

FUTURE STUDIES

ALTERNATIVE ENERGY FUTURES

**A PRESENTATION on 11/18/06 FOR
MINNESOTA FUTURISTS**

by

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NATURAL GAS

- **Much higher, flatter, and longer reserves peak than oil.**
- **Could supply as much energy as oil has.**
- **But faster use could cause a gas crises in 20 to 30 years**
- **Problem - Politicalization**

NUCLEAR

- Could supply our energy needs well into the long-range future
- Problems:
 - ◆ **Long-term storage of wastes**
 - ◆ **Wastes could be used to make bombs**

HYDRO

- Could supply 5 to 15% of our energy needs
- Requires high capital investments for dams
- Creates downstream problems
- Creates good recreation lakes
- Recyclable water in rivers
- Floods lots of good land

REDUCING FUTURE OIL NEEDS

- **35% Savings: Conservation & more efficient appliances**
- **20% Savings: Wind**
- **15% Savings: Bio-power - (biomass gasification and methane generation)**
- **10% Savings: Distributed Generation**
- **10% Savings: Solar**
- **5% Savings: Geothermal Power**
- **5% Savings: Ocean Power - (wave power and tidal power)**

GLOBAL ENERGY TRENDS

■ Global Progress:

- ◆ Energy efficiency advances
- ◆ Starting to use more alternative energies
- ◆ More alternative energy R&D
- ◆ Less pollution per car

■ Global Regression:

- ◆ Over reliance on oil
- ◆ Oil usage growth
- ◆ Too little alternative energy R&D & usage
- ◆ CO² emissions
- ◆ Terrorist attacks on oil producers

GLOBAL ENERGY TRENDS: IMPACTS & CONSEQUENCES

■ Global Progress:

- ◆ Wealth, SOL, & QOL growth per person
- ◆ Increased health care
- ◆ Increased literacy
- ◆ Improved photosynthesis

■ Global Regression:

- ◆ Rich vs. poor - widening gap
- ◆ Pandemic's faster spread
- ◆ Slow post oil peak transition
- ◆ Slow hedging against a variety of futures

ETHANOL

- **Helps farmers**
- **Uses lots of water to produce**
- **Locally produced**
- **Negative environmental effect**
- **Research & development continues**
- **Autos: less efficient**

METHANOL

- US has current total annual production capacity of over 2.6 billion gallons and is produced from natural gas.
- Using methanol as our major transportation fuel requires greatly upping production.
- The biggest potential source of methanol in the U.S. is coal.
- Plants using coal to produce methanol are among the cleanest energy producers.
- By a simple reaction between coal and steam, a gas mixture called syn-gas (synthesis gas) is formed which is turned into methanol.
- This process does not release carbon dioxide into the atmosphere.

WIND POWER

- **Minnesota is a local producer**
- **USA needs to use more wind power**
- **Requires lots of land**
- **Negative scenic effect**
- **USA needs manufacturing capability**
- **Needs better power storage capability**

FUEL CELLS

- **Over-hyped**
- **Multiple usages**
- **Scalable**
- **Promising long-range future**
- **Requires hydrogen infrastructure**
- **Great substitute for small batteries**
- **Pollution free at point of use**

WAVE/TIDAL POWER

- **Lots of R&D being conducted and needs more**
- **Environmental concerns**
- **Great for coastal areas**
- **Non-polluting**
- **Totally renewable energy source**
- **USA has lots of shoreline**
- **USA good potential exporter of equipment**

SOLAR POWER

- Potentially a major source of clean energy
- Need more R&D to create high efficiency and lower cost solar cells
- Two production methods: heat and direct electric
- Requires large surface areas, plentiful sun, and good storage capacity
- Current solar cells are made of toxic materials
- Potential is to make the solar cells from bio materials
- Need longer lasting solar cells
- Very long-range: Beaming energy from space

GEO-THERMAL

- **Costly and not evenly distributed globally**
- **Good potential as a renewable resource**
- **Best areas for geo-thermal power are highly unstable; earthquake and volcanic**
- **Requires extensive R&D to be competitive**
- **Minnesota potential**