

How Digital Twins can help cities creating Positive Energy Blocks and zero carbon roadmaps

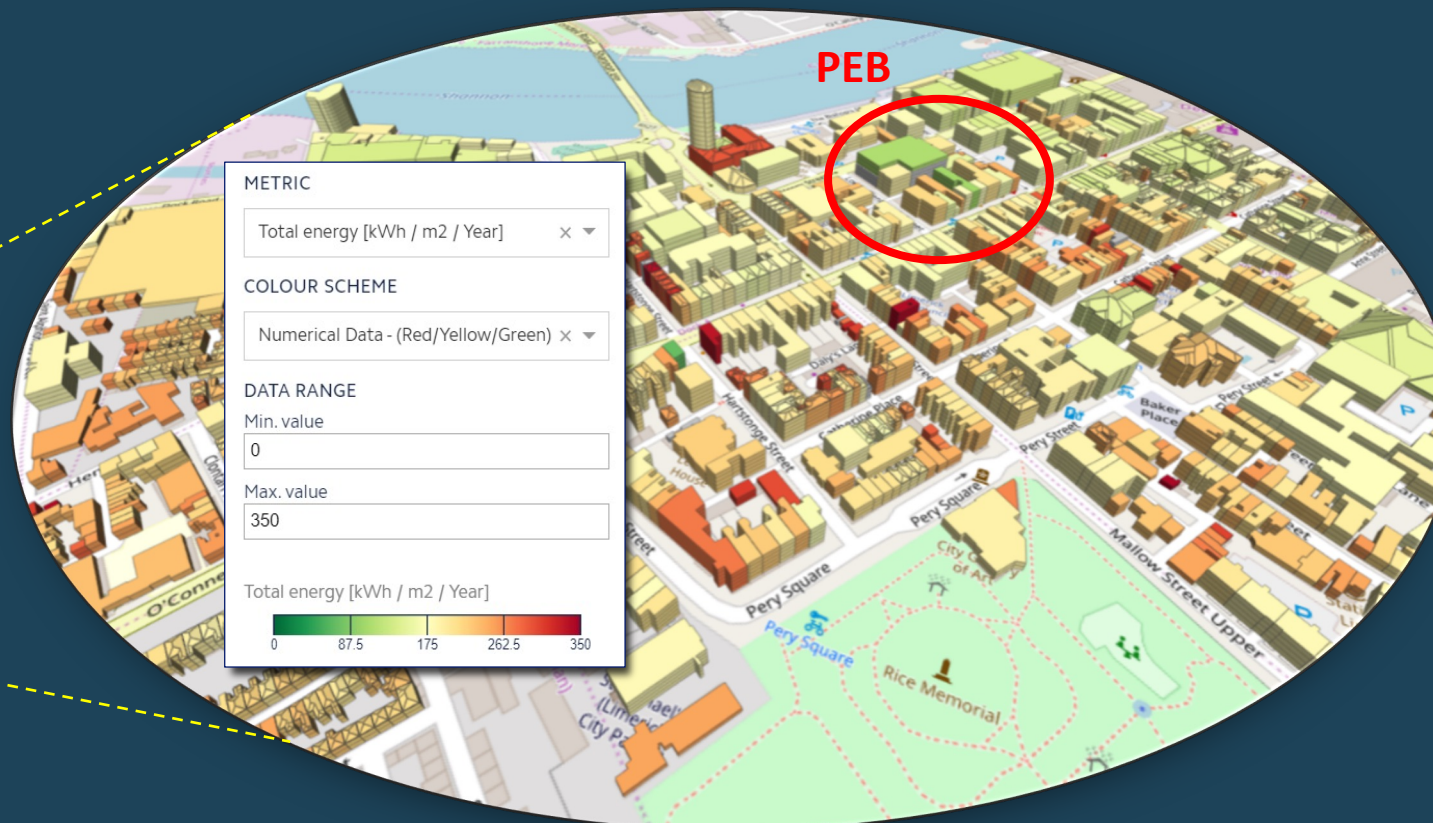
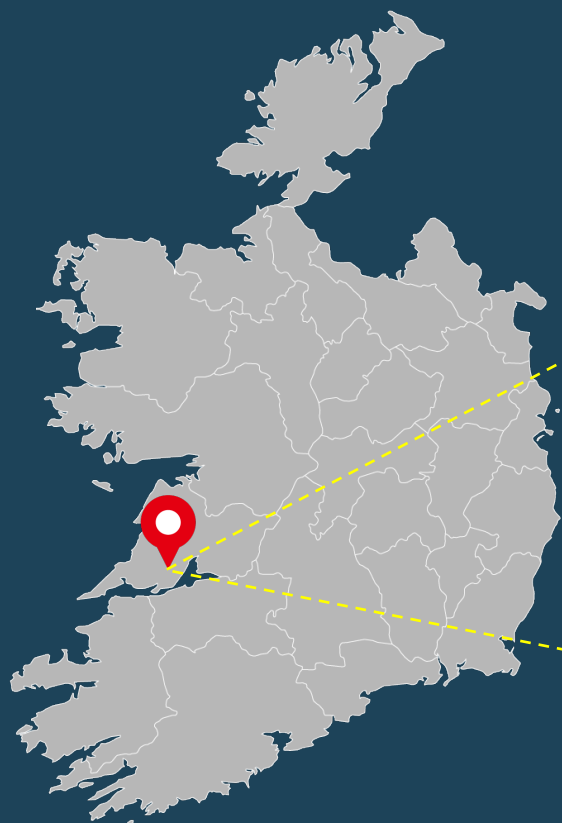
Dr. Valeria Ferrando,
Associate Director, ICL Consultancy



Towards positive energy

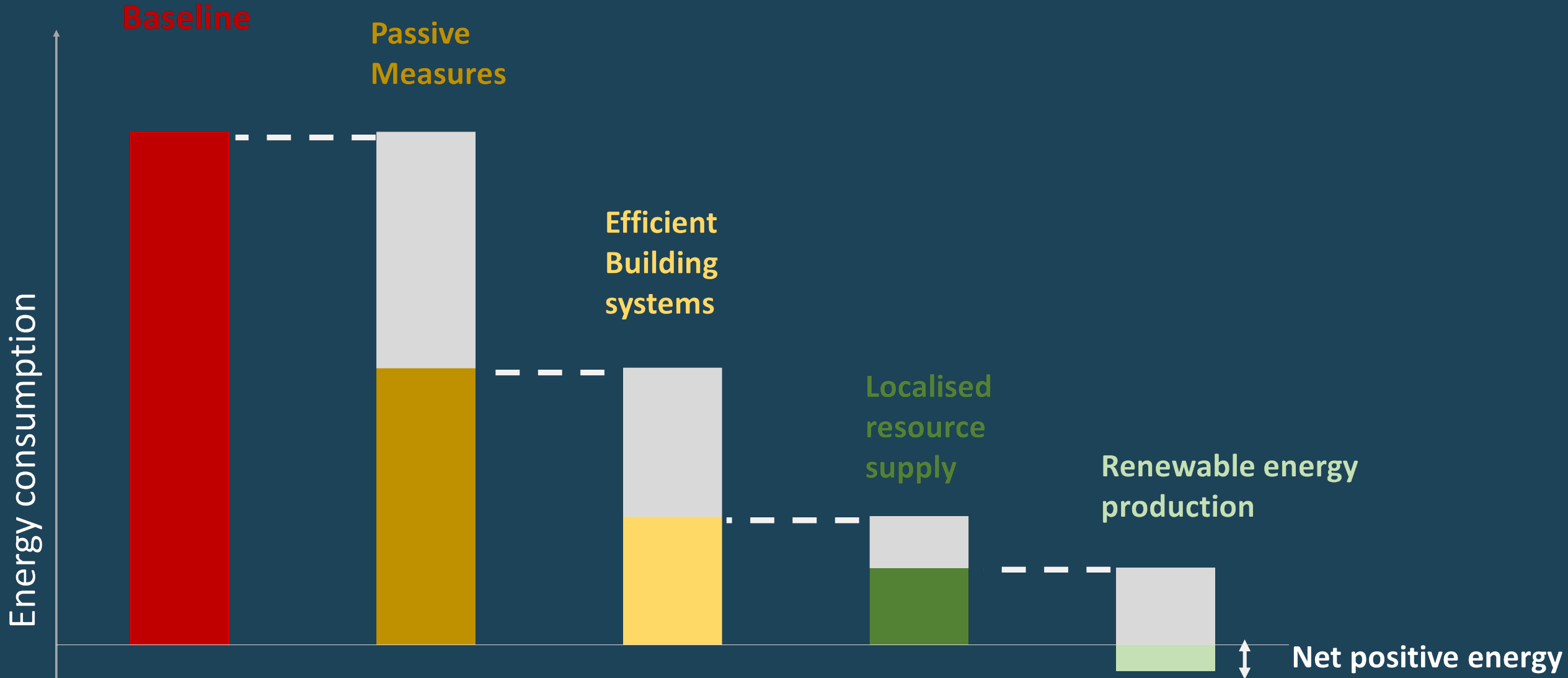
Turning Georgian District into a Positive Energy Block

LIMERICK'S HISTORIC CITY CENTRE

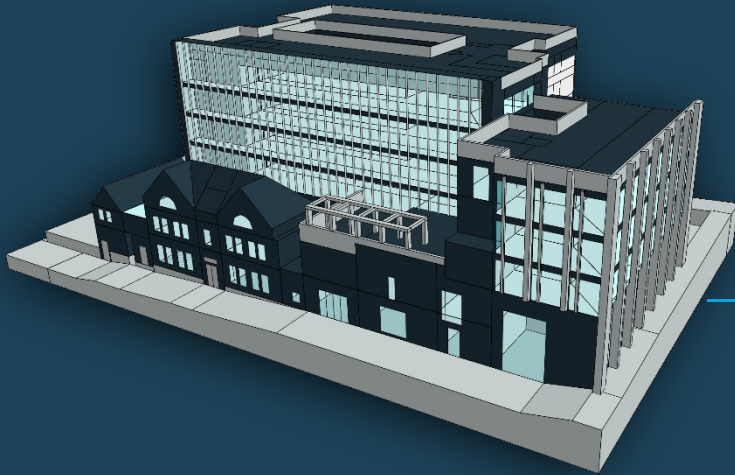


intelligent Community Information Model (iCIM)

PEB METHODOLOGY- OVERVIEW



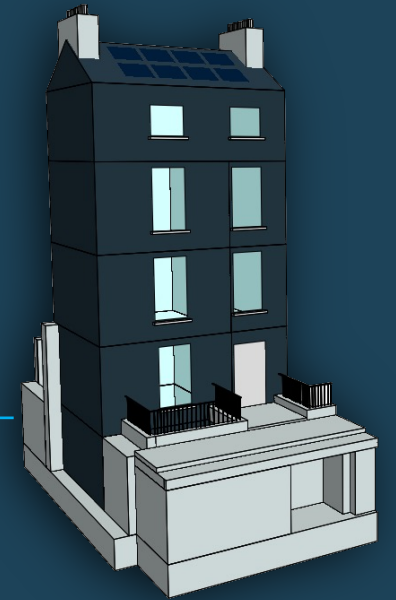
POSITIVE ENERGY BLOCK: VE MODELS



Building 2
Commercial



Building 3
Post Office



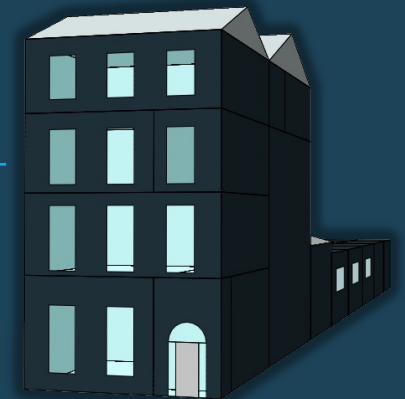
Building 4
Residential



Building 1
Educational

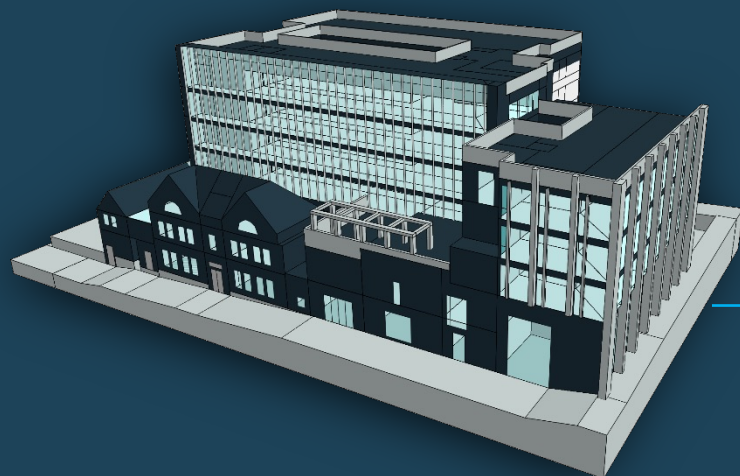


*intelligent Community
Information Model (iCIM)*



Building 5
Mixed use

POSITIVE ENERGY BLOCK: IMPROVEMENT FROM BASELINES



-3.6%

Building 2
Commercial



Building 3
Post Office
-56.8%



-62.4%

Building 4
Residential



Building 1
Educational

-63.2%



*Intelligent Community
Information Model (iCIM)*

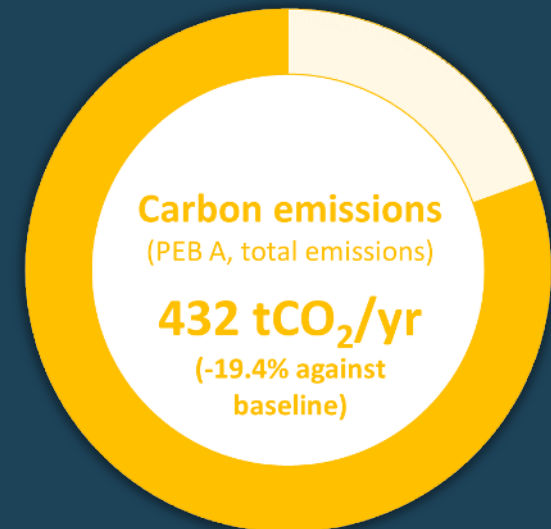
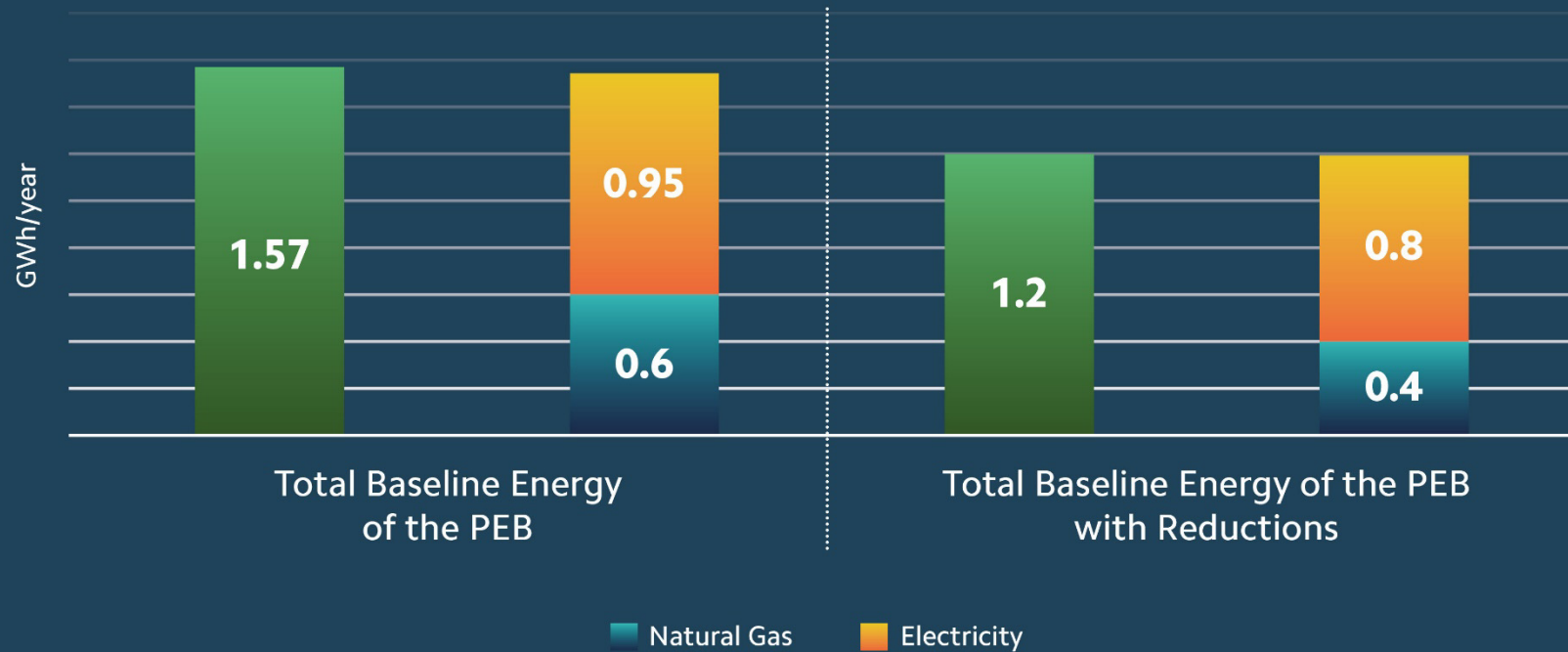
-86.9%

Building 5
Mixed use



APPLICATION OF C12 PROCESS TO THE WHOLE BLOCK

Total Positive Energy Block (PEB) Analysis with Energy Efficiency Improvements



MOVING TOWARDS NZEB

CI2 Process (Collect, Investigate, Compare, Invest)

1. Creation of a Digital Twin

Collect Data and Create Digital Twin

2. Operational measures

Investigate Different Energy Conservation Measures such as Operation, Shallow Retrofit or Deep Renovation

3. Shallow retrofit interventions

4. Deep renovation interventions

Compare to the Baseline Model and Select Scenarios that meet Client Financial and Technical Constraints

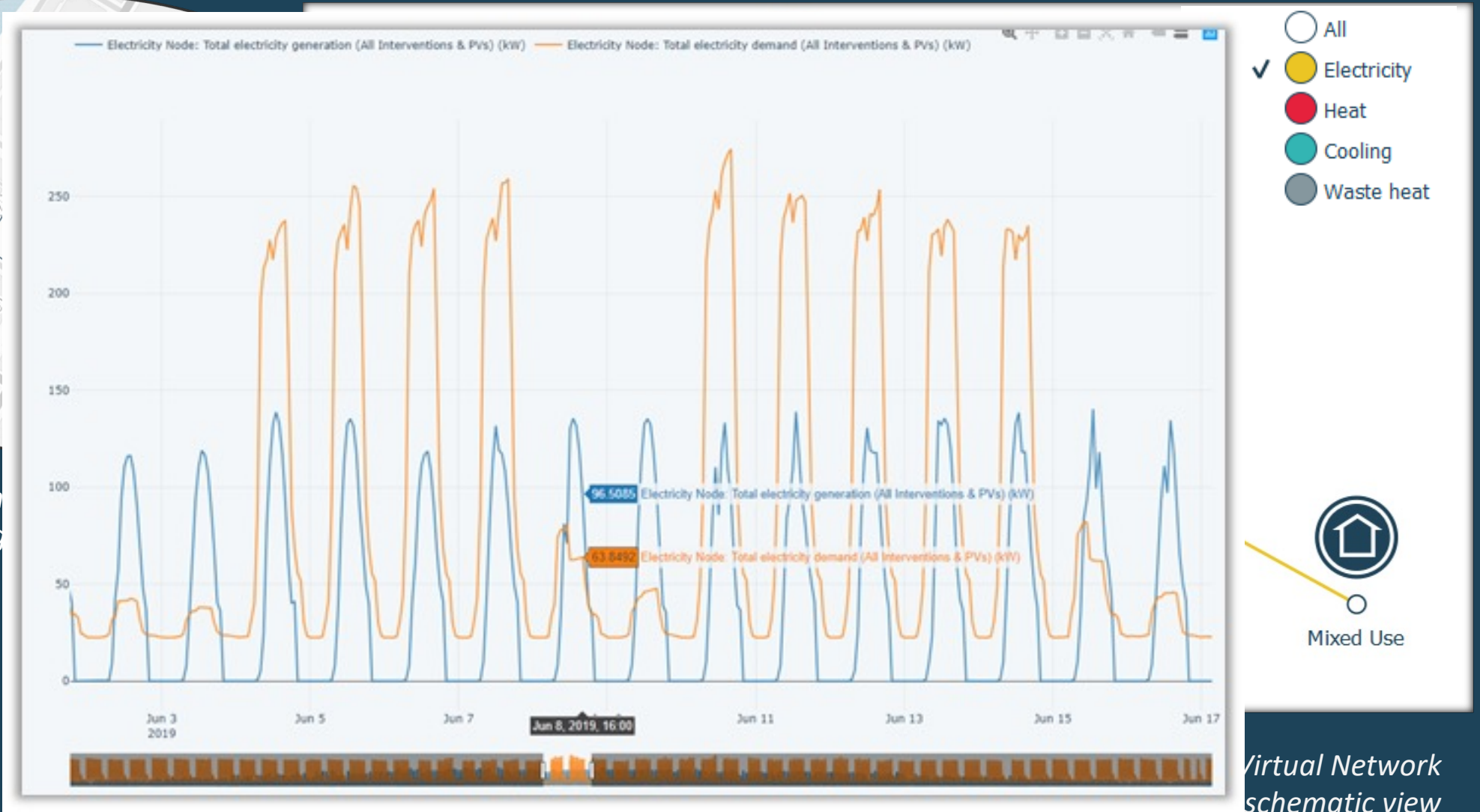
5. Integration of RES

Invest in Different ECMs and Potential Local Renewable Production

INTEGRATION OF RENEWABLE ENERGY SYSTEMS



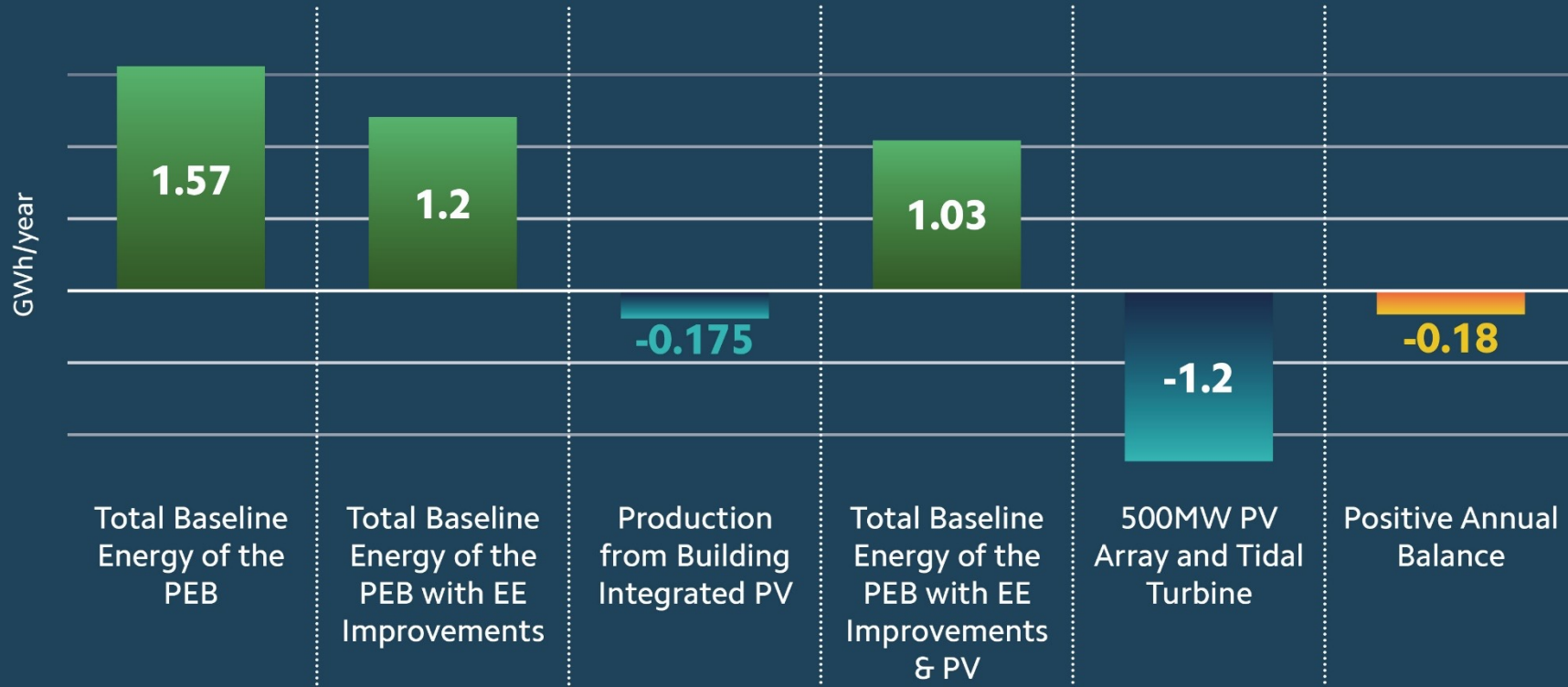
Intelligent
geog



Hourly profile of generation and demand

IMPROVEMENTS SUMMARY & COMPARISON WITH INITIAL ESTIMATION

Total Positive Energy Block (PEB) Analysis with Energy Efficiency Improvements (GWh/yr)

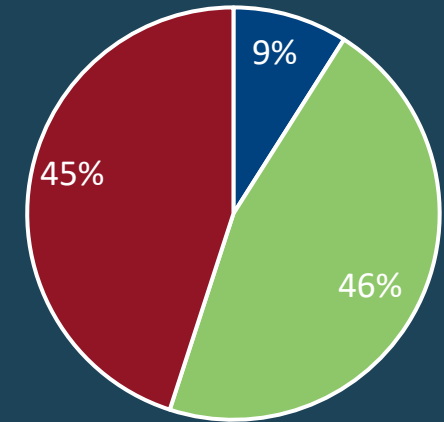
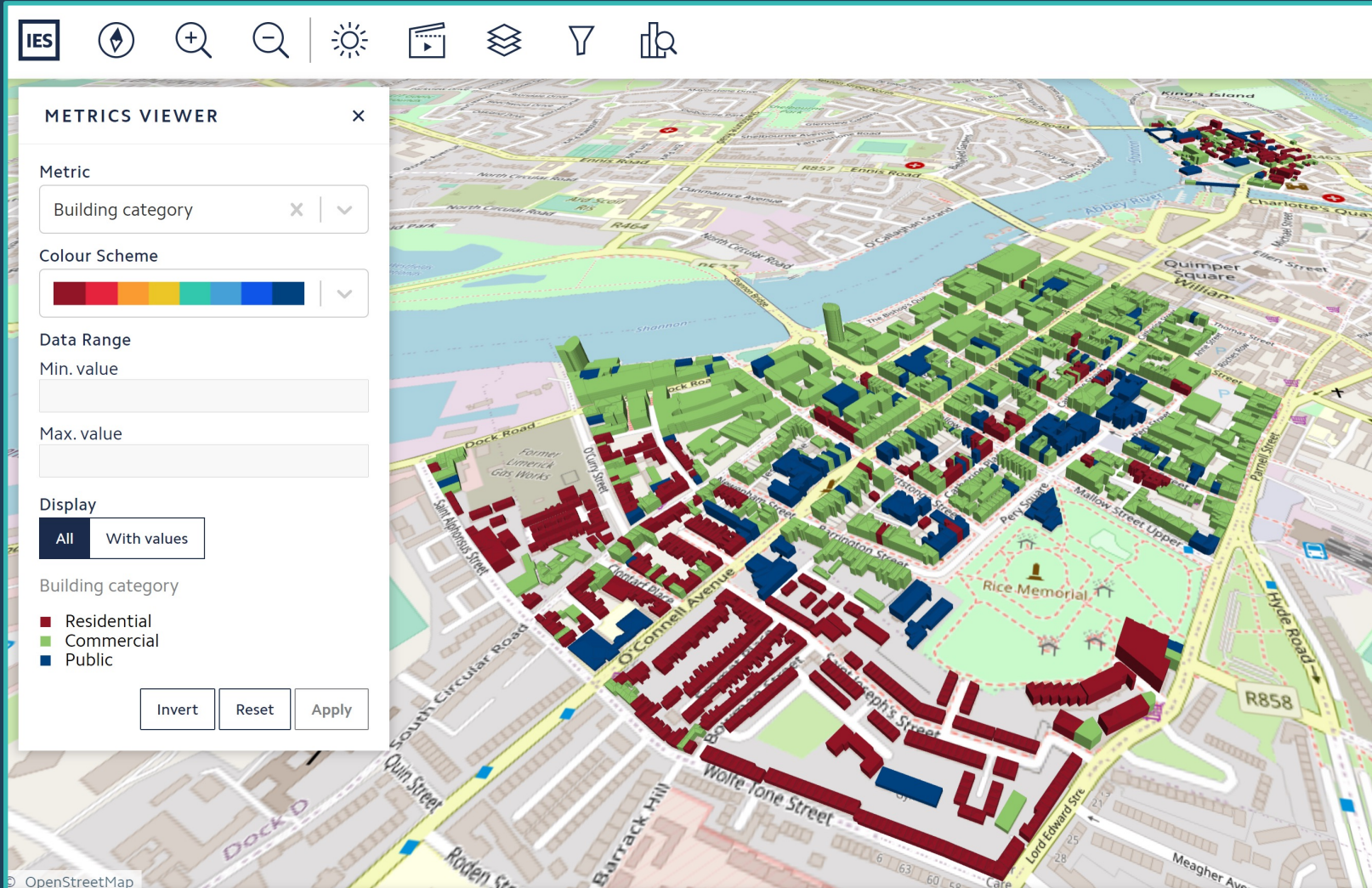




Net Zero Audit

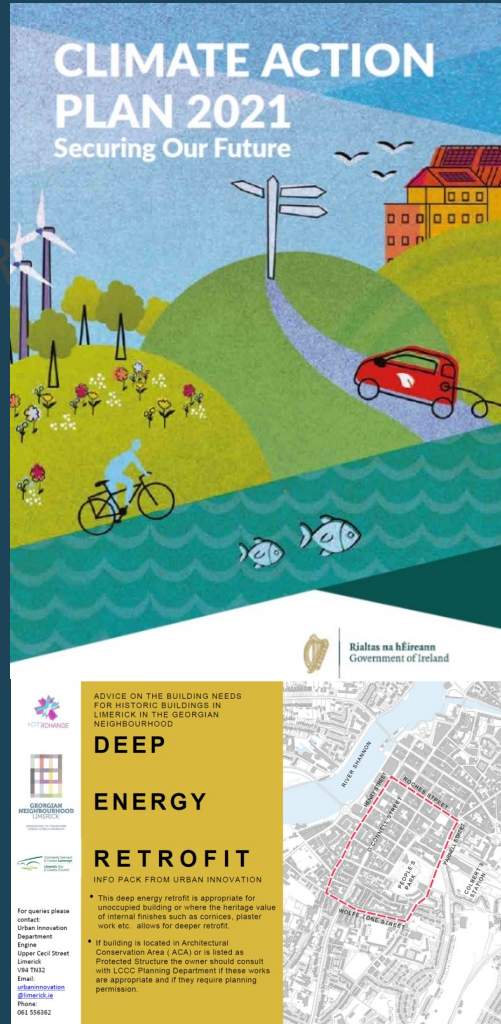
Auditing Limerick Roadmap to Net Zero

Baseline - Buildings



Public Commercial Residential

Retrofit



Building targets:

- 500,000 homes to B2 BER nationally by 2030
- Global developed countries retrofit rate in cities of 2.5% per year to 2050
- All public sector buildings to B2 BER by 2030



- 50 mm external wall inner insulation



- Double glazing with U-value of 1.6 W/m²K



- 100 mm roof insulation added



- Full LED lighting upgrade



- Reduction in heat losses and rate of infiltration



- Air source heat pump (CoP 2) for space heating and domestic hot water

Climate Action Plan (2021)
IEA Net Zero by 2050 (2021)

Transport



Transport targets:

- 60% of private cars electric by 2050
- More public and active transport journeys

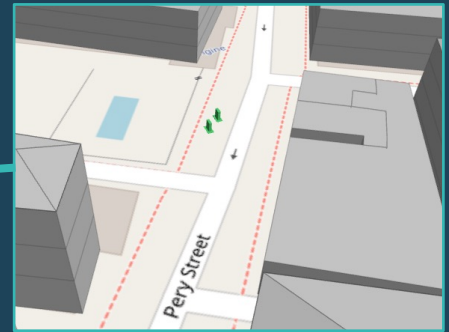
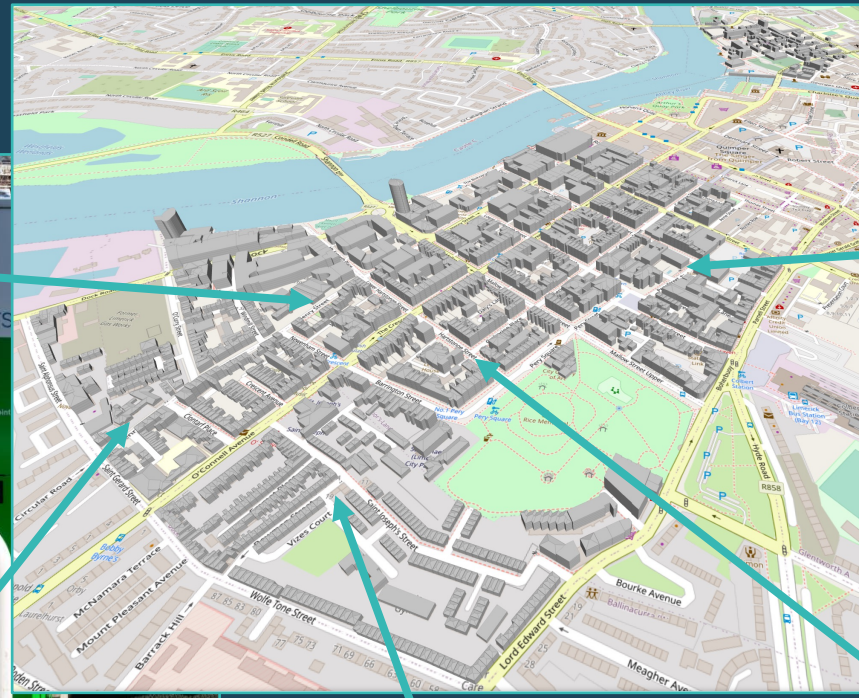
Electrification of vehicles



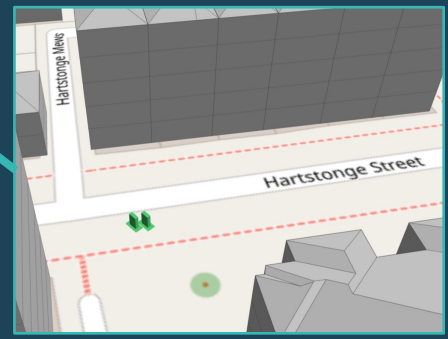
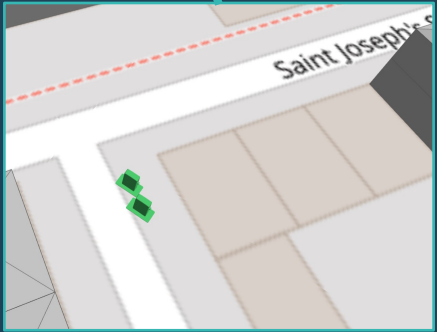
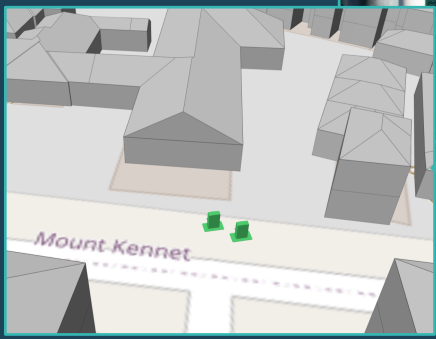
Change in transport modes



Transport



Vehicle chargers



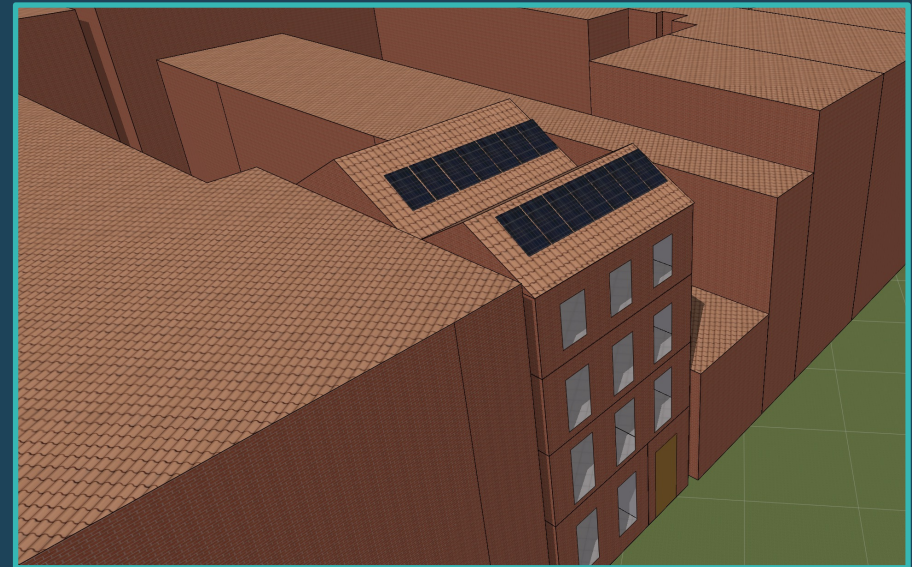
Smart Meters

- Installed in all buildings as planned by 2024
- Smart services provided to building owners
- 10% saving on CO₂ emissions



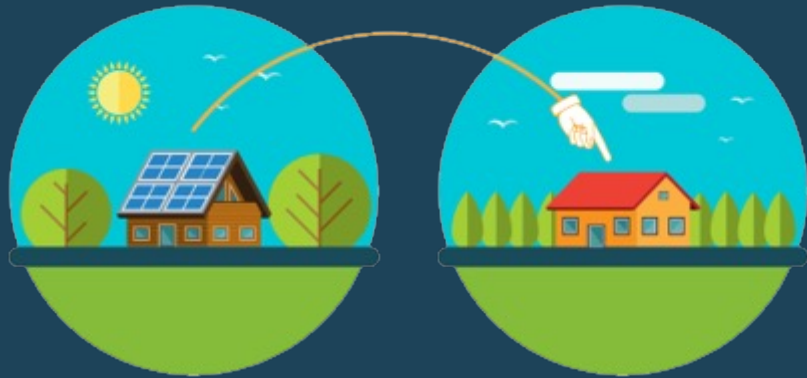
Solar PV

- **Maximum Power - Single Unit: 300 W**
- **PV Area - Single Unit: 1.64 m²**
- **Efficiency: 18.3%**
- **Roof Area Covered: 35%**
- **Installed on each roof after completing B2 BER retrofit**



Energy Trading & Community Projects

Energy Trading



Community Projects



METRICS VIEWER

Data Range

Min. value

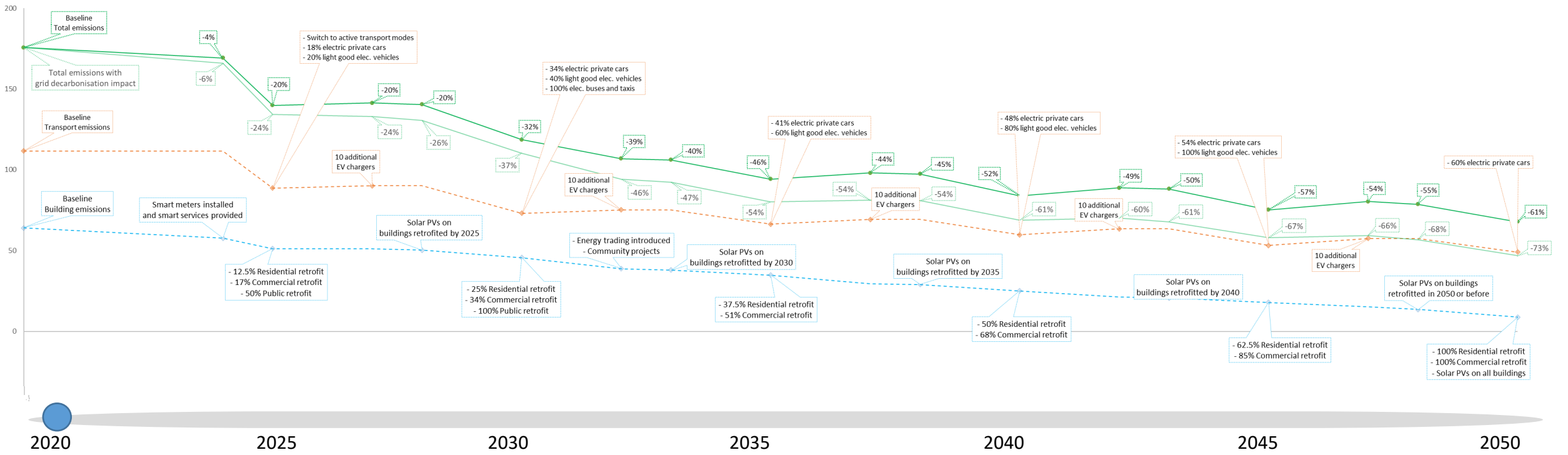
Max. value

Display

All With values

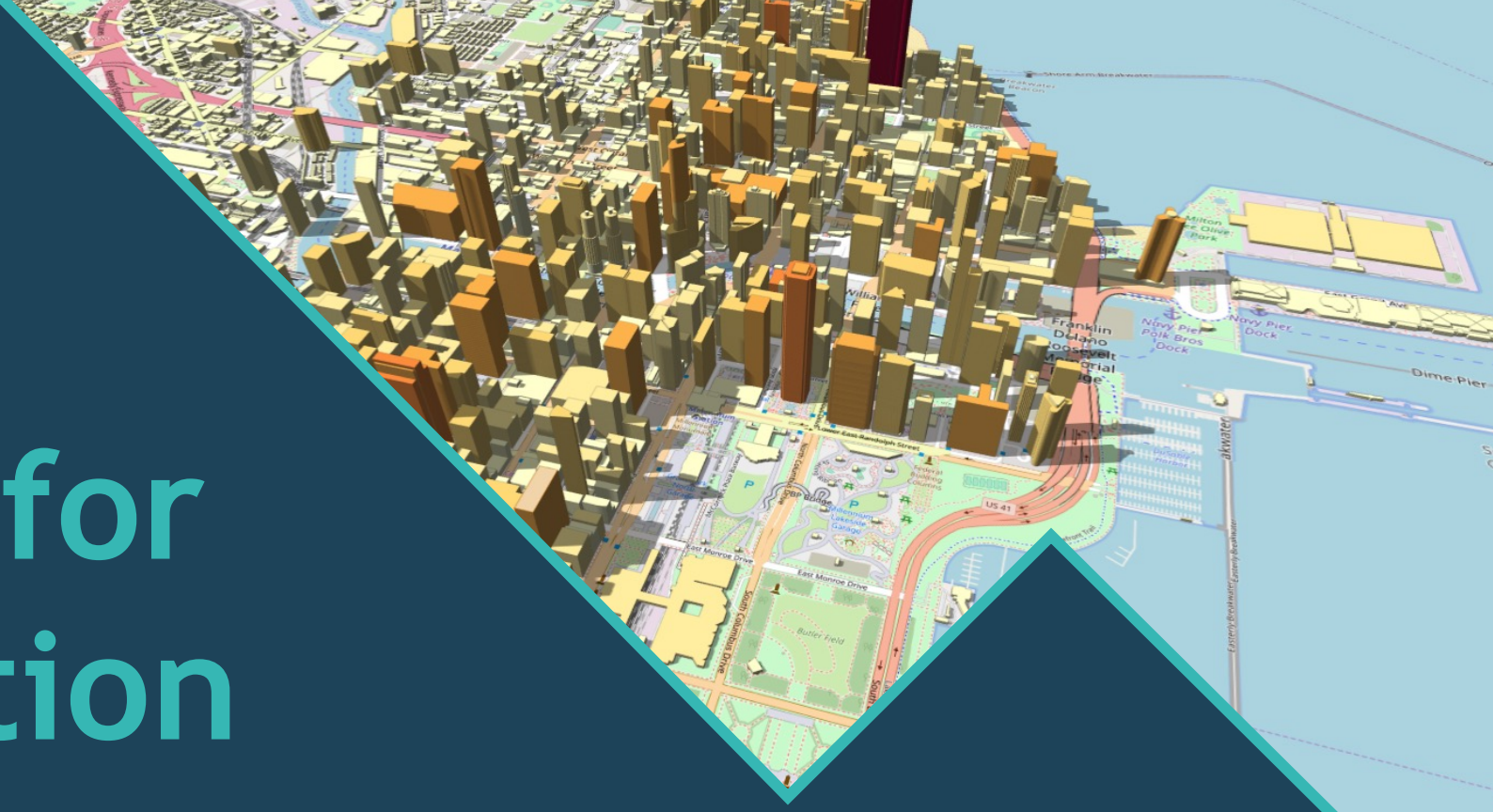
Retrofit year

- 2025
- 2030
- 2035
- 2040
- 2045
- 2050





Thank you for
your attention



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