



MEMO TO: Mayor and City Council

FROM: Rob Odle, Director, Planning and Community Development

DATE: June 2, 2015

SUBJECT: Overlake Village District Energy Feasibility Study Results and Recommendation

I. RECOMMENDED ACTION

Staff recommends not proceeding with establishing a City-owned or operated district energy system in Overlake Village, as described in this memo. Staff will be available to answer Council Members' questions as part of the Council's staff report on this topic.

II. DEPARTMENT CONTACTS

Lori Peckol, AICP, Policy Planning Manager, 425-556-2411

Cathy Beam, AICP, Principal Planner, 425-556-2429

Jeff Churchill, AICP, Senior Planner, 425-556-2492

III. DESCRIPTION/BACKGROUND

Background

The City of Redmond has investigated the potential to establish a district energy system in Overlake Village as part of the City's climate action planning efforts. District energy has the potential to reduce energy use, carbon emissions and energy costs while creating a competitive edge in redevelopment by eliminating the need to provide on-site heating and cooling equipment.

The City evaluated district energy for Overlake Village in a two-step process: a pre-feasibility study completed in late 2013 that was funded by a HUD grant, and a feasibility study completed in December 2014 funded significantly by Puget Sound Energy.

Feasibility Study Results and Staff Recommendation

Staff briefed the Council Planning and Public Works Committee at its May 12, 2015 meeting on the feasibility study results and staff recommendation. In brief, the feasibility study found that there were potential economic and environmental benefits to establishing a district energy system in Overlake Village; however, the benefits do not appear sufficient to offset the one-time and ongoing resources it would take for the City to be the primary entity to launch and maintain a new utility considering the City's existing service responsibilities and other strategic initiatives underway. This is in light of Puget Sound Energy's decision not to participate as the lead in developing and sustaining this new utility.

There are three key reasons for the staff recommendation. First, and most important, existing City resources are fully deployed for existing utilities, transportation, and other Public Works functions. Therefore, taking on the development of a new district energy utility – including policy development, funding, planning, design and construction of physical infrastructure, staff resourcing, operational agreements, etc. – would require significant additional budget and resources and would take away from the City’s ability to achieve current strategic objectives. Second, there are significant logistical challenges to locating a distribution system (pipes) in City right-of-way. This can be evidenced in the sample 152nd illustration shown in Attachment B. Third, the financial model, including estimated costs, rate design, requirements for customer usage of the system and other factors, would require further development and analysis to assure consistency with City cost estimate assumptions and fiscal policies. The results and recommendation are described more fully in Attachment A.

Council Member Questions and Key Areas of Interest

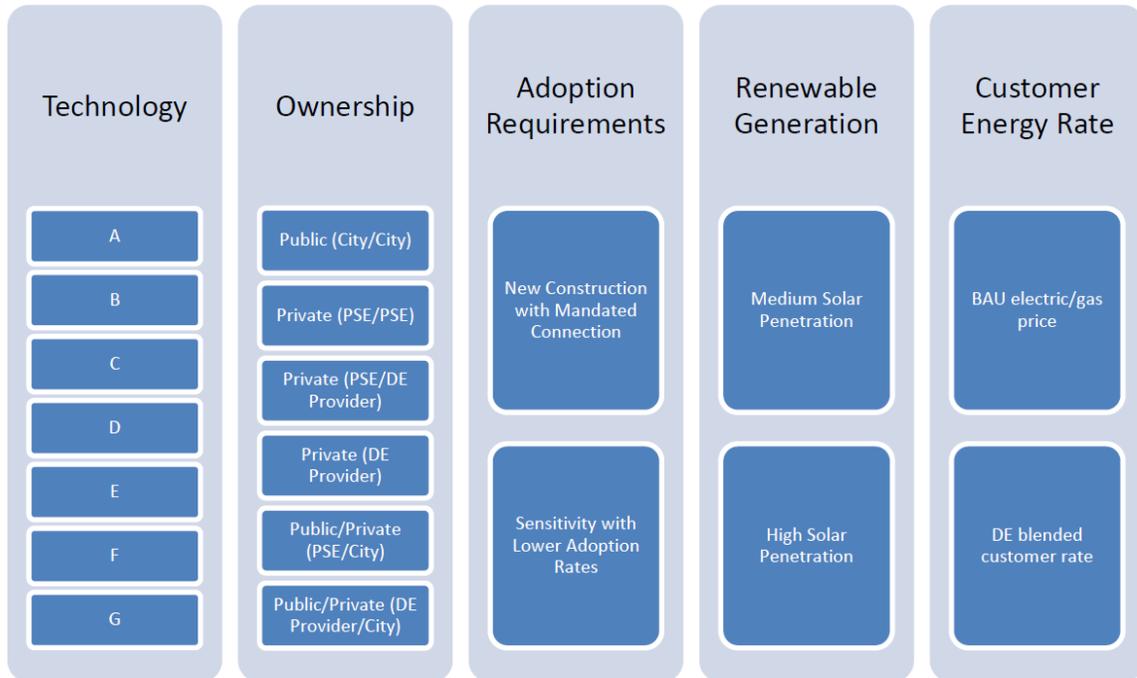
At the May 12, 2015, Planning and Public Works Committee meeting Council Members identified the following key questions and areas of interest. Staff has provided written responses below and will provide additional information as part of the staff report on June 2, 2015.

What were the study methodology and scenario assumptions, including the different technologies studied?

The study methodology comprised five key elements:

- Developing energy use data for Overlake Village
- Developing suitable technologies for the district energy systems
- Assessing ownership structures and demarcation for the systems
- Evaluating the economic and environmental impacts of the district energy systems based on assumed adoption rates
- Comparing the district energy scenarios to business-as-usual scenarios

The study considered seven different technologies, six ownership scenarios, two adoption scenarios, two renewable energy scenarios, and two customer rate scenarios, as shown in the figure below.



The technologies considered for the central plant, keyed to the figure above, were: A) hot and chilled water plant, B) hot water only plant, C) geothermal plant, D) combined heat and power plant, E) demand response / thermal energy storage, F) waste heat recovery, and G) low temperature condenser water system with distributed heat pumps.

In lieu of evaluating every possible scenario, which was not feasible, the consultant team constructed four scenarios that were in alignment with success criteria for the study and City environmental and economic priorities, would have relatively uncomplicated development and operations, and would provide a spectrum of scenarios for consideration. The scenarios are shown in the table below.

Criteria	Scenario 1 Low Carbon A	Scenario 2 Low Carbon B	Scenario 3 Low Cost	Scenario 4 Rate Parity
Objective	Minimize carbon footprint	Minimize carbon footprint	Minimize DE implementation and O&M costs	Hold customer rate steady
DE Technology	Waste Heat Recovery & Distributed Heat Pumps	Hot Water & Chilled Water Plant with Geothermal	Central Heating Hot Water-only Plant	Central Heating Hot Water & Chilled Water Plant
Ownership – Central Plant	PSE	Private Entity	PSE	PSE
Ownership - Distribution System	City of Redmond	Private Entity	City of Redmond	Private Entity
Regulatory Considerations	WUTC and City Council Regulation	Unregulated	WUTC and City Council Regulation	WUTC and City Council Regulation

Would another time be better for establishing a district energy system in Overlake Village?

The feasibility study confirmed that if the critical components such as supportive partners and funding can be assembled, the best time to establish a district energy system in Overlake Village is now because as the area develops, there will be continued missed opportunities, and a critical mass of customers are needed for the system to be financially viable.

Would district energy compete with other PSE initiatives like Energize Eastside?

District energy would not necessarily compete with PSE capacity-enhancing initiatives as it is an energy service delivery model. However, in order to be fully pursued by PSE, district energy would need to be identified in PSE's Integrated Resource Plan as an integral element to meet energy demand. This coupled with the small scale compared to PSE's service area make district energy in Overlake Village a low priority to the company.

Would expanding the potential service area into the Bel-Red corridor make a system more feasible?

This would need to be analyzed in further detail. The district energy study focused on Overlake Village. On one hand, an expanded service area would provide additional demand and potentially economies of scale. On the other hand, expanding the district over a larger area would require more infrastructure investment and would be more complex in terms of development and operation.

Could a system start small – a single property, e.g. – and grow from there?

Possibly, though it would depend on the customer potential. A successful district energy system requires a critical mass of anchor tenants/anchor loads. These systems can be deployed in small areas, but the density of thermal energy demand must be sufficient to support the commercial development of the infrastructure. A major part of the cost of a district energy system is the distribution system (pipes to carry the energy). The shorter the distance energy has to travel, the lower the cost. The more densely-packed the buildings, and the greater the demand for heating and cooling, the more efficient and viable the network is likely to be.

Regardless of the size of the start-up area, the issues remain of needing to have a willing owner and operator and sufficient space in the right-of-way.

If an entity wanted to build a private district energy system are there barriers to doing so?

A private ownership structure is possible, meaning a private entity is wholly responsible for the energy generation and delivery business. Private investors would likely seek support from the City in the form of accelerated planning approvals, changes to policy and/or regulations, community awareness, and permitting. The big risk for a private party is estimating probable adoption rate for connecting to the system. Without the City mandating connections, the project would have more risk, necessitating higher returns,

thus likely negatively impacting the adoption rate and customer rates. Supporting an unregulated private entity could create some risk of leaving the impression that the City endorses a private investor/owner.

What did we learn that can be applied going forward, for example, to craft policies that would support a third party establishing a district energy system?

One key lesson from this study is that developing a district energy distribution system that requires use of existing right-of-way is difficult due to space constraints. In contrast, a newly-developing location with fewer right-of-way constraints, or a campus setting, could be more suitable for district energy and the City will continue to look for opportunities for this.

Conclusion and Next Steps

For the reasons provided in this staff report and the attached May 12 memo, staff recommends against establishing a City-owned or operated district energy system in Overlake Village. As noted, a pilot project on a campus-style setting might be a more feasible application, where property control is of single-ownership.

Additionally, staff recommends exploring additional ways to achieve community carbon footprint reduction as suggested in the district energy feasibility report, and in alignment with the Climate Action Implementation Plan. For example, staff will explore the possibilities of transitioning new multifamily construction from electric to natural gas heating.

IV. IMPACT

A. **Service/Delivery**: None

B. **Fiscal**: None

V. ALTERNATIVES TO STAFF RECOMMENDATION

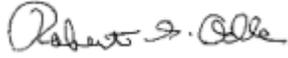
N/A

VI. TIME CONSTRAINTS

None

VII. LIST OF ATTACHMENTS

Attachment A: May 12, 2015 Memo to City Council
Attachment B: 152nd Ave NE Right-Of-Way Cross Section



**Robert G. Odle, Director of Planning and Community
Development**

05/28/2015
Date



Approved for Agenda _____
**Erika Vandenbrande, Deputy
City Administrator**

05/28/2015
Date

To: City Council

From: Cathy Beam, AICP, Principal Planner, 425-556-2429
Jeff Churchill, AICP, Senior Planner, 425-556-2492

Date: May 12, 2015

Subject: Overlake Village District Energy Feasibility Study Results and Recommendation

The purpose of this memo is to describe the results of the Overlake Village district energy feasibility study and staff's recommendation going forward. Staff is providing this memo for your May 12, 2015 Planning and Public Works Committee meeting so that Councilmembers can identify key questions and topics of interest for when this comes back to the Council as a staff report on June 2, 2015.

Background and Context

The City of Redmond has investigated the potential to establish a district energy system in Overlake Village as part of the City's climate action planning efforts. District energy has the potential to reduce energy use, carbon emissions and energy costs while creating a competitive edge in redevelopment by eliminating the need to provide on-site heating and cooling equipment.

The City evaluated district energy for Overlake Village in a two-step process: a pre-feasibility study completed in late 2013 that was funded by a HUD grant and a feasibility study completed in December 2014 funded nearly entirely by Puget Sound Energy. The pre-feasibility study found that a district energy system could potentially reduce energy use by 10-30 percent; energy costs related to heating and cooling by 10-50 percent; and carbon emissions by 15-45 percent, with the higher end representing what may be achievable if combining generation technologies like natural gas and geothermal.

The City Council expressed interest in pursuing the next level of analysis and evaluation. As a result, in early 2014, staff sought a partnership with Puget Sound Energy to perform a comprehensive feasibility study. The purpose of the study was to perform engineering analysis and economic evaluation to help define the economic feasibility of implementing district energy for Overlake Village. The success criteria for the feasibility study were:

1. Rates are competitive with business-as-usual (BAU) energy rates.
2. Greenhouse gas emissions are reduced over BAU greenhouse gas emissions.
3. Energy use is lower than BAU energy use.
4. Central plant is financially viable and meets the investor's objectives.
5. District energy is adopted and requires critical mass anchor tenant/load.
6. Central plant is built on economic structure that is adaptive to change.

The City Council endorsed the partnership and work scope by resolution on May 20, 2014 and PSE and consultant team completed the study during the remainder of the year with consults along the way with City staff.

Draft Feasibility Study Findings

PSE and the consultant team – McKinstry and Sound Energy Investments – evaluated four district energy scenarios and two BAU scenarios.

Economic feasibility. The economic feasibility results are shown in the figure below.

	BAU- Gas Heat	BAU- Electric Heat	Scenario 1 Low Carbon A	Scenario 2 Low Carbon B	Scenario 3 Low Cost	Scenario 4 Rate Parity
25-year NPV Total Capital and O&M Costs for Building Systems	\$53.5M	\$61.6M	N/A	N/A	\$25.6M	N/A
25-year NPV Total Capital and O&M Costs for District Energy Systems	N/A	N/A	\$51.7M	\$56.0M	\$24.3M	\$55.5M
25-year Total Revenues	N/A	N/A	\$59.0M	\$81.9M	\$32.6M	\$36.9M
Internal Rate of Return	N/A	N/A	6.7%	12%	6.7%	-0.25%
Years to Cash Positive	N/A	N/A	16	13	16	25
Blended Retail Rate (\$/MMBTU)	\$21.17	\$42.92	\$34.79	\$50.06	\$33.36	\$21.17

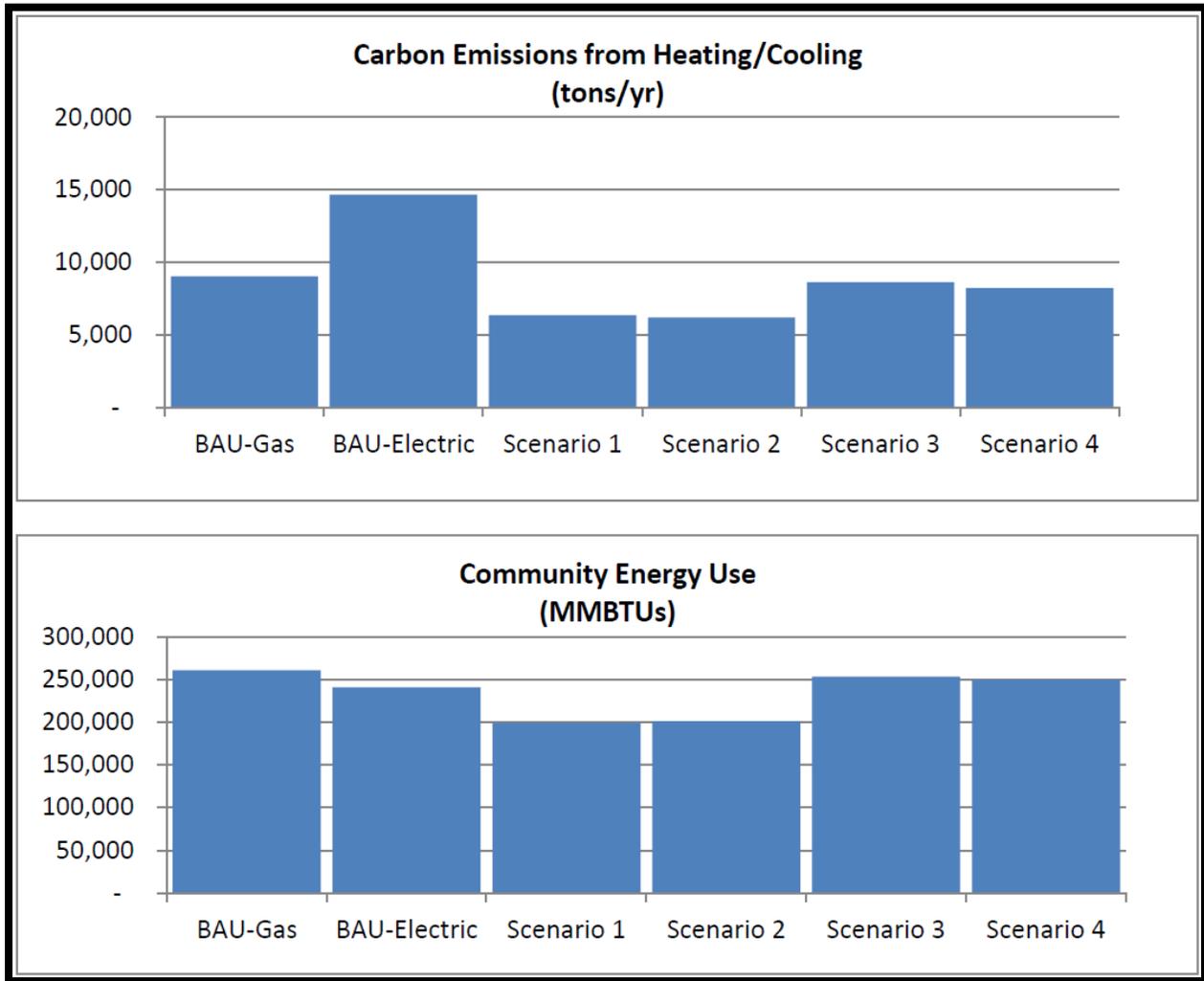
NPV: net present value

O&M: operations and maintenance

MMBTU: million British thermal units – a unit of energy

Scenario 3 appears the most promising on economics alone. It would reduce customer rates compared to today’s electric heating rates, which is what most customers pay since most new construction in Overlake Village is constructed with electric heating. It is also less technically complex and costly than Scenario 1, which includes waste heat recovery, and it assumes City or PSE ownership, reducing the required rate of return. Scenario 2 assumed a private third-party owner and as a result showed unacceptably high customer utility rates because the private owner was assumed to require competitive rates of return commensurate with risk. Scenario 4 held customer rates constant at today’s low natural gas costs and resulted in unacceptably low returns.

Environmental feasibility. Carbon emission reduction was an important success criterion in the study because this study is part of the City’s climate action planning efforts. As the figures below show, the low-carbon scenarios (1 & 2) perform best, as one would expect. All district energy scenarios out-perform the BAU scenarios, and do much better than the BAU electric heat scenario. Overall energy usage, including heating, cooling and other electric loads like appliances, is lowest in the low-carbon scenarios.



Critical Questions from Feasibility Study

City staff from Planning, Public Works and Finance reviewed the draft feasibility study. Among the questions and comments were three critical questions that project staff investigated further internally and with PSE. Those questions were:

1. Would the City consider owning or operating any part of a district energy system?
2. Would a district energy system physically fit in the right of way?
3. What cost estimate assumptions and fiscal policy assumptions were used in the scenarios?

Owning and operating a district energy system. Establishing a district energy system at reasonable customer rates would likely require the City or PSE to own the distribution system and central plant. For both the City and PSE district energy would be a new venture requiring new resources and expertise. For PSE, this venture would represent a departure from its current technology and service models and would serve only a very small part of PSE's service area, thereby making it a relatively low priority. For the City, district energy has potential benefits, but they do not appear sufficient to offset the one-time and ongoing resources it would take to launch and maintain a new utility considering the City's existing service responsibilities and other initiatives underway.

Physical fit in the right-of-way. District energy systems rely on pipes that circulate steam, hot water, cold water, or a combination thereof. Staff investigated what utilities already exist in the 152nd Ave NE right-of-way because this would be the most logical location for the system spine. The 152nd Ave NE right-of-way is crowded and it would be challenging to accommodate district energy pipes. Adding such pipes further crowd the right-of-way and thereby likely add cost and risk to future public and private projects.

Cost estimate and fiscal policy assumptions. Staff concluded that the cost estimates would need to be much more detailed before recommending moving ahead with any future phases of this project. It is also unclear whether the financial model used in the analysis takes into account City utility fiscal policies, especially those concerning replacement reserves.

Staff Recommendation

As described above, staff does not believe the potential benefits of district energy outweigh potential costs and risks associated with establishing a new utility, nor does staff believe the City is equipped to take on a new utility. If the potential benefits were spread over a much wider area, or if other partnership opportunities existed then the recommendation might be different.

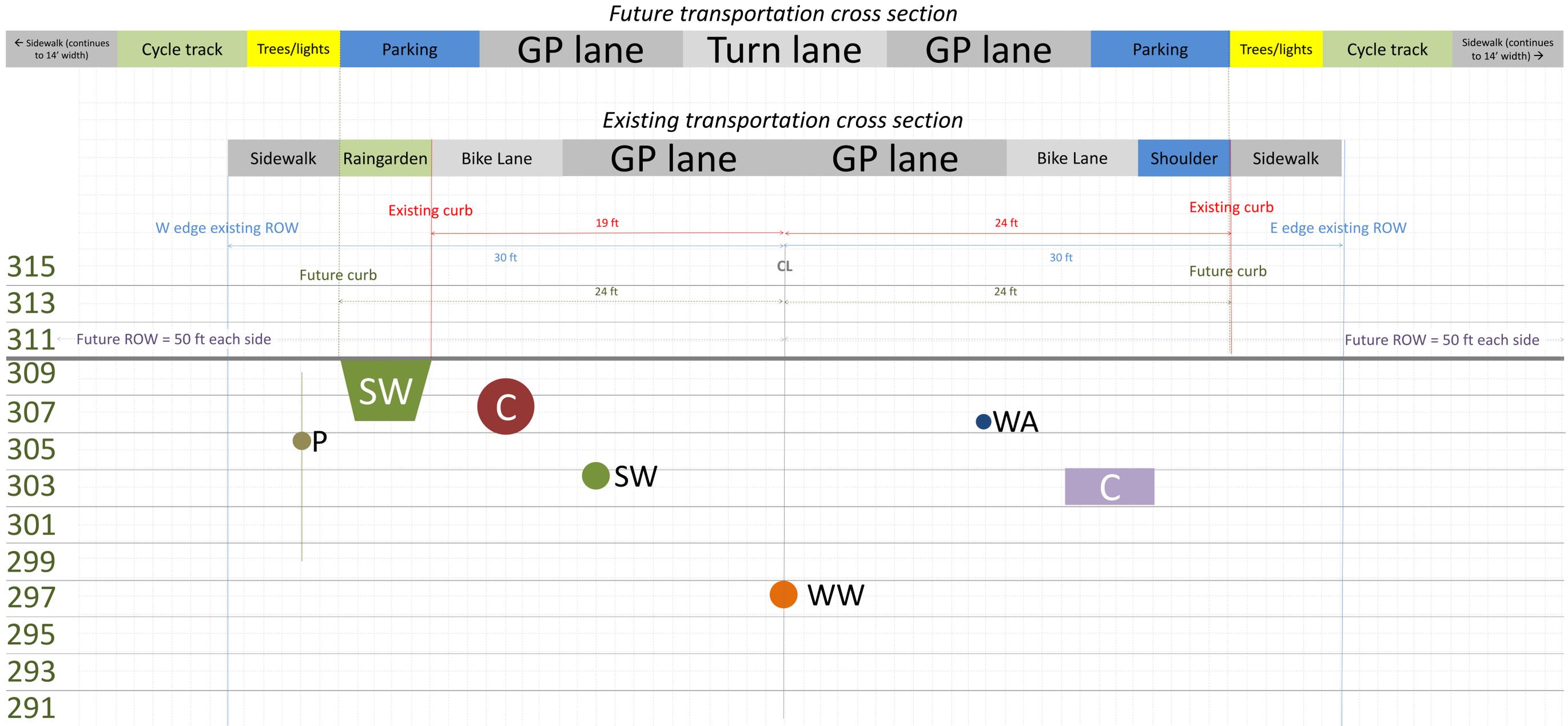
While staff does not recommend proceeding with a district energy system, the feasibility study notes other ways to advance economic and environmental goals that may be feasible and staff recommends exploring them. For example, natural gas heating is cheaper for customers and less carbon-intensive compared to electric heating, and yet electric heating is widely installed in new multifamily development because it is less costly to install. Staff recommends exploring ways to achieve natural gas, rooftop solar and other carbon-light and economically competitive heating sources in new construction. This could yield benefits in Overlake Village and across the city. Also, the City recently won PSE's Green Power Challenge. Building on that success would also yield reductions in the community carbon footprint.

Next Steps

Staff will provide a staff report on June 2, 2015 that incorporates Council key questions and topics of interest. Thereafter staff will begin exploring other ways to achieve community carbon footprint reduction, in alignment with the Climate Action Plan.

Please contact Cathy Beam or Jeff Churchill with questions.

Representative utility cross section for 152nd Ave NE, south of NE 24th St



- Legend**
- C = communication
 - G = gas (none shown)
 - P = power
 - SW = stormwater
 - WA = water
 - WW = wastewater

- Notes:**
- All locations and dimensions are approximate
 - Power depth unknown
 - West communication conduit size uncertain
 - Other franchise utilities exist outside existing 60-ft ROW
 - Existing grade = approx. 311 feet
 - Scale: 1 in. = 2 ft.
 - District Energy (DE) shown at 2'x12' (4 pipes) or 2'x6' (2 pipes), location TBD

DE (4 pipes)
DE (2)

