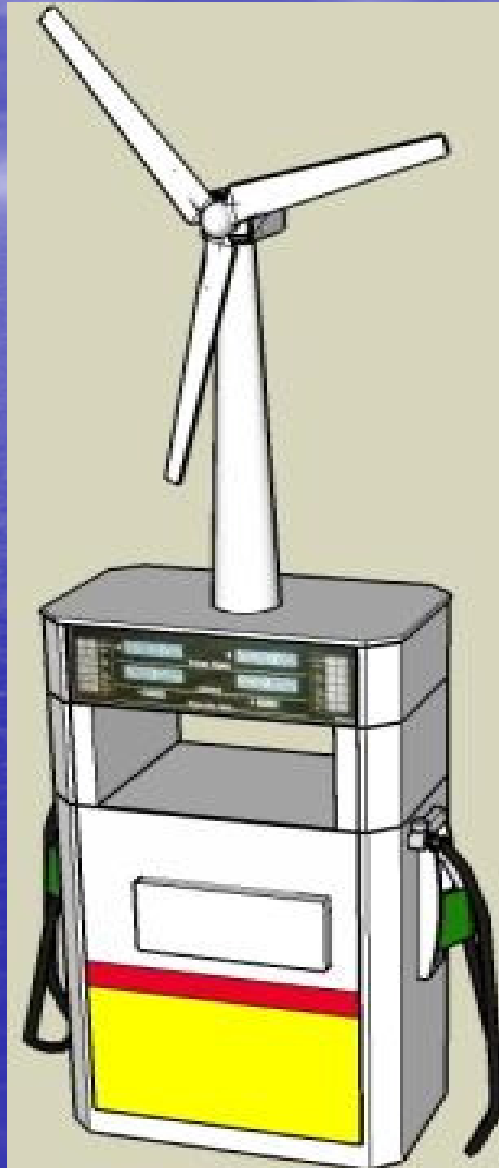


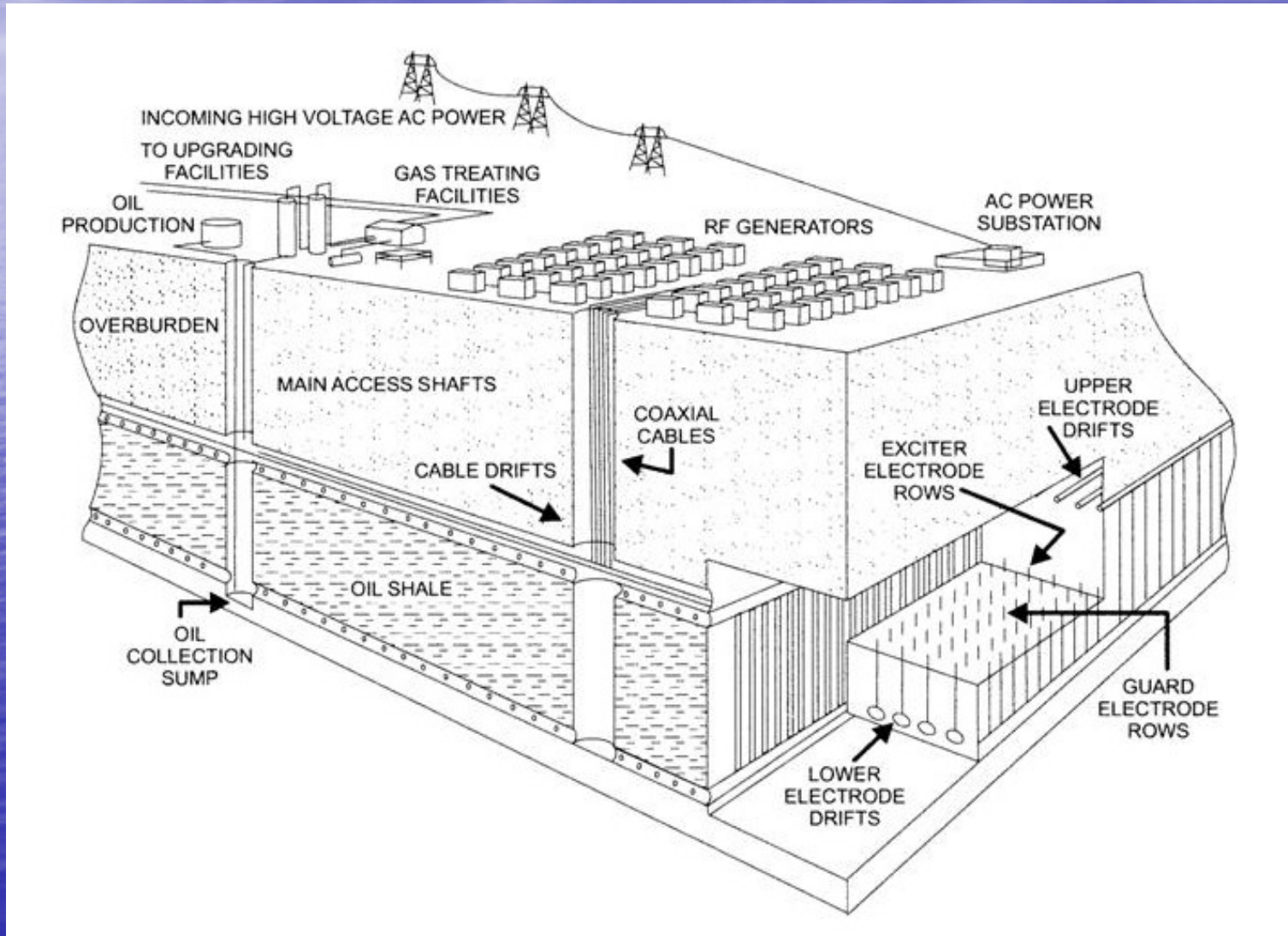


Wind Power Storage to Produce Wind Clean Fuels and to Stabilize the Grid

PyroPhase, Inc



Bechtel/Parsons 100,000 bbl/d Study



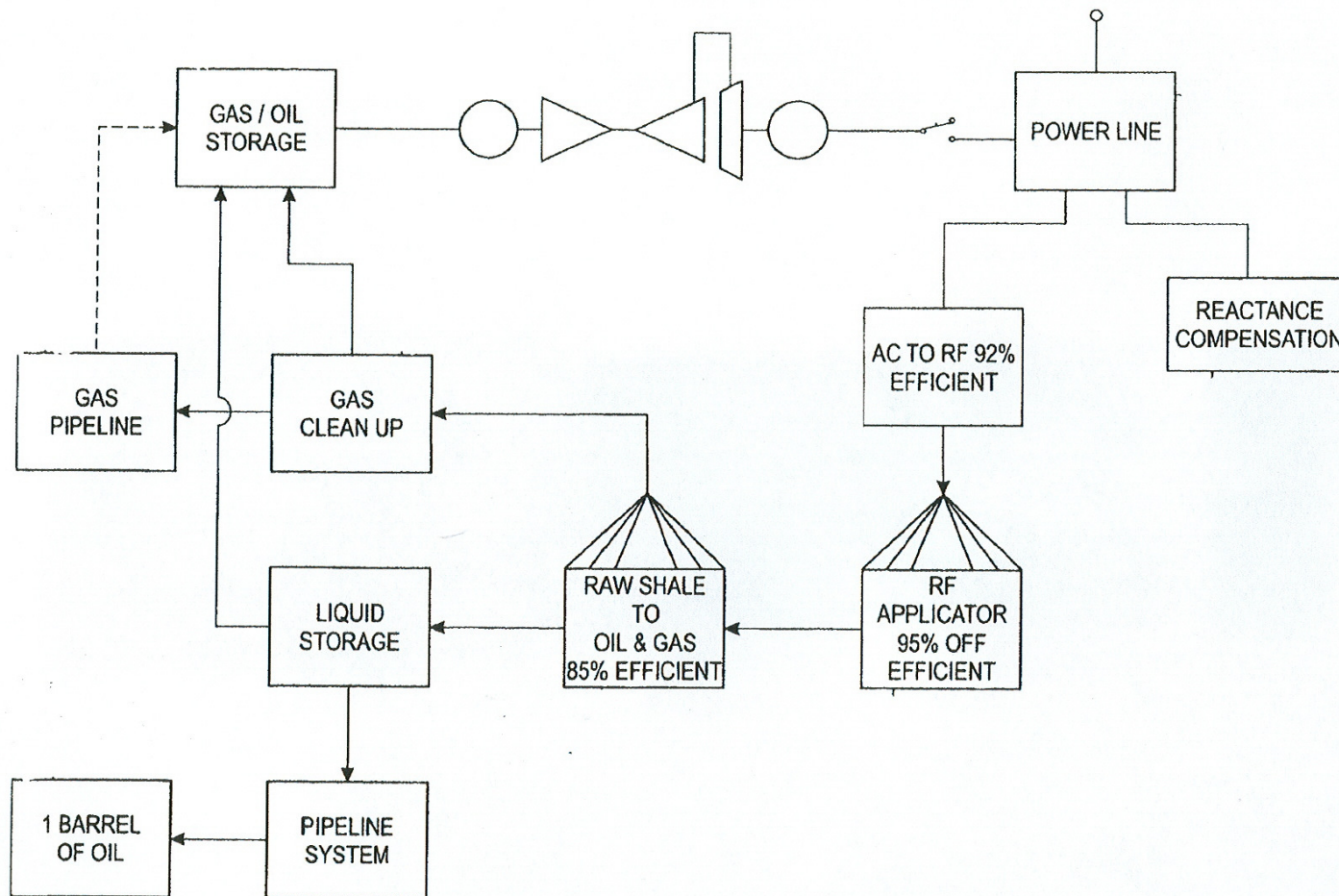
1. Energy Storage To Accommodate Varying Wind

- Adding generator capacity
 - increases input capacity
 - Maintains average power input as wind varies
 - Maintains RF plant production capacity
 - Increases only part of investment cost

Output

- Produces wind-clean fuel
- Fuel Energy content 6 times input wind power for oil shale, or 3 times for combined cycle power plants
- Fuel, especially gas can power combined cycle plant
- Produce power anywhere

Power Flow Diagram



2. Stabilize Electric Grid

- Adjust input power instantaneously
 - Track variations in wind
 - Track variations in grid load
 - Stabilize over periods up to one hour
- Replaces need for spinning power
 - Grid operator saves cost, fuel, CO₂
 - Grid can transmit more power
 - RF plant gets paid for regulation
- Non-spinning sources for longer times

Economics

- Added RF generator cost is fraction of total: \$6/bbl for oil shale
- Wind-Related Income:
 - Proposed \$10/ton CO₂ tax credit
 - \$1.48/bbl for oil shale
 - Income from grid regulation services
 - Lower price for off-peak and wind power
 - Other possible benefits

Environmental Benefits

- Grid stabilization
 - Makes more wind power viable
- Wind-clean fuel substantially reduces CO₂ emissions
- Ecosystem:
 - Avoids plant life and surface damage
 - Installing electrodes from underground drifts
- Little water needed
- Sustainable over many generations
- In-situ installation of impermeable barriers

Expected RF Oil Shale Benefits For 10 Million Bbl/Day Industry

- Economic
 - with oil at \$35/bbl (tar sands)
 - with oil at \$45/bbl (oil shale)
- Generates \$180 Billion /Yr Value at \$50/Bbl
 - **3 times the US trade deficit of \$56 billion per year**
- Royalty and Tax Revenue At \$70 Billion/Yr
 - **Improves government budget deficit**
- Creates Jobs For 200,000 Workers
 - per Bechtel report

Strategic Advantages

- Uses existing oil energy infrastructure
 - no need to redesign engines
- Wind Clean Fuel For Vehicles
 - Saves 500 Million Tons Of CO₂ Per Year
 - [33% Savings From Well To Tailpipe]
- Provides half of US oil needs for hundreds of years
- Frees Our Foreign Policy From Oil Dependence.

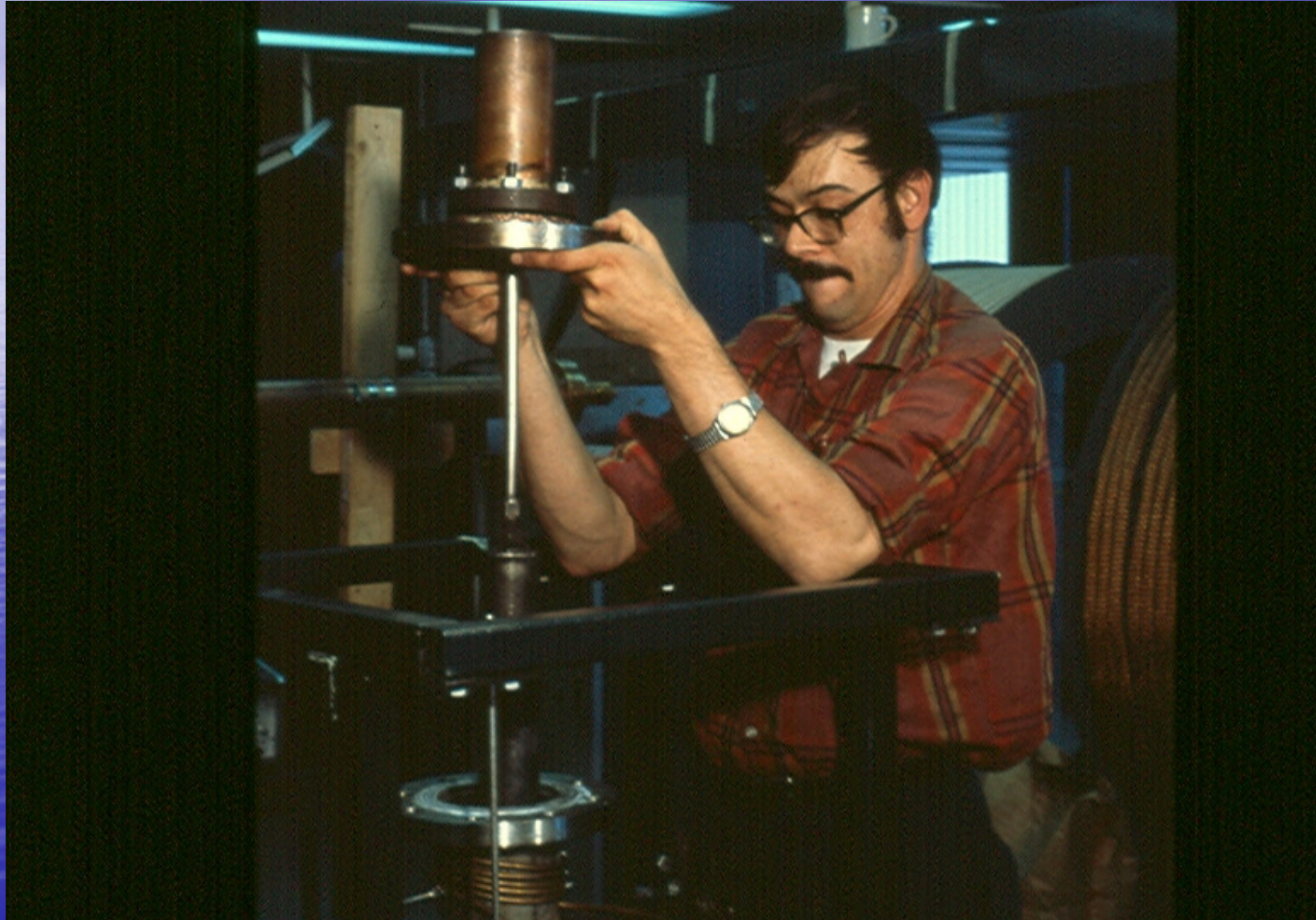
3. Review of RF Technology



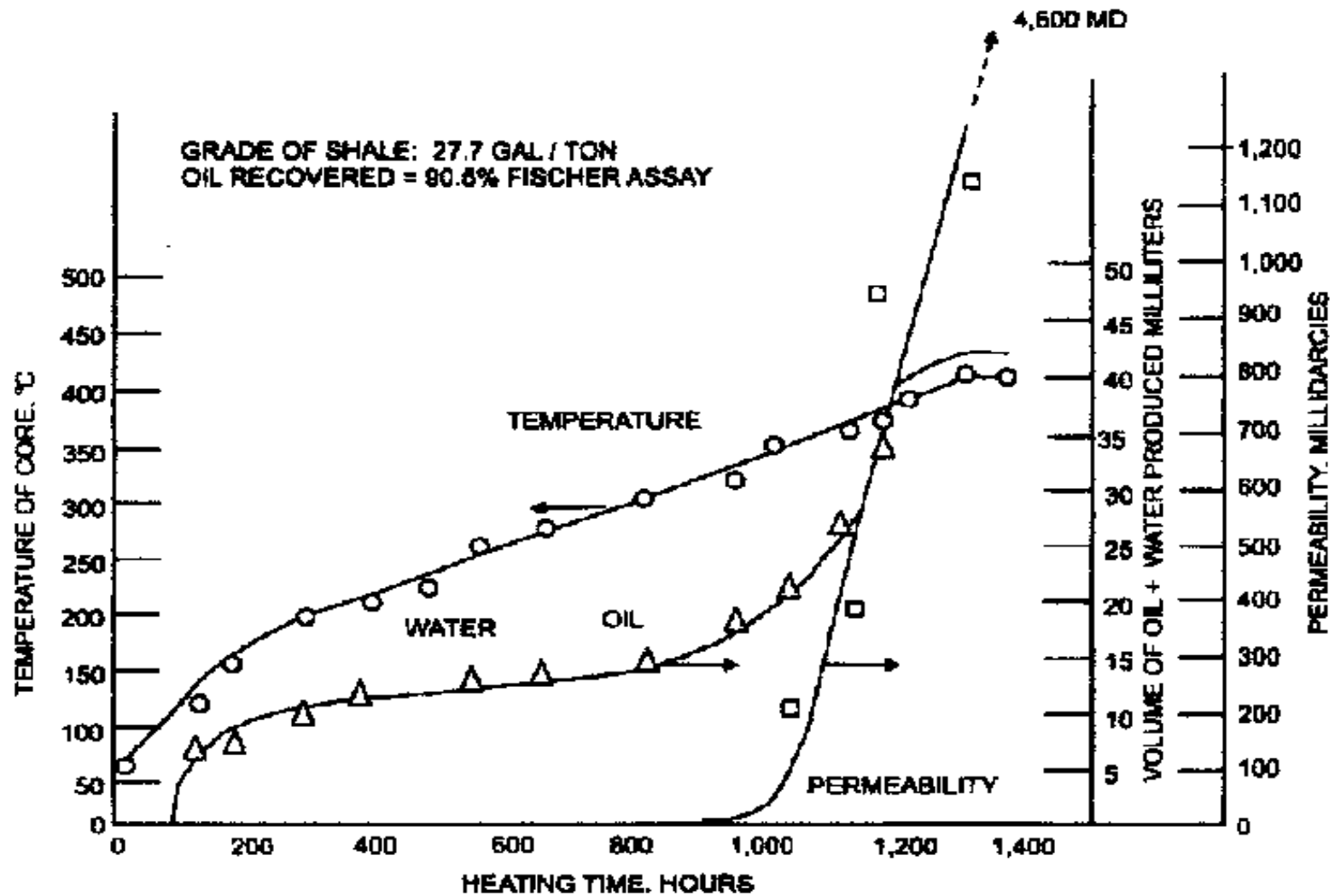
Oil Shale Lab – the Process Works

- Lab Reactor – Measured dielectric properties
- Demonstrated oil production at various temperatures
- Measured permeability before and during heating
- Simulation of heating

Inserting Shale Into Reactor



Lab Reactor Results



Shale Pilot Heating Site



Tar Sand Pilot



Asphalt Ridge Utah

Sound Technology

- IITRI reports to DOE
- Our publications and patents
- DOE studies verifying RF technology
 - Jarvis & Ingemar– Laramie ETC
 - Mallon & Burnham – LLNL
- Bechtel & Parsons economic analysis
- In-situ decontamination

Recent Work Done by PyroPhase

- Definitive engineering study
- Simulation to guide design
- Work Plans developed:
 - Optimize via pilots
 - Scale up to commercial module
- Asphalt Ridge site for tests
- Mining/economic study updated

Conclusions

- Urgent: Resolve Foreign Oil and Greenhouse Gas Problems Soon
- Massive Wind Power Storage can be Implemented Relatively Quickly