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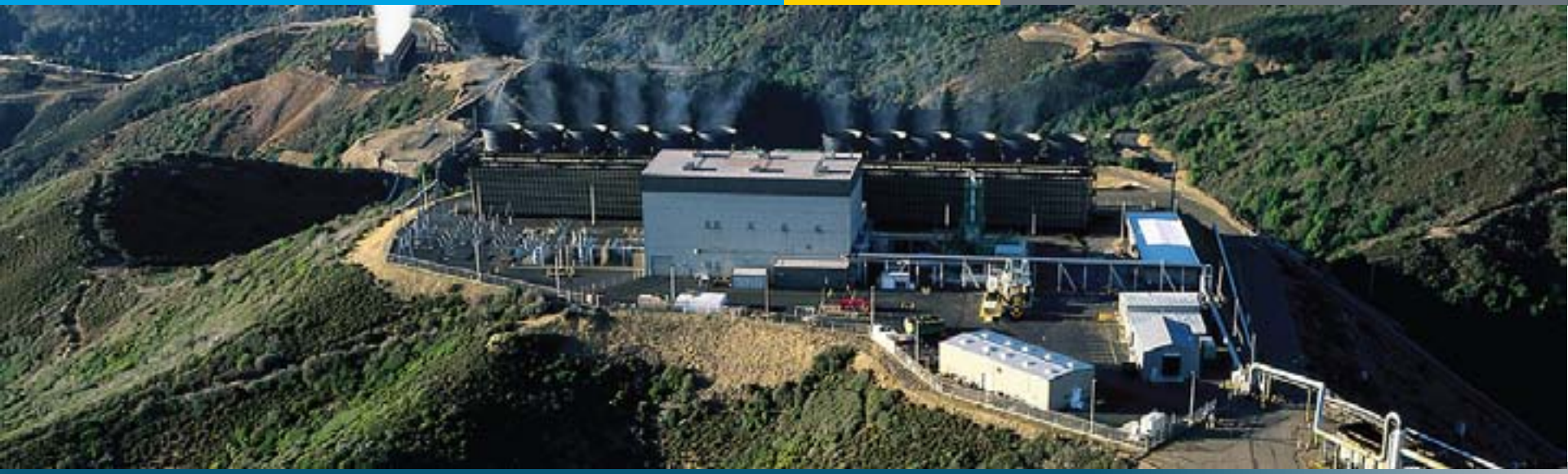


Enhanced Geothermal Systems Subprogram Overview

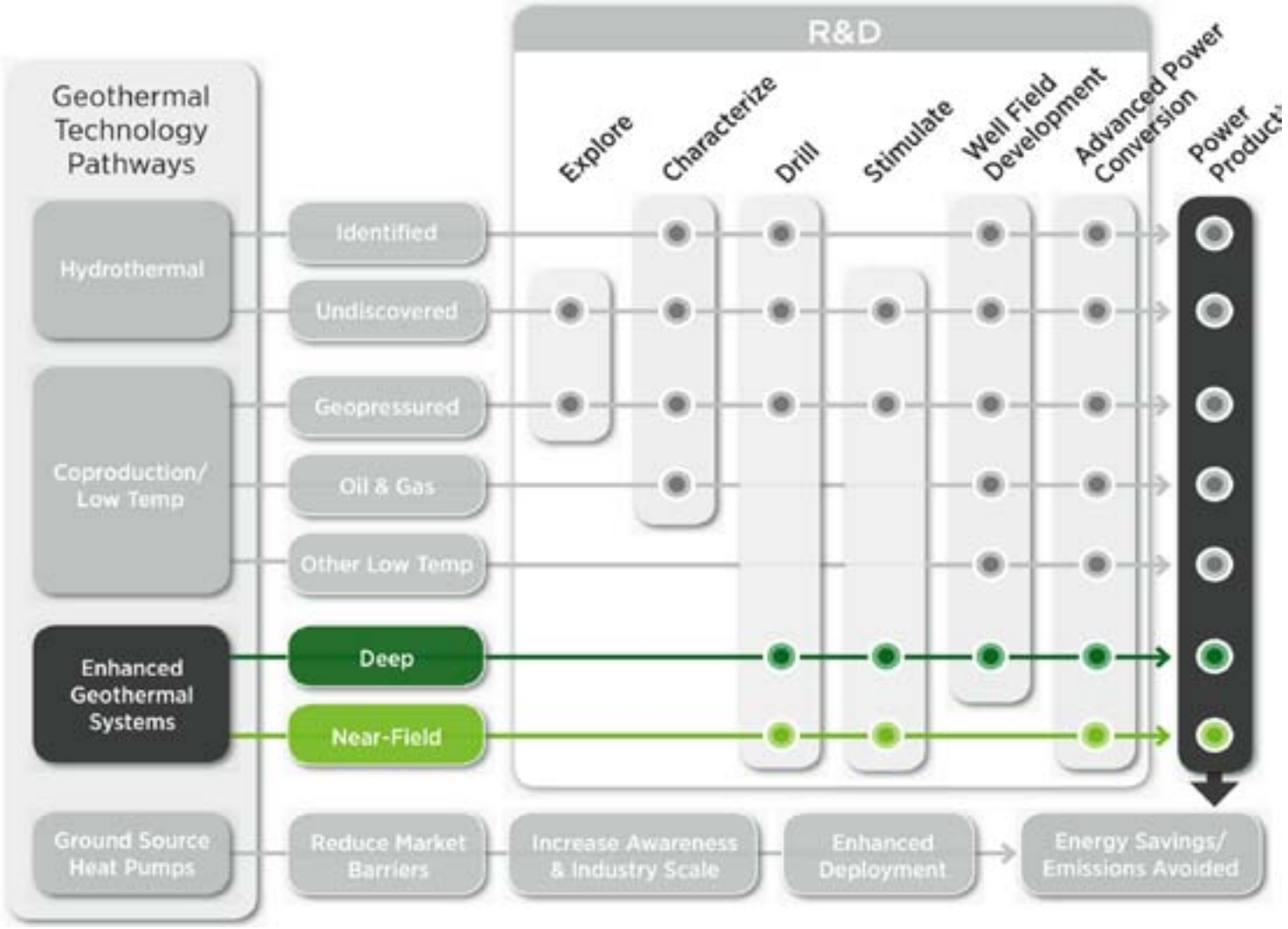
May 18, 2010

Geothermal Technologies Program Peer Review

Crystal City, VA

Lauren W. Boyd
Geothermal Technologies Program
Office of Energy Efficiency and Renewable Energy
U.S. Department of Energy

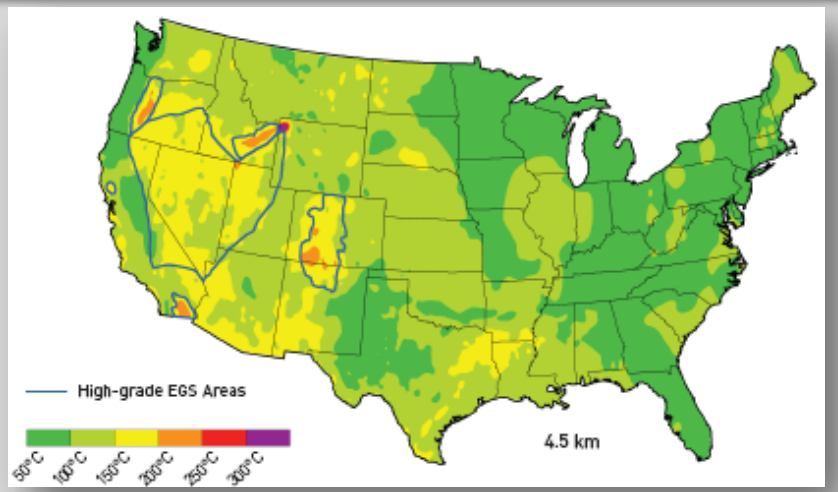
Technology Pathway

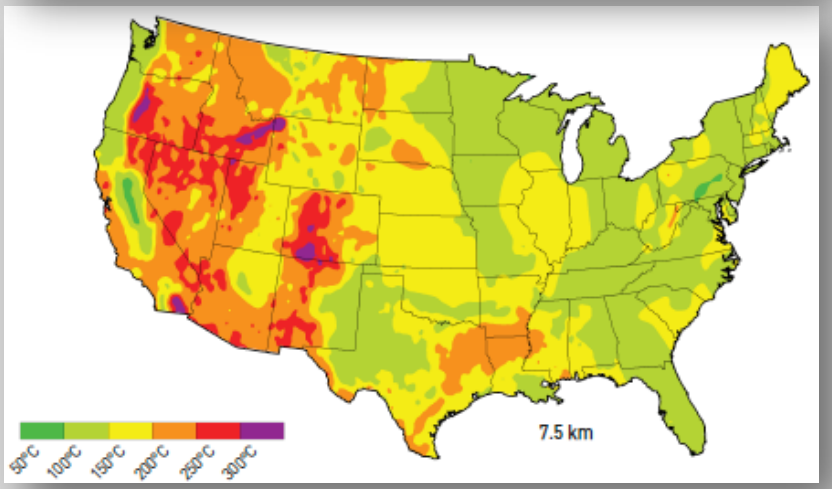


The Significant Potential of EGS…

Heat Mining:

- Significant energy resources stored in the Earth's crust as **heat**:
  - Estimated ***500,000 MW of EGS resource*** lies beneath the western United States (USGS)
- Geothermal energy can be produced from areas with high heat flow
  - MIT Report estimated ***50 GWe generating capacity*** from EGS by 2050 without government
- The only ***baseload*** renewable

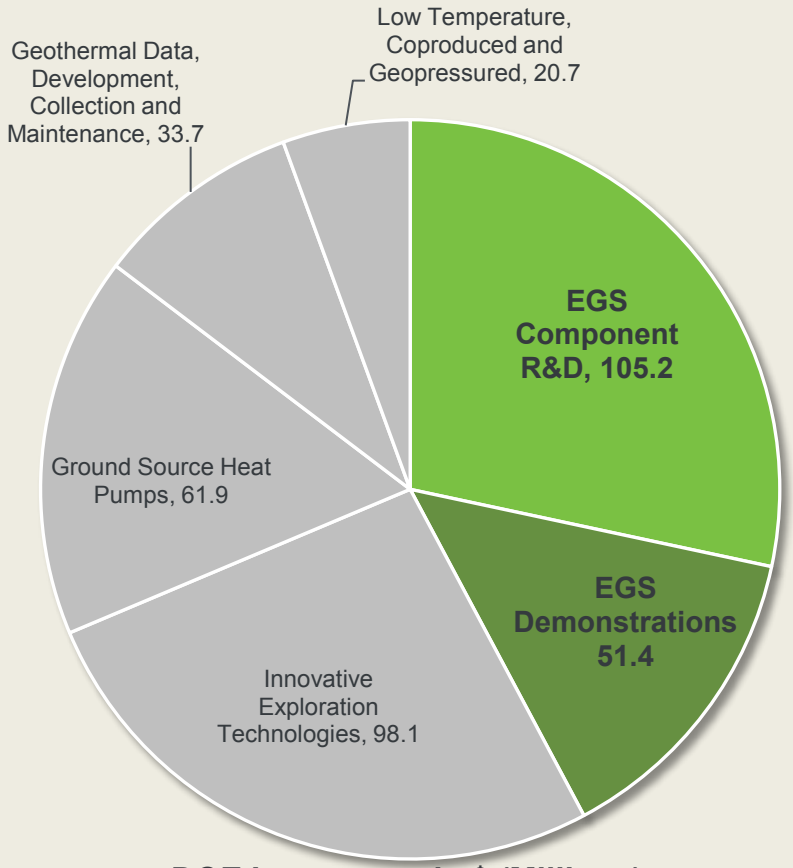




DOE Investments

ARRA Investment Categories	Funding Source	Funding Amt. (M)
EGS Component Research & Development	ARRA	105.2
EGS Demonstration Projects	PreFY08/FY08	21.3
	ARRA	51.4
TOTAL:		**$ 177.9**

GeothermalTechnologies Program Recovery Act Funding



DOE Investment in $ (Millions)

Total : 371 M

EGS Total: $ 156.6

R&D Projects

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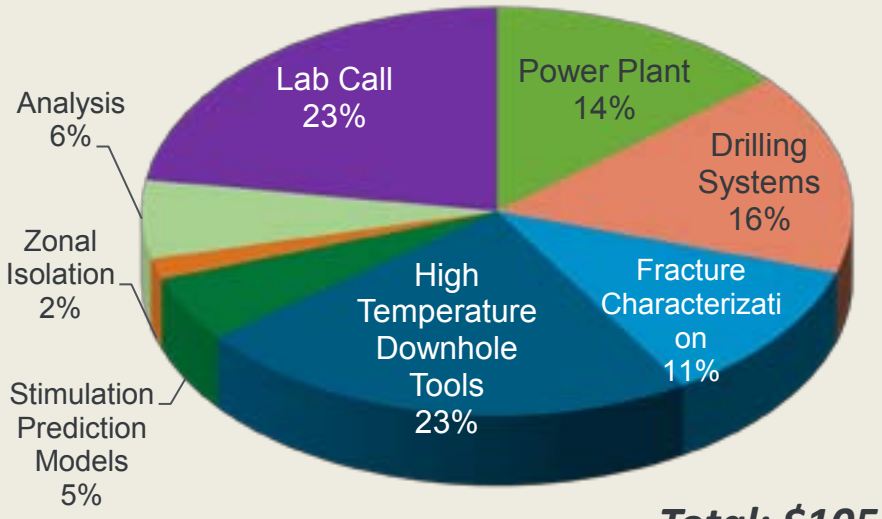
- **Total R&D Awards: 76**
  - ***Lab Call: 31***
  - ***Other ARRA: 45***
- **Total R&D Funding: 105.2 M**
  - ***Lab Call: 23.8 M***
  - ***Other ARRA: 81.4 M***

R&D Subtopic Areas Funding



Total: $105.2

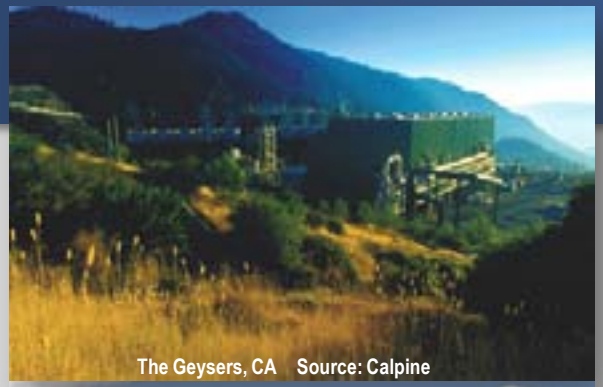
R&D Project Recipients

United Technologies Research Center	Array Information Technology
Baker Hughes Oilfield Operations Inc.	Texas Engineering Experiment Station
Impact Technologies, LLC	William Lettis & Associates, Inc.
Novatek, Inc	Board of Regents, on behalf of UNR
Potter Drilling, Inc.	Colorado School of Mines
University of Southern California	Pennsylvania State University
AltaRock Energy, Inc.	Simbol Mining Corp.
Board of Regents, NSHE, for UNR	Science Applications International Corp.
The University of Texas at Austin	Regents of the University of Minnesota
University of Utah	Symyx Technologies, Inc.
Trabits Group, LLC	CSI Technologies, LLC
GE Global Research	California State University, Long Beach
Honeywell International Inc.	Power, Environmental & Energy Research Institute
Composite Technology Development	The Regents of the University of CA
Draka Cableteq USA, INC.	General Electric Company
Argonne National Laboratory	Oak Ridge National Laboratory
Brookhaven National Laboratory	Idaho National Laboratory
Lawrence Berkeley National Laboratory	National Renewable Energy Laboratory
Lawrence Livermore National Laboratory	Sandia National Laboratory
Los Alamos National Laboratory	Pacific Northwest National Laboratory

EGS Field Demonstration Projects

- **Total Demonstration Awards: 8**
  - *Pre-FY08/FY08: 4*
  - *ARRA: 3*
- **Total Demonstration Funding: $ 72.7 M**
  - *Pre-FY08/ FY08 Demos: $ 21.3 M*
  - *ARRA Demos: $ 51.4 M*

Recipients	Year	Demonstration Project Sites
Ormat Technologies, Inc.	Pre-FY08	Desert Peak, Nevada
Geysers Power Company, LLC	FY08	The Geysers, California
University of Utah	FY08	Raft River, Idaho
Ormat Technologies. Inc	FY08	Bradys Hot Springs, Nevada
AltaRock Energy Inc.	ARRA	Newberry Volcano, Oregon
TGP Development Co.	ARRA	New York Canyon, Nevada
NakNek Electric Association	ARRA	NakNek, Alaska


The Geysers, CA Source: Calpine


Raft River, ID Source: US Geothermal


NakNek, AK Source: NEA

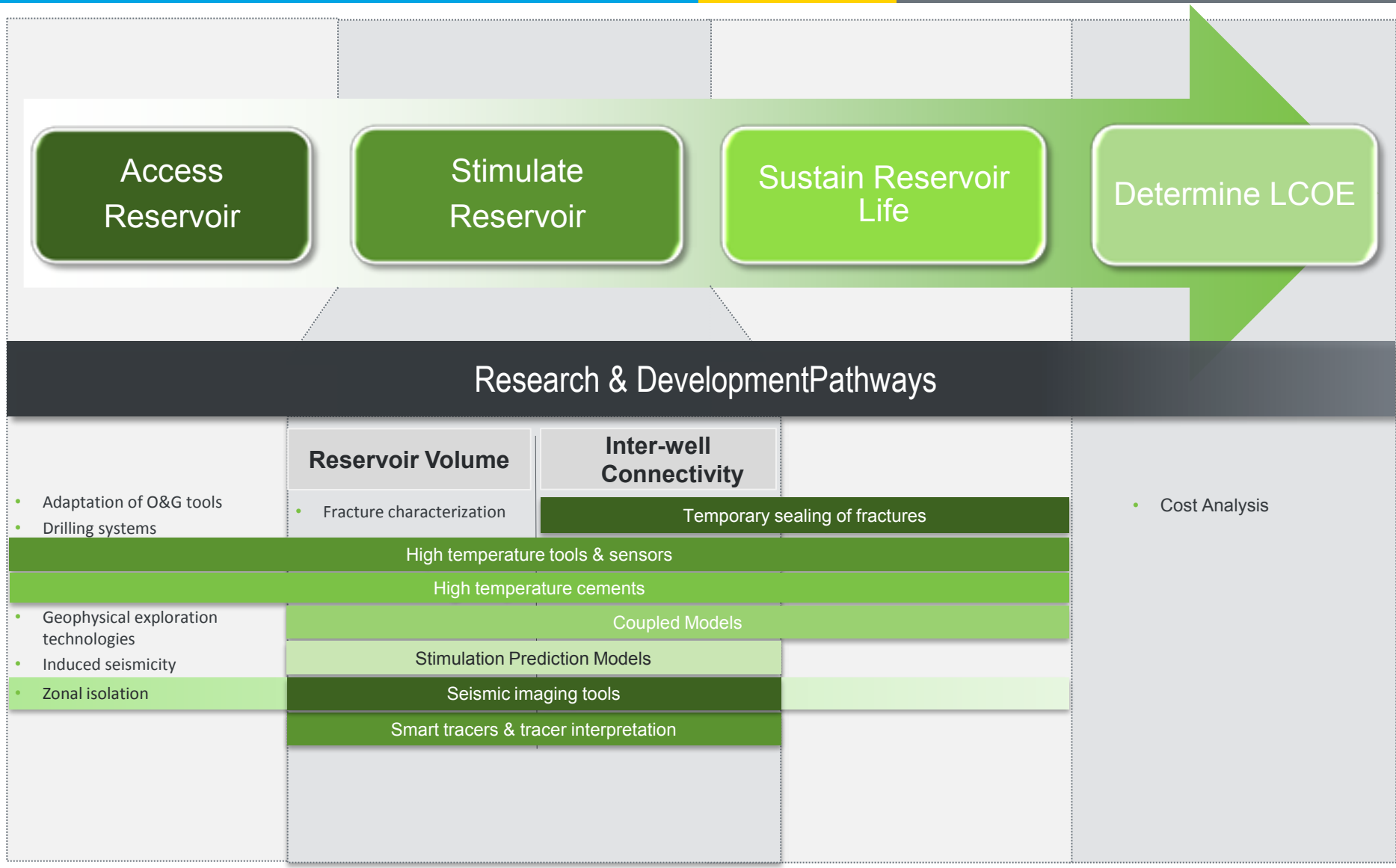
Goals

Advance and accelerate EGS technology development

- ***Reduce high level of risk*** during early stages of EGS development
- ***Resolve*** key Component R&D challenges
- ***Demonstrate and validate*** stimulation techniques that sustain fluid flow and heat extraction rates.
  - ***Validate EGS*** reservoir creation through demonstration projects in a variety of geologic environments
- ***Provide field data*** to the NGDS

- ***Demonstrate*** the ability to create an EGS reservoir capable of producing 5MW by 2015
- ***Sustain*** a 5 MW EGS reservoir for 5 years by 2020

Steps to Achieving EGS Goals



Steps to Achieving EGS Goals

Strategy for Accelerating EGS Demonstration Success Nationwide:

In existing hydrothermal fields

- Heat and fluid confirmed, permeability lacking
- Existing infrastructure with excess capacity – *reduces cost*

Margins of existing hydrothermal fields

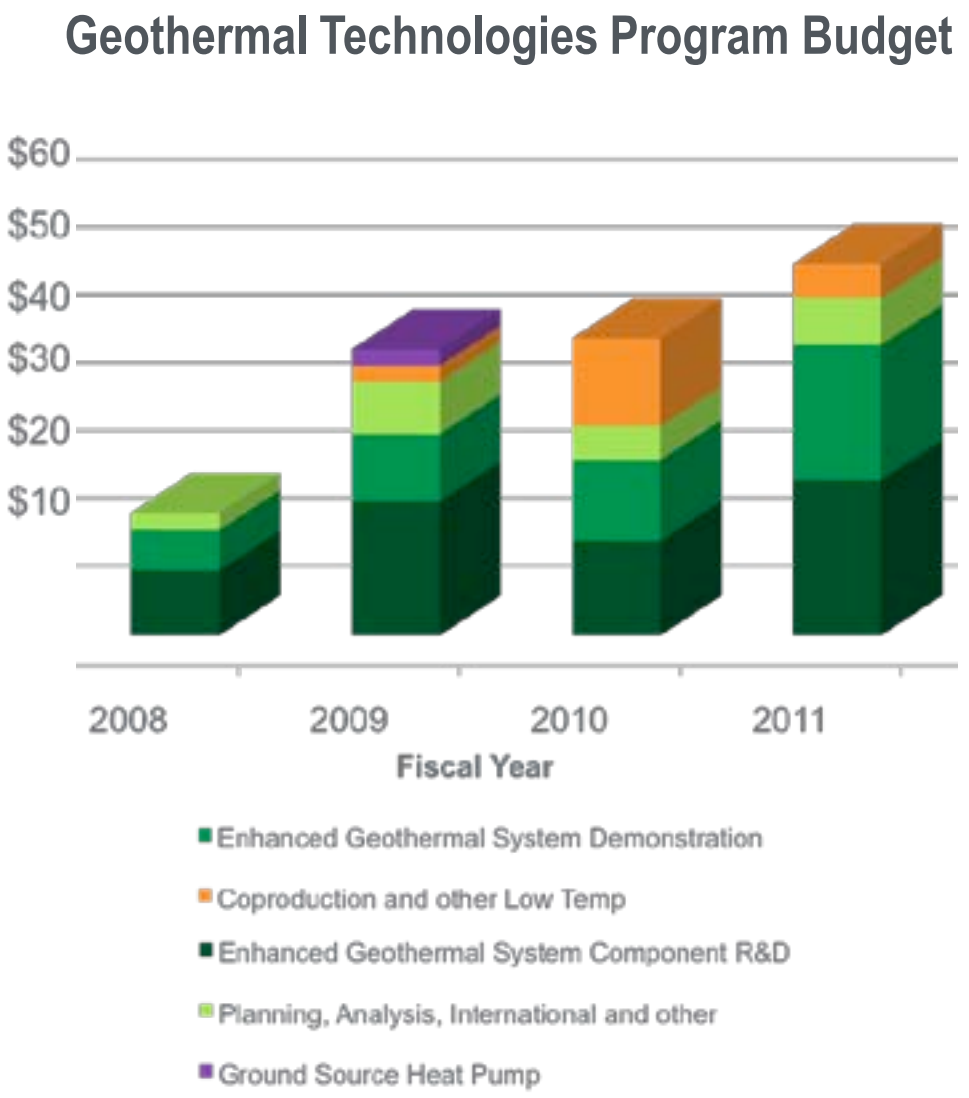
- Heat and fluid confirmed, permeability lacking
- Proximity to existing infrastructure

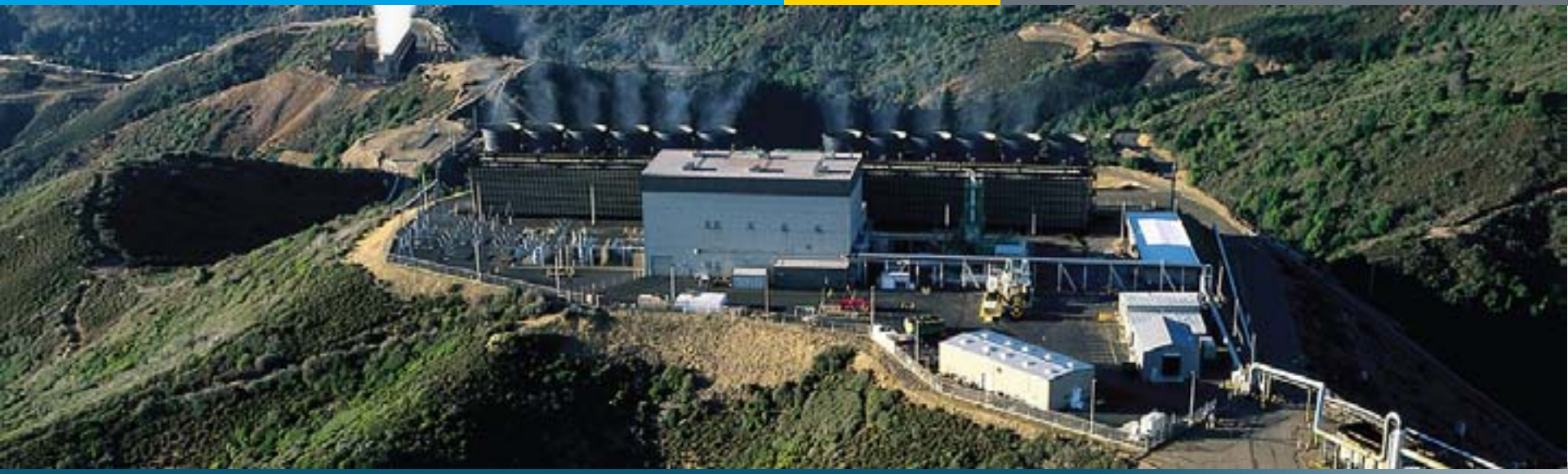
Diverse Geologic Environments

- Partially known resource: **Heat is confirmed but permeability and fluid are lacking or insufficient**
- New power plant necessary with limited existing infrastructure
- New geologic environment

Future…

- Sedimentary/Alternative EGS
- Future FOAs :
  - EGS Demos and R&D
  - Lab Call
- Gather data from current R&D and Demo projects:
  - Determine effective techniques and utilize them in the future!
  - Submit Data to NGDS





Thank you!

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U.S. Department of Energy

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