Environmental Effects of The Supergrid

- Potential
- Problems
- Solutions
- Blowback
- Grand Schemes

First, Limitations

- Nothing here about environmental effects of power generation
- My view: supergrid may be supplied by a mixture of facilities
- I am not an expert

What is the Supergrid?

- At its base, an electrical grid of superconducters, i.e.,
- Pipes carrying electricity
- And SOME liquid Hydrogen (or nitrogen?)
- At ground or underground level (?)

Implications of a H_2 pipeline

- Hydrogen leaks (spills, normal venting)
  - Flammable
  - But not very toxic
  - No disposal cost
  - At a river , lake, or wetland crossing?
  - In a forest (could start a fire)
  - Explosion hazard, particularly in underground sewer
    - (Oh, the humanity!)
- Large hydrogen leak (rupture)
  - Flammable
  - Toxic to workers only
  - Ice grenades? (???, s.g. = 0.07) (Cost of collecting and disposing)
  - At a river, lake, or wetland crossing?
  - Explosion **LESS** likely? Hmmm

Environmental Engineering (really)

- System of isolation valves and bypass conductors
- Place valves 2-300 m apart
- valve flanges capable of carrying full current at ambient temperature
- Remove leaking pipe section, replace with a new section, repair bad section later

Implication of a pipeline generally

- May disrupt wildlife migration routes
  - Not a great problem if undergrounded
  - Stay out of calving areas, though, undergrounded or not
- Unsightliness, especially if overground
- Electrical fire hazard if overground

Compromise solution?

- Trenching with some earth cover, some grate covers
- Grate covers near isolation valves
- Enough for adequate natural venting to minimize explosion hazard (???)

Location, location, location

- Interstate highway median strips?
  - Route established
  - land owned
  - risk to motorists
  - possible difficulty of access after accident
- Railroad beds
  - Little risk to motorists
  - Less land available in some places (access)
- Existing power corridors
  - Access, steepness, in places

Secondary Environmental Effects

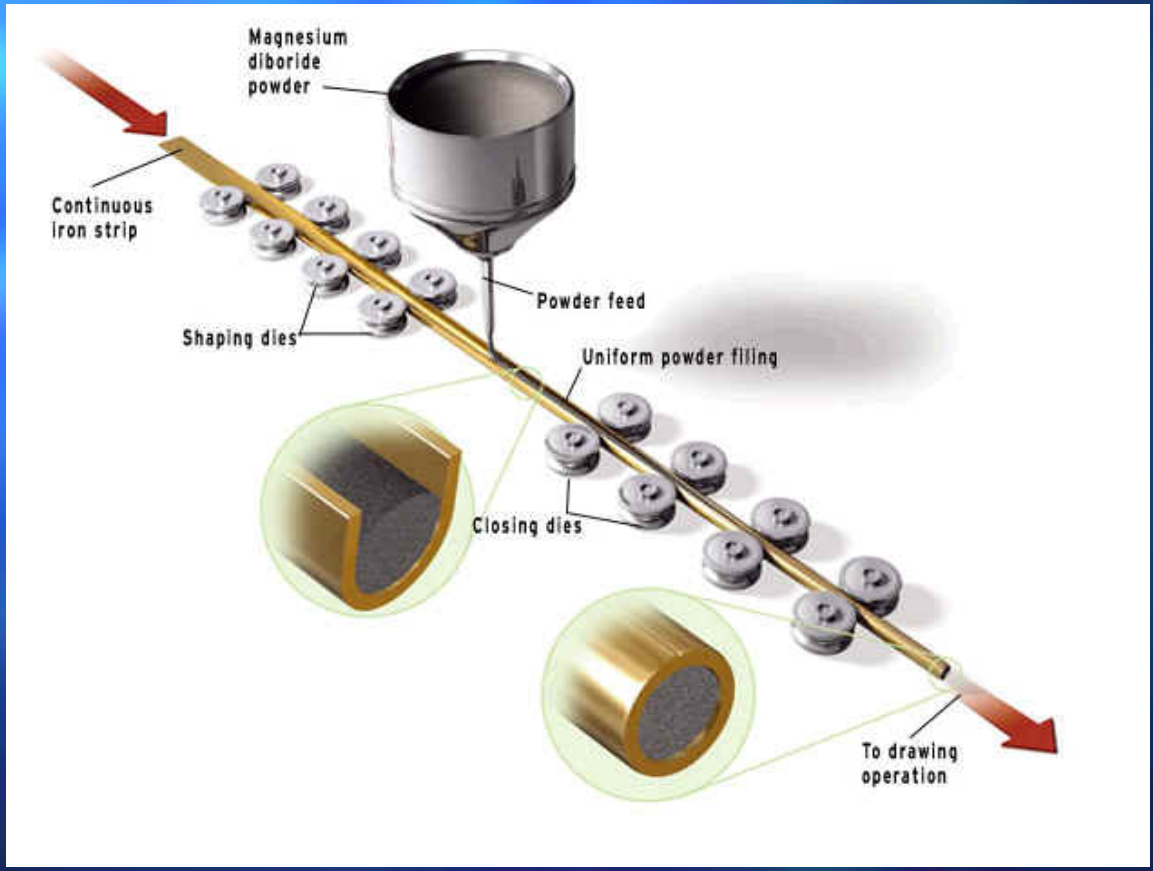
- Really really cheap O_2
  - (Liquid O_2 in separate conductor?)
- → More cost effective sewage treatment
- → Dispersed sewage treatment (household activated sludge)
- Better Industrial waste treatment

Effects of MgB_2

- Magnesium mining and production
  - (SF_6 and Cl_2)
- Boron mining and production
- Vs. Copper mining and smelting

Locations where boron production and processing are likely to influence the environment

Manufacturing Conductors



The stealth environmental effect?

Humidity???

- It **is** a greenhouse gas
- But it does condense out quickly
- Possible locally high humidity

On the positive side…

- Savings in generation from efficiency gain
- Millions of household equivalents
- Greenhouse gas emissions curtailment
  - Under Kyoto, sell emissions credits?

Effects of new generating opportunities

- The ability to ship electricity (and hydrogen??) over long distances with little loss has particular implications
- No more power plant SOx or NOx sources near cities
- Mine mouth generation
  - (pollution export)

How we generate energy
New ideas that may emerge

- Renewables (wind, geothermal, tidal, etc.)
- Dispersed storage (generation by car)
  - The 21st century pawnshop
- Dispersed electrolysis
- Dispersed supplies
  - The monopoly becomes a monopsony
- May influence grid route
  - From hydro site through wind farm to city
    - Shasta—Sacremento Valley—San Francisco

Even Wilder Ideas

- Ambient temperature (well, pretty chilly e.g., Arctic) superconducters?
- Untapped hydro potential in N. Canada
- Much more in Northern Russia

More wild ideas

- Undersea superconducters? (circumpolar)
- Bering Strait Dam (environmental effects)?
  - Tidal generation
  - (Visit the Diomede Spa and Resort)
- Alberta tar sands generation facility

Environmental Bottom Line

- We hope we're not blindsided, but…
- So far, effects appear positive on the balance sheet

To those still awake…

- Thanks for your attention
- Questions?