

Optimisation of Localised Energy Services for Commercial Portfolio Owners

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IDEA Conference Theme 4A – Development Trends, Business Models, and
Incentives for CHP & District Energy

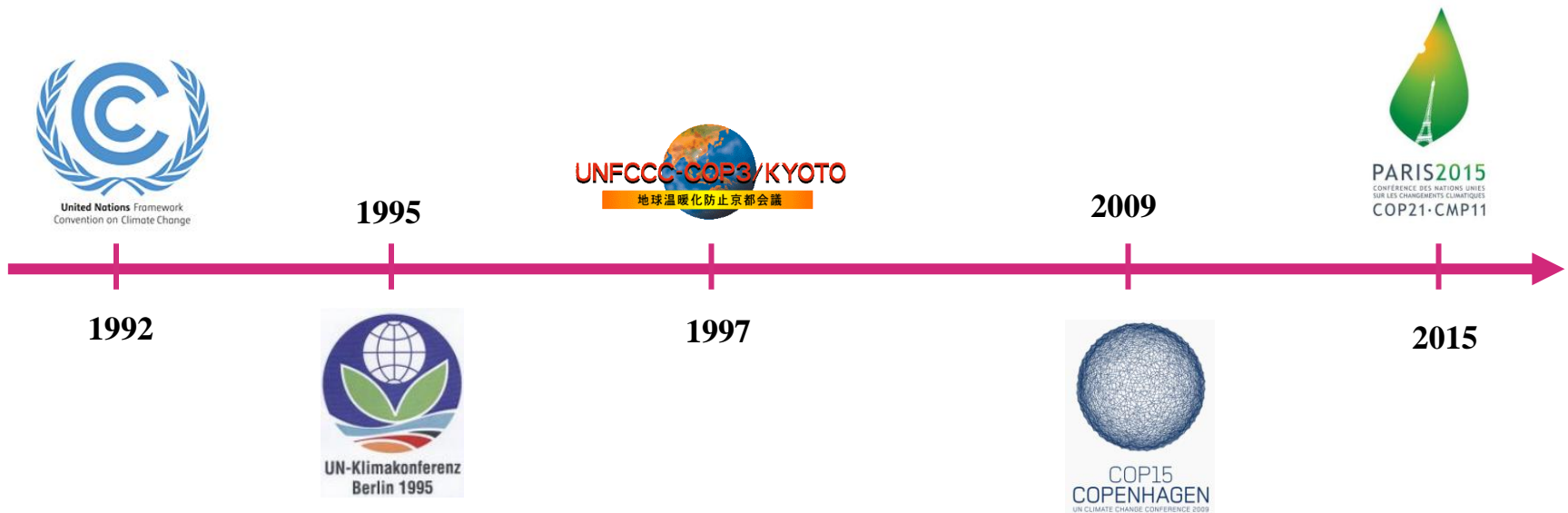
June 20, 2016

Drivers of Change

Planning, Carbon and Energy in the UK

- Grid reliability – signs of weakness
 - Lowest margin recently...
- UK Climate Change Act + INDCs
 - Zero carbon by 2016 (homes) and 2019 (non-domestic)
 - Building Regulations
- London Planning Policy energy performance standards
 - 35% better than national standards
 - From October: Zero carbon offset payment @ £1800/tonne [US\$2600 per ton]

United Nations Framework Convention on Climate Change (UNFCCC) and the Conference of Parties (CoP)



Voluntary Commitments and Non-State Actors

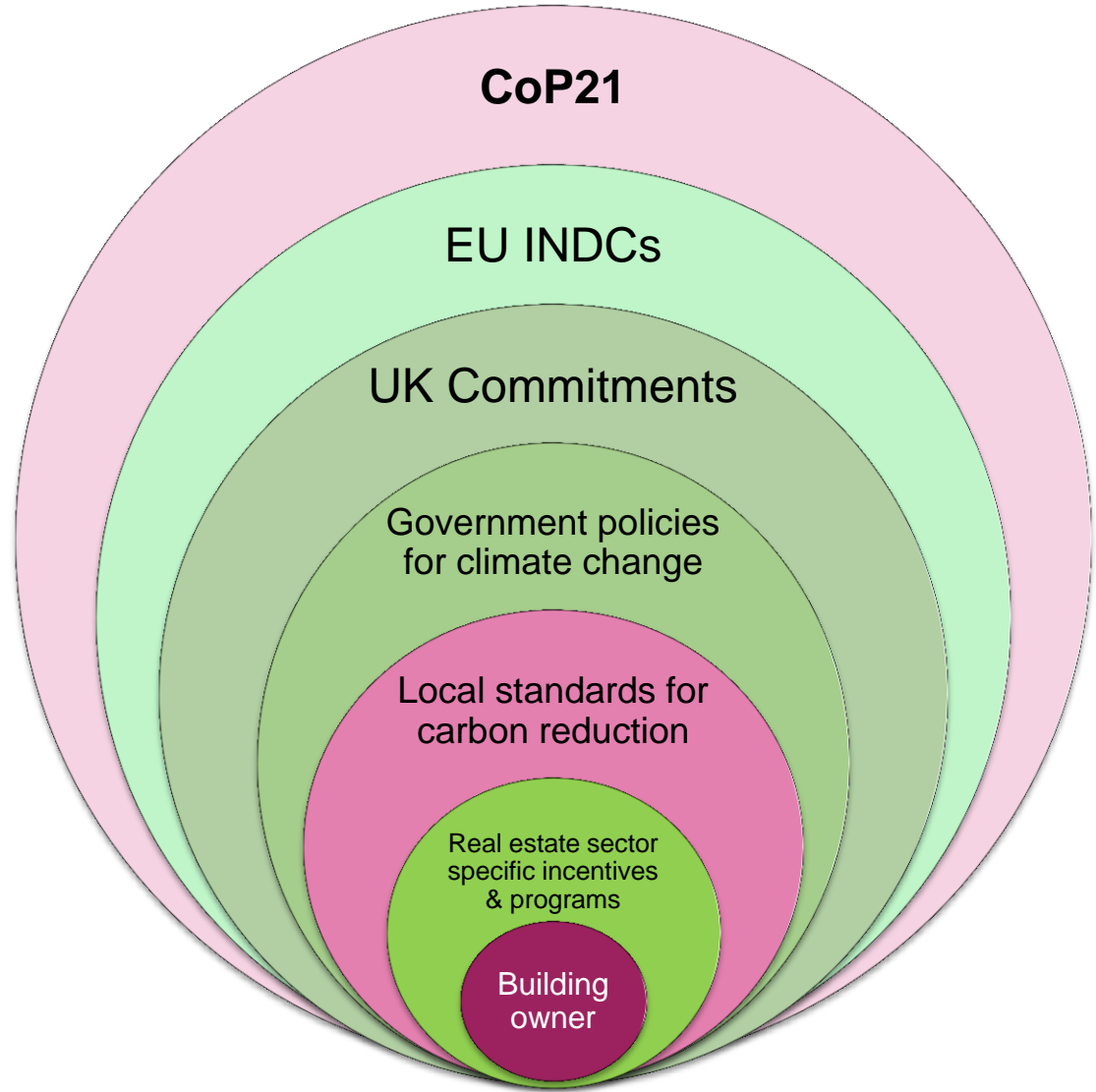
The Paris Pledge for Action

COP21: European companies launch 'Nearly Zero Energy Building' programme

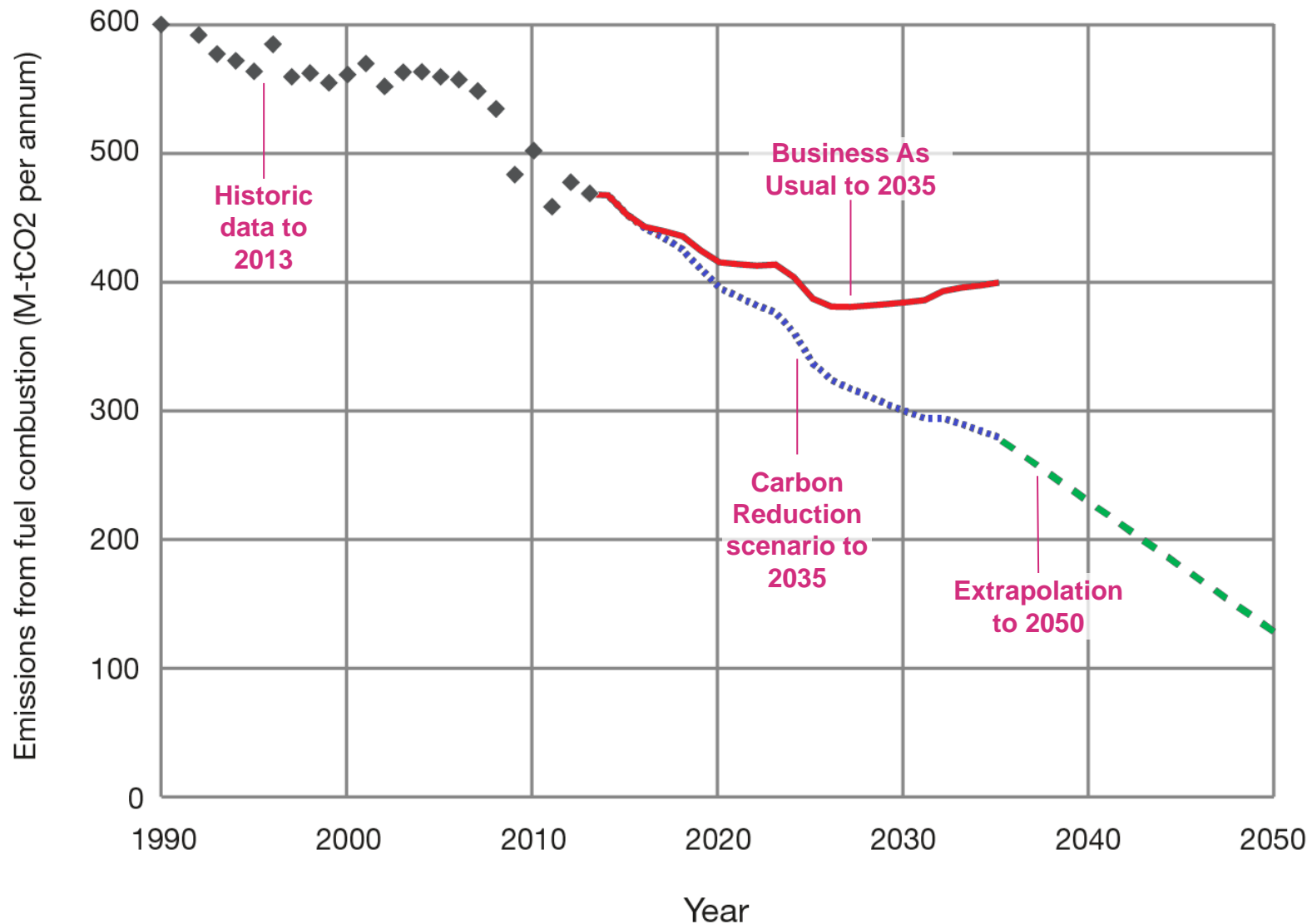
MAINSTREAMING CLIMATE ACTION WITHIN
FINANCIAL INSTITUTIONS



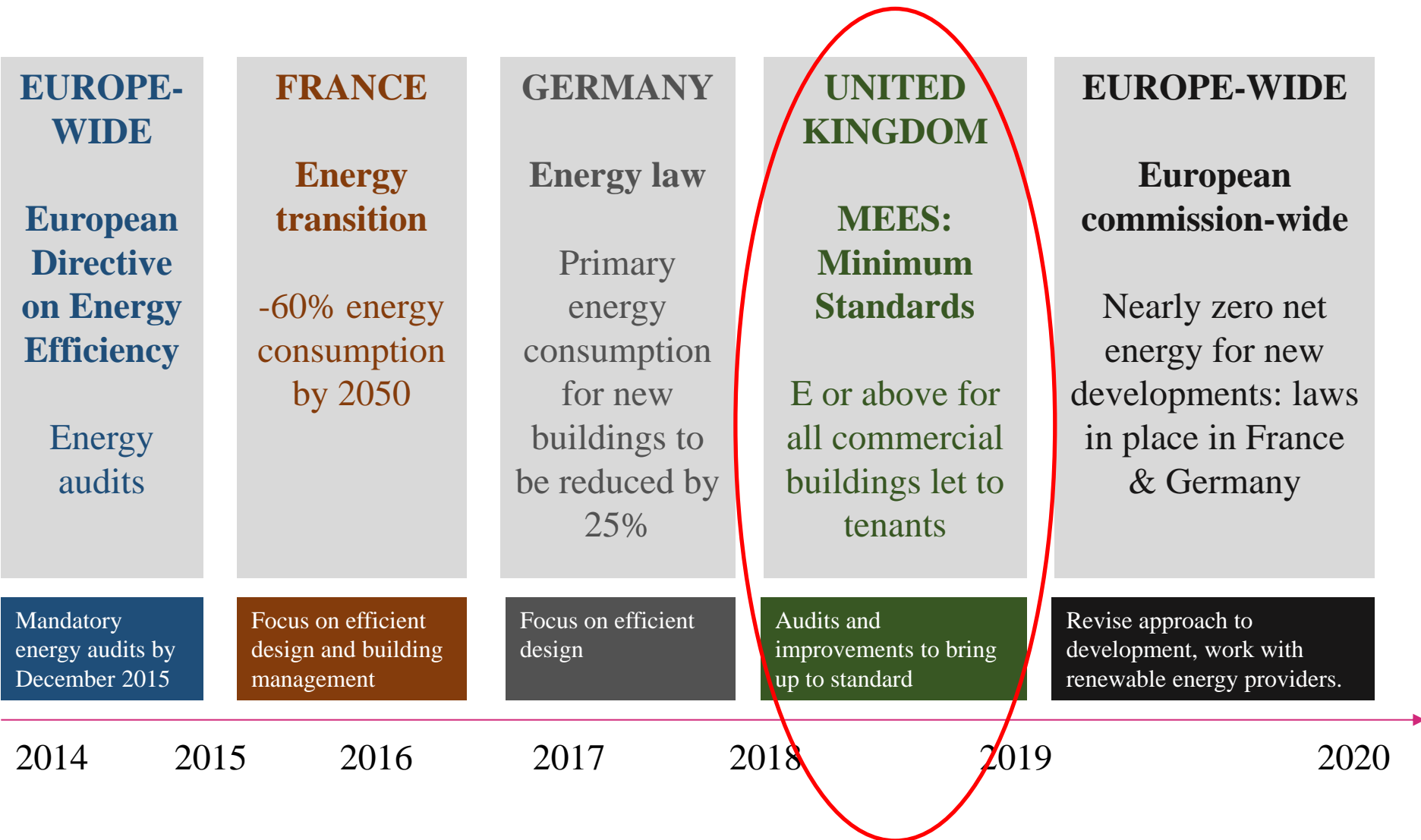
C40CITIES
CLIMATE LEADERSHIP GROUP



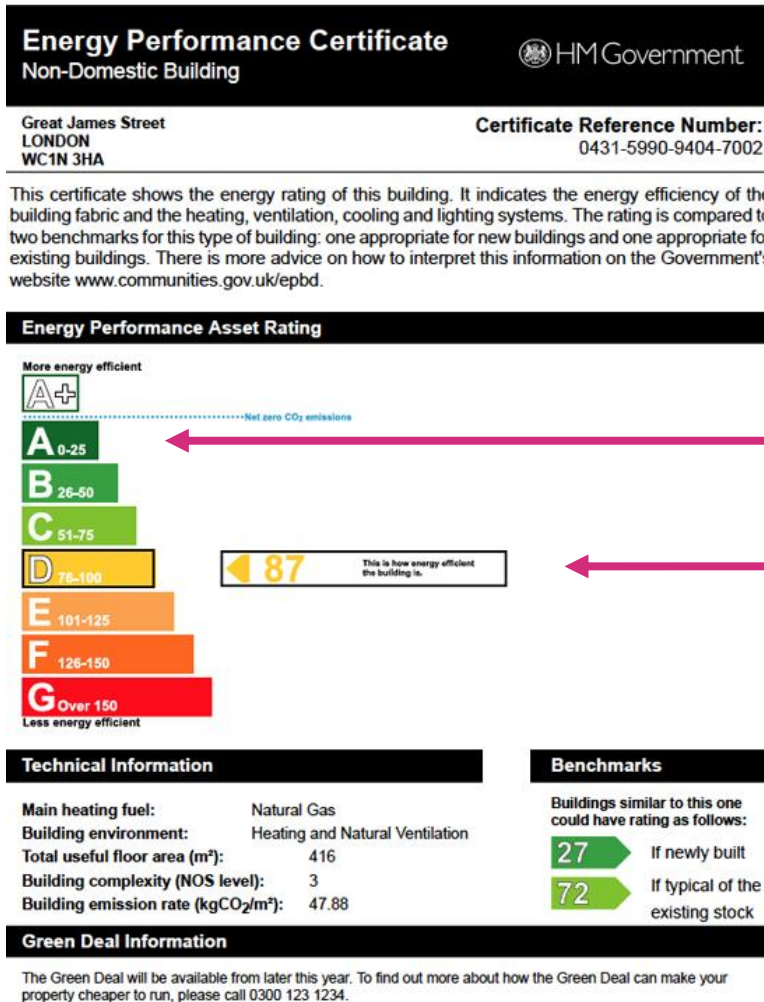
Carbon budgeting



Legislation impacting the building sector



Energy Performance Certificates and Minimum Energy Efficiency Standards



By 2050 we need to get here

UK average building EE today

London Plan Energy Policy

Today:

- New development CO₂ emissions to be **35% below** current national building standards (Part L 2013)
- Strong policy preference for heat networks

From October 2016:

- 35% standard still in place
- “Zero carbon homes:” **Offset payment** of £1800/tonne [~\$2500/ton], £60/tonne x 30 years

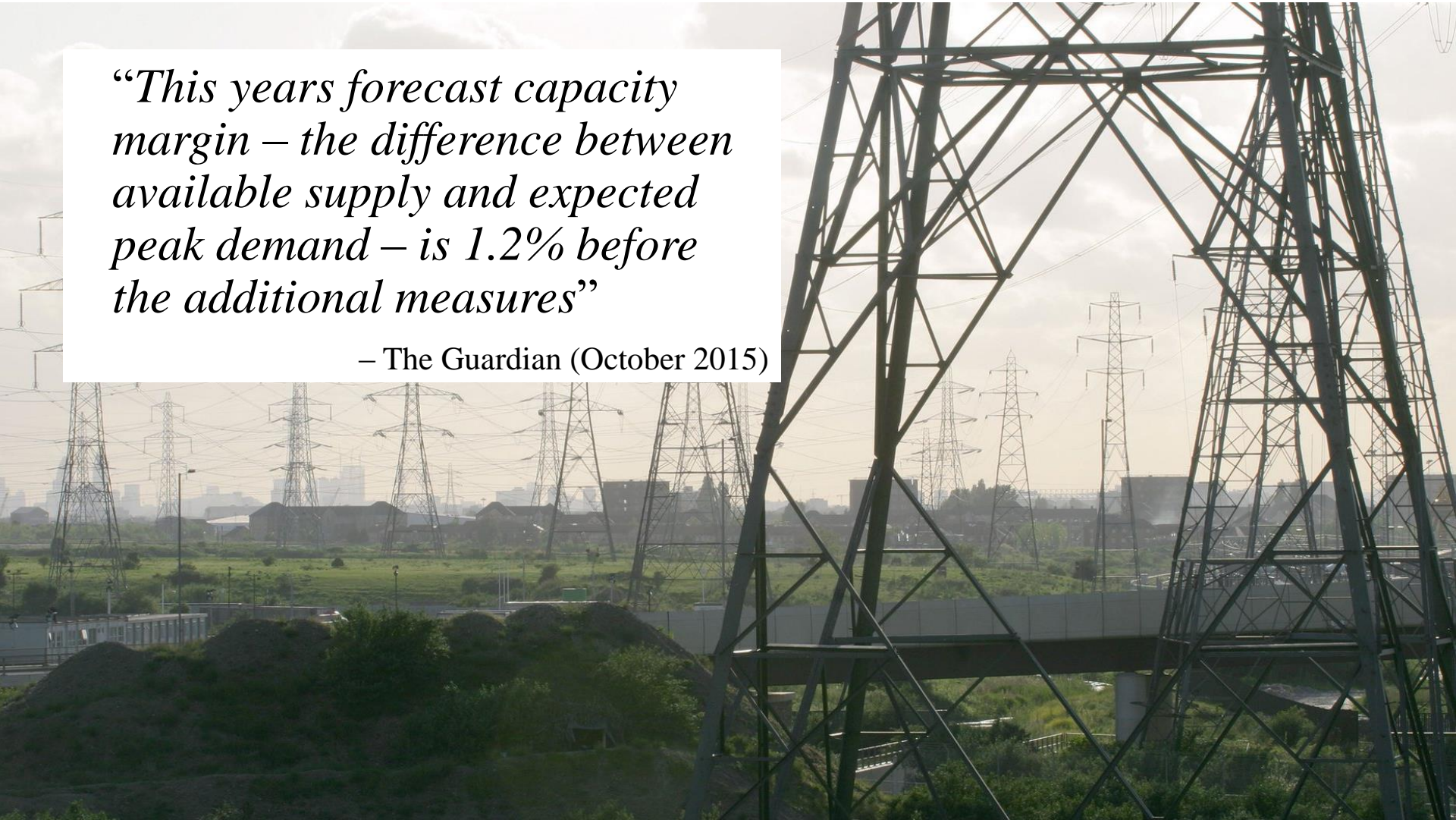
From 2019:

- “Zero carbon” non-domestic buildings

National Grid winter capacity is lowest in a decade

“This years forecast capacity margin – the difference between available supply and expected peak demand – is 1.2% before the additional measures”

– The Guardian (October 2015)



Distributed Energy Systems case studies

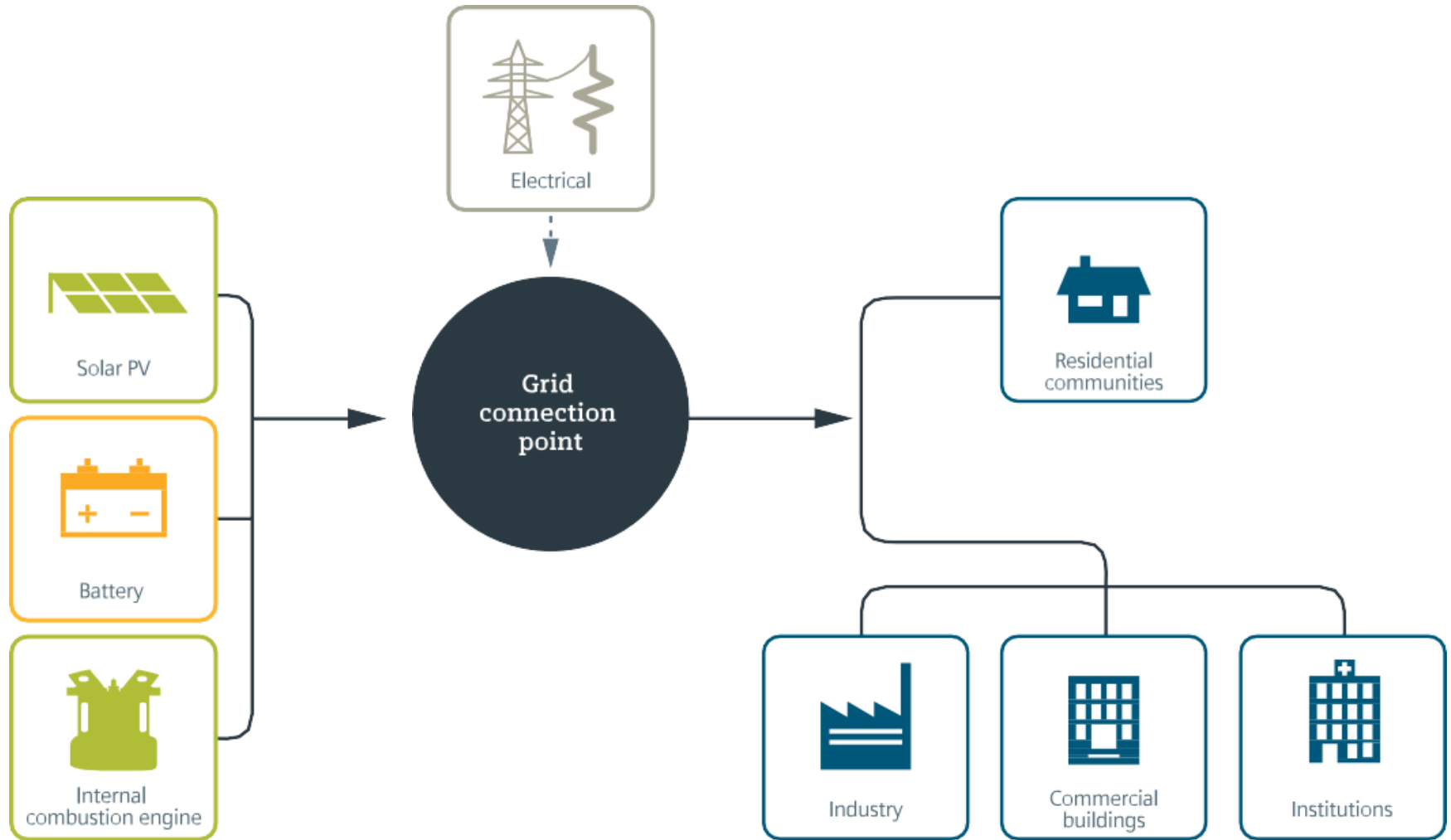


Distributed Energy Systems

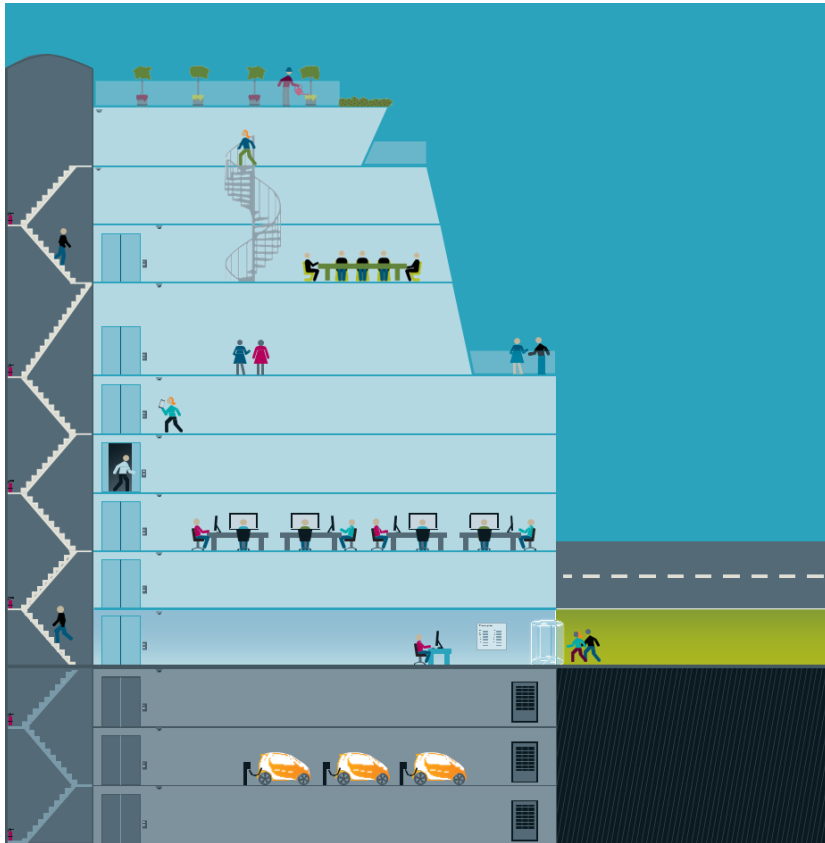
Flexible and Efficient Power for the New Energy Era

A research project carried out by Arup and Siemens

Distributed Energy Systems



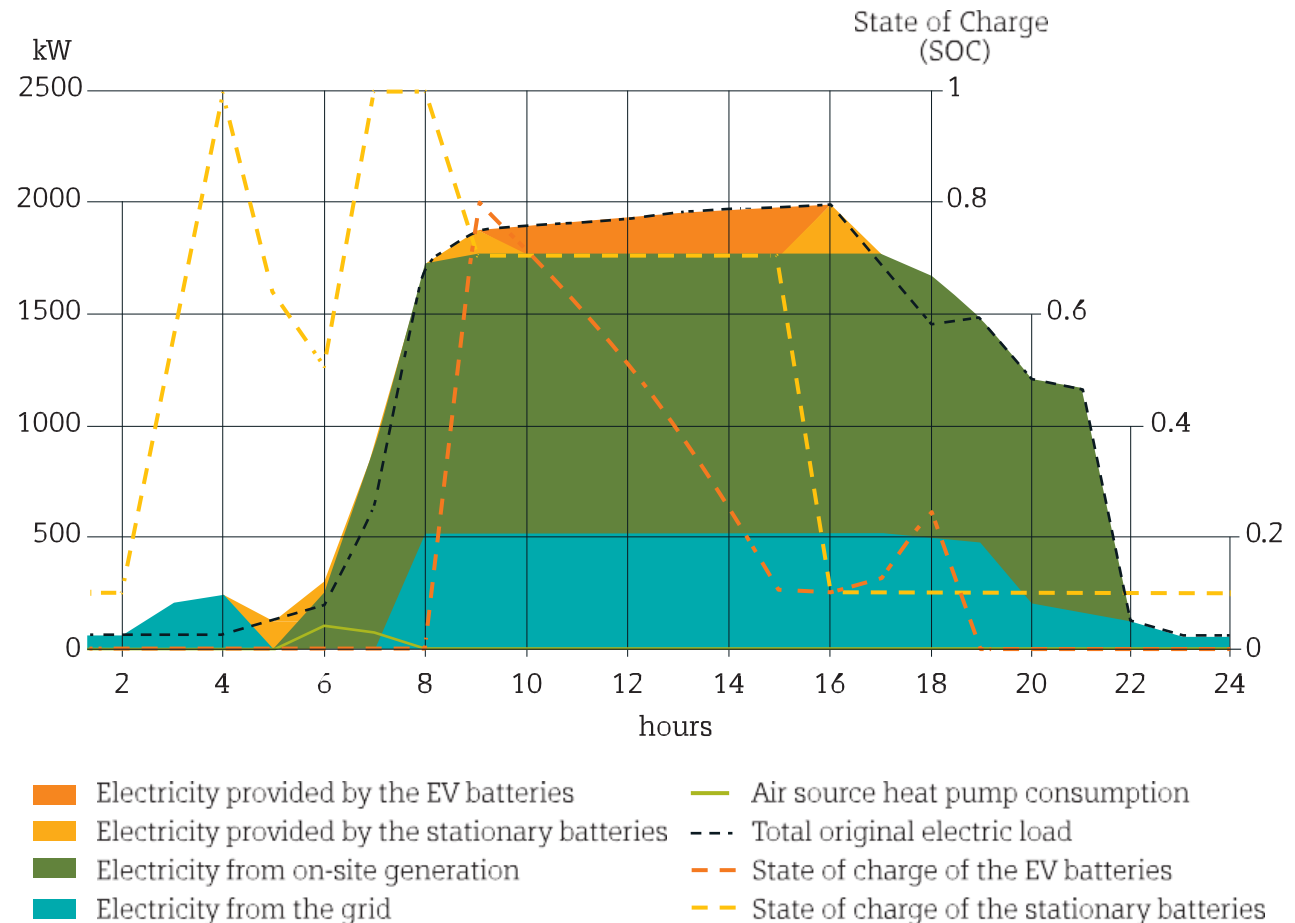
Smart Green Building, Germany



- 1000 kW diesel engine
- 250 kW gas-fired CHP engine
- 360 kWh batteries
- 2700 kWh heat store
- EV charging points
- Building Energy Management System

Smart Green Building, Germany

- 4-8% annual cost savings
- 8-10% annual CO₂ savings
- Less than 10 year return on investment



Microgrid with Anchor Load, India



Buildings:

- Factory anchor load
- Village homes and community building

Energy system:

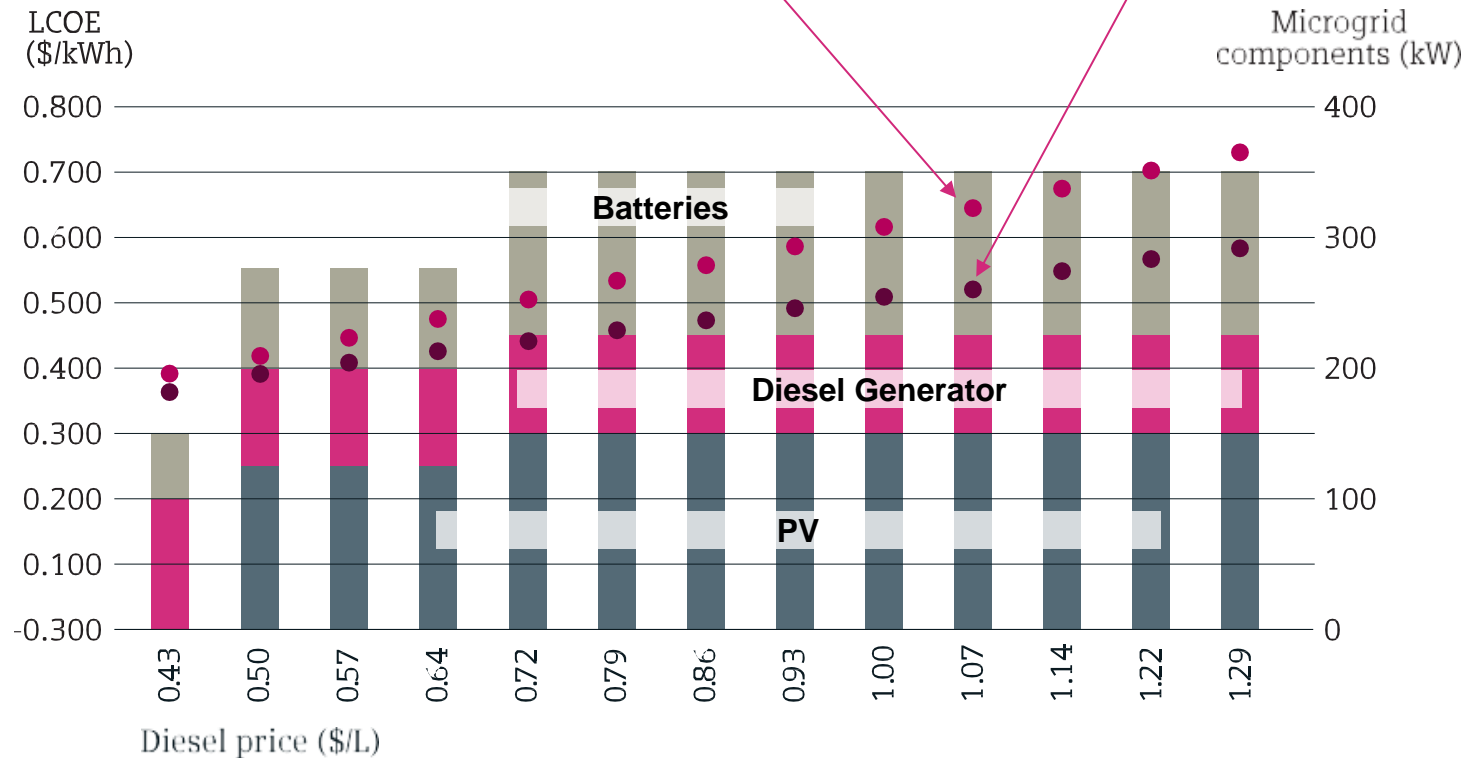
- 125 kWp PV array
- 75 kW diesel generator
- 280 kWh batteries (75kW peak output)

Microgrid with Anchor Load, India

As the price of diesel rises...

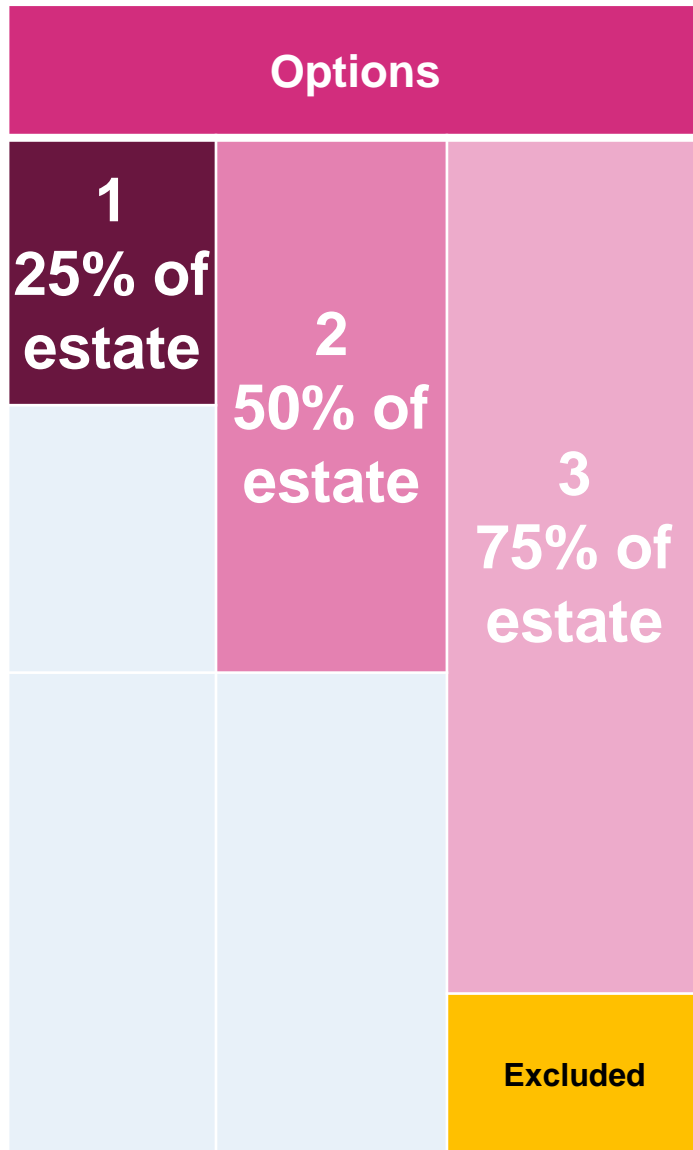
...the savings from the hybrid system increase.

- 28% annual cost savings
- 38% annual CO₂ savings
- LCoE 40¢/kWh

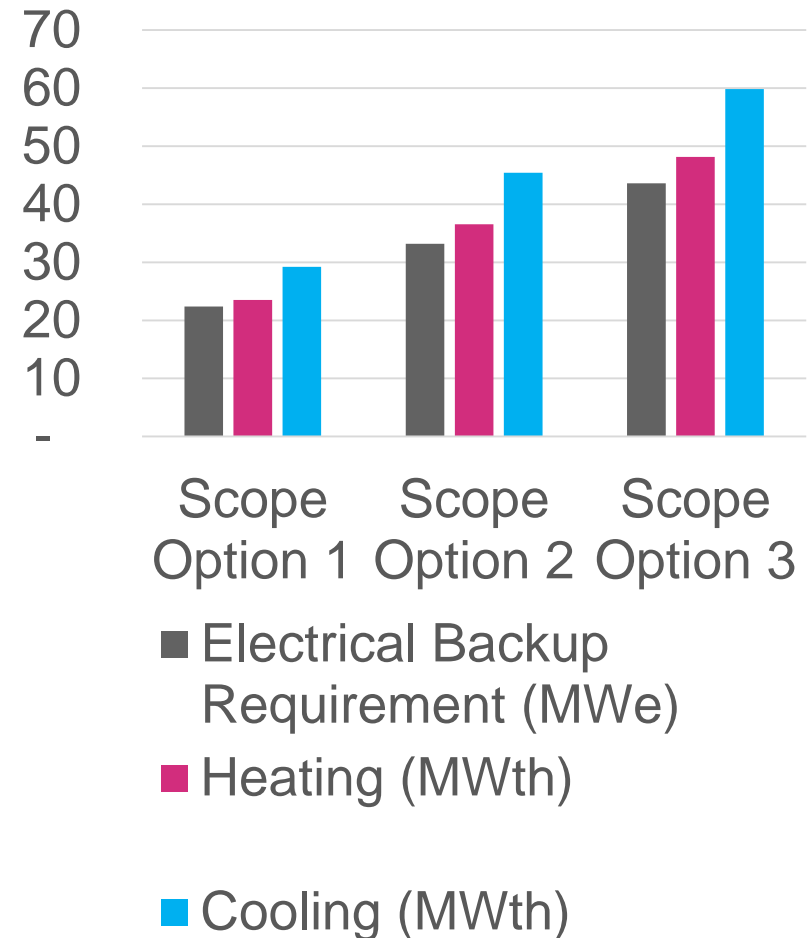


London Commercial Property Energy Strategy

Scoping the opportunity



Peak Energy Demands (MW)



The Drivers of Centralised Energy Systems

Reduced life cycle cost and improved resilience due to centralised maintenance and operation activities;



Reducing energy consumption and carbon emissions through increased efficiency of central systems



Increase net lettable area and quality of service while potentially lower costs; **plug & play** backup



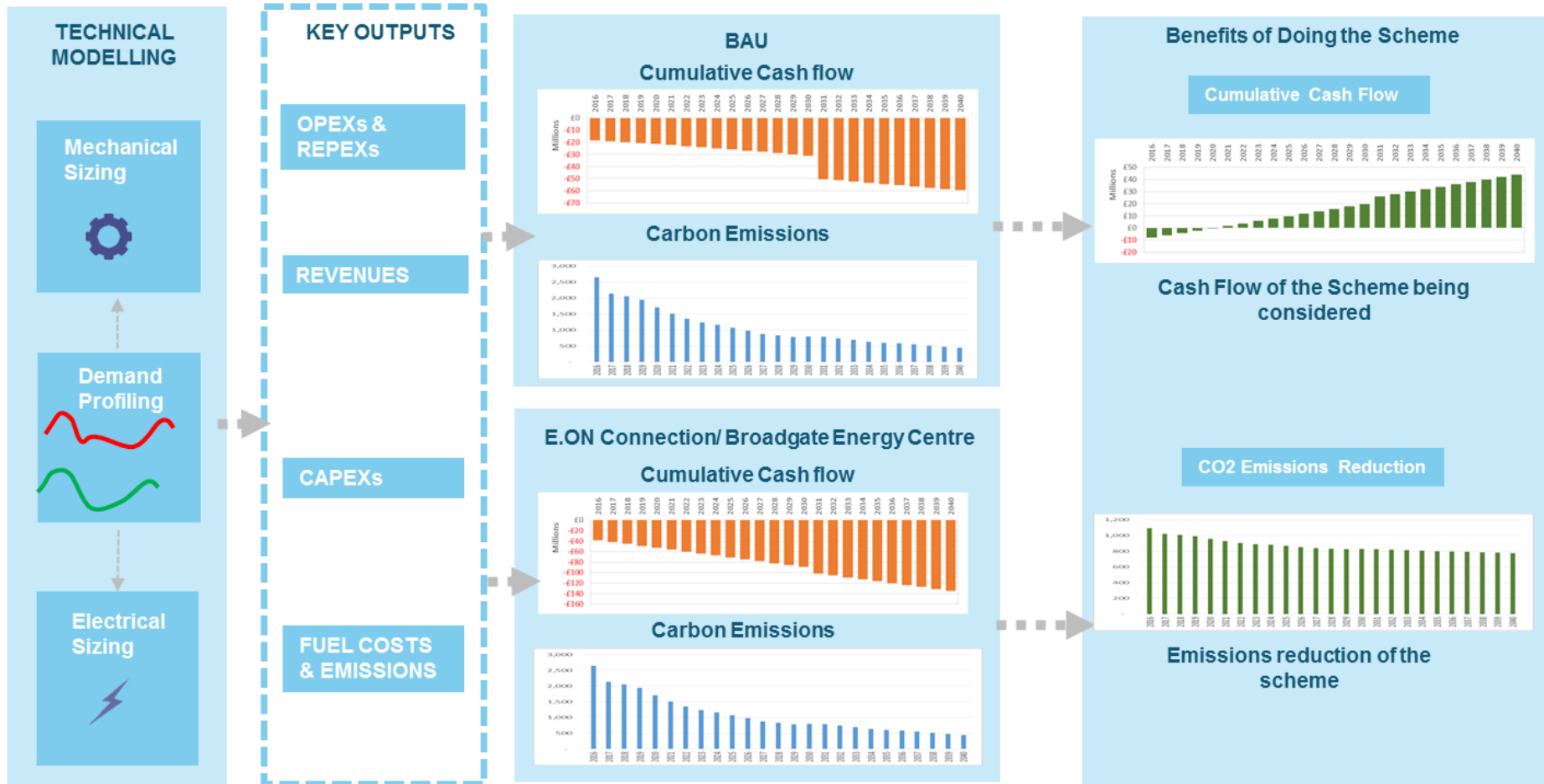
Future proof and secure energy planning requirements so that penalties are not incurred

ENERGY PLANNING
Greater London Authority guidance on preparing energy assessments (April 2015)



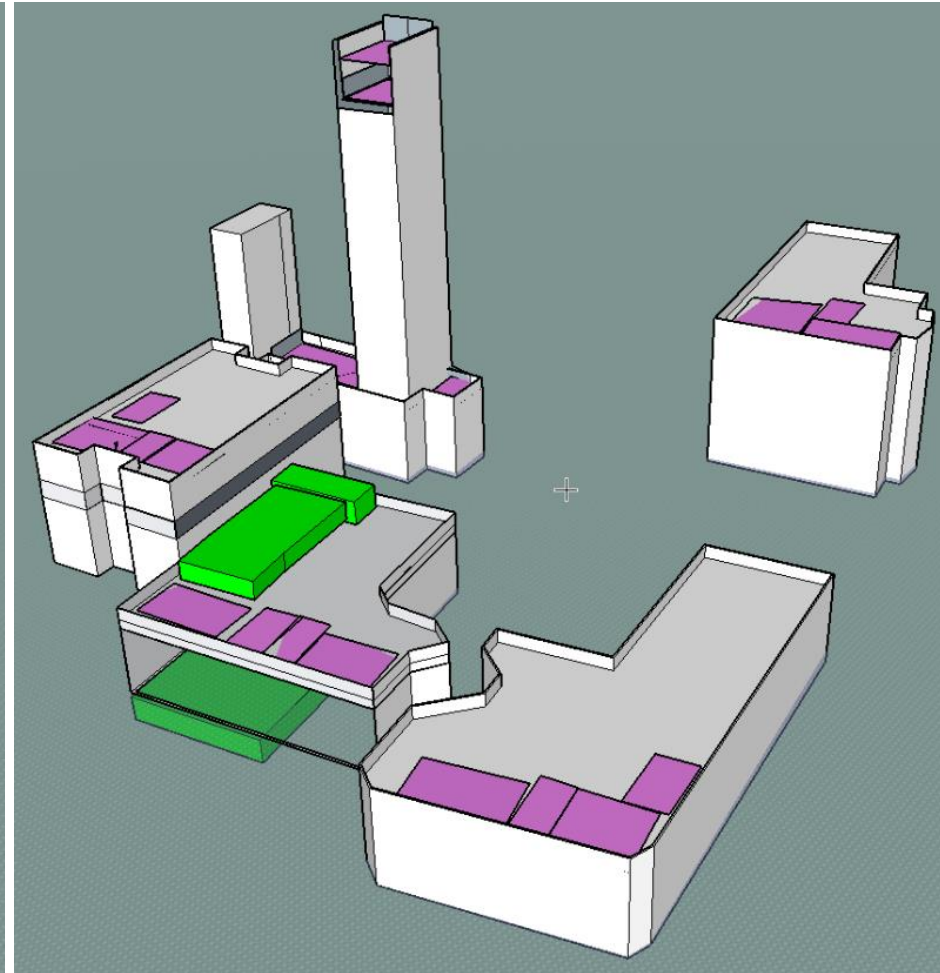
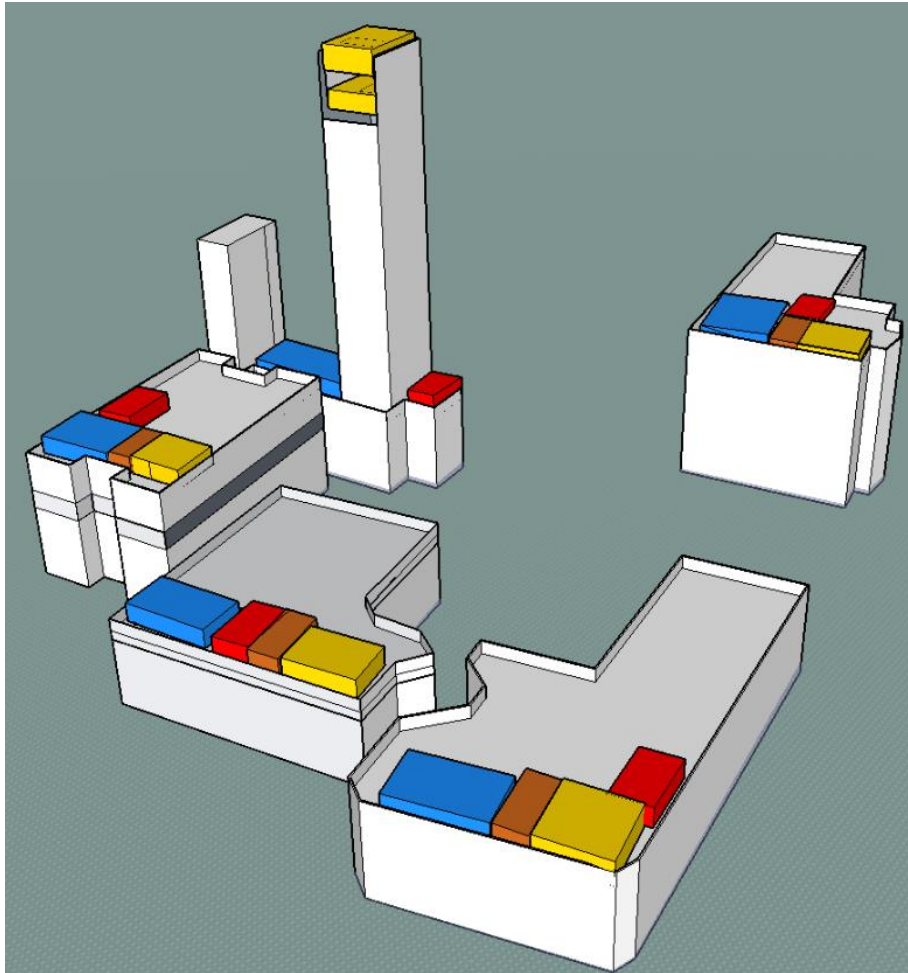
The London Plan

Techno-economic Modelling



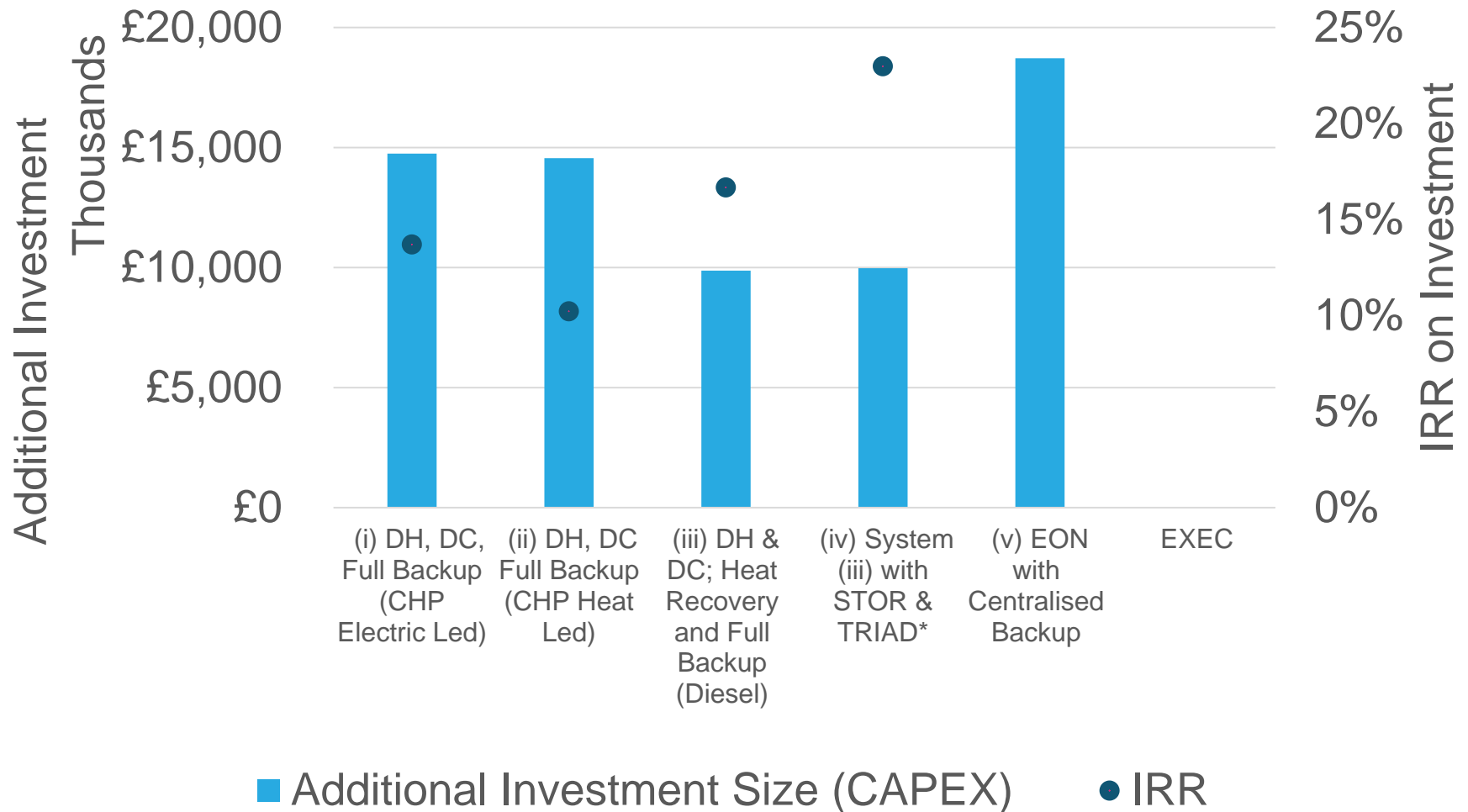
Centralising Energy Services

- Landlord Generators
- Tenant Generators
- Boilers
- Chillers
- Energy Centre
- Space Saved



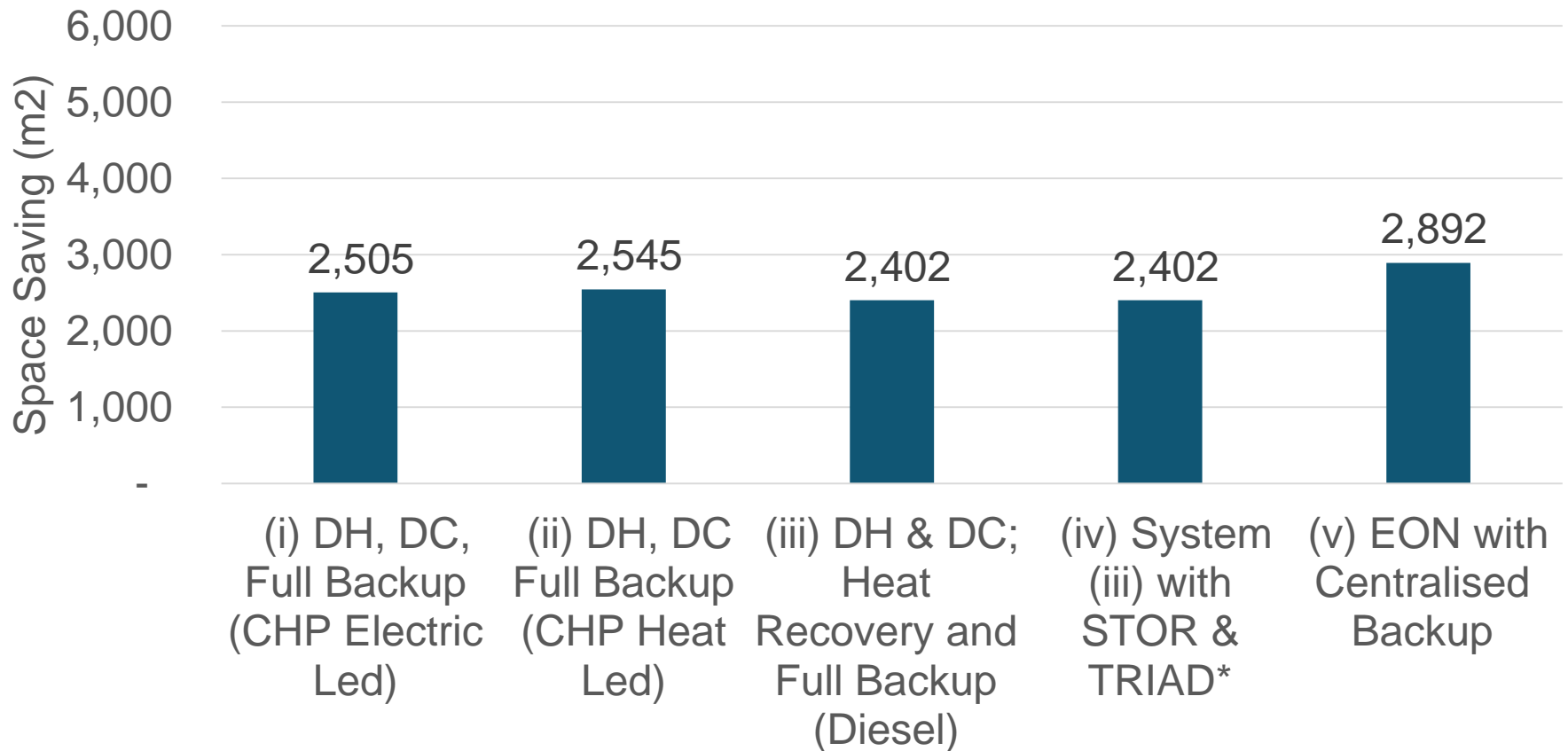
Commercial results

Additional CAPEX & IRR

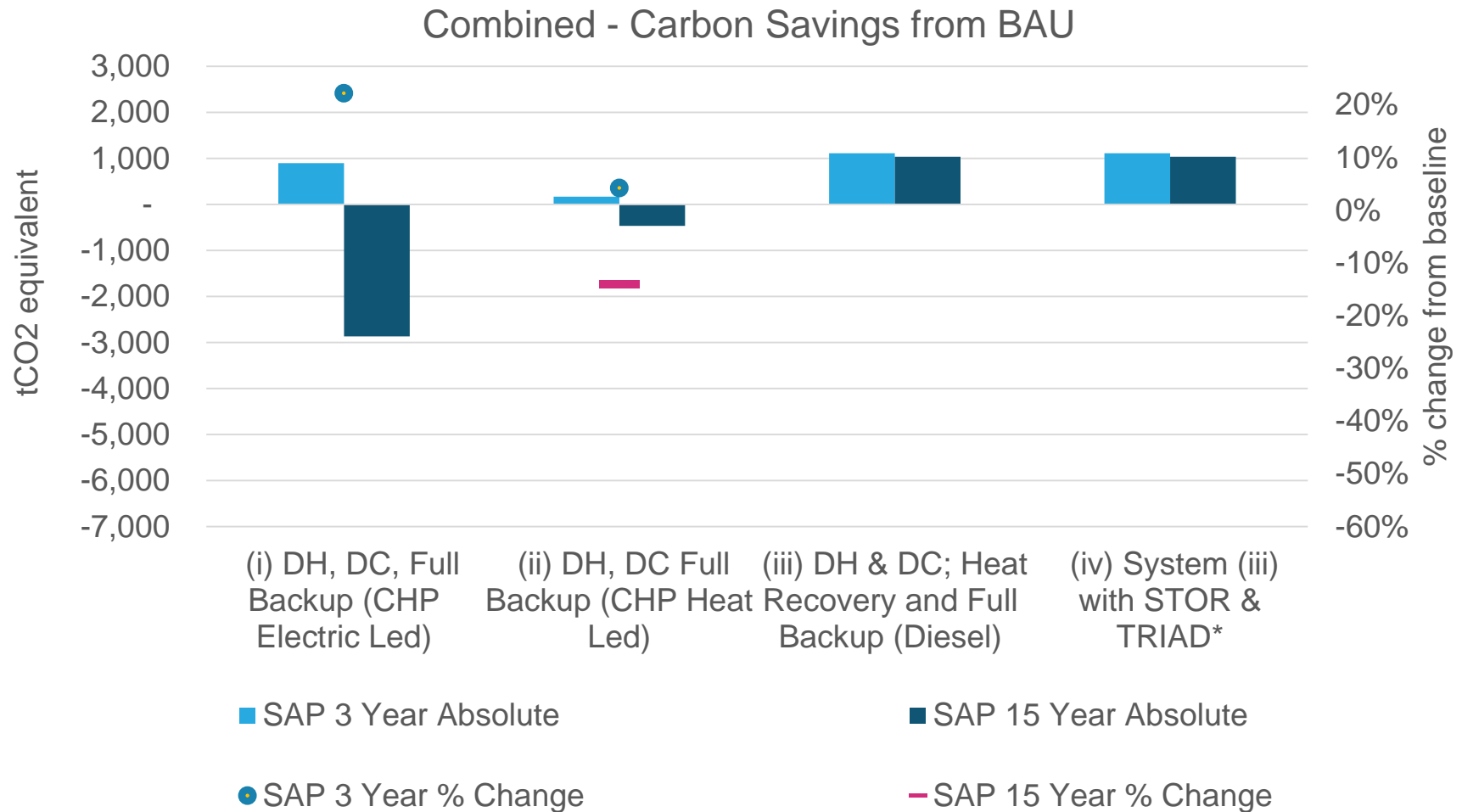


Space Performance

Combined Space Saving



Carbon Savings



Conclusions

- tbc

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