

ROCKY MOUNTAIN OILFIELD TESTING CENTER



RMOTC



The Rocky Mountain Oilfield Testing Center (RMOTC) is an operating oil field focusing on environmentally balanced energy technologies and alternatives.

RMOTC is the only Federally owned and operated energy technology testing and demonstration field in the nation.



RMOTC Location



Administration, Project Management and Engineering Offices are in Casper, Wyoming

Operations and Testing Facilities are about 30 miles north of Casper within the NPR-3.



RMOTC Offers Solutions



- Located within the Naval Petroleum Reserve No. 3 (NPR-3), RMOTC can:
 - Explore environmentally balanced solutions to the nation's energy issues
 - Develop, demonstrate, and evaluate a variety of energy related technologies
 - Collaborate with top professionals in the energy, environmental technology, and engineering fields
 - Share industry knowledge by reports, journal articles, and presentations



Fossil & Renewable Energy Partnership



- Current conditions and trends point to the utility of RE & FE technology synthesis
 - Energy Demand Increasing
 - New O&G Discoveries Down
 - 67% of Oil is Unrecoverable
 - R&D Investment is Shrinking
 - Economics Drives Production
 - Electricity a Key Economic Factor



RE & FE Trends



- Major technology advances made recently
 - Fossil Energy Extraction
 - Electricity from Renewable Sources
- Advances in RE & FE technologies have so far proceeded independently



RE & FE Opportunities



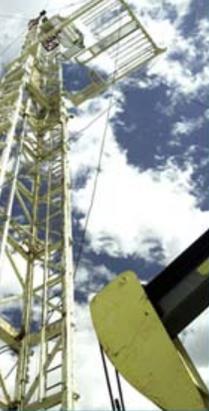
- Trends and conditions point to opportunities to increase FE extraction efficiencies from the synthesis of FE & RE technologies
 - RE Can Improve Economics
 - RE Can Reduce Environmental Impact
- These factors combined, could result in O&G development in remote areas that historically were both uneconomic and undesirable.



Path Forward



- Achieving this synthesis will require collaboration from many different areas
 - Industry
 - Academia
 - Government
- Bringing these resources to bear on the issues is the objective of the Rocky Mountain Fossil and Renewable Energy Partnership



Path Forward (Cont.)



- Field scale testing and demonstration is required before acceptance by industry
 - RMOTC Site for Test & Demonstration
 - Cost & Risk Mitigated
 - DOE Oil Field Infrastructure
 - Cooperative Research and Development Agreements (CRADA) Cost Sharing



Example (Energy Efficiency)



- Motor Efficiency Study Collaboration with EERE, State of Wyoming & RMOTC
 - Phase I: 20 electric motors and meters installed on field pumping units to monitor power usage
 - Phase II: Electric motor replacement study
 - 471 motors Identified as economically feasible candidates for high efficiency motor replacement



Example (Adjust-a-Pump)



- Beam pumping unit installed at RMOTC to test cost efficient production, including from renewable energy sources
 - Energy Efficient Gear Box and Small DC Motor
 - Wind Power Supplemented by Grid Power
 - Wind Power or Solar Power Available
 - Allows for Off-Grid, Remote, Applications
 - Energy Efficient Design Reduces Power Needs
 - 48% Less Power Required
 - Lower Reactive Power/Higher Power Factor



Example (Wind Power)



- Wind power to be demonstrated as an alternative source of power for O&G fields.
 - Collaboration with NREL & Industry
 - Install Wind Farm to Power Gas Plant
 - Two Phase Project
 - Start Date FY06



Example (Wind Power)



- Project is divided into 2 phases and provides alternative power for the operation of the field's gas plant
 - Phase 1: 350KW Propane Fired Generator
 - Phase 2: 1.5MW Wind Generator
 - Backup Power for Gas Plant
 - Excess Used for Field Operations
 - Installation of MET Tower FY06
 - Gather Data for Wind Generator
 - 1 Year's Data Needed for Design



Example (Solar Power)



- Solar energy used to power intermittently operated transfer pump
- Demonstrates the feasibility of using solar power in remote locations for transfer of fluid
 - Collaboration with NREL & RMOTC
 - Install Solar Panel & $\frac{3}{4}$ HP Pump on a Production Testing Facility
 - Start Date: September 2004



Example (Hot Water)



- Thermal energy from hot, produced water used beneficially rather than wasted atmosphere
 - Project contemplated as a collaboration between RMOTC & Industry
 - Captures “waste” heat from produced water and converts it to electricity
 - 40K BBLs/Day 200°F Water Released



Example (Hot Water)

- Concept uses temperature differences to generate electricity directly
 - Low Efficiency ~ 4%
 - Large Volumes of Water Compensate
 - 250KW @ 45K BBLs/Day
 - 100°F Temperature Differential
 - Very Small Gains in Efficiency Result in Large Gains in Power Available



Example (Hot Dry Rock)



- By deepening existing wells, large quantities of thermal energy is made available from the hot rock to the surface
 - Project Contemplated as a Collaboration Between RMOTC, DOE & Industry
 - High Temperature Gradient
 - Shallow Basement Rock – 7,000 ft
 - Potentially Taps Vast Quantities of Thermal Energy Available Below O&G Wells
 - High Demand for Field Electrical Use



Example (Hot Dry Rock)



- Existing Infrastructure Supports Project
 - 300 °F Rock is Expected at 8,650 Feet
 - New Drilling Rig Capabilities
 - Recent 3-D Seismic Indicates Deep Faults
 - Existing Surface Discharge Permits
 - Existing Well Produce 290,000 lbs/hr @ 205 °F
 - Water Treatment Facilities



Examples (Solar/Thermal)



- Solar augmented geothermal energy could be used to both store heat energy generated through solar power and to enhance oil production in older O&G fields.
 - Project Proposed as a Collaboration Between RMOTC & Industry
 - Produced Water Heated by Direct Solar and Injected into Drained O&G Reservoirs
 - Energy Generated by Solar is Stored
 - Heated Water Stimulates Oil Production



Examples (Solar/Thermal)

- Project is at a conceptual level
- Multiple products from a single industrial installation with little environmental impact
 - Water from O&G Fields Heated by Solar
 - Heated Water is Injected into Reservoir
 - Heated Water Enhances Production
 - Thermal Energy is Stored
 - Hot Water Available for Power Generation
 - Brine Available for Hydrogen Generation



Contact



- Rocky Mountain Oilfield Testing Center
907 N. Poplar, Suite 150
Casper, WY 82601
- Phone: 888.599.2200
- Fax: 307.233.4800
- Email: info@rmotc.doe.gov
- Internet: www.rmotc.com

