

The SuperCable:

Dual Delivery of Chemical and Electric Power

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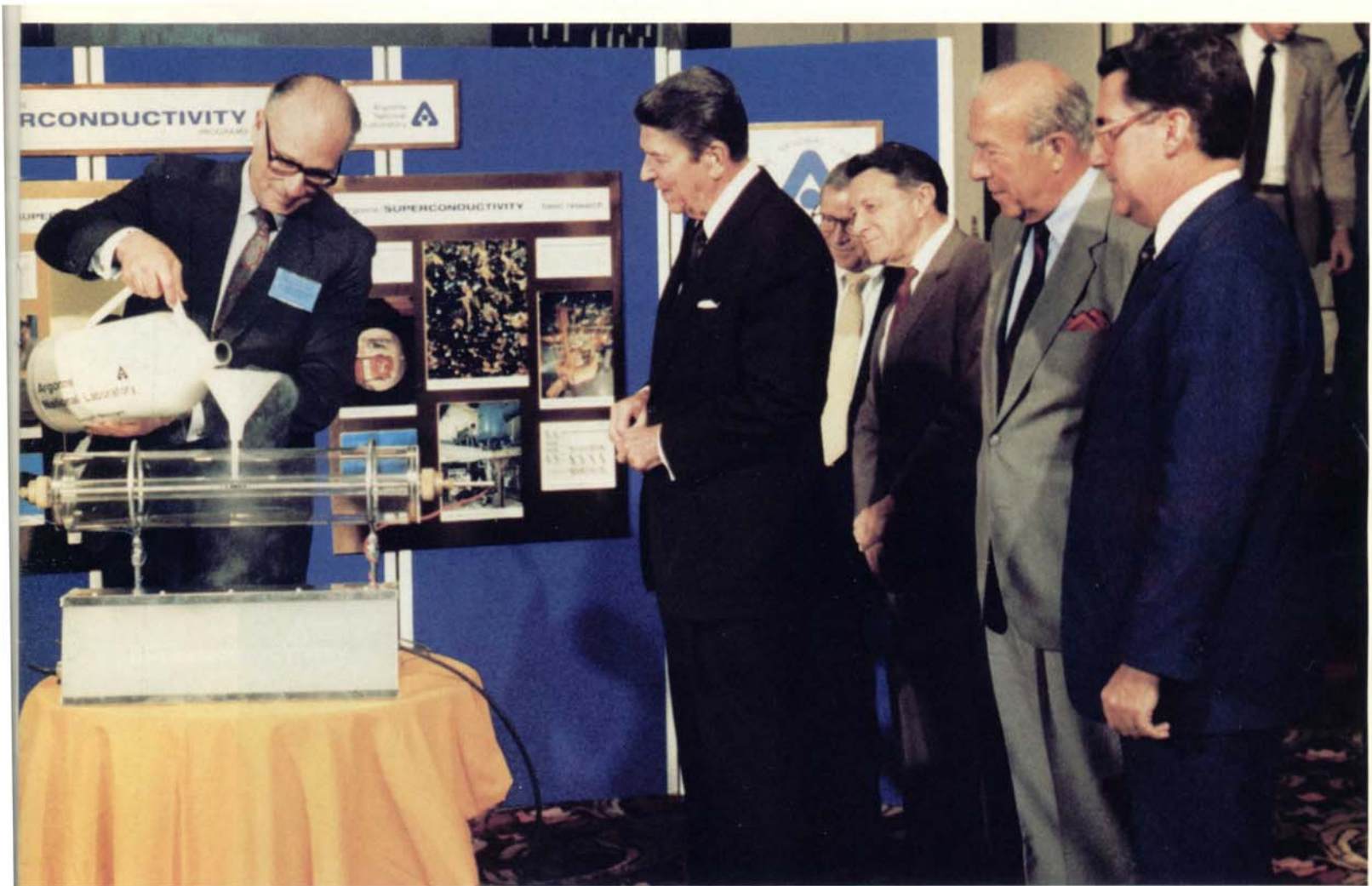
Applied Superconductivity Conference 2004

3-8 October 2004, Jacksonville, FL

Session: HTS Power Cables – III

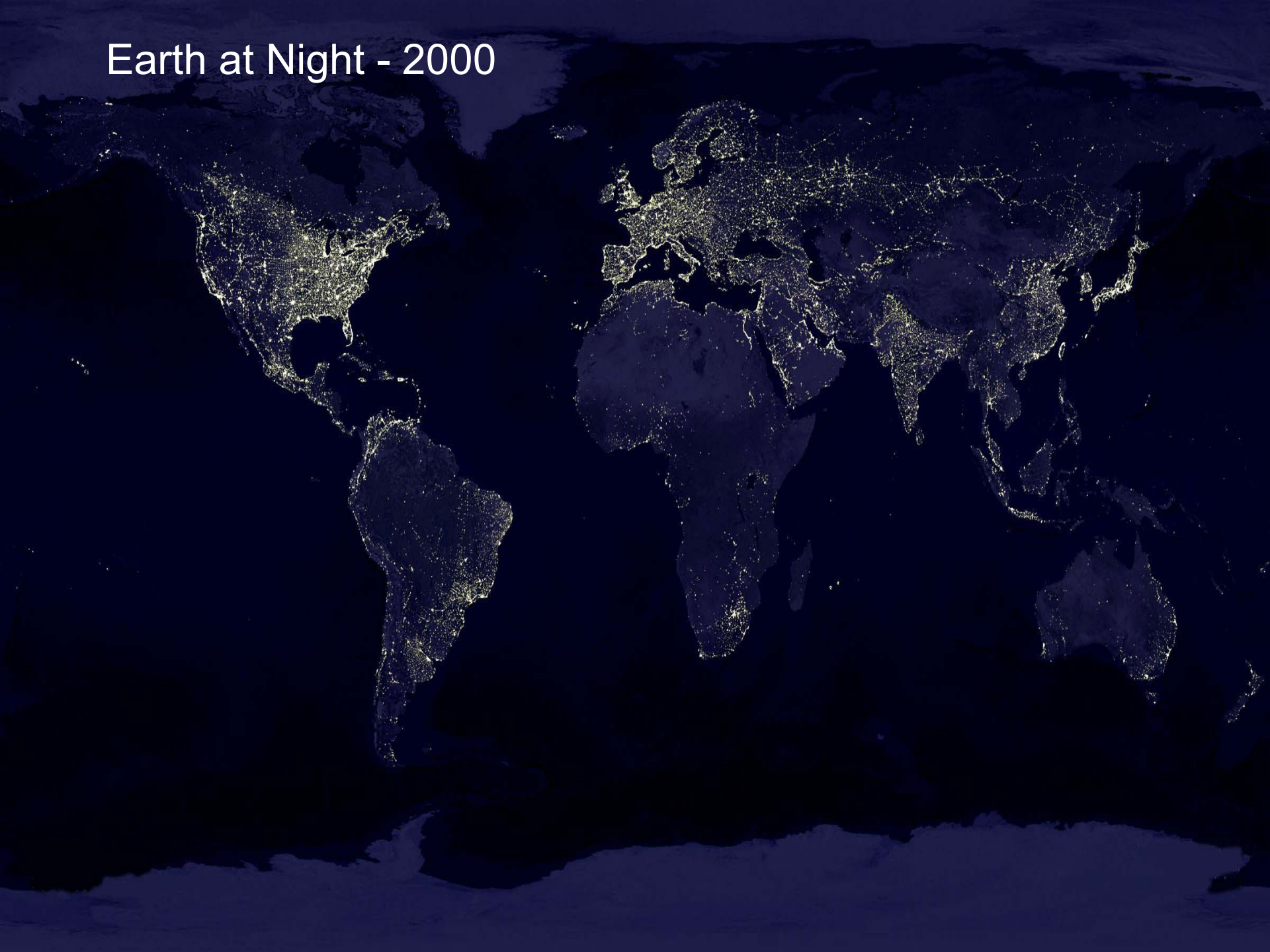
Paper: 1LT06, Monday 4 October 2004, 5:30 PM

“The Great Communicator”

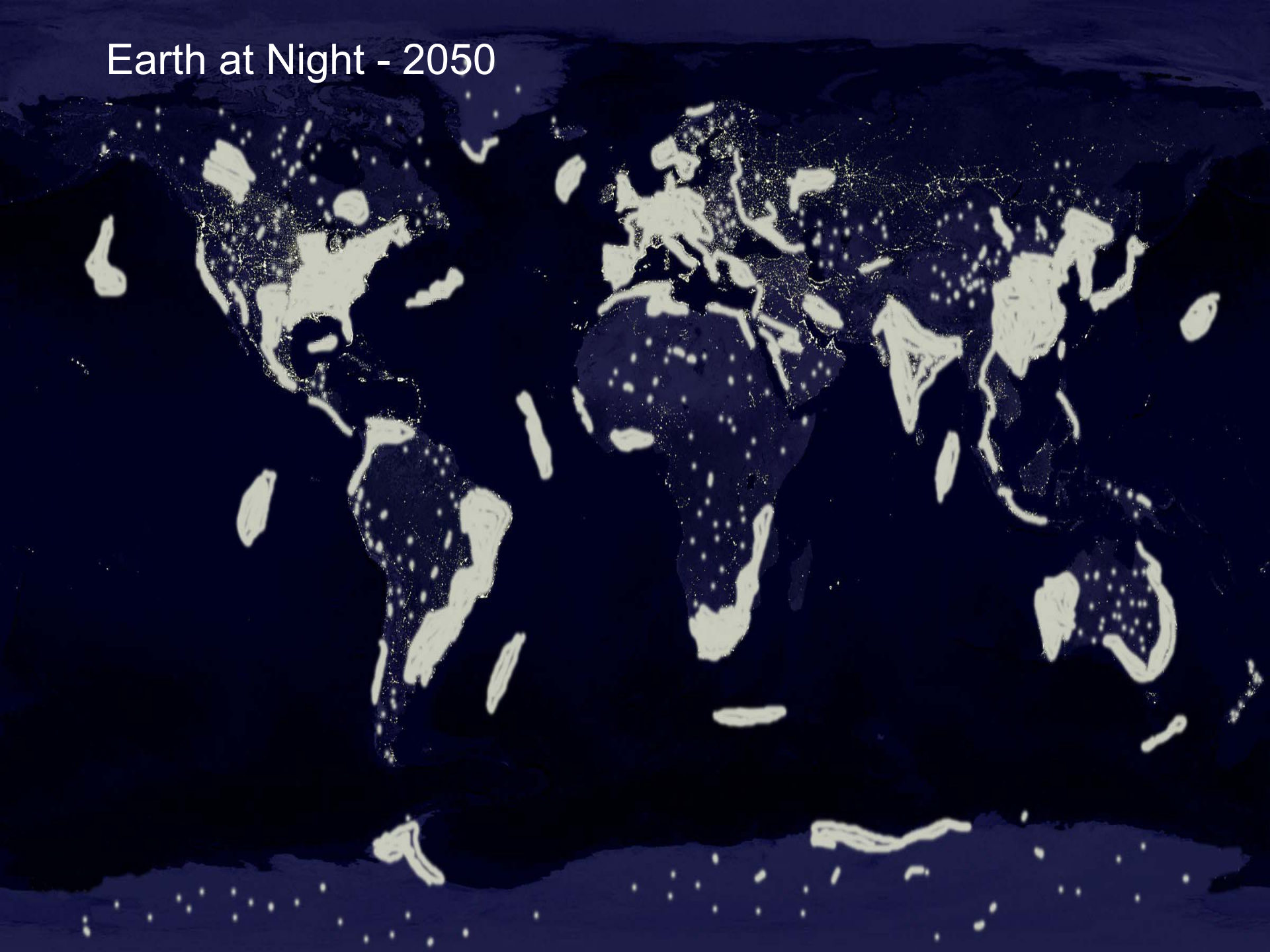


Alan Schriesheim, Director of Argonne National Laboratory, demonstrates superconductivity to the President, Chief of Staff Howard Baker, Secretary of Defense Caspar Weinberger, Secretary of State George Shultz and Secretary Herrington.

Earth at Night - 2000



Earth at Night - 2050

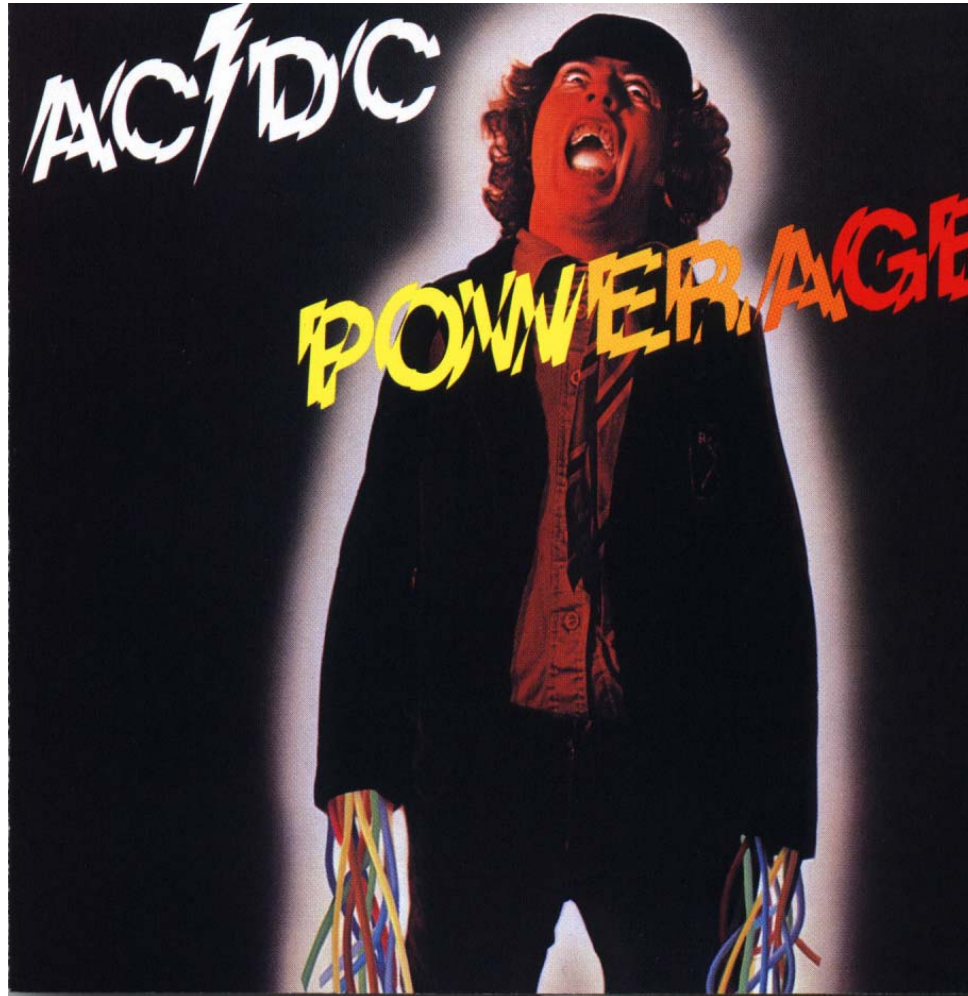


“The Present Grid”



Wired Magazine, June 2001

Californication!



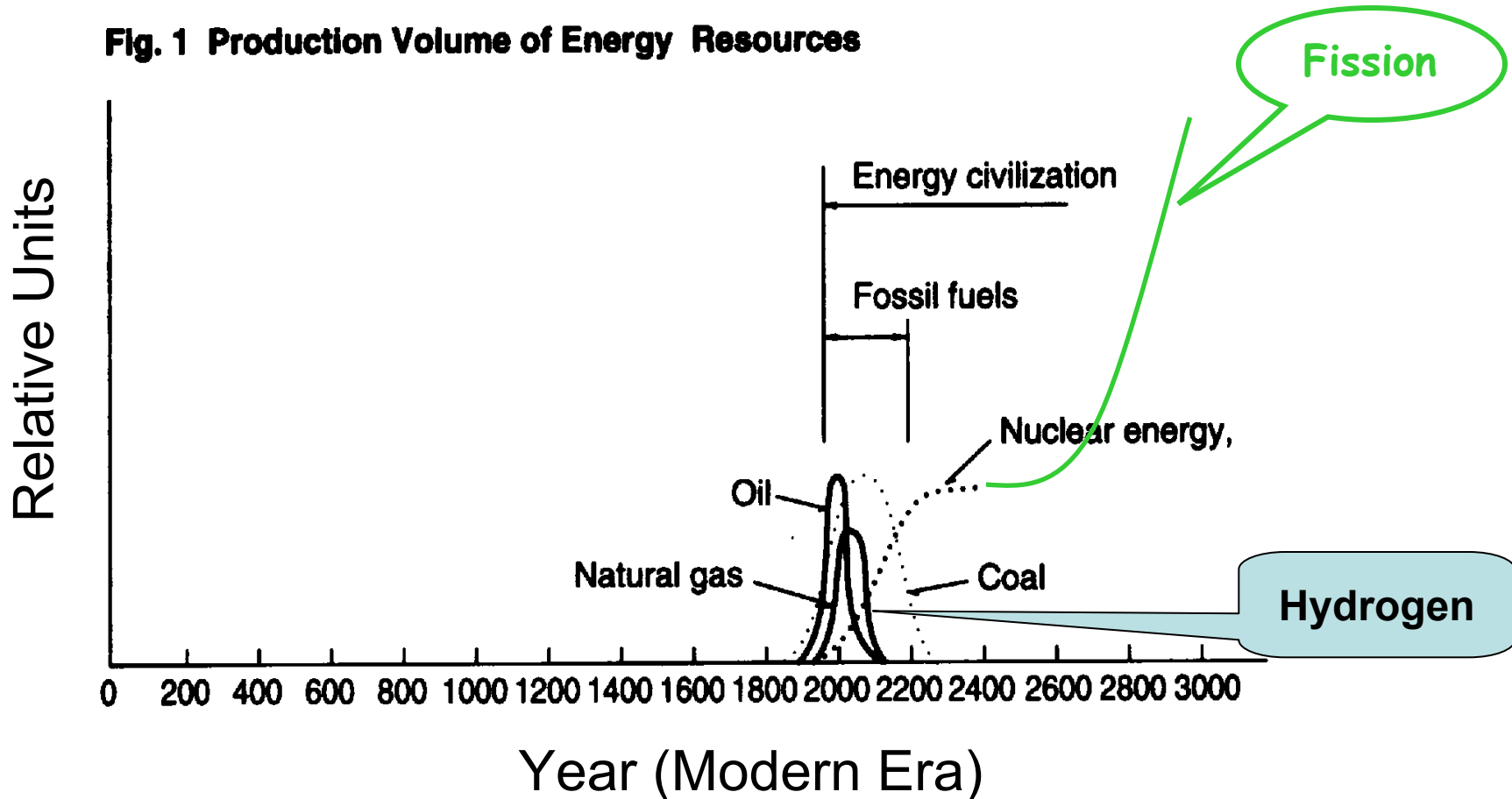
Reading Assignment

1. [Garwin and Matisoo](#), 1967 (100 GW on Nb₃Sn)
2. [Bartlit, Edeskuty and Hammel](#), 1972 (LH₂, LNG and 1 GW on LTSC)
3. [Haney and Hammond](#), 1977 (Slush LH₂ and Nb₃Ge)
4. [Schoenung, Hassenzahl and Grant](#), 1987 (5 GW on HTSC, 1000 km)
5. [Grant](#), 2002 (SuperCity, Nukes+LH₂+HTSC)
6. [Proceedings](#), SuperGrid Workshop, 2002

These articles, and much more, can be found at www.w2agz.com, sub-pages [SuperGrid/Bibliography](#)

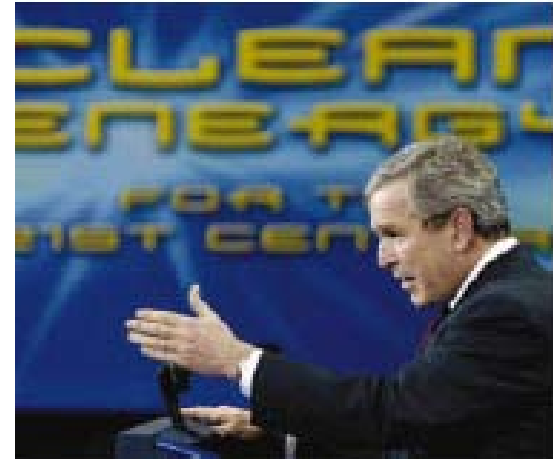
Past & Future Energy Supply

Fig. 1 Production Volume of Energy Resources





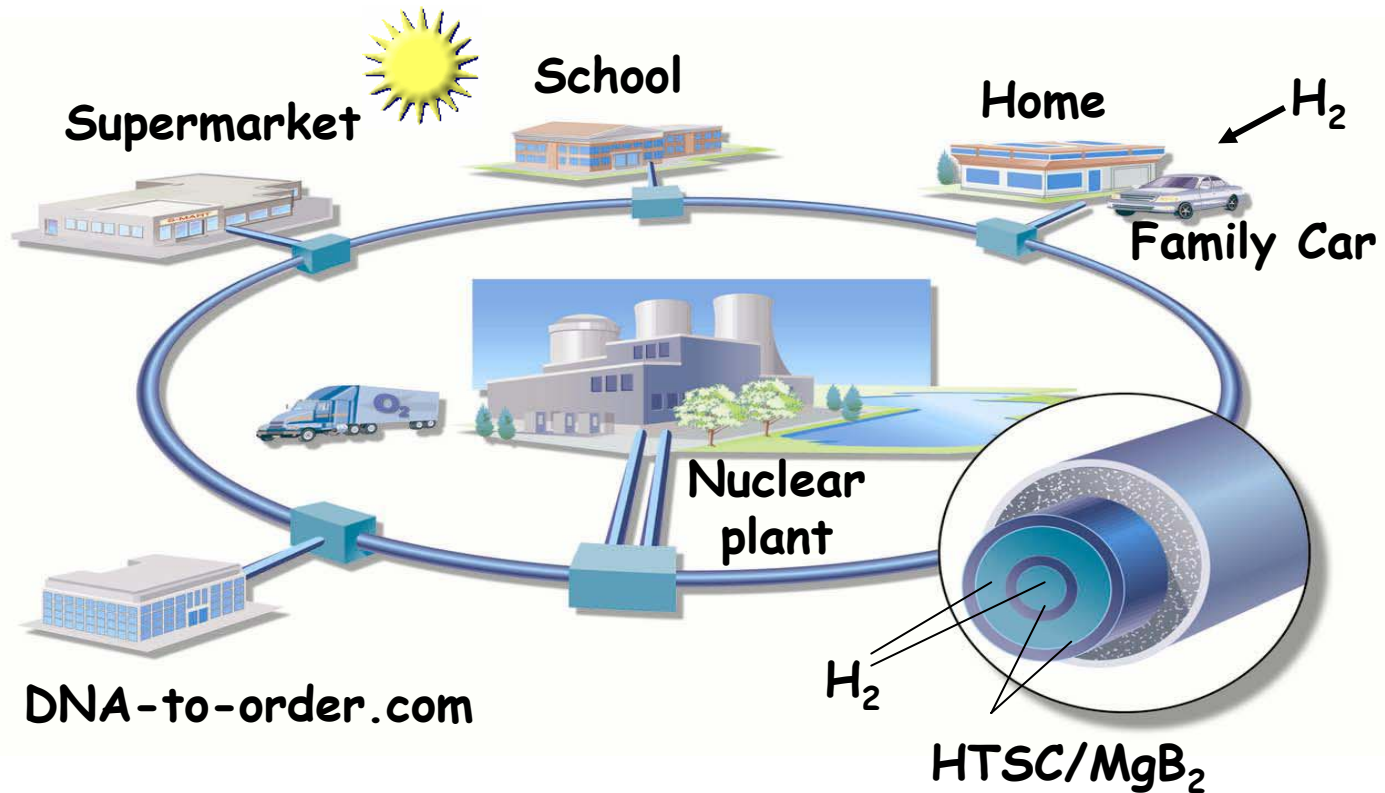
The Hydrogen Economy



- You have to make it, just like electricity
- Electricity can make H₂, and H₂ can make electricity ($2\text{H}_2\text{O} \rightleftharpoons 2\text{H}_2 + \text{O}_2$)
- You have to make a lot of it
- You can make it cold, - 419 F (21 K)

P.M. Grant, "Hydrogen lifts off...with a heavy load," Nature 424, 129 (2003)

SuperCity

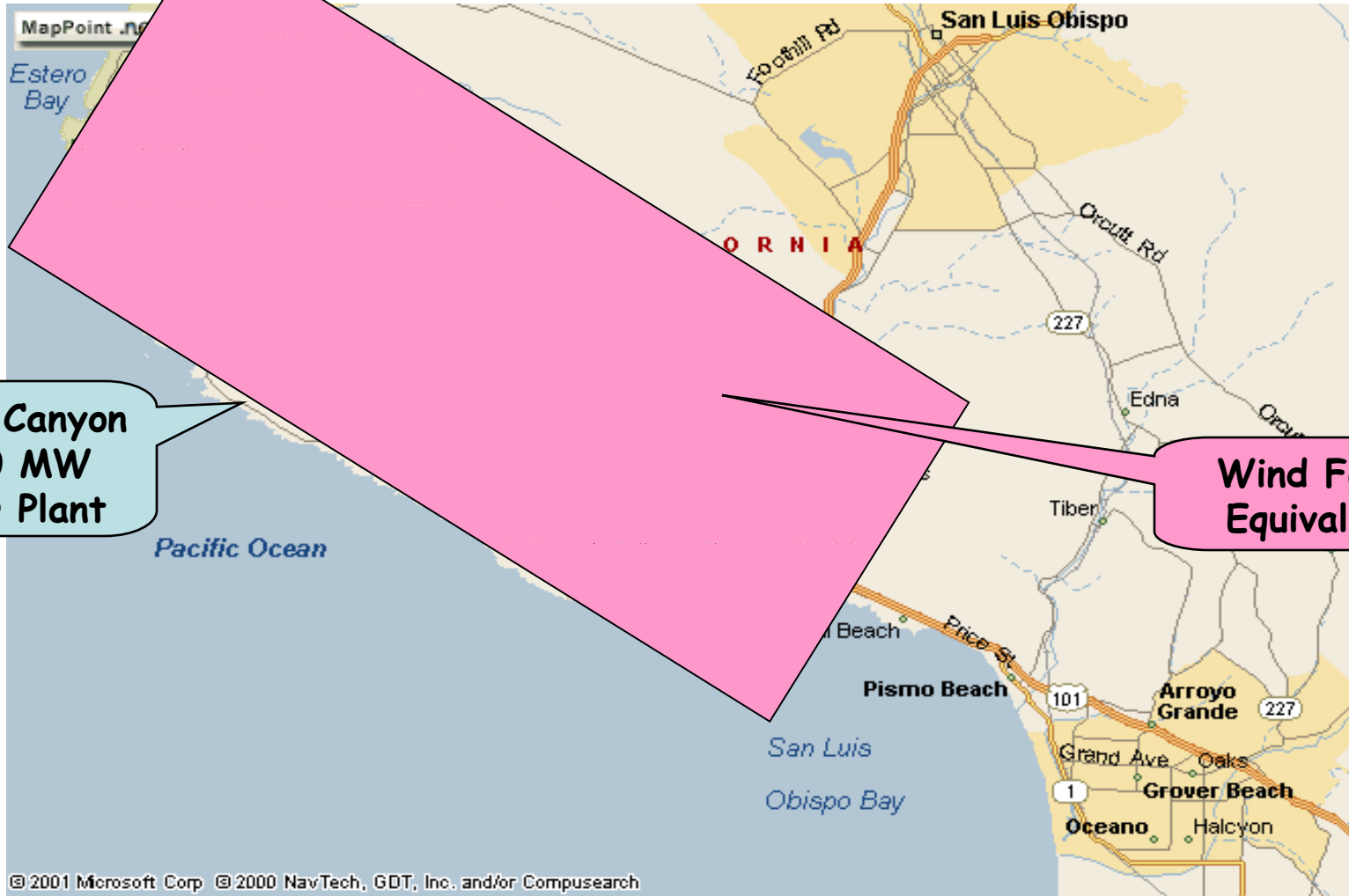


P.M. Grant, The Industrial Physicist, Feb/March Issue, 2002

Diablo Canyon



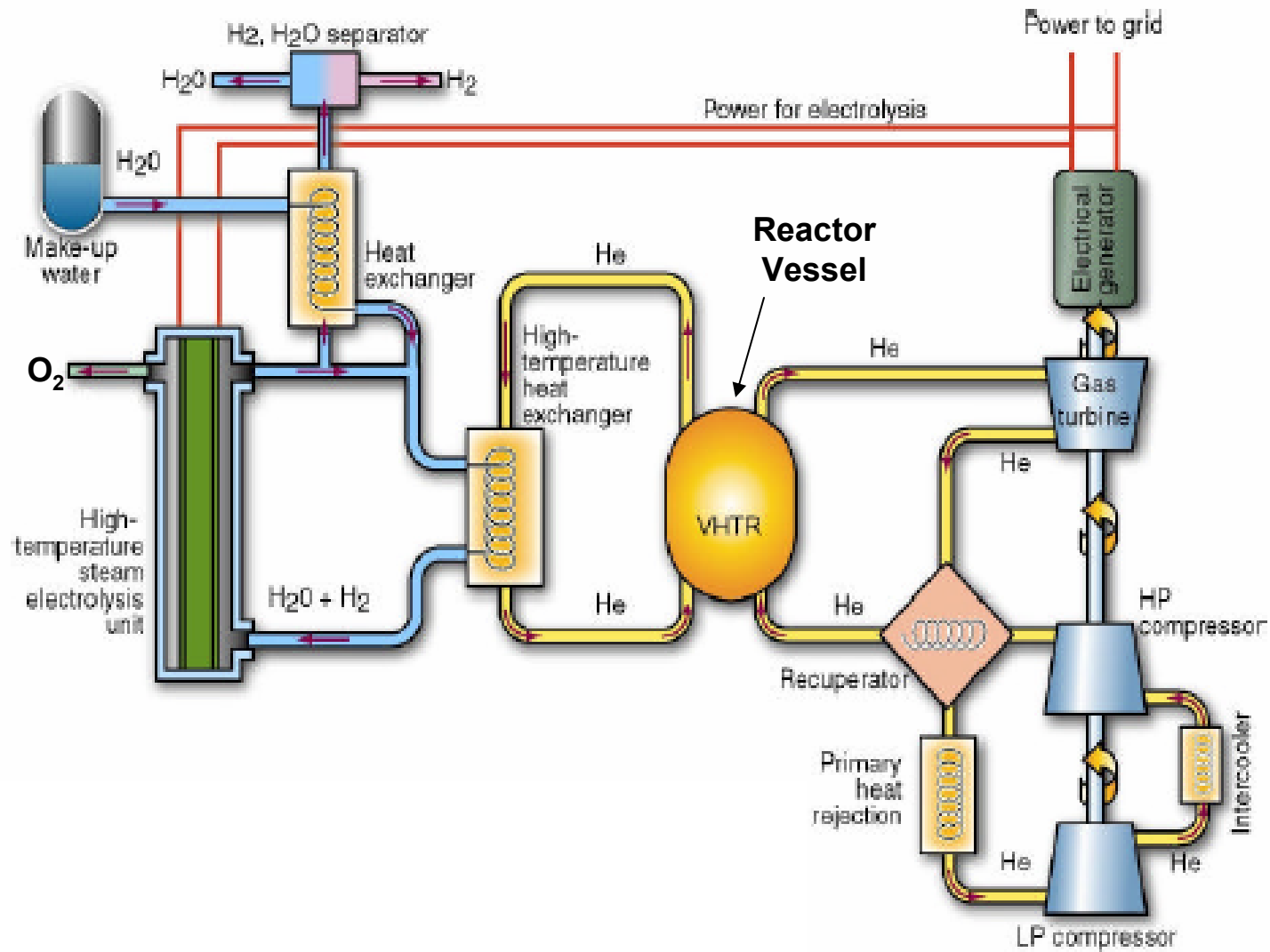
California Coast Power



Diablo Canyon
2200 MW
Power Plant

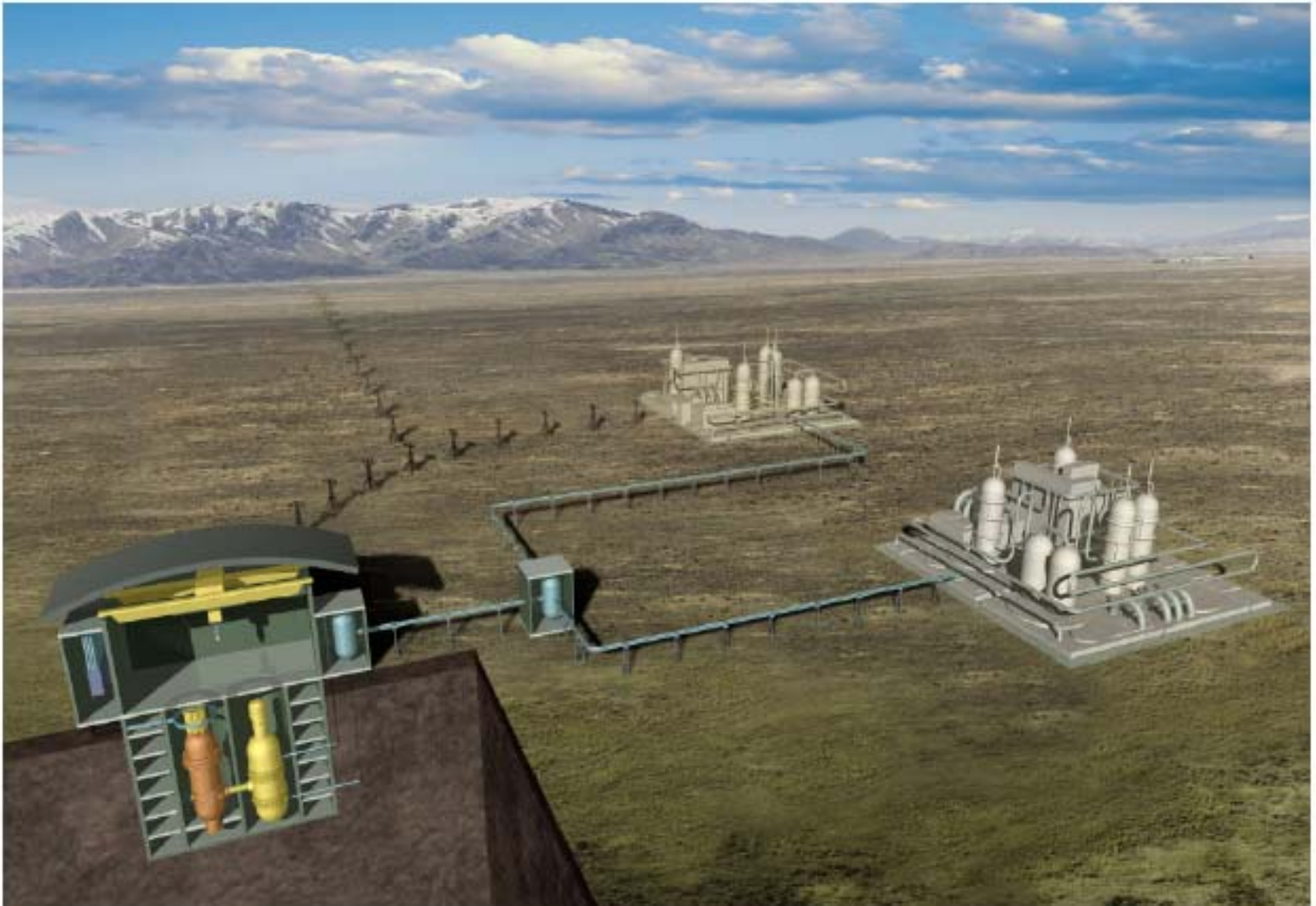
Wind Farm
Equivalent

Co-Production of Hydrogen and Electricity



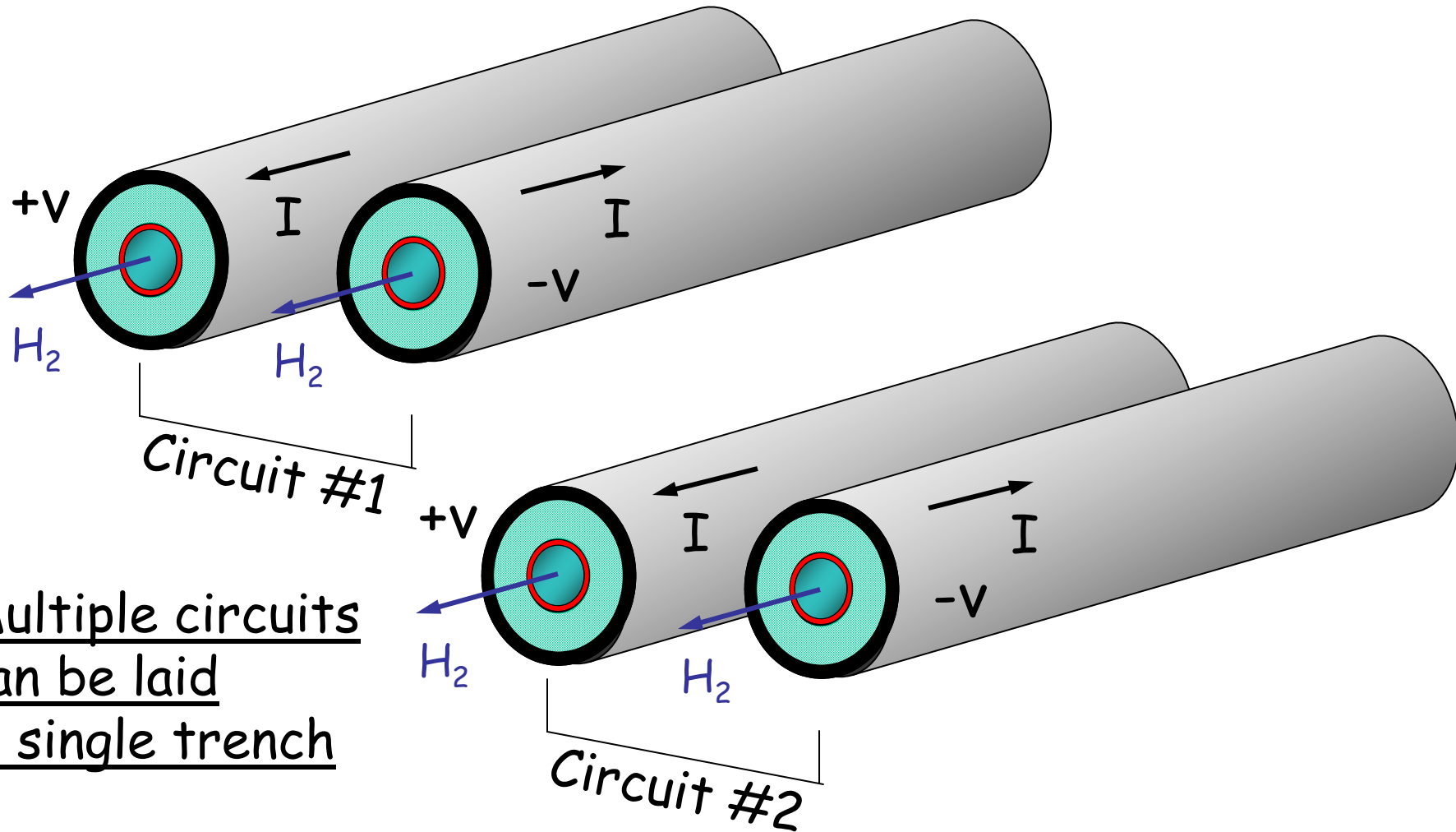
Source: INEL & General Atomics

Nuclear “Hydricity” Production Farm



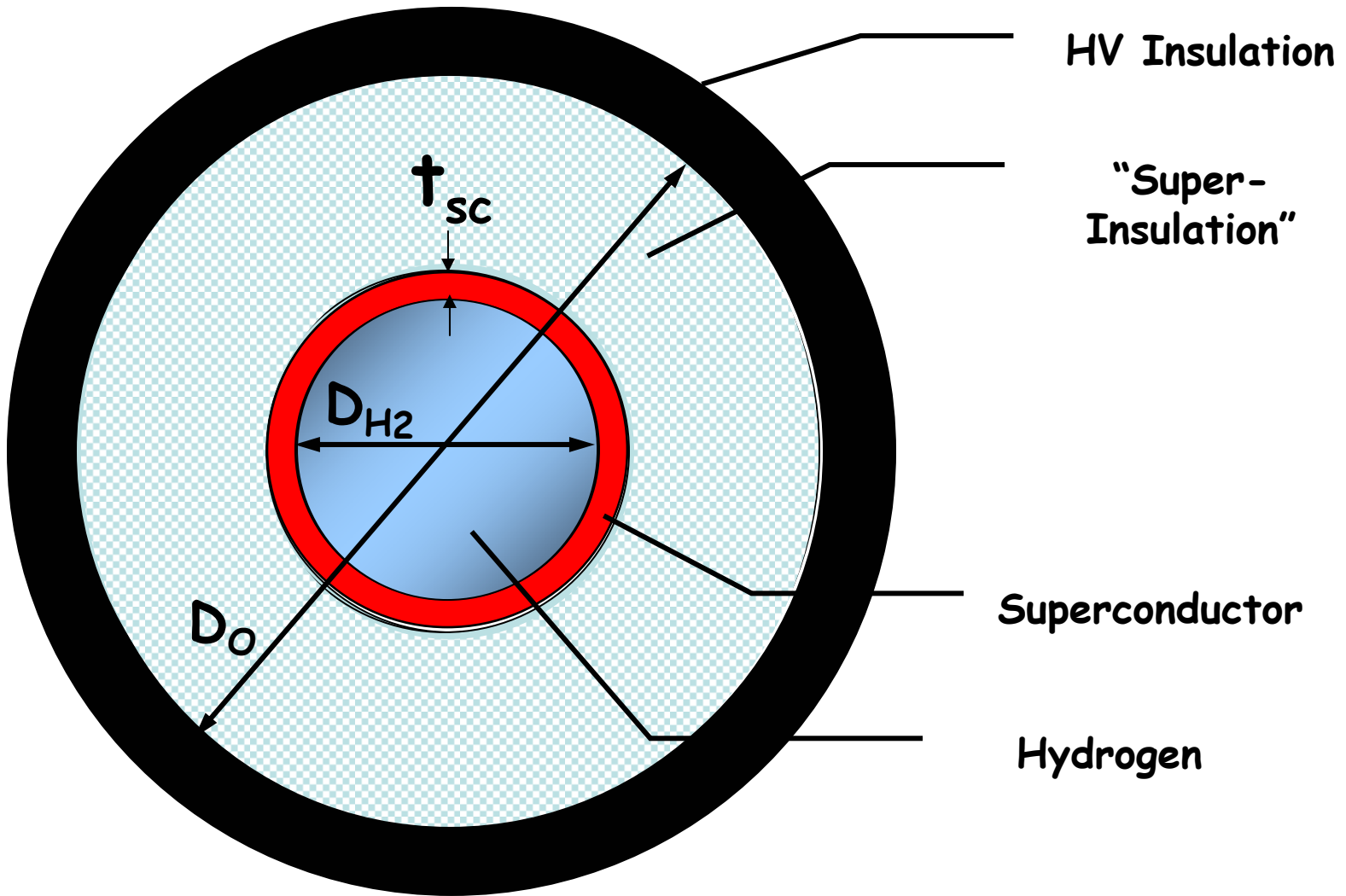
Source: General Atomics

“Hydricity” SuperCables



Multiple circuits
can be laid
in single trench

SuperCable Monopole



Electric & H₂ Power

Electricity

Power (MW)	Voltage (V)	Current (A)	Critical Current Density (A/cm ²)	Annular Wall Thickness (cm)
1000	+/- 5000	100,000	25,000	0.125

Hydrogen (LH₂, 20 K)

Power (MW)	Inner Pipe Diameter, D _{H2} (cm)	H ₂ Flow Rate (m/sec)	“Equivalent” Current Density (A/cm ²)
500	10	3.81	318

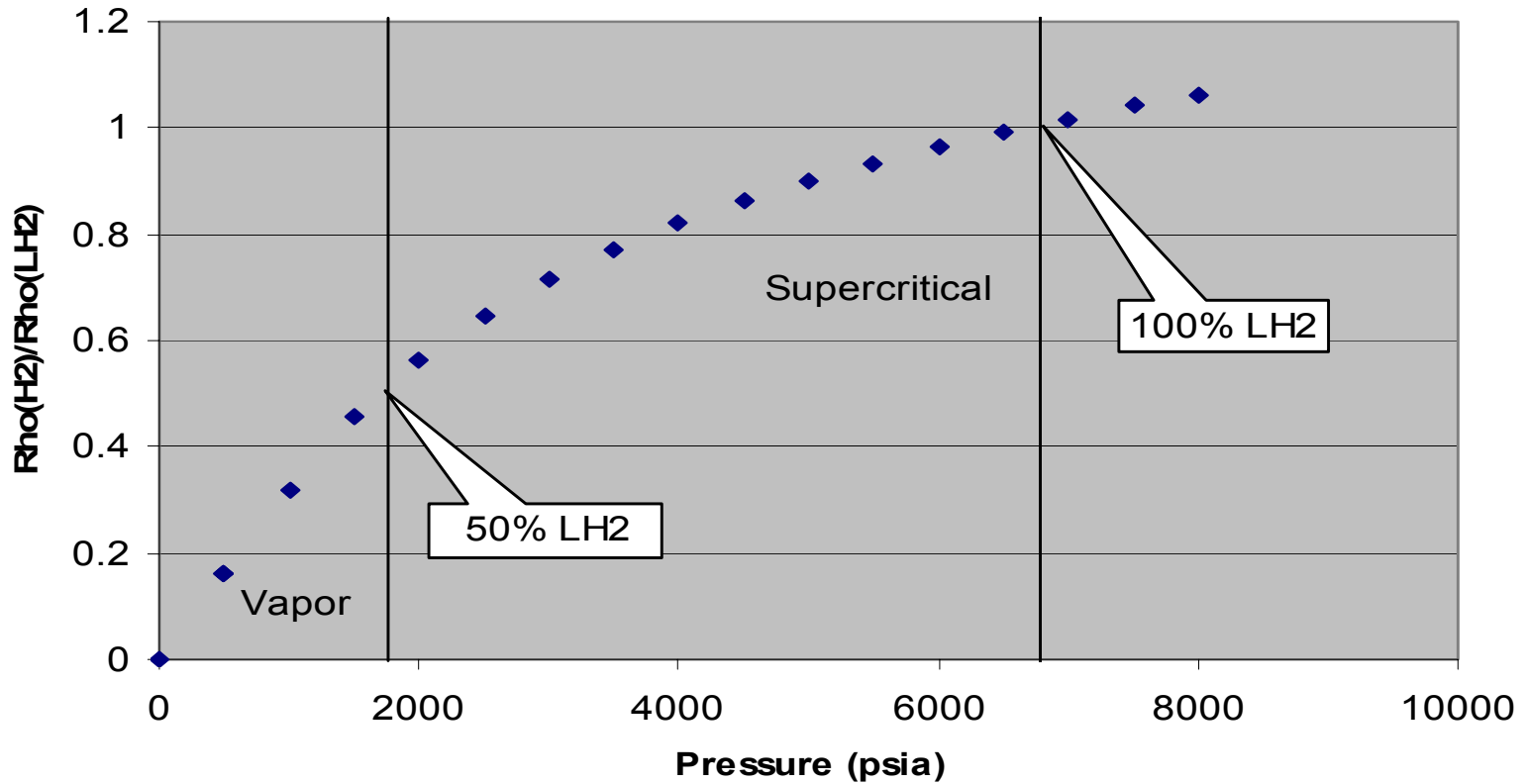
SuperCable H₂ Storage

<u><i>Some Storage Factoids</i></u>	Power (GW)	Storage (hrs)	Energy (GWh)
TVA Raccoon Mountain	1.6	20	32
Alabama CAES	1	20	20
Scaled ETM SMES	1	8	8

One Raccoon Mountain = 13,800 cubic meters of LH₂

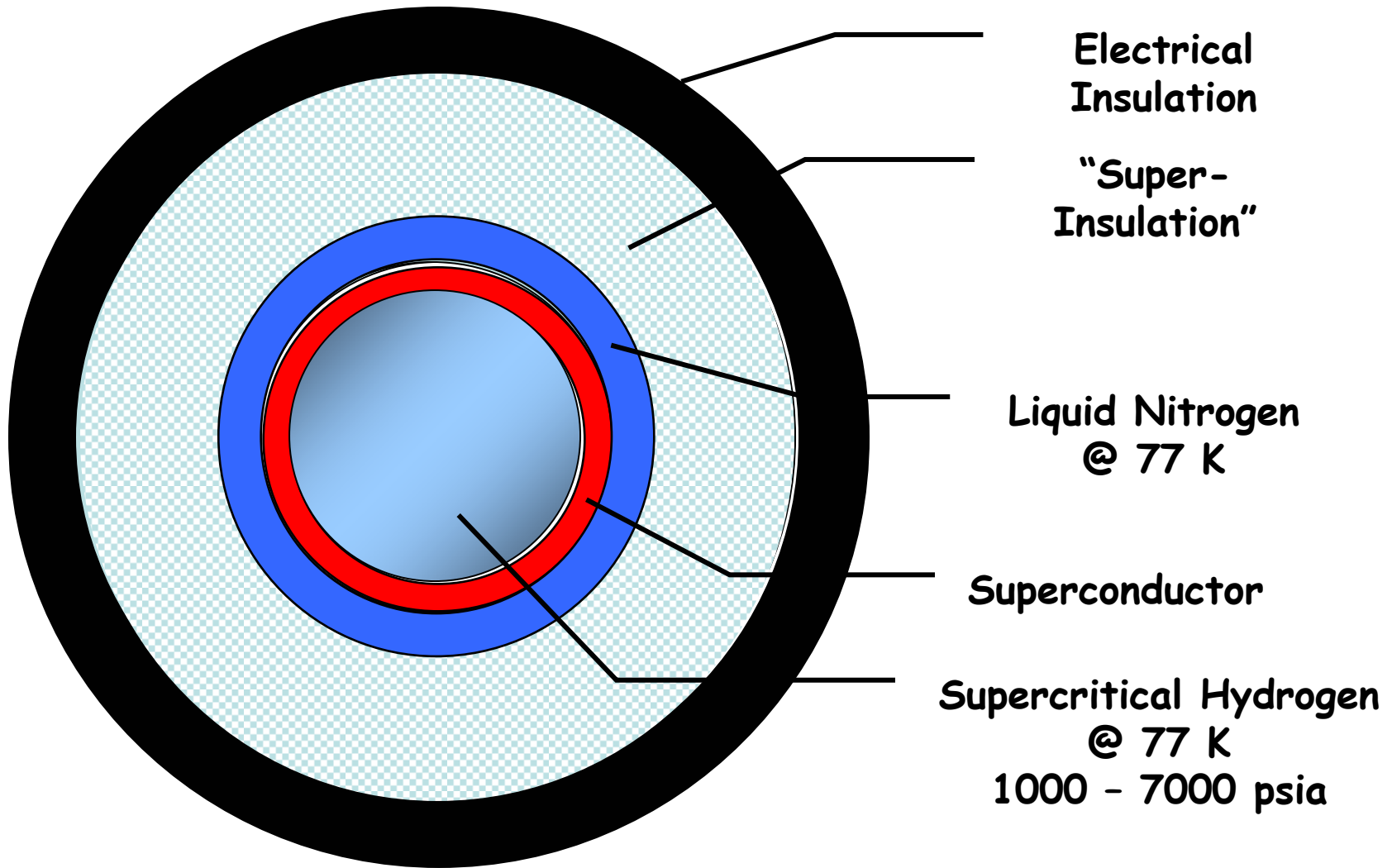
**LH₂ in 10 cm diameter, 250 mile bipolar SuperCable
= Raccoon Mountain**

Relative Density of H₂ as a Function of Pressure at 77 K wrt LH₂ at 1 atm

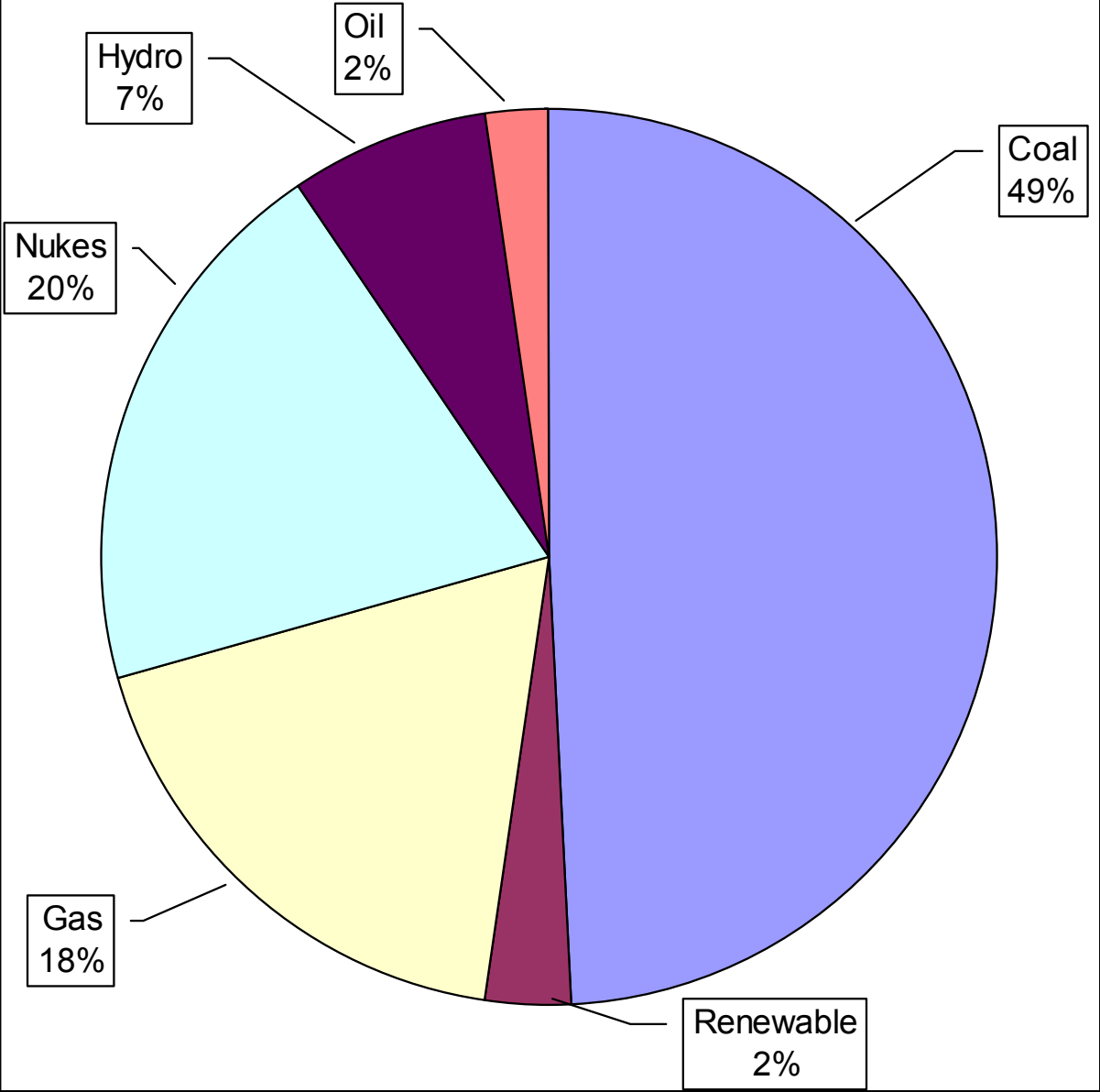


H₂ Gas at 77 K and 1850 psia has 50% of the energy content of liquid H₂ and 100% at 6800 psia

H₂ - Gas SuperCable



Electricity Generation - June 2004

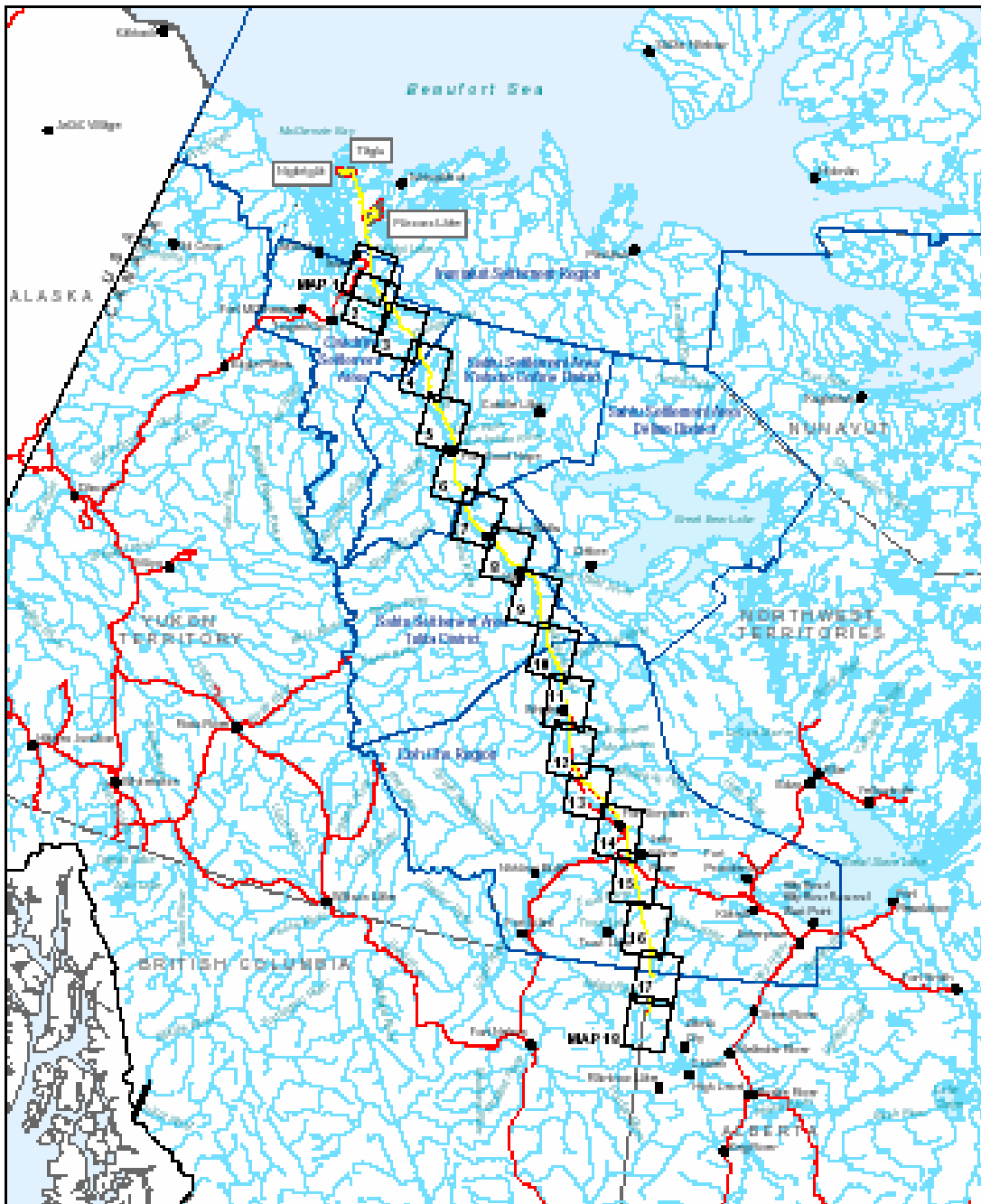




Al-Can Gas Pipeline Proposals

- PROPOSED**
- Alaska Natural Gas Transportation System
 - Trans-Alaska Gas System
 - Northern Pipeline Route
 - Central Pipeline Route
 - Mackenzie Valley Pipeline
 - Dempster Lateral
 - Alternative LNG Export Route
- EXISTING**
- Foothills Pipeline
 - PG&E Transmission – NW
 - Northern Border

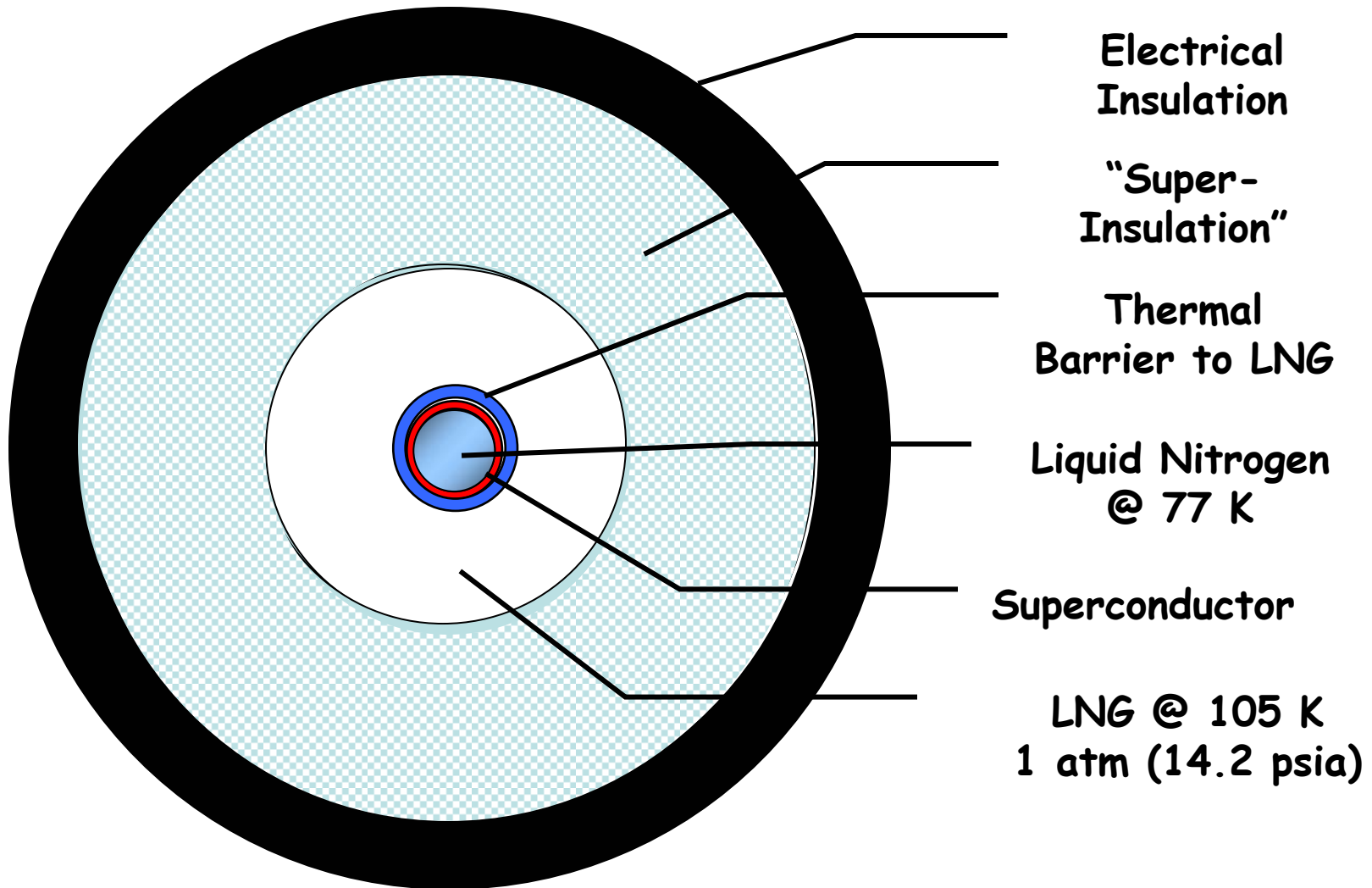
Source for graphic:
 T.J. Glauthier,
 Deputy Secretary,
 U.S. Department of Energy,
 "Testimony to the Senate
 Committee on Energy and
 Natural Resources"
 (September 14, 2000).



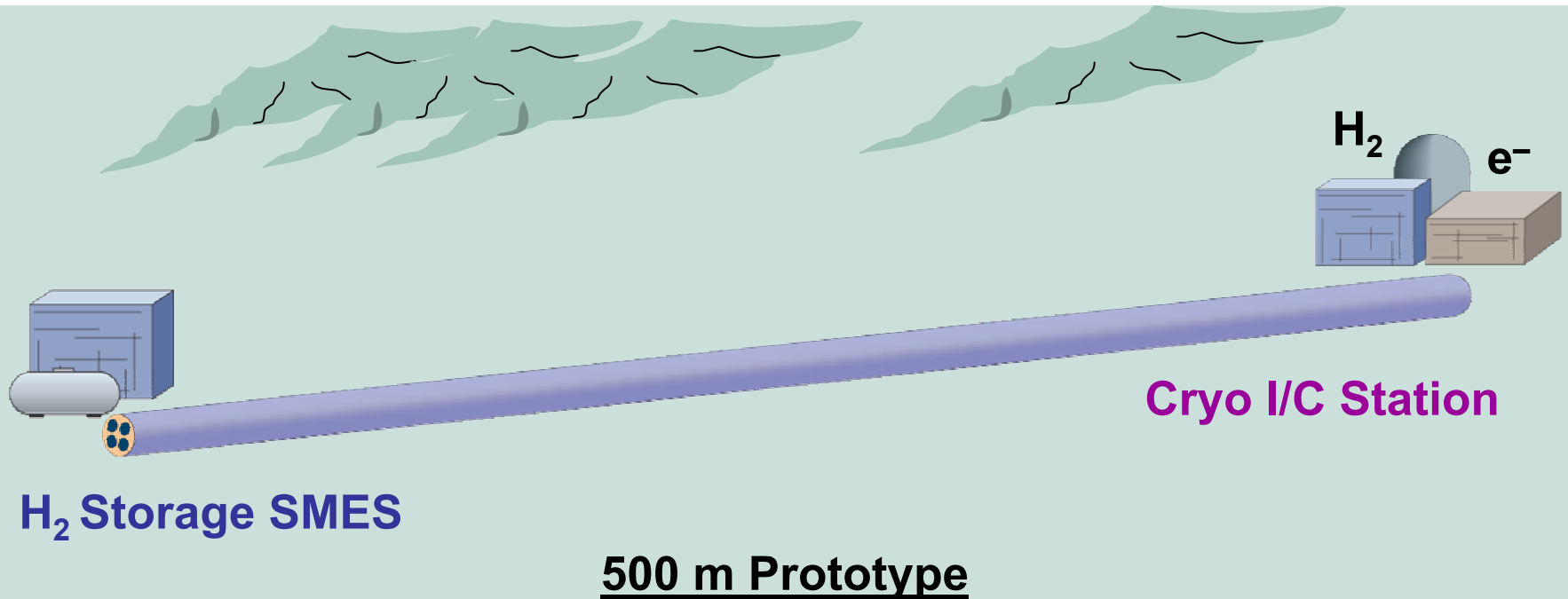
Mackenzie Valley Pipeline

1300 km
18 GW-thermal

LNG SuperCable

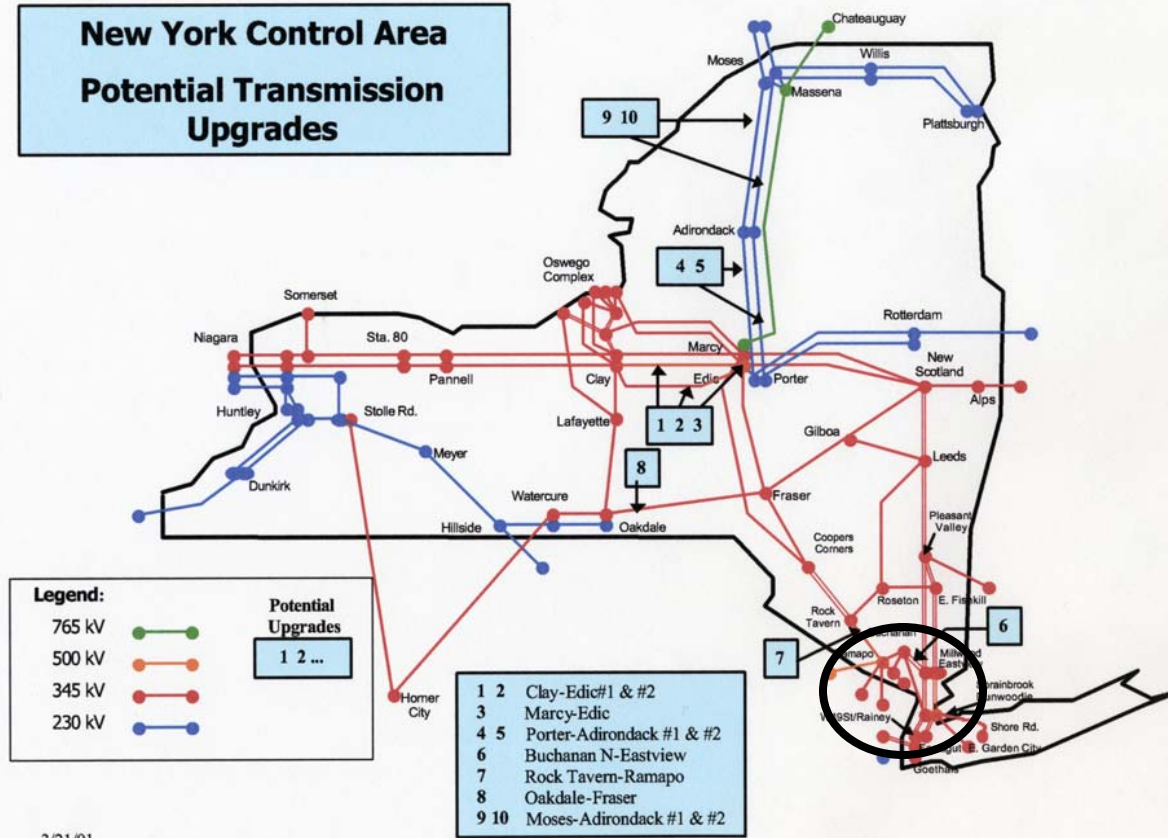


SuperCable Prototype Project



**“Appropriate National Laboratory”
2005-09**

Regional System Interconnections



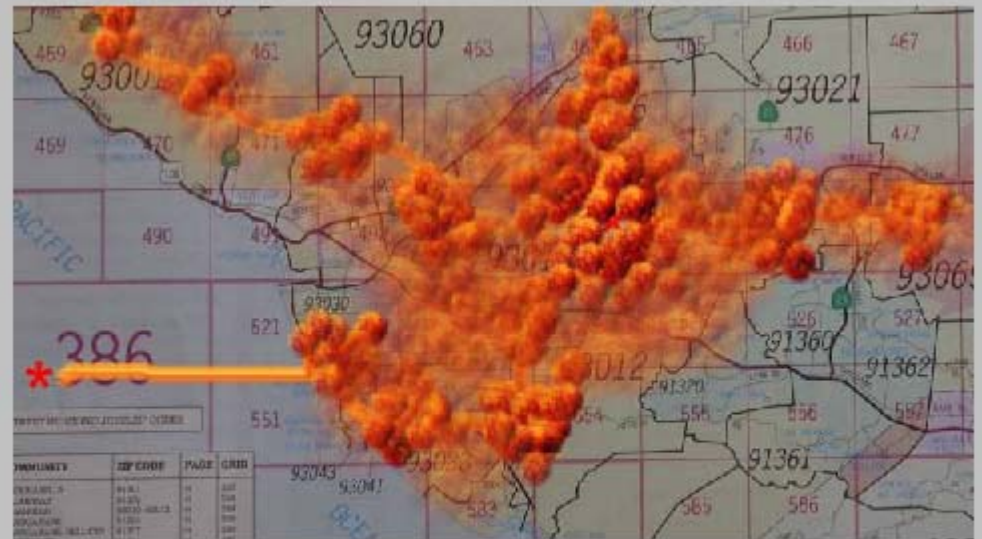
3/21/01

LNG Danger To Our Communities **Tim Riley Law .com** 805-984-2350

Consumer Protection Attorney Tim Riley Warns About **L**iquefied **N**atural **G**as

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Pipeline

Something Very Dangerous

“Underfoot” **PIPELINES A CONSTANT HAZARD!**