WIDESPREAD DEPLOYMENT OF ELECTRIC STORAGE IN THE INDUSTRIAL AND MANUFACTURING SECTORS

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ABSTRACT

An overview summary of a proprietary deterministic model developed to assess the intrinsic and extrinsic values of electric storage deployed behind the fence at large industrial and manufacturing facilities is presented.

INTRODUCTION

The electric industry has long recognized the contribution that efficient and affordable electric storage will make toward maintaining grid reliability. Sandia National Laboratories' (SNL's) 2010 paper titled *Energy Storage for the Electricity Grid Benefits and Market Potential Assessment Guide, A Study for the DOE Energy Storage Systems Program*, SAND2010-0815, provides a "framework for assessing potential benefits from, and economic market potential for, energy storage used for electric-utility-related applications." The SNL paper describes 17 applications for utility-scale electric storage, four of which relate to end user/utility customers. The SNL study utilizes a utility tariff (PG&E Tariff #E-19) to quantify the potential benefits of applying electric storage "behind the fence" of a utility customer qualified to take service from the utility under that tariff. The SNL report opens the door for a more extensive assessment of the key factors that will drive the large end user to make the commitment to install electric storage either independently or in collaboration with its utility provider.

DISCUSSION

EMB Energy has developed a Microsoft Excel-based deterministic model that evaluates the customer's load profile both with and without electric storage and determines the optimal electric storage configuration to achieve maximum "intrinsic" economic benefit. Our "intrinsic value" model, as further described in this paper, seeks to answer the question, "What size electric energy storage deployment affords the best overall economic outcome to the industrial customer?" The model does not suggest alternative operating practices to the customer. In other words, it will not suggest that the customer change its operating practices by curtailing demand during peak hours. It will, however, suggest alternative tariffs that may be offered by the utility to qualifying customers, but had been unavailable to the customer before the deployment of storage. Because the intrinsic value model is static, it can only take a "snapshot" in time. The model is indifferent to future facility demand growth (decline), power quality and reliability concerns, special conservation incentives, and future tariff rate adjustments. All of these factors, especially in the aggregate, will likely strongly influence any capital commitment decision.

As the SNL study recognizes, electric storage contributes to electric service reliability. A number of key factors relating to the operational capabilities of the storage technology, the sensitivity of the customer's processes to interruptions, and the potential cost to the customer in terms of both lost product and downtime determine the full extent of that contribution. Our parametric stochastic (probabilistic) model describes this "extrinsic value" as a probability weighted distribution of net present values associated with the capital investment. This distribution of potential investment outcomes provides information not visible from the static intrinsic model; for example, it allows for an estimate of the probability that a project has a net present value greater than zero (or any other value). Our model, which employs classic Monte Carlo simulation techniques, allows the analyst to portray the company's proprietary fundamental forecasts of the several exogenous and independent variables that should be factored into determination of extrinsic value as probability-weighted distribution rather than singular, discrete values. Since each probability-weighted distribution actually reflects the company's uncertainty with respect to that variable input (i.e., decision criterion), “risk adjustment” is effectively achieved simply by running the simulation many times and presenting the outcome, itself, as a distribution.

CONCLUSIONS

The combination of the intrinsic benefits of reduced demand charges and overall lower energy costs, and the extrinsic benefits of improved electric service reliability, will create the incentive for end users/utility customers to install electric storage. Progressive electric utilities will collaborate with their large industrial and manufacturing customers and their regulators to implement new tariffs that share both the costs and benefits of distributed electric storage. An overview summary of the multiple synergies that can be exploited through cost and benefit sharing is also presented.