NREL
NATIONAL RENEWABLE ENERGY LABORATORY

Geothermal Prospects in Colorado

Geothermal Peer Review

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NREL Snapshot

Dedicated Solely to Advancing Energy Efficiency and Renewable Energy

- Physical Assets Owned by the U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy
- Operated by the Alliance for Sustainable Energy under Contract to DOE
- 2,400 staff and world-class facilities
- Annual Budget ~$350M (2012)
- More than 350 active partnerships annually
- Campus is a model of sustainable energy

Scope of Mission

Energy Efficiency

- Residential Buildings
- Commercial Buildings
- Personal and Commercial Vehicles

Renewable Energy

- Solar
- Wind and Water
- Biomass
- Hydrogen
- Geothermal

Systems Integration

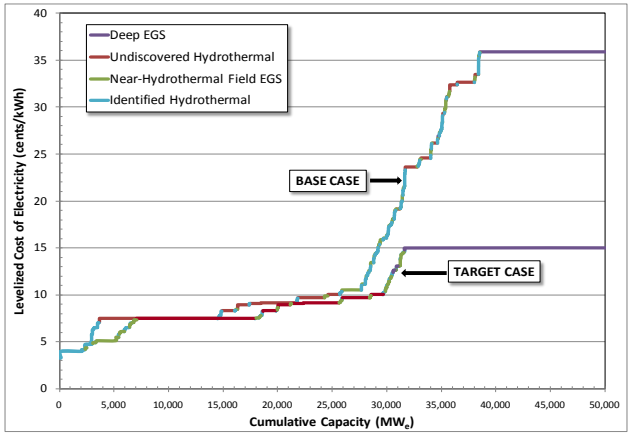
- Grid Infrastructure
- Distributed Energy Interconnection
- Battery and Thermal Storage
- Transportation

Key Roles

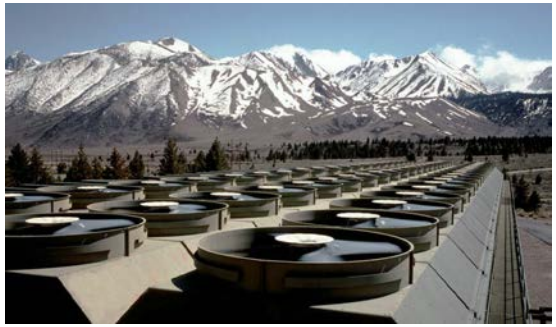
- Science
- Applied R&D
- Performance Validation
- Technology Maturation
- Systems Integration
- Deployment
- Analysis

NREL Capabilities Applied to Geothermal

- **Analysis**
  - Techno-Economic
  - Resource Assessment
  - Regulatory Roadmap Process
- **Decision Science**
  - Energy Data and Visualization
  - Geothermal Data Repository (e.g., DOE's National Geothermal Data System)
  - Geothermal Prospector
- **Power Systems**
  - Advanced Air/Water Hybrid Cooling
  - Geothermal Coproduction Field Power Validation
- **Systems Engineering and Integration**
  - Field Project Technical Advisory
  - Hydrothermal Exploration Projects
  - Enhanced Geothermal Systems Underground Field Laboratory
  - Resource and Feasibility Assessments

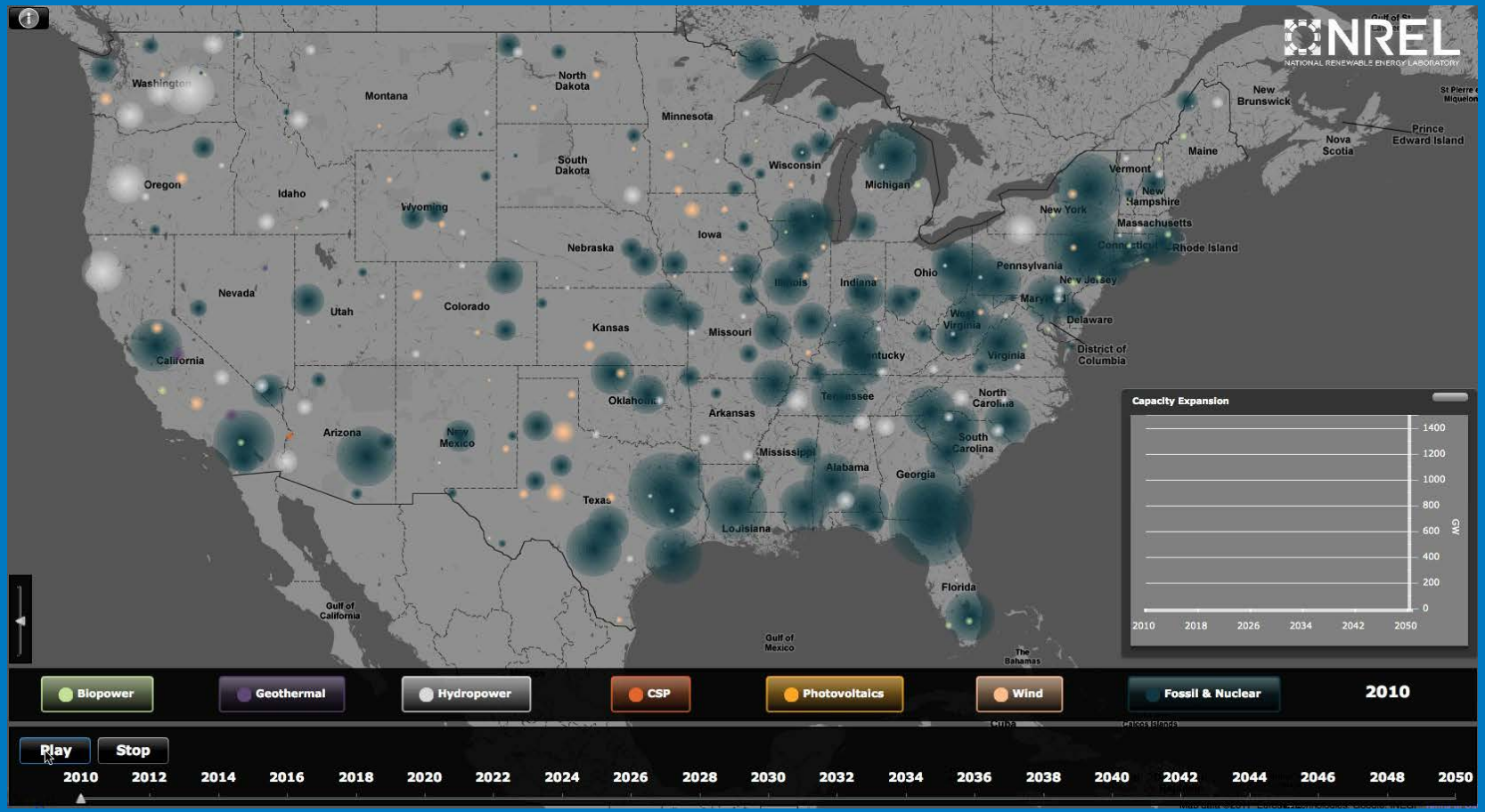


Techno-economic analysis needed for R&D optimal planning.



Advanced and innovative concepts in air/water hybrid cooling shows promise, including for conventional power plants.

Credible resource and feasibility assessments are vital to development.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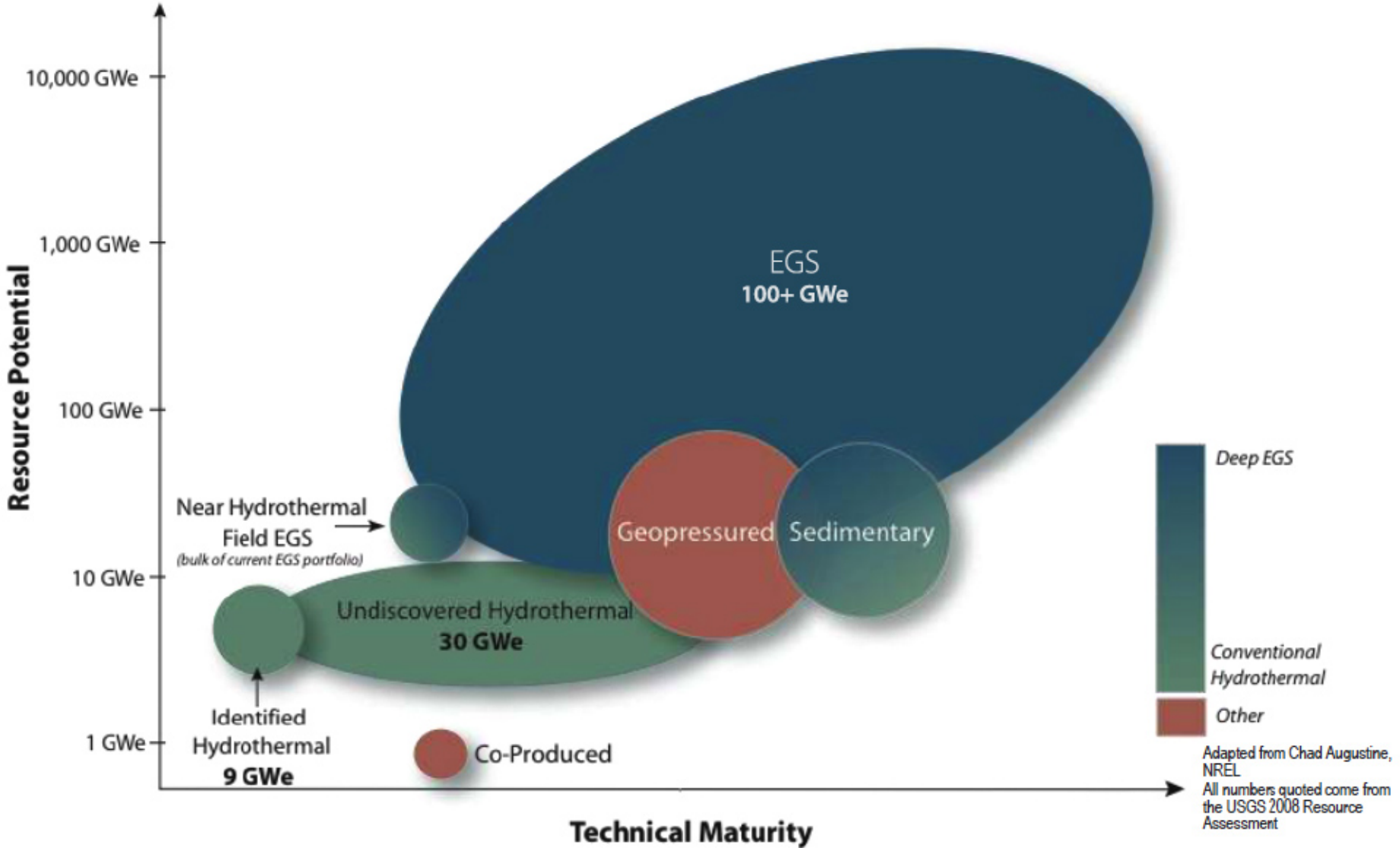
Capacity Expansion
1400
1200
1000
800
600
400
200
0
GW
2010
2018
2026
2034
2042
2050
Biopower
Geothermal
Hydropower
CSP
Photovoltaics
Wind
Fossil & Nuclear
2010
Play
Stop
2010 2012 2014 2016 2018 2020 2022 2024 2026 2028 2030 2032 2034 2036 2038 2040 2042 2044 2046 2048 2050
Washington
Oregon
California
Idaho
Nevada
Montana
Wyoming
Utah
Arizona
Colorado
New Mexico
North Dakota
South Dakota
Nebraska
Kansas
Oklahoma
Texas
Minnesota
Iowa
Missouri
Arkansas
Louisiana
Wisconsin
Illinois
Michigan
Indiana
Ohio
Kentucky
Tennessee
Mississippi
Alabama
Georgia
Florida
South Carolina
North Carolina
Virginia
West Virginia
Pennsylvania
New York
Maryland
Delaware
New Jersey
District of Columbia
Vermont
New Hampshire
Massachusetts
Connecticut
Rhode Island
Maine
New Brunswick
Nova Scotia
Prince Edward Island
Gulf of California
Gulf of Mexico
The Bahamas

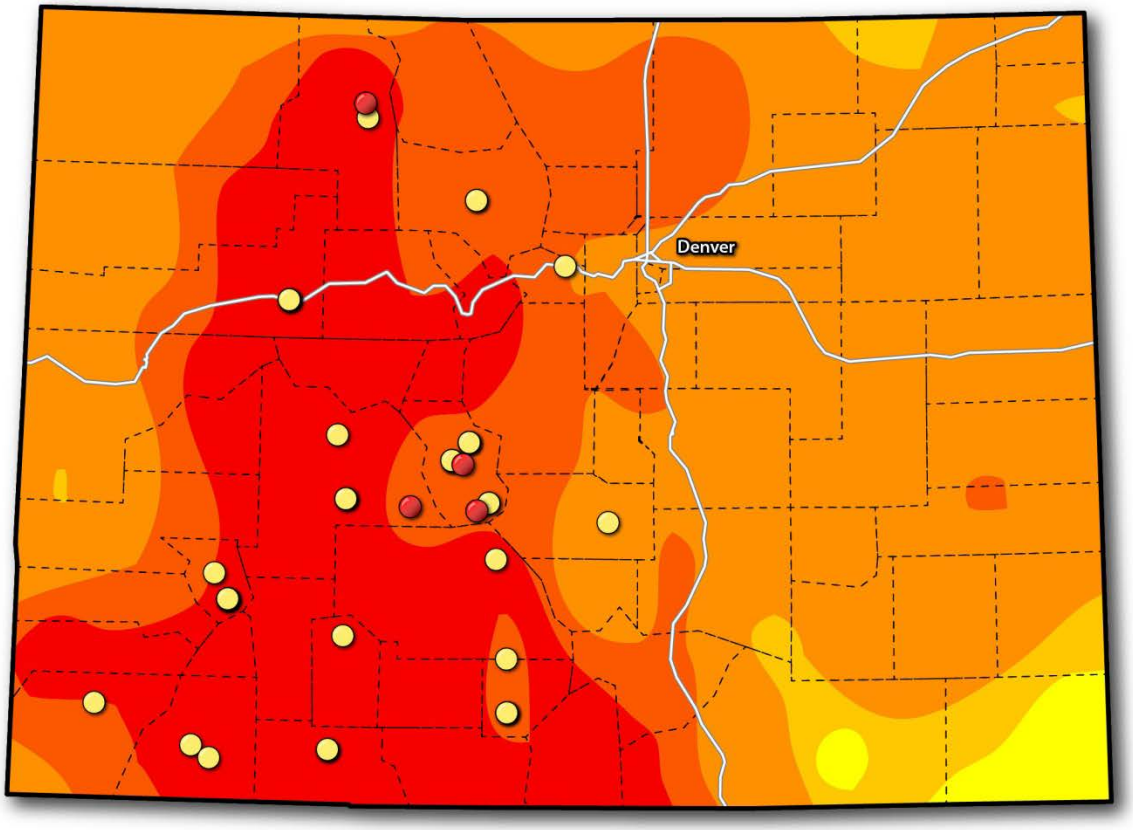
Geothermal Resource Potential



Source: Hollett (2012). "Stanford Geothermal Workshop Presentation," http://www1.eere.energy.gov/geothermal/pdfs/stanford_keynote_2012_hollett.pdf.

EGS Electricity Production Potential

Deep Enhanced Geothermal Systems (EGS) Resource of the State of Colorado



Identified Hydrothermal
Direct Use
Interstate
County

Favorability of Deep EGS

Most Favorable
Least Favorable

Source data for deep EGS includes temperature at depth from 3 to 10 km provided by Southern Methodist University Geothermal Laboratory (Blackwell & Richards, 2009) and analyses (for regions with temperatures ≥ 150°C) performed by NREL (2009).

This map was produced by the
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for the US Department of Energy.
Billy J. Roberts
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