Geothermal Technologies Office (GTO)

Courtesy GRC

Courtesy NREL

Tim Reinhardt, Program Manager
Systems Analysis and Low Temperature (SALT)

Large, Global Resource

- 3.4 GWe US installed
- 12 GWe worldwide
- 12 GWe global under development

GTO Key Goals, Objectives, and Priorities

Identify New Geothermal Opportunities

- Lowered risk and cost
- New prospecting workflow/
- “ “ validation and industry engagement

Accelerate a Commercial Pathway to EGS

- Frontier Observatory for Research in Geothermal Energy (FORGE)
- Reservoir characterization/creation technologies

Subsurface Engineering Crosscut

- Intra- and inter-agency efforts to address common subsurface challenges and better leverage DOE funding

Overcome Deployment Barriers

- National Geothermal Data System: Reducing upfront exploration cost

Additive Value

- Co-production and Distributed Power
- Mineral Recovery

Vision Study/Strategic Analysis

- Identify likely out-year issues for GTO
- Better guide funding decisions

The Energy Department addresses geothermal challenges at every stage of development

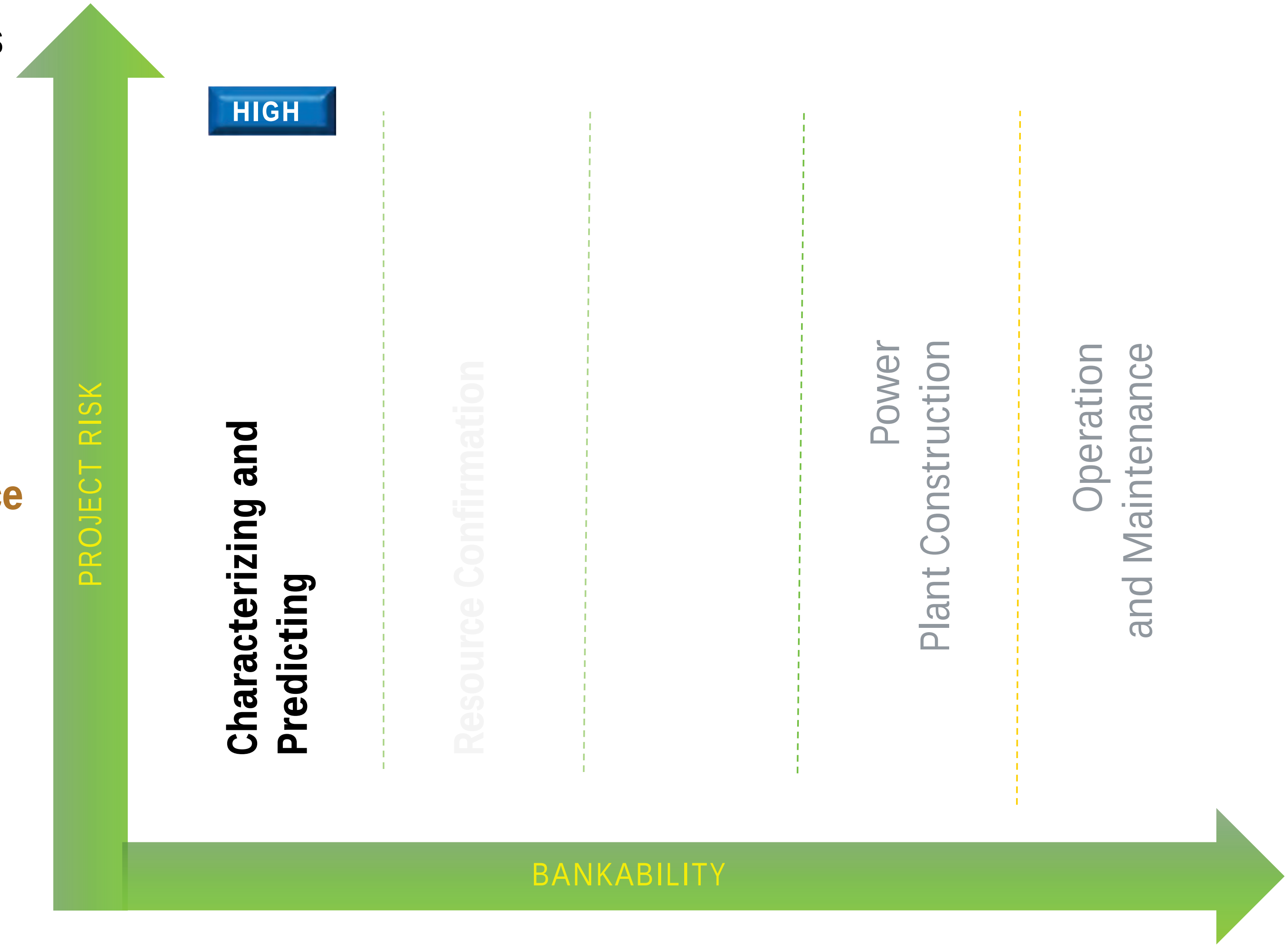
with a full complement of projects to accelerate the adoption of geothermal energy:

- Better targeted drilling
- Improved under-standing of the subsurface
- Innovate new tools and techniques that improve the value equation
- Lower upfront costs

Stage One: Characterize the Subsurface

Mitigate the risks of geothermal exploration

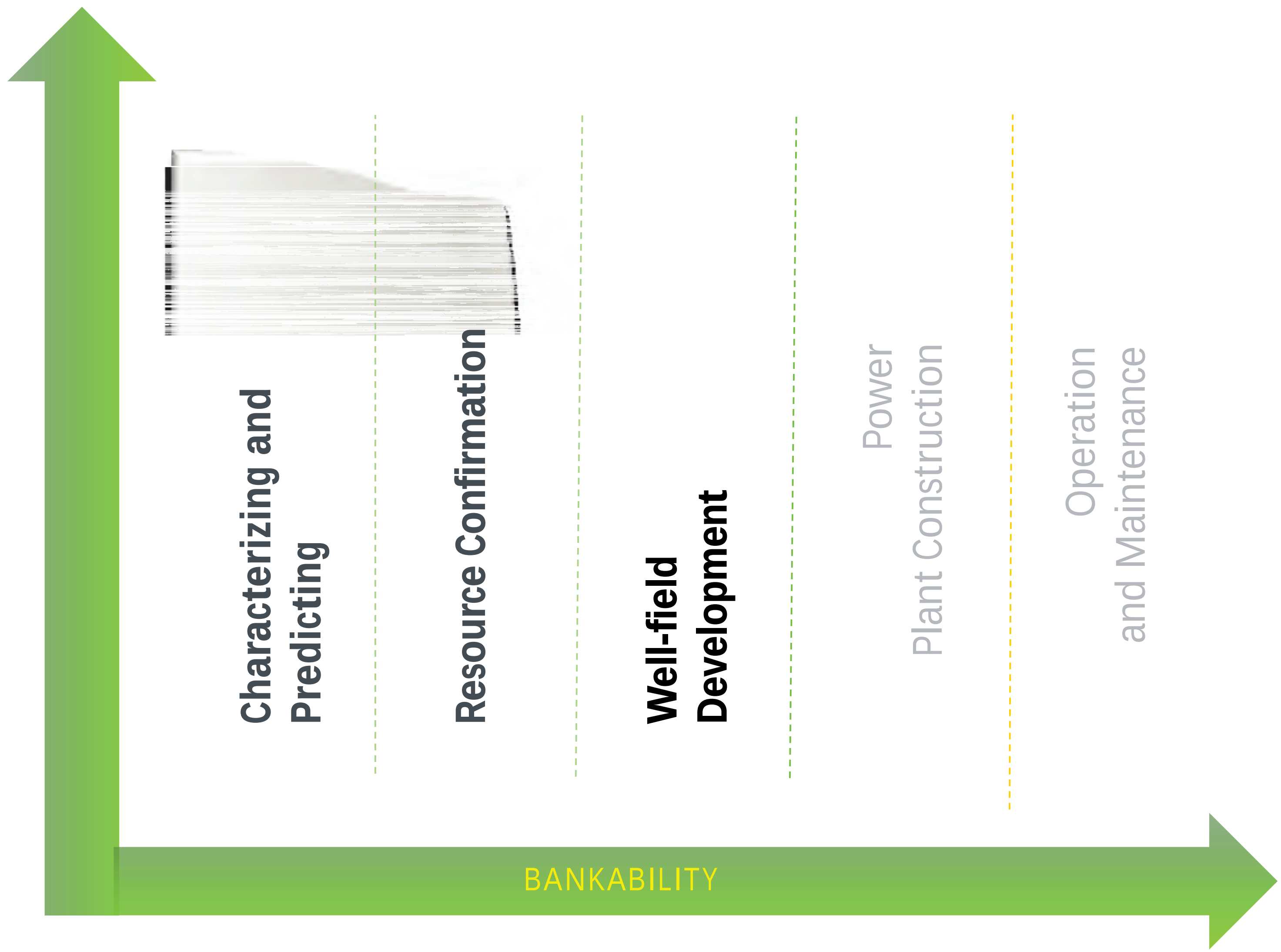
- **National Geothermal Data System**
- **Play Fairway Analysis**
- **New Subsurface Signals**
- **Geochemical/ Geo-physical Tools**
- **Exploration Decision Tree**



Stage Three: Wellfield Development

Reservoir engineering & optimization

EGS R&D
FORGE
Laboratory
Subsurface
Crosscut



Low Temperature and Coproduced Resources

Low temperature, coproduced and geopressured resources are geographically widespread

Low temperature geothermal resources more widely distributed than conventional hydrothermal resources, spreading into the upper Midwest and Gulf Coast region

Coproduction – hot water is a by-product of oil & gas wells. Resource quality depends on the amount of water produced &

Technology Barriers

GTO-Funded Solution Set

GOAL

Low-Temp
& Co-pro
Growth

Game-

Materials Extraction, Direc Use, Hybrid Systems

- Execute on **Coproduction** initiative
- **Mineral Recovery** - Resource assessment and feasibility
- Large-scale **Direct Use**: where does it make technical and commercial sense?
- **R&D** on innovative energy conversion/Hybrid Systems

GTO awarded 9 p

Funding Opportunity Objectives

Figure above provided by Lawrence Berkeley National Laboratory showing their process schematic for mineral extraction using thermophiles

DOE Geothermal Technologies Office (GTO) explores opportunities to partner with Industry to deploy binary systems in operating commercial oil and gas (O&G) fields. These GTP units could be available for two year demonstration periods.

100% proceeds/electricity goes to industry partner

GTO provides:

- Units at low/nominal cost (subject to final contract)
- Funds for minimally invasive and fast installation
- Necessary O&M of the unit

Industry Partners Provide:

- Site Access for installation and contingency operations
- Shared i

Permitting Challenges

- Geothermal Vision Study
- Continued validation of GTO-f

GTO Vision Study

By 2016, DOE seeks to develop credible analysis jointly with the Geothermal community that:

I. Articulates clear ***GTO investment strategies*** across different sectors and has a cohesive plan to attain the goals;

II. Discusses ***geothermal growth scenarios*** for 2020, 2030 and 2050 backed by robust data, modeling and analysis;

III. Addresses *all market segments* existing and potential hydrothermal, electrical and non-electrical usages, new EGS sector, and other value streams; and is

IV. Supported by ***peer-reviewed*** **industry data** and

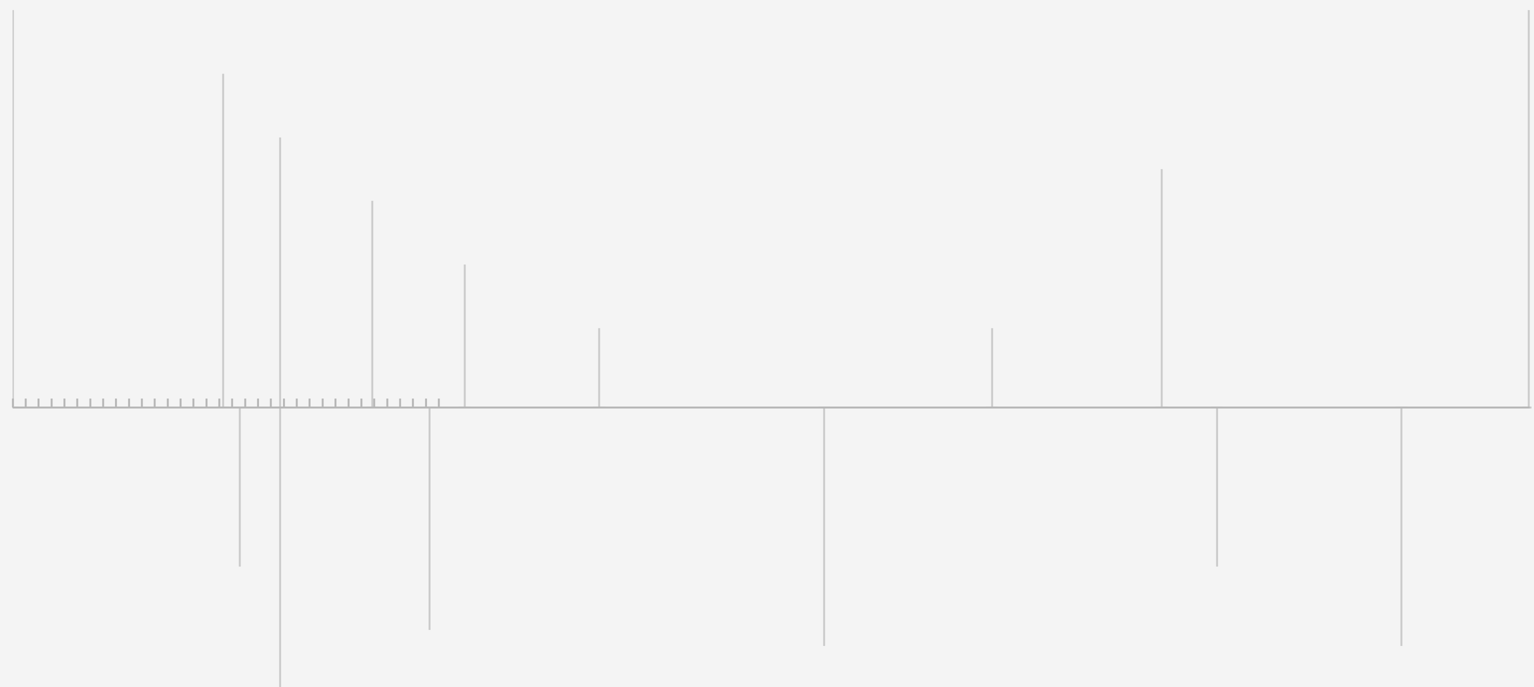
V. Is ***aspirational*** and ***inspirational***

Vision Study Objective

The Geothermal Vision Study will conduct a **credible** analysis of potential geothermal growth scenarios for 2020, 2030, and 2050 across multiple market sectors.

Market Sectors: Power Generation, Thermal Application

GTO Vision Study Timeline



Questions?

Low Temperature Potential in the Near-Term

Low-temperature and co-produced resources represent a small but growing sector of hydrothermal development, in geothermal resources below 150°C (300°F). Considered non-conventional hydrothermal resources, these technologies are bringing valuable returns on investment in the near-term, using unique power production methods.

Value-Added Streams - Forward Osmosis Purification of Co-Produced Water
Idaho National Lab

Waters produced during oil and gas operations are typically in the range of lower temperature geothermal resources (<150°C). In addition, these wells generally are not prolific producers of fluid and the power production is less than what is typical of a well on a hydrothermal resource. This project seeks to purify these produced waters to establish an additional revenue stream for a project, and reduce the magnitude of the costs currently being incurred to dispose of these waters. By doing so, the additional revenue