

## Analyzing the Potential for Natural Gas Imports to Uruguay

### Opportunity

Uruguay's energy supply system is rapidly changing because of ongoing energy market reforms, continued regional integration in the MERCOSUR free trade zone, and ongoing upgrades and modifications to existing energy supply facilities. The Government of Uruguay (GOU) needed to analyze the effects of importing natural gas on its energy supply system as part of a broader fuel diversification strategy.

### Approach

The GOU contracted Argonne's Center for Energy, Environmental, and Economic Systems Analysis (CEEESA) to conduct a detailed energy supply and demand analysis using the ENergy and Power Evaluation Program (ENPEP). Specifically, CEEESA was asked to analyze the potential for expanding electricity ties with Argentina and Brazil and developing a new natural gas infrastructure. CEEESA collaborated with several Uruguayan institutions, including the presidential planning office and oil, gas, and electric companies.



### Routing of New Natural Gas Pipeline

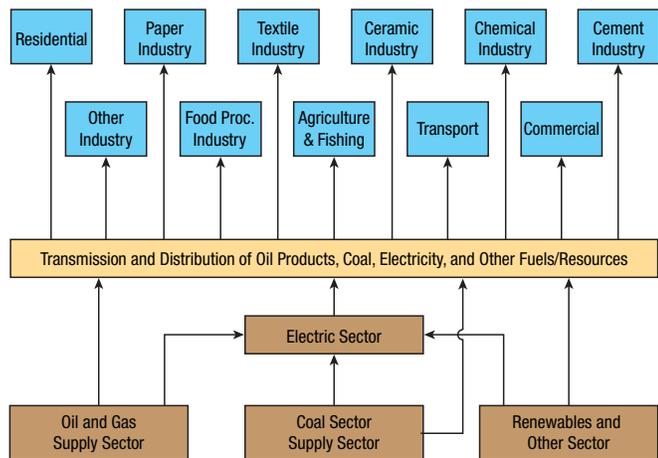
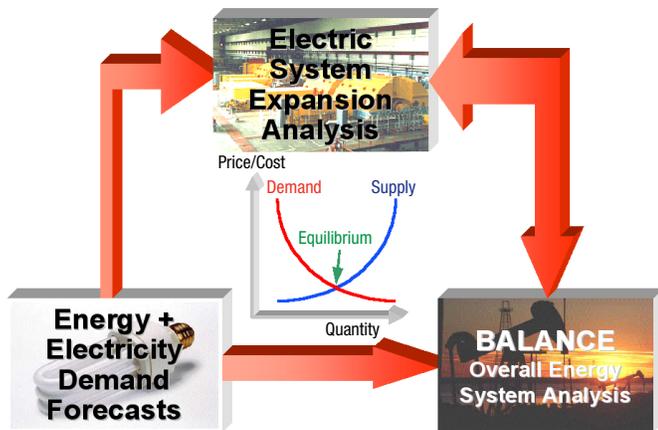


### Scope of Work

Our CEEESA staff developed energy demand projections based on a local analysis of past patterns, determined the market penetration of natural gas by sector, evaluated the effects of increased electricity exchanges, and estimated the potential level of natural gas imports under different scenarios. We also installed ENPEP on local computers, provided training, and transferred all model runs to local PCs. Uruguay's Energy Office and Ministry of Environment continue to use the model for energy and climate change studies, demonstrating the success of the project.

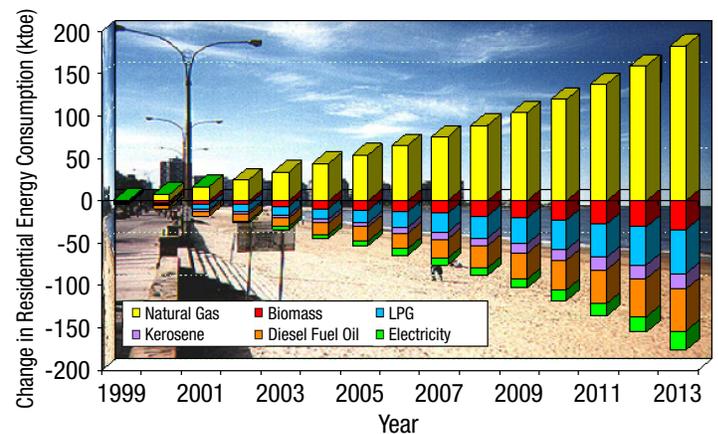
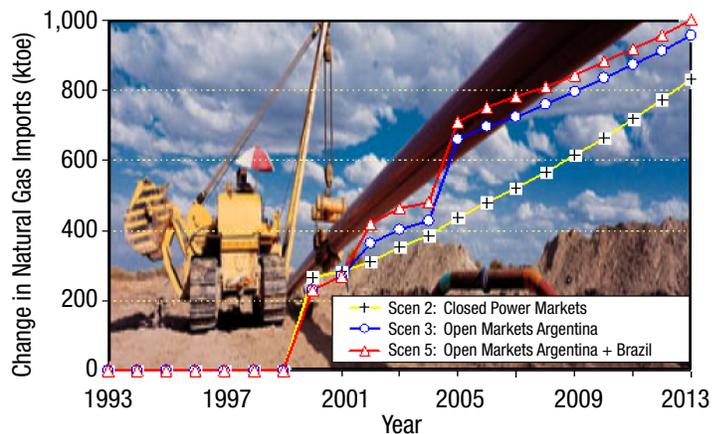
CEEESA staff projected future fossil and nonfossil energy flows for Uruguay using ENPEP's BALANCE module. This generalized equilibrium model consists of a system of simultaneous nonlinear relationships that specify the transformation of energy quantities and prices through various stages of energy production, processing, and use. The basic assumptions in the equilibrium approach are that the energy sector consists of autonomous energy producers and consumers that carry out production and consumption activities while pursuing individual objectives. BALANCE is not an optimization model; rather, it simulates and describes energy market choices that are made by producers and consumers. For this study, BALANCE used an energy network (see figure) designed to simulate the interactions among all energy supply and demand sectors. Local experts developed a forecast for useful energy demand, such as residential space heat, industrial steam demand, and passenger transportation demand. CEEESA staff obtained the projected expansion of the electricity generation system from Uruguay's electricity company (UTE). Uruguay's oil company, ANCAP, provided

oil-sector-specific information. Because one of the outputs of BALANCE was the demand for electricity, CEEESA experts performed several iterations between the UTE expansion model and BALANCE.



## Results

This study showed that natural gas imports will be strongly affected by the projected electric sector capacity expansion plan. The level of electric system integration with Argentina and Brazil will also play a significant role in natural gas demand. With electric integration, electricity exports are expected to increase substantially, driving up the demand for natural gas in the power sector. Natural gas imports in 2013 are forecast to be 25-28% of primary energy. Results for the residential sector show that the overall market share of natural gas will reach around 24% by 2013 with a range up to 83%, depending on gas availability by region. Although natural gas will displace some residential electricity demand in areas where it is available, the overall demand is not expected to change significantly. Similar results are available for other sectors.



Learn more about the Center for Energy, Environmental & Economic Systems Analysis at:

<http://www.dis.anl.gov/ceeesa>

November 2007

For more information, contact:

**Guenter Conzelmann** ([guenter@anl.gov](mailto:guenter@anl.gov))

Decision and Information Sciences Division

Center for Energy, Environmental & Economic Systems Analysis

Argonne National Laboratory



UChicago  
Argonne<sub>LLC</sub>

A U.S. Department of Energy laboratory  
managed by UChicago Argonne, LLC