State Clean Energy-Environment Technical Forum
State Energy Forecasting
June 19, 2008
Call Summary

Participants: 46 participants from 25 states and national organizations

Materials: The participant list, agenda, and all presentation materials from this call are available at http://keystone.org/Public_Policy/2007_8DOCS_CLEANENERGY/2007_8DOCS.html. Please refer to these documents for additional background information and detail on presentations.

Key Issued Discussed

- How states use energy forecasts to support clean energy policies
- Different types of forecasting models and advantages and disadvantages
- Sources of energy data for forecasting models
- Forecasting under funding and resource constraints

Presentation Summaries and Discussion

A. Welcome/Introduction – Julia Miller, US EPA; Catherine Morris, The Keystone Center

- This is the last in this season's tech forums and is the 2nd of a two-part series involving gathering, using and forecasting state energy data.

- EPA is always happy to receive suggestions for the Tech Forum and is generally able to quickly integrate suggested topics into the schedule.

B. Denise Mullholland, EPA Clean Energy-Environment State Partnerships

- The Tech Forum Background materials contain more detailed information about forecasting, while Denise's presentation is designed to provide an overview

- What is a state energy forecast?
  - A state energy forecast predicts the state's energy outlook in a prolonged business as usual paradigm and serves as a beneficial reference point for developing state policies.

- Why develop these forecasts?
  - They serve to document how energy consumed and generated in the past and estimate future trends compared to the past; they estimate emissions and aid in the implementation of target-setting.

- How is a baseline forecast created?
  - Denise outlined the following steps: define objectives, compile data, choose appropriate forecasting method (basic or sophisticated; review different models), develop and review assumptions (i.e., population and economic variables), apply

the method, evaluate output; assumptions may need to be revisited if data does not meet established needs.

- Issues/considerations
    - Data lags exist—look at more recent data from available sources to get a more comprehensive picture.
    - Transparency is a needed element of the forecasting process.
    - If the budget is a concern, exploit data that's already available.

C. Riley Allen, Vermont Department of Public Service

- As a small state, Vermont constantly faces resource issues and constraints.

- Vermont borrows as much information as possible from others, as they only have one forecaster.

- Comprehensive energy plan produced every 5 years (though it has been 10 years since last update).
    - 20 year electric plan (trying to converge these two documents).

- Vermont's "traditional" planning framework:
    - Vertically integrated utility structure unlike most other states.
    - Electric Efficiency Utility has assumed responsibility on behalf of other utilities for delivering statewide efficiency programs. The state relies on utility reports for their energy plans.
    - New areas/markets and new demands on forecasting capabilities add new challenges for forecasters.

- Public engagement/stakeholder processes:
    - Mediated electric modeling effort involved the inclusion of 16-20 stakeholders.

- Forecasting process:
    - estimate future fuel cost on a regional basis, compare to avoided fuel cost projections that are forecast to estimate efficiency benefits,
    - incorporate EE potential study and DSM program projections into energy demand forecast rather than rely on historical embedded projections.

- With projected DSM electricity programs integrated in forecasts, electricity use is expected to hold steady and projected to decline slightly, but peak energy demand is expected to increase because of increased air conditioning penetration.

- DOE study indicates significant error on past fuel price predictions (mean absolute percentage error of approximately 50%), though EIA forecasts have done better since the 1990s.

- Conclusions:
    - Need for forecasting abilities is ever-expanding.

- Vermont relies on outsourcing (i.e., California firm helped with some analysis).
- Vermont relies on utilities for their forecasts; can bill back to utilities for big projects.
- Vermont shares license arrangements with sister agencies for forecasting efforts.
- Dynamic modeling capability preferred, though challenges have prevented widespread use.
- Vermont's limited resources have created challenges.

Q&A

Who typically does energy forecasting? Is it done by every state? Done by energy department? Done on a regional basis?

- Utilities do forecasting, VT has in-house forecasting capabilities and ISO New England does regional electricity consumption forecasts and peak electricity demand for Vermont. Forecasts are developed for Comprehensive Energy plan as well as 20-year electricity plan and other plans as mentioned earlier. Electric efficiency utility is also developing forecasts in VT.

D. Adrienne Kandel, CA Energy Commission (CEC)

- Utilities used to do their own forecasts, had economic incentive to project growth; state recognized the need to employ a government agency for the purpose of transparent, unbiased modeling.
  - Funded by utility bill surcharge
  - CEC forecasts fuel, transportation and electricity sectors.
  - Forecast end-use electricity usage.

- What types of forecasting do we do?
  - End-use model (doesn't blindly forecast historical trends).
    - Residential end use model- 3 housing types, 24 appliance and space conditioning catgories; forecasts the number of households of each housing type, multiplies how many appliances per house, energy usage per appliance.
    - Commercial end use model- representing 12 commercial types of buildings, 10 equipment and space conditioning categories; estimates utilization rates by building type, fuel, age of building.
  - Mixed model
    - Industrial model- econometric model (production by sector), then number fed into an end-use model; (EPRI's model).
  - Econometric model
    - Agricultural/water pumping model.
  - Important data inputs and sources of data (see Powerpoint presentation).

- Forecast summary model (total of all predictions)
  - Summer peaks- take demand total and spread into load shapes; can then predict peaks. Annual energy demand and peak electric demand can then be reported.

- Forecasting uses: Efficiency target and GHG reduction planning; long-term power procurement and resource adequacy assessments; Integrated Energy Policy Report, and transmission planning and grid analysis.

Q&A

Where can I find more information on end-use models?

- Links to reports on end-use modeling methods posted on Keystone website in background documents section at: http://keystone.org/Public_Policy/2007_8DOCS_CLEANENERGY/2007_8DOCS.html..
- Recommend two reports: June 2006 staff report on energy demand forecast methods report (good tutorial) and Energy Commission report (Can google report: CEC-400-2005-036).

Are you using average weather data or synchronized? Are you using the same year weather data as the model run or average of years? Using the same hour across the state?

- CA does not use an hourly model, so we are not using hourly weather data in the model.

How do you check validity of results? Do you use sensitivity or uncertainty analysis?

- CEC uses back casting to calibrate the forecast by changing parameters or multiplying by factors to make forecast backward correct. Conduct some sensitivity analysis—just changing weather for example, or develop high-low-medium scenarios of the economic demographics. We're considering way to get forecast uncertainties into end-use analyses.

How do you incorporate volatile energy prices into scenarios? Do you run different fuel price scenarios or incorporate projected carbon costs?

- Commercial model -unit energy consumption can be responsive to price.
- Agriculture model - energy use is directly responsive to price.
- Take price elasticity into consideration in other parts of the forecast.
- For carbon costs, all we can do is say "we think it will add this much to electricity/fuel price".

Do you know where fuel price assumptions come from?

- We have our own fuel price projections.
- Industrial model, fuel extraction sector- uses a less volatile indicator of economic activity than value of the fuel extracted (for example, employment in the extraction sector).

Do you do scenarios based on price?

- Last Integrated Energy Policy Report included Scenarios Analysis Project, which ran a high natural gas scenario and varying penetrations of energy efficiency and renewable energy measures to see response. Also modeled different prices in western electric system. That way CEC moved forecasts away from strictly point forecasts. Plan to continue effort in the future forecast scenarios.

Q&A (all presenters)

What resource and funding is used to support forecasting and how do you make decisions regarding where to cutback to second choice of forecasting options?

- **Vermont**: Make the case through rates or formal investigation to get funding.

- VT forecasting is funded through electricity rate surcharge or dovetail with a formal utility investigation.
- VT decides whether to "fish or cut bait"; reconstructing dynamic/sophisticated model with help of contractor.
- Trend/econometric models are generated more easily and are used when they're pressed to produce a report quickly.

- **California**: Does not update models each year; it does update the data it enters into the models How to address cutbacks? The speaker couldn't say, as she wasn't in management.

- **Jim Mapp of Wisconsin** (provided an overview of the forecasting process in Wisconsin):
  - Used to have integrated planning process, contracted with public utility commission to provide alternative to utilities' forecasts; advocate for end-use modeling, in particular, allows to analyze efficiency standards at federal and implement at state level.
  - Involved in active process of what can be done to reduce greenhouse gas emissions —end-use model very important in this area as state passes rules for efficiency.
  - Public benefits program in WI places emphasis on improving efficiency in all sectors (residential, commercial and industrial); work closely with organizations across country to see what is coming (i.e. Consortium for Energy Efficiency (CEE).
  - There will be a report by Governor's GHG advisory board with recommendations on efficiency standards and funding programs to achieve reduction targets.
  - States should make use of individual state agencies for historic data. Use a benchmark year and rely on employment projections. Most states involved in some ISO or reliability council, which develop forecasts for transmission and power procurement.

How do you integrate economic drivers in end-use models?

- Price elasticity is built into Oak Ridge models and you can also incorporate improved efficiencies into replacement schedule of certain end uses such as refrigerators, lighting, etc. in those models. Don't use personal income to drive consumption.
- General economic drivers are incorporated mostly driven by price forecasts and household population forecasts. Have misestimated population forecasts in past because didn't predict in-migration to the state.

What is the difference in forecasting in states that are vertically integrated versus states that have been de-regulated?

- **Vermont**, (speaking for vertically integrated state): formal process to permit new generation projects requires need determination by public service board). Based on forecast, will assess if project is needed. Competitive environment alternative is to purchase directly from market or enter contract. VT does operate within a wholesale competitive market.

- **California**: Need for independent voice. The Public Utilities Commission requires utilities to seek the right amount of procurement of electricity generation (through building sources and signing contracts to buy electricity). They use our forecasts for this.

How much attention is paid to outside forecasts to integrate into your forecasts?

- **Vermont**: Those are important benchmarks. Rely on outside sources like www.economy.com and ISO-New England region forecast of peak demand for Vermont. Perform independent forecast for large projects, smaller projects likely to rely more on outside sources and utilities themselves.

- **California**: We host workshops when developing forecasts and discuss our differences and try to come to a consensus over utility forecasts.

Is the impact of climate change on energy demand considered in forecast?

- **Vermont**: Part of forecast is focus on carbon issues, but in terms of whether climate change is having impact on forecast, it is included to the extent that it is picked up in the historical data (for example, temperature increases increased penetration of air condition load.)

- **Wisconsin**: In the past, a 30-year average was used, but more recently using 10-year average to more accurately reflect current weather. Must consider recent increases in maximum temperatures in estimating peak demand.

- **California**: On the need to use carbon reduction targets—had not at time of webinar developed and released a plan for how to implement carbon reduction. (Now a scoping study draft has been released, giving a general approach.)

What about modeling the effects of climate change on the demand end?

- **Pierre Duvair, CEC, Calfornia**: Research team projects regional climate impacts and how that effects energy demand (research program $6-8 million/year dedicated to this)
- AB32 (Global Warming Solutions Act)- lots of modeling to look at wide range of climate scenarios. Still in modeling stages; scoping plan out June 26, 2008 on how CA wants to reduce greenhouse gas emissions.

- **Wisconsin**: Hope to get greenhouse gas reductions from individual measures, then focus on what policy needs to be enacted to address those issues.

Are there models forecasting impacts of climate change on supply, not demand? For example, NC in 2nd year of drought. Last year, low water levels shut down one of the Browns Ferry nuclear units because extreme temperatures were affecting cooling capabilities of power plant. Are these type of impacts being taken into account?

- **Vermont**: No.

- **Wisconsin**: Too site specific—depends on location of particular plant. Have similar cases, such as lake levels and fish kills causing constraints at specific plants but not reflected in general trends.

- **California**: The state relies heavily on hydropower, so is very vulnerable to change in hydro availability, thus changes in hydro availability have been in scenario analyses of future greenhouse climate change studies.

NEXT TECHNICAL FORUM CALL: October, 2008
TOPIC: TBA