

# Optimisation of Localised Energy Services for Commercial Portfolio Owners

Stephen Cook

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

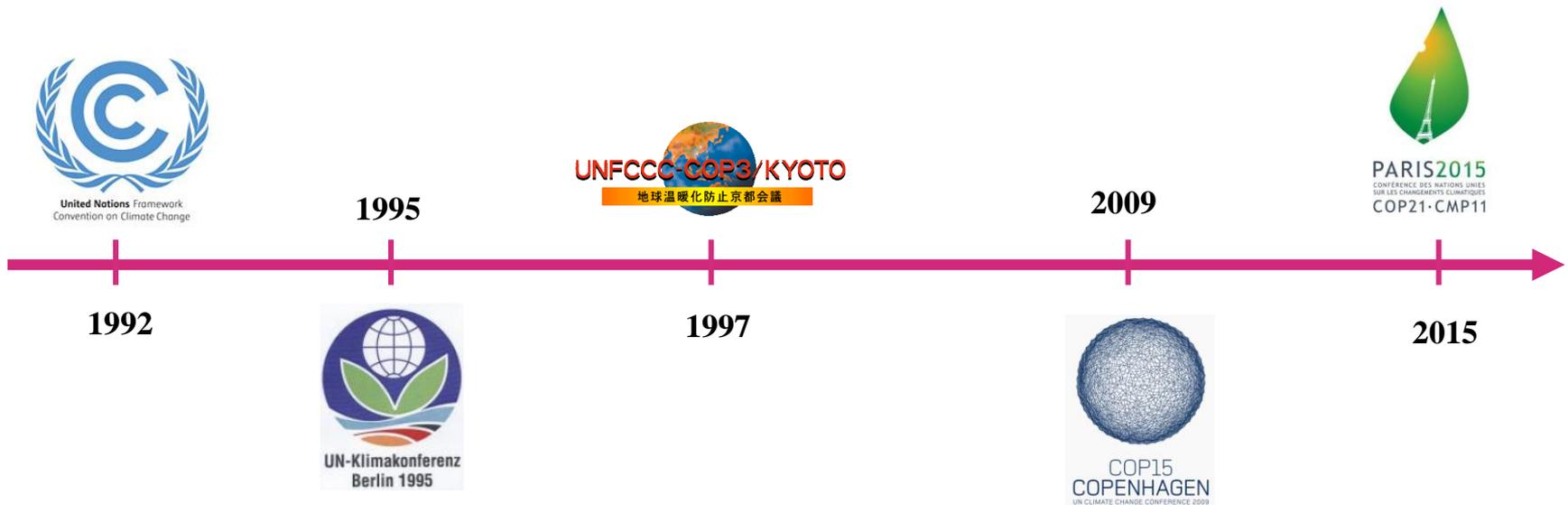
June 20, 2016

# 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

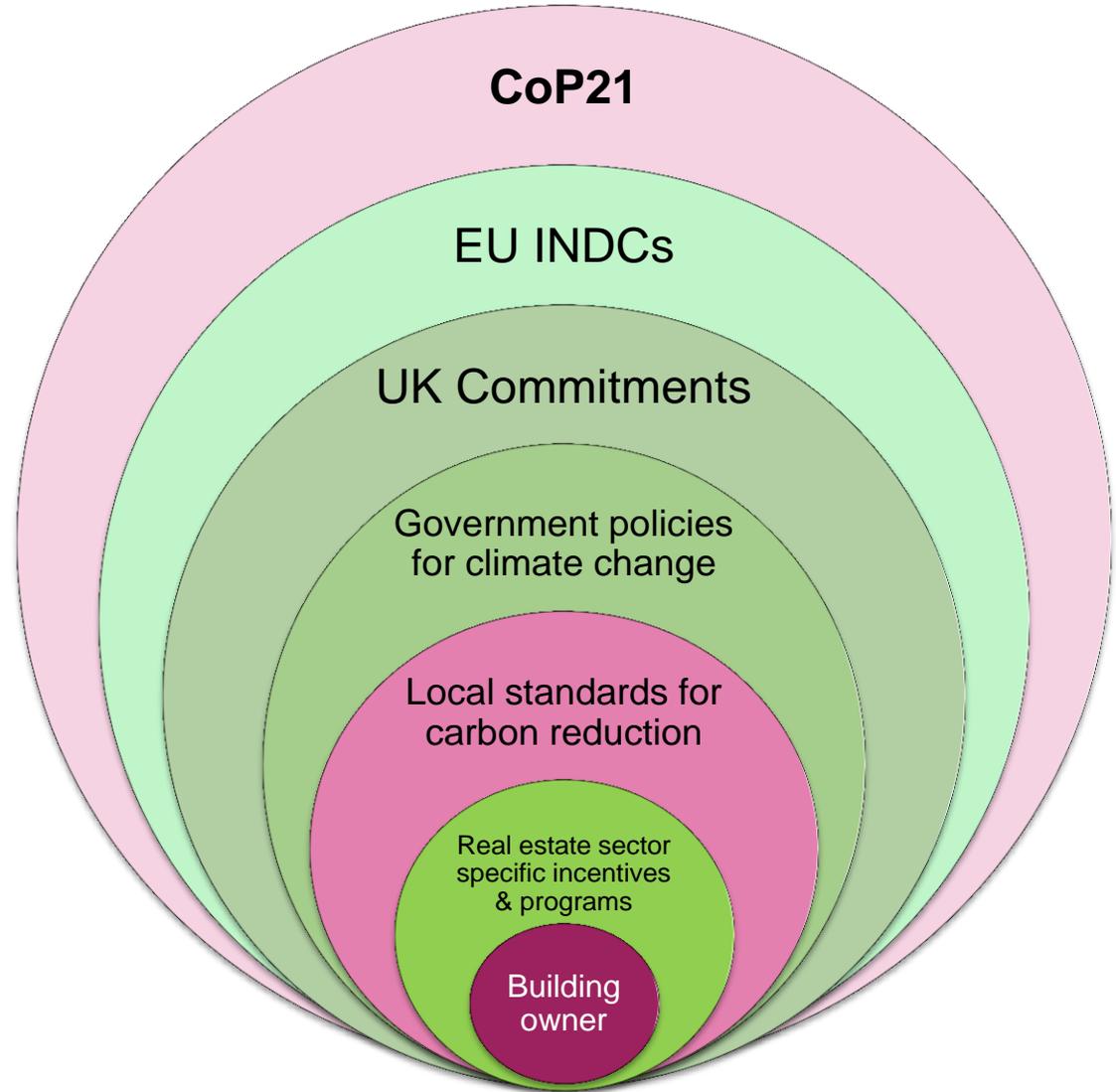
**COP21: European companies launch 'Nearly Zero Energy Building' programme**



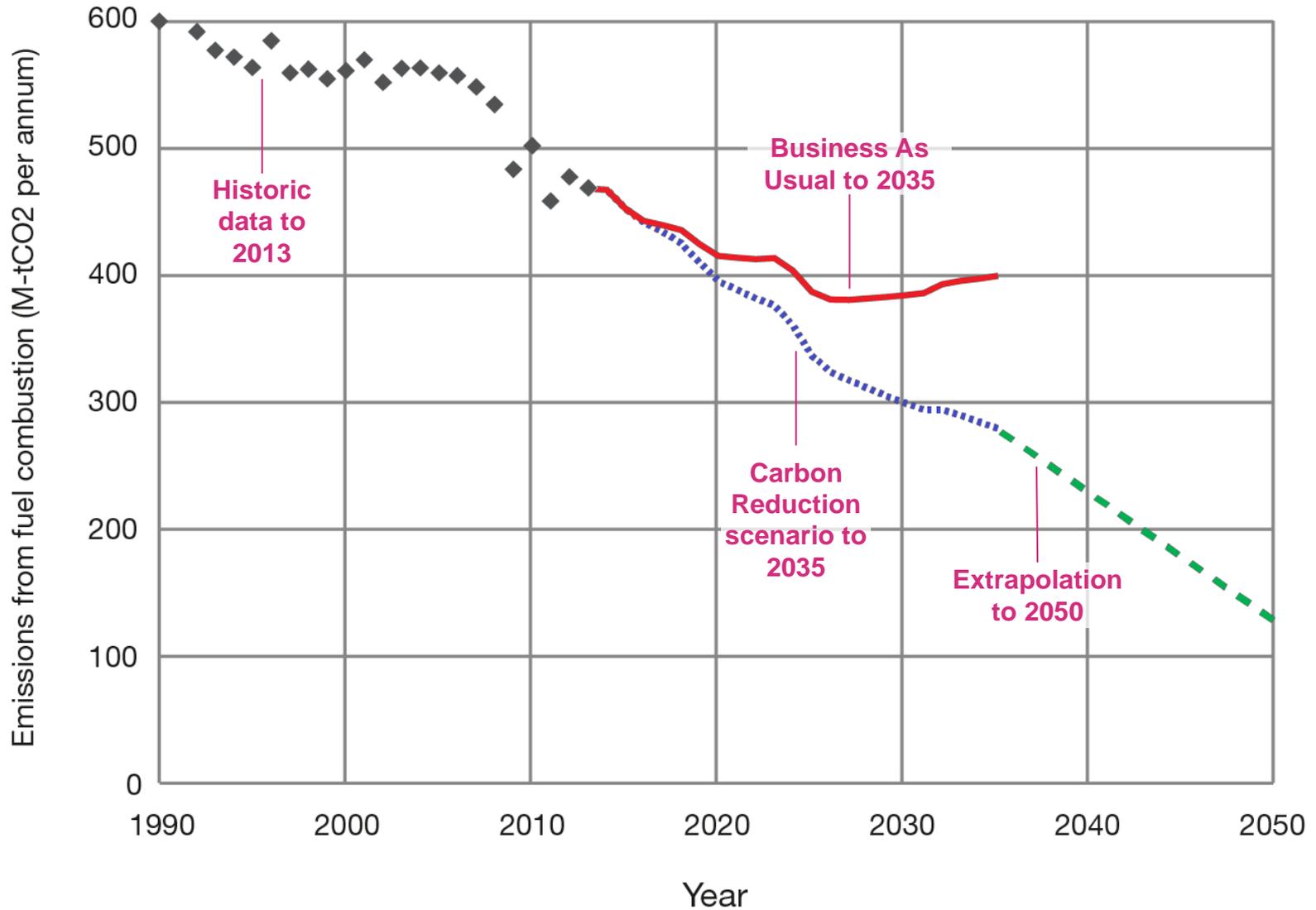
MAINSTREAMING CLIMATE ACTION WITHIN FINANCIAL INSTITUTIONS



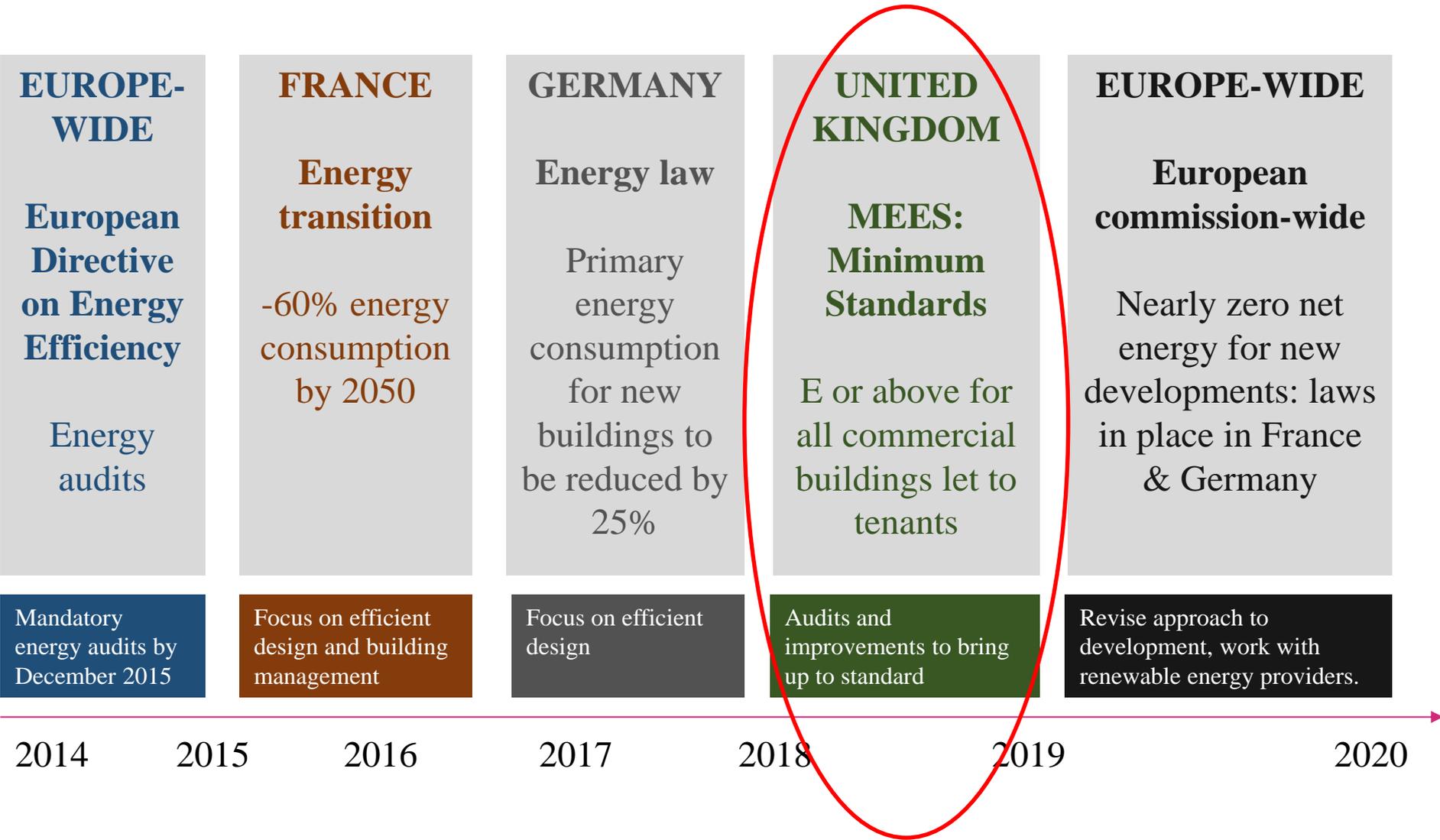
**C40CITIES**  
CLIMATE LEADERSHIP GROUP



# Carbon budgeting



# Legislation impacting the building sector



# Energy Performance Certificates and Minimum Energy Efficiency Standards

## Energy Performance Certificate Non-Domestic Building



Great James Street  
LONDON  
WC1N 3HA

Certificate Reference Number:  
0431-5990-9404-7002

This certificate shows the energy rating of this building. It indicates the energy efficiency of the building fabric and the heating, ventilation, cooling and lighting systems. The rating is compared to two benchmarks for this type of building: one appropriate for new buildings and one appropriate for existing buildings. There is more advice on how to interpret this information on the Government's website [www.communities.gov.uk/epbd](http://www.communities.gov.uk/epbd).

### Energy Performance Asset Rating

More energy efficient



87 This is how energy efficient the building is.

By 2050 we need to get here

UK average building EE today

### Technical Information

Main heating fuel: Natural Gas  
 Building environment: Heating and Natural Ventilation  
 Total useful floor area (m<sup>2</sup>): 416  
 Building complexity (NOS level): 3  
 Building emission rate (kgCO<sub>2</sub>/m<sup>2</sup>): 47.88

### Benchmarks

Buildings similar to this one could have rating as follows:

- 27** If newly built
- 72** If typical of the existing stock

### Green Deal Information

The Green Deal will be available from later this year. To find out more about how the Green Deal can make your property cheaper to run, please call 0300 123 1234.

# London Plan Energy Policy

## Today:

- New development CO<sub>2</sub> 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

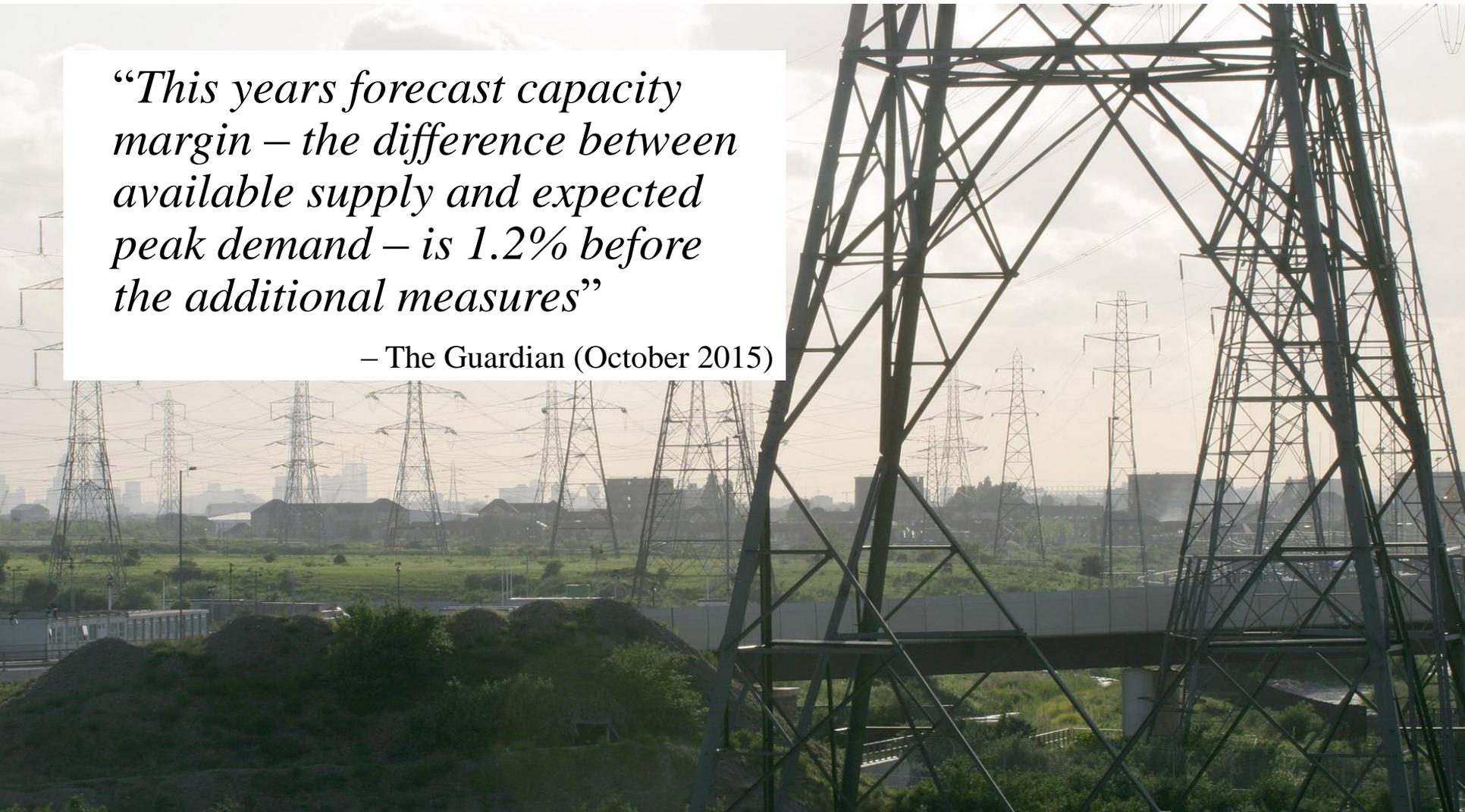
## From 2019:

- “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

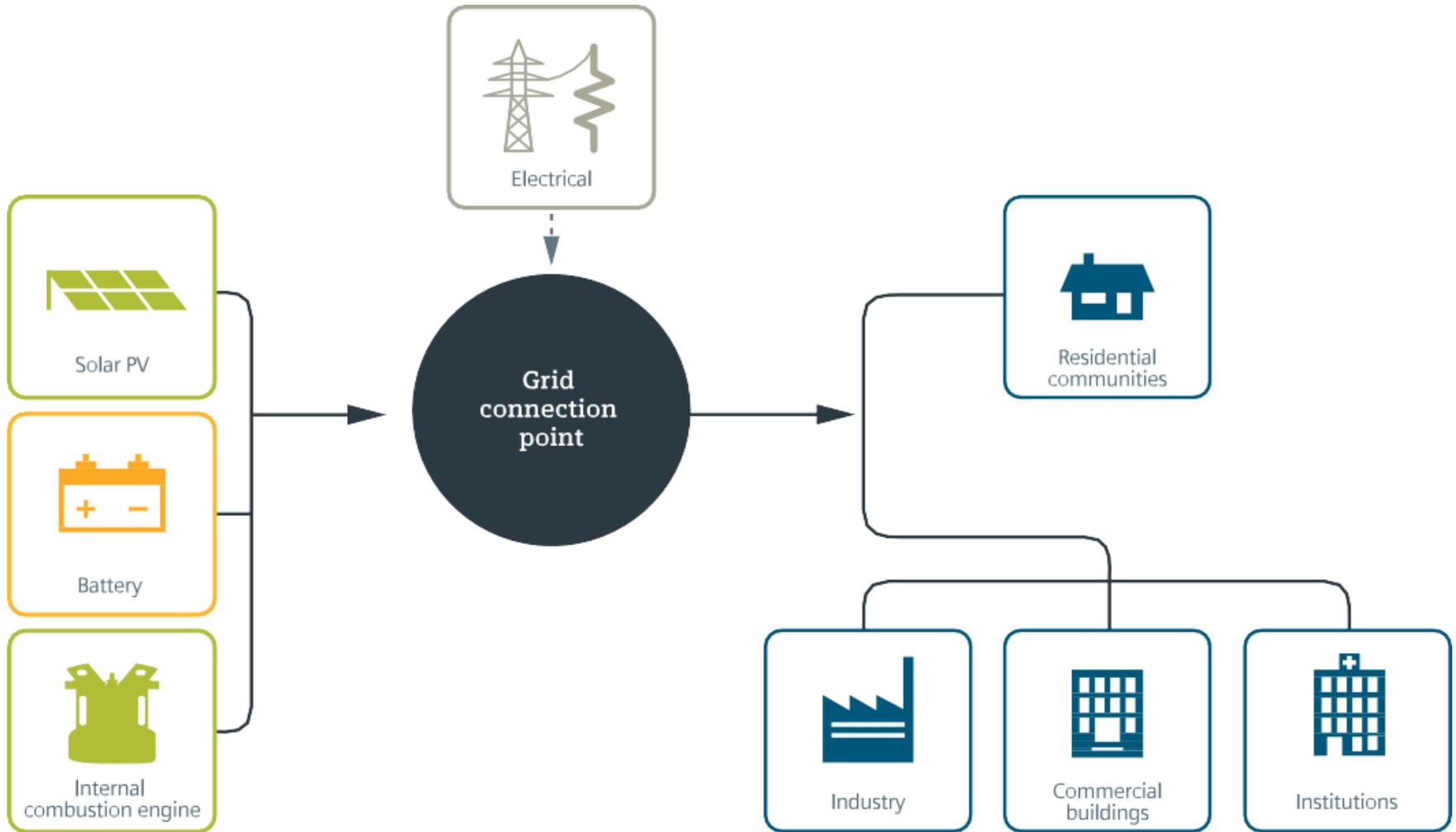


# Distributed Energy Systems

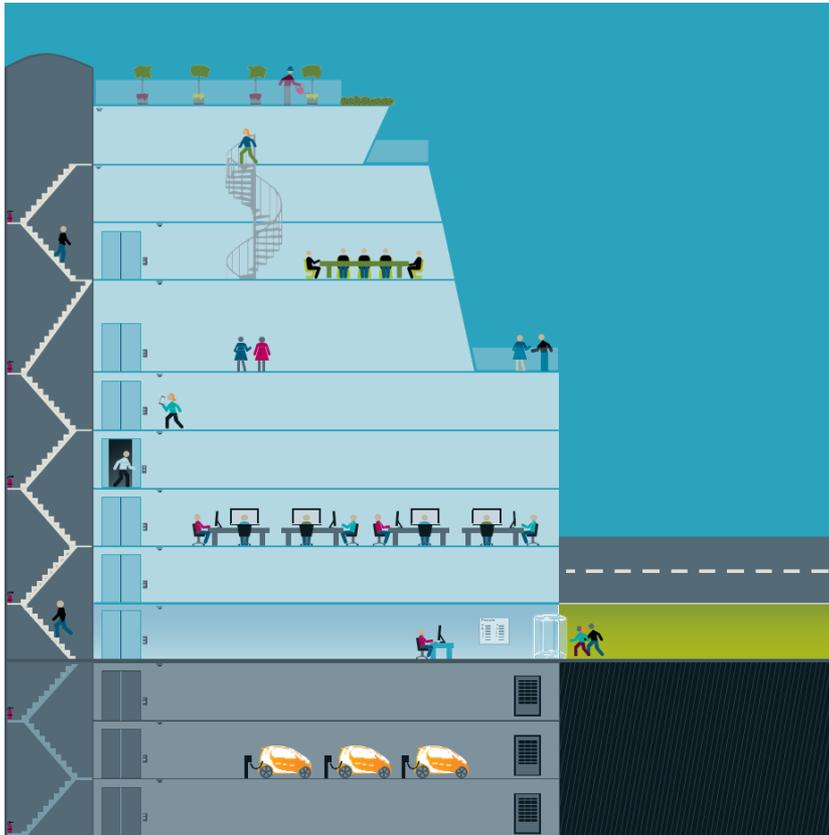
Flexible and Efficient Power for the New Energy Era

A research project carried out by Arup and Siemens

# Distributed Energy Systems



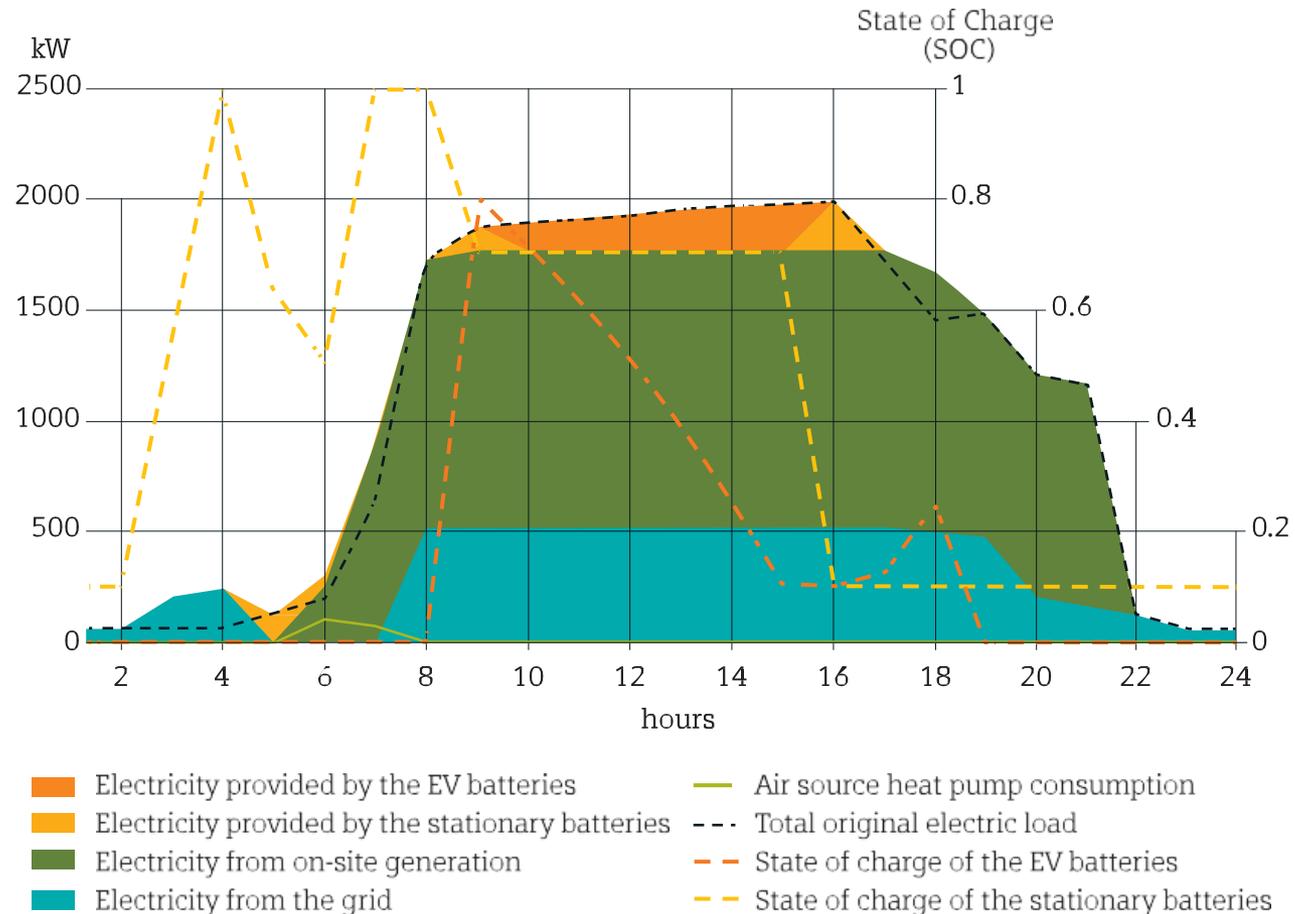
# Smart Green Building, Germany



- 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 CO<sub>2</sub> savings
- Less than 10 year return on investment



# Microgrid with Anchor Load, India



## Buildings:

- Factory anchor load
- Village homes and community building

## Energy system:

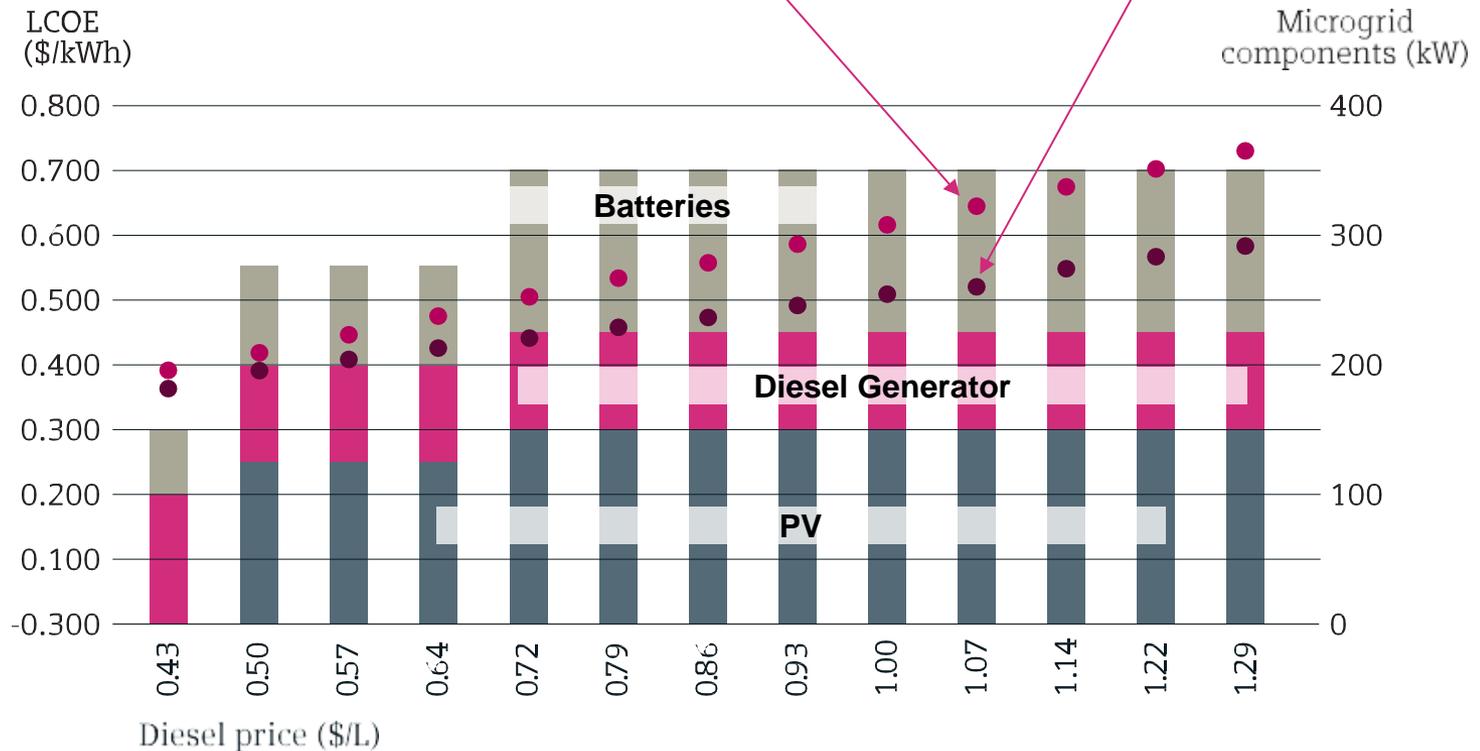
- 125 kWp PV array
- 75 kW diesel generator
- 280 kWh batteries (75kW peak output)

# Microgrid with Anchor Load, India

As the price of diesel rises...

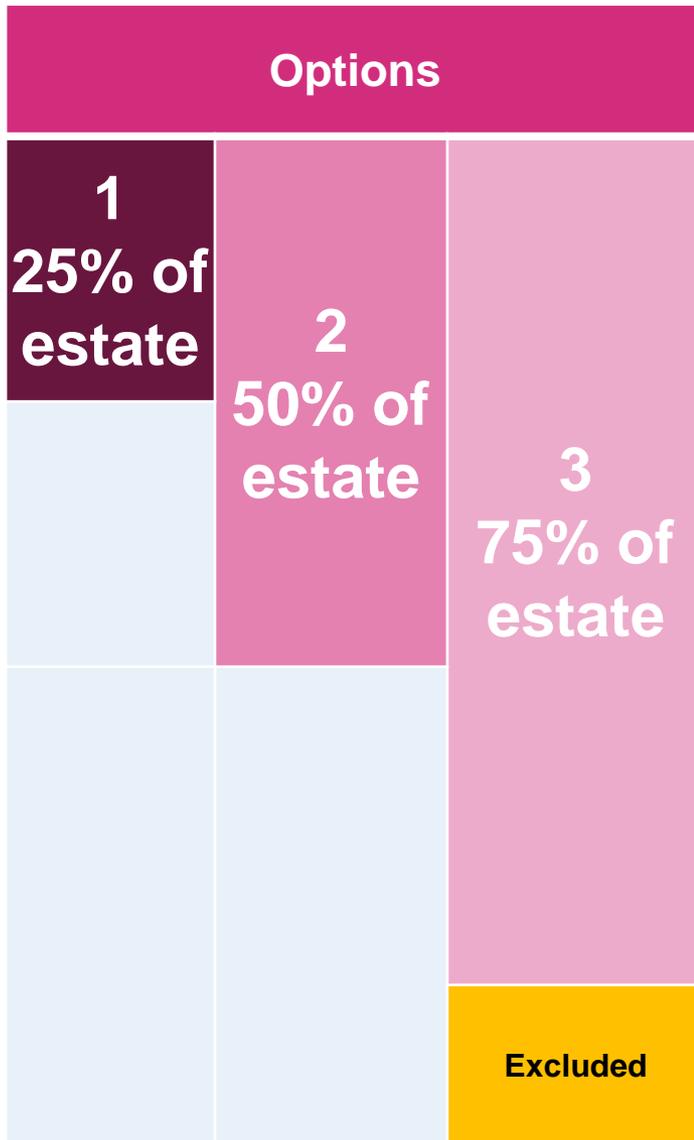
...the savings from the hybrid system increase.

- 28% annual cost savings
- 38% annual CO<sub>2</sub> savings
- LCoE 40¢/kWh

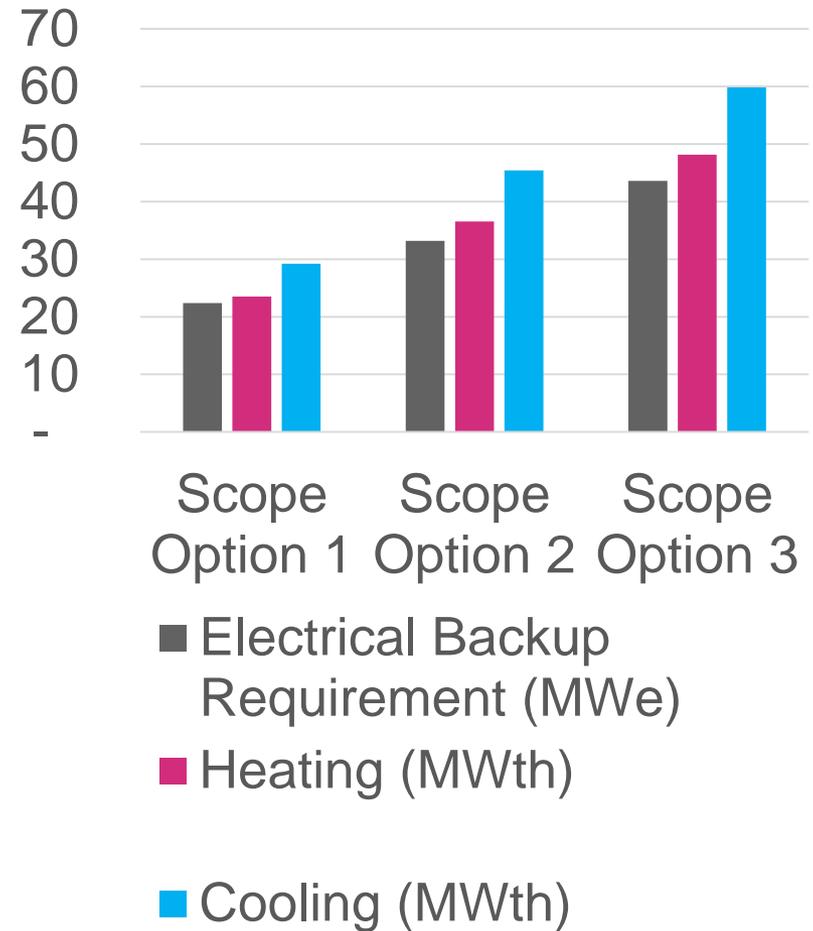


# London Commercial Property Energy Strategy

# 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



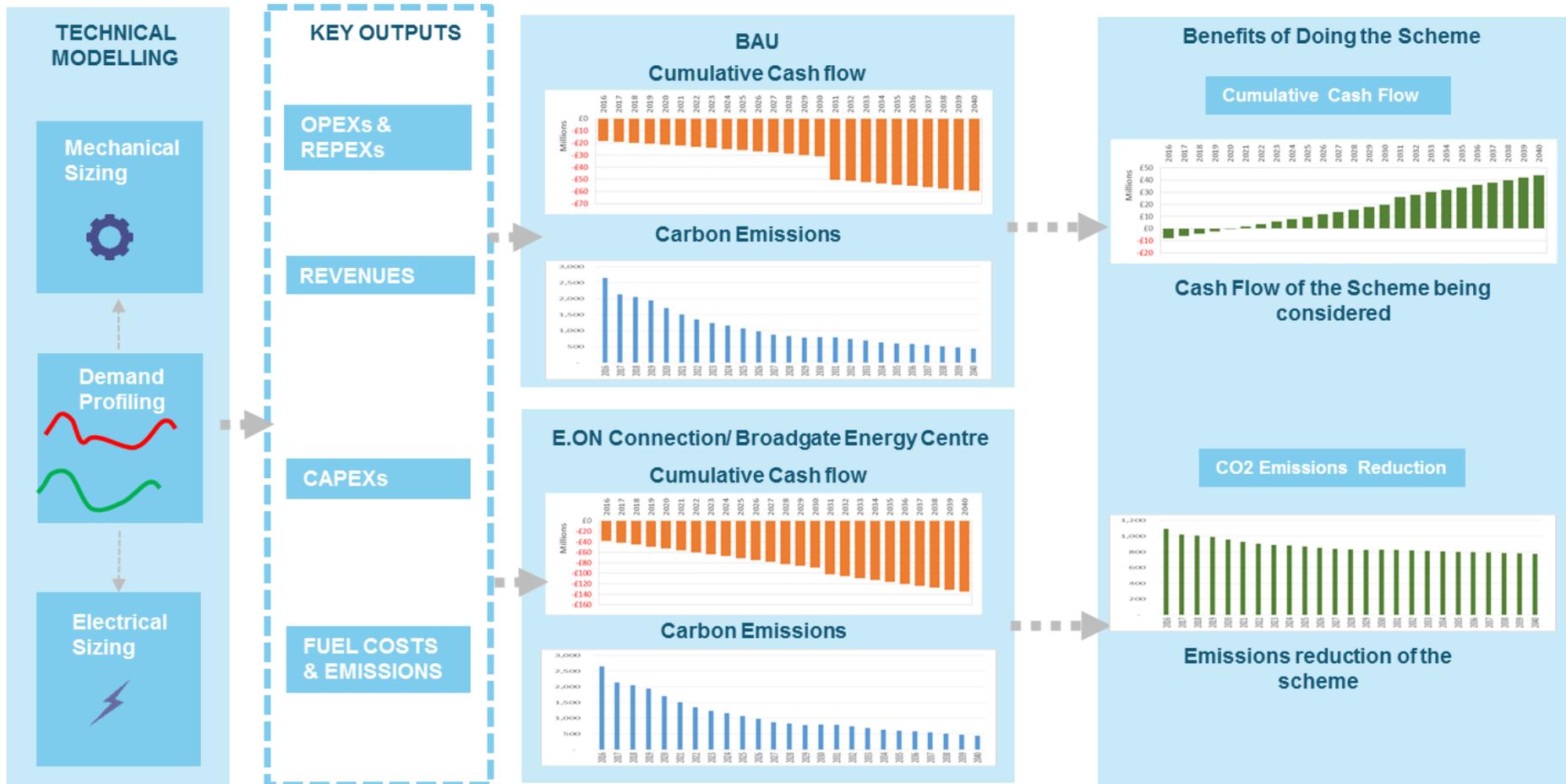
Future proof and secure energy planning requirements so that penalties are not incurred

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



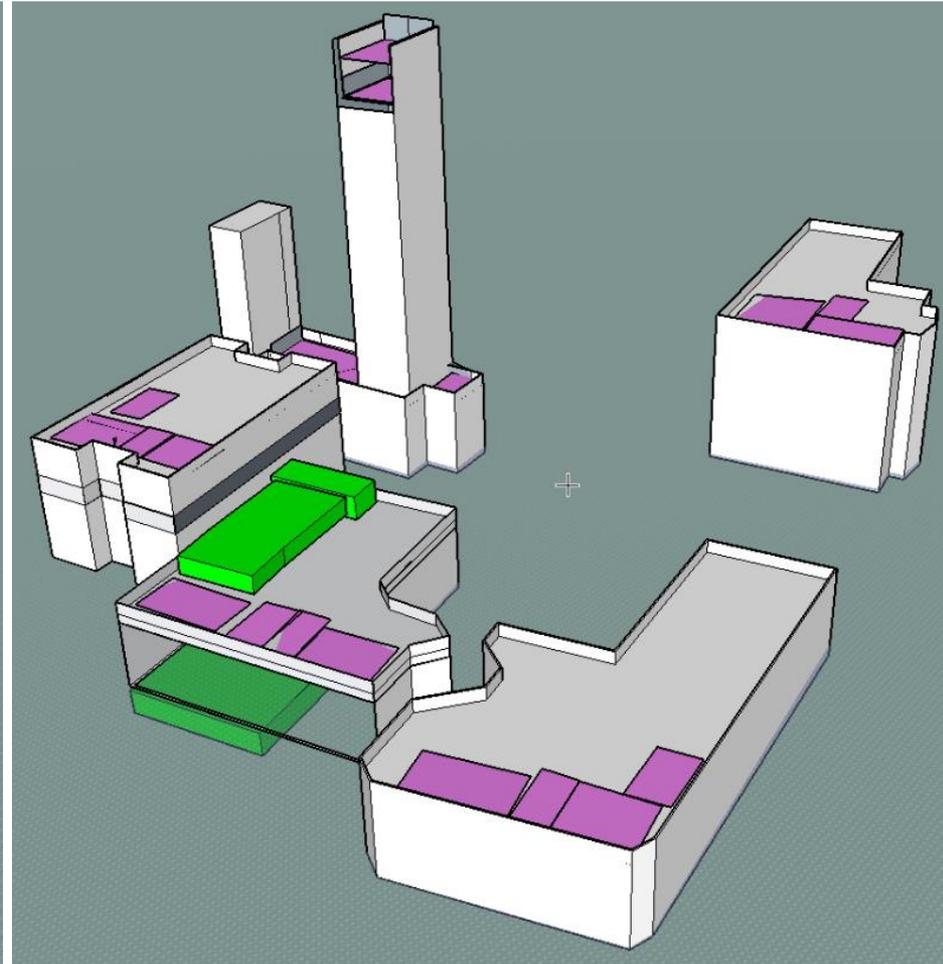
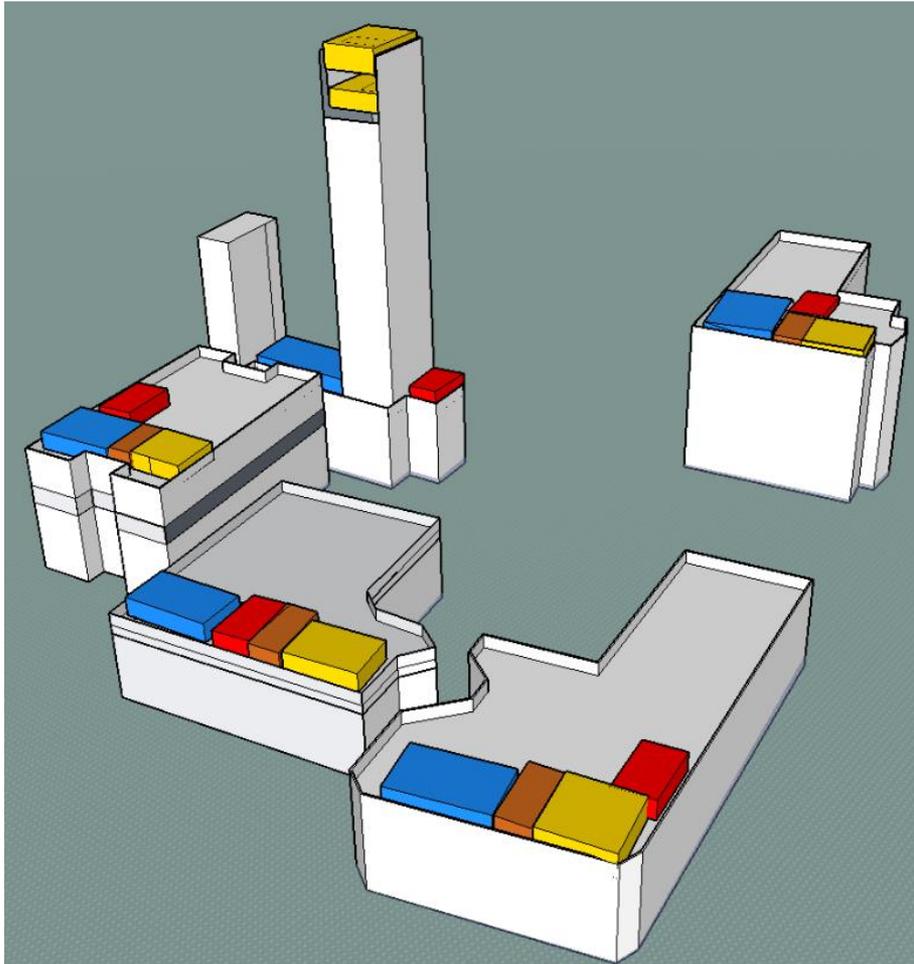
**The London Plan**

# Techno-economic Modelling



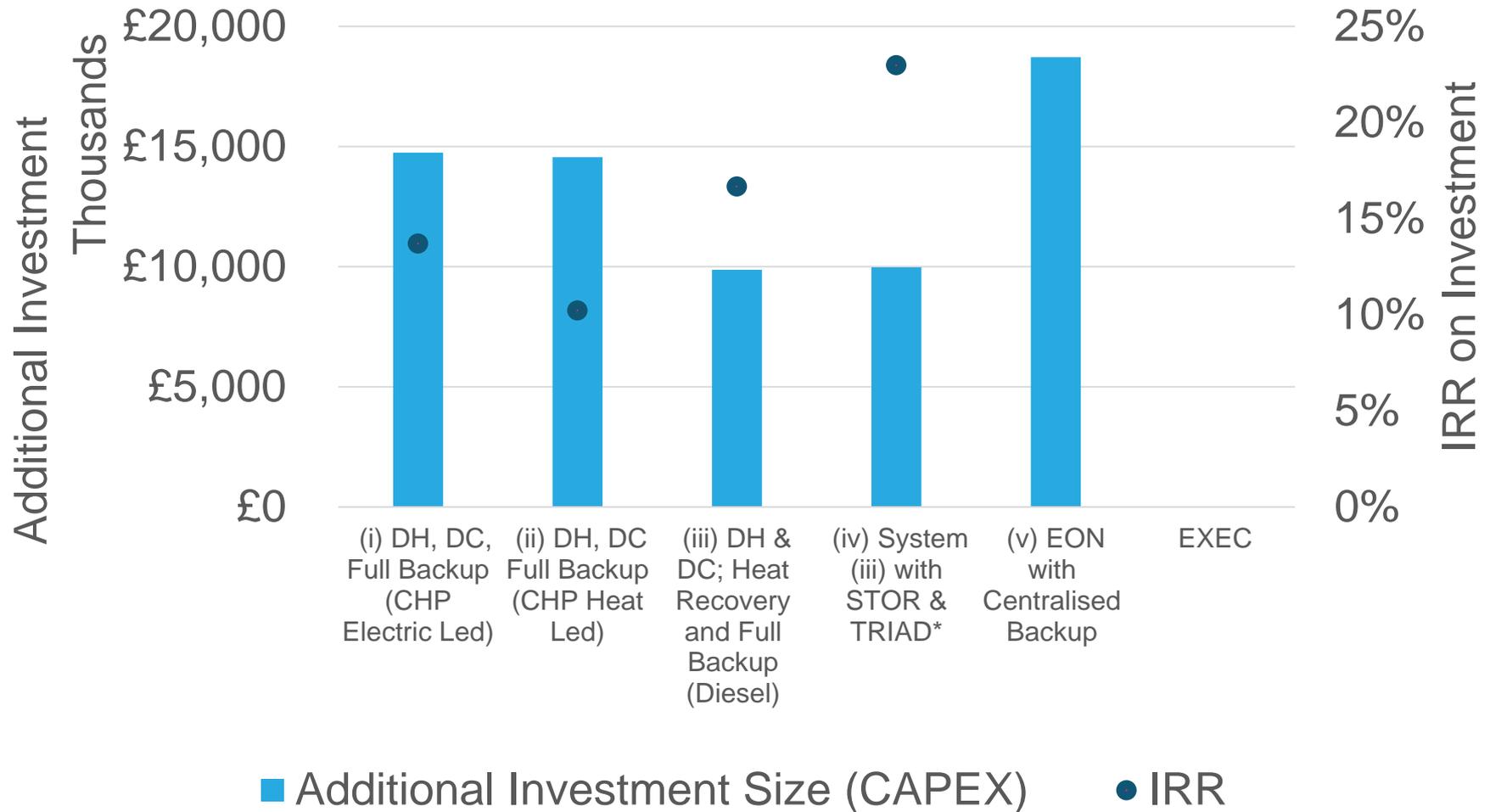
# Centralising Energy Services

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



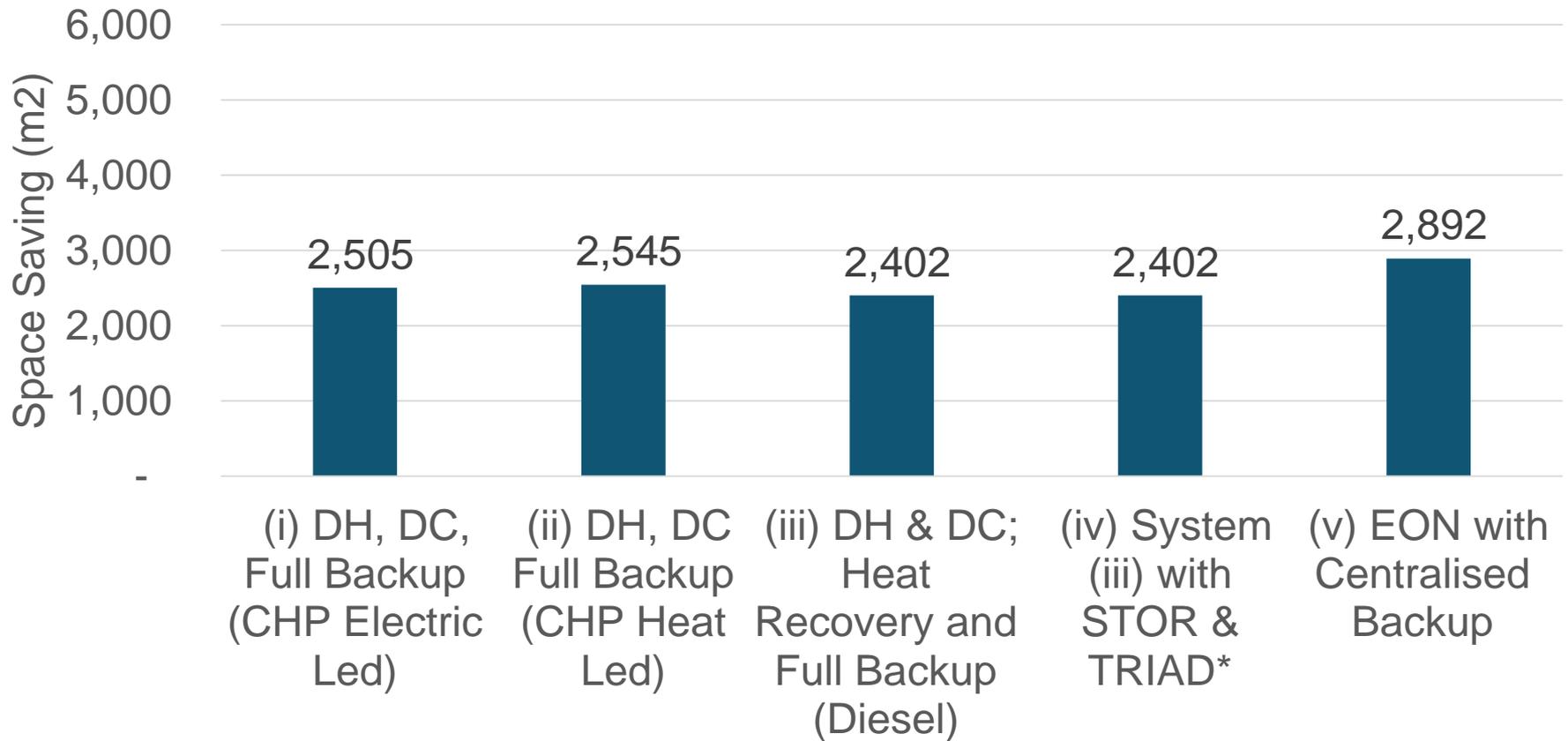
# Commercial results

## Additional CAPEX & IRR

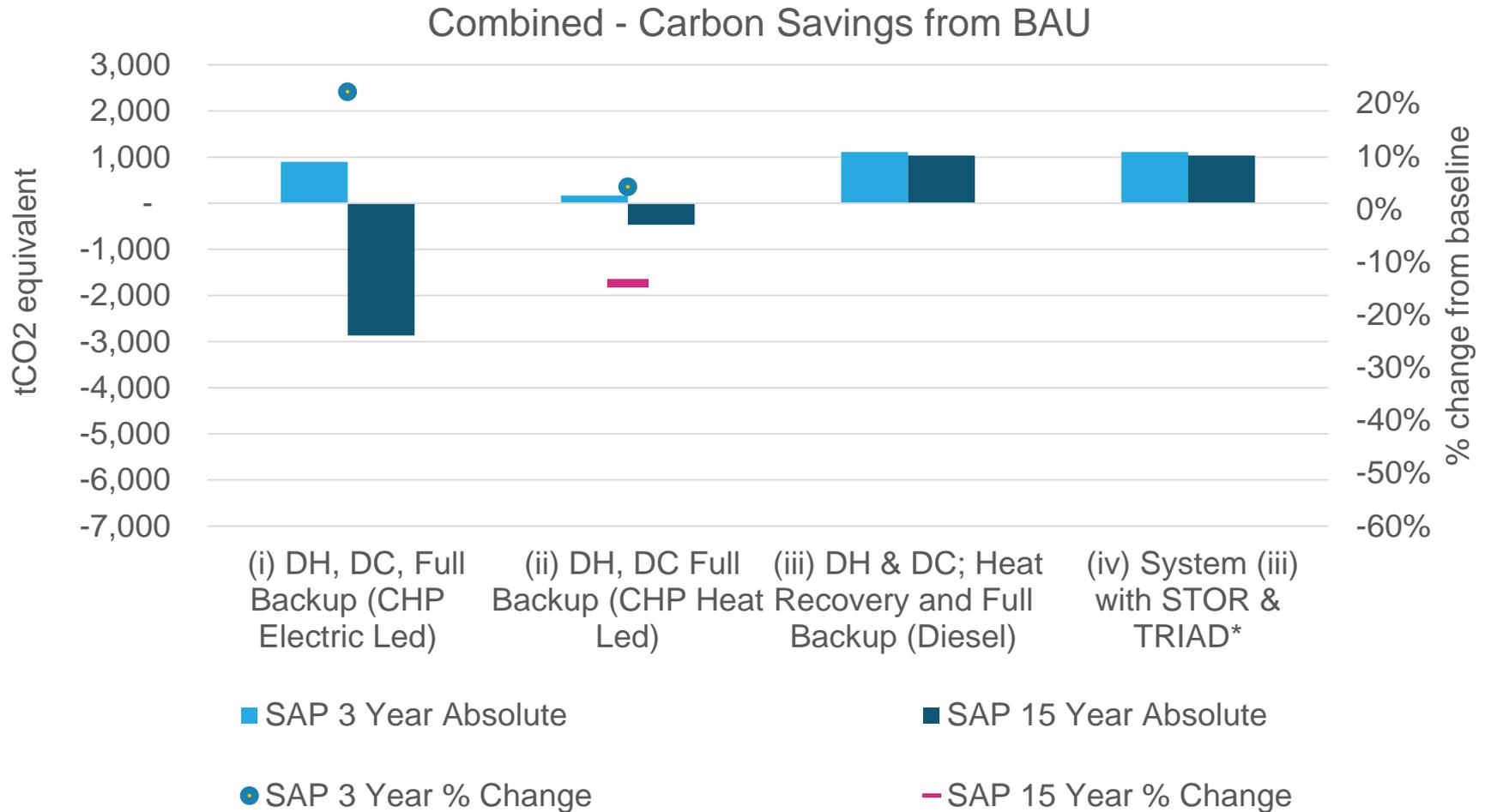


# Space Performance

## Combined Space Saving



# Carbon Savings



# Conclusions

- tbc

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