Notice of Intent No. DE-FOA-0001061

Notice of Intent to Issue
Funding Opportunity Announcement No. DE-FOA-0000841

The Office of Energy Efficiency and Renewable Energy (EERE) intends to issue, on behalf of the Geothermal Technologies Office, a Funding Opportunity Announcement (FOA) entitled "Geothermal Play Fairway Analysis".

Background

Geothermal energy today has expanded its horizons beyond traditional, surface-identified hydrothermal resources to include blind hydrothermal systems with no surface expression, enhanced geothermal systems (EGS) and low temperature systems. These varied types of potential geothermal resources offer a significant economic opportunity to the geothermal industry as well as the potential to significantly increase the amount of geothermal energy available for power generation, direct use, and other ancillary benefits in the U.S.

Significant advances have been made in recent years in the understanding of the geologic controls on these various geothermal systems (e.g., Sabin and others, 2004; Walker and others, 2005; Iovenitti and others, 2011; Faulds and others, 2012, Jolie and others, 2012). However, major questions remain as to how to best identify the location and quality of these resources, many of which do not have an overt surface expression. Without some sort of screening criteria, the search for these blind systems can be time and resource intensive, with a low probability of success. Developing a systematic approach to the identification of the type and location of potential blind geothermal resources early in the exploration process will improve the probability of success, lower the overall exploration costs and improve access to financing for drilling.

Early approaches to identifying blind hydrothermal systems focused on regional heat flow mapping (e.g., Costain and Speer, 1988). The concept of 'play fairway analysis' has recently been used to identify potential locations of blind hydrothermal systems (e.g., Carranza and others, 2008; Siler and Faulds, 2013) and to describe geothermal opportunities in rift-zone settings (King and Metcalfe, 2013). This tool, borrowed from the petroleum industry, incorporates the regional or basin-wide distribution of known geologic factors besides heat flow that control the occurrence of a particular example of a geothermal system. The analysis of all the contributing factors are used to estimate the probability that a particular type of occurrence will exist in areas where limited data are available. In the oil and gas industry, the result is frequently displayed as probability maps, showing the 'sweet spots' in a basin and ruling out areas that are not likely to be prospective (e.g, Doust, 2010; Rose , 2001).

The Geothermal Technologies Office (GTO) is interested in research that would further develop this technique for use in identifying and exploring for all types of potential geothermal systems (Phillips and others, 2013). Just as effective oil and gas play fairway analysis goes well beyond

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simple hydrocarbon documentation, it is expected that geothermal fairway mapping will extend well beyond observation of subsurface temperatures and will include a diversity of data including but not limited to structural and tectonic setting, chemical and isotopic data, rock mechanical properties, and hydrologic and basin history.

What is play fairway analysis?

A geothermal play refers to the combination of unique geophysical, geologic, structural and/or stratigraphic elements that have resulted in a geothermal resource. A play can either be based on the characteristics of a known field or prospect (e.g., Dixie Valley-type) or on a concept (e.g., granite-hosted greenfield EGS; e.g., Iovenitti and others, 2011, 2013). A play can thus be based on fields or prospects in a given basin or region, or can be a global-scale categorization. Some play types are well documented with actual examples, while other play types may be conceptual or speculative in nature.

A play fairway is the area in a basin or region where examples of an individual play type actually occurs and/or is projected to exist with high probability based on the geologic characteristics of the basin and of the play type. Play fairway analysis is generally conducted during the early phases of resource exploration in order to highlight areas where more detailed exploration would be productive.

What is the process?

1. Compilation of existing relevant geologic and geophysical data, including but not limited to:

      *   Surface and subsurface geologic data (e.g., surface maps and drill hole data)
      *   Geophysical data (e.g., magnetotelluric, seismic, gravity, resistivity and electromagnetic)
      *   Remote sensing data (InSAR, satellite imagery, hyperspectral data)
      *   Geochemical data (e.g., surface seeps, soil samples)

2. Determining the possible play types within the particular region and the necessary conditions required for each play type to occur. This step generally involves examining, interpreting and integrating the data.

3. Based on the data and on the play type, a probability map is constructed for each factor that needs to exist for that play type. This step may require additional modeling that incorporates the tectonic, structural, sedimentologic and thermal evolution of the region.

4. These individual probability maps are then used to generate a composite probability map. This map should summarize the probability that a play exists given a specific set of causative factors. An example of a hypothetical probability map is shown in Figure 1.

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Integral to the above process is careful documentation of underlying data and methodologies, to ensure the ability to replicate and adapt materials for play refinement and the development of future play types.
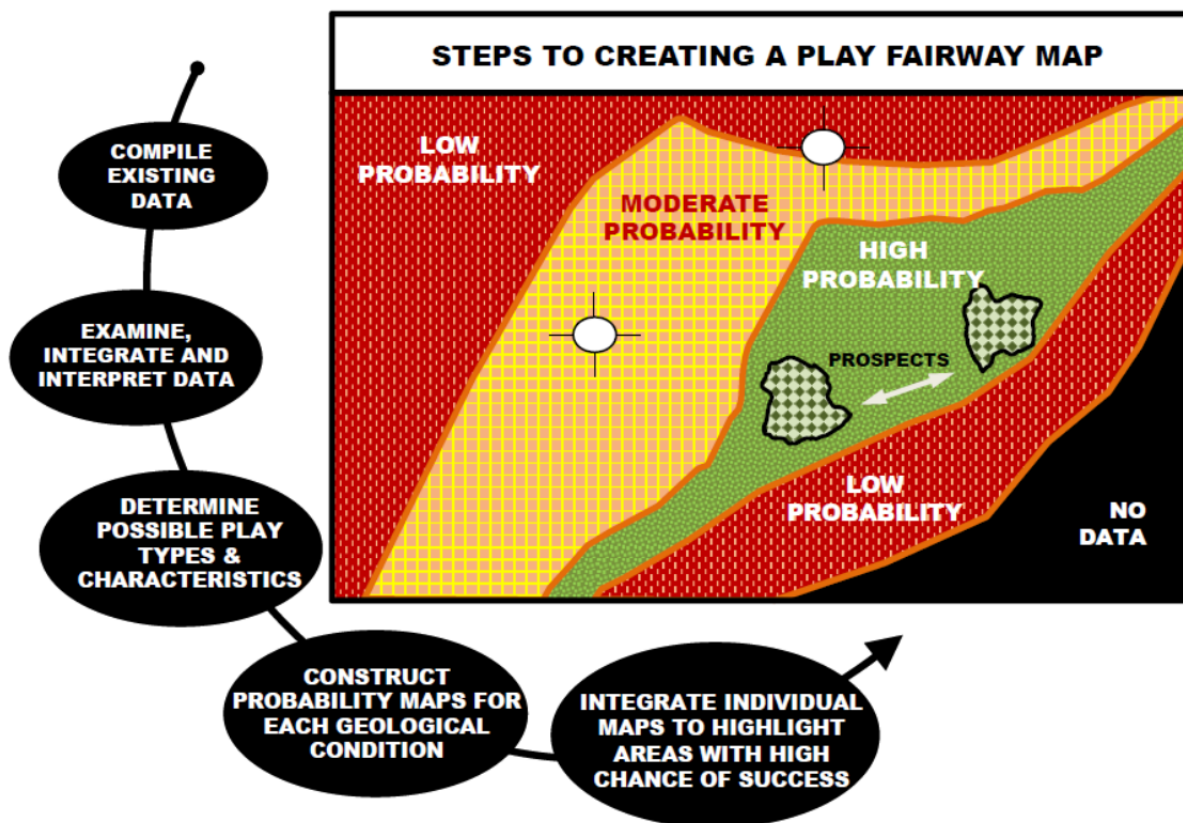

Figure 1. General process of creating a play fairway map. Note that critical to the process is determining the type or types of possible geothermal resources in the region of study. Not all the individual probability maps might be used in the creation of each play fairway map.

GTO believes that if play fairway techniques can be widely deployed in geothermal exploration, it will both quantify and lower exploration risk, thus lowering development risk, making investment in geothermal energy more attractive. GTO believes that both identifying and quantifying the level of risk are equally important for long term investment in the sector.

Areas of Interest

GTO intends to support projects that will serve as case studies to illustrate the use of the play fairway concept and ideally move geothermal exploration beyond currently known geothermal resource areas into new regions and provinces. Of particular interest are projects that:

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- develop new data analysis techniques that couple disparate data types;
- incorporate a wide range of geologic and geophysical data. Use of the National Geothermal Data System (NGDS) is highly encouraged;
- develop a clear and repeatable methodology for play fairway analysis of all types of geothermal resources;
- assemble a consortium of organizations with specific expertise and access to data

Applications for conducting play fairway analysis in unexplored or underexplored basins or regions or using new play concepts in basins with known geothermal potential are especially encouraged. Funds will not be provided in initial project phases for the collection and/or acquisition of data. Depending on the initial results of the funded work, a subset of awardees may be selected for continuation to subsequent project phases (including field work). If viable leads or prospects are identifed in the initial phase, then the Phase 1 report must include a plan for further exploration. Subsequent project phases may allow funding for acquisition of new data (field surveys) and/or exploratory drilling.

EERE envisions awarding multiple financial assistance awards in the form of cooperative agreements. The estimated period of performance for each award will be up to1 year for Phase 1, with more expedited completion preferred.

This Notice is issued so that interested parties are aware of the EERE's intention to issue this FOA in the near term. All of the information contained in this Notice is subject to change. Comments on potential opportunities in geothermal play fairway analysis, level of interest, and scale of possible projects are welcomed, and may be directed to playfairway@go.doe.gov. Any responses to this notice are subject to the Freedom of Information Act. Do not include any proprietary information in responses. EERE will not respond to questions or comments concerning this Notice. Once the FOA has been released, EERE will provide an avenue for potential Applicants to submit questions.

EERE plans to issue the FOA in winter 2014 via the EERE Exchange website (https://eere-exchange.energy.gov/). If Applicants wish to receive official notifications and information from EERE regarding this FOA, they should register in EERE Exchange. When the FOA is released, applications will be accepted only through EERE Exchange. In anticipation of the FOA being released, Applicants are advised to complete the following steps, which are **required** for application submission:

- Register and create an account in EERE Exchange at https://eere-exchange.energy.gov/. This account will allow the user to register for any open EERE FOAs that are currently in EERE Exchange. It is recommended that each organization or business unit, whether acting as a team or a single entity, use only one account as the contact point for each submission.

  Questions related to the registration process and use of the EERE Exchange website should be submitted to: EERE-ExchangeSupport@hq.doe.gov
- Obtain a Dun and Bradstreet Data Universal Numbering System (DUNS) number (including

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the plus 4 extension, if applicable) at http://fedgov.dnb.com/webform

- Register with the System for Award Management (SAM) at https://www.sam.gov. Designating an Electronic Business Point of Contact (EBiz POC) and obtaining a special password called an MPIN are important steps in SAM registration. Please update your SAM registration annually.

- Register in FedConnect at https://www.fedconnect.net/. To create an organization account, your organization's SAM MPIN is required. For more information about the SAM MPIN or other registration requirements, review the FedConnect Ready, Set, Go! Guide at https://www.fedconnect.net/FedConnect/PublicPages/FedConnect_Ready_Set_Go.pdf

- Register in Grants.gov to receive automatic updates when Amendments to a FOA are posted. However, please note that applications will not be accepted through Grants.gov. http://www.grants.gov/. All applications must be submitted through EERE Exchange.

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