

GPRA Representation of the Solar Energy Technologies Program

The Solar Program encompasses several technologies in thermal heat and electric markets. The solar buildings component is focused on developing low cost solar hot water and pool heaters to displace fossil-fueled alternatives. For electricity generation, photovoltaics are being improved for both distributed and central generation applications, and the Solar Program is working to accelerate PV adoption through the Million Solar Roofs Initiative. Concentrated Solar Power R&D has also been part of the Solar Program but is not included in the FY04 budget request except at a close-out level. As a result, CSP has not been included in the GPRA04 benefits estimates.

The GPRA benefits for solar water and pool heaters are represented within the residential module of NEMS-GPRA04. The solar water heater is a specific technology defined by its capital cost, O&M costs, and electrical usage. The baseline assumptions are modified to reflect the program goal of \$1000 per unit and a backup fraction of 40 percent. The costs are changed for both new and replacement water heaters.

The pool heaters could not be modeled based on economics, because there is not a pool heating end-use within NEMS-GPRA04. In addition, it appears that the program is not really aimed at reducing the cost for solar pool heaters, but rather making them more acceptable by producing them in colors other than black. Therefore, the penetration rates and energy savings estimated by the program office were used to exogenously reduce water heating demand in the residential model.

Photovoltaic systems are represented using two methods. The capital and O&M costs were modified to reflect the program's goals, as reflected in the EERE/EPRI Technology Characteristics report. The regional capacity factors in the Baseline were already a similar to those in the EERE report, so they were left unchanged. In addition to competing on an economic basis with other electricity generation technologies, PVs may be constructed for their environmental benefits. The PERI Green Power Market Model was used to estimate the potential demand for renewable generation, including PVs, in response to the expanding green power markets in many places across the country. The projections for green power PV installations was combined with the Million Solar Roofs installation goals to determine the planned PV capacity additions that were incorporated into NEMS-GPRA04. All of the projected PV capacity for GPRA stems from the green power and MSRI additions.

Estimates of primary energy, oil, and carbon emissions savings result from direct displacement of fossil fuels for water and pool heating and from electricity demand reductions and PV generation. The savings associated with reduced electricity requirements depend on which types of generating plants 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 decline per kilowatt-hour of renewable generation or electricity demand reductions. 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. Energy savings from water and pool heaters also directly reduce energy expenditures.

FY04 GPRA Benefits Estimates for Solar (NEMS-GRPA04)			
	2005	2010	2020
Capacity (GW)	0.2	1.0	5.0
Generation (GWh)	0.4	1.7	8.9
Energy Savings (quads)	0.02	0.09	0.12
Oil Savings (quads)	0.00	0.01	0.01
Carbon Savings (MMT)	0.3	1.6	2.4
Energy Expenditure Savings (B2000\$)	0.1	0.7	1.2