

City of Bellevue Comprehensive Plan Utilities Element Update Puget Sound Energy Electrical Utility System November 2006

This document has been prepared by Puget Sound Energy (PSE) to update information regarding PSE's electric utility transmission and distribution systems in the City of Bellevue. In addition to this document, please see the accompanying map (Figure 1) depicting PSE's existing transmission system (transmission lines, transmission stations and distribution substations) and planned system improvements within and surrounding Bellevue. Questions concerning this information may be directed to PSE's Community Services Department.

Introduction and Summary

PSE's goals are to meet future customer needs for electrical service, enhance system reliability, and maintain safe facilities. PSE plans for electrical facility needs based on measurement and forecasting of peak load conditions. Within the Greater Bellevue Area (including Bellevue, Beaux Arts, Clyde Hill, Medina, Hunts Point, Yarrow Point, southern portions of Kirkland and Redmond, northern Newcastle and nearby small areas of unincorporated King County) the 2005-2006 winter peak electrical load (demand for service) was 500 MVA (Megavolt-amperes). Based on population, employment and development forecasts provided by the City of Bellevue and other sources, PSE projects a 625 MVA winter peak load in 2020. Looking further into the future and assuming a 1.1% growth rate from 2020 to 2030, PSE projects a 700 MVA winter peak load in the Greater Bellevue Area by 2030. Actual load growth could vary from projections due to economic cycles, land use zoning changes and other drivers.

Projected electric load growth in Bellevue can be accommodated with the existing transmission system and distribution substations together with planned system improvements as currently shown in the Bellevue Comprehensive Plan. However, PSE has identified additional system improvements which will further enhance the capacity and flexibility of PSE's systems in the coming years. PSE recommends the following changes to PSE's electrical system as depicted in the Comprehensive Plan:

- a) Updating portions of the electrical system constructed and put into service since the previous update in 1998;
- b) Moving the planned 115 kV (kilo-volts) transmission switching station functionality from the existing Kenilworth substation to the proposed Ardmore substation; and
- c) Adding a new future 115 kV transmission line between the planned Ardmore Substation and the planned Westminster Transmission Switching Station.

Refer to the accompanying updated system map (Figure 1) for existing and planned facilities locations.

There are several drivers that result in these recommendations. Presently, the Bellevue area is served by some of the most highly loaded transmission lines within PSE's system. This is a result of steadily increasing demand for electric service (driven by new development) which has nearly "used up" the capacity of the existing transmission system infrastructure. Installation of additional transmission switching stations will be required to provide increased transmission system flexibility and maintain transmission system reliability. With additional switching stations, fewer customers will be impacted by transmission system outages and available transmission system capacity will be more efficiently utilized. Eventually, more transmission system capacity will be required, at which time 230 kV to 115 kV transformation will need to be installed within the Bellevue area.

In addition, PSE is required to meet North American Electric Reliability Council (NERC) standards for system reliability in the planning for and operation of the electric transmission system. PSE conducts annual reviews of transmission system and transmission line capacities and performs contingency analyses to assure that PSE continues to meet NERC guidelines. System improvement projects have been constructed and additional improvements are planned in the Bellevue area in order to meet NERC requirements. Recent examples of such improvements include the reconfiguring and rebuilding of selected transmission lines to increase line capacity, the installation of a transmission system circuit breaker at Sammamish Transmission Station in Redmond, and the construction of the new Novelty Transmission Switching Station and associated 115 kV transmission lines east of Redmond.

Planned System Improvements

System improvement projects within Bellevue for which PSE expects to submit permit applications within the next two years (2007-2008) include:

- 1) Adding second transformer banks at the existing Bridle Trails, Factoria (rebuilding), and Center distribution substations,
- 2) Construction of a new distribution substation combined with a 115 kV transmission switching station (Ardmore) in the vicinity of NE 24th Street and 156th Avenue NE together with new 115kV transmission line segments (note PSE has not selected nor acquired a site for this project),
- 3) Construction of a new 115kV transmission line segment to “loop” through the existing Interlaken Substation (in conjunction with construction of the Ardmore Substation),
- 4) Construction of a new 115kV transmission line segment connecting the existing Phantom Lake and Lake Hills substations, and
- 5) Increasing the capacity rating of existing transmission lines between the Sammamish and Clyde Hill substations, between the Clyde Hill and Lochleven substations, and between the Lakeside and Lochleven substations.

Planned transmission system and substation improvement projects anticipated for permit submission in the two to five year time frame (2009-2011) include:

- 6) Installation of a second transformer at Northrup Substation,
- 7) Expansion of the existing Clyde Hill Substation to accommodate installation of transmission system circuit breakers to create a new switching station, and
- 8) Construction to complete the Sammamish-Clyde Hill #2 115 kV transmission line.

Between 2010 and 2020, additional system improvements are planned. It is anticipated that the Westminster Transmission Switching Station will be constructed during this period. This project may include distribution substation functionality in addition to the planned transmission switching station. Other improvements include rebuilding the Sammamish-Lakeside-Talbot 115 kV transmission line to operate at 230 kV, and, depending on area load growth, it may be necessary to install 230 kV to 115 kV transformation at the existing Lakeside Switching Station (this improvement will require expansion of the existing switching station). These improvements will increase system capacity and system reliability within Bellevue and the Greater Bellevue Area. Required facilities and improvements could change if actual load growth varies from projections due to economic cycles, land use zoning changes and other drivers.

In addition to the system improvements described above, over time PSE will replace existing infrastructure as part of ongoing normal system maintenance.

Load Analysis

This detailed review updates the Bellevue Comprehensive Plan Utilities Element for PSE’s electrical system last updated in 1998. Development growth in most areas of Bellevue has been relatively moderate between 1998 and 2006, because there has not been much vacant land to develop. Bellevue forecasts similar moderate growth for the foreseeable future. Exceptions to this forecast are the Downtown core and certain areas targeted by the City for redevelopment and additional development such as the Bel-Red corridor, the 116th Avenue NE corridor and the Factoria and Eastgate areas. The possible range of development plans which may be chosen for these areas makes projection of associated future electric loads uncertain. Therefore, this update proposes no significant changes to the planned system improvements contained in the 1998 plan update for the Factoria, Eastgate, Bel-Red, and 116th Avenue NE areas. PSE will work with the City as land use development decisions are made to review and update PSE plans for system improvements which may be needed to support planned future land uses.

Study Areas

There are two overlapping but different study areas used for this load analysis. The transmission system study area is essentially the area between the Sammamish and Lakeside substations (north to south) and between Lake Washington and Lake Sammamish (west to east). From the transmission system perspective, the study area for the Greater Bellevue Area includes all of the cities of Bellevue, Beaux Arts, Clyde Hill, Medina, Hunts Point, Yarrow Point, together with portions of south Kirkland and south Redmond, most of Newcastle, and small portions of unincorporated King County in the Eastgate area.

Distribution system concerns are more “localized” in nature, therefore the distribution system study area corresponds more closely with the Bellevue city limits. The distribution study area is generally bounded by Lake Washington to the west, Lake Sammamish to the east, NE 60 Street to the north and SE 60th Street to the south. This area includes the all of Bellevue and Beaux Arts, portions of south Kirkland and south Redmond, and some unincorporated King County in the Eastgate area.

Distribution Study Results

The City of Bellevue provided information regarding the floor space square footage of various uses of non-residential buildings and the number of single family and multi-family residences in existence in 2005 and forecast for 2020 by Transportation Analysis Zones (TAZs). PSE applied unitized electric load factors to the square footages and numbers of residences to calculate projected electric loads in areas served by each distribution substation. The resultant Bellevue area load projections are shown in Table 1 below.

Table 1: Total Bellevue Area Loads

	<i>Winter 2005</i>	<i>Summer 2005</i>	<i>Winter 2020</i>	<i>Summer 2020</i>
Calculated by TAZ	463 MVA	398 MVA	558 MVA	475 MVA
PSE Metered	473 MVA	397 MVA	N/A	N/A
Difference	2%	0%		

An attempt was made to localize load projections to individual substations. This was a challenging endeavor, because while the overall area load could be calculated fairly accurately, individual TAZ data often do not match up with actual metered substation loads. Using the most appropriate methodology and accounting for data characteristics, the best data and projections of Bellevue Area Substation Loads and Capacities are shown in Table 2 below, including distribution substation measured (actual) peak loads and transformer capacities in 2005 together with projected loads and planned transformer capacities and in 2020.

Table 2: Bellevue Area Substation Loads and Capacities

Substation	2005 Measured Peak Load MVA	2005 Transformer Capacity MVA	2020 Projected Peak Load MVA	2020 Planned Transformer Capacity MVA
Ardmore ¹	-	-	20.0	25
Bridle Trails	25.7	25	32.4	50
Center	24.7	25	49.3	50
Clyde Hill	23.4	25	38.3	50
College	20.2	25	21.8	25
Eastgate	32.0	50	27.1	50
Evergreen	54.1	50	57.6	50
Factoria ³	28.9	25	33.8	50
Houghton	22.8	25	19.9	25
Interlaken	23.6	25	28.9	50
Kenilworth	24.6	25	25.3	25
Lake Hills	22.4	25	22.6	25
Lochleven ²	19.2	25	41.1	50
Midlakes	20.7	25	22.9	25
North Bellevue	43.9	50	48.2	50
Northrup ³	26.5	25	37.5	50
Phantom Lake	19.3	25	21.0	25
South Bellevue	22.8	25	24.3	25
Somerset	18.3	25	19.6	25
Total	473.1	525	591.6592.9	725

Notes:

1. Substation planned for construction in 2008.
2. Second transformer bank installed in 2006.
3. 2005 Peak load exceeded substation transformer rated capacity.

The Lochleven Substation rebuild has just been completed in 2006 with installation of a second 25 MVA transformer to serve recent and ongoing load growth in the downtown area. Installation of an additional 25 MVA transformer is planned at Center Substation in 2008 to serve increasing load in the downtown area. Installations of additional 25 MVA transformers are planned at Bridle Trails and Factoria substations in 2008. In the future, an additional transformer will be required at the Clyde Hill Substation to serve projected downtown and vicinity loads and at Northrup and Interlaken substations to serve growing loads in the surrounding areas.

Development forecasts provided by the City may be conservative compared to the current rapid load growth in downtown Bellevue area and in southwest Redmond. Ardmore Substation is planned to be built in southwest Redmond or northeast Bellevue in 2008. If Ardmore Substation is not built, additional capacity will have to be added to one or more existing substations in the area, at Evergreen, Interlaken, and/or Kenilworth to serve area loads east of SR-520. The additional transformer shown at Bridle Trails Substation will serve new load in this area west of SR-520.

Central Business District

Table 3 below shows recent and projected loads on the substations serving the downtown Bellevue Central Business District (CBD) and the immediate surrounding area in 2005, 2020, and 2030 (rounded to the nearest whole MVA).

Table 3: Bellevue CBD Substation Loads and Capacities

	<i>2005 Peak Load MVA</i>	<i>2005 Capacity MVA</i>	<i>2020 Projected Peak Load MVA</i>	<i>2020 Planned Capacity MVA</i>	<i>2030 Projected Peak Load MVA</i>	<i>2030 Planned Capacity MVA</i>
Center	25	25	49	50	62	75
Clyde Hill	23	25	38	50	48	50
Lochleven	19	25	41	50	52	75
North Bellevue	44	50	48	50	70	75
Total	111	125	176	200	232	275

Projected 2020 and 2030 substation loads are based on population, employment and development forecasts provided by the City of Bellevue. Based on these growth forecasts, existing substations together with planned installation of additional transformers should be able to serve the CBD and the surrounding area through 2030.

Factoria

The City of Bellevue envisions developing the Factoria area to a more dense urban center. Current City forecasts do not show such development in the Factoria area by 2020. Such development is possible at Factoria Mall and in the surrounding area resulting in a significant load increase beyond 2020. Factoria and Somerset substations may not have enough capacity to serve such a dense urban center; therefore, a planned Newport Substation is envisioned to serve such development when it occurs. This substation is not included in the load table, but is shown on the map of proposed facilities.

Bel-Red Corridor

The City of Bellevue has plans to establish an economic development zone for the Bel-Red Corridor, a large area roughly bounded by Bel-Red Road on the south, I-405 on the west, SR-520 on the north, and 148 Ave NE on the east. This area is currently served by the North Bellevue, Northrup, Midlakes, and Interlaken substations. Insufficient information is currently available to make load projections, but any of the planning alternatives currently under consideration could add significant load to this area. A new distribution substation in the vicinity of the planned Westminster Transmission Switching Station would be well positioned near the center of future development in the Bel-Red corridor. This substation is not included in the load table, but is shown on the map of proposed facilities.

**Bellevue Comprehensive Plan – Utilities Element Electric Service Text
Update Revisions Proposed by Puget Sound Energy
November 2006**

Electrical Service

Puget Sound Energy (PSE) builds, operates, and maintains the electrical utility system serving the City of Bellevue. PSE is an ~~n-private~~, investor-owned utility with the responsibility for providing service to over ~~750,000~~ 1,024,000 electric customers in a nine county service area. ~~The system serving~~ Bellevue is part of a larger service area called the “Greater Bellevue Area” which is roughly ~~an-the~~ area between Lake Washington and Lake Sammamish. The ~~area~~ Greater Bellevue Area includes the entire cities of Bellevue, Beaux Arts, Medina, Hunts Point, Yarrow Point and Clyde Hill. ~~This area also includes~~, portions of Kirkland and Redmond and small portions of unincorporated King County.

PSE imports electrical energy from generation sources in Canada, on the Columbia River, and from other generation sites inside and outside of PSE’s service territory.

~~Based on population and employment forecasts for the next 20-30 years as of 1993, PSE estimates that there will be a peak winter load of approximately 680 MVA (Megavolt-amperes) in the greater Bellevue Area. In comparison, the winter load in 1993 is 475 MVA. New facilities, including transmission lines and substations, may have to be constructed to meet this demand. PSE’s goals are to meet future customer needs for electrical service, enhance system reliability, and maintain safe facilities. As of the end of 2006, PSE served more than 57,200 electric customers within the City of Bellevue. During the winter of 2005-2006, peak electrical load (demand) in the Greater Bellevue Area was 500 MVA (Megavolt-amperes). Based on population, employment and development forecasts for the next twenty to thirty years as of 2006, PSE estimates that peak winter loads in the Greater Bellevue Area will be approximately 625 MVA in 2020 and 700 MVA in 2030. Actual load growth could vary from projections due to economic cycles, land use zoning changes and other drivers. While PSE’s existing infrastructure is well positioned to meet City needs, several new system facilities including transmission lines and substations will need to be constructed to meet the projected increased demand for electrical service.~~

**Bellevue Comprehensive Plan – Utilities Element – Natural Gas Text
Update Revisions Proposed by Puget Sound Energy
November 2006**

Natural Gas Service

Puget Sound Energy (PSE) builds, operates, and maintains the natural gas facilities distribution system serving the City of Bellevue. PSE is an investor-owned utility serving nearly 650,764 more than 703,000 natural gas customers in five western Washington counties including King, Snohomish, Pierce, Thurston, and Lewis counties a six county service area. There are approximately 30,697. As of the end of 2006, PSE served more than 31,100 natural gas customers within the City of Bellevue.

Natural gas is delivered to a regional distribution network via an interstate pipeline system. Northwest Pipeline Corporation owns and operates the regional network that supplies gas to the states of Washington, Oregon, and Idaho. The pipeline serving Bellevue consists of two pipelines running north and south, in an area east of Lake Sammamish. The Pacific Northwest receives natural gas from widely disparate regions of the United States and Canada. Natural gas is transported throughout the states of Washington, Oregon and Idaho via a network of interstate transmission pipelines owned and operated by Northwest Pipeline Corporation. PSE takes delivery of natural gas from Northwest Pipeline east of Lake Sammamish and distributes the gas to customers via PSE's distribution system. The distribution system serving Bellevue consists of both high pressure and intermediate pressure mains.

Based on available population projections for the next 20 years as of 1993, PSE does not foresee a need for major new distribution facilities in Bellevue in the next 20 years. PSE's goals are to meet future customer needs for gas service, enhance system performance, and maintain safe facilities. As of 2006, PSE's natural gas distribution system has sufficient capacity to serve existing demand for gas service in Bellevue. However, system capacity enhancements will be required in next few years to provide service to new development within the Bellevue Downtown area. Additional high pressure mains will need to be extended into the downtown area and additional intermediate pressure mains will be needed to serve specific developments. Thereafter, the need for additional system improvements will be driven by future development.