Energy Crossroads 2007 Conference
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Themed "Building a Coalition for a Clean, Prosperous and secure Energy Future," this event was sponsored by many Stanford institutions and departments, and the focus was 'cleantech' and 'greentech'.

Panel I: Clean Energy Solutions: Setting Priorities

This Panel was moderated by **Erik Straser**, Partner, Mohr Davidow Ventures.

Jeff Goodell, Author, *Big Coal*, contributing editor, *Rolling Stone*
26,000 people die every year in the United States from coal-related deaths. Coal is responsible for 40% of CO_2 emissions in the world. One coal power plant in Georgia spews out 25 million tons of CO_2 per year. The Federal government is planning on building CO_2 storage structures and the largest one we have today has a capacity of one million tons. We think we have 200 years of coal reserves in the U. S., but it is more like 50 years. The huge amount of coal we have is a carbon dump.

Burton Richter, Nobel Laureate and Professor Emeritus, Stanford Linear Accelerator Center
Nuclear power is cheaper than natural gas and is a reality. Over 80% of power generated in France is nuclear. One solution to nuclear proliferation, especially from 'rogue' countries, may be by leasing nuclear fuels. We have to plan on alternatives to coal. The earth receives 10,000 times more energy from the sun than the entire world uses, yet we are not harnessing it properly.

Chris Flavin, President, The Worldwatch Institute
The rate of growth of renewables and solar photovoltaic cells is high compared to those of coal, gas, and nuclear power. Note, these are starting from a small base, but that is no reason not to pursue these options. Remember, Bill Gates started from a zero installed base and eventually replaced entrenched, often superior, products — CPM, Harvard Graphics, Lotus 1-2-3, OS/2, WordPerfect—on the desktop.

Mark Delucchi, Institute of Transportation Studies, UC Davis
A major problem today is not power generation, but its transmission. For instance, an entrepreneur in west Texas has excess wind power, but to export it to Illinois or California requires permits from six to eight grid owners on the way. Remember, Eisenhower initiated the Interstate Highway system for *transportation of trucks* in the event of a conflict during the Cold War. What we need now is a federally funded national grid for *transmission of power*. Also, just as computing morphed from centralized mainframe computing to distributed and client-server computing, we will see distributed power generation with smart power meters, photovoltaics, local generators, and microturbines.

Panel II: "Making Renewables and Energy Efficiency Competitive"

This panel was moderated by **John Weyant**, Director, Stanford Energy Modeling Forum.

Jeff Byron, Commissioner, California Energy Commission
California leads the U. S. in not just energy conservation but also in energy efficiency. Since1975, while the per capita energy consumption in the U. S. has doubled, that in California has remained steady. Incidentally, the Red States had the highest increase in per capita consumption. (Is it ignorance or apathy? They don't know and they don't care.) During the last week alone, over 200 energy-related bills were proposed in the California Assembly and Senate. California Assembly Bill 32 (AB32) requires, for instance, to reduce California's global

warming emissions to 2000 levels by 2010 (11% below business as usual), to 1990 levels by 2020 (25% below business as usual), and 80% below 1990 levels by 2050.

Ira Ehrenpreis, General Partner, Technology Partners
Venture capitalists in the valley have traditionally ignored the energy area. For instance, in 2001 one percent of VC money went to energy; in 3Q2006 it was 14%. Silicon Valley is tied to Moore's Law; however, maintaining status quo in the energy industry is the norm. Yet, the three largest IPOs in 2005 were energy companies and some of the best technologists today are working in the energy/greentech area. The next President cannot win without a decent energy policy.

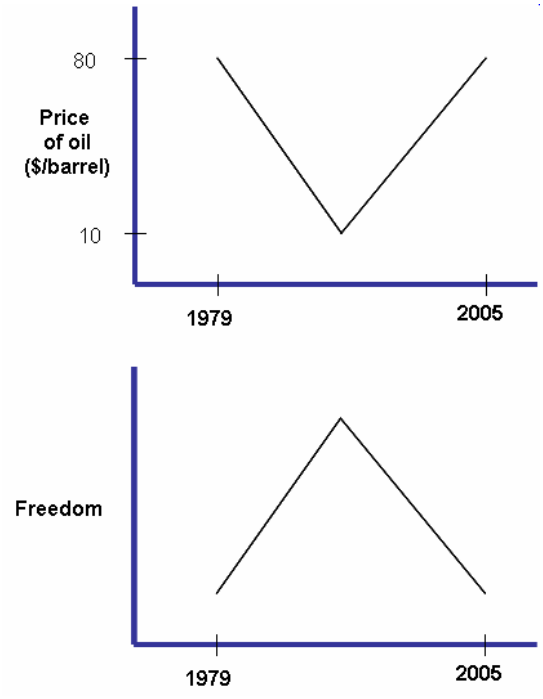
Jonathan Livingston, Pacific Gas & Electric Company Emerging Technologies
PG&E, in line with the State of California, is promoting energy efficiency and not juts energy conservation. It hands out ~$350 million every year in consumer rebates for using energy-efficient appliances.

Keynote Address: "Green is the New Red White and Blue", Thomas L. Friedman, New York Times Columnist.

This was an expanded version of the article Tom published in *The New York Times* on January 6, 2006 and undoubtedly the liveliest event of the entire conference.

It is no longer geopolitics, but geogreen. The current and looming energy crises are breath-taking challenges posing as insolvable problems, to quote John Gardner. Three main issues our children will face as they grow up will be jobs, temperature, and terrorism. The Red Menace of the Cold War should morph into Green Patriotism.

9/11 flattened the World Trade Center; Katrina flattened New Orleans; and the Internet flattened the world. But terrorism is far from over because we are funding it by every gallon of oil we import from Saudi Arabia. The current trend of terrorism has its roots to the attack on a mosque in Saudi Arabia in 1979. Saudi Arabia has one percent of the world's population, but funds 90% of the world's terrorism. This was obvious if one looks at the profiles of the hijackers of 9/11. This leads us to the First Law of Petropolitics: The price of oil and the pace of freedom work in opposite directions. This is true of Russia, Nigeria, Venezuala and many OPEC countries. Whereas we believed in no taxation without representation, oil-rich countries believe in no representation without taxation.



Fortunately for us, even the U. S. Army is going green. They have realized transporting hundreds of thousands of gallons of oil to battlefields in Iraq by a long fleet of trucks from Kuwait is inviting terrorists who can blow up these trucks. So, the army is looking into how it can embrace distributed/local power generation. If the Army does go green, it will be a major coup for the energy-conscious citizenry.

Global warming, despite denial by our ignorant leaders from oil and coal states, is a real threat. To quote Tom, "I was in Moscow on Christmas last year and it was the first Christmas in decades that Moscow had no snowfall. Two days later, I walked in London with no overcoat. The Governor of Montana complains that river temperatures in his state have risen an average of five degrees and he can't find enough salmon to fish." Unfortunately, the world's appetite for energy continues unabatedly. The worldwide installed capacity today is 13 Terawatts and it is expected to double to 26 TW in 10 years. To meet this need, we need to build a new nuclear power every day for the next 30 years. The solution is not selling expensive solar cells or wind turbines but getting the green down to the China price — meaning selling inexpensive power at the price of China-made athletic shoes. How do we achieve this?

- Develop R&D here and deploy in the BRIC (Brazil, Russia, India, and China) countries
- Partner massively with China

Unfortunately, what we have in Washington is oil *politics*, not oil *policy*. The ethanol research being funded by the Federal government is a political scam and makes no sense. We should be importing Brazilian technology, but the mid-western corn lobby in Washington is fighting it. What California has done should be copied at the Federal level. The problem with the energy industry is that there is no innovation. Jeff Immelt, GE's CEO, laments there were seven innovations in GE Health in 25 years (CAT, MRI, diagnostics, X-Ray…), but there has been only one innovation in the energy industry in over 50 years — the introduction of nuclear power in 1955. What we need is a national grid; unfortunately, our most of our elected leaders in Washington are clueless. To quote Will Rogers, "The problem with the House of Representatives is that it is so damn representative."

Our biggest challenge will be to convince China to fix its catastrophic environment. But this won't occur easily: Reducing pollution means closing huge, inefficient, state-operated enterprises, resulting in massive layoffs. A typical Chinese bureaucrat's response: "I would rather have my people coughing, than unemployed."

Panel III: "Developing the International Clean Energy Market"

This panel was moderated by **David Victor**, Professor, Stanford Law School; Director, Stanford Program on Energy and Sustainable Development.

Steve Westwell, Group VP, BP Alternative Energy
BP is a major UK corporation, with one out of every six dollars in pension funds in the UK invested in BP. BP (*Beyond Petroleum*, we call it Burning Petroleum) is spending $8 billion a year on alternative energy technologies — wind, solar, geothermal, and renewables. BP is investing in these areas because customers are demanding low-carbon alternatives.

Wen Shei, Partner, Kleiner Perkins Caufield & Byers
KPCB is very serious about green/clean technology, has over $200 million in funds for biofuels, wind, solar, and thermal energy sources, and has invested in 14 companies in these areas. KPCB believes it is driven by concerns resulting from continued urbanization and climate crises. In 1950, New York and London were the only megacities with a population of over 10 million. In 2005, there were over 25 such areas. Buy 2050, we expect to have over 400. Many of them will be metacities with a population of over 20 million.

The need to find alternative energy sources is imperative:
- Create 'dino' fuels; take sugar and create gas/fuel substitutes; investigate cellulosic and fermentation technologies, create bioethanols, and biofuels.
- Covert coal to LNG directly.
- Create solar wafers that don't use silicon, use nanoscale materials.
- Invent new batteries and capacitors.

Vijay Vaitheeswaran, Global Correspondent, *The Economist*
Our current energy model is unsustainable. There is a direct correlation between poverty and energy (or the lack thereof). One-third of the world's population that have insufficient energy are poor. We constantly fight wars over oils, yet there will be no war in the next 50 years over windmills. Two-thirds of the world's oil is in the Middle East. China is shrewdly buying up oil companies in Kazakhstan, Russia, Ukraine, Latin America and the OPEC countries, and is making strong inroads into the Middle East and Africa, e. g., Nigeria. China is not a great friend of Israel and will not lecture anyone on democracy. The curse of oil is petropolitics.

Unfortunately, energy has been an uninnovative process: You may change your cell phone every six months to a year, but you don't tear down your refinery even every six years.

Eric Heitz, President, The Energy Foundation
China is both an economic blessing and an environmental curse. It consumes 40% of the world's coal — more than India, Russia, and the U. S. combined. More than 100,000 MW of new capacity was built in China in 2005; over 90% of it was coal. Energy is growing faster than economy. Air quality badly needs improvement in China. China has set up the following goals:

- Achieve 10% reduction in emissions by 2010.
- Improve energy efficiency by 20% by 2010. To gain a better perspective, 1,000 enterprises, mostly inefficient and state-run, consume 30% of all the energy in China.
- 15% of all the energy generated by 2020 will be renewables.

These are all lofty goals. But, will China ever achieve these? We will never know; one can't trust any figures coming out of China, because there is no transparency there and bureaucrats at every level in the government are encouraged to lie and exaggerate.

Bottom Line: Will we ever solve our energy problem that has been looming over us since 1973? Yes, provided we start acting now.

The problem with us Americans is that when prices go down, we buy monstrous, gas-guzzling SUVs; our government even gives us subsidies, and Detroit pushes them like drugs. When gas prices go up, we may cut down on driving, but are still married to our SUVs. We keep adding more lanes to our highways, instead of inserting railroad tracks on the median. And, traffic expands to fill every available lane during rush hours.

In the early 1990s we had an acid-rain problem. We don't hear it about it anymore. What we need is enlightened leadership at both the State and Federal levels, and not rhetoric, or lobbying-influenced, crooked leaders from oil and coal states. The tar sands in Alberta have more energy than all the oil in Saudi Arabia. Can we be nice to our neighbors to the north and not treat them as our 51st state?