GETTING GEOTHERMAL ELECTRICITY PROJECTS ON LINE

July 23, 2007
Portland, Oregon

Daniel J. Fleischmann
ORMAT Nevada, Inc.
www.ormat.com
dfleischmann@ormat.com
775-356-9029 ext. 2239

ORMAT: Innovative Power Plant Technology

- Vertically integrated company active in the design, engineering, supply, installation, support & operation of renewable & sustainable energy products and projects since 1965.

- Four decades of experience developing modular power plants from 0.3 MW to 130 MW for geothermal, waste heat, biomass, solar, and re-powering rehabilitation of existing plants.

- Supplied app. 900 MW of geothermal and heat recovery power generation in 23 countries, about half of the supplied MW are currently owned by Ormat. As of the end of 2006, Ormat owns 386 MW net generating capacity.

- The only pure play geothermal and renewable energy company supplying equipment and technology to utilities and developers as well as owning and operating geothermal projects world wide.

ORMAT'S WORLD WIDE PRESENCE

Over 800 MW of Geothermal Power Plants

57 MW Ormesa Binary Geothermal Complex, California

30 MW Puna Combined Cycle Geothermal Power Plant, Hawaii

125 MW Upper Mahiao Combined Geo Power Plant, Philippines

40 MW Heber Geothermal No. 2 Binary Power Plant, California

20 MW Burdette Binary Geothermal Power Plant, Nevada

60 MW Mokai Combined Geo Power Plant, New Zealand

Geothermal is resurging

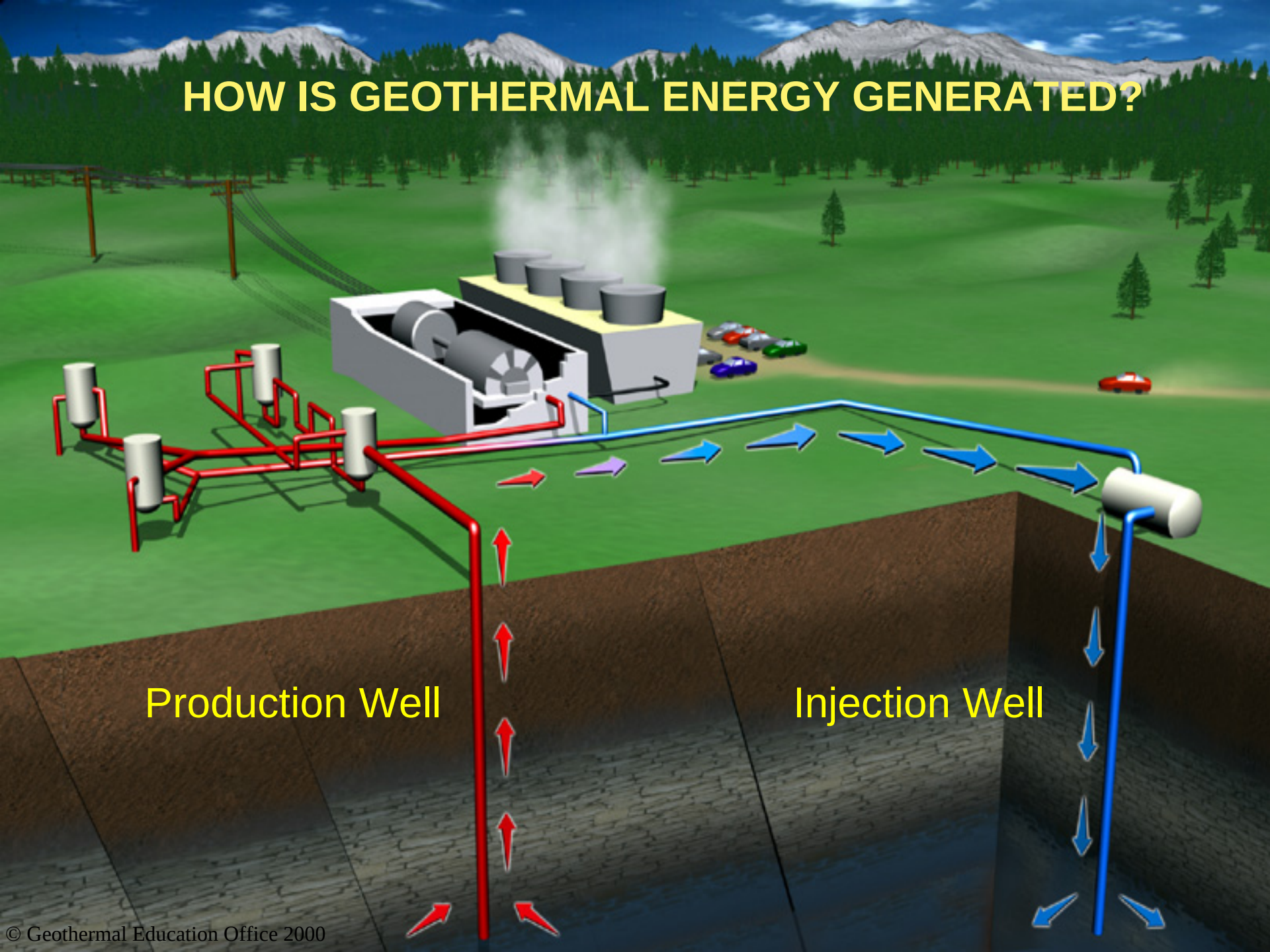
- Facilitated by rising interest in energy independence /energy security
- Concern over climate change/climate change policy
- Costs becoming competitive with fossil fuels/other renewables
- Desire by utilities for base-load renewable energy
- RPS standards/Production Tax Credits/Clean Renewable Energy Bonds
- A maturing industry, seeing technological progress

GEOTHERMAL ELECTRICITY

QUESTIONS TO BE ANSWERED

1. How is geothermal electricity generated?
2. What are the attributes of geothermal energy?
3. Where can we find geothermal resources?
   (General U.S. and Oregon)
4. What are the barriers to geothermal development?
5. How much does it cost to bring to market?

HOW IS GEOTHERMAL ENERGY GENERATED?



How is Geothermal Energy Generated?

RESOURCE TEMPERATURES FROM 250^{O} TO 350^{O} F

- Organic Rankine cycle (ORC) Technology most appropriate
- Plant uses organic fluid with lower boiling temp than water
- Air cooled condensers possible – 100% injection of all fluids/gases
- Most new western US resources are in this category (including Oregon)
- Lowest environmental impact

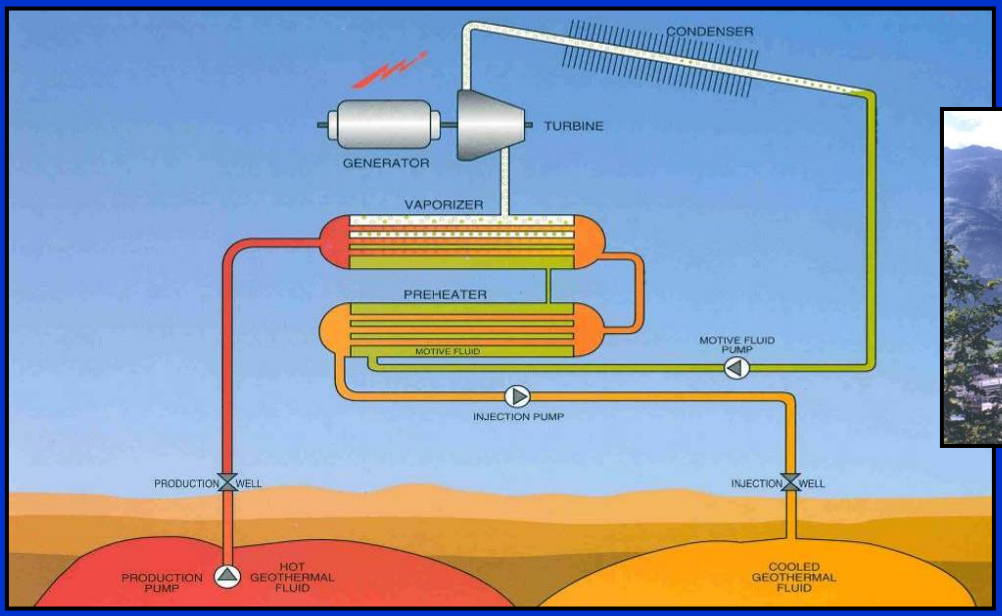
RESOURCE TEMPERATURES OVER 350^{O} F

- Flash technology produces steam for driving turbine (see previous slide)
- Combined steam & ORC system allows for air cooling

DRY HIGH PRESSURE STEAM PRODUCTION

- Conventional steam turbine technology most appropriate
- Geysers (CA), Italy, Iceland, Indonesia & New Zealand
- Water cooled condensers needed
- Higher environmental impact

Improving Project Viability by Matching the Geothermal Power Plant to the Resource

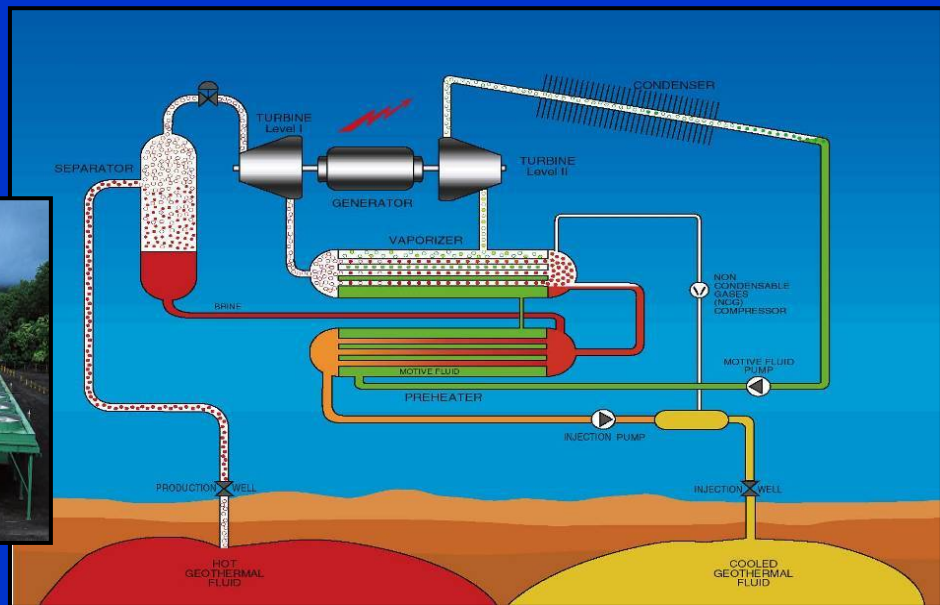


Binary Geothermal Power Plants

24 MW Zunil Geothermal Power Plant, Guatemala

Combined Cycle Geothermal Power Plants

30 MW Puna Geothermal Power Plant, Hawaii



Plug and Play On Site Geothermal Power

Pre-Packaged Equipment Supply for Self Construct

Ormat supplied equipment for remote and rural applications

First commercial geothermal application in Nevada. 800 kW OEC. with power supplied to Sierra Pacific Power Co.
22 years of operation.

800 kW Wabuska Geothermal Power Unit, Nevada.

Supplying local electrical power and energy for crop drying and cold storage since 1989.
17 years of operation.

300 kW Egat Geothermal Power Plant, Thailand

Owner installed plant using Ormat supplied equipment, documentation and technical assistance.

1.8 MW Oserian Geothermal Power Plant in Naivasha, Kenya

250 kW air-cooled geothermal CHP plant generating electrical power as well as district heating, by utilizing a low temperature geothermal resource.
5 years of operation

250 kW Geothermal Power Unit at Rogner Hotel & Spa, Bad Blumau, Austria

GEOTHERMAL ENERGY ATTRIBUTES

COST EFFECTIVE UTILITY POWER

- Modular power plants are readily expanded as needs increase.
- Power costs competitive with current fossil fuel technologies.
- Base Load power produced 24/7 @ over 90% Capacity Factor.

RELIABLE, SUSTAINABLE & ENVIRONMENTALLY SAFE

- Renewable – first geothermal power plant in Larderello, Italy – 1904; field still producing electric power.
- Many projects operating for decades at 98%+ availability.
- Geothermal is non-combustion - near zero emissions.

MINIMAL LAND SURFACE IMPACT

FIELD PROVEN TECHNOLOGIES - ~9,000 MW installed WORLD WIDE

EASY TO INSTALL, OPERATE AND MAINTAIN

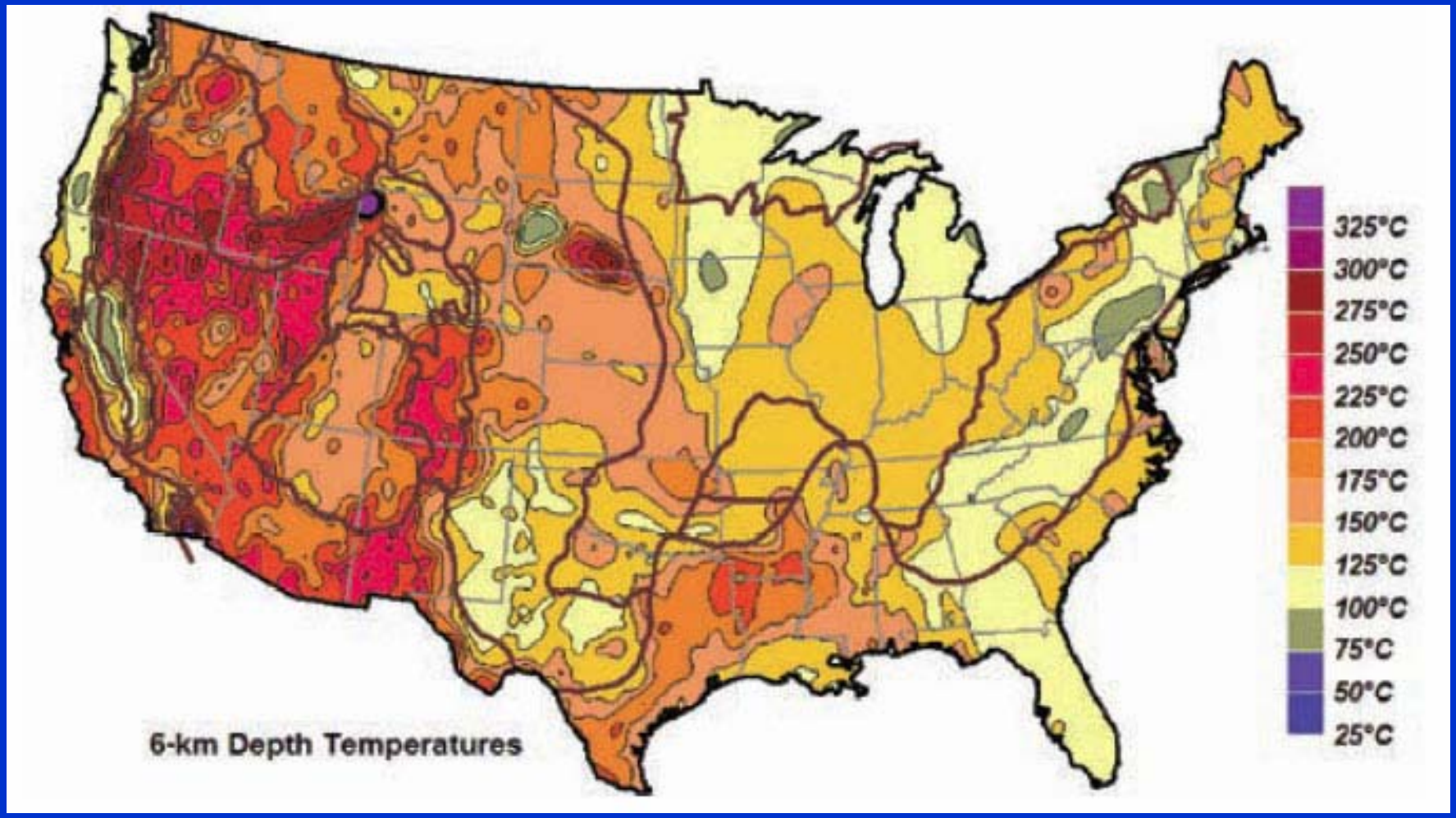
- Projects developed over 3 year period - O&M by local staff.

CAPITAL INTENSIVE

- Exploration, drilling costs high upfront.
- Lifetime supply of fuel capitalized – no fuel price risk.

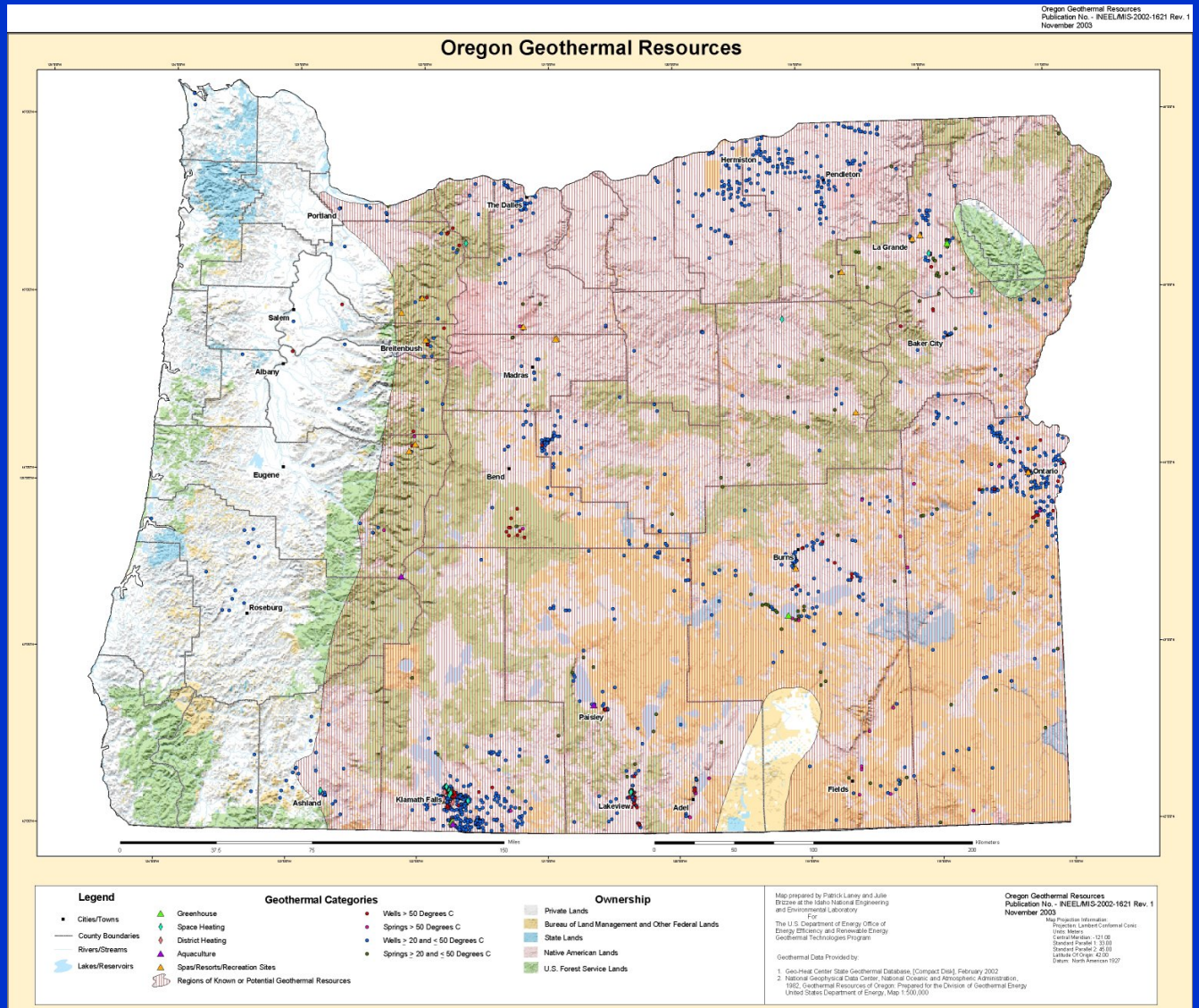
Where are Geothermal Resources Located?

Estimated Earth temperature at 6-km (3.7-mile) depth. Southern Methodist University (SMU) Geothermal Laboratory. Source – National Renewable Energy Lab (NREL)



Oregon Geothermal Resource Map

Source: Idaho National Laboratory



Oregon's Geothermal Potential

- As part of the Pacific Ring of Fire, Oregon's geothermal resources are among the best in the U.S.
- Oregon's first geothermal power plant was an ORMAT unit, installed in 1984.
- Historical limitations to geo-power development in Oregon include:
  - Low energy costs;
  - Sufficient capacity (mainly from Hydro);
  - Transmission constraints;
  - Resources situated on forest service lands;
  - Environmental concerns; and
  - Preference for geothermal heating projects for recreation and commercial business.
- The 2006 WGA Geothermal Taskforce Report, estimated that up to 1,250 MW of geothermal power could be developed in Oregon by 2025. This installation could produce enough power for more than 20% of current consumption.
- Because permitting has been a major challenge in Oregon, there needs to be an organized effort in the state to show how geothermal development can work in concert with the environment, In addition, there needs to be an effort to educate the public on how this can be done and what the benefits can be.
- Oregon passed an RPS in June of 2007 that requires that utilities serving at least 3% of the state's load to generate 15% renewable energy by 2015, 20% by 2020, and 25% by 2025.
- Could Oregon become another Iceland?
  - Could Oregon's existing hydro resources, wind, tidal, biomass, solar, and geothermal resources make Oregon perhaps the most sustainable/carbon neutral state in the U.S.?

BARRIERS TO GEOTHERMAL DEVELOPMENT

- **Federal Agency Procedures - Including**
  - Delayed leasing of Federal Lands by the BLM
  - Extended Environmental Reviews
  - Extended Processing of Permits
- **Availability of Financing for new projects**
  - Need to reduce exploration costs and risks
- **Need for continuous opportunities for Power Sales**
  - Need to provide incentives to utilities
  - Need to have consistent Renewable Portfolio Requirements
- **High initial Capital Costs**
  - Need for long-term renewable tax credit programs
- **Availability of Transmission**
  - Geothermal Projects are often in rural areas

PROJECT RISK BARRIERS

ORMAT

PROJECT RISK	MITIGATION
Exploration – Lack of heat/fluid 50% success risk	Max use of surface technologies Go-No Go exploration steps
Resource Capacity Risk 70% drilling success risk	Drill & Test deep wells Develop resource model
Regulatory Risk Minimal with planning	Use experienced permitting consultant Apply early & take no short cuts
Drilling Risks (dry well) 70% drilling success risk	Prepare geological model and drill with blow out protectors & control of well insurance
Plant Construction Risk Minimal Risk if previous items performed competently	Use credible supplier/contractor Get turn-key fixed price/date certain contract Use Field Proven technology supplier Get start-up performance guarantee
Financing Risk Only a major concern for independent developers	Execute financible take or pay PPA with utility Execute binding commitment with lender

HOW MUCH DOES IT COST TO BRING TO MARKET?

FINANCING ISSUES FOR INDEPENDENT DEVELOPERS

- ⇨ **Exploration Financing**
  - Investor may want returns equal to multiples of investment
- ⇨ **Need investment grade power purchaser**
- ⇨ **Construction Financing**
  - Interest rates may be up to 10% or more
  - Construction Lender requires “take out’ guarantee at commissioning.
- ⇨ **Term financing usually based on 30% equity/70% debt**
- ⇨ **IRR targets in “high teens”/ interest 7% (or more) for 15 yr**
- ⇨ **Energy Price from geothermal IPP will be $60 to 75/MWH**

HOW MUCH DOES IT COST

BUDGET FOR 20 NET MW PROJECT DEVELOPMENT

1. **Exploration & resource assessment** **$ 7.0 M**
   12 Months time frame
2. **Well field drilling and development (12 wells)** **20.0**
   12 Months time frame after completion of item 1
3. **Power plant, surface facilities, & transmission** **35.0**
   18 Months time frame with overlap of item 2
4. **Financing, and "soft costs":** **8.0**
   - Financing Commitment fees;
   - Legal, Accounting & consulting fees;
   - Interest during construction;
   - Debt service and operating reserve; and
   - Project contingencies and Development Fee

   12 Month process, begins after completion of item 1
5. **TOTAL *FINANCED* COST FOR 20 MW PROJECT $70 M**
   To be provided as construction phase financing
6. **TOTAL AVERAGE DEVELOPMENT PERIOD 36 MONTHS**
   Plus approximately 12 months to acquire federal or private site lease control.

CONCLUSIONS

THERE ARE MANY OPPORTUNITIES FOR GEOTHERMAL PROJECT DEVELOPMENT IN WESTERN UNITED STATES.

(Geothermal is competitive with fossil fuel technologies)

RENEWABLE ENERGY PROJECT DEVELOPMENT NEEDS TRANSPARENT MARKETS SUPPORTED BY PUBLIC POLICY.

(State Renewable Portfolio Standards, PTC and/or ITC)

GEOTHERMAL ENERGY HAS SPECIAL ATTRIBUTES WHICH MUST BE CONSIDERED WHEN ENTERING INTO AGREEMENTS.

(Capital Intensive with lifetime supply of fuel paid up front)

DEVELOPERS NEED INTERNAL RESOURCES TO COVER INITIAL DEVELOPMENT EXPENSES AND GUARANTEES.

(Initial high risk exploration financing hard to obtain)

PROJECT DEVELOPMENT SCENARIOS MAY BE LENGTHY AND COSTLY FOR SMALLER PROJECTS.

(The process takes longer and cost more than anticipated)

UTILITIES WHO PURCHASE GEOTHERMAL POWER ARE CUSTOMERS.

(Agreements are bilateral with negotiations in good faith)