Southwest Alaska Regional Geothermal Energy Project

May 19, 2010

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Engineered Geothermal Systems Demonstration Projects

Project Overview

Timeline

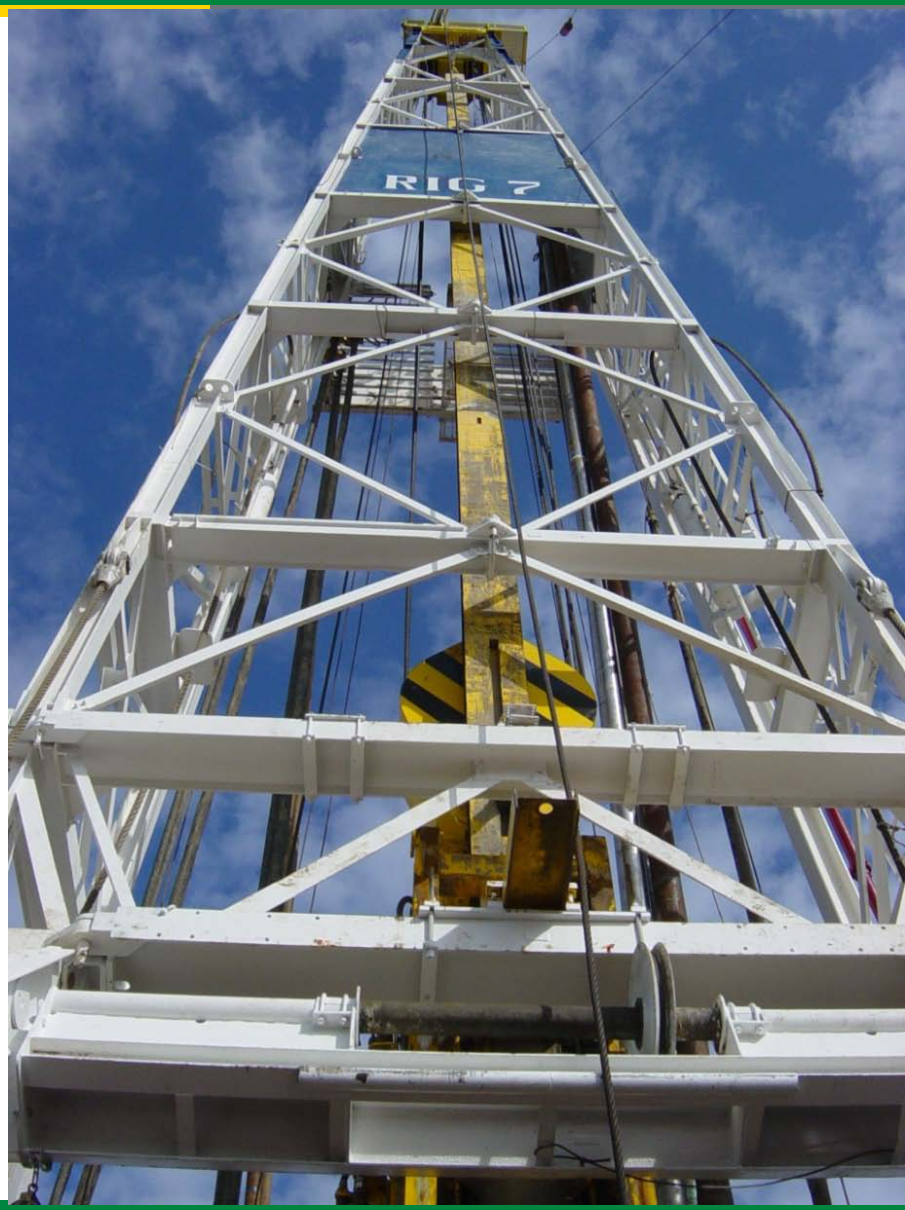
- Project start date: May 1, 2010
- Project end date: December 31, 2011
- Percent complete: 1%

Budget

- Total project funding: $31,346,500
- DOE share: $12,376,000
- Awardee share: $18,970,500
- Funding received in FY09: $0
- Funding for FY10: $278,380

Barriers

- Developing EGS in an area anticipated to have normal temperature gradient -- different from nearly all other EGS demonstration projects in the US and throughout the world.



Project Overview

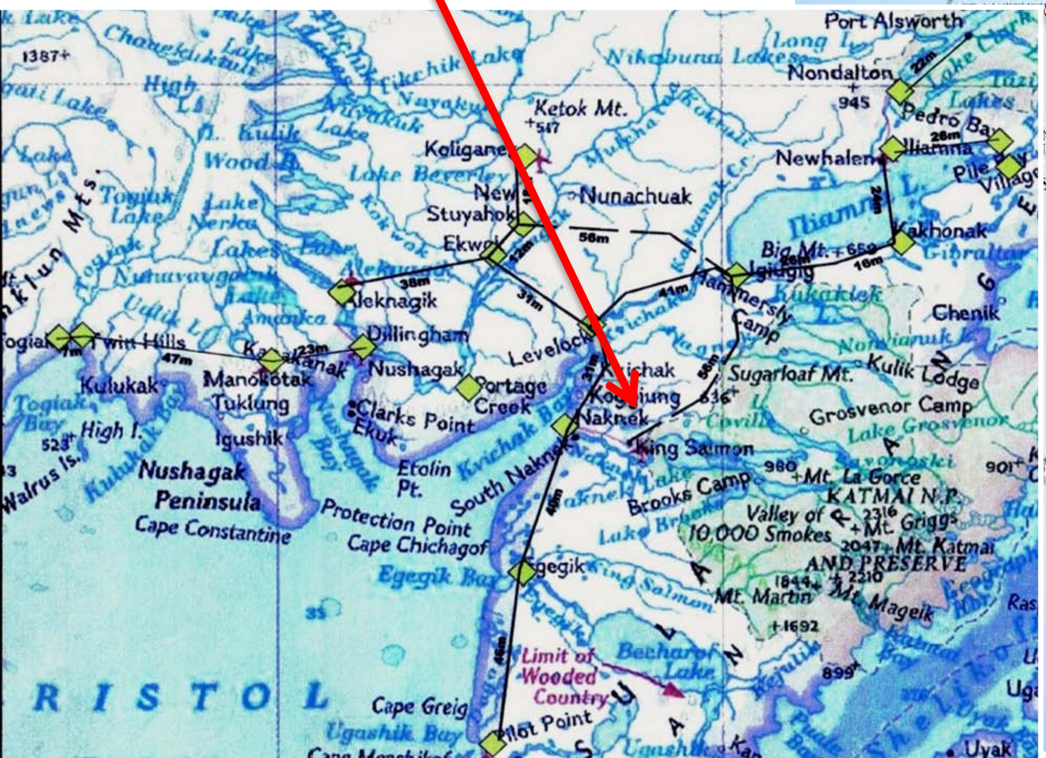
- Drilling to target depth of 12,000 to 14,000 feet is extremely expensive.
- High existing electricity costs and the variability of fuel prices make this deep EGS option attractive for Naknek and other remote locations in Alaska.

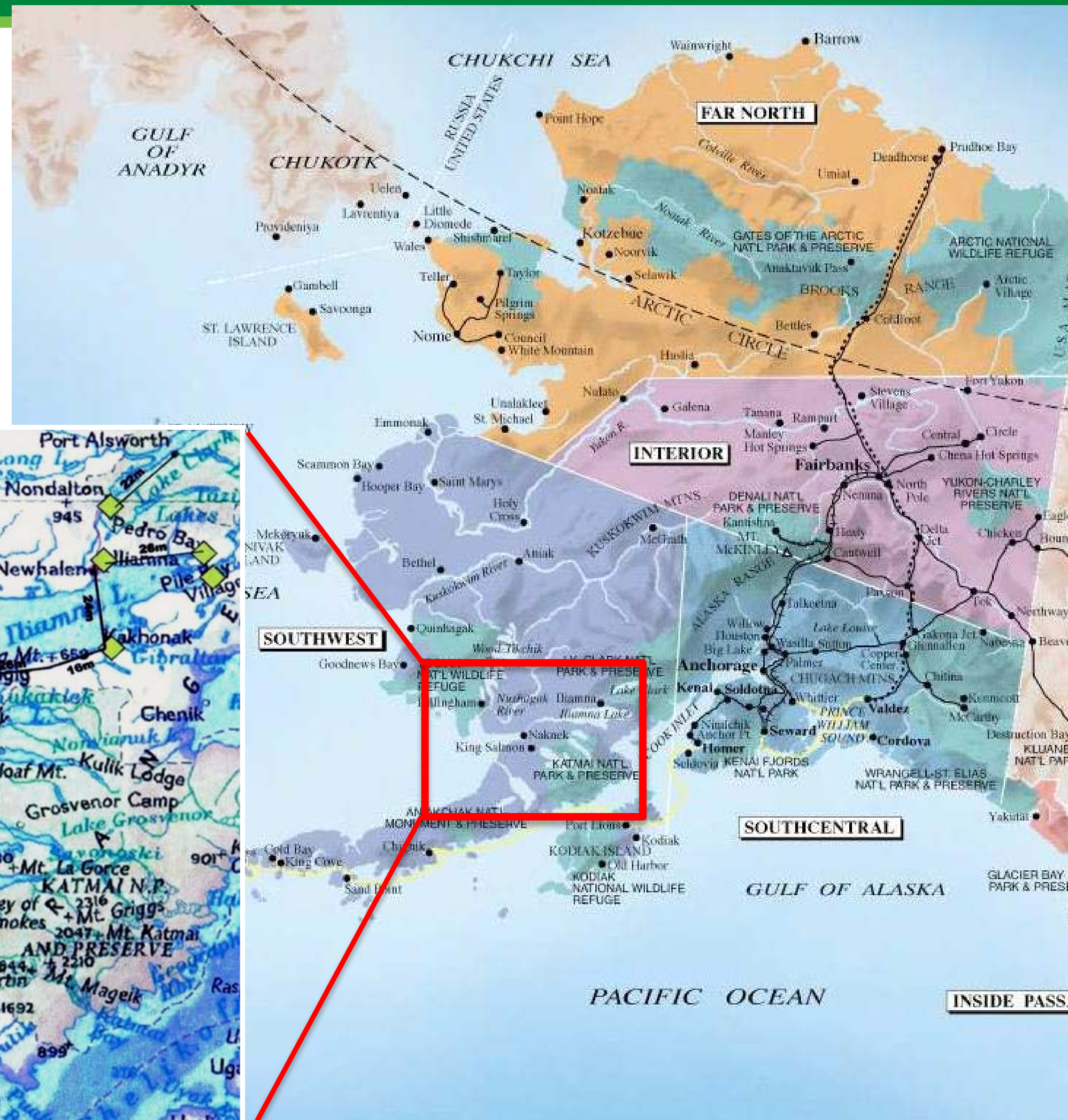
Technical Partners

- Alaska Earth Sciences
- Castle Mountain Group
- GeothermEx

Project Location

Naknek Electric Association Geothermal Site





Relevance/Impact of Research

Project Objectives

- Develop a renewable energy resource to offset diesel-fired electricity and heating in a region with few alternatives.
- Stabilize electric rates in Naknek and 25 rural communities by replacing >5.4 mm gals of diesel used for electricity and heating, avoiding >$15,000,000/yr in fuel costs.
- Decrease costly and hazardous transportation of fossil fuels along habitat-sensitive waterways of Bristol Bay, home of the world's largest wild salmon runs.
- Stabilize energy costs to foster economic development

Relevance/Impact of Research

- The **Southwest Alaska Regional Geothermal Energy Project** will advance geothermal energy development in remote regions of Alaska and across the US:
  - Demonstrating EGS technology where energy costs are high and the geothermal gradient is normal
  - Procuring a rig capable of drilling up to 20,000' for use throughout Alaska
  - Training and employing local residents in geothermal drilling technology
  - Serving as a stepping stone to a regional geothermal power initiative for Southwest Alaska, which is poised geographically and geologically for major economic development.

Scientific/Technical Approach

- Comprehensive EGS Field Demonstration Project
  - To characterize the region of Alaska lying behind the volcanic arc
  - To create and validate a sustainable EGS reservoir to initially supply 8MW electrical power for Naknek Electric Association members
  - To ultimately provide 25MW to 50MW to power 10 to 30 rural communities in Southwestern Alaska
- **Phase I:** Analyze rocks encountered in well Naknek G-1 to facilitate development of an EGS reservoir
  - Determination of stress field orientation
  - Assessment of geothermal resource

Scientific/Technical Approach

- Methods
  - Conduct Environmental Assessment
  - Install Passive Seismic Array
  - Analyze Geophysical Logging Data from well G-1
  - Petrologic / Mineralogic Analyses of Cuttings.
  - Baseline Injection and/or Production Testing of Well G-1
  - Heat-Up Temperature Surveys in Well G-1
  - Stress Modeling
  - Design and Establish Seismic Monitoring System
  - Construct a Conceptual Geothermal Resource Model
  - Pre-Stimulation of Well G-1

Scientific/Technical Approach

- **Phase II**: Stimulation of G-1, and planning for the drilling and evaluation of well G-2 or G-3
  - Conduct Chemical and/or Hydraulic Stimulation in Well G-1
  - Evaluate Stimulation Results
  - Finalize G-2 or G-3 Drilling Target

- **Phase III**: drilling, logging and testing of well G-3
  - Drill well to 10,000 – 14,000 feet
  - Collect sonic velocity, density, caliper, gamma ray, and wellbore image logs
  - Collect core & perform mini-frac
  - Evaluate temperature and productivity of well
  - Circulation test

Scientific/Technical Approach

- **Phase IV:** Long-term testing and evaluation of results to determine the power generation level of the project.
  - Circulation testing
  - Analysis of circulation testing results for long-term operation of the system and power generation

Accomplishments, Expected Outcomes and Progress

- Well G-1 has been drilled to 10,433’
- With an eye to the most essential elements of the EGS plan, NEA will characterize the rock mass and stress field to facilitate hydraulic and/or chemical stimulation of the well.
- Work will begin immediately on planning and contracting for G-2
- The focus lies squarely on generating EGS power.

Project Management/Coordination

- NEA has assembled a highly qualified team with significant EGS experience
- NEA's share of drilling G-1 is $18 million
- NEA members are paying a temporary $0.09/kW surcharge to finance the project
- The State of Alaska has allocated $2 million to G-1
- $2.8 million in FY09 and $2.5 million in FY10 Congressional Designated Program funds are allocated to drill G-2

Future Directions

May 2010: Evaluation & flow testing of G-1

June: Design, contracting and procurement for G-2

July: Skid rig, set conductor, ship materials to Naknek

August - November: Drill G-2

November-December: Stimulation of G-2

December – February: Circulation testing

March – May 2011: Design, permitting and procurement for G-3

June 2011: Skid rig, set conductor and ship materials to Naknek

July – October: Drill G-3

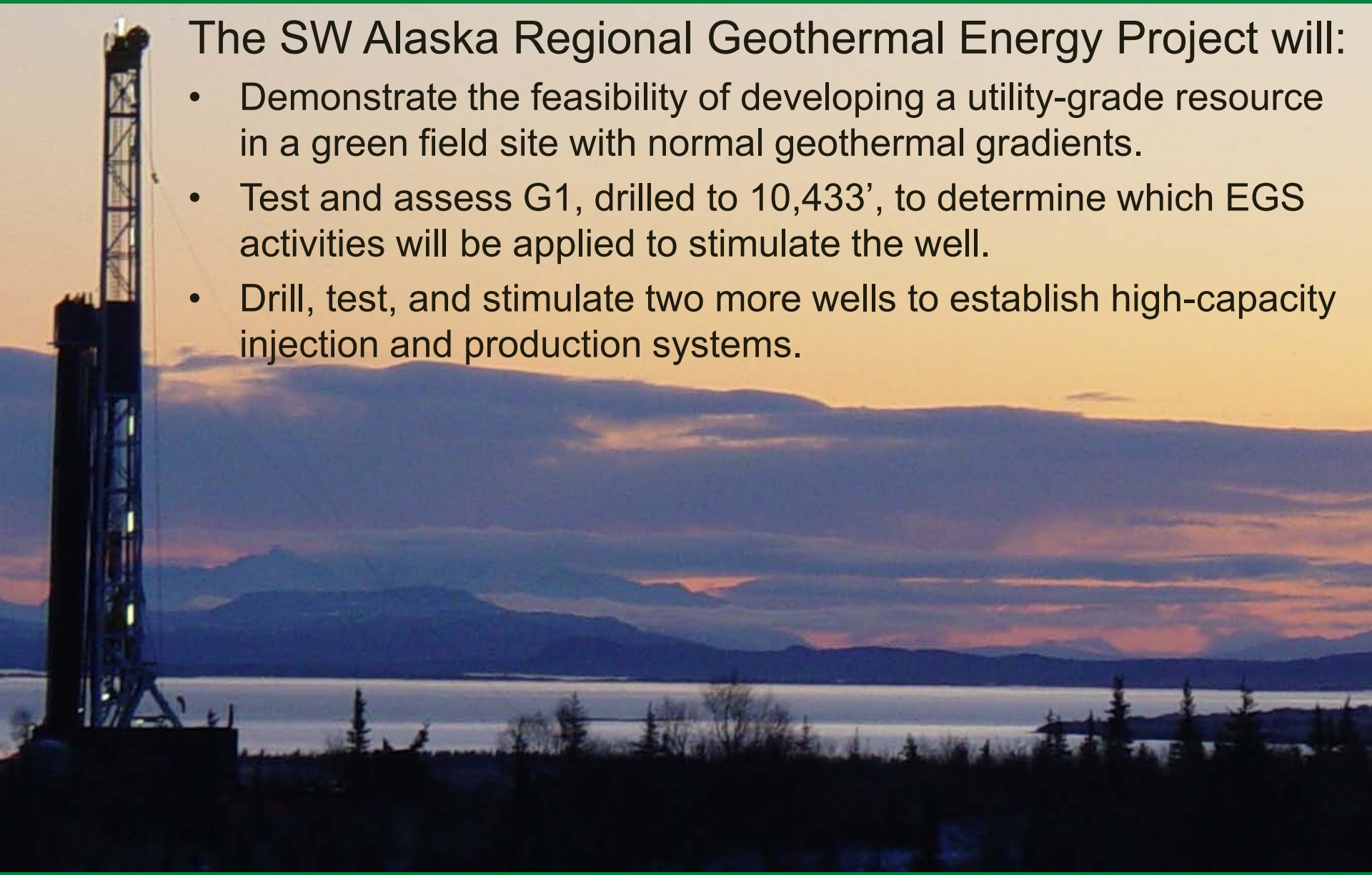
November-December 2011: Analysis, evaluation, stimulation and circulation testing

ARRA Job Creation

The SW Alaska Regional Geothermal Energy Project will:

- Leverage $100,000 in Alaska Department of Labor funding to train drillers in collaboration with the Southwest Alaska Vocational Education Center
- Create 35 locally-based, full-time jobs to drill, stimulate and prepare three geothermal wells for production (not including another 40 temporary positions hired through subcontractors)
- Provide high-quality jobs in the continuing development of this and other spinoff geothermal energy projects in rural Alaska

Summary



The SW Alaska Regional Geothermal Energy Project will:

- Demonstrate the feasibility of developing a utility-grade resource in a green field site with normal geothermal gradients.
- Test and assess G1, drilled to 10,433', to determine which EGS activities will be applied to stimulate the well.
- Drill, test, and stimulate two more wells to establish high-capacity injection and production systems.