Orison's Unique Challenges and Possible Assistance that Could be Provided by a National Laboratory or Partner Organization

The Orison system includes various form factors of user-installable, self-install energy storage units, a simple stick-on multi-circuit energy/current monitor, and a cloud-based distributed energy/power management system that is tied in with both the distributed set of Orison units at user's homes/offices/etc., and the various utilities that provide those locations with conventional grid-sourced electricity. This distributed system provides, at the grid edge, a highly flexible, responsive source of what Orison terms "negative and positive demand"—that is, the ability to provide, at all levels of granularity from across the grid down to a single home, nearly instantaneous management of electrical *power* demand both by reducing it (when supply is limited or demand spikes) or increasing it (when supply is excessive or demand suddenly drops). The Orison system is designed to provide this demand management over multiple time scales, ranging from seconds (where peak power and latency are the critical aspects) to multiple hours (where total stored energy is the critical factor).

By performing these services at the grid edge, the Orison system maximizes the positive impact on both consumer energy cost and on utility near term and far term economics (when compared with more centralized grid-scale storage). While the simple aspects of this economic benefit are well known and easy to model, (e.g. consumer cost impact due to peak to off-peak shifting of energy usage when time of use billing is in place, or absorption of excess home solar energy production to offset peak demand in a low feed in tariff or net billing combined with time of use billing regime), the more complex impacts to the economics of the utility side are much more difficult to quantify (through experiment or model) and monetize. This latter area is where Orison believes a combination of National Laboratories and/or partner organizations could be of great support.

In terms of what assistance could be provided, it is best to outline the specific impacts we believe are possible when grid-edge, distributed, responsive storage like the Orison systems are present and provide for each the type of information and/or analysis needed. To make this easier, we typically break the problem into parts based on the flow of electricity from generation to consumer, and further define the economic impact of the Orison system on those parts in near and far term impacts. While we can obtain some of this data on specific regions and customer groups through our present utility partners, industry-level averages and/or wider statistics on specific quantitative data is needed to better assess the total impact of Orison energy storage on the overall electric grid.

Generation

Near term: Slower load-following requirements enabling a selection of electric generation sources of higher efficiency and/or lower online standby requirements resulting in lower fuel and O&M costs—high frequency (seconds to minutes) data on present day generation level output and efficiency on a plant by plant basis and analysis of this data to clearly outline the economics.

Far term: Reduced / delayed generation capital investment requirements by enabling lower peak to average power and thus reducing operating margin requirements—need for data on present levels of investment and planning.

Transmission and Distribution

Near term: Lower peak to average power ratio reduces ohmic loss (direct reduction of energy cost of transmission) and reduces probability of blackout due to peak loading of lines or transmission components—we require data on transmission level ohmic loss based on peak to average power data on enough lines and help with obtaining proper statistics.

Long term: Ensuring lower peak to average power will enable reduced O&M requirements as well as reduced capital investment through lower operational margin requirements. Data needs are similar to far term generation, however information on present levels of investment and planning is necessary.

Local distribution

Near term: The peak to average power ratio increases as the granularity becomes finer (i.e. a single home has a far greater peak to average (in some cases >20) compared to grid level (3-4 is a typical max)). This dramatically increases the ohmic loss. Our present models predict that the few minutes a day of peak power usage in a home represent most the Ohmic loss on distribution for that home and correspondingly a reasonable impact on the overall loss. This is also the case for other losses dependent on the electrical current magnitude (e.g. transformer losses). This is one area where there is not only a lack of good data (even modern smart meters don't record data at a sufficient time scale, seconds, for this analysis), but it is also an area where there is a need for mutual support. Orison's energy monitor can provide data at low cost with high granularity, and the National Labs and/or partner organizations could provide modeling and early data to enable Orison energy storage to make its case for the value of our products.

Far term: This is like the T&D in advantages and data needs.

Energy Retailers

Near term: By enabling demand management on the customer side of the meter, Orison energy storage would enable retailers to economically manage overages without the need to push costs/burden out to consumers. The data that would be helpful here would be to compare regional or national level energy pricing information of typical peak demand pricing as compared to base load expenditure ratios.

Far term: Better balancing and management of peak to average demand would enable utilities to offer options to consumers (i.e. low cost fixed rate or even fixed total) through multiple contractual purchase plans that support individual needs. By having Orison's capabilities, energy retailers could effectively mitigate, in a consistent and repeatable manner, the overage probability which would support the bundling of a significantly higher percentage of lower base load purchase blocks vs contracts with higher peak demand blocks, thus reducing overall expense. Currently, energy retailers must plan costly peak demand contingency blocks that buffer for the unknown variability of peak demand. Data needs here would be source data and analysis of typical energy markets at differing time scales and over multiple regions.