

## **Sandia National Laboratories U.S. Energy and Greenhouse Gas Model**

The U.S. Energy and Greenhouse Gas Model (USEGM) is a user-friendly, high-level dynamic simulation model that forecasts energy demand, the associated emissions of carbon dioxide, and oil import requirements through 2020. This model allows the user to quickly explore various scenarios related to energy use based on different economic growth rates, fuel prices, and energy efficiency. The USEGM has been copyrighted and is available, together with a user's guide and technical report on CD-ROM.

Key features of the model include:

- Written in Powersim Constructor 2.5, a dynamic simulation software package, and runs on a laptop.
- Tuned to the Department of Energy's *Annual Energy Outlook 2000*.
- Driven by GDP, energy prices, energy intensity, and population.
- Projects energy demand by sector (industrial, commercial, transportation, residential) and by fuel (coal, oil, natural gas, nuclear, renewables, electricity).
- Peer-reviewed by energy experts from a wide range of institutions (academia, government, industry, and NGOs) at an April 1999 technical workshop.
- Easy to use policy screens that allow the user to explore "What-if?" questions, such as:
  - If the national goal is to reduce carbon emissions, what level of effort would be required to significantly reduce emissions using renewables or nuclear?
  - How much would a doubling of oil prices over the next ten years reduce carbon emissions or reduce oil import requirements?
  - In which sector can further efficiency gains have the biggest impact in terms of reducing overall demand?

The summary and policy control screens are shown on the next page. The summary screen shows the projected results in 2020 for the base case. The policy control screen demonstrates the types of control levers available to the user.

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## U. S. Energy and Greenhouse Gas Model

### Energy Drivers

GDP - BII 98\$ **14,441.35**

Population - Millions **323.40**

### Energy Balance Sheet - Quads

Total\_Q **121.02**

Total Energy Consumed **121.02**

Industrial **42.17**

Coal **25.76**

Commercial **18.25**

Oil **50.89**

Transportation **37.57**

Natural Gas **31.35**

Residential **23.02**

Renewables **7.46**

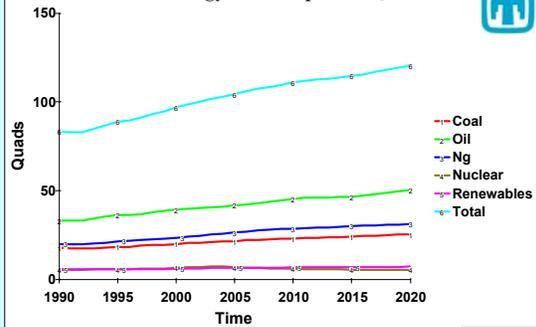
Nuclear **5.57**

### Carbon Emissions

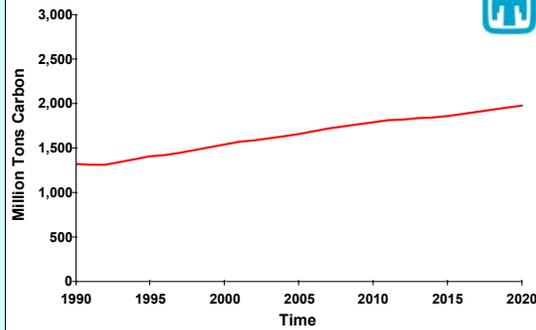
Total Carbon - mtC **1,978.23**

Per Capita - tC **6.12**

Total Energy Consumption - Quads



Total Carbon Emissions - mtC



1990 Carbon Emissions - mtC **1,326.29**

1990 AEO Oil imports - Mbd **8.03**

2020 Carbon Emissions - mtC **1,978.23**

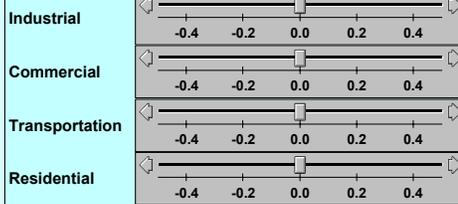
2020 Oil imports - Mbd **16.96**

Electric Fuel Share  
 EIA Reference  
 User Set  
 Price Driven

Ind - Comm Controls

Trans - Res Controls

Additional Income Elasticity Change in %



Inc Elasticity	Δ IE%	Δ EI%
0.735	-17.14%	-34%
0.882	-4.63%	-27%
1.19	-1.00%	-16%
0.52	-0.41%	-31%

Set	Electric Relative Share	Electric Fuel Share %	2020	1997
<input type="checkbox"/> Coal			49%	53%
<input type="checkbox"/> Oil			4%	3%
<input type="checkbox"/> Ng			25%	14%
<input type="checkbox"/> Hydro			8%	10%
<input type="checkbox"/> Nuclear			13%	18%
<input type="checkbox"/> Othr Ren			2%	2%
<input type="checkbox"/> Wind			0%	0%