PRACTICAL APPLICATIONS OF INTEGRATED RESOURCE PLANNING

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INTRODUCTION

Integrated resource planning implies that utilities treat energy efficiency with the same concern and criteria as the more traditional utility activities of generation and transmission planning, power contracting, system dispatching, and operations. This is rarely the case for either long- or short-term resource planning. Energy efficiency is a secondary concern. It is seen as a customer service rather than as a firm, dependable resource. Obvious changes in the utility industry since the 1970s attest to the difference energy efficiency in buildings can make. But many of the lessons learned are still being integrated into the utility resource planning process. And until DSM affects the daily system operation decisions it will remain only partially effective in improving utility resource utilization efficiency and cost stability.

DSM is defined here to include the full range of energy conservation and load shaping activities, and "supply-side planning" is defined as the full range of traditional utility planning for generation, delivery and contract resources. For most utilities, DSM planning has been evident only since the mid-1970s and the standards and methods of this discipline are still evolving. A key part of DSM planning is predicting customer behavior. On the other hand, traditional supply-side planning began with the advent of electric utilities at the start of the 20th century, and has a well-developed set of standards and methods. The focus of these methods is predicting availability and performance of equipment.

This paper discusses the practical problems and issues in creating a level playing field between the two disciplines. The authors' utility is attempting to integrate DSM and supply-side planning to meet resource needs, and this poster session presents considerations that may apply to other utilities.

LONG-TERM RESOURCE PLANNING

The integration of DSM into long-term resource decisions requires changes in staff responsibilities, methods, and sequence of tasks. This utility has revised the planning process to first complete the base forecast, accounting only for impacts of existing DSM programs. Next it makes resource decisions for both demand- and supply-side resources using modified supply-planning models. Finally, the official peak and energy forecasts are prepared, incorporating all the DSM programs selected.

At their utility, the authors found the most crucial step was to improve communications between DSM planners, load forecasters, and resource planners, since all assumptions and information must be consistent if DSM resources are to be fully integrated. Load forecasters need to use more detailed models to create the information needed as the basis for comparison. DSM planners generally need to develop further information on program impacts for inclusion in the EGEAS and UPLAN resource planning models, such as hourly impacts over time at different funding levels. Note that model vendors are making changes to supply-planning models such as EGEAS and UPLAN to more clearly account for DSM. The trend toward competitive resource bidding should also mean development of more tools for direct comparisons.

Differences in resource unit size and "construction" lead time compound problems of comparing DSM and supply-side resources. DSM typically comes in smaller increments with a shorter lead time, which allows utilities to respond more quickly to changing conditions. Supply side resources typically are available in larger increments, and must be added in discrete blocks. It may be both economical and less risky to add a power plant a year or two before the full amount is needed. At the authors' utility, risk reduction was weighted higher than economics in the final iteration, which meant that less expensive but "unproven" DSM programs were not implemented. To avoid this situation, DSM impacts must be demonstrated and resource planners made more comfortable with customer behavior predictions.

LONG-TERM LOAD FORECASTING

In integrated resource planning, future additions of DSM are directly compared to the economics of adding traditional supply-side resources. The major component of this comparison is the 20-year load forecast. The base forecast used for this comparison includes only embedded DSM; i.e., savings already achieved which will not be affected by future program funding changes. Some considerations are:

- When embedded DSM program impacts are incorporated into the forecast, adjustments must be made to program projections to account for persistence of measures with no further funding.
- The method used to integrate DSM into long-term load and energy forecasts is crucial; simply subtracting DSM from the forecast introduces unknown errors. Developing full end-use econometric forecasting models is essential for integrated planning.
- DSM impacts must be on the same basis as the load forecast, such as predicting the average peak, not extreme peak. For example, if the peak forecast is based on a 104°F day in June, using measured DSM load reductions from a 112°F day will overstate the DSM impact. The impacts at the higher temperature may be accounted for in setting planning and operating reserve margins.
- It is essential to avoid double-counting, such as between price effects incorporated in a forecast model and discrete DSM program projections.
- Several forecasts are required and must be clearly identified: a base forecast with no further DSM expenditures, the "official" forecast with all adopted DSM, and the "official" forecast less dispatchable DSM to provide to system operators.
- Staff accountability is an increasing concern and must be addressed by the integrated resource planning process. A problem arose at this utility when the load forecasters predicted a peak of about 2000 mW, but on the peak day very inexpensive economy energy was available and had been purchased, so 100 mW of residential air-conditioning load control was not dispatched. So the observed load was 2100 mW. Did the load forecasters have a large margin of error in their forecast, or were they very close?

SHORT-TERM LOAD FORECASTING

The short-term forecasts are those used by system operation planners to project yearly resource needs, maintenance schedules, and hydro system operations. Short-term forecasts also include the daily, weekly, and monthly forecasts used for resource commitment and economy energy decisions. It is even more crucial in these forecasts to correctly represent the case of dispatchable DSM being available in previous years, but not dispatched due to lower than normal summer loads, and not showing up in the observed load. Thus, the historical load does not provide a good basis for forecasting future impacts. For integration at the operation level, DSM must be predictable even down to an hourly basis by the system operators. A daily DSM prediction model has been developed and is being tested at this utility.

SYSTEM DISPATCH DECISIONS

Energy management systems and the dispatchers' experience are based on historical trends in loads, but newly added DSM makes historical trend information invalid. Dispatching a system with a high percentage of non-dispatchable and dispatchable DSM is even more complex than dispatching a traditional hydro-thermal and power contract system. The latter resource mix is a complex planning problem by itself. Another problem system dispatchers face is that DSM is a distributed resource: it often affects many substations in the system, unlike supply-side resources, which are available over discrete delivery routes and more easily accounted for.

Until DSM affects the daily system operation decisions, it is only partially effective in improving a utility's resource utilization efficiency and in stabilizing costs. System dispatchers must learn about a whole new set of variables as they operate the system to optimally supply the load. New tools must be developed for fully integrated system dispatch. At the authors' utility, economy energy is used instead of dispatching DSM, as the dispatchers don't believe they can rely on DSM. By opening lines of communication, the concerns have been identified and are being addressed with further monitoring equipment.

CONCLUSION

There are a number of challenges to overcome as utilities evolve and DSM becomes relied upon in the same fashion as supply side resources. Load forecasting is the key component to achieving comparability between resources. DSM resources must be carefully and explicitly included in both long- and short-term forecasts. Resource planners and system operation planners must expand their models and techniques to include DSM. DSM planners must provide more detailed information, down to even hourly details. In working together, efficient and effective utility planning can be accomplished.