HIGH ELECTRIC DEMAND DAY – CT PILOT PROJECT

OTC-HEDD Workgroup Meeting

Feb. 1, 2007

PROJECT GOALS

- Establish a replicable analytical approach for **quantifying avoided emissions of nitrogen oxides (NOx)** on high electric demand days in the summer ozone season;
- Identify path forward & challenges for other States that would like to pursue this approach;
- Provide supporting documentation for CT SIP to meet the 8-hour ozone standard

PARTICIPANTS & FUNDING

- **Participants include:**
  - Connecticut Department of Environmental Protection (DEP);
  - DJ Consulting LLC (DJC);
  - National Renewable Energy Laboratory (NREL);
  - Environmental Resources Trust (ERT);
  - Resource Systems Group (RSG).
- **Funded by U.S. DOE**
  - Clean Energy/Air Quality Integration Initiative
  - Technical Assistance Project
- **Coordination with EPA & CT load-serving entities.**

PROJECT ROLES

- CT DEP – Lead;
- DJC – Coordination and Policy;
- NREL – Review energy-savings methodology;
- ERT – Compile and refine energy-savings data;
- RSG – Develop analytical methods for calculating avoided NOx emissions and conduct such analysis;
- CT load-serving entities – UI and CL&P – Data support and coordination;
- EPA – Advisory role.

NREL REVIEW - APPROACH

- **Focused on energy savings methods** (Program Savings Documentation) utilized by load-serving entities that administer CT efficiency programs;
- Reviewed 40 out of 93 methods (43 percent) used to calculate energy savings;
- Selected initial methods for review based on reviewer expertise;
- Reviewed additional measures following identification of high impact measure types by ERT;
- Refined results following discussion with authors of the Program Savings Documentation manual.

NREL REVIEW – RESULTS

- Initially identified 8 “major” issues - methodology or assumptions that could substantially change energy savings quantities *for that type of energy measure*
- Major issues resolved through discussion with UI and CL&P and determined that methods reviewed met generally accepted standards
- NREL recommends refinements in the next annual Program Savings Documentation and suggests peer review of the remaining methods

METHODOLOGY - LESSONS LEARNED

- States that have not adopted methodologies to calculate energy savings will face obstacles in replicating the CT model in time for the June 2007 SIP deadline;
  - NREL work for MWCOG provides one option for consideration.
- State efforts to develop energy savings methodologies for future air quality and climate plans can build on existing approaches:
  - State energy savings methodologies (e.g., NJ, CT);
  - EPA's forthcoming guidance on measurement & verification protocols.

ERT REVIEW OF ENERGY SAVINGS - APPROACH

- Reviewed energy savings in residential and commercial and industrial (C&I) programs administered by UI and CL&P to determine the measure types (e.g., lighting, AC) with the highest impact on peak demand summer days;
- Identified the high impact measure types, as follows:
  - Residential Lighting
  - Residential Cooling
  - C&I Lighting
  - C&I Cooling

ERT REVIEW - PRELIMINARY RESULTS

- Four measure types comprise the bulk (66%) of energy savings on peak summer days;
- These four categories represent about 27 MW of savings during peak hours in summer:
  - Approx. 28% of the savings are cooling-related, and 72% are lighting-related
  - Approx. 27% are residential energy savings, and approx. 73% are C&I energy savings.

ANALYSIS OF ENERGY SAVINGS - CHALLENGES

- Publicly available data is high-level (by program rather than measure type);
- Limitations on availability of certain utility-controlled data:
  - Confidentiality issues
  - Some useful data not compiled
- Significant resources required to work with load-serving entities to obtain necessary data;
- Need for sampling approach because of large number of programs and measure types.

ANALYSIS OF ENERGY SAVINGS - LESSONS LEARNED

- Compensating for limited granular data on individual EE measure types requires the use of resource-intensive sampling and modeling approaches;
- Focusing on a few high-impact measure types is an effective way of reducing workload without sacrificing most of the energy savings;
- Generating meaningful load profiles with only publicly available data is difficult, if not impossible.

RSG REVIEW OF AVOIDED EMISSIONS - APPROACH

- Energy efficiency programs displace NOx emissions in two ways on high demand days:
  - Reduce fossil fuel generation at “peaker units” of grid-connected generators;
  - Reduce emissions from “behind the meter” generators (e.g., small diesel & natural gas engines)
- Analysis will be based on a representative sample of 3-10 high demand days;
- The energy savings profiles of the four high impact measure types are matched against emission profiles for the same time of day.

RSG REVIEW - PRELIMINARY RESULTS

- Electric demand response programs are comprised of not only load reduction but also “behind-the-meter generation;
- Increased generation by “behind the meter” units in CT is estimated to be 3 to 4 times greater than load reduction on the highest demand days;
- Thus, NOx emissions from “behind the meter” generation are very significant on high demand days;
- Although total energy savings from cooling measures are lower than lighting measures, they have a greater proportional effect on net peak hour emissions.

ANALYSIS OF AVOIDED EMISSIONS - CHALLENGES

- Data collection and protocols for EE programs were not designed with avoided emissions analysis in mind. As a result:
  - Data submission requirements for hourly generation and emission rates are insufficient;
  - Even where data exists, confidentiality problems hamper validation of estimates;
  - The time profiles of EE programs are difficult to determine and match with generation profiles;
  - Data is typically not available in a useful electronic format;
  - EPA guidance and precedents for the analysis are a work in progress.

ANALYSIS OF AVOIDED EMISSIONS - LESSONS LEARNED

- Close cooperation among EE program administrators, load-serving entities, State air agencies, consultants, and EPA is critical. Cooperation has been very good in this project;
- Information on the relative proportion of "behind-the-meter" generation versus load reduction from customers is currently not available to air regulators;
- More specific reporting requirements for the load-serving entities and small generators would improve the analysis, reduce the costs of demonstrating air quality benefits, and facilitate credit for NOx (and eventually CO2) emission reductions;
- Additional EPA guidance is essential.

SUMMARY

- Energy efficiency (EE) offers a win-win-win approach for load-serving entities, ratepayers, and improved air quality;
- Under a well-designed EE program, significant NOx emission reductions can be achieved at no additional cost (and even at cost savings);
- EE offers a far more cost-effective strategy than NOx controls.

CONTACT INFORMATION

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