



Expansion of Domestic Production of Lithium Carbonate and Lithium Hydroxide to Supply US Battery Industry

John Groves

Jeff Davis

Chemetall Foote Corp

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Overview

Expand Lithium Raw Material Base in US

Timeline

Start Date: April 14, 2010

End Date: February, 2013

Barriers

**Geothermal Resource
Strength and Viability of
Geothermal resource**

Budget

DOE Share - \$28.4 million

**Rockwood Share - \$39.5
million**

Partners

**Engineering: BE&K[®] (a KBR
company)**

**Environmental Assessment:
Nevada Bureau of Land Mgmt**

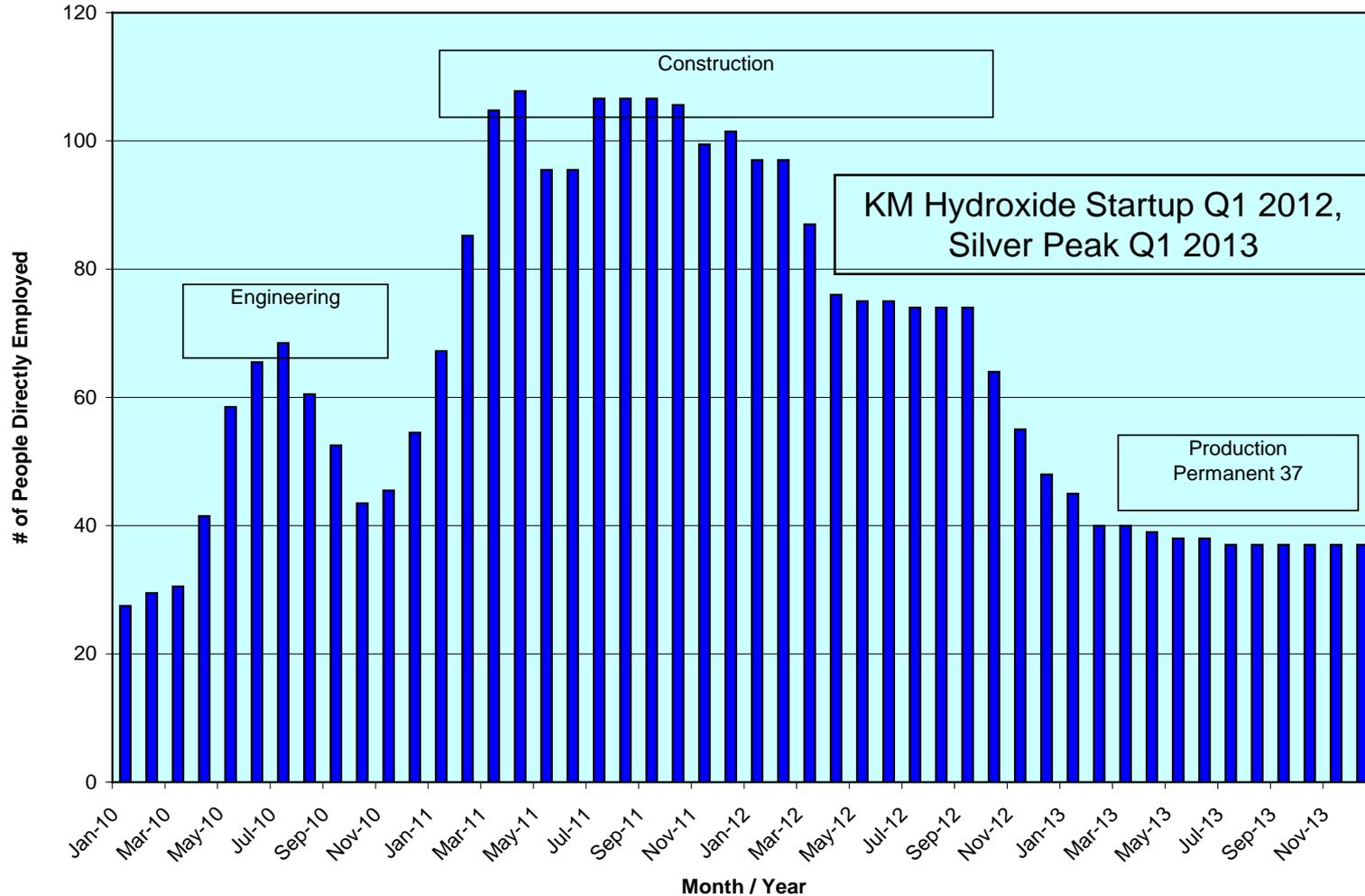
Relevance: Domestic Source of Strategic Materials

- **Objectives**
 - **Expand domestic lithium carbonate and lithium hydroxide production to supply the US electric drive automotive market.**
 - **Deliver high quality lithium products to battery component manufacturers to produce high quality lithium ion batteries.**
 - **Create construction jobs over the first two years in the US and permanent jobs for production of lithium raw materials.**
 - **Stimulate the US economy with worthwhile long term benefits that will support the conversion to electric drive mobility.**

Relevance: Domestic Source of Strategic Materials

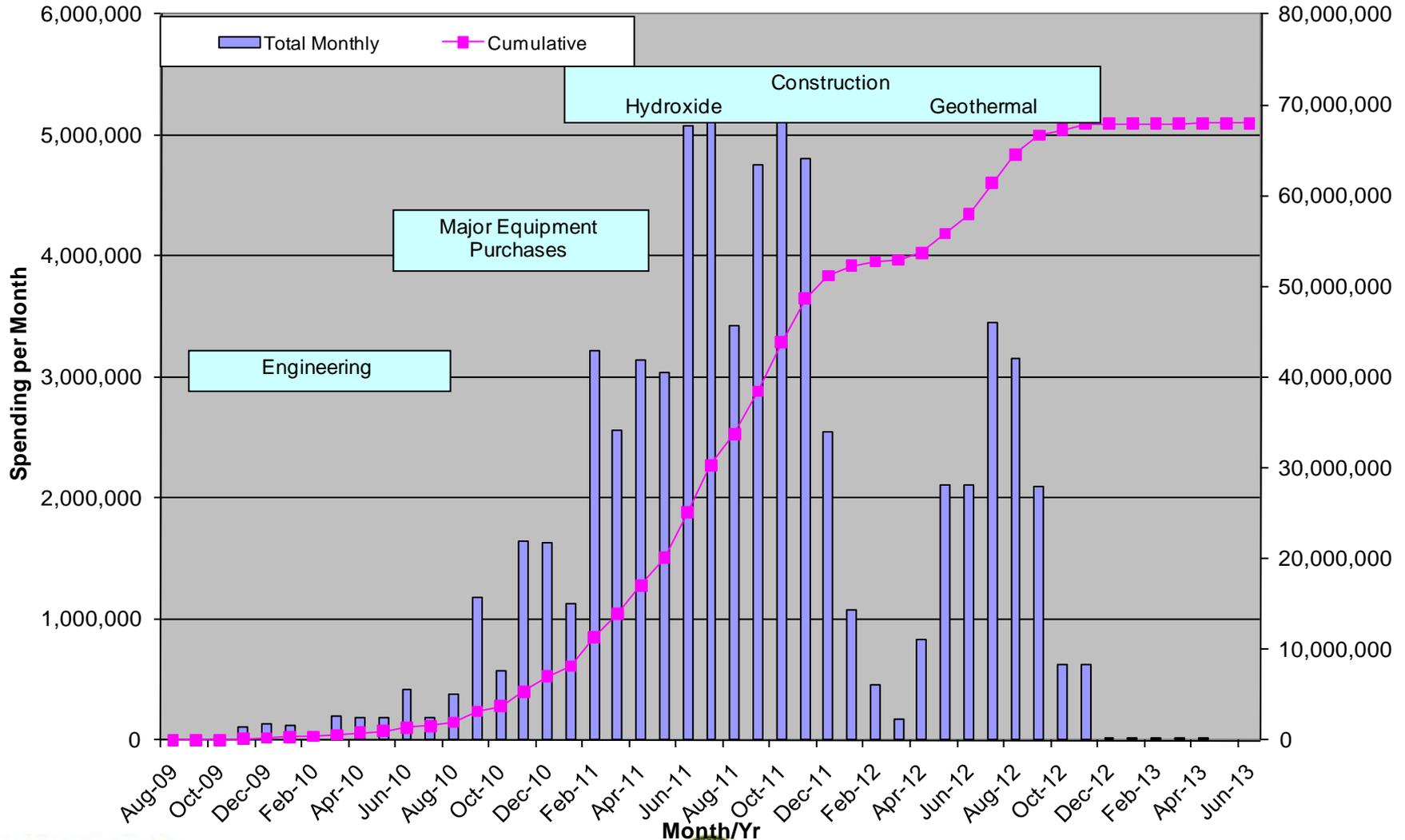
- **Milestones**
 - **Deliver battery grade lithium products to the DOE and component manufacturers in 2012 from this project.**
 - **Maintain the long term viability of domestic production of lithium raw materials by lowering operating cost and at the same time reducing fossil fuel based energy consumption.**
 - **Job Creation throughout 2010-2012 for engineering and construction peak at over 100 workers and 35 permanent Chemetall Foote positions.**
 - **Stimulate the US economy with nearly \$70 Million in direct spending over the three year period.**

Relevance: Job Creation

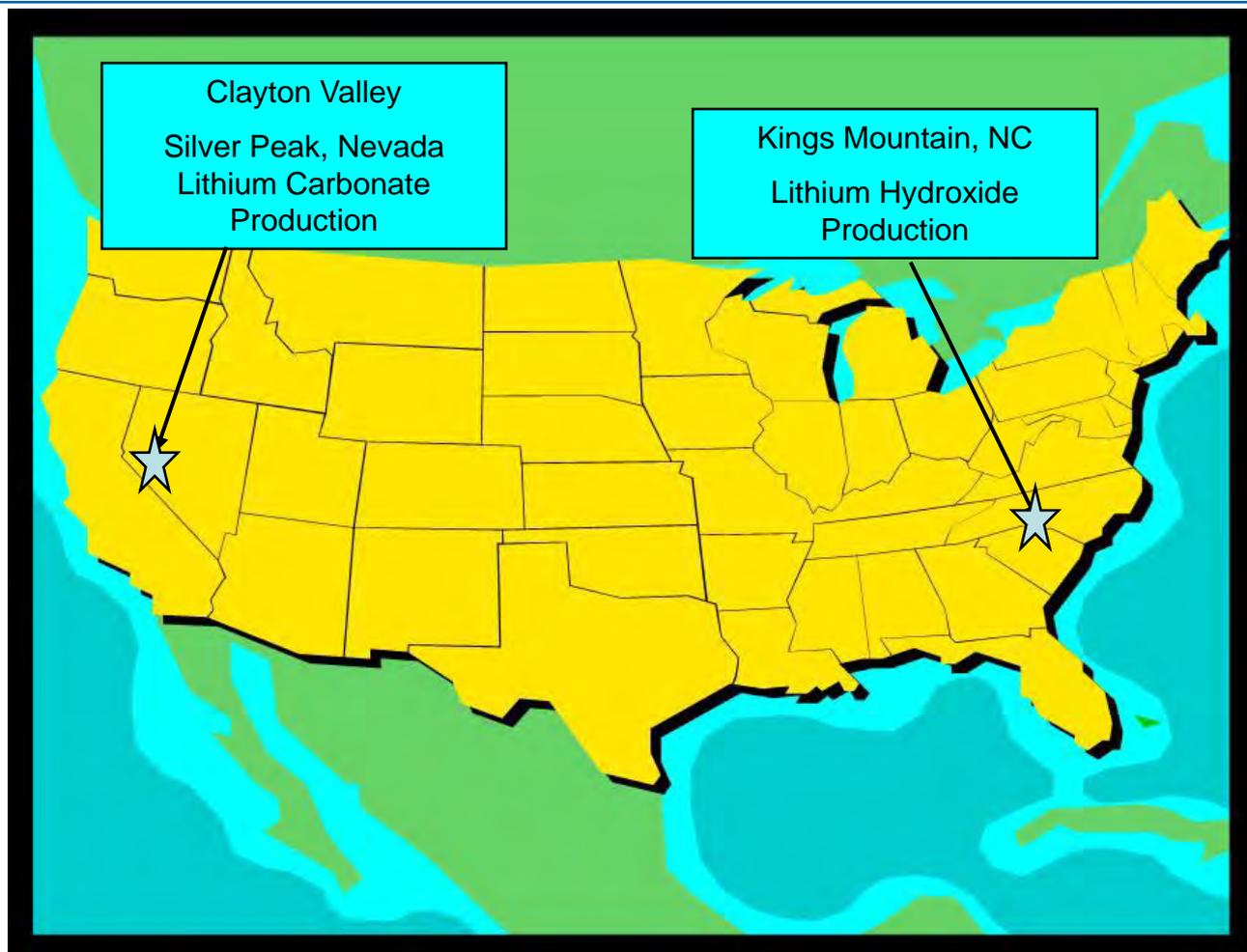


Relevance: Economic Stimulus

Direct Spending (not including peripheral effect)



Approach: Expand Domestic Production of Key Lithium Raw Materials



Approach: Lithium Carbonate Expansion Solar Evaporation Ponds in Silver Peak, Nevada

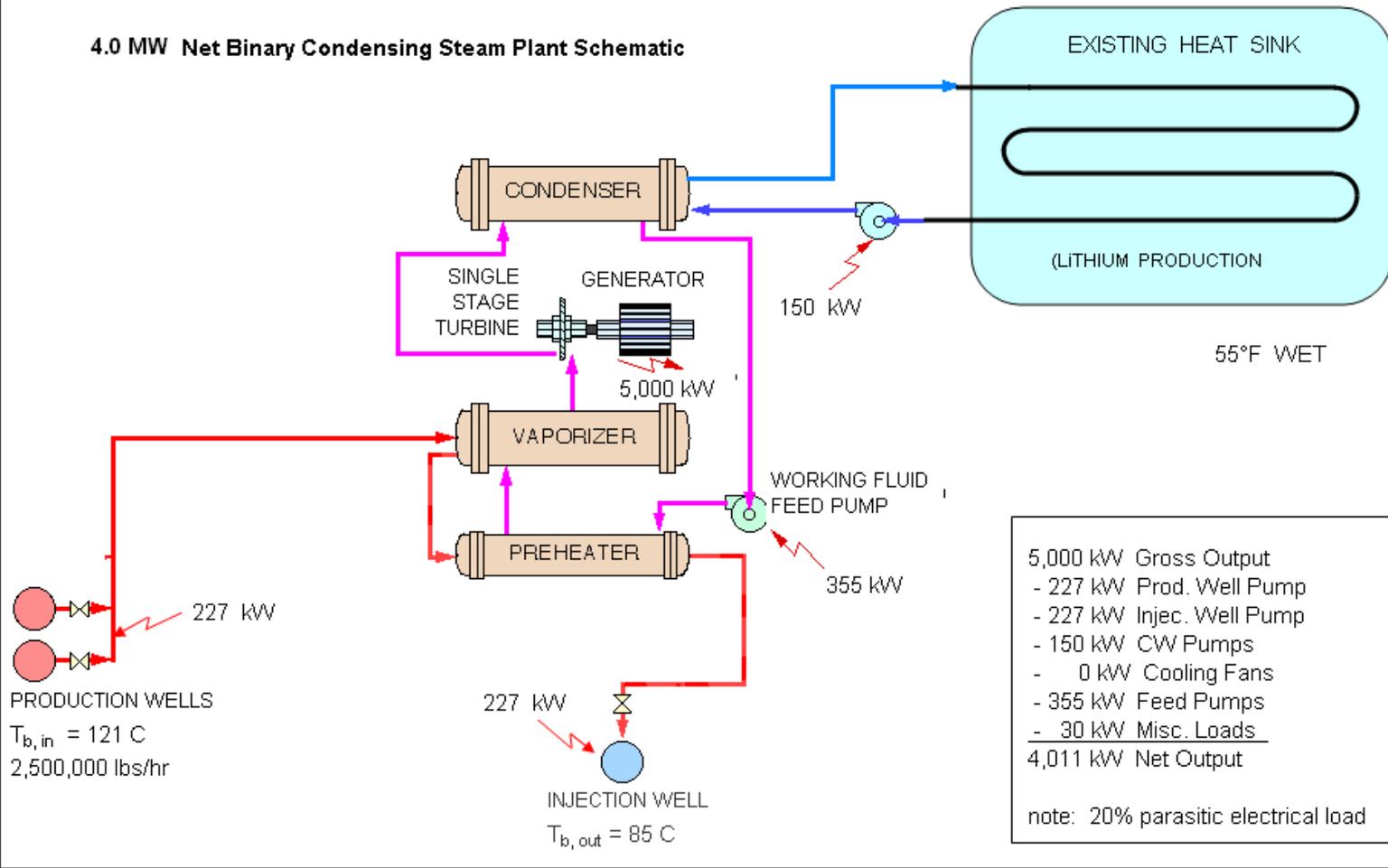


Approach: Lithium Carbonate Expansion

- **Expand lithium carbonate plant in Nevada using green technology.**
 - **Expand use of solar energy used to evaporate water and concentrate lithium in brine.**
 - **Install a new geothermal power plant to provide electricity for pumping and processing lithium brines and conversion into lithium carbonate.**
 - **Create the greenest lithium carbonate plant in the world with an energy usage of 99+ % solar and geothermal.**
 - **Technical barrier is geothermal viability. Exploration will determine whether sufficient resource is available. Early indications are favorable.**
 - **Go/no-go decision on geothermal in 2011 based on resource temperature and flow.**
 - **Environmental assessment of geothermal production currently underway in joint effort between Chemetall Foote, DOE and Nevada BLM.**

Approach: Geothermal Power Plant

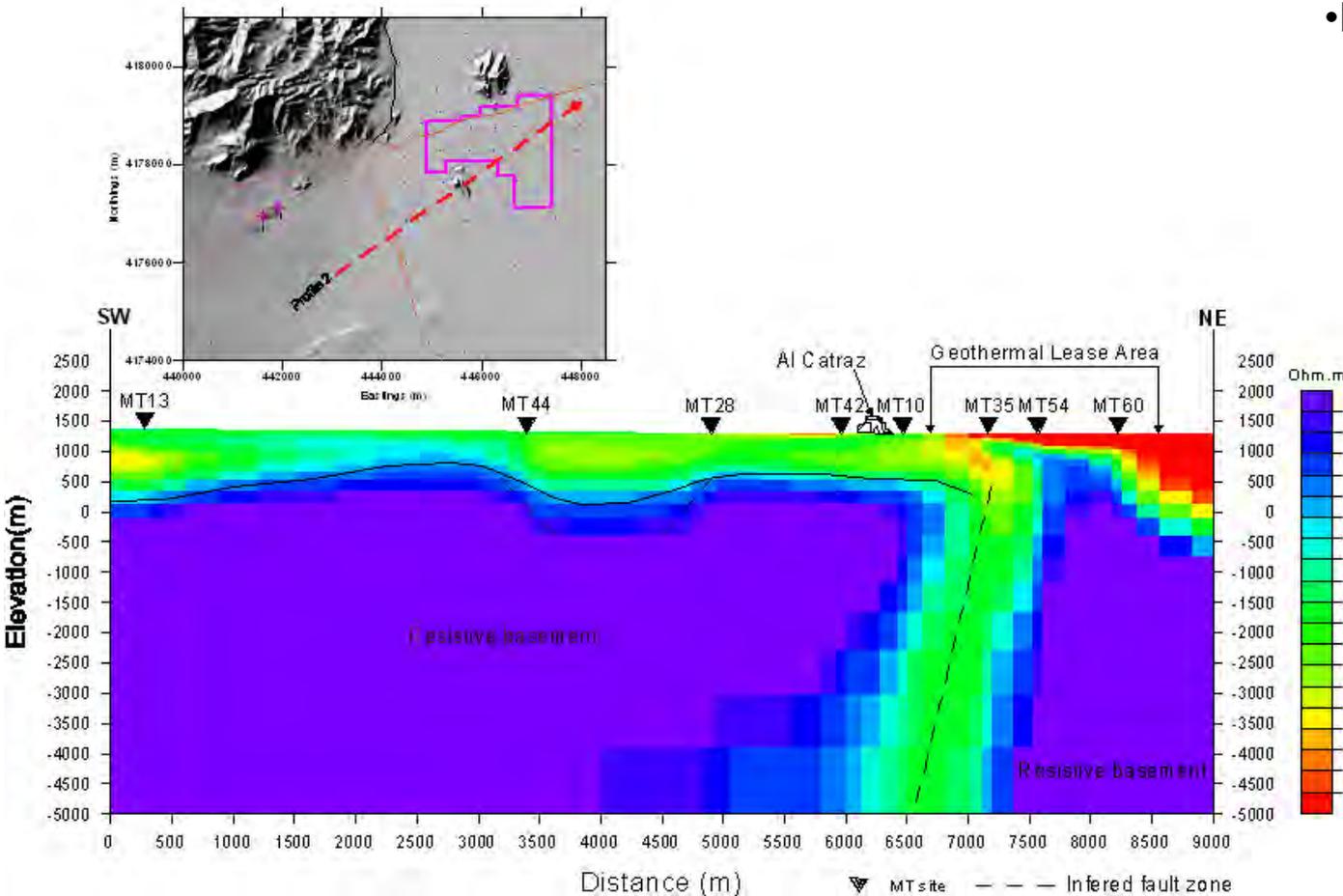
4.0 MW Net Binary Condensing Steam Plant Schematic



5,000 kW Gross Output
 - 227 kW Prod. Well Pump
 - 227 kW Injec. Well Pump
 - 150 kW CW Pumps
 - 0 kW Cooling Fans
 - 355 kW Feed Pumps
 - 30 kW Misc. Loads
4,011 kW Net Output

note: 20% parasitic electrical load

Approach: Geothermal Power Plant Results of Geotechnical Evaluation



- Fractured zones (fault lines) identified
- Blue = rock
- Red = brine

Approach: Lithium Hydroxide Plant

- **Kings Mountain Lithium Hydroxide Plant will use best available technology developed by Chemetall Foote.**
- **Combination of purification techniques will provide battery grade lithium hydroxide for the automotive industry.**
- **Key parameters are low variability, low concentration of contaminants.**
- **Major milestones are start of construction late 2010 and startup early 2012.**

Technical Accomplishments and Progress

- **Project Approved April 14, 2010.**
- **Lithium Hydroxide Basic and Detailed Engineering Nearly Complete**
- **KM Major equipment ordered**
- **KM Pre-construction demolition 95% complete**
- **Geotechnical evaluation completed at Silver Peak shows high feasibility for geothermal power plant**
- **Drill Rig, Salt Harvester and other main equipment purchased**
- **Overall Spending nearly \$10 Million of \$70 Million forecast**

Kings Mountain Plant February 2011



Silver Peak Well Drill Rig February 2011



Collaborations/Partnerships

- **Engineering to date has been primarily in conjunction with BE&K (a KBR company located in Birmingham, AL).**
- **Environmental assessment for Geothermal is a joint effort by DOE, Chemetall Foote and the Nevada BLM.**

Completed and Future Work

- **2010**
 - Completed basic engineering Lithium Hydroxide, purchased major equipment, began preparation for construction
 - Completed exploration for Silver Peak Geothermal and reach first go/no-go point on resource viability
 - Complete drilling and pond expansion for Silver Peak lithium carbonate expansion
- **2011**
 - Complete construction of lithium hydroxide plant
 - Drill observation and production wells for geothermal plant and reach second go/no-go point
 - Complete lithium carbonate expansion
- **2012**
 - Start up lithium hydroxide plant
 - Build geothermal power plant

Summary

- Objective: Supply key raw materials to lithium battery industry and create jobs and support stimulus of US economy.
- Relevance: Chemetall Foote is only domestic supplier to lithium battery industry and is expanding operations.
- Approach: Lower costs and improve technology to enhance ability to be long term supplier to industry.
- Milestones: Geothermal plant go/no-go feasibility decision point reached in 2011 but other portions of project are low risk – proven technologies being implemented.
- Timeline: All projects implemented between first quarter 2012 and first quarter 2013.