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2009 BLM Renewable  
Energy Summit

# Geothermal Power Production:

- Current Production,
- Projects Under Development,
- Future Outlook

**States generating geothermal power and existing capacity:**

**8 states – 3,040 MW**

# The Geysers



# ORMAT 20MW Burdette Power Plant - Reno, Nevada



# UTC Power 225 KW Power Plant - Chena, Alaska

- *Commissioned July, 2006*
- *1 system, 2<sup>nd</sup> unit in Dec 06*
- *Lowest geothermal temp in world <165°F*
- *Drivers: Off-Grid, sustainable geothermal power and heat, for multiple applications*



# New Projects Under Development

- 12 States: Alaska, Arizona, California, Colorado, Florida, Hawaii, Idaho, Nevada, New Mexico, Oregon, Utah, Washington
- 3,638 – 5650 MW

# New Projects Under Development

## March 2009

- **Phase I:** Identifying site, secured rights to resource, initial exploration drilling
- **Phase II:** Exploratory drilling and confirmation being done; PPA not secured
- **Phase III:** Securing PPA and final permits
- **Phase IV:** Production Drilling Underway/Facility Under Construction
- **Unconfirmed:** Proposed projects that may or may not have secured the rights to the resource, but some exploration has been done on the site
- **Please Note:** GEA is reporting information that is provided to us about these projects. We do not independently verify the data provided.

**Figure 3: Developing Projects by Phase**

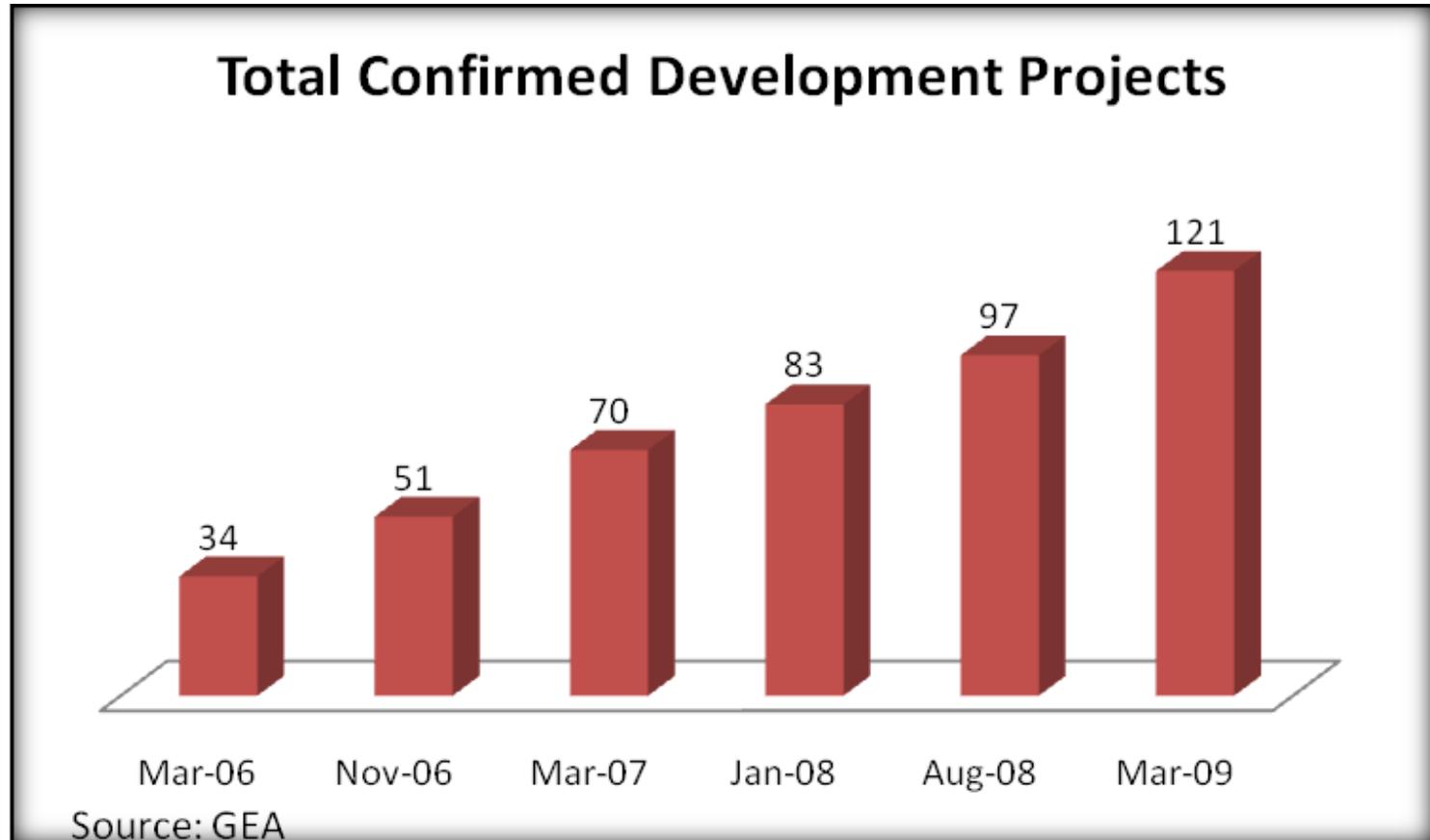
State	Unconfirmed		Phase I		Phase II		Phase III		Phase IV	
	#	MW	#	MW	#	MW	#	MW	#	MW
Alaska			4	35-75	1	25				
Arizona	1	Unspecified	1	2-20						
California	1	18-38	12	409-677	7	295.7-316.7	6	249	2	84.9
Colorado					1	10				
Florida			1	0.2-1						
Hawaii	1	Unspecified	1	Unspecified			1	8		
Idaho			3	125-200	1	100	1	13-26		
Nevada*	2	75-125	30	711-1262	15	327-625	7	421-924	6	233.4-361.4
New Mexico									1	10
Oregon			7	111	1	20-26	3	160.2-180.2	1	1.2
Utah			5	25	1	69	1	100		
Washington			1	Unspecified						
<b>Totals</b>	<b>5</b>	<b>93-163</b>	<b>65</b>	<b>1418.2-2371</b>	<b>27</b>	<b>846.7-1171.7</b>	<b>19</b>	<b>951.2-1487.2</b>	<b>10</b>	<b>329.5-457.5</b>

NV\* - There are 30 projects in Phase I, but developers did not disclose projected MW values for five projects

**Figure 4: Developing Projects by State**

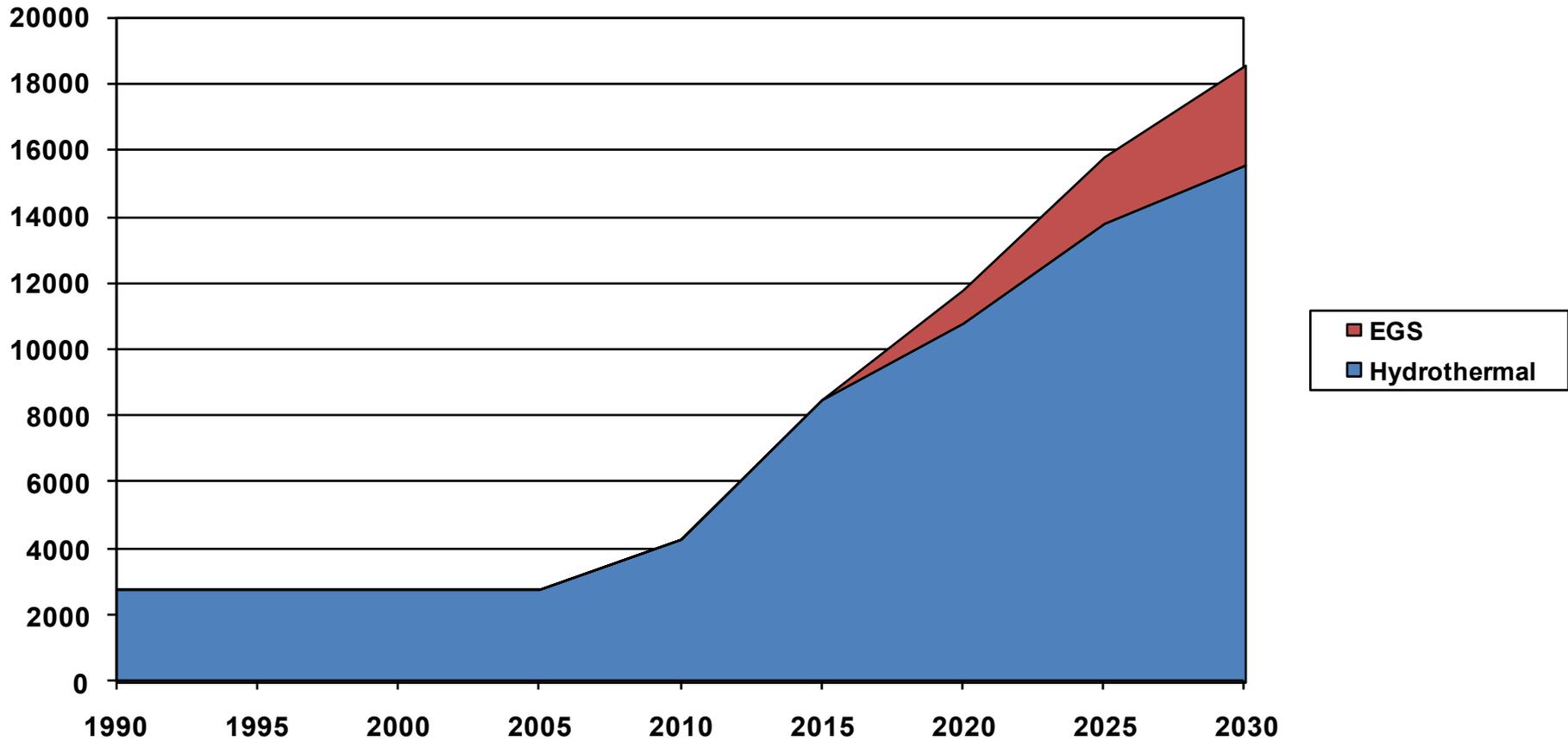
<b>State</b>	<b>Phase 1 to Phase 4</b>	<b>TOTAL (with unconfirmed)</b>
<b>Alaska</b>	5/60-100 MW	5/60-100 MW
<b>Arizona</b>	1/2-20 MW	2/2-20 MW
<b>California</b>	27/1038.6-1327.6 MW	28/1056.6-1365.6 MW
<b>Colorado</b>	1/10 MW	1/10 MW
<b>Florida</b>	1/0.2-1 MW	1/0.2-1 MW
<b>Hawaii</b>	2/8 MW	3/8 MW
<b>Idaho</b>	5/238-326 MW	5/238-326 MW
<b>Nevada</b>	58/1692.4-3172.4 MW	60/1767.4-3297.4 MW
<b>New Mexico</b>	1/10 MW	1/10 MW
<b>Oregon</b>	12/292.4-318.4 MW	12/292.4-318.4 MW
<b>Utah</b>	7/194 MW	7/194 MW
<b>Washington</b>	1/Unspecified	1/Unspecified
<b>Total</b>	<b>121 projects 3545.6-5487.4MW</b>	<b>126 projects 3638.6-5650.4 MW</b>

# Comparison of Results from GEA Surveys: May 2006 – March 2009



# Projected Growth

Deloitte Market Analysis Report to DOE (9/2008)



# Emerging Resources

- Co-production from oil/gas wells
- Geopressured resources
- Enhanced Geothermal Systems/Deep Geothermal

# Geothermal's Potential



National Renewable Energy Laboratory

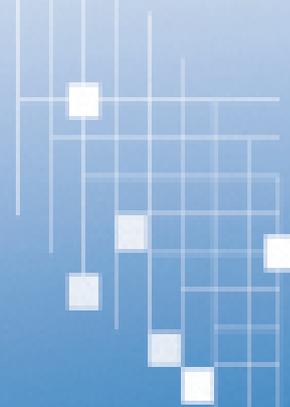
A national laboratory of the U.S. Department of Energy  
Office of Energy Efficiency & Renewable Energy

*Innovation for Our Energy Future*

## **Geothermal— The Energy Under Our Feet** Geothermal Resource Estimates for the United States

Bruce Green and Gerry Nix,  
National Renewable Energy Laboratory

*Technical Report*  
NREL/TP-840-40665  
November 2006



## **Geothermal Contribution by 2025**

<b>Identified Resources</b>	<b>15,000 MW</b>
<b>New Discoveries</b>	<b>5,000 MW</b>
<b>Co-production/DG</b>	<b>10,000MW-70,000 MW</b>
<b>Deep Geothermal</b>	<b>10,000 MW</b>
<b>Direct Use</b>	<b>4,200 MWt</b>
<b>Geothermal Heat Pumps</b>	<b>8,400 MW (Direct Offset)</b>
<b>Total Electric*</b>	<b>38,400 MW – 98,400 MW</b>

\*not including thermal energy from direct use applications

- **Federal leasing and permitting are keys to achieving geothermal potential**

# Delays associated with geothermal leasing on Federal lands could stall geothermal investment

## Resources in Federal Land

A majority of western land with geothermal resource potential is located on Federal land requiring a lease application to be developed.

- Most of the Known Geothermal Resource Areas (KGRA) are found in Nevada of which 86% is managed by the Federal Government.

## Land Lease Delays

BLM lease operations have gone through significant restructuring, nevertheless processing remains slow.

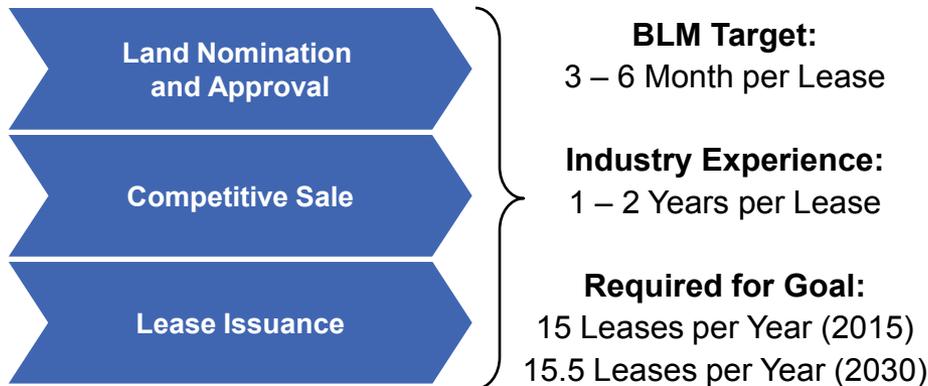
- Recorded variance of 6 months to 2 years to process a geothermal land lease pose major challenges for project development

## Land Lease Labor

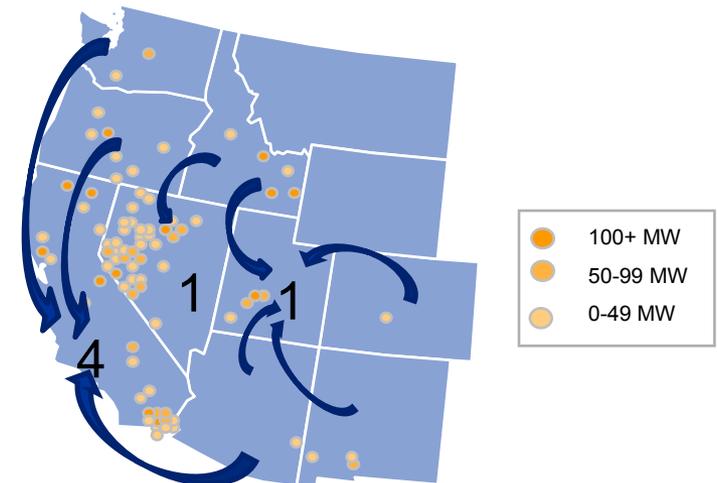
Lease packages can only be processed by 6 individuals spread out in CA, NV, UT

- Geothermal leases from states without officials qualified to process are sent to individuals with the ability and experience to arrange complicated lease packages.

## Timeline Constraints of the Lease Process



## Lease Application Processors by State at BLM



Recent development of the Programmatic Environmental Impact Statement (PEIS) is promising in terms of improved lease processing capability by BLM . In August 2008, 35 parcels of land equivalent to 100,000 acres was auctioned in Nevada.

# Delays associated with geothermal permitting could impede geothermal investment but these challenges can be addressed by Federal actions

## Permit Delays

The number of agencies involved in the upfront permitting process create high variability at the riskiest stage of development.

- Geothermal permitting is a complicated process and can derail a project if the applicant fails to navigate it.

## Permitting Capacity

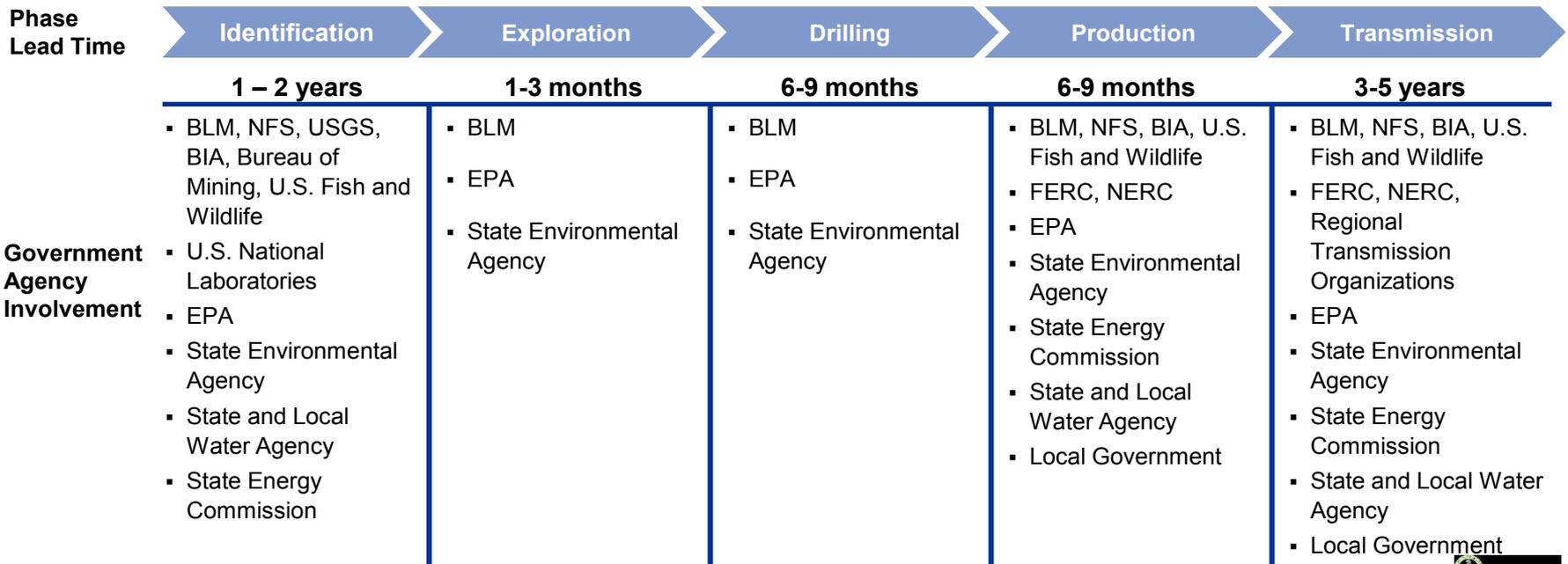
Due to the lower MW scale, future Binary power plant development will require 250% more permits compared to larger Flash plants.

- BLM PEIS of Federal Lands and recent lease auctions will create a tremendous surge in permitting applications.

## California Permitting

50% of new geothermal is in California which has the more complex permitting and longer time delays.

- NIMBYism in California local government is causing permitting delays and termination of transmission build out.



# Revenues from Geothermal Leasing and Royalties are Substantial

	2007	2008	Total
California	17,271,644	11,668,670	28,940,314
Idaho	5,727,012	22,015	5,749,027
Nevada	13,944,863	30,076,255	44,021,118
Utah	3,926,297	267,608	4,193,905
<b>Total</b>	<b>40,869,816</b>	<b>42,034,548</b>	<b>82,904,364</b>

Table 3 shows total revenues from four states which had lease sales in 2007 and 2008.<sup>16</sup>

# For More Information



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