Keeping the Athletes Warm with Sewer Heat: How did the System Perform?

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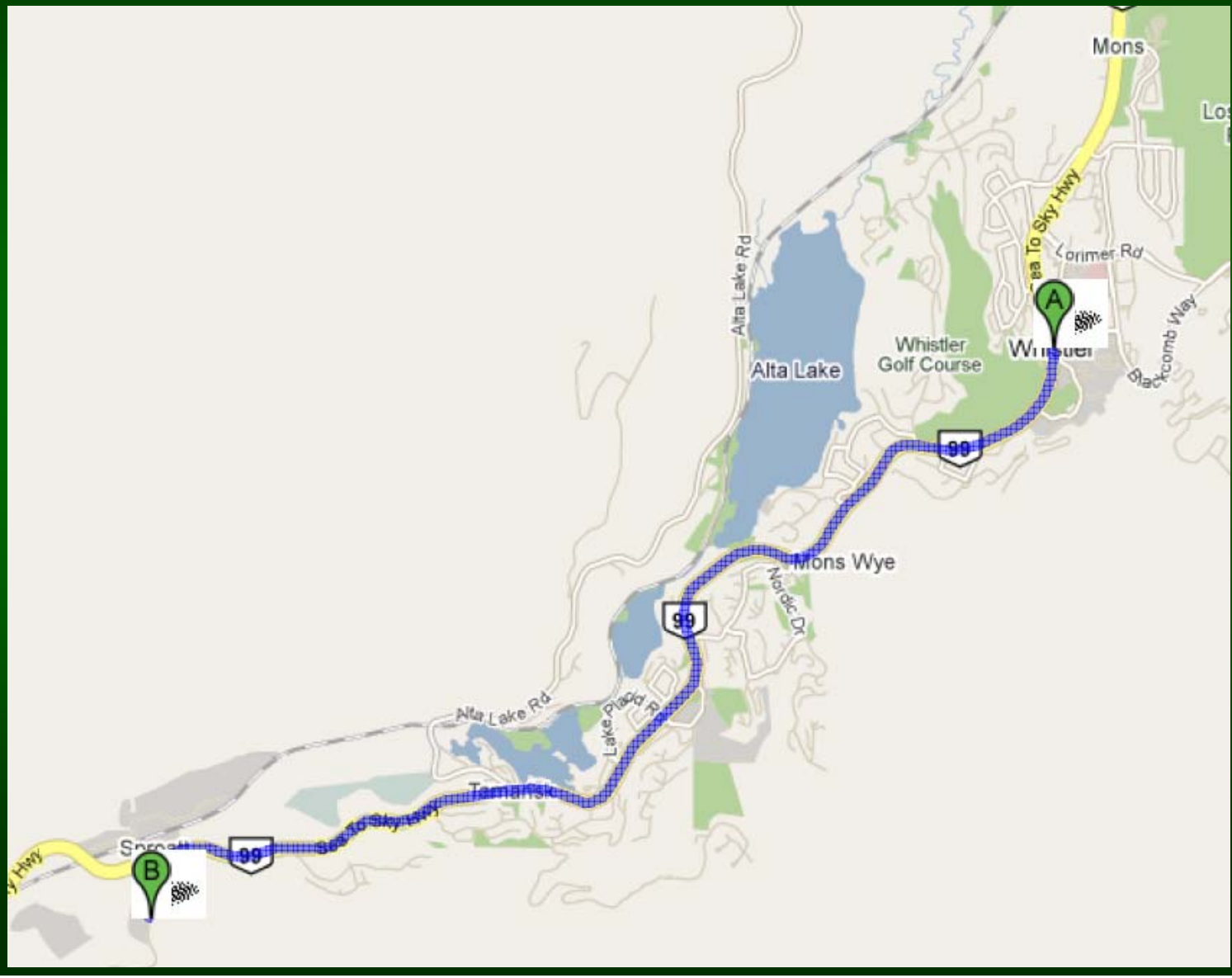
- **EMPAC Engineering Ltd. (Electrical)**

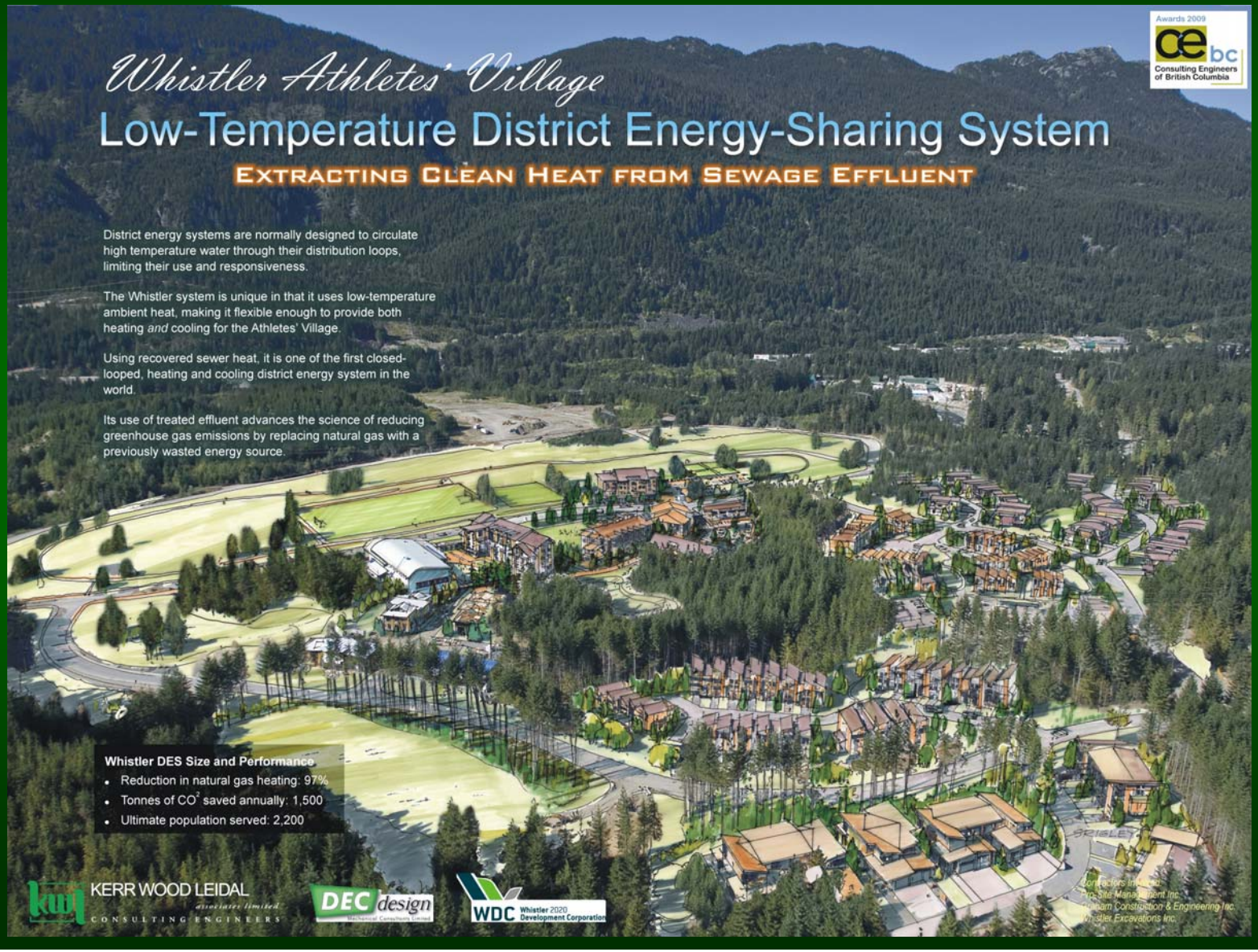
Presentation Overview

- Overview of District Energy System (DES)
- System Design Parameters
- System Performance: Commissioning & the Games
- Lessons Learned

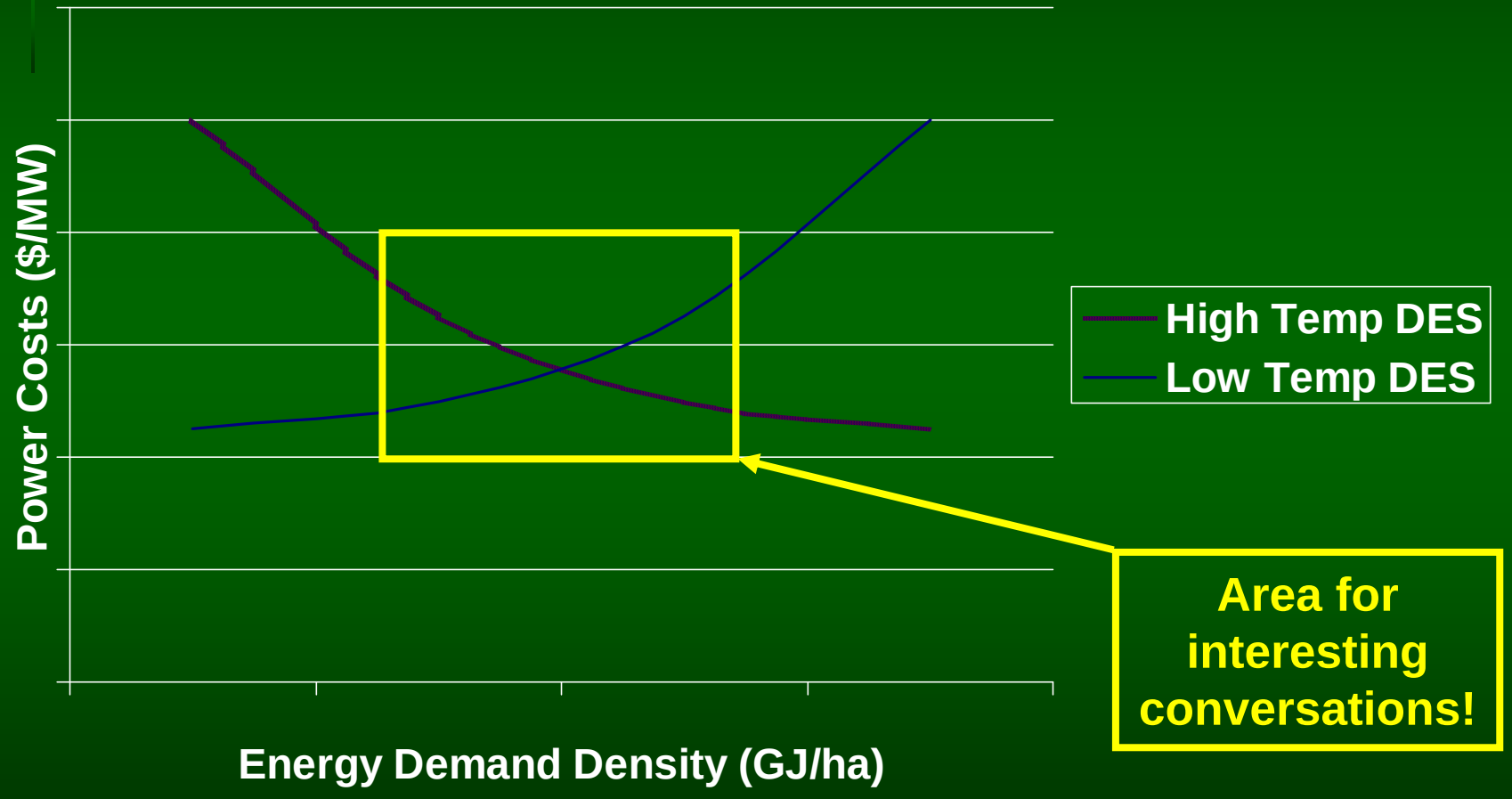
Location Plan



Whistler Athletes' Village



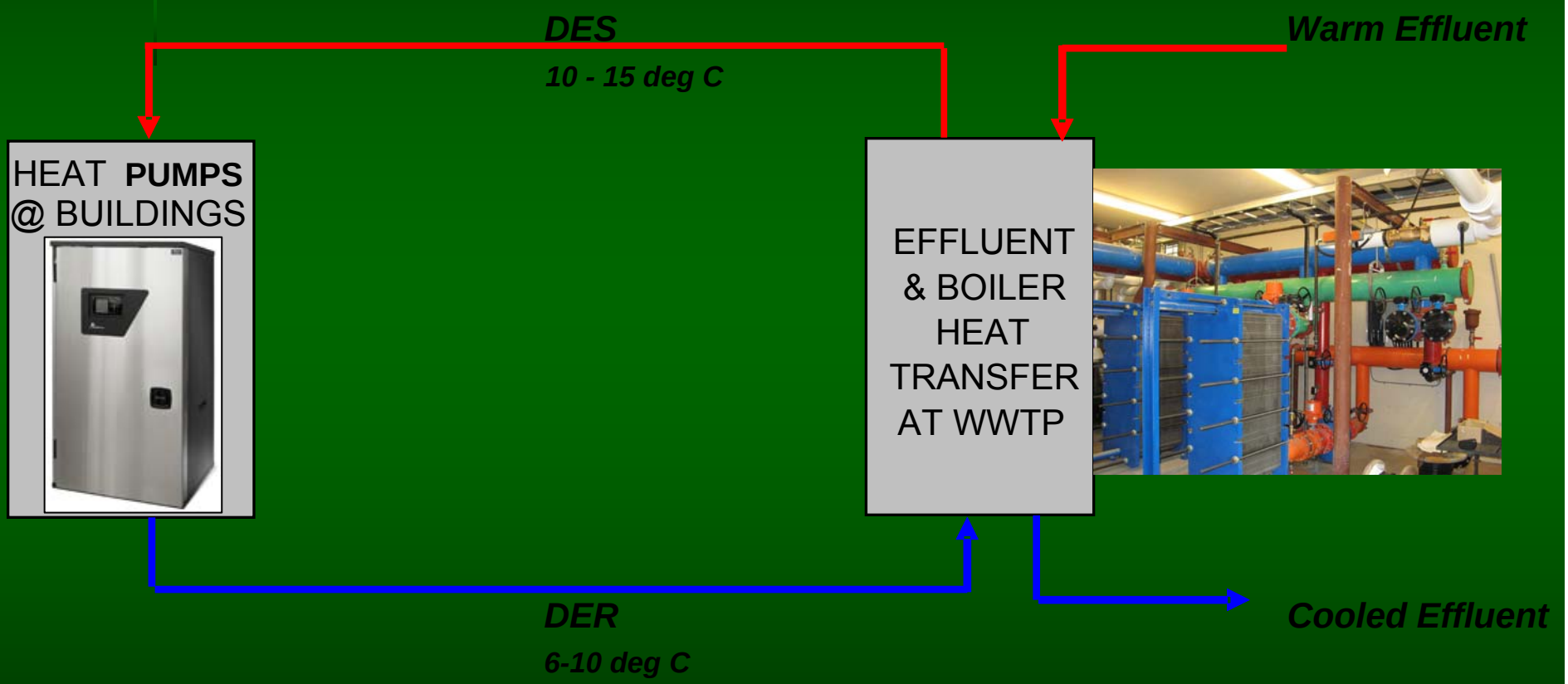
Selecting a DES Technology?
(*…over-simplified for illustrative purposes!)*



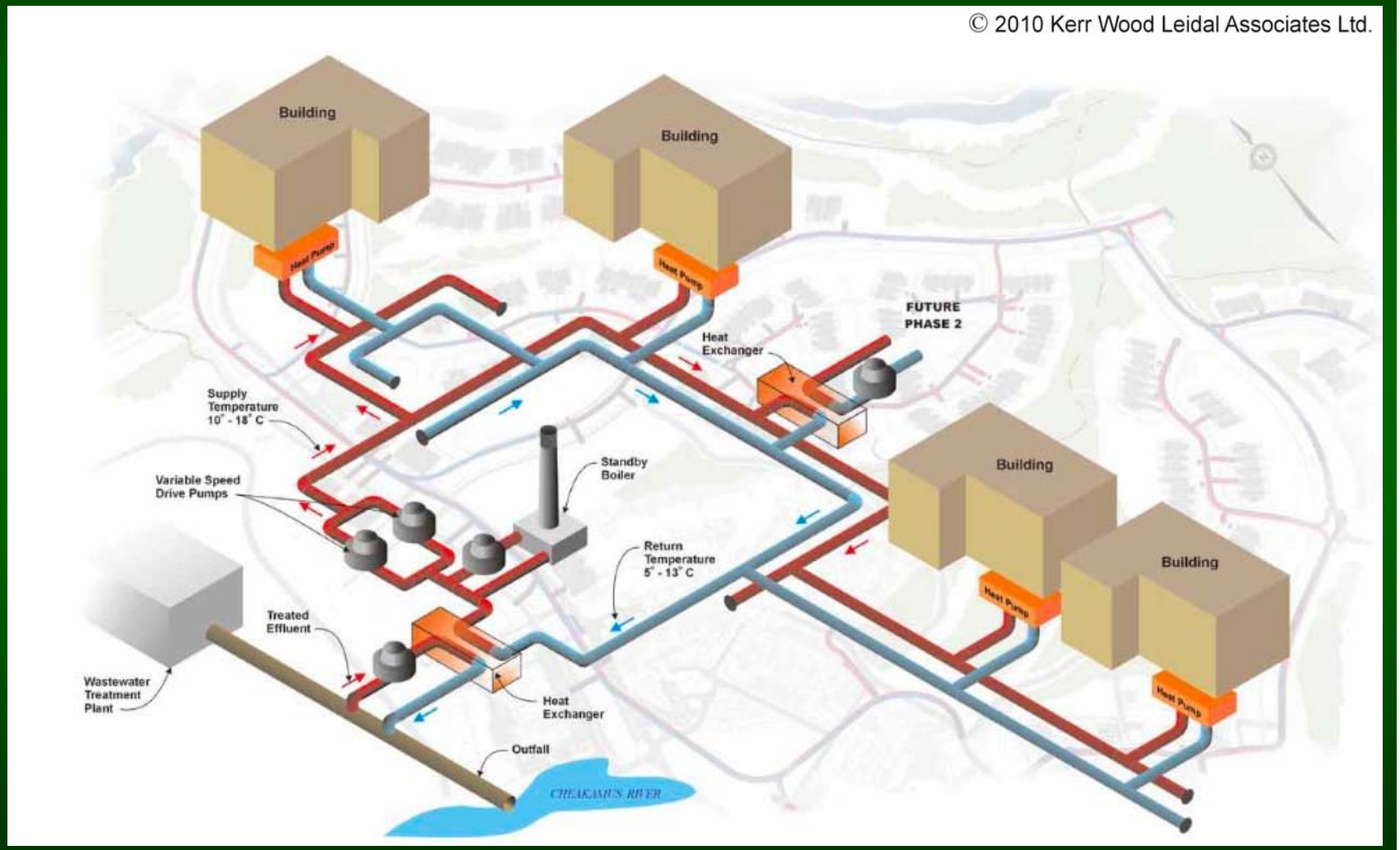
Whistler Athletes' Village - DES

- Low temperature District Energy System (DES)
- Primary heat source: WWTP treated effluent
- Secondary heat source: natural gas boilers
- Load-side ETS: heat pumps & heat exchangers
- Heat sharing: MURBs/Institutional cooling – shed heat to supply loop
- Phase 1 (current): 300 units; Phase 2: 600 units

WAV DES Design



DES System Schematic



Whistler Athletes' Village
(or now, Cheakamus Crossing)

DES Effluent Heat Recovery System

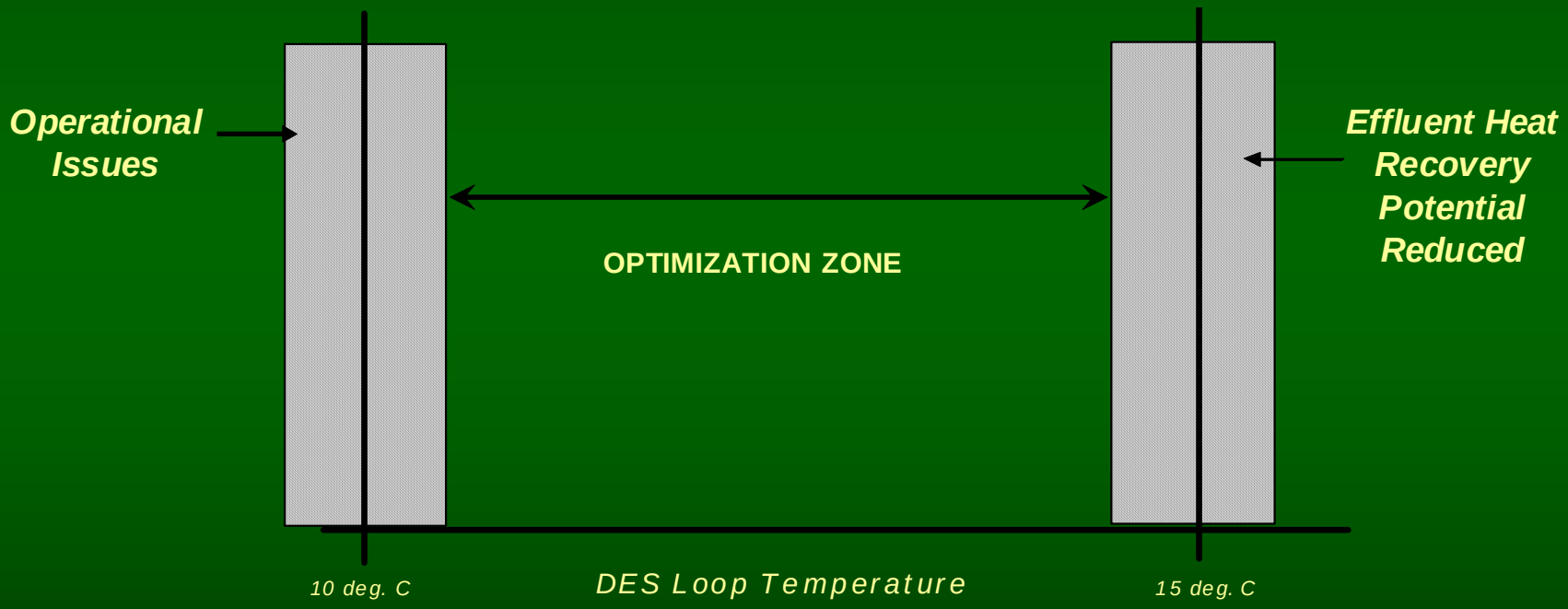
WAV DES Key Variables

- Whistler Population (≈WWTP Effluent Flow and Temperature)
- Weather Conditions; Rain-on-Snow (≈WWTP Effluent Temperature)
- Outside Temperature (≈Village Heat Demand)
- DES Supply Temperature (≈DES Efficiency): Controllable Variable

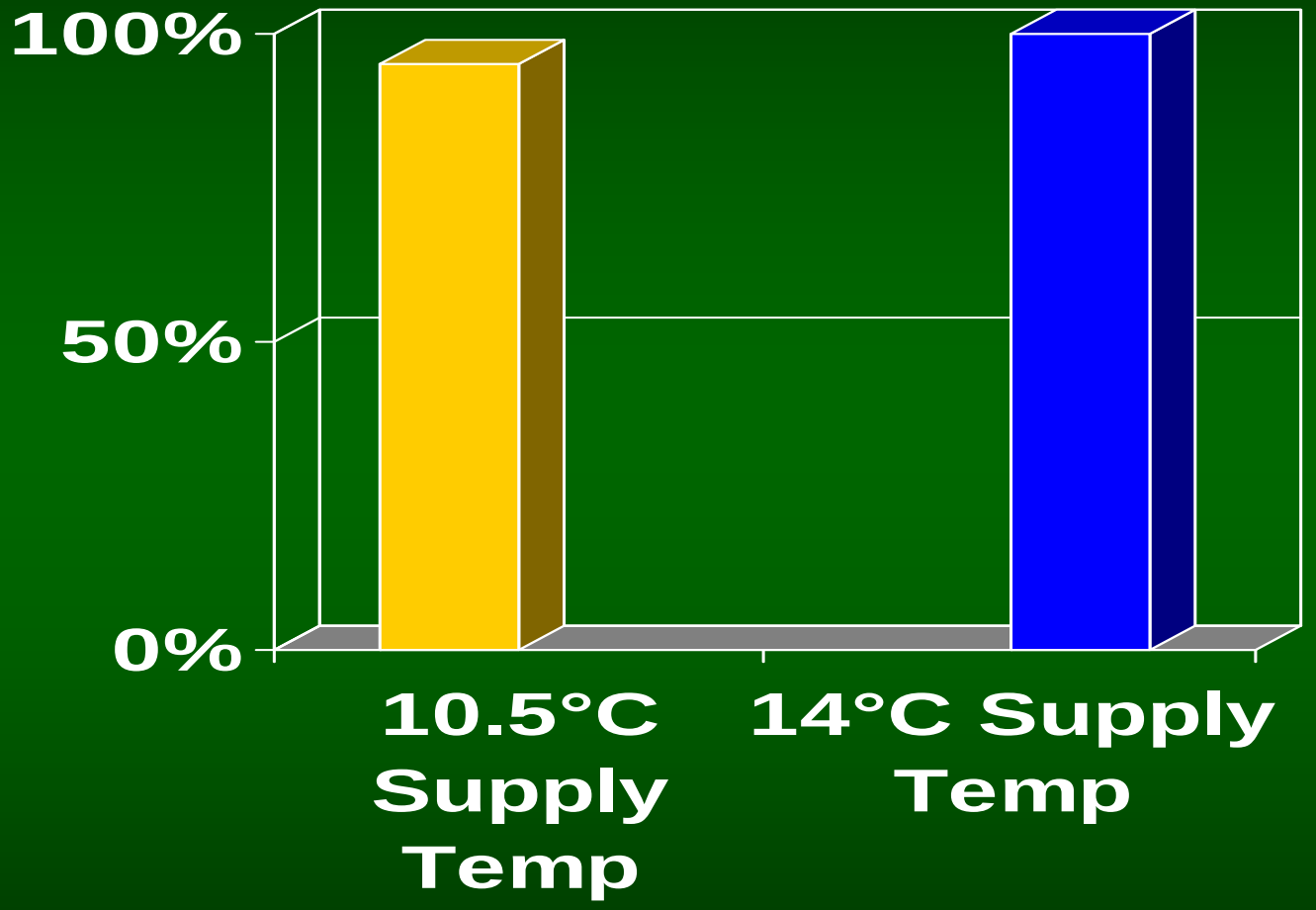
WAV DES Design Parameters

- Flow rate: 1 to 4 m^3/min (Phase 1)
- Supply Temperature: 10°C to 15°C
- Return Temperature: 6°C to 10°C

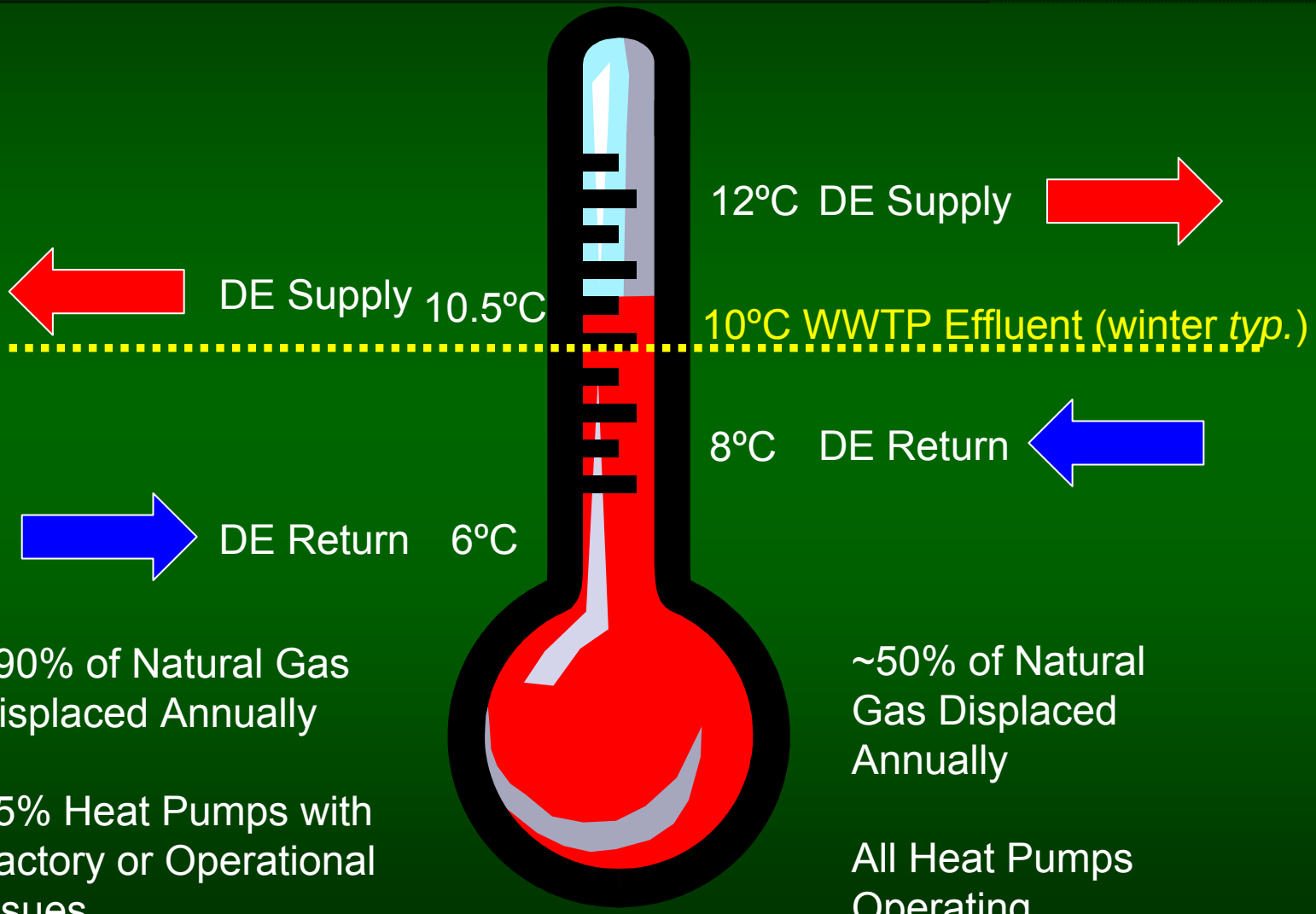
WAV DES Optimization



% Village Buildings On-Line (Load-Side Operations)



WAV DES Optimization



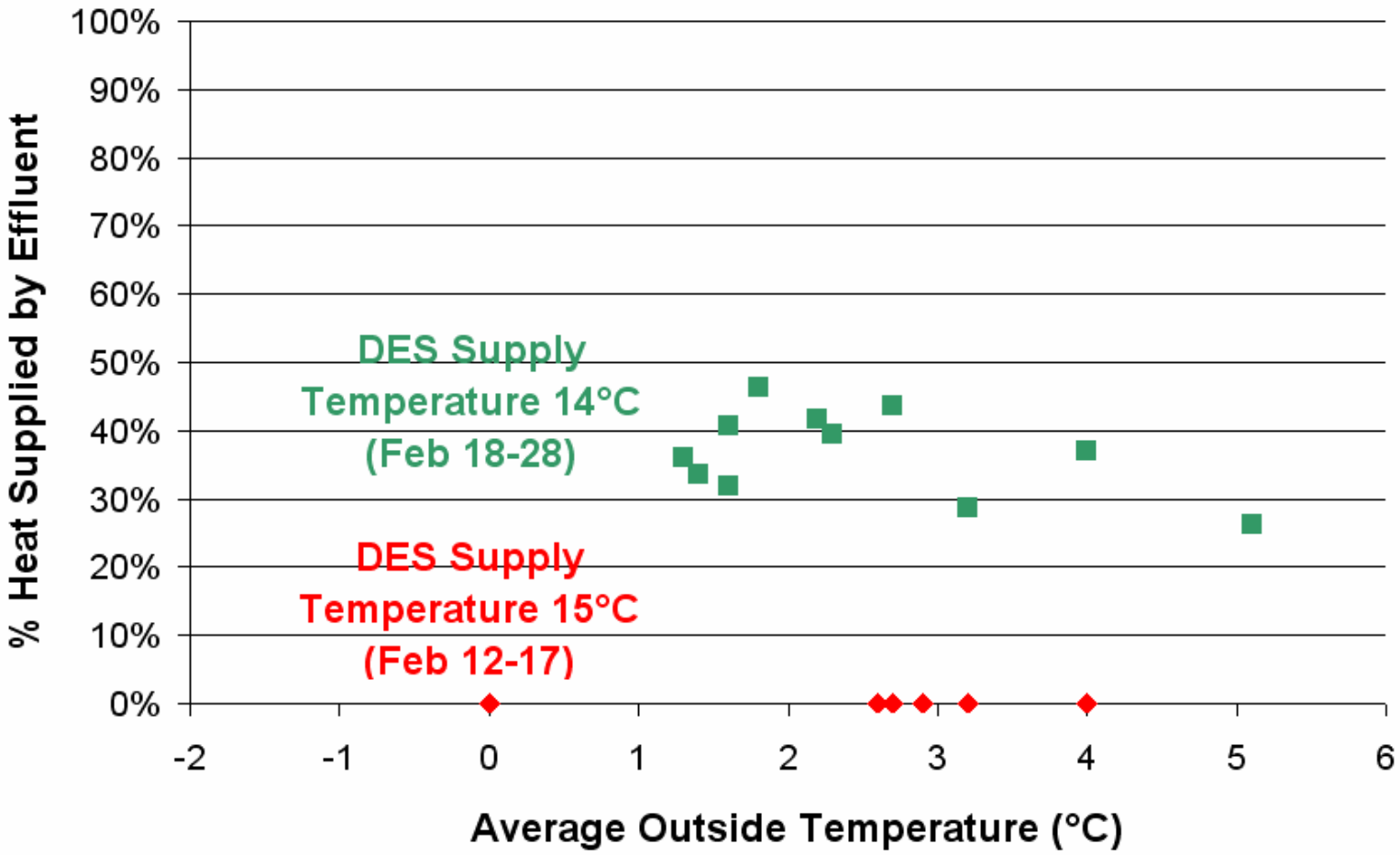
>90% of Natural Gas Displaced Annually

~5% Heat Pumps with Factory or Operational Issues

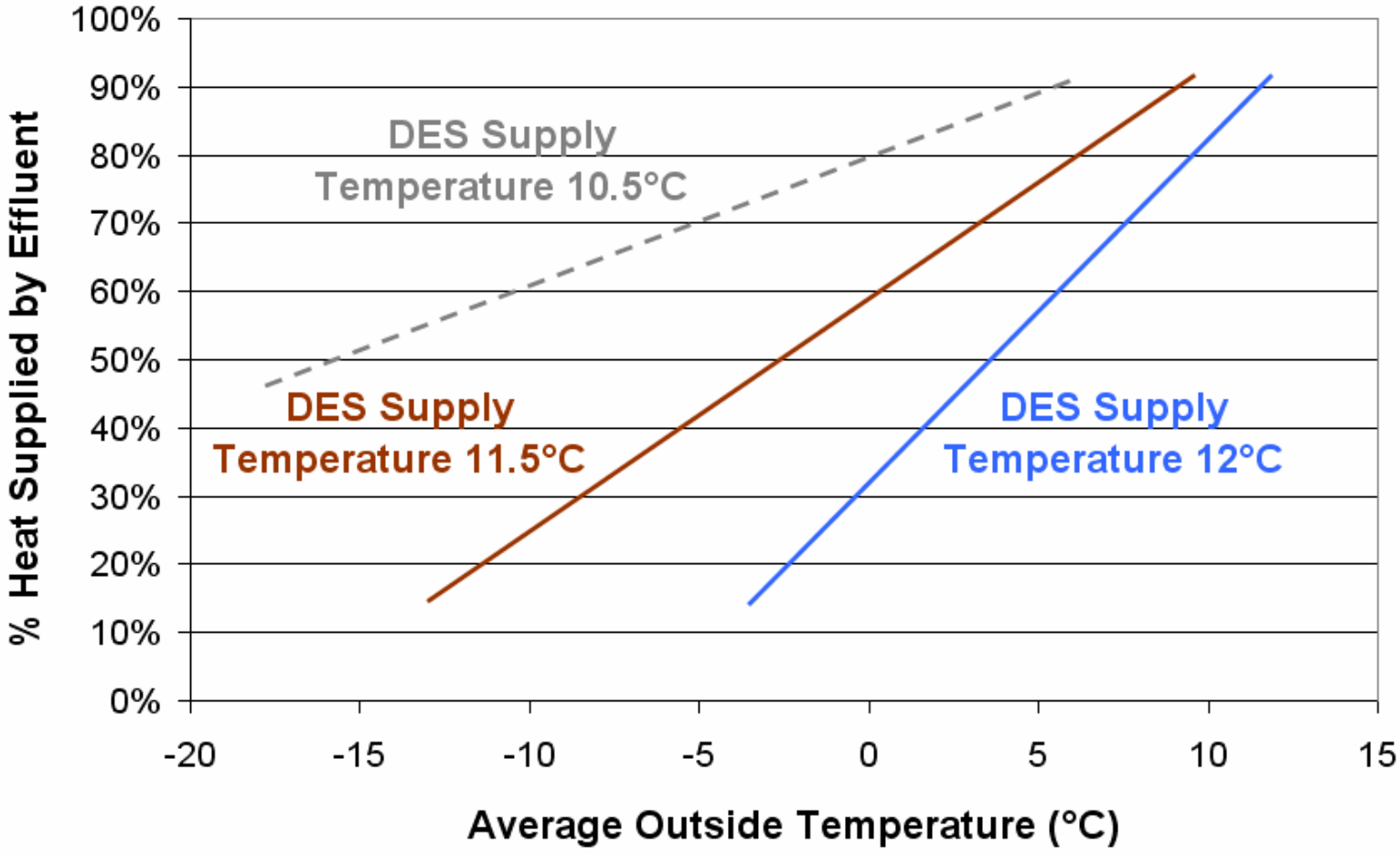
~50% of Natural Gas Displaced Annually

All Heat Pumps Operating

WAV DES Operation During the Olympic Games

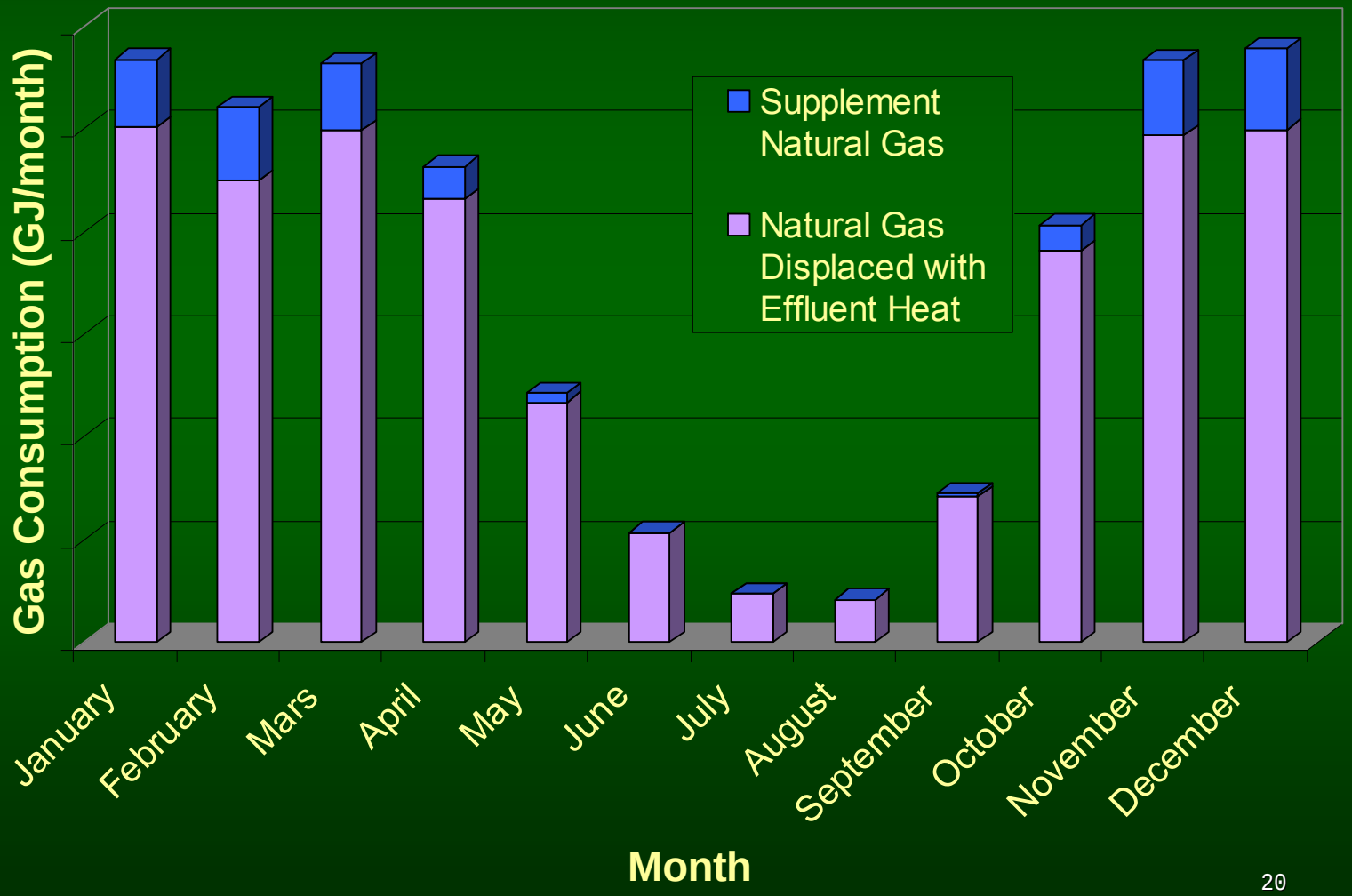


WAV DES Commissioning: Heat Supplied By Effluent



Notes - solid lines: operational results; dashed line: system design parameters.

WAV DES – Forecast Performance
10.5 deg C Loop Temperature



Notes - February 2006 was warmer than average.

Forecast Heating Energy Cost Savings – Development Phase 1

- 10.5°C DES Supply Temperature:
  - **>90% displacement of natural gas**
  - **Annual saving of ~ $300K from BAU (@2010 NG prices)**

- 12°C DES Supply Temperature:
  - **~50% displacement of natural gas**
  - **Annual saving of ~ $170K from BAU (@2010 NG prices)**

Lessons Learned

- The Whistler DES is a robust system; operating parameters are finely tuned
- Δ0.5°C in loop supply temperature has large effect on effluent heat recovery
- DES load-side users must understand system configuration, and employ heating equipment congruent with system operation parameters

Questions?

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