Overlake Village District Energy Concepts and EcoDistrict Applicability
Potential District Energy Value Proposition and Implementation Recommendations

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Otak, Inc.

In association with:
BAE Urban Economics and
Nelson\Nygaard Consulting Associates
Putnam Infrastructure
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Acknowledgements

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Preface

THE REGIONAL VISION

VISION 2040 is the central Puget Sound region’s long-range vision for maintaining a healthy region and is a guiding premise for all regional planning and implementation. VISION 2040’s cornerstone is its emphasis on development of vibrant, mixed-use centers where people can live, work, and play. Integrating affordable housing in mixed-use centers throughout the region contributes to achieving a jobs-housing balance that increases access to opportunity, lowers households’ combined cost of housing and transportation, and helps ensure that infrastructure investments enhance equity across the region.

SUMMARY OF THE GROWING TRANSIT COMMUNITIES PARTNERSHIP

In keeping with the regional vision described above, the central Puget Sound region is investing more than $25 billion dollars in high-capacity transit over the next twenty years, providing a once-in-a lifetime opportunity to capitalize on these investments by growing and strengthening communities around stations. The Growing Transit Communities Partnership (Partnership), funded by a grant from the US Department of Housing and Urban Development’s Sustainable Communities Regional Planning Grant Program and administered by Puget Sound Regional Council (PSRC), has been designed to help make the most of this investment by locating housing, jobs, and services close enough to transit so that it is a viable option for many people. If done right, more people will have a faster and more convenient way to travel.

The Partnership was formed through a coalition of city and county governments, housing authorities and affordable housing interests, transit agencies, public health agencies and departments, real estate and development interests, social justice and community development groups, economic development and business interests, community based organizations, educational interests, environmental advocacy groups, and the public. This coalition of the Partnership has been supporting neighborhood planning for more connected, livable, and sustainable communities around more than 74 high capacity transit centers in the region—including existing, new, and future station areas.

Through these efforts, the Partnership has been working to shape the region and station areas in ways that benefit current and future residents, local businesses, and the wider region. Working within the framework of existing plans, policies, and goals of local governments and guided by VISION 2040, the Partnership has been helping local communities bring their visions to reality and to make the most of new light rail service, bus rapid transit, and other...
transit investments, including identifying unique roles and opportunities for community development associated with high-capacity transit investments. For more information about the Growing Transit Communities Partnership and PSRC, visit: http://www.psrc.org.

THREE CORRIDORS/THREE TASK FORCES
Planning activities of the Partnership have focused along the three light rail corridors from Seattle north to the city of Everett, south to Tacoma, and east to the city of Redmond. Based on the premise that change can happen at the local level through tools and solutions that address similar challenges shared by communities in the region, the Partnership has provided a big-picture perspective so that people can see both local and regional benefits, and local entities can apply lessons learned in other places in the region. Corridor task forces for the North, East, and South corridors were charged with analyzing and reviewing existing conditions and identifying unique opportunities and challenges for development of existing and future transit station areas.

In development of its work plan and specific assignments for each task force, the Partnership felt that it was important to focus implementation activities in specific station areas of the region’s transit corridors to serve as models for other parts of the region. In the case of the East Corridor, the intention was to work with the East Corridor Task Force to identify what catalyst project, or projects, were most appropriate. This evolved into the defined scope of work for the East Corridor Implementation Support Project.

EAST CORRIDOR CONTEXT
In 2011, the Sound Transit Board of Directors made its final decision about the East Link light rail transit (LRT) corridor alignment and station locations. Also in 2011, King County Metro began operation of its Bus Rapid Transit service (BRT) RapidRide line B. In order to help areas around LRT and BRT stations transform into more transit-oriented communities, the four cities participating in the East Corridor Task Force (Seattle, Mercer Island, Bellevue, and Redmond) and other Task Force members were interested in developing focused implementation strategies and tools for specific East Corridor station areas. Seattle and Mercer Island had already completed extensive planning for the station areas in their jurisdictions, so the Task Force decided to focus on stations in Bellevue and Redmond.

Staff from the cities of Bellevue and Redmond indicated that the station areas in the Bel-Red Corridor and Overlake were in most need of implementation support. Given these considerations, the Task Force determined that the East Corridor Implementation Support Project should focus on the following subset of East Corridor station areas in the cities of Bellevue and Redmond, along East Link and King County Metro’s RapidRide Route B stations.

**East Link Light Rail Station Areas (Future) Selected for the East Corridor Implementation Support Project:**
- Hospital Station Area in Bellevue
- 120th Avenue NE/Spring Creek Station Area in Bellevue
- 130th Avenue NE Station Area in Bellevue
- Overlake Village Station Area in Redmond
- Overlake Transit Center Station Area in Redmond

**King County METRO RapidRide B Line Station areas (Existing) Selected for the East Corridor Implementation Support Project:**
- Located in Bellevue’s Crossroads Neighborhood:
  - NE 10th Street Station Area
  - NE 15th Street Station Area

The Partnership funded and guided the East Corridor Implementation Support Project to examine opportunities for TOD along Sound Transit’s East Link Light Rail and King County Metro RapidRide Line B alignments through the Eastside cities of Bellevue and Redmond in these station areas initially as part of Phase 1 of the project, and then to provide more focused analysis and strategies for selected station areas as part of Phase 2. Portions of the project area are located within the areas known as the Bel-Red Corridor and Overlake.
FOUR FOCUS AREAS FOR EAST CORRIDOR IMPLEMENTATION ACTIVITIES

Through a series of meetings, the East Corridor Task Force examined key issues and identified barriers to transit-oriented development in the East Corridor, along with particular challenges to implementing equitable TOD in station areas. In its discussion of how to incent and accommodate equitable transit-oriented development in station areas, the Task Force determined four areas of focus for the East Corridor Implementation Support project. The Task Force identified the need for detailed strategies and action steps to implement existing local plans, particularly in the areas of:

- Affordable Housing
- Business Retention and Attraction
- Public and Private Partnerships
- Transportation Access and Connectivity

EAST CORRIDOR PROJECT PURPOSE AND OVERVIEW

The East Corridor Implementation Support project has identified pivotal opportunities to transform Eastside station areas into more vibrant, economically healthy neighborhoods that offer equitable housing choices, more convenient access to jobs and jobs-to-housing balance within the high-capacity transit corridors and region, and better connectivity to goods and services.

The project is supporting immediate advancement of the implementation of visions and plans that have already been developed by participating jurisdictions on the Eastside, and the project team has leveraged other products developed by PSRC and the Growing Transit Communities Partnership, including affordable housing and opportunity mapping, existing conditions reports, market analyses, station area typologies, Center for Transit-Oriented Development (CTOD) market strength index, and other information as a base of reference for the project.

IMPLEMENTATION SUPPORT PROJECT GUIDANCE AND TIMELINE

All phases of the East Corridor Implementation Support Project have been informed by representatives of the East Corridor Task Force. The Task Force identified a subset of members, called the Project Management Team (PMT), to advance the project and bring back matters to the Task Force for direction and decisions. PMT members were selected from the general membership of the Task Force (including representatives from the cities of Bellevue and Redmond) and confirmed by the Task Force co-chairs. See the Acknowledgements page for PMT members.

Growing Transit Communities staff and the PMT members of the Task Force retained a consultant team with expertise in affordable housing, urban design, transportation planning and policy, real estate and economic development, and other areas to assist in identifying actions and strategies to address these issues and help to catalyze TOD.

OVERVIEW OF PHASES 1 AND 2

The scope of work for the East Corridor Implementation Support Project was completed in two phases. Phase 1 included best practices research, a high level assessment of seven East Corridor station areas, screening and selection of station areas for further analysis in Phase 2, and development of the scope of work for Phase 2. See the Phase 1 Best Practices Research Report for a detailed description of initial tasks:

http://www.psrc.org/about/pubs

Phase 2 involved more intensive analysis and development of specific recommendations for TOD implementation for two station areas: 130th Avenue NE in Bellevue and Overlake Village in Redmond. Phase 2 explored innovative approaches to leverage opportunities and incent TOD implementation in the short- and long-term in these station areas. Phase 2 developed recommended actions, strategies, and products to address specific issues in each station area per the scope of work that was developed by the Task Force and overseen by the PMT.
PHASE 2 PRODUCTS

Products developed in Phase 2 supporting these four focus areas are listed in the chart below.

<table>
<thead>
<tr>
<th>housing, development, and infrastructure funding</th>
<th>Affordable Housing</th>
<th>Business Retention and Attraction</th>
<th>Partnerships</th>
<th>Transportation Access and Connectivity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Analysis and Recommendations</strong></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

| vibrant urban neighborhoods                  | ✓                 | ✓                              | ✓           | ✓                                   |
| Creating Transit-Oriented Communities for All Ages |                |                                |             |                                     |

| business retention and attraction            | ✓                 | ✓                              | ✓           | ✓                                   |
| Analysis and Recommendations                 |                |                                |             |                                     |

| overlake village district energy concepts and ecodistrict applicability | ✓ | ✓ | ✓ | ✓ |
| Potential District Energy Value Proposition and Implementation Recommendations | | | | |

| 130th avenue NE transit-oriented development | ✓ | ✓ | ✓ | ✓ |
| Opportunity Study and Financial Assessment | | | | |

| benefits of green transit-oriented development | ✓ | ✓ | ✓ | ✓ |
| Summary of Best Practices and Green Building Standards | | | | |

| stakeholder involvement and outreach         | ✓ | ✓ | ✓ | ✓ |
| Summary of Project Outreach Activities and Recommendations for Ongoing Engagement | | | | |

| transit integration and parking management   | ✓ | ✓ | ✓ | ✓ |
| Analysis and Recommendations                  | | | | |

| bicycle and pedestrian connectivity          | ✓ | ✓ | ✓ | ✓ |
| Analysis and Recommendations                  | | | | |

These products have been completed as stand-alone, complementary documents and reports. All reports are available for download at [http://www.psrc.org/about/pubs](http://www.psrc.org/about/pubs) (look for Growing Transit Communities Partnership, East Corridor information).
PARTNERSHIP FOR SUSTAINABLE COMMUNITIES LIVABILITY PRINCIPLES

The Growing Transit Communities Partnership supports the livability principles of the Partnership for Sustainable Communities. The US Department of Housing and Urban Development (HUD), US Department of Transportation (DOT), and the US Environmental Protection Agency (EPA) have joined together to help communities nationwide improve access to affordable housing, increase transportation options, and lower transportation costs while protecting the environment through the Partnership for Sustainable Communities. The Partnership for Sustainable Communities works to coordinate federal housing, transportation, water, and other infrastructure investments to make neighborhoods more prosperous, allow people to live closer to jobs, save households time and money, and reduce pollution. The Partnership agencies incorporate the following six principles of livability into federal funding programs, policies, and future legislative proposals.

Provide more transportation choices—Develop safe, reliable, and economical transportation choices to decrease household transportation costs, reduce our nation’s dependence on foreign oil, improve air quality, reduce greenhouse gas emissions, and promote public health.

Promote equitable, affordable housing—Expand location- and energy-efficient housing choices for people of all ages, incomes, races, and ethnicities to increase mobility and lower the combined cost of housing and transportation.

Enhance economic competitiveness—Improve economic competitiveness through reliable and timely access to employment centers, educational opportunities, services, and other basic needs by workers, as well as expanded business access to markets.

Support existing communities—Target federal funding toward existing communities—through strategies like transit-oriented, mixed use development and land recycling—to increase community revitalization and the efficiency of public works investments and to safeguard rural landscapes.

Coordinate and leverage federal policies and investment—Align federal policies and funding to remove barriers to collaboration, leverage funding, and increase the accountability and effectiveness of all levels of government to plan for future growth, including making smart energy choices such as locally generated renewable energy.

Value communities and neighborhoods—Enhance the unique characteristics of all communities by investing in healthy, safe, and walkable neighborhoods—rural, urban, or suburban.
The Focus of this Phase 2 Report: Overlake Village District Energy Concepts and EcoDistrict Applicability

This Phase 2 report of the East Corridor Implementation Support Project provides an evaluation of the potential district energy value proposition and implementation recommendations for district energy in Overlake Village. This report also includes an assessment of EcoDistrict applicability to Overlake Village and potentially other station areas in the region.

Thomas Puttman of Puttman Infrastructure, Inc. was the principal analyst and author for the District Energy Concepts evaluation, and Otak prepared the EcoDistrict applicability content based information from the non-profit EcoDistricts organization in Portland, Oregon.

The information developed as part of this work, supported by the Growing Transit Communities Partnership, can serve as a model and reference to other transit-oriented development studies for station areas throughout the region.

BACKGROUND AND INTRODUCTION
As part of the East Corridor Implementation Support project for the Growing Transit Communities Partnership, an evaluation of the potential for implementing district energy in the Overlake Village station area was conducted by Thomas Puttman of Puttman Infrastructure. District energy is viewed as a potential opportunity to create a market advantage for new development in Overlake Village, and as such, could become a catalyst for urbanizing the neighborhood as envisioned in the adopted neighborhood plan. Implementing green transit oriented development, including district energy as part of the mix, creates multiple social, environmental and economic (people, planet, prosperity) benefits. These benefits are further summarized in the report, Benefits of Green Transit-Oriented Development and Summary of Green Building Standards, another Phase 2 report of the East Corridor Implementation Support Project. http://www.psrc.org/about/pubs

Focusing on Overlake Village, this preliminary evaluation has been organized under the following primary topics:

1. Potential District Energy Value Proposition
2. District Energy Implementation Recommendations

The findings and recommendations of this evaluation should be considered preliminary in nature. Additional evaluation should be conducted to further validate these findings and recommendations. (See District Energy Implementation Recommendations for next steps.)

WHAT IS DISTRICT ENERGY?
District energy systems produce steam, hot water or chilled water at a central plant. The steam, hot water or chilled water is then piped underground to individual buildings for space heating, domestic hot water heating and air conditioning. As a result, individual buildings served by a district energy system don’t need their own boilers or furnaces, chillers or air conditioners. The district energy system does that work for them, providing valuable benefits, such as:

- Improved energy efficiency
- Enhanced environmental protection
- Fuel flexibility
- Ease of operation and maintenance
- Reliability
- Comfort and convenience for customers
- Decreased life-cycle costs
- Decreased building capital costs
- Improved architectural design flexibility

Source: adapted from information on the EcoDistricts organization website
Objective of This District Energy Evaluation

The objective of the preliminary evaluation presented in this report was to explore the value proposition of developing a district energy system for Overlake Village. This report is a companion document to the Overlake Village District Energy Concepts digital presentation developed by Puttman Infrastructure, Inc. (see Appendix).

Potential District Energy Value Proposition

Overlake Village Overview and Development Assumptions

Located in the City of Redmond, Washington, Overlake Village is the mixed-use heart of the Overlake urban center as identified in the Overlake Master Plan and Implementation Strategy (City of Redmond, 2007). At 175-acres the district is bounded by SR-520 to the north, 156th Avenue NE to the east, NE 20th Street to the south, and 148th Avenue NE to the west. Projected 2030 development assumptions for Overlake Village, based on transportation analysis zones overlapping Overlake Village, were provided by the City of Redmond. The figures on this page illustrate the future vision of Overlake Village at full build-out.
2030 Development Assumptions

<table>
<thead>
<tr>
<th>Land Use</th>
<th>Area</th>
<th>Units</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Office</td>
<td>1,610,224</td>
<td></td>
<td>22%</td>
</tr>
<tr>
<td>Retail</td>
<td>1,113,369</td>
<td></td>
<td>15%</td>
</tr>
<tr>
<td>Institutional</td>
<td>7,163</td>
<td></td>
<td>&lt; 1%</td>
</tr>
<tr>
<td>Hotel</td>
<td>99,812</td>
<td></td>
<td>&gt; 1%</td>
</tr>
<tr>
<td>Residential (multi-family)</td>
<td>4,364,500</td>
<td>4,988</td>
<td>61%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>7,196,068</strong></td>
<td><strong>4,988</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

Source: City of Redmond

Development assumptions, based on information from the City of Redmond are summarized in the chart above. All projected development within the district is assumed to be new development. It should be noted that development assumptions did not include current development specific plans for the Group Health/Capstone site located in the NE corner of the district. The reason this area was excluded is that it was thought development plans may be too far along to begin to integrate district energy at that site or to bring the site into the fold of a larger district. However, if that assumption were to change, it is anticipated that integration of the Group Health/Capstone site would result in the same potential value proposition as the rest of area covered in this analysis. All development assumptions were based on full build out per the assumptions noted above. A deeper assessment of the future development potential for Overlake...
Village should be conducted as district energy feasibility efforts progress.

**OVERLAKE VILLAGE ENERGY USE, COST, AND CARBON ESTIMATES**

For each land use type identified in the development assumptions above, energy use intensity factors (EUIs) were established to estimate annual energy consumption. As Overlake Village is envisioned to be a green development, EUIs typical of green building in the central Puget Sound region were utilized. As a result, future annual energy use for Overlake Village was estimated as follows:

- **Office**: 104,665 MMBtu/year (27%)
- **Retail**: 53,442 MMBtu/year (14%)
- **Institutional**: 401 MMBtu/year (<1%)
- **Hotel**: 6,787 MMBtu/year (2%)
- **Residential**: 218,225 MMBtu/year (57%)

**Total**: 383,520 MMBtu/year (100%)

*Source: City of Redmond*

Multi-family residential and office will generate the majority of energy use within Overlake Village at almost 84% of the energy use estimated because they make up over 80% of the development assumed for the district.

Further assessing energy use for each land use type allows thermal and non-thermal energy uses to be identified. Thermal uses include building heating and cooling while non-thermal energy use includes elements such as lighting, air movement, and plug loads. As a result, thermal energy use for Overlake Village was estimated at 49% of the total energy use for the district and non-thermal was estimated at 51%. Further refinement of energy use allows estimated thermal energy use to be distributed into energy used for building heating (92%) and energy used for building cooling (8%). As a result, building heating and cooling energy use, cost, and carbon emissions were estimated as follows.

**Future Estimated Annual Heating Energy Summary**
- **Energy Use**: 1,454,988 therms
- **Cost**: $480,146
- **Carbon**: 9,748 tCO2

**Future Estimated Annual Cooling Energy Summary**
- **Energy Use**: 3,817,695 kWh
- **Cost**: $343,593
- **Carbon**: 1,985 tCO2

Overall, annual energy use for building heating and cooling is estimated at over 145,000 MMBtu/year with a cost of approximately $823,000/year and carbon emissions of 11,734 tCO2/year. This summary will be considered the “business-as-usual” (BAU) scenario as it represents the performance and cost of conventional building with in-building heating and cooling systems. Please note that all cost estimates are represented in 2013 dollars.

**DISTRICT ENERGY OVERVIEW**

District energy is a highly efficient solution to produce and distribute thermal energy at a local scale. Not only are transmission losses reduced from conventional centralized utilities but opportunities for recovered thermal load are also realized as well as the potential for future fuel switching to further reduce carbon emissions. As a result, district energy systems allow for enhanced energy efficiency, reduced cost and reduce carbon emissions at a district scale when compared to conventional in-building heating and cooling systems.

Traditional district energy systems are comprised of a central plant to generate heating and cooling energy typically with natural gas boilers (heating) and electric chillers (cooling), a distribution network to supply heating (2-pipes) and cooling (2-pipes) energy to buildings throughout the district, and energy transfer stations at each building to provide heating and cooling thermal energy to building systems as shown in the diagram below.
Although more common in Scandinavian and other northern European countries, district energy is not new in the United States. Currently, there are over 700 district energy systems in the United States today. District energy has been increasingly viewed by environmentally and fiscally progressive communities in North America as a more effective energy solution – from a performance, cost and carbon reduction perspective – than conventional in-building heating and cooling systems. Advances in more sustainable city development, most notably catalyzed by the EcoDistrict concept, focuses the need for district infrastructure systems like district energy to further accelerate sustainability in the built environment. (See more about EcoDistrict potential later in this report.)

District Energy systems similar in nature to what would be considered for Overlake Village include South False Creek (Vancouver, BC), Dockside Green (Victoria, BC), Regent Park (Toronto, ON), The Brewery Blocks (Portland, OR), and The Round (Beaverton, OR). New district energy systems are being implemented in Los Angeles, San Francisco, Eugene, Portland, Seattle, and Bellingham just on the west coast alone. Some examples of these projects are provided in the digital presentation in the Appendix.

DISTRICT ENERGY OPTIONS FOR OVERLAKE VILLAGE

From an energy efficiency, cost and carbon emissions perspective, would district energy make sense in Overlake Village? To answer this question, two conceptual district energy options were established as follows:

Option A—District Energy

District Energy Option A includes a central plant located in the middle of the district to simplify distribution network piping. The central plant is assumed to be located within a building to avoid the need for a stand-alone central plant building that would not fit with the desired urban village vision of Overlake. The central plant would include a natural gas boiler(s) and electric chiller(s) to produce heating and cooling energy for all the buildings in the district.

Based on other systems of similar scale to Overlake Village, the footprint of the central plant would likely be around 20,000-30,000 SF. Distribution piping for heating (2-pipe) and cooling (2-pipe) has also been identified.

Option B—District Energy with Geothermal

The efficiency of Option A could be further enhanced with the addition of a ground-source geothermal system to reduce the natural gas and electricity requirements to produce the same amount of heating and cooling energy. District Energy Option B builds on the same central plant and distribution network identified in Option A but includes an open-loop geothermal system. An open loop geothermal system utilizes constant temperature groundwater as a thermal supply input to the central plant. The open loop system would likely include one production well and two reinjection wells.

Open Loop vs. Closed Loop Geothermal Options

Both open loop and closed loop geothermal options were considered; however, due to the intensity of development anticipated for Overlake Village a closed loop system, which requires much greater open space than what is available in Overlake, is not likely feasible at a scale that would significantly benefit the district energy system.
Open loop is not without its regulatory and technical challenges however. Further evaluation from a regulatory and technical perspective should be conducted to further assess the viability of open-loop geothermal for Overlake Village.

Puttman Infrastructure’s proprietary AIM Model (Assess to Invest) was utilized to analyze the performance of each district energy option allowing each option to be compared to each other based on City of Redmond defined criteria including energy use, energy cost and carbon emissions. Moreover, AIM allows proposed district energy options to be compared to the BAU option (i.e., in-building heating and cooling systems). The results from the preliminary AIM Model evaluation are summarized and illustrated on the next page.

**Heating and Cooling Energy Use**
- **BAU:** 145,499 MMBtu/year
- **DE Option A:** 126,521 MMBtu/year
- **DE Option B:** 101,217 MMBtu/year

**Heating and Cooling Energy Cost**
- **BAU:** $823,738/year
- **DE Option A:** $700,178/year
- **DE Option B:** $350,089/year

**Heating and Cooling Energy Carbon Emissions**
- **BAU:** 11,734 tCO2/year
- **DE Option A:** 9,974 tCO2/year
- **DE Option B:** 7,040 tCO2/year

From an energy efficiency, cost of energy, and carbon emissions perspective, implementing district energy in Overlake Village appears to have clear benefits as compared to conventional development with in-building heating and cooling systems. Energy used for heating and cooling was estimated at approximately 10-30% less than BAU. Heating and cooling related energy costs were estimated at 10-50% less than BAU. Carbon emissions associated with heating and cooling energy production were estimated at 15-40% less than BAU. These results are depicted graphically in the chart below.

**Source:** Puttman Infrastructure

- District energy system reduces overall energy demand, energy cost and carbon emissions within Overlake Village.
- Moreover, district energy allows opportunity for fuel switching and more efficient technology to further improve efficiency and reduce carbon emissions.
Heating Dominated Energy Use

With 92% of thermal energy use associated with heating, Overlake Village would be considered a heating dominated district creating good opportunity for a district heating system to supply heat to building within the district cost effectively. For a cooling perspective, at only 8% of thermal energy use, Overlake Village likely lacks the cooling load to justify a district cooling system. Redmond could consider a heating only district energy system.

District Energy Implementation Recommendations

Clearly, the value proposition for implementing district energy in Overlake Village is positive. But how are district energy systems developed? What are the next steps the City of Redmond should take to catalyze district energy in Overlake Village? Potential answers to these questions are explored below.

DISTRICT ENERGY DEVELOPMENT MODELS

There are four development models under which district energy is implemented. In the case of Overlake Village, the public development model assumes the City of Redmond would finance, develop and operate the district energy system. Under the private development model, the City of Redmond would engage with a third party, district energy provider to finance, develop and operate the district energy system. A public private partnership development model would be used to leverage the expertise of a third party district energy provider with the low cost financing, public engagement, and policy development capacity of the City of Redmond to finance, develop and operate a district energy system. A cooperative development model would require Overlake Village property developers and owners to come together, typically creating a new non-profit company, to finance, develop and operate a district energy system. Each model is summarized below.

Public Development Model
Ownership: Public
Funding: Public
Design/Build/Permit: Public
Operations: Public
Customer Relationships: Public

Private Development Model
Ownership: Private
Funding: Private
Design/Build/Permit: Private
Operations: Private
Customer Relationships: Private

Public Private Partnership Development Model
Ownership: Public/Private
Funding: Public/Private
Design/Build/Permit: Private
Operations: Private
Customer Relationships: Private

Cooperative Development Model
Ownership: Property Owners via Non-Profit Company
Funding: Property Owners via Non-Profit Company
Design/Build/Permit: Property Owners via Non-Profit Company
Operations: Property Owners via Non-Profit Company
Customer Relationships: Property Owners via Non-Profit Company

Recent district energy development efforts in Portland, Oregon and Seattle, Washington initially began as private development models where the city engaged with a third party district energy provider through a competitive, public procurement process. However, based on the results of these initial efforts, it became evident that the third party district energy providers needed some type of partnership with cities – either financially or policy wise – to ensure commercial viability for the district energy system. As a result of these recent efforts, it is recommended that the City of Redmond pursue a public private partnership (P3) development model to implement district energy in Overlake Village.
A P3 development model for district energy in Overlake Village would require the City of Redmond to engage with an experienced third party district energy provider (DE Provider). The terms of the P3 would likely include the following.

**Overlake Village DE P3 Development Model (Example)**

**Ownership:** City/DE Provider

**Funding:**
- Central Plant: DE Provider
- Distribution Network: City

**Design/Build/Permit:**
- Design/Build/Permit: DE Provider

**Policy Support:** DE Provider

**City Operations:** DE Provider

**Customer Relationships:** DE Provider

The City and DE Provider would jointly own the district energy system. Each partner would be responsible for financing specific components of the system consistent with financial return needs and risk profiles. This would likely result in the City financing the distribution piping network – to be constructed with public street improvements – and the DE Provider financing the central plant – based on the timing of heating and cooling energy growth within the district.

The DE Provider, utilizing their expertise and experience, would design/build/permit the system as well as operate and manage customer relationships. The City would support system development through the creation of support policies such as mandatory connection requirements for each building developed in the district to connect to the district energy system. Revenue generated from the district energy systems would be shared by the City and DE Provider based on the capital and risk invested into the system.

**Other Partner/Stakeholder Engagement**

In addition to the P3 development model recommended above, it will also be important to engage with key stakeholders early in the district energy system development process to ensure support. These stakeholders include:

- **Property Developers/Owners**—Early in the process, property developers and owners should be engaged with to ensure system acceptance. Particularly outreach should be made to Microsoft as its adjacent campus and employees are such a significant presence in Overlake Village.

- **PSE (Electricity and Natural Gas)**—Puget Sound Energy should be engaged early to help shape system development, including potential incentives and other forms of support.

- **Regulators (Washington UTC)**—The Washington Utility and Transportation Commission (UTC) should be engaged early as well to understand permitting requirements including specific requirements of the UTC related to developing district energy systems under a P3 development model.

- **Local NGOs**—Local non-profits should be engaged to foster support for the district energy system as a means to accelerate sustainability nationally and in the Puget Sound region and Redmond.
DISTRICT ENERGY IMPLEMENTATION

Development will drive district energy implementation in Overlake Village. In Washington state, cities are not generally allowed to operate as energy utilities in competition with existing regulated utilities such as Puget Sound Energy and others. This analysis assumes that a private, third party would develop, own, finance, and operate the system. The following steps should be considered to ensure district energy is ready to meet the energy demands of future development when it comes.

1. District Energy Feasibility Evaluation (Consultant Cost = $200,000, Staff Cost TBD, Timeframe = 9-12 months)

   A detailed district energy feasibility evaluation should be conducted to refine the value proposition for district energy in Overlake Village including:
   - Energy, cost and carbon savings.
   - DE system options (including technologies and distribution networks)
   - Detailed cost estimate
   - Cost of energy service comparison (BAU vs. DE with various options)
   - DE utility development model refinement including roles and responsibilities for public and private partners.
   - Identification of key “enabling strategies” to ensure DE system development (i.e., mandatory connection policies).

2. Preliminary Go/No Go Decision (Consultant Cost = $0, Staff Cost TBD, Timeframe = 2 months)

   Based on the findings of the feasibility evaluation, City Council makes a go/no go decision to engage with a third party district energy provider and makes preliminary commitment of capital for distribution network piping.

3. Third Party District Energy Provider Selection (Consultant Cost = $0, Staff Cost TBD, Timeframe = 2-3 months)

The City of Redmond would develop and issue an RFQ to select a third party DE provider. Based on experience with other cities, this effort will probably take about 2-3 months to develop the RFQ including internal review and approval, issue the RFQ, review responses and make a selection (with or without interviews). As part of this step, the City would need to conduct a legal review of requirements related to utility operation in Washington state to determine conditions to be specified in the RFQ. Legal analysis to confirm operating parameters also would be needed as part of the steps below.

4. District Energy Evaluation Refinement and Initial Agreements (Consultant Cost = $0, Staff Cost TBD, Timeframe = 6 months)

   Once the DE Provider is selected, an initial MOU will be established between the City and DE Provider to outline requirements for further evaluation including go/no go decision criteria. Refinement efforts will focus on commercial viability (i.e., cost of service acceptable to building owners, investment requirements acceptable to City and DE Provider).

5. Final Go/No Decision (Consultant Cost = $0, Staff Cost TBD, Timeframe = 2 months)

   Based on the go/no go criteria identified in Step 4, City and DE Provider to make go/no go decision.

6. District Energy Development (Consultant Cost = TBD, Staff Cost TBD, Timeframe = 18 months)

   DE Provider to design, permit and build district energy system.

7. District Energy Operations (Cost = TBD, Time = Ongoing)

   DE provider to operate district energy system.

Overall, development of district energy based on the preliminary implementation schedule identified above should take around three (3) years.
EcoDistrict Development Potential

According to the EcoDistricts organization based in Portland, Oregon (formerly the Portland Sustainability Institute), more people live in cities than ever before, and development of EcoDistricts provides the opportunity to address several pressing challenges as our world urbanizes. (See What is an EcoDistrict? box on the next page.)

A SHARED VISION

EcoDistricts represent a shared vision for creating sustainable cities from the neighborhood scale up centered on the following values.

- Neighborhoods are building blocks of sustainable cities.
- Everyone deserves to live in a healthy, safe, connected, and vibrant neighborhood.
- Economic opportunity, community well-being, and ecological health are fundamental ingredients for sustainable neighborhoods and cities.
- Neighborhood sustainability requires a new model for action—rooted in collaboration and inclusion—to co-create innovative district-scale projects.
- Organization—the EcoDistricts board and staff—is committed to meeting the mission and reflecting the diversity of the clients and communities served.
The EcoDistricts Framework is a practical tool created by the EcoDistricts organization to guide innovative district-scale sustainable development projects from concept through implementation. It is specifically designed to help cities and urban development practitioners team up to be more successful, with an emphasis on process management, integrated project delivery and community collaboration. The Framework guides and supports implementation across a diverse range of projects, from large-scale brownfield redevelopments to low-income neighborhood revitalization. The EcoDistricts Framework document, May 2013, can be downloaded at: http://ecodistricts.org/tools/framework/

Some common components and projects typical of EcoDistricts are listed in the blue box on the right. EcoDistricts should include as many of these components and project types as possible, and in the case of the East Corridor, transit-oriented neighborhoods being planned in Overlake Village and the Bel-Red corridor, many of these are already being implemented.

APPLICABILITY TO OVERLAKE VILLAGE AND OTHER STATION AREAS

Overlake Village and the Bel-Red Corridor, including the 130th Avenue NE and 120th Avenue NE station areas represent potential opportunities for EcoDistrict implementation because wide-scale district redevelopment to create vibrant urban neighborhoods is envisioned in these areas. Additionally, the City of Redmond’s adopted plan and code provisions for Overlake Village and the City of Bellevue’s adopted plan and code provisions for the Bel-Red already call for many of the components recognized as eco-friendly and relevant to EcoDistricts. In these proposed new districts, some of these components that are considered to be EcoDistrict relevant are required by the cities of new development, while others are voluntary. For example, district energy implementation is one of these key components, but district energy is not required by code. While there is not a specific formula of requirements for EcoDistrict designation and there appears to be some flexibility in how EcoDistricts are recognized, every effort should be made to achieve net zero energy efficiency—as one goal of the program.

Ecobenefit Projects

Ecobenefit projects can take many forms, depending on the unique characteristics of a neighborhood and a community’s priorities. Examples of potential projects include:

- Smart grid
- District energy and water management
- Bike sharing
- Rainwater harvesting
- Green streets
- Zero waste programs
- District composting
- Waste to energy
- Safe routes to schools
- Tree planting campaigns
- Transportation demand management
- Car sharing
- Bike lanes
- Sidewalk improvements
- Urban agriculture
- Public art
- Green Maps
- Multi-modal transit

Source: Adapted from the EcoDistricts Framework
An immediate priority in pursuing formal EcoDistrict designation for either Overlake Village or the 130th Avenue NE station area (or the Bel-Red corridor as a whole) would be to coordinate with the EcoDistricts organization or other guiding entities to confirm how districts can be formed, the advantages of designation, and the implications on potential redevelopment.

According to the EcoDistricts organization, urban development leaders from mayors to universities to affordable housing providers see EcoDistricts as a powerful way to address many of the pressing challenges faced in today's world such as climate change, neighborhood degradation, the need to improved health and expanded transportation choices in our communities, and the importance of offering a high quality of life in our cities.

According to implementation guidance provided by the EcoDistricts organization, in order to facilitate policy-making at the leadership level in both the Overlake Village and 130th Avenue NE station areas (as well as other station areas), it will be important to clearly explain the economic, environmental, and social benefits achieved through EcoDistrict designation and how these benefits apply to the private sector as well as local governments. As such, it is highly recommended that if either city is interested in moving forward toward EcoDistrict formation, the first step would be a full study of implementation feasibility that would quantify the full-scale benefits, similarly to how this report has quantified the value proposition for implementing district energy in Overlake Village.

The EcoDistricts organization brings together innovative practitioners and policy makers, providing a clearinghouse of information and resources to support EcoDistrict implementation regionally, nationally, and internationally. The organization sponsors an EcoDistrict Summit each year as a key outreach activity. Refer to Ecodistricts.org for additional information.

MARKET DIFFERENTIATOR

One of the key benefits of implementing EcoDistricts is the potential to create a market advantage. According to recent studies, more home buyers and renters are interested in living in walkable, environmentally-friendly urban neighborhoods and in homes where long-term energy and life-cycle costs are lower. (Refer to the report, Benefits of Green Transit-Oriented Development and Summary of Green Building Practices, another East Corridor Implementation Support Project Phase 2 report, for more information about recent research and studies on the growing market demand for sustainable homes and neighborhoods. To review and download this and other Phase 2 reports go to: http://www.psrc.org/about/pubs and look for Growing Transit Communities Partnership, East Corridor information.

The graphic on the next page depicts the process of EcoDistrict formation. As shown, important principles of EcoDistrict development include establishing a policy with leadership support; organizing and assessing the district; implementing improvements at the site/buildings, infrastructure, and community programs levels; and then ongoing monitoring of district performance.

A major challenge is obtaining the support and commitment of property owners in a district for implementation. In both the Overlake Village neighborhood and Bel-Red corridor, there are multiple property owners and some who have already moved forward with redevelopment plans for their sites. Most of the basic principles and components of EcoDistrict development already exist within these proposed urban neighborhoods (transit, pedestrian and bicycle facilities, housing choices, green spaces and trees, energy conservation and renewable energy, and other features.) While district energy is not yet specifically proposed, there is the potential for it to be integrated with new development. And although some sites are already redeveloping, perhaps implementation of district energy could include retrofitting these sites to connect them to the system.
The EcoDistricts Approach

Source: The EcoDistricts Framework—Building Blocks of Sustainable Cities
2030 Development Assumptions

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Energy Use Intensity (EUI) = kBTU/sf year

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<td>Bullitt Center</td>
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PUTTMAN INFRASTRUCTURE, INC.

OVERLAKE VILLAGE DISTRICT ENERGY CONCEPT

NOVEMBER 2013
ENERGY DEMAND PROJECTIONS

FINDINGS

• Total annual energy demand estimated at 383,520 MMBtu.
• Residential and office make up over 75% of the district.
• Almost 50% of projected energy use is related to thermal energy (ie, heating and cooling).
• Heating dominated district with 92% of thermal demand.
WHY DISTRICT ENERGY?

DISTRICT ENERGY

- District energy is the local production and distribution of thermal energy.
- It is a highly efficient means of providing locally generated thermal energy for heating and cooling homes, commercial and institutional buildings, and industrial processes.
- District energy systems are comprised of two main elements: central plant and distribution network.

WHAT THE FUTURE HOLDS

- More efficient use of resources
- Community-based economic engine
- Safe, secure and reliable energy
- Affordable, high-quality thermal services
- Attractive local environments
- Livable towns and cities
DISTRICT ENERGY SYSTEM

CENTRAL PLANT
Plant Integrated into Building

DISTRIBUTION PIPING

BUILDING CONNECTION
Energy Transfer Station
CENTRAL PLANT EXAMPLES

SOUTH FALSE CREEK
Vancouver, BC

DOCKSIDE GREEN
Victoria, BC

REGENT PARK
Toronto, ON

THE BREWERY BLOCKS
Portland, OR

THE ROUND
Beaverton, OR

Hartford Central School District
Hartford, NY
CENTRAL PLANT EXAMPLES

SOUTH FALSE CREEK
Vancouver, BC

Mixed Use Development
76 acres
CENTRAL PLANT EXAMPLES

REGENT PARK
Toronto, ON

Mixed Use Development
70 acres
DISTRICT SCALE ANALYSIS

CENTRAL PLANT
- Central generation of heating (boilers) and cooling (chillers)
- Boilers to be natural gas fired.
- Chillers to be electric.
- Footprint likely 20,000-30,000 SF.
- Central plant can be integrated into open space or buildings.

DISTRIBUTION SYSTEM
- Traditional four pipe system.
- 2 pipes for heating (supply and return)
- 2 pipes for cooling (supply and return)

CENTRAL PLANT INTEGRATED INTO URBAN FABRIC
The Brewery Blocks (Portland, OR)
DISTRICT SCALE ANALYSIS

CENTRAL PLANT
- Central generation of heating (boilers) and cooling (chillers)
- Boilers to be natural gas fired.
- Chillers to be electric.
- Footprint likely 20,000-30,000 SF (to confirm).
- Central plant can be integrated into open space or buildings.

DISTRIBUTION SYSTEM
- Traditional four pipe system.
- 2 pipes for heating (supply and return)
- 2 pipes for cooling (supply and return)

GEOTHERMAL SYSTEM
- Open loop groundwater source heat pump
- Production well and injection well system.
- Well locations in open space.
GEOTHERMAL OVERVIEW

OPEN LOOP SYSTEMS
Production well and injections well(s). Groundwater withdrawn and re-injected.

CLOSED LOOP SYSTEMS
Multiple "wells" but no groundwater withdrawn.

PROS
• Highly efficient
• Simple system (2-3 wells)
• Less space requirements
• Locate in publically owned property
• Least cost (compared to closed loop)

CONS
• Regulatory requirements (water rights)
• Depth to groundwater (TBD)
• Well cost higher (larger diameter)

PROS
• Efficient
• Less regulatory hurdles

CONS
• More costly
• More complicated system (lots of parts)
• Lots of "wells" (100-1,000s)
• Public space/ROW constraints
BUILDING VS. DISTRICT ENERGY

**FINDINGS**

- District energy system reduces overall energy demand, energy cost and carbon emissions within Overlake Village.
- Moreover, district energy allows opportunity for fuel switching and more efficient technology to further improve efficiency and reduce carbon emissions.
OWNERSHIP & DEVELOPMENT MODELS

PUBLIC
- Ownership = Public
- Funding = Public
- Design/Build & Regulatory = Public
- Operations = Public
- Customer Relationships = Public

PRIVATE
- Ownership = Private
- Funding = Private
- Design/Build & Regulatory = Private
- Operations = Private
- Customer Relationships = Private

PUBLIC PRIVATE PART.
- Ownership = P3
- Funding = P3
- Design/Build & Regulatory = P3
- Operations = P3
- Customer Relationships = P3

COORDERATIVE
- Ownership = Properties
- Funding = Properties
- Design/Build & Regulatory = Properties
- Operations = Properties
- Customer Relationships = Properties

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Solar PV
Groundsource Geothermal
Living Machine Wastewater Treatment and Reuse
DEVELOPMENT PATHWAY

- **CONCEPTS (2 MONTHS)**
- **FEASIBILITY EVALUATION (9-12 MONTHS)**
- **PRELIMINARY GO/NO GO**
  - **DE PROVIDER SELECTION (3 MONTHS)**
  - **EVALUATION REFINEMENT & INITIAL AGREEMENTS (6 MONTHS)**
- **FINAL GO/NO GO**
  - **CONSTRUCTION (18 MONTHS)**
  - **DE SYSTEM OPERATIONAL**

Years:
- 2013
- 2014
- 2015
- 2016
- 2017
THANK YOU