Development of an Energy Resource Accounting Module for a Global Energy Optimization Model

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Abstract

Geologic assessments of world energy resources and projections of world energy demand indicate that the world will have depleted half of its conventional oil resources by the year 2020. The United States currently depends on oil as a primary energy resource for its economy, especially for transportation. Because of this trend, the United States and other countries will have to develop new sources of energy and new methods of fuel production or processing in order to supply the needs of their economies in ways that do not threaten the global environment. A model representing the process of resource production and depletion was constructed to better comprehend and analyze the effects of energy policies to protect the environment, promote economic growth and ensure adequate energy supplies for world economy. The optimization model consists of an excel workbook containing: 1) data on the world's fossil energy, 2) a model of resource extraction and depletion, including cost of production by region, 3) representation of the processes for converting energy into fuels, 4) energy demands along with the drivers of those demands, and 5) the technological changes affecting all components. A market model will find equilibrium between the supply and demand. In this study, the resource extraction and depletion accounting model was developed to observe production and consumption of the world's energy resources.

Issues

- **Oil Markets and Economy**
  - Crude oil prices fluctuate as a result of the shifts in the global balance between the production and demand. Oil price shocks have cost the U.S economy trillions of dollars
- **Greenhouse Gases**
  - With the current usage of fossil fuels, the increased emission rates of carbon dioxide, a greenhouse gas, will contribute to potential global warming.
- **Environmental Stewardship**
  - As inhabitants of the earth, it is unjustifiable to diminish resources available for future generations.

Global Energy Resource Optimization Model

- The Model is designed to “optimize” an energy market solution for a world regions given exogenous forecasts of population and economic growth.

- Components
  - data on the world’s fossil energy
  - a model of resource extraction and depletion, including cost of production
  - representation of the processes for converting energy into fuels
  - energy demands along with the drivers of those demand
  - the technological changes affecting all components.
  - market model to find equilibrium between the supply and demand.

The Accounting Model

- The Resource and Extraction Accounting Model is designed to analyze the production and consumption trends of the world's energy resources. After feeding the model forecasts of energy resource demands, the accounting tool calculates the depletion of fossil energy resources and the resulting increases in production cost.

- The model helps explore when resources are likely to be depleted and when transitions to new energy sources must be made.