Getting Started
With District Energy
Overview

- Content applies to:
  - Expanding existing DE utility
  - Replacing existing DE utility
  - Creating a new DE utility

- Planning for DE in a growing community

- Strategies to defer capital investment
  - Temporary Energy Centers
  - Pre-packaged ETS

June 20, 2016
Terminology

Energy Transfer Stations (ETS)

District Piping System (DPS)

Energy Center

Source: City of Surrey
• Propose area for DE
  – Define physical boundaries
  – Define targeted service area

• Development Timeline
  – Most critical document used to schedule and design

• List of key drivers
  – Environmental, financial, political, etc.
  – Used in business case and to maintain project focus
Development Timeline

- List all buildings to connect
- Locations of buildings and energy sources
- Connection dates
- Building loads
  - Floor Area, # Units
- Fluid document
- Total demand at final buildout (winter vs summer)

<table>
<thead>
<tr>
<th>Name</th>
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<th>Address</th>
<th>Heated Area</th>
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<tbody>
<tr>
<td>Bldg A</td>
<td>Sep-16</td>
<td>1 Main St</td>
<td>200,000 sqft</td>
</tr>
<tr>
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<td>Oct-16</td>
<td>7 Como Ave</td>
<td>438,000 sqft</td>
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<td>Jan-17</td>
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Changes to the Development Timeline

• Permits
• Developer’s schedule
• Changes in housing market
• Funding availability for larger DE conversion projects (phased approach)
Development Timeline Map

DE Development Timeline

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• Identify all buildings to connect in order
• Locate permanent energy center
• Map optimal DPS routing at full build-out
• Identify looping opportunities for redundancy
Several iterations are required to find ideal routing

Consider:
- Congested utility corridors
- Accessibility for O&M
- Expensive hard/soft landscape to replace
- Future development
- Changes in roadways
- Utility right of Ways
- Proximity to energy source(s)
- Valve plan
- Minimize pipe length and size
- Looping for redundancy in case of repair or expansion
Estimating Final Total District Load

Too High
• Oversize DPS and Energy Centre
• Increase capital cost for larger pipe
• Increase O&M cost
  – Pumping larger volume, larger materials

Too Low
• Limits total connections
• Risk of under-sizing energy center
• Risk of reinstalling DPS or installing duplicate lines

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Deferring Capital Investment

- Identify groups for early energization
Deferring Capital Investment

- Temporary Energy Centers (TECs) with micro-grids can defer large upfront capital investment
Deferring Capital Investment

- Temporary Energy Centers (TECs) with micro-grids can defer large up front capital investment
- Reduce the DPS required to get started
- Quick start
- Defer construction of main plant
Temporary Energy Centers

- Pre-designed
- Pre-packaged, assembled off site
- Mobile: Containerized or Skid-mounted
- Inputs: Natural Gas, Propane, Diesel, Steam
- Outputs: Hot Water or Steam
Skid-mounted TECs / Custom Enclosures
Containerized TECs

- Over 8.2 MW in a 54’ container
- Over 6 MW in a 40’ container
- Design-built in 8 months
Temporary Energy Centers

- TECs are ideal for:
  - Deferring capital investment on permanent energy center
  - Deferring capital investment on underground piping
  - Quick implementation / lean construction
  - Starting construction before completing full build-out plan
  - Variable development plans
  - Spread out early connections
  - Hard to access locations
  - Green field applications
TECs in Challenging Locations

- Forests and parks
- Tight spaces
- Temporary locations
- Barren lands
TECs in Challenging Locations

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**Without TECs**

- Earlier detailed design costs for permanent plant
- Earlier construction start for permanent plant
- Higher startup project costs
- Delay on return on investment
- Risk front-end loaded
- Cannot energize any buildings until plant complete
- Miss some early connection opportunities
- Aged equipment and expired warranty before full build-out
- Commissioning challenges
- Large boilers cannot turn-down enough for small load
Permanent Plant vs. TEC

With TECs
- Minimize DPS at start
- Energy 6-8 months from approval
- Fixed cost: reduced risk of changes
- Construction off-site (tandem with permitting, etc.)
- Remain flexible with design of plant and DPS
- Smaller footprint
- Unmanned and controlled remotely
- Allows for project phasing
- Repurpose boilers into permanent plant
- Smoother commissioning of permanent plant
Changes to Development Timeline

- Reduce initial commitments
- Plan for changes
  - Buildings relocate
  - Re-sequence
  - Different size/loads
  - Delay / cancel
  - Buildings added
  - Change energy center location
• Community Members
  – Proven Technology
  – Utility gains presence in community

• Funding Authorities
  – Proven business case in phases
  – Proven schedules
  – Proven technology
Energy Transfer Stations (ETS)

• Pre-engineered / pre-packaged
• Known stats (size, weight, performance)
• Single warranty
• Customizable
Energy Transfer Stations

- Reduce construction management costs
- Reduces engineering costs
- Defer capital investment
- Reduce time on site
- Load-bearing frame
• Plan for the future. Build for the present.

• Make a Development Timeline Map for the long-term plan
• Prove project success with smaller phases (micro-grids)
• Plan for change

• Pre-packaged TECs and ETSs
  – Defer early large investments
  – Allow for variable development plans
  – Reduce engineering costs
  – Reduce construction on site
  – Smoother commissioning
  – Streamlined operations