Hands-On Modeling United States Energy Policy: Achieving Emissions Targets and Exploring Scenarios

Jeffrey Rissman

Senior Analyst

Energy Innovation: Policy and Technology LLC

Workshop Date and Time

Thursday, July 23, 2015

10:30 am – 12:00 pm

Workshop Description

This workshop is a follow-up to my presentation earlier in the System Dynamics Conference, titled "A Model of Energy Policy Impacts on Pollutant Emissions, Costs, and Social Benefits Developed for China's Central Government." In that presentation, I describe a System Dynamics model that Energy Innovation LLC developed to assist the Chinese central government in selecting policy measures that will allow China to achieve its emissions reduction goals. The model simulates the effects of 35 policies over years 2013-2030 and covers the Transportation, Electricity Supply, Buildings, and Industry sectors. For more details, please see the uploaded conference paper associated with that presentation.

This workshop will give conference attendees a chance to use two versions of this model (the Energy Policy Simulator):

- The version created for China, adapted for a web application interface that users interact with via a web browser

- An improved version, loaded with a complete set of U.S. data and tuned to represent the United States. This is a Vensim download and can be used in Vensim Model Reader or Vensim DSS.

The model is user-friendly for beginners, but it also includes powerful features to enable more advanced analysis to be done. The workshop will have two main sections.

First, I will demonstrate the online web application we have constructed that allows the model to be run on a webserver and results to be visualized in a web browser. This application was built by Todd Fincannon in the Ruby programming language and relies on a multi-user version of Vensim running behind the scenes. China has specified emissions

targets as part of a bilateral agreement with the United States and in its submission to the UNFCCC for the upcoming conference in Paris. Workshop participants will be asked to design policy scenarios inside the web application that enable China to achieve these emissions targets, as well as other non-emissions targets, such as cost minimization. This will provide a user-friendly introduction to the model and its capabilities, without relying on locally installed software on participants' computers. I will also answer questions about the development of this web application, to help any attendees who might be interested in deploying their own Vensim models online using custom web-based software.
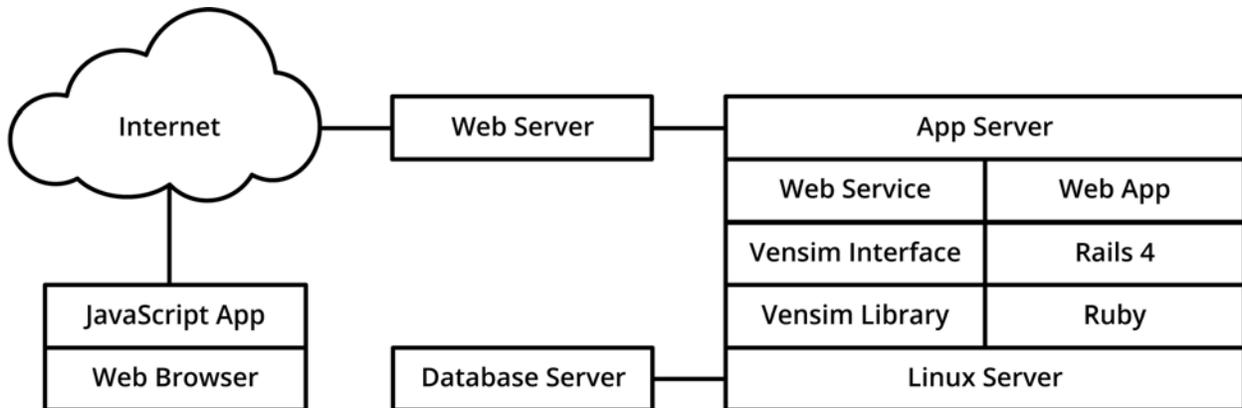
Figure 1: Architecture of the Energy Policy Simulator web application

Second, I will show the model inside Vensim and demonstrate the use of a Python script we have developed to control the software and automatically test thousands of different policy combinations, searching for ones that meet particular criteria (for example, those that have emissions below a specified carbon cap, ordered from lowest to highest monetary cost). Workshop participants will be invited to download the Vensim model. All participants can download the free Vensim Model Reader, in which they can run and use the model and obtain detailed output. Any participants who own Vensim DSS (the version of Vensim that supports scripting) can use the Python script to perform runs in an automated manner. I will answer questions about the functionality of the model and the Python script. This will help teach users both how to use this model and how to perform automated runs and subsequent analysis for their own Vensim models.

The goals of this workshop are to give attendees knowledge of the technical workings of the Energy Policy Simulator, an understanding of the support tools we have created (the Ruby web application and Python scripts), and to help them come away with ideas and new skills that they can apply to their own System Dynamics modeling projects.

What to Bring

No equipment is required if you simply desire to watch and listen. To use the model via the web interface, you will need an internet-connected laptop. To use the Vensim model, you

will need a copy of the free Vensim Model Reader. To use the Python script, you will need a copy of Vensim DSS (the version of Vensim that supports scripting).

What to Read Beforehand

Although not required, it is strongly recommended that you either attend my presentation earlier in the conference titled "A Model of Energy Policy Impacts on Pollutant Emissions, Costs, and Social Benefits Developed for China's Central Government" or read the uploaded conference paper associated with that presentation.