Energy and Water Consumption in Vancouver Case Study: False Creek Residential Buildings

Yann Herrera
Rei Van
Sujin Lee

Introduction

The City of Vancouver has set a goal to become the greenest city in the world by 2020. Part of the action plan is to reduce energy and water consumption from multi-unit residential buildings (MURB's) and minimize greenhouse gas (GHG) emissions. The City wants to encourage MURB managers to report their buildings' energy and water use so that retrofit incentives and GHG policies can be improved. Their current action plan consists of several steps for gathering data and summarizing results.

Here we provide examples of energy and water consumption analysis from three MURBS in False Creek using two of the City's proposed approaches:

1. Thermal Imaging
2. Benchmarking: Collection of utility data

1. Thermal Imaging

- RED indicates hot surfaces (heat emission)
- BLUE indicates cold surfaces (less heat)
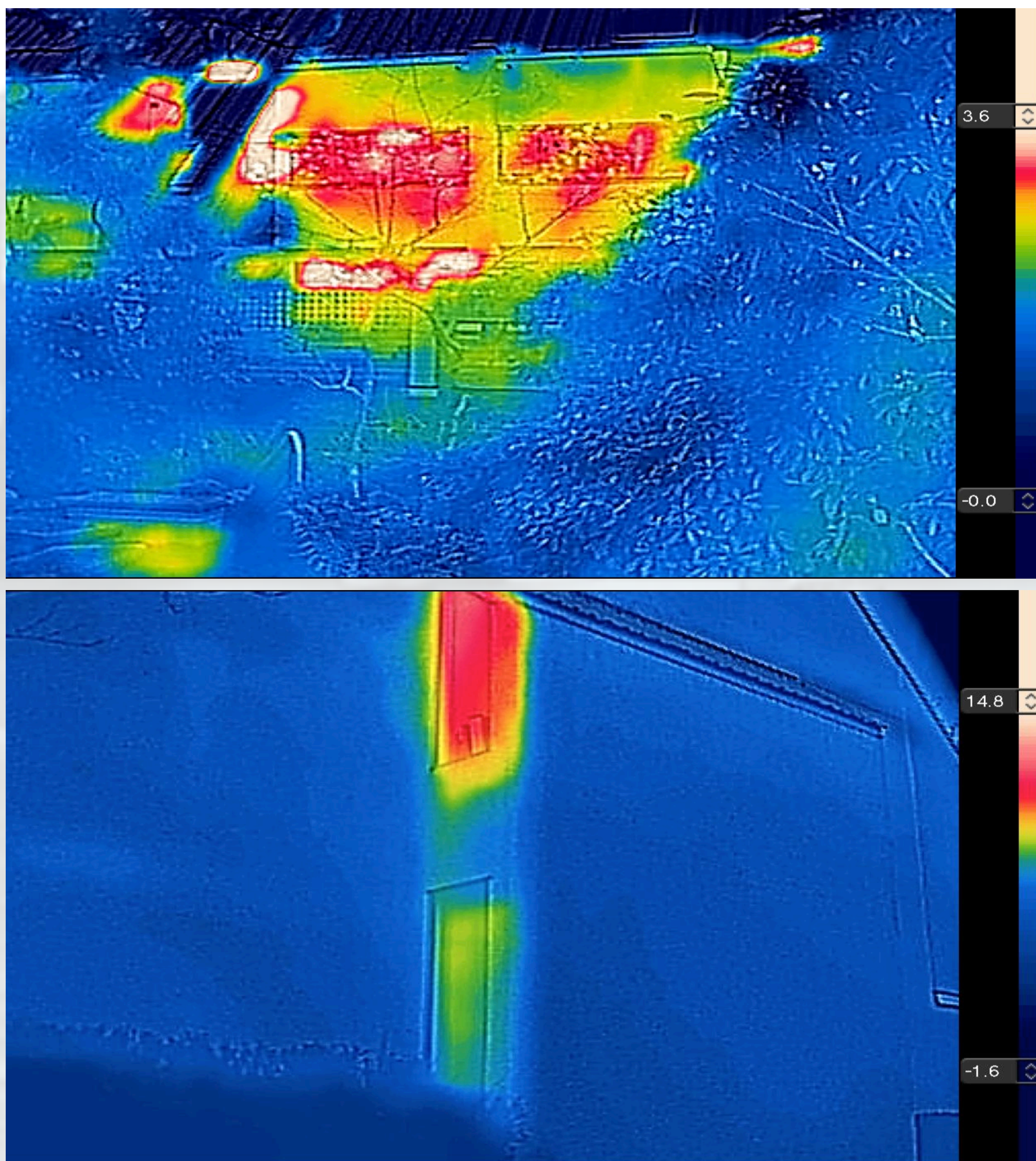
Thermal images taken using a FLIR tool on January 26, 2016

Temperature is calculated based on: distance from the building, outdoor temp (10°C), typical household maintains indoor temperature of 20°C.

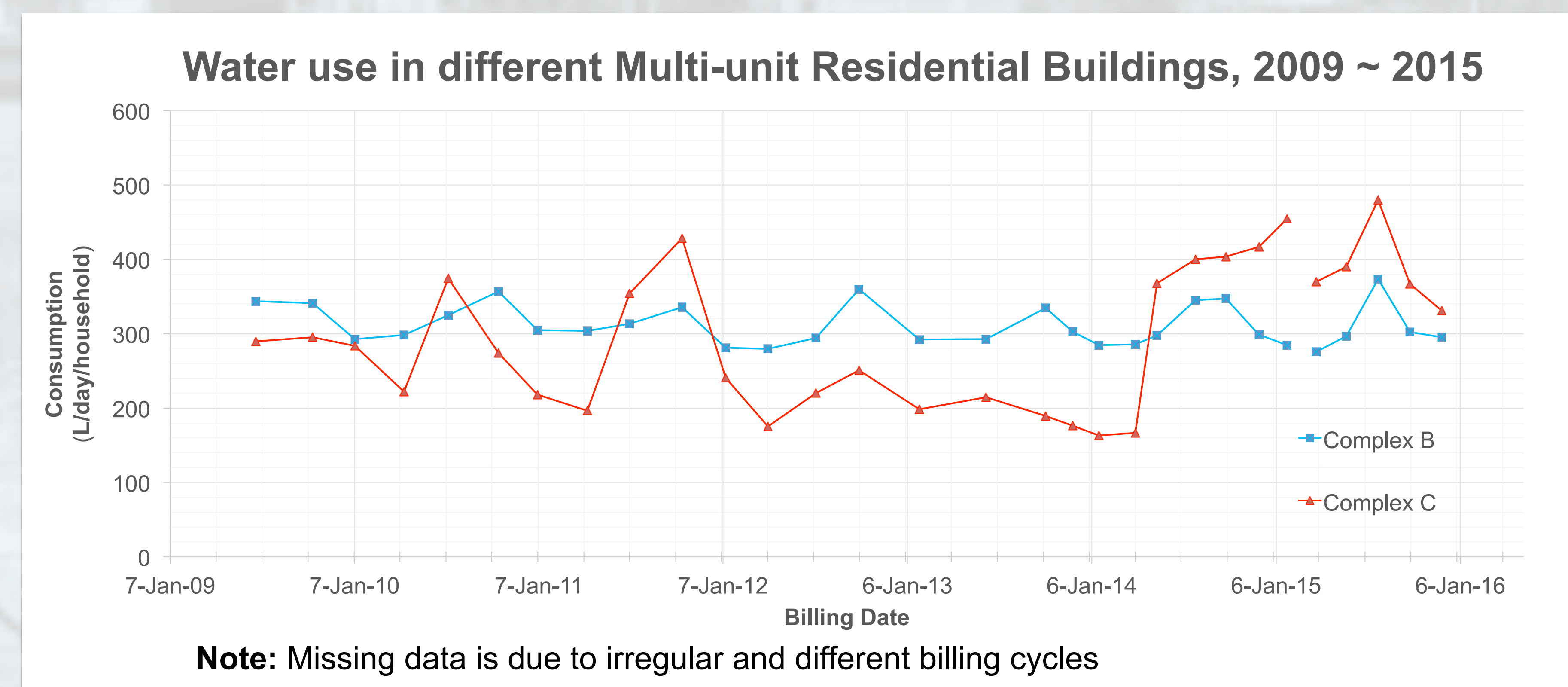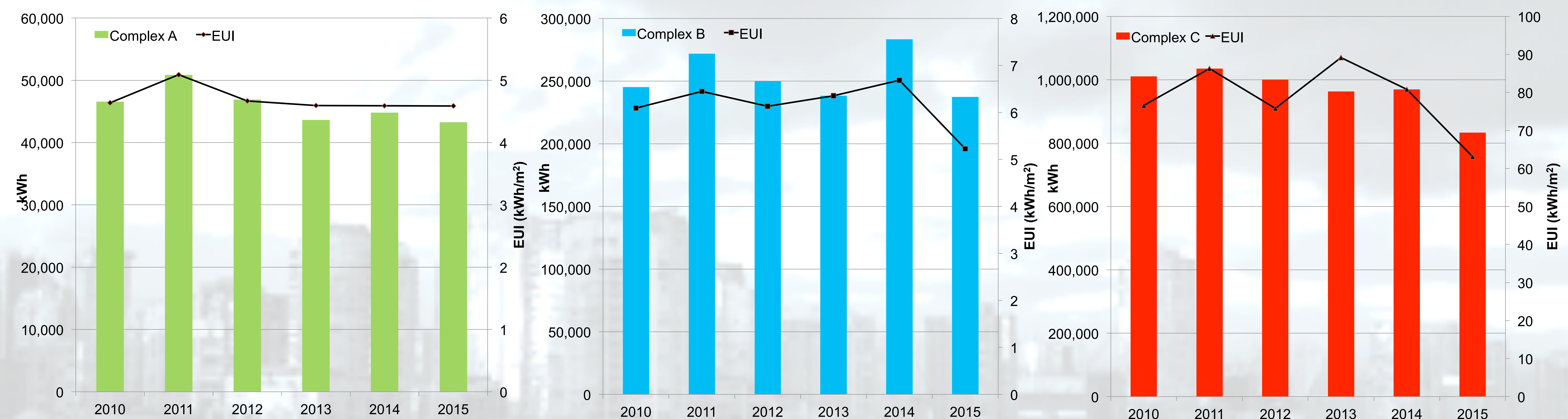### Summary results from Thermal imaging:

- Average heat loss: 3.6°C
- Heat loss is mainly from windows - Approx. 20%

2. Benchmarking: Water and Electricity Data Analysis

Benchmarking tracks the consumption of electricity, water and gas of a building and allows building managers to assess the need for consumption reduction. A sample analysis for electricity and water of three different housing complexes is shown below:

Complex A	Complex B	Complex C
5 buildings, 4 storeys, 98 units	11 buildings, 2 storeys, 170 units	1 buildings, 6 storeys, 55 units
Heating system: Gas	Heating system: Gas	Heating system: Electricity
Co-op housing	Co-op housing	Condominium
Average electricity consumption: 46 017 kWh/yr	Average electricity consumption: 254 322 kWh/yr	Average electricity consumption: 968 861 kWh/yr
Average EUI: 4.7 kWh/m²	Average EUI: 6.2 kWh/m²	Average EUI: 78.6 kWh/m²
Average electricity use per household: 470 kWh	Average electricity use per household: 1496 kWh	Average electricity use per household: 17 616 kWh

* **EUI**: Energy use intensity, calculated as electricity consumed per gross floor area (kWh/m²)

Water use in different Multi-unit Residential Buildings, 2009 ~ 2015

Note: Missing data is due to irregular and different billing cycles

Summary results from Benchmarking:

- Electricity consumption varies with housing type, number of storeys and heating systems
- Water consumption patterns are similar for different buildings with seasonal fluctuations and peaks during summer months.

Benefits of Thermal Imaging and Benchmarking:

- Identify and quantify heat loss
- Normalize units for inter-building comparisons
- Reveal where consumption should be reduced and where utility costs are highest
- Provide a platform to report back to the City
- Develop policies and incentives to improve building performances via retrofitting or behavioural change

Reaching the 2020 greenest city goals:

1. Collect data: electricity, water and gas – from MURB's
2. Calculate GHG emissions per building
3. Create policy / incentives informed by the data