

Petroleum & Chemical Industries



- 7% and 5% of total U.S. energy consumption respectively.
- Chemicals spend \$48 billion per year on energy. \$9.8 billion for petroleum because they burn their own byproducts.
- NHES can be used in heat exchangers and distillation columns.
- Replacing petroleum byproducts means finding other ways to deal with them.

Alternative Transportation Fuels

- Transportation is 28% of total U.S. energy use.
- NHES can be used in the production of syngas, biodiesel, ethanol and hydrogen fuels.



- High Temperature Electrolysis means NHES is a very efficient way to create hydrogen.
- Still less efficient thermal energy use than producing gasoline.
- Possibly no economic or environmental benefit if process is not carefully controlled.

Underwater Oil Platforms

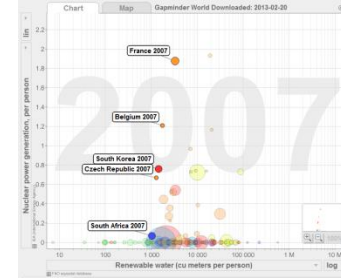


- A Brazilian company is developing them for use by 2020.
- Nuclear power makes the most sense for these platforms.
- NHES could be used to heat the lines sending oil and gas to land.
- Not always efficient, especially in long pipelines.
- The amount of heat needed also varies widely

$$Q_r = \frac{T_i - T_o}{\frac{1}{2\pi r_i L h_r} + \frac{\ln(r_1/r_i)}{2\pi k_1 L} + \frac{\ln(r_2/r_1)}{2\pi k_2 L} + \frac{\ln(r_o/r_2)}{2\pi k_3 L} + \frac{1}{2\pi r_o L h_o}}$$

Water Purification

- Pure water is a byproduct of other NHES options.
- About 1.05 gal/kW hr of electricity generated.
- Significant water supply improvement in some
- South Africa can increase renewable fresh water by 3%.
- Few countries benefit.
- Some have plenty of fresh water.
- Many do not have nuclear power plants.



Thermal Energy Storage

- Removes and stores thermal energy before it goes through the turbine in the reactor.
- Can decrease and increase electrical output without changing thermal output.
- High efficiency energy storage.
- Can transfer heat to another system or remove heated water from system.
- Can supplement less reliable renewable sources like wind and solar.
- Long storage time loses efficiency.

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