

GPRA Representation of the Geothermal Technologies Program

The primary goal of the Geothermal Program is to reduce the cost of geothermal generation technologies, including both conventional and engineered geothermal source (EGS) systems. Measuring the GPRA benefits involves projecting the market share for these technologies based on their economic and environmental characteristics.

The NEMS-GPRA04 electricity sector module performs an economic analysis of alternative technologies in each of 13 regions. Within each region, new capacity is selected based on its relative capital and operating costs, its operating performance (i.e. availability), the regional load requirements, and existing capacity resources. Geothermal capacity is treated in a unique manner due to the specific geographic nature of the resources. The model characterizes 51 individual sites of known hydrothermal geothermal resources, each with a set of capital and O&M costs. For the GPRA program case, an additional set of EGS sites were added to this slate.

The program was represented by reducing the capital and O&M costs for all hydrothermal geothermal sites, so that the average of the three lowest cost sites matched the program cost goals, as reflected in the EERE/EPRI Technology Characteristics report. Separate program technology goals were provided for the added EGS sites. In addition, the program was assumed to reduce the risk associated with new geothermal development, and the Baseline case limit on the size of annual developments per geothermal site was relaxed from 25 MW or 50 MW (depending on year) to 100 MW per year.

In addition to competing on an economic basis with other electricity generation technologies, geothermal capacity may be constructed for its environmental benefit. The PERI Green Power Market Model was used to estimate the potential demand for renewable generation, including geothermal, in response to the expanding green power markets in many places across the country. The projections for green power geothermal installations were incorporated into NEMS-GPRA04 as the planned capacity additions.

The primary energy, oil, and carbon emissions savings all stem from geothermal power displacing fossil-fueled generation sources that were built in the Baseline case. Over time, the new facilities that are constructed in the Baseline become more efficient as gas combined cycle and combustion turbine technologies continue to improve. As a result the energy and emission savings from the central grid decline per kilowatt-hour of renewable generation. Energy expenditure savings are measured as the reduction in consumer expenditures for electricity and other fuels. Lower cost renewable generation options reduce the price of electricity directly and reduce the pressure on natural gas supply, both of which benefit end-use consumers.

The renewable programs have been modeled together, and the GPRA benefits are allocated to each proportional to their generation share.

FY04 GPRA Benefits Estimates for Geothermal (NEMS-GPRA04)			
	2005	2010	2020
Capacity (GW)	0.0	1.8	6.7
Generation (GWh)	0.4	14.8	54.6
Energy Savings (quads)	0.00	0.11	0.41
Oil Savings (quads)	0.00	0.01	0.02
Carbon Savings (MMT)	0.1	1.8	7.3
Energy Expenditure Savings (B2000\$)	0.0	0.6	1.7