OREGON INSTITUTE OF TECHNOLOGY

Oregon Renewable Energy Center (OREC) and Geo-Heat Center (GHC)

Promoting Renewable Energy use in Oregon through Education, Technical Assistance, and Applied Research!

The Oregon Renewable Energy Center (OREC) is the leader in the development and application of renewable energy systems in the Pacific Northwest. The Center conducts applied research, provides education and technical assistance, and works with industry and electric utilities in Oregon and the region to make renewable energy the energy of choice for the future of the nation. The Geo-Heat Center (GHC) is a national center for technical assistance in the low temperature applications of geothermal energy typical for the small farmer, rancher or home owner. Some examples of the work at OREC and GHC are listed below. Both OREC and GHC have a history of support from the US Department of Energy.

1. Leadership in Energy Conservation and Efficiency

Energy Efficient Homes

- OREC staff and students designed and built the data acquisition and controls system to monitor the operating energy systems for two Net Zero energy homes in Oregon, the Rose House (an 800 ft^2 "green" cottage) and the Cannon Beach Cottage (a 2,268 ft^2 custom home).
- The Rose House is one of Oregon Department of Energy's (ODOE) demonstration homes in Portland, Oregon. The Cannon Beach cottage has won the National Association of Home Builder's 2005 "National Green Builder of the Year" award.

The Rose House

Waste Heat Recovery

- OREC staff and students designed and built a system with bi-facial solar cells on a parabolic solar concentrator.
- The system demonstrated 80-90% recovery of solar energy that is rejected from the solar cell and can be used in a heating process.
- The system also improved the electrical efficiency of the solar cells by lowering the cell temperature.

Students testing the bi-facial solar cell parabolic concentrator system

2. Leadership in Future Transportation

OREC's Fuel Cell Car

- OREC's staff and students built a single person fuel cell powered car. This system utilizes a Proton Exchange Membrane Ballard 1.2 KW Hydrogen fuel cell as its sole power source that is capable of driving the 280 pound vehicle at 55 MPH.
- This prototype car represents the first step in the development of an entirely self-contained fuel cell powered vehicle of tomorrow that will run clean, efficient, and virtually silent.

OREC's Fuel Cell Car

OREC's Hybrid Kit Car

- OREC's staff and students have entered hybrid technology by creating a hybrid vehicle conversion kit as a commercial package in much the way that kit airplanes are sold today.
- The prototype hybrid vehicle converted a 1970 Datsun station wagon. The hybrid power-train is a single cylinder 9.5 horsepower air cooled diesel engine that utilized a drive belt to spin a generator that charges a set of eight truck batteries which in-turn power the vehicle.

Students with OREC's Hybrid Kit Car

3. Leadership in Renewable Energy Education, Technical Assistance, and Information Dissemination

The Geo-Heat Center

The Geo-Heat Center, the only one of its kind in the United States, has been providing for 30 years, a unique service to enhance use of geothermal energy on a national (to all 50 states) and an international level through:

- Technical assistance program for developers and operators of geothermal direct-use, small scale power generation and geothermal heat pump projects. This program has helped design and review the geothermal heating system for two important facilities in Oregon: the Oregon State Work Camp in Lakeview and a brewery/ restaurant in Klamath Falls – the latter is the first geo-thermally heated brewery in the nation.
- Information dissemination by publishing a Quarterly Bulletin on the uses of geothermal energy - sent free to approximately 2,000 subscribers, technical publications, presentations at professional meetings and through our extensive web site.
- Training in the form of workshops, seminars and lectures on and off campus.
- Maintenance of a geothermal library with over 5,000 publications and an extensive website of over 1900 files; a 12,000 well and hot spring data base for 16 western states; a U.S. direct-use data base of 2,345 projects; 172 PDF articles; accessed by 1,350 users downloading over 2,000 files daily.
- Applied research and development for geothermal equipment and their use.

Education in Renewable Energy Systems

- Oregon Institute of Technology has introduced the first Bachelor of Science (B.S) degree in **Renewable Energy Systems** (RES) in the United States.
- Program is based on renewable-energy specific courses in energy systems, heat-pump systems, photovoltaics, energy-management, wind and bio-mass, renewable energy transportation systems, net zero-energy buildings and fuel cells.
- This unique RES degree program will educate and train engineers in Oregon in the application of renewable energy systems for high-technology jobs created in Oregon by the state-wide rapidly increasing renewable energy industry.

4. Leadership in Applied Renewable Energy Systems Research

GHC's New Downhole Heat Exchanger(DHE)

- The Geo-Heat Center has installed a new type of DHE constructed of cross-linked polyethylene (PEX) tubing with a data acquisition system to record system temperatures and operating pressures.
- This proto-type DHE represents development of a low-cost corrosion-resistant DHE for the Klamath Falls Community. Future plans exist for experimentation of a direct-buried PEX DHE in a vertical borehole.

New Downhole Heat Exchanger (DHE)

OREC's Portable Photovoltaic Array Tester

- OREC's staff and students have designed and built a portable PV array tester capable of measuring I-V characteristics of up to 5KW Photovoltaic systems
- Compact design makes this measurement equipment easy to operate and transport to field sites.
- Potential to become a standard tool for PV array installers and inspectors.

Students with a Photovoltaic Array Tester