Appendix E – Demand Response Assessment

Seattle City Light has considered dispatchable Demand Response (DR) as a resource in its 2008 Integrated Resource Planning process. On behalf of Seattle City Light, Paragon Consulting Services conducted a Demand Response Assessment.

Due to the nature of the utility's hydro resources, peaking resources have not thus far presented a serious issue. Peaking capability is not inexhaustible, however, and there may come a time when there is a need for peak capacity additions. While demand response in the form of load control is not intended to meet base load, it is a useful tool to control peak loads. City Light recognizes the potential value in demand response and has first hand experience with programs and customer behavior. In addition, there is adequate time to build a significant DR capability.

The approach used in determining the DR potential for City Light comprised benchmarking, engineering and proven marketing results. If City Light proceeds with a load control program, several program decisions will impact the available kW and the costs. The first two key components are desired market penetration and technology choice. The assumption that the residential programs will focus on electric space and water heating in homes owned by the occupants was applied to all options. The basic winter peaking capability is estimated to be as much as 40 MW.

The market for Commercial and Industrial potential, based on industry expert "rules of thumb," is between five and 10 percent of total peak load. On the conservative side in the first few years of a program, a market penetration of between 0.05% and 3% is used for estimating potential. Commercial and Industrial load control programs are highly customized and therefore program costs and performance are highly variable. Based on information from other programs across the U.S., levelized costs are expected to be about $84-$100/kW-year. The cost per kW-year is a measure of the capacity cost. It does not represent the actual cost of the energy, since that is a function of how often the demand response is called.

Program costs are based on actual offers to customers in other areas of the country. Cost information includes rental spillover and accounts for line losses. Based on technology, assumptions were made about the need for incentives: homes with switches would receive incentives; homes with communicating thermostats would not receive incentives.

Levelized costs associated with the different residential load control technologies at different market penetration rates are based upon national averages and are estimated by Paragon to range from $36-$69 per kW-year. It is anticipated that further work would be needed to study and verify costs that are specific to City Light.

Intrinsic Value of Demand Response

Overall cost reduction in the form of reduced risk or reduced power purchases are the primary reasons utilities pursue load control. However, Demand Response in the form of load control has additional intrinsic value: improved connection between the customer and City Light, environmental and distribution benefits.

Increasing the Connection between the Customer and City Light.

When properly used and positioned, load control programs increase customer knowledge of a complex business, at the same time increasing customer satisfaction with how the utility manages growth.

Environmental Benefits

Any program reducing the need to purchase power for peak demand will reduce the need for expensive (and often dirty) peak power plants - an important consideration given City Light's values and the passage of I-937.

Distribution Benefits

Targeted load control programs have shown the ability to defer distribution investments for several years. It can also help reliability in potentially over loaded circuits.

Note: There is a significant daily fluctuation in demand that necessitates a significant amount of flexible resources. Flexible resources are those that can be brought on line quickly (intra-hour) and reduced just as quickly. Gas turbines and any available hydro can meet this requirement. DR resources can function in this manner as well.

Resource need summary (with respect to DR)

Winter peaking

Multiple day cold snaps are the largest resource concern

Morning and evening peak resource needs

Demand Side Management Resource Types

A large variety of programs and efforts are included under the umbrella of Demand-side management (DSM) programs. They vary in whether they are firm and predictable, or non-firm, variable and unpredictable. Some load reduction programs allow dispatch or prescheduling and some, once deployed, are constant. Some program results are persistent, some results degrade rapidly. From a resource planning perspective, demand side management programs can be broken down into four major types: dispatchable load control, firm energy efficiency, price responsive conservation and education.

Dispatchable or Pre-scheduled Firm Load Control

These DSM resources are activated by direct utility control for immediate response or scheduled future event (hour ahead, day ahead, etc.). Many dispatchable load control programs can meet the WECC requirements for non-spinning.

Non-dispatchable Firm Energy Reduction

Energy and capacity savings are achieved through the installation of more efficient technologies or improvements to building shells. Once these measures are installed, the energy savings lasts for the life of the measure. Examples include efficient lighting systems and controls, premium efficient motors and air conditioners, improved insulation levels, improved windows, etc.

Risks such as market price volatility, fuel costs, among others, are taken into account in the IRP process. Demand Response resources can help mitigate those risks. Specifically, load control can contribute to planning reserve margins as well as be dispatched economically.

When contracting for supply-side resource some of the factors that impact value are firmness, dispatchability and term (duration) of resource, etc. All these factors can all be translated to a load control resource. The load control resources estimated in this report are firm, with an added non-firm component during extreme weather conditions. They can also be dispatched within 10 minutes, which meets the WECC reliability requirements for non-spinning reserves. Additionally, they have a proven life of at least 15 years; and, many load control programs in existence have lasted much longer.

Given this information, load control can behave like, and therefore has been modeled as:

- a very low capacity factor generating plant,
- a long term firm capacity contract at a fixed (known) price, or
- as an option where the program costs are the option "premium" and the "strike" can be determined by the utility's desired program parameters.

Even though the load control resource is very similar to the three supply side resources described above, valuing them is difficult. Load control is most valuable at the extremes of a utility's peak load and at the hours of highest wholesale market prices. In an IRP scenario, forward market prices are generally modeled as a deterministic stream of values with an "expected case," and alternative high and low cases that are also built as fixed streams of value. This type of modeling tends to smooth out the extreme highs and lows of market price thus reducing the potential cost avoidance value of DR.

Valuing DR as one would a supply side "option" can also be problematic. Option value depends on price volatility. As mentioned above, most price forecasts smooth out volatility. Additionally, fixed (known) market prices for options going out 15 years generally do not exist.