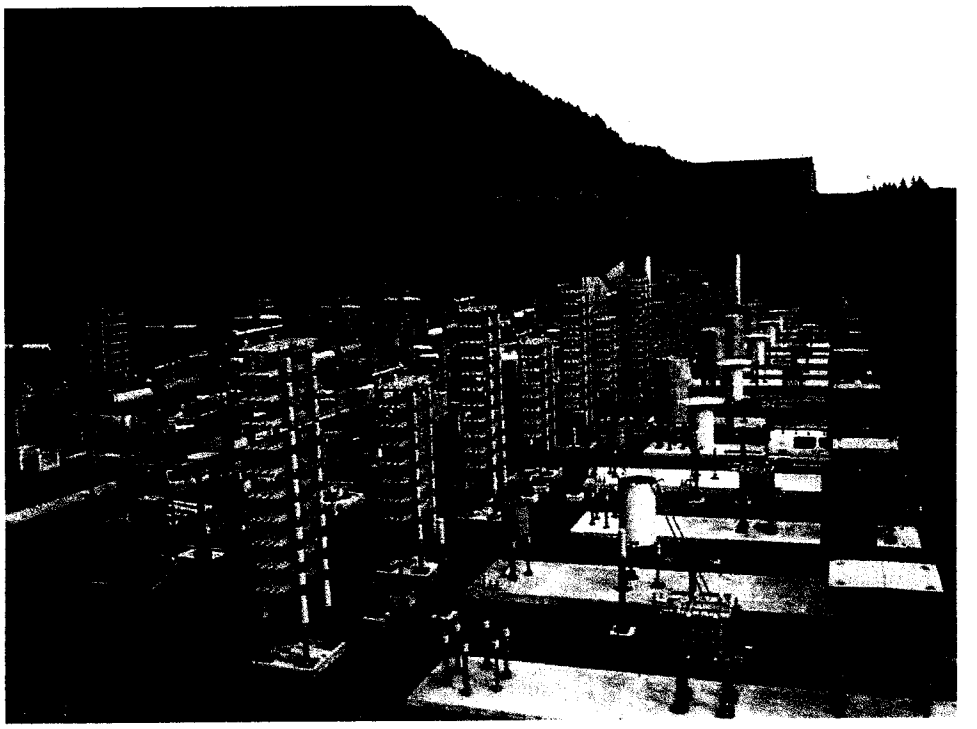


**161.5 mile, 1300 megawatt BritNed DC powerlink ($870 million construction cost)**

# DC Converter Stations

Based on the Norway-Netherlands DC link (shown below) a 1000 megawatt DC converter station could fit on less than 4 acres and would cost an estimated $125 million, which could reduce the overall construction costs by up to 38%. However, underground DC could also save an additional $3 billion to $20 billion in environmental damages, business and property losses, along with providing up to a 400% increase in transmission capacity, higher efficiency, lower maintenance, better security, the elimination of EMF and related medical liabilities.

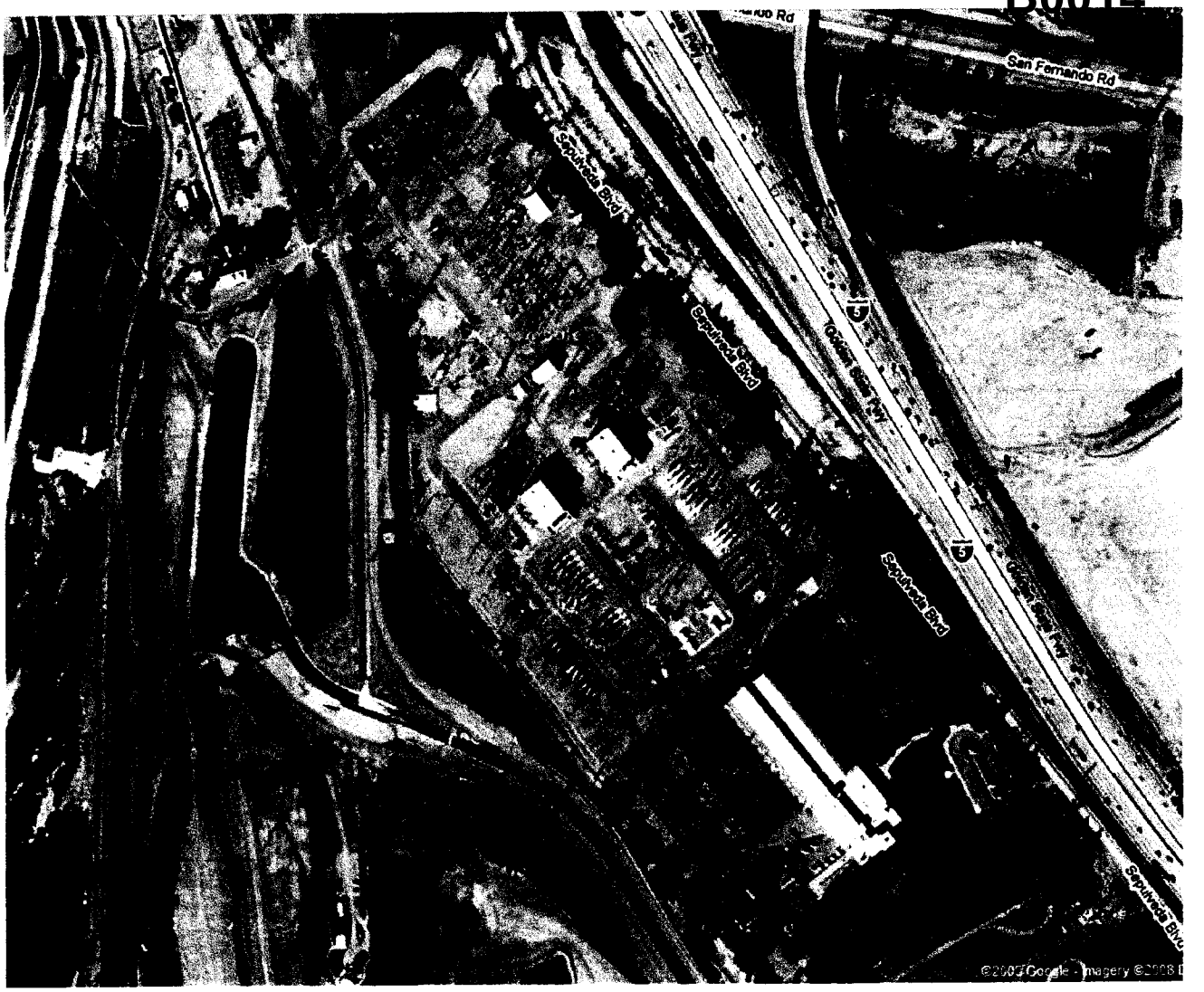

**580 kilometer (360 mile) 700 megawatt 450,000 volt DC underwater cable between Norway and the Netherlands**



**700 megawatt 450,000 volt DC to AC Converter station on a 3 acre parcel, using approximately 2.75 acres**

## Transmission for Los Angeles Department of Water and Power

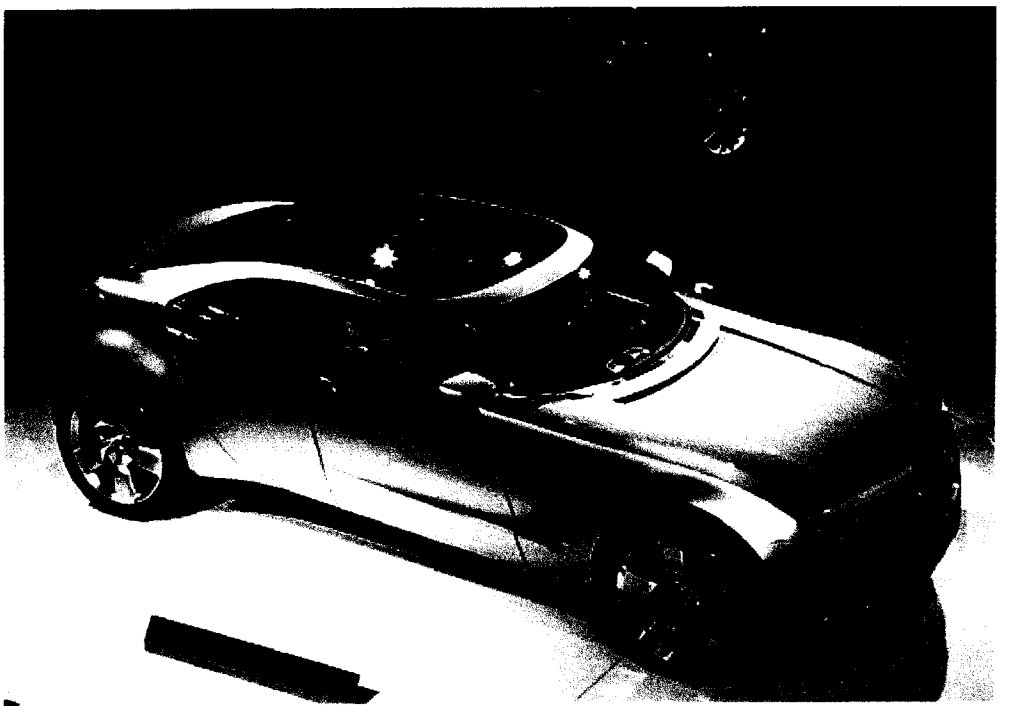
The 850 mile 500 kV DC Intertie delivers 3100 megawatts using pairs of pylons carrying 2 cables each, 2 cables on one pylon for positive and 2 cables on the second pylon for negative. Each cable is steel reinforced aluminum 1.8 inches in diameter (ACSH 2312 mil designation). The DC to AC converter station and the AC to AC transformer distribution facility is located together in the San Fernando Valley near where the 210 and 5 Freeways meet. The DC to AC facilities are much smaller now. 500 kV DC is equivalent to the capacity of 1000 kV AC since there is a positive and negative difference on DC cables. The LADWP converter station and AC distribution facility for 3100 megawatts is all widely distributed over about 33 acres (in a area approximately 2400 feet by an average of 600 feet) west of the 5 freeway (or west of Sepulveda Blvd) and south of San Fernando Road, with a smaller portion used for DC conversion. For a facility with less than 1/3 the capacity with newer hardware, approximately 5 acres would be sufficient for DC to AC conversion on a project the scale of the Sunrise Powerlink. To observe the facility use Google Maps to find: San Fernando Rd & Sepulveda Blvd, Sylmar, CA 91342, then select satellite view.




**3100 megawatt DC to AC converter and AC transformer distribution network for LADWP, begun in 1965, bringing power 850 miles from Oregon and Washington State hydroelectric dams on the Columbia River**

# III. Electric Vehicle Power Requirements, at 10 kWh / day, could require 20,000 megawatts

## Electric Transportation



GM Volt, 161 horsepower electric car, 0-60 in 8.5 seconds, 600-700 mile range.

**Impact of Plug-In Hybrid cars on electrical transmission capacity**

General Motors Chevy Volt plug-in hybrid is estimated to require 240 watt hours of charging to travel one mile, or about 1 kWh to travel 4 miles and 10 kWh to move 40 miles, which is its expected all electric range. At 5½ cents per kilowatt hour (.05569) for peak summer rates to charge an electric vehicle, then each mile would cost about 1.4

cents in electricity costs through SDG&E. At the highest residential rates of 15¼ cents per kilowatt hour (.15267) the cost would be 3.8 cents per mile driven, which is still well below gasoline costs. At $3.60 per gallon, a 30 MPG vehicle would cost 12 cents per mile for fuel, as well as require far greater maintenance, labor and parts expenses than an electric vehicle, which could amount to at least 10 cents per mile in addition, or totaling approximately 22 cents per mile, excluding depreciation of well over $1000 per year for the lower cost vehicles, which can easily exceed the cost of the gasoline, plus insurance which can range from $600 to well over $2000 dollars per year. Nevertheless, saving 20 cents per operating mile can cut transportation costs to less than ½ for most people. So if 1 million people drive their plug-in electric cars an average of 40 miles per day, and need use 10 kilowatt hours to charge their vehicles over a 10 hour period, that would amount to an additional demand of 1000 megawatts. Naturally, when people notice that they could easily afford to move away from 1 ton vehicles and drive 3 ton trucks again, then electric consumption would rapidly grow for three reasons. 1st there would be no incentive to drive a gasoline powered vehicle so nearly all domestic and small business vehicles would shift toward plug-in technology. 2nd Since plug-in electric is considerably more efficient than gasoline, then heavy vehicles would once again replace conventional automobiles, perhaps tripling electric vehicle charging consumption. 3rd Since there is a continuing rapid population influx across California's borders, with a population that doubles every 20 years then far greater electrical capacity will have to be provided for. So is the proposed electrical capacity for the Sunrise Powerlink capable of charging 3 to 6 million cars which require 30 kilowatt hours of charging capacity every day? That would amount to between 10,000 and 20,000 megawatts, or about 10 to 20 times the proposed Sunrise Powerlink for San Diego County alone, and about 60 to 80 times the capacity of the Sunrise Powerlink to charge all the household vehicles in 5 Southern California counties. How could any overhead power line system carry cables heavy enough or voltages high enough to address such a demand, without covering over Southern California with 80 additional Sunrise Powerlinks? Obviously weight is not an issue with higher efficiency DC copper underground cables, which can already quadruple the capacity of the Sunrise Powerlink, operating at 450 kV DC using only two 6¼ inch cables in a 5 foot deep trench, 1 foot in width. Why would underground DC transmission be avoided? Because there is more familiarity with the AC transformers? So far not one reason based on fact, overall cost savings or environmental protection has been offered which supports overhead power line construction.

**Photovoltaic Automotive Charging**

If solar panels were used to charge a plug-in hybrid car such as a Chevy Volt, then 1 kW of photovoltaic panels during 10 hours could fully charge the car to run 40 miles. If Nanosolar's panels were used, at a cost of $1 per watt, then the cost of the panels would

be $1000 which would pay for itself in fuel savings alone within 10,000 miles of driving, which would typically occur well within 1 year, with panels that could last well over 30 years. Apparently photovoltaic panels can power a car over 50 times cheaper than gasoline, so spending $50 at a gas station could be replaced by a $1 solar investment.

**Autos, SUV's and pickups registered for 2006 in Southern California**

| | | |
|---|---|---|
| San Diego County | 2,295,324 | (autos 1,875,748 + (trucks 503,511 * .83 = 419,576) |
| Orange County | 2,281,798 | (autos 1,926,712 + (trucks 426,120 * .83 = 355,086) |
| Riverside County | 1,417,570 | (autos 1,091,918 + (trucks 390,798 * .83 = 325,652) |
| Los Angeles County | 6,912,168 | (autos 5,917,189 + (trucks 1,194,022 * .83 = 994,979) |
| Ventura County | 650,085 | (autos 524,605 + (trucks 150,582 * .83 = 125,480) |
| Total: | 13,556,945 | cars, SUV's and pick-ups |

**Reference links:**

GM Plug-in hybrid charging:
SDGE Vehicle rates:
SDGE Residential rates:
Nanosolar photovoltaics:
Nanosolar Wikipedia:
DMV Vehicle count: , 5/6
(approx. 83%) of the trucks listed are pick-up trucks typically for household use.

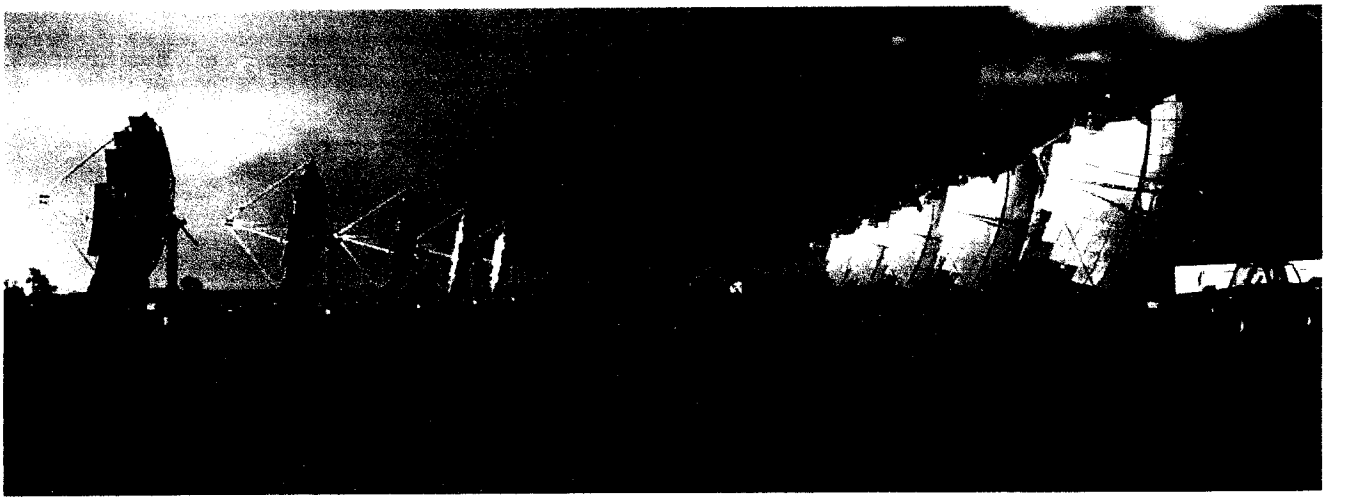
# IV. Solar Electric Generation at $1 per watt equals ½ cent per kilowatt hour

The first choice alternative to the Sunrise Powerlink was gas fired powerplants. While that is a vastly more attractive option than overhead extra high voltage power lines, we would also encourage some consideration for printed photovoltaic technology which is being used in homes, carports, office buildings and large scale power plants, with manufacturing in San Jose California and panel costs of $1 per watt, which can be completive with gas powered power plant construction for peak demand generation purposes.

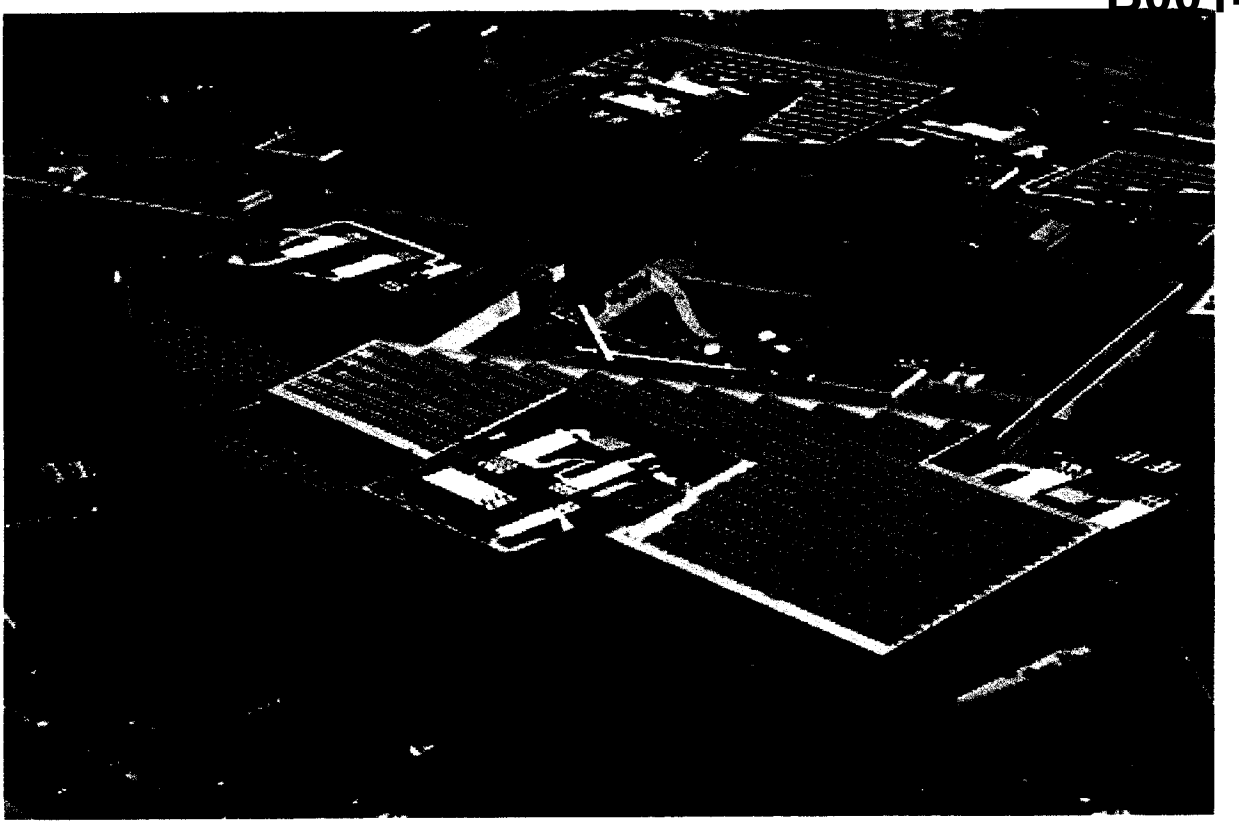
**Nanosolar's photovoltaic panels are being priced at $1 per watt, which amounts to ½ cent per kWh, or 30 to 80 times less costly than from utility companies.**

## Nanosolar Photovoltaic Panels

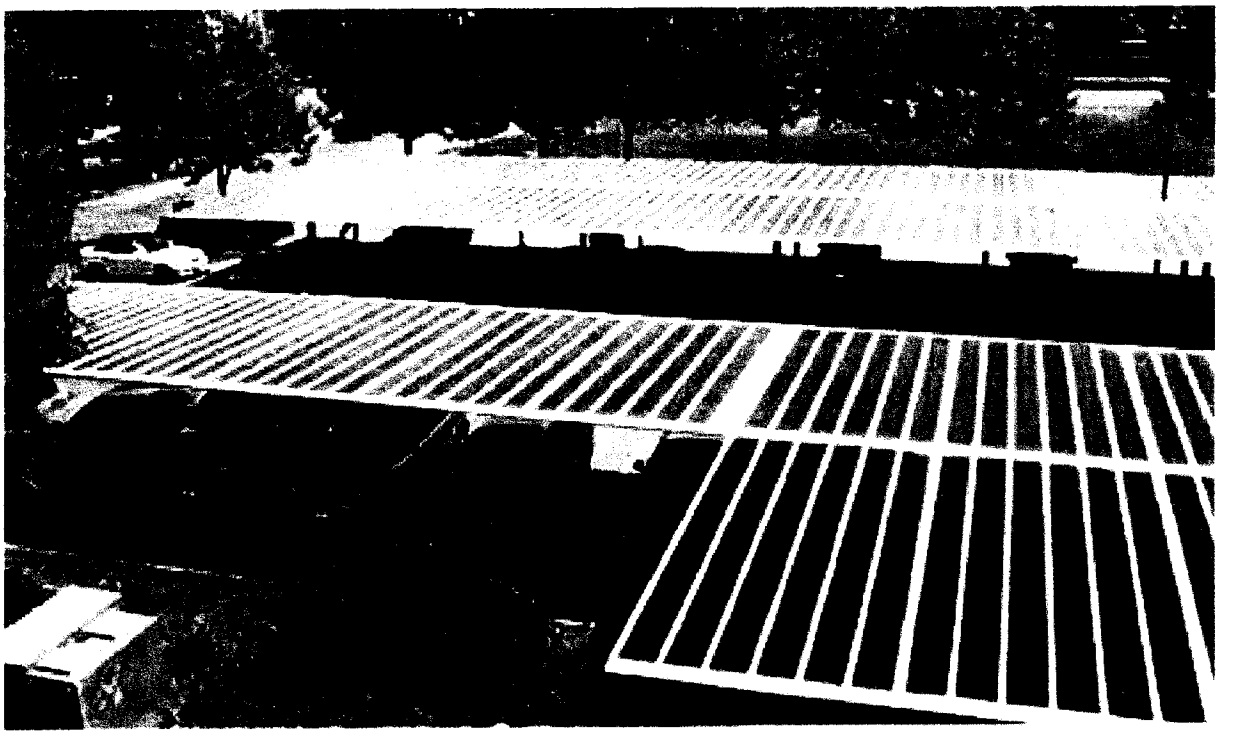
Solar panels that could deliver 1000 watts would cost $1000 and deliver approximately 12 kilowatt hours of electricity per day, for more than 40 years, delivering a total of over 175,200 kWh, at $.0057 per kWh or about ½ cent per kWh. With electric companies charging 15 to 40 cents per kWh, then the newer panels can generate electricity at 30 to 80 times less cost, which would mean that the power companies could ultimately supply most of its power at night and during rainy weather, so that anyone on the electrical grid wouldn't need batteries or a back-up system. However, it may ultimately be less costly to generate hydrogen at home through electrolysis to drive a fuel cell whenever backup power is needed. While it may take a while for homes to be adapted, or for parking lots to be covered with solar panels, companies are being created in California to address the large scale installation of photovoltaic systems, along with large scale 50 to 100 megawatt installations in China and Europe, using the same panels.



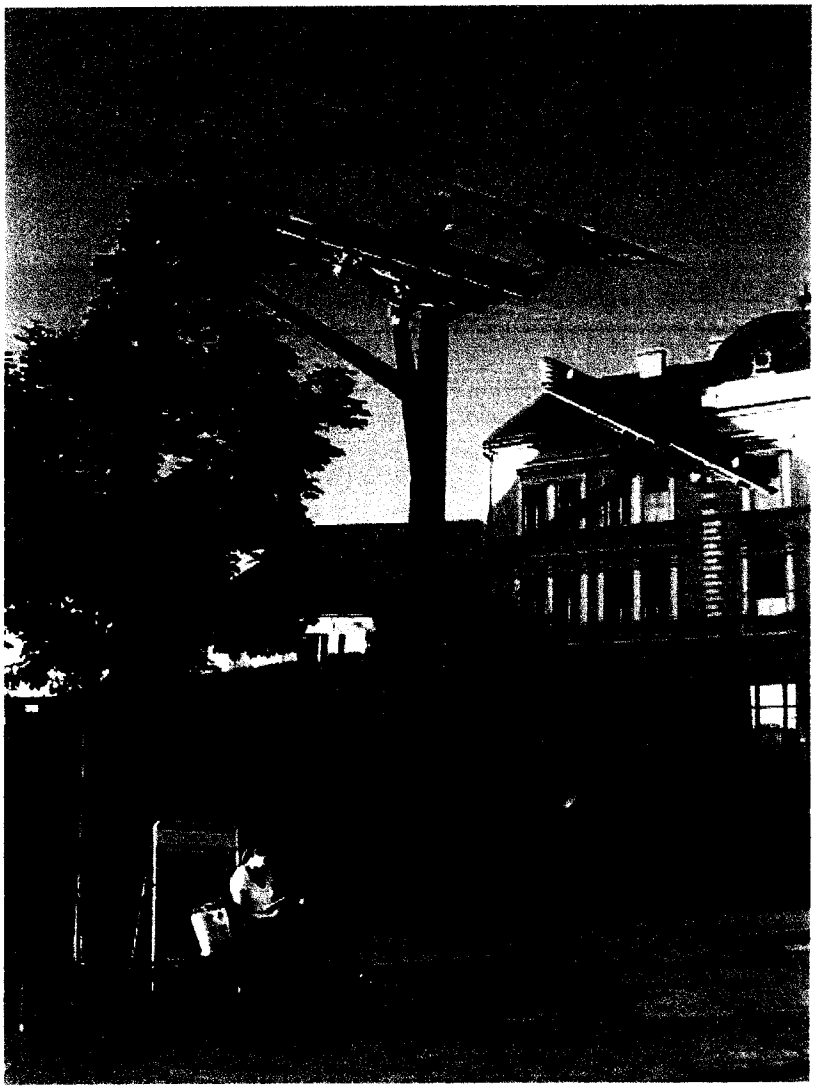
**154 megawatt solar concentrator power station in Victoria Australia, at a higher cost of $2.70 per watt, potentially located on a farm, (solarsystems.com).**



**1.6 megawatts from the roof of Google's offices**



**153 kilowatt from a solar carport in Vacaville California**



**Solar tree in Styria Austria (70 panels on 5 branches, occupying about 1 square foot on the ground)**