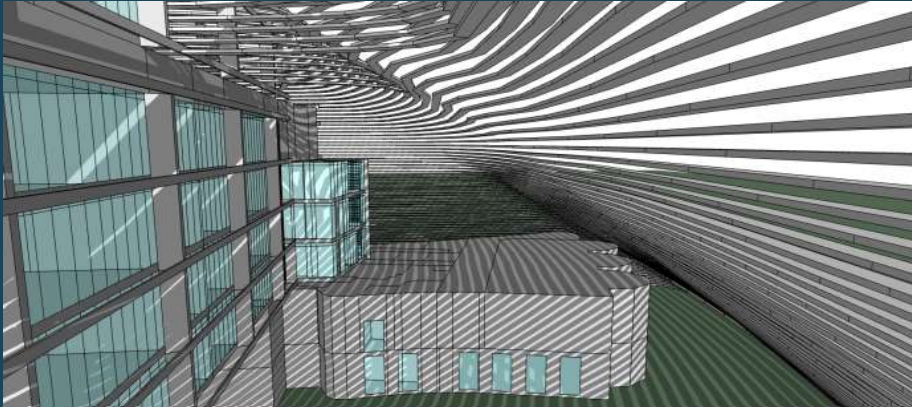


Digital Twins for the Built Environment

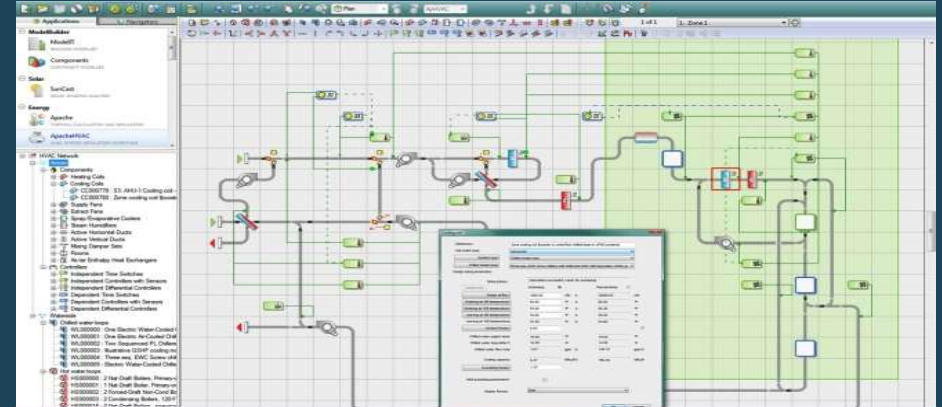
Building Performance Simulation

1



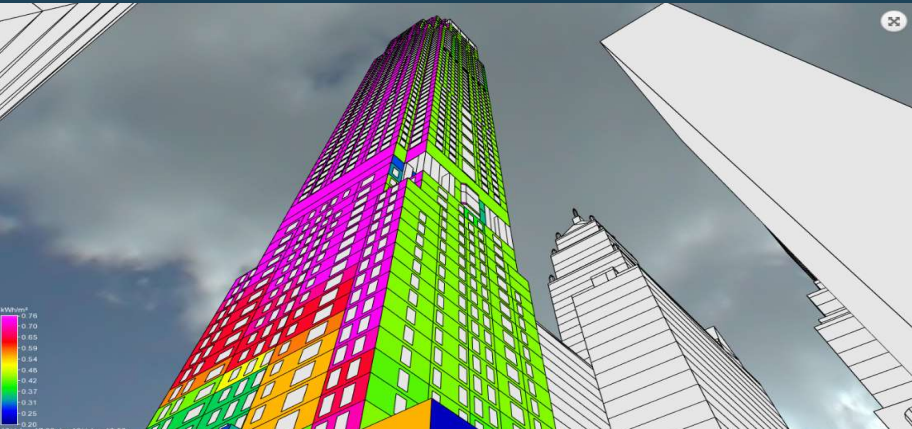
Complex building performance simulation

2



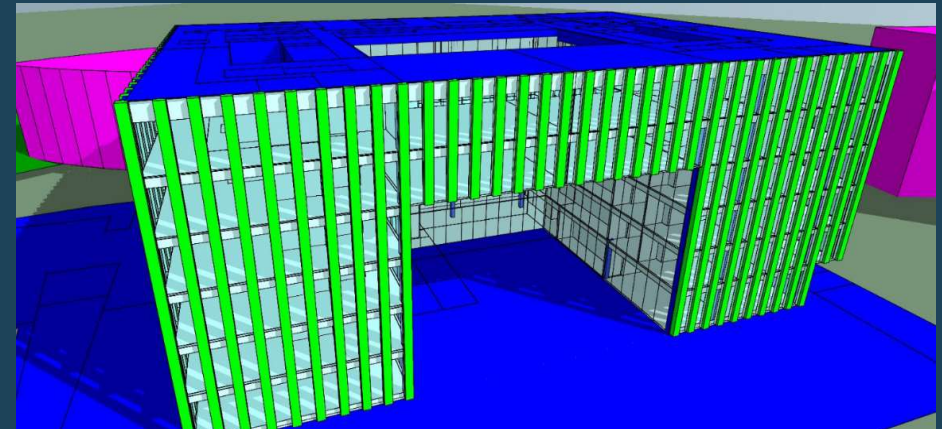
HVAC: Comprehensive modelling of HVAC systems

3



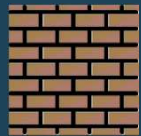
Large building energy and environmental assessments

4



Building Compliance and building rating assessments

Model Inputs - Base Case - Building Envelope and Systems



Building Construction

- Concrete Masonry Unit



External windows

- Windows double glazed (air) ($U=2.8$ w/m²k)



Lighting and Lighting Controls

- Fluorescent T5
- Standalone occupancy switching (-15%)



Ventilation System

- Windows (natural)
- Infiltration Tight 4.0 ACH50



Space conditioning

- Air Conditioning CAV
- Good chiller CoP4.5



Profiles of use

- Weekly (Mon-Sat): 8:00 - 18:00
- Sundays: closed

Model Inputs - Improved Case - Building Envelope & Systems



Building Construction

- Curtainwall Insulated Panel



External windows

- Windows double glazed (gas lowE warm edge) (U=1.4 w/m²k)



Lighting and Lighting Controls

- LED Best
- Networked switching, daylight harvesting, smart scheduling & load shedding (-55%)



Ventilation System

- Windows (natural)
- Infiltration Best 1.5 ACH 50
- Ventilation Heat Recovery 50%
- BEMS (savings & implementation)



Space conditioning

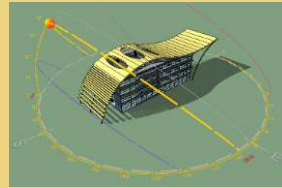
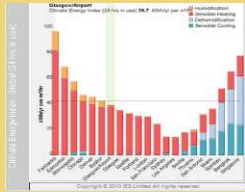
- Air Conditioning VAV
- Excellent Chiller CoP 6.0



Profiles of use

- Weekly (Mon-Sat): 8:00 - 18:00
- Sundays: closed

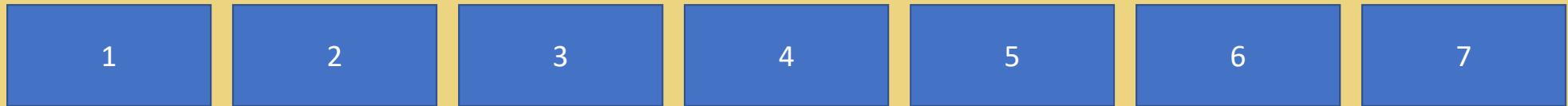
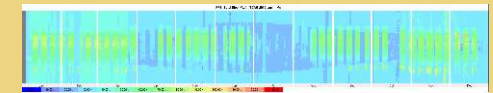
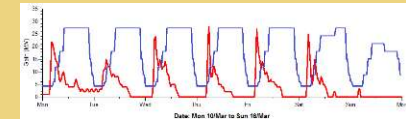
Site study



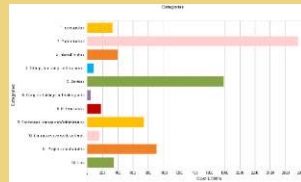
Compliance, Performance



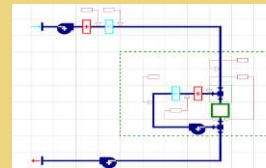
Optimising operational performance



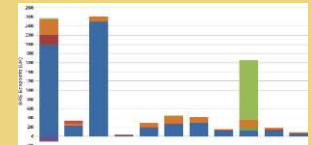
LCC/LCA



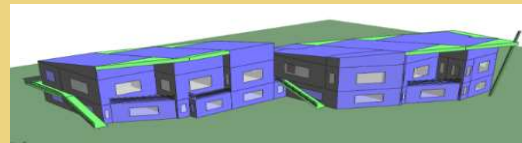
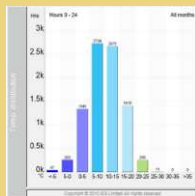
Optioneering



Systems design



Climate analysis



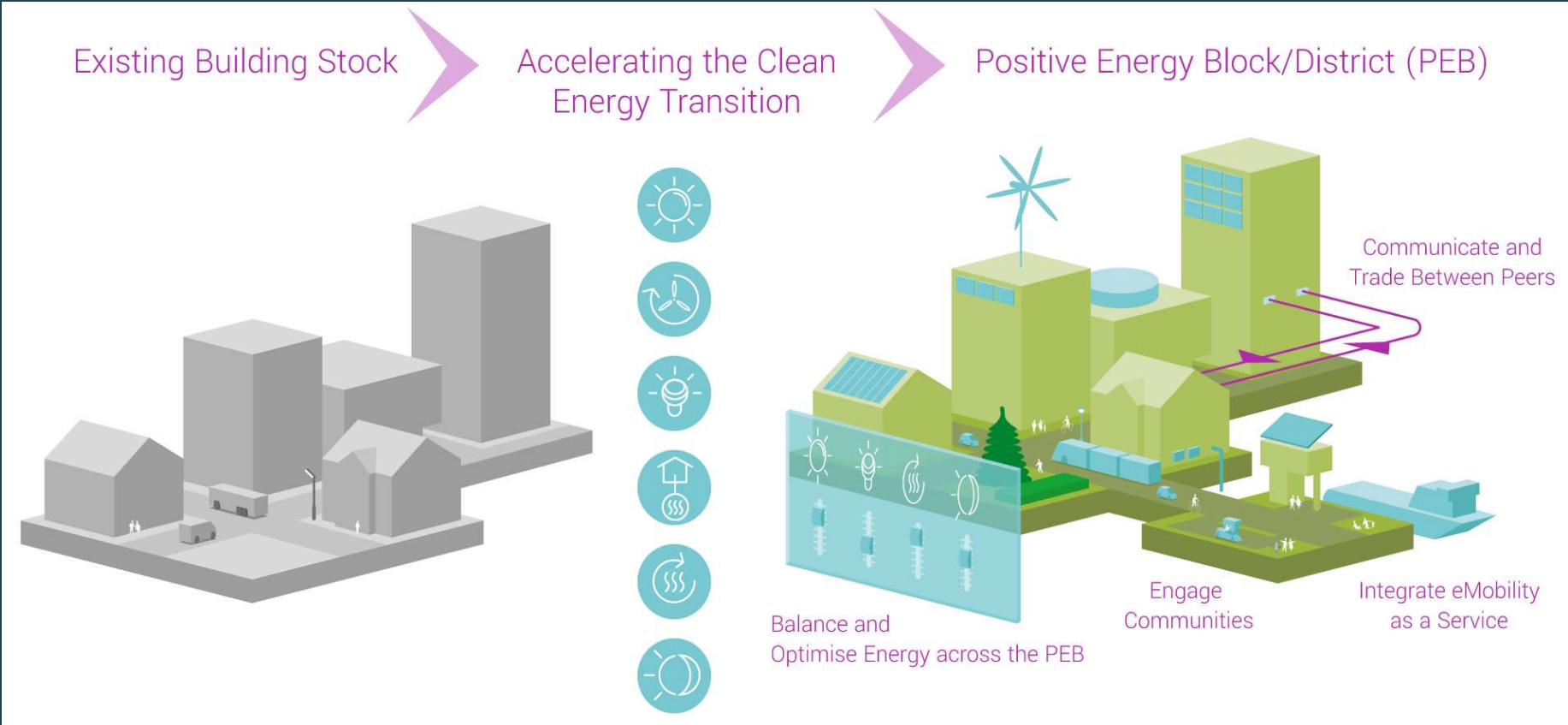
“a realistic digital representation of assets, processes or systems in the built or natural environment”

Centre for Digital Built Britain



DIGITAL TWIN DEFINITION

DIGITAL TWINS FOR THE BUILT ENVIRONMENT







Digital Twin


BMS 

Gas 

Temperature 

Comms 

Light 

Site Data 



Physical Asset

 Climate

 Occupancy

 IAQ

 Carbon

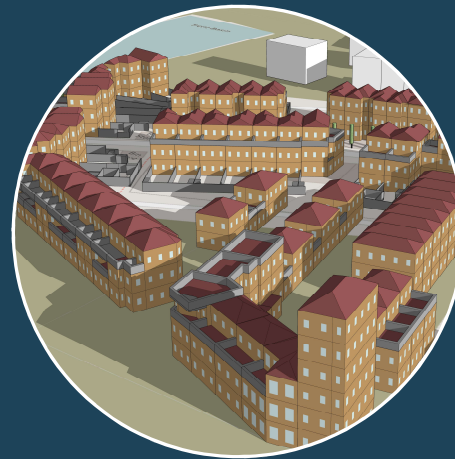
 Water

 Electricity

DIGITAL TWIN MATURITY ELEMENTS



Physical Asset



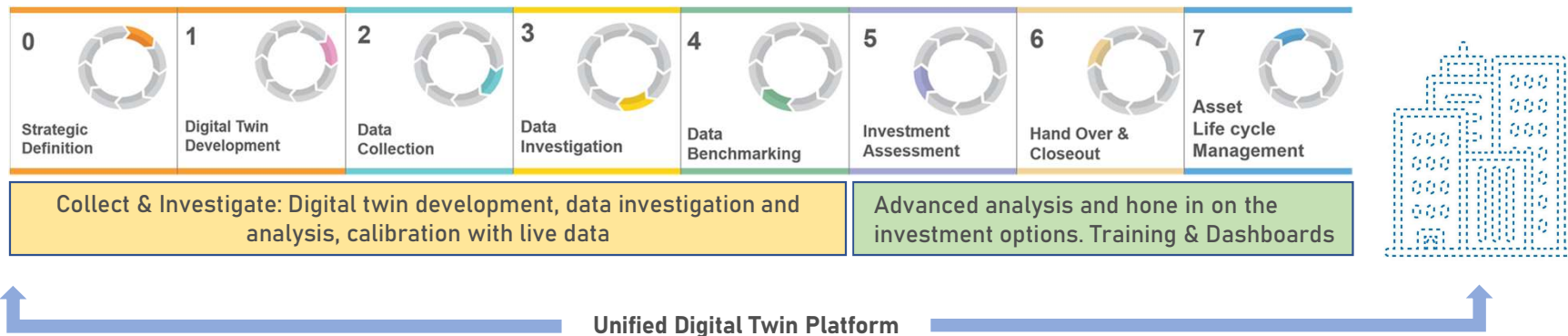
Digital Twin

3. Two-way integration
2. Real-time data
1. 3D Model
0. Reality capture

Digital Twin Overview and Value Proposition



Digital Twin Overview and Value Proposition

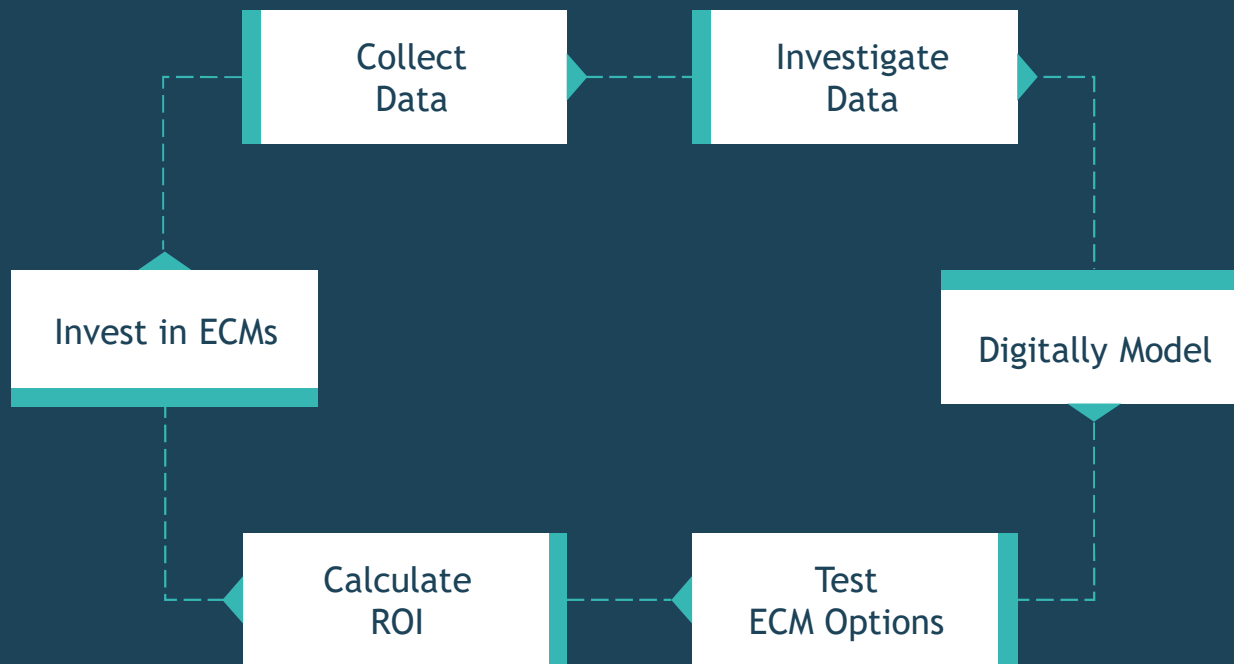


The Centrepont

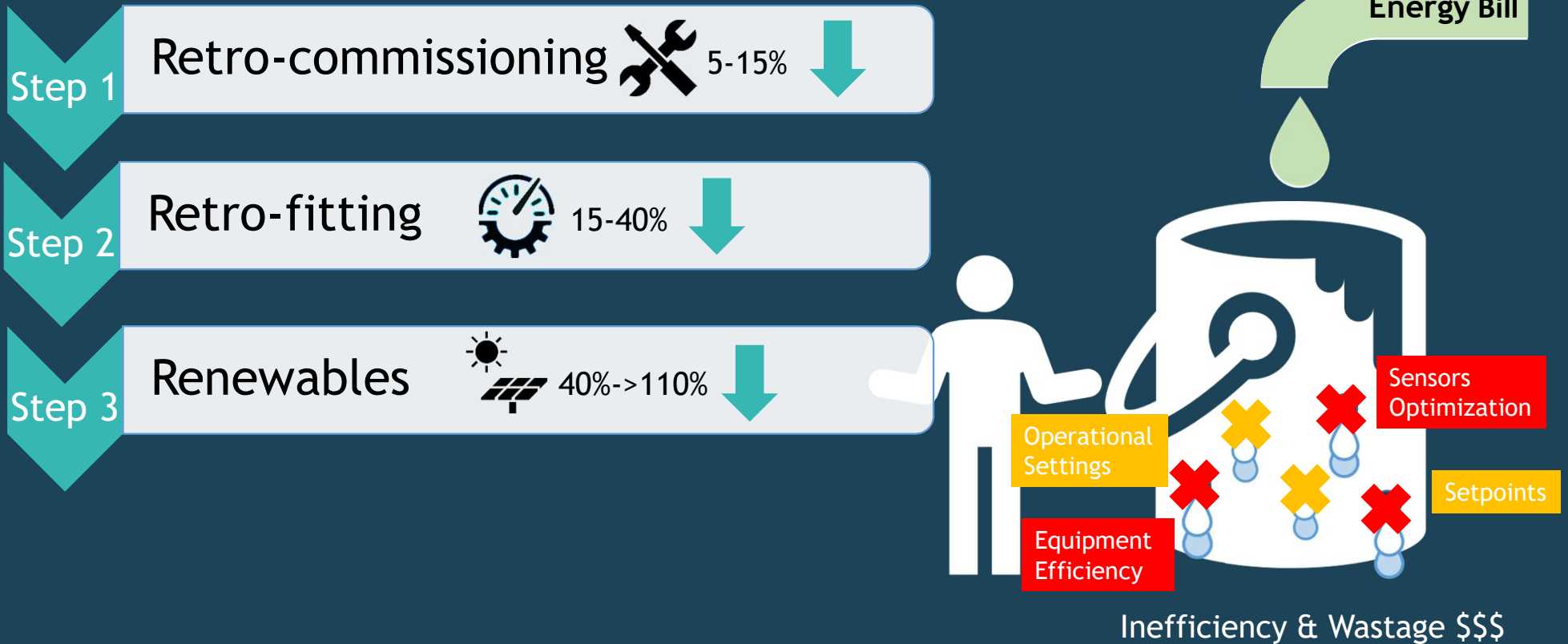
1. What will be the deliverables and the desired outcomes?

- Deliverables
 - High value digital asset that can be used throughout the lifecycle of the building.
 - Create a working digital twin together that can be used perpetually to try and test the Energy Conservation Measures (ECMs) on virtual assets and then scale it to the physical assets. The produced digital twin self identifies and funds the ECMs.
 - Support sustainability team to perform future “What If” scenarios using analytics tools and Digital twin (Physics based energy model).
- Outcomes
 - Dashboards to figure out the operational anomalies, which can be flagged to the facilities managers.
 - Benchmarking of the building energy performance, design bespoke dashboards around your KPIs and create command centres.
 - Portfolio mapping and asset performance comparison at granular level.
 - Digitize overall property portfolio.
- Future enhancements
 - This may then be used for advanced comfort studies and health and well-being analysis to identify potential issues which may arise as a result changes in building operation, changes in space use, future weather scenarios, etc.

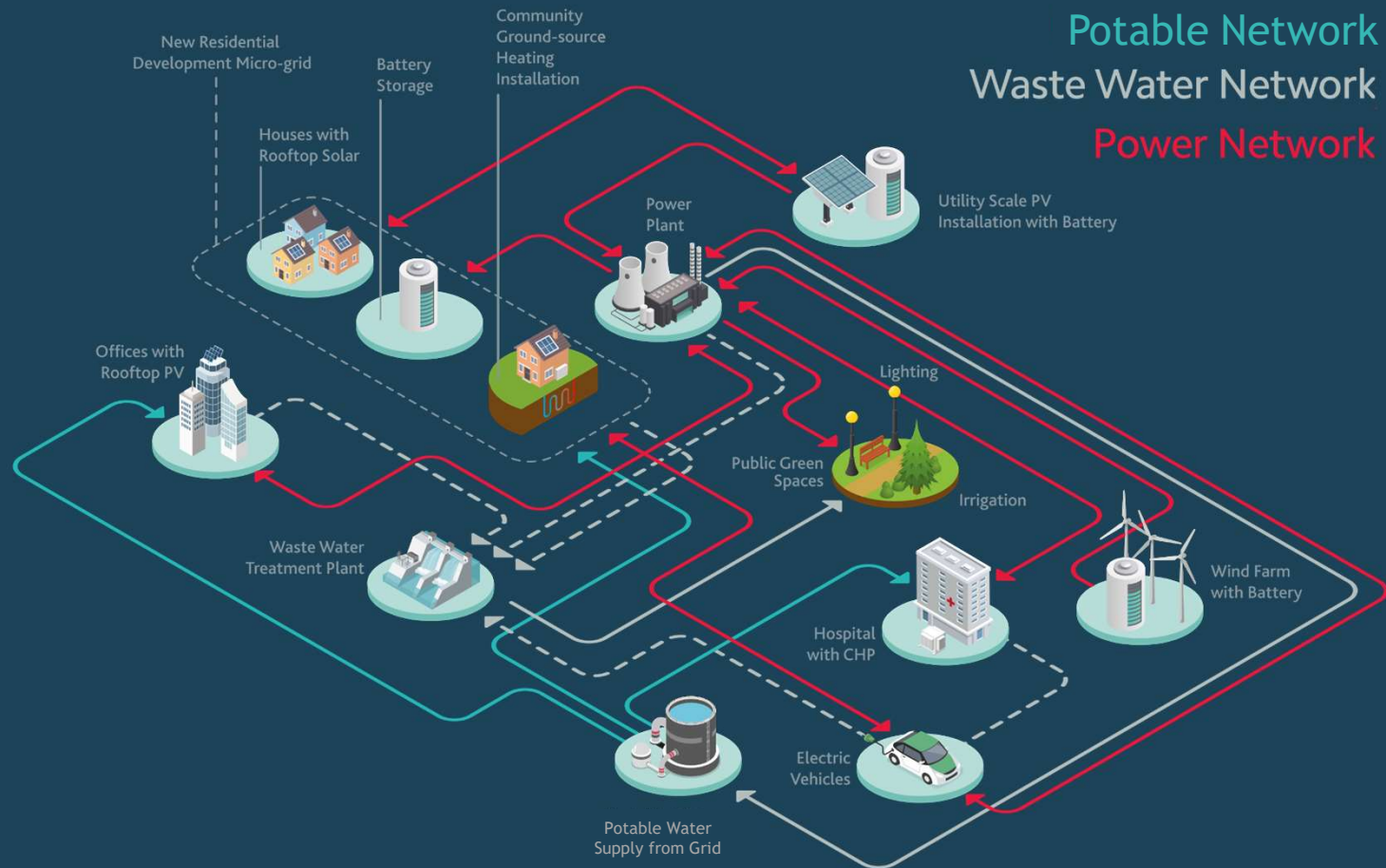
Decarbonisation using Digital Twin



Holistic Approach of Optimization



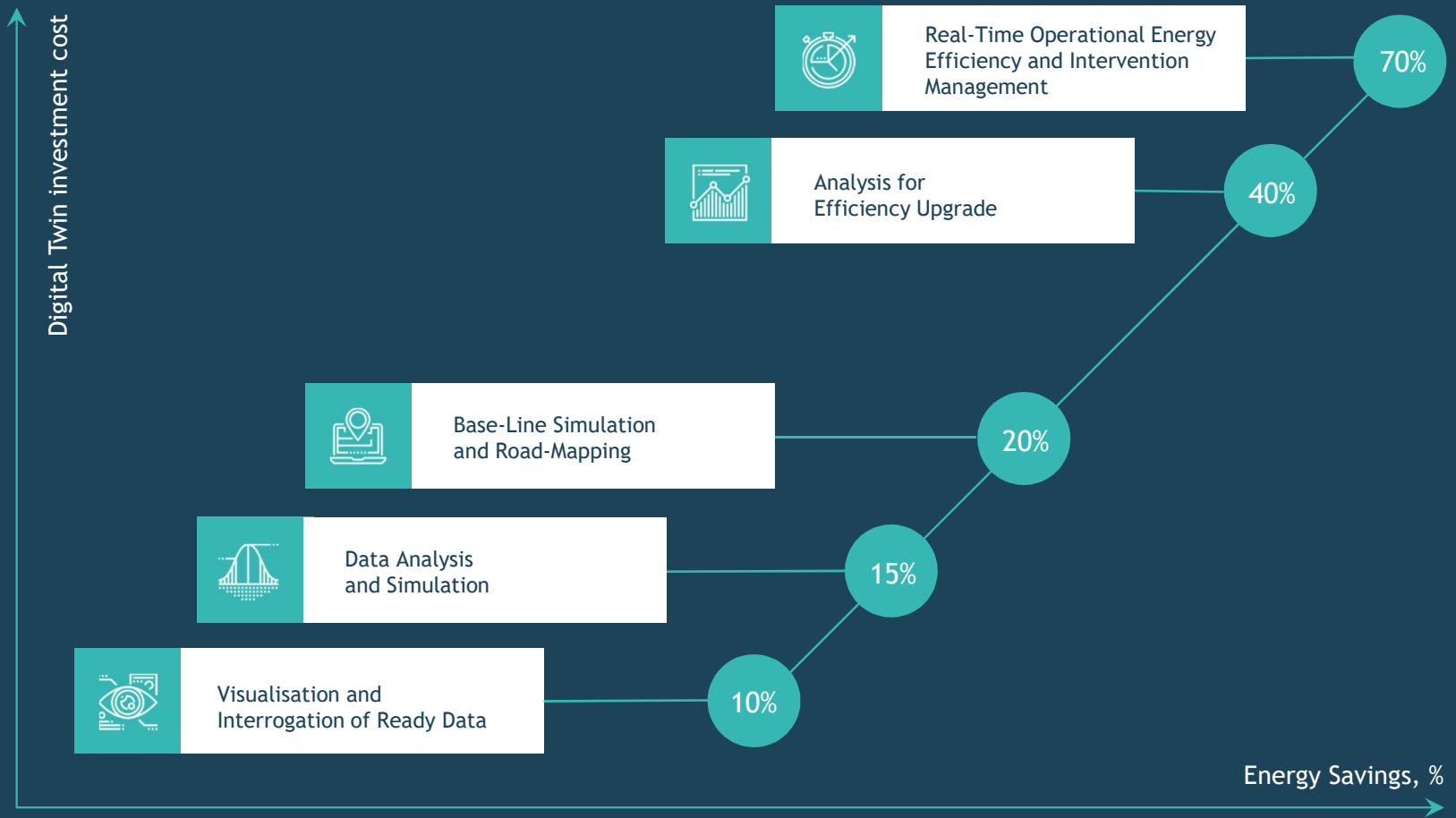
RESOURCE NETWORK ANALYSIS



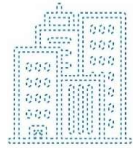
Potable Network
Waste Water Network
Power Network



DIGITAL TWIN SCALABLE RETURN ON INVESTMENT



Sustainable Smart Buildings – Digital Twin Investment



Collect Information

Building data is collected and used to build digital model

Build Digital Model

Digital Model is built and calibrated with building data to create a Digital Twin

Simulate ECMs

Numerous ECMs are simulated and evaluated in the Digital Twin

Install ECMs

ECMs are installed and set up to be tracked in real time by the Digital Twin

Live Digital Twins

Digital Twin optimizes performance for full building life cycle

- **10-15%** initial savings with 1 year payback
- **30-40%** future savings via investment in ECMs

High Value Digital Twin assets are created to “High Performance Buildings”





For more information contact: sriman.ncvk@iesve.com