



Memorandum

To: Fran Cummings, MTC
From: Andy Brydges and Liz Hicks, KEMA, Inc.
Subject: Projections of Installed DG in Massachusetts
Date: December 18, 2006

In order to provide a basis for workshop discussions of technical and economic issues surrounding the installation of distributed generation systems in Massachusetts, KEMA produced a “back of the envelope” analysis of estimated DG installations in Massachusetts based on projections from other, nearby, states including New York, New Jersey, and Connecticut. This memorandum summarizes that analysis and documents areas for further research that would be necessary to refine it for publication or more rigorous study.

Methodology

In constructing our projections, KEMA reviewed the following reports:¹

- New York State Energy Research and Development Authority, 2002, *Combined Heat and Power Market Potential for New York State, Final Report 02-12, October 2002*. Prepared by Energy Nexus Group, Onsite Energy Corporation, and Pace Energy Project.²
- Rutgers University Center for Energy, Economic, and Environmental Policy, 2004, *New Jersey Energy Efficiency and Distributed Generation Market Assessment, August 2004*. Prepared by KEMA, Inc.³
- Institute for Sustainable Energy at Eastern Connecticut State University, 2004, *Distributed Generation Market Potential: 2004 Update / Connecticut and Southwest Connecticut*. Prepared by KEMA, Inc.⁴

In addition, data on numbers of commercial and industrial customers, peak loads, retail sales and prices of electricity, and prices of natural gas were gathered from publicly available information at the DOE Energy Information Administration.

In the above referenced reports, projected installations of distributed generation in New York, New Jersey, and Connecticut were evaluated and presented in two scenarios, a “base case” and an

¹ These reports are posted at <http://www.masstech.org/dg/Benefits.htm>, under the heading “Studies of Market Potential of Distributed Energy,” along with additional reports and information on the benefits and costs of DER.

² http://masstech.org/renewableenergy/public_policy/dg/resources/Resource_MarketAM_NYSERDACHPMarketinNY_October2002.pdf

³ http://masstech.org/renewableenergy/public_policy/DG/resources/2004-08_NJ_DG_Kema_Report.pdf

⁴ http://masstech.org/renewableenergy/public_policy/DG/resources/Resource_MarketAM_CTDGMarket_2004.pdf

“accelerated case”. The accelerated case anticipated market transformation policy initiatives that would provide incentives and/or reduce barriers to the installation of distributed generation. In Connecticut, the analysis was further broken down technology-based scenarios, including a “current technologies” scenario, and an “advanced technology” scenario to model the impact of technical improvements on distributed generation systems.

The New York evaluation, which served as a model for both the New Jersey and Connecticut projections, developed specific customer profiles to estimate penetration of DG into various market segments. The methodology, as described in the New York report, was to:

Identify applications where CHP provides a reasonable fit to the electric and thermal needs of the user. Target applications were identified based on reviewing the electric and thermal energy consumption data for various building types and industrial facilities. Data sources include the DOE EIA 1995 Commercial Buildings Energy Consumption Survey (CBECS), the DOE Manufacturing Energy Consumption Survey (MECS), 1994 and various market summaries developed by GRI and the American Gas Association. Existing CHP installations in the commercial/institutional and industrial sectors were also reviewed to understand the required profile for CHP applications and to identify target applications.

Quantify the number and size distribution of target applications. Once applications that could technically support CHP were identified, the iMarket, Inc. MarketPlace Database was utilized to identify potential CHP sites by SIC code or application. The MarketPlace Database is based on the Dun and Bradstreet financial listings and includes information on economic activity (8 digit SIC), location (metropolitan area, county, electric utility service area, state) and size (employees) for commercial, institutional and industrial facilities. In addition, for select SICs limited energy consumption information (electric and gas consumption, electric and gas expenditures) is provided based on data from Wharton Econometric Forecasting (WEFA). The MarketPlace Database was used to identify the number of facilities in target CHP applications and to group them into size categories based on average electric demand in kW.

Estimate CHP potential in terms of MW capacity. Total CHP potential was then derived for each target application based on the number of target facilities in each size category. It was assumed that the CHP system would be sized to meet the average site electric demand for the target applications unless thermal loads limited electric capacity.

The New Jersey and Connecticut evaluations used the estimated customer profiles from New York as a basis for their analysis. Those analyses therefore assumed that the breakdown of total CHP potential by application size in New York State is similar to that of CT or New Jersey.

For Massachusetts, a similar assumption was made. To estimate projected DG installations in Massachusetts, the projections from New York, New Jersey, and Connecticut were scaled up or down based on the ratios of total customers from Massachusetts to the other states. Estimates were also constructed using the ratios of total retail energy sales for commercial and industrial customers from Massachusetts to the other states. The resulting estimates, in turn, were averaged to determine projected installations of DG in Massachusetts. This was done for both the base and accelerated cases; from Connecticut the analysis only used the current technologies scenario.

In addition, KEMA reviewed the DG penetration curves from New York, New Jersey, and Connecticut to estimate penetrations for a single year (2015). For New York, this involved extending the projected penetration curve in that report by 3 years. For Connecticut, it was extended by one year, and for New Jersey, 2015 was within the 20 year estimations that were included.

The resulting projections suggest that:

- DG installations in MA are likely to be between 400MW (base case) and 1400 MW (accelerated policy case) by 2015; that would represent between 4% and 13% of summer peak load.
- DG installations would average 34-120 MW/year until 2015. (By comparison, the annual energy efficiency impact was 48 MW in 2002, according to MA DOER.)

Conclusions and Recommendations for further study

The analysis was intended to provide a starting point for discussions of technical, strategic, and economic issues that require consideration of the magnitude of the potential impact of DG on the electricity distribution system. A more accurate estimate would certainly be useful to policymakers, regulators, and the utilities as they refine economic models for dealing with the impact of distributed generation on the grid.

Such an analysis could be refined with more exacting estimates of the total number of Massachusetts customers by market size (i.e. 100-500kw, 500kw-1MW, 1-5MW, 5-20MW, or >20MW). As stated above, in this estimate the ratios of these types of customers in New York formed the basis for the other analyses. As customer data of this nature is not likely to be provided by the utilities, to improve those estimates KEMA would recommend obtaining and reviewing data from private databases such as the iMarket, Inc. MarketPlace Database, as was done for New York.

Additionally, for the advanced policy scenario, this initial analysis assumed identical policy initiatives would be instituted in Massachusetts as were instituted in the other states. A more detailed review of those policies, or consideration of policy initiatives specifically proposed or being considered for Massachusetts would help to refine the projections and determine the shape of the penetration curve.

Finally, the model analyses were based on studies done in 2002, 2003, and 2004, respectively. Since 2004, additional increases in prices of both electricity and natural gas have occurred. Therefore, as increasing fuel prices typically reduce the payback period for DG systems, it is likely that the potential penetration of DG has been understated. Constructing an analysis using current and projected fuel prices as they are understood as we begin of 2007 would also improve the accuracy.