

cost between an AC vs. a DC converter station would be a fraction of that cost, and clearly not \$125 million more than AC transformers. Also in Imperial County the cost of converting from high voltage AC to high voltage DC could be relatively small, about \$15 million, not \$250 million (16 times that amount). Currently High Voltage DC cable technology can supply 1850 megawatts on two 6 inch underground DC cables separated by 8 inches, which can be directly buried in a 1-foot wide trench, 5-feet deep under a desert highway.<sup>2</sup> The costs of High Voltage DC underground cables and trenching are very similar to the costs of erecting high-voltage pylons and overhead cables. In fact when environmental impacts, right of ways and losses of real property values are taken into account the cost of the overhead 500 kV power lines would be considerably more than the cost of underground DC, perhaps by over \$6 billion. So we are saying that the numbers are exactly the opposite as shown by the government sponsored report and that High Voltage DC would not cost an extra \$500 million, but could save several times that amount. The cable technology used in these underground cables has been proven in over a dozen underground DC power lines, including underground AC cables installed in San Diego which are very similar. Perhaps there is a reluctance to extend efforts to consider this extraordinarily low impact and cost saving approach that could be commercially, as well as environmentally beneficial. If it would be of assistance I could provide a more detailed analysis of the data and the economic differences between underground DC and overhead AC high power lines, as well as review the reliability and safety issues of underground DC lines as installed over the past 6 decades.

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<sup>2</sup> Improved temperature dissipation can be achieved through the direct burial of the HVDC cables in sand to protect against rocks or earth movement, without utilizing conduits, as well as by avoiding excessive depth to minimize the soil's insulating properties, which also lowers costs. Additional amperage or capacity is included to minimize cable heat build-up in desert areas. Two 6-inch diameter cables are capable of carrying 1840-megawatts utilizing only 75% of its capacity, which is almost twice the capacity of the proposed overhead 500 kV high-power lines. If twice that capacity is required a second pair of DC cables can be placed under the pavement on the opposite side of the road, delivering 3680-megawatts without any increase in cable heat.

Powerlink environmental impacts, costs and overhead vs. underground AC and DC alternatives



**Continuous trenching equipment used to install underground power lines in Australia**



**Installation of 110-mile underground DC cable in Australia (Murraylink)**



## **Underground and underwater HVDC construction videos:**

<http://www.abb.com/cawp/gad02181/0ca04adc1b0b9c76c12570f3002eb4c7.aspx?>

(Index of HVDC videos)

1. [http://library.abb.com/GLOBAL/SCOT/scot221.nsf/VerityDisplay/28D9D5CEEC51A0B3C12572520029ED45/\\$File/Estlink%20Large.wmv](http://library.abb.com/GLOBAL/SCOT/scot221.nsf/VerityDisplay/28D9D5CEEC51A0B3C12572520029ED45/$File/Estlink%20Large.wmv) (3.5 minutes, 29.5 MB, "Digging the Future")
2. [http://library.abb.com/GLOBAL/SCOT/scot221.nsf/VerityDisplay/DC7A21C94EBE6BD0C12570F30031AA83/\\$File/Touching%20Tomorrow512K.wmv](http://library.abb.com/GLOBAL/SCOT/scot221.nsf/VerityDisplay/DC7A21C94EBE6BD0C12570F30031AA83/$File/Touching%20Tomorrow512K.wmv) (4.4 minutes, 13.3 MB, "Touching Tomorrow")
3. [http://library.abb.com/GLOBAL/SCOT/scot221.nsf/VerityDisplay/C1E4771D75B8F199C1256FDA003B4D37/\\$File/ABB%20-%20Maps\\_Stor.mpg](http://library.abb.com/GLOBAL/SCOT/scot221.nsf/VerityDisplay/C1E4771D75B8F199C1256FDA003B4D37/$File/ABB%20-%20Maps_Stor.mpg) (10 minutes, 27 MB, "Maps", Murraylink HVDC project in Australia, New York Cross-Sound, etc.)
4. [http://library.abb.com/GLOBAL/SCOT/scot221.nsf/VerityDisplay/938D96A8B12BC99DC1256FDA004F7785/\\$File/TheSilverThread-\(2\).mpg](http://library.abb.com/GLOBAL/SCOT/scot221.nsf/VerityDisplay/938D96A8B12BC99DC1256FDA004F7785/$File/TheSilverThread-(2).mpg) (5.4 minutes, 15.1 MB, "The Silver Thread", The history of HVDC)

## **IV. Facility Replacement:**

Given the adverse impacts proposed against our preservation project, another alternative would be the acquisition of an equivalent wilderness site and the full relocation of the nature preserve to a site along Interstate 8 between El Cajon and the Boulevard area, if an equivalent site could be located or would be available, and if the Powerlink project would evaluate the cost of habitat reimbursement. Without initiating a detailed survey to locate an accessible site with equivalent privacy, open-space visibility, undisturbed habitat, endangered species, anthropological resources, geological

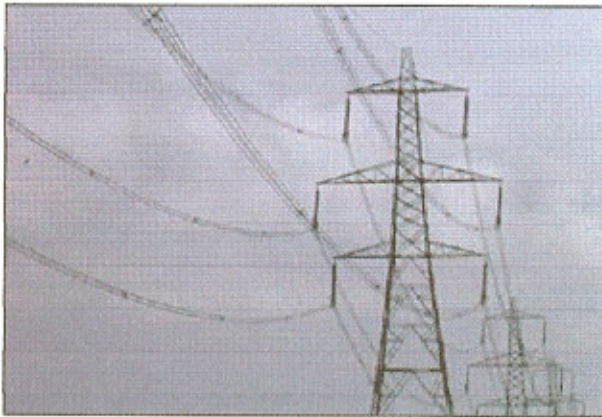
Powerlink environmental impacts, costs and overhead vs. underground AC and DC alternatives formations, expansive views of wilderness, energy and water resources, perhaps the site acquisition costs would be considerably greater than any underground power line alternative, if such a site existed.

## **V. Facility construction and utilization:**

It has been our intention to construct a full-time research laboratory and plant propagation workspace exactly where a 160 foot tall 500 kV pylon is designated for construction, and apparently where hot sagging 500,000 volt aluminum cables would be hanging low to the ground. We have made improvements to the roadway leading to this particular site, as well as established gates and fencing to protect the area from destructive impacts. We have designated the area below the proposed high-voltage cables for caretaker and work facilities; incidentally for several reasons, including highway access, gradual slope conditions and a long established roadway to this area. Naturally there is also some reason to be concerned with the effects of high-voltage, as well as alternating-current fields, particularly when a large scale study in the UK at the Bristol University Medical Center involving over 58,000 children, found that children whose birth address was within 200 metres (656 feet) of a local overhead power line had a 70% increased risk of leukemia, while children living 200 to 600 meters (1968 feet) away from the power lines had a 20% increased risk. No doubt voltages which are 50 times higher and capacities which are 100 times greater may have a considerably larger, or perhaps a proportionally greater hazardous impact. Journal reference: *British Medical Journal* (vol 330, p 1290)



## **BBC News: Cancer rise linked to power lines**



**By Alex Kirby, BBC News**

UK researchers claim to have found sharply higher cancer rates in people living close to overhead power lines.

If their findings apply nationally, it would suggest premature deaths on the scale of the annual road accident toll.

The researchers say the excess cancers are found only in people living downwind of the lines.

And they say this is strong evidence to support one theory of how electric fields may damage health.

### **Ionizing effect**

The research appears to vindicate a theory developed by Professor Denis Henshaw, of the physics department at Bristol University in the west of England.

He has found that a power line ionizes the surrounding air, and believes this makes wind-borne pollution much more dangerous.

"It splits the air up into positive and negative electrical charges, which are blown away from the power line by the wind," he says.

"They attach themselves to particles of pollution in the air and put an electrical charge on to them. When you inhale these small particles, they have a much higher probability of sticking in the lung."

Professor Henshaw stresses that his work deals with the electrical effects of power lines, not their magnetic fields. The head of the research team is Dr Alan Preece, an epidemiologist in the oncology department of Bristol University medical centre.

### **Large excess of lung cancers near power lines**

Dr Preece told the program: "We're assessing the relative cancer risk within 400 meters of the lines. We looked at the postcodes of all the diagnoses of the different sorts of cancer for the whole of South West England.

"We found an excess, particularly of lung cancer, in that group of people who had been living within 400m of a line at the time of diagnosis.

"You are likelier to get cancer there, but only if you live downwind, which is almost proof, or very strong supporting evidence, for the effect of the aerosols driven by the wind."

Dr Preece's own work is yet to be published officially. But a conference in Germany earlier this year of the Bioelectromagnetics Society heard that it suggested an average increase in the cancer risk of 29% over the expected rate.

Across the country, this could mean more than 3,000 premature deaths annually, roughly the number of people killed every year on the UK's roads.

Asked how confident he was of his findings, Dr Preece said: "I'm amazed at how robust they appear to be.

"Being cautious, I would love to repeat the study in another area of England, to see if we've got the same effect. It would be very easy to do."

Studies of electricity industry workers in Canada and elsewhere support the hypothesis that electric fields are involved in the cancer process as a tumor promoter.

But the National Grid, which owns the UK's power lines, says: "We have never said in a categorical way that power lines are safe."

<http://news.bbc.co.uk/2/hi/sci/tech/933678.stm>



While we do not oppose, and in fact do encourage high-capacity underground DC power lines; naturally we do oppose the extraordinarily destructive environmental impacts proposed along this route using overhead power lines, as well as preliminary efforts required in order to initiate those damages, including seismic refraction and subsurface borings up to a depth of 50 feet and 8 inches in diameter. We acknowledge that those and vastly more serious impacts are not necessary or desirable and are in complete opposition to our interests, as well as the entire San Diego region as a result of inflicting damages to and defacing Southern California's wilderness regions and its scenic highways, and further that there are other far less threatening and far less costly alternatives presently available to provide the same or greater transmission capacity, which are not being considered for any valid technical or economic reason and are apparently being intentionally ignored. Unfortunately these issues still need to be addressed in order to avoid disastrous consequences to our wilderness region and decades of our efforts. More considerate alternatives have not been evaluated, and apparently are not even being proposed for consideration, and in fact are so far being avoided by those being paid to provide a detailed analysis of these extraordinarily critical issues.