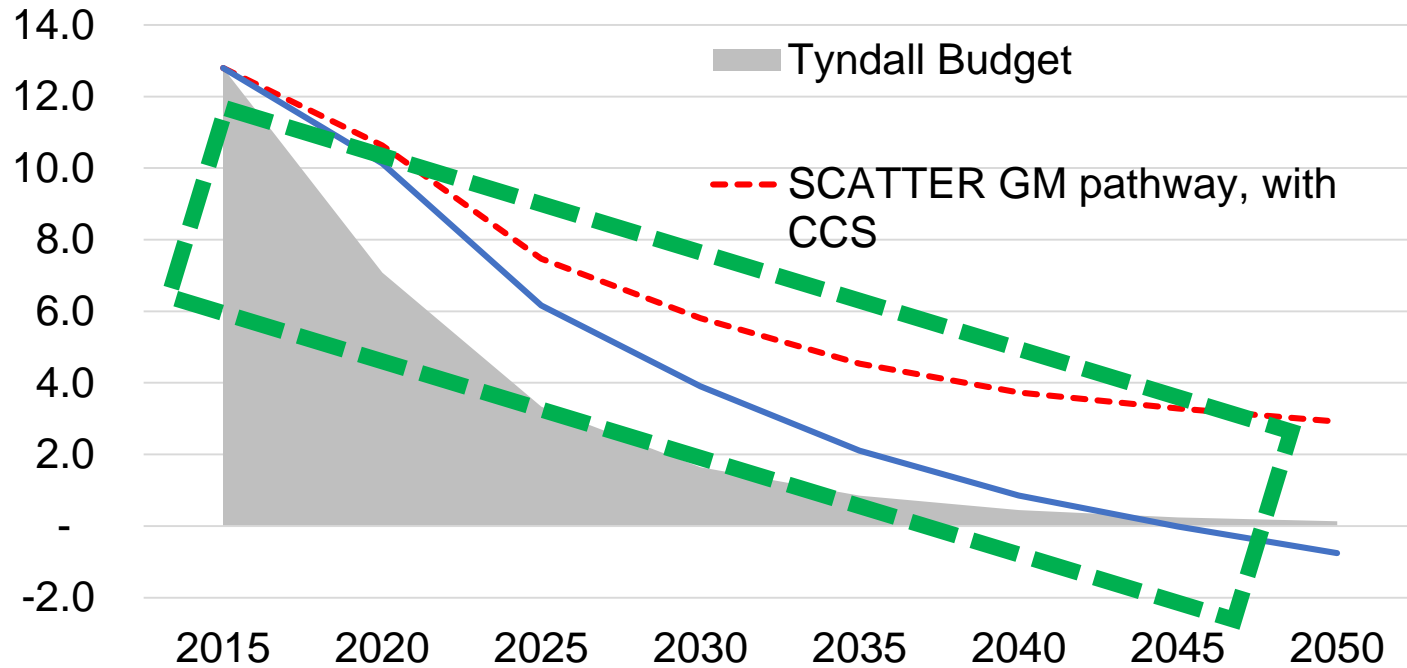




**PFER:
Local Energy Market Proposal**



The Local Place Based GM Challenge



Highest Impact Local Actions

- Renewables (Solar PV/Thermal, Heat networks, Heat Pumps)
- Energy efficiency of domestic properties
- Improved efficiency of commercial heating and cooling
- Biomass power generation
- Shift from fossil fuels to battery or fuel cells for transport
- Shifting domestic transport behaviour
- Waste reduction, reuse and recycling

Outstanding Questions

- How quickly will technology evolve e.g. battery storage and hydrogen to grid?
- How do we fund building retrofit for energy efficiency/fuel poverty?
- What is the role of nuclear (SMR) and biomass?
- What opportunities for negative emission and disruptive technology?
- Do we have sufficient skilled workers for the task?

...the scale of the GM challenge...

Some examples of the assumptions about now to 2040 in the SCATTER GM model



Half of our homes have solar PV plus a further 5.5km² commercial/ground-mounted

Gas accounts for less than 35% of heating supply



All cars on our roads are zero emissions (tailpipe) by 2035



61,000 homes a year are retrofitted

Commercial heating demand drops by over 20%



Industrial emissions reduce by 50-75%

Informed, validated and Optimised

The GM Local Energy Market (LEM) project aims to reduce and ultimately remove the known challenges through,



1. **Informed:** Local Area Energy (Master) Planning

1. Urban
2. Semi Urban
3. Rural
4. Across 10 districts and aggregated to a regional level

2. **Validated:** investment ready business model

1. Operational testing (inc controlled energy assets)
2. Deployment of new assets alongside the leveraging of £10M existing energy related legacy projects

3. **Optimised:** Digital Energy Platform Design

1. Supporting the control of 7-10MW of energy asset
2. Responding to 'place based' constraints market needs
3. At a regional, district, and or micro grid level



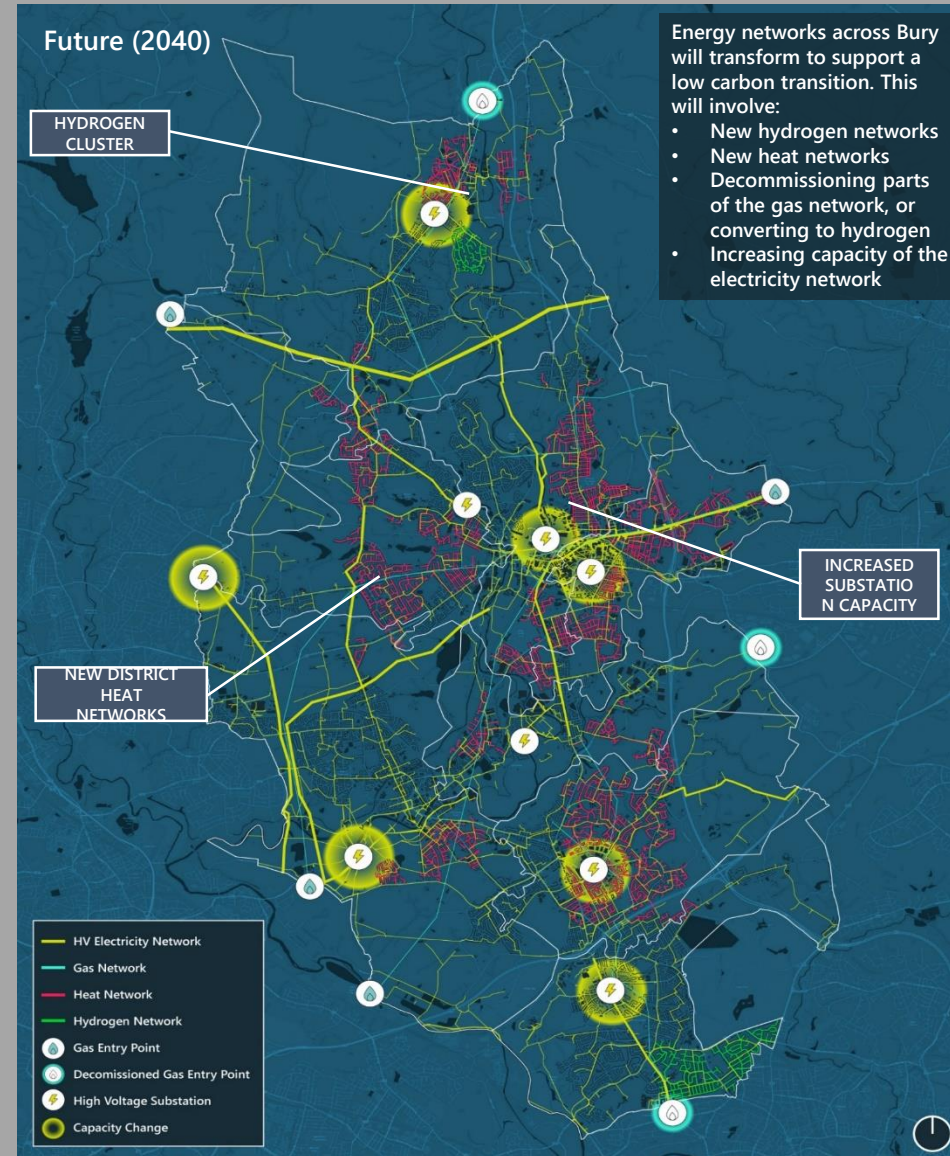
Network and local area understanding

Comprehensive Local Area Energy Planning (LAEP), capable of providing, district and aggregated region scale understanding across;

1. Generation and storage
2. Decarbonised heating (Inc. Hydrogen ingress)
3. Low carbon transport (Inc. Hydrogen ingress)
4. Diversity flexibility (current and future possible network constraints)

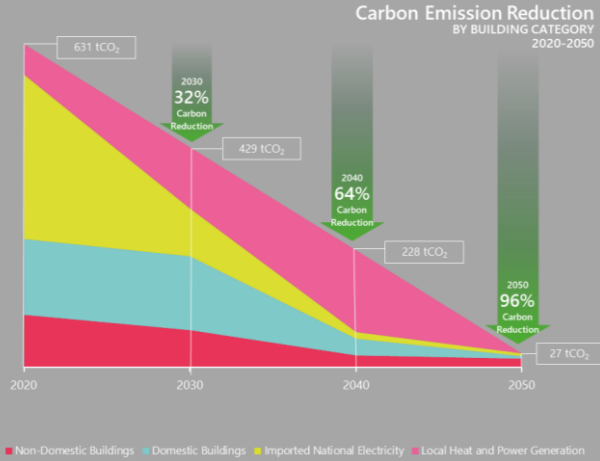
Supporting the optimisation of the current energy system as we transition to the future.

Exploring a range of possible energy system options

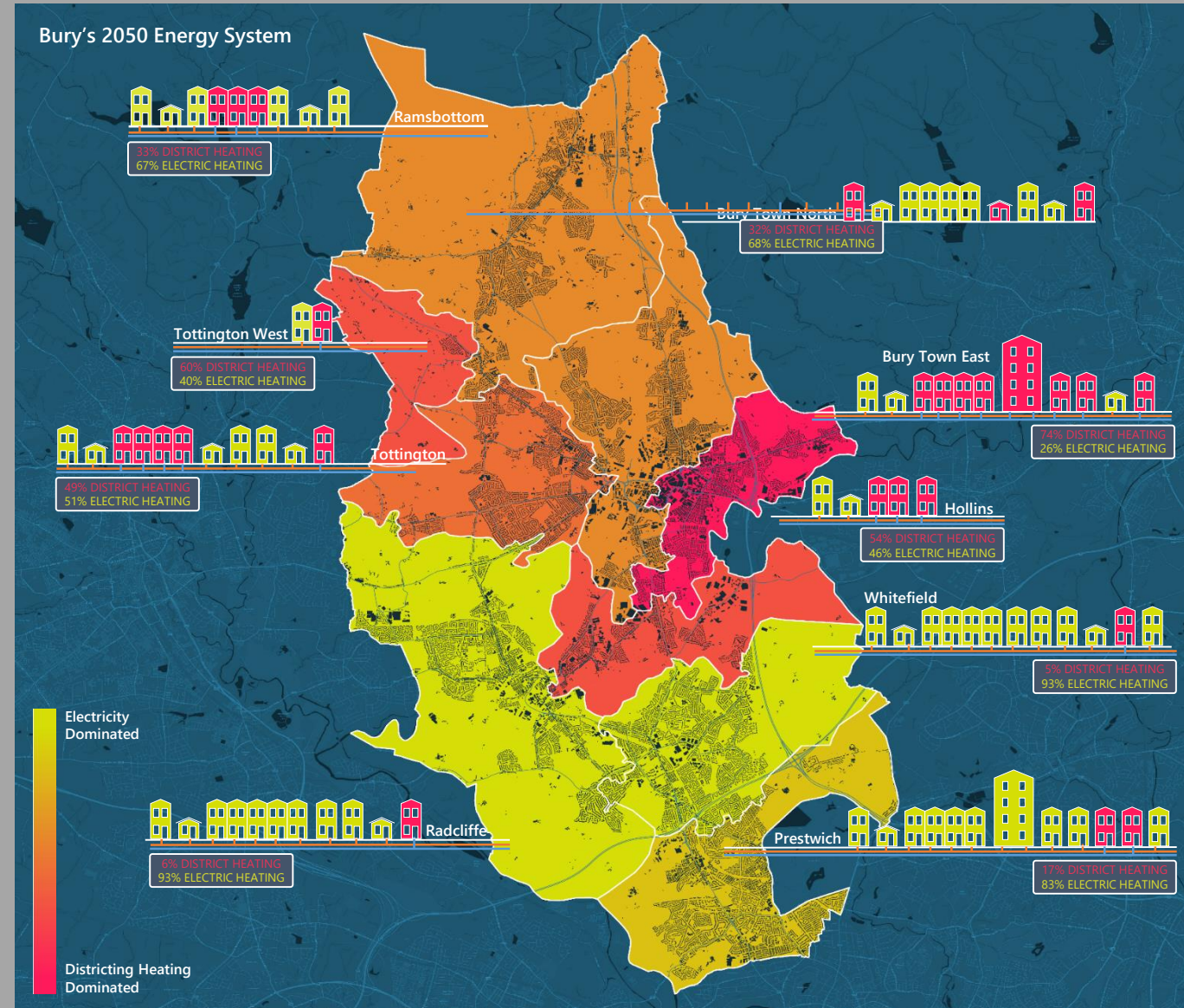
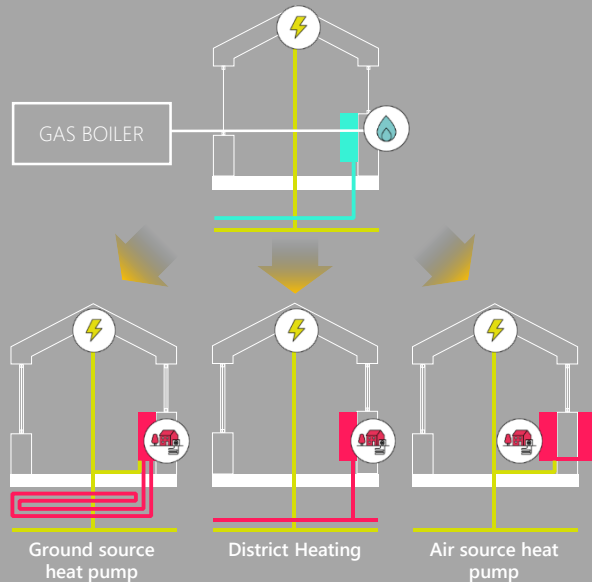


To develop a Local Area Energy Plan for each borough

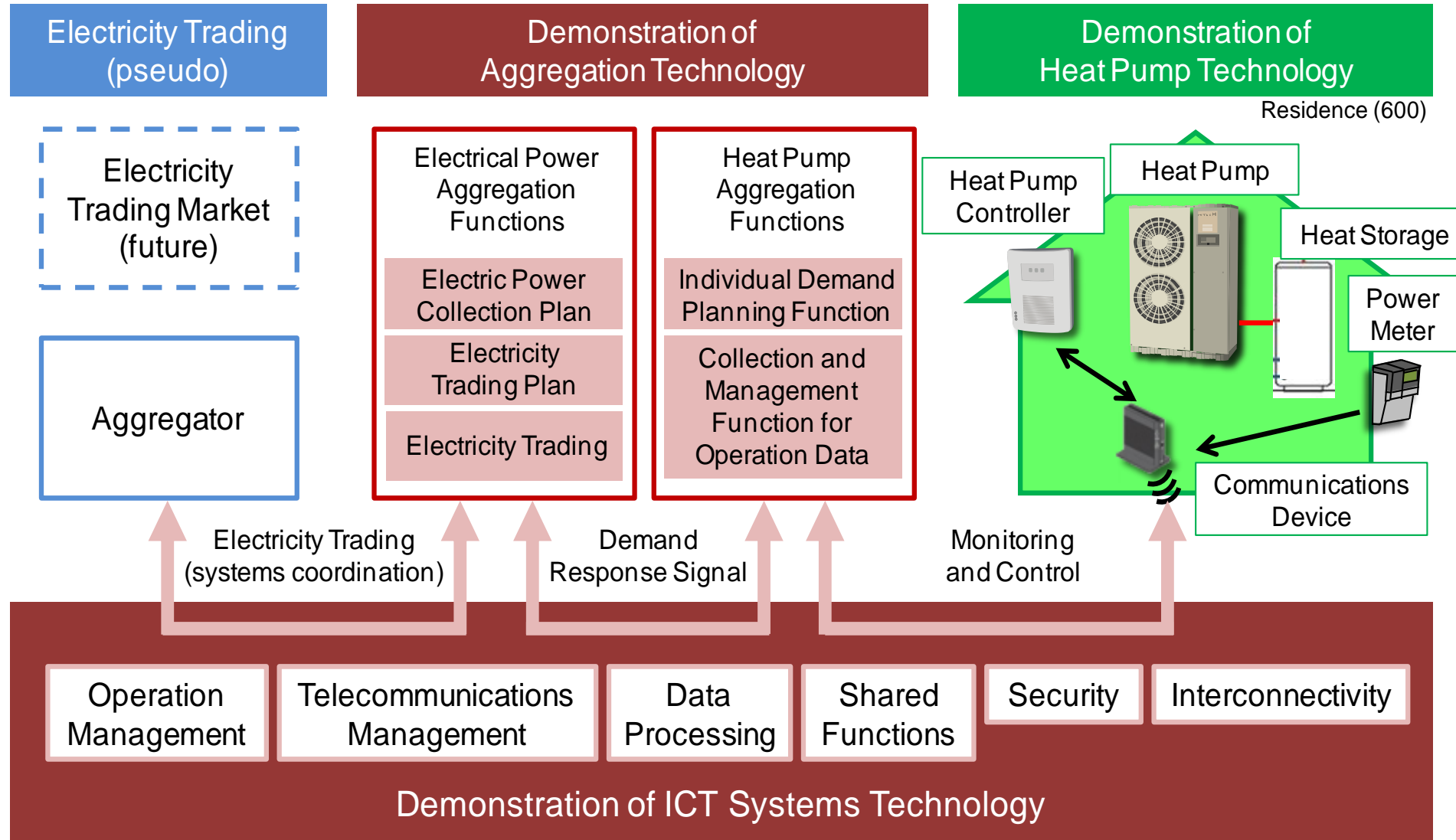
Your local energy system is changing to meet our commitment to reducing carbon emissions. This means installing new low carbon technologies and phasing out the use of gas boilers.



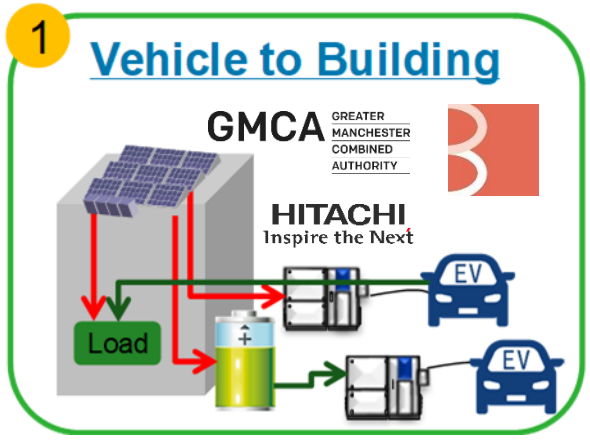
Homes with gas boilers may transition to different heating systems, such as those illustrated below.



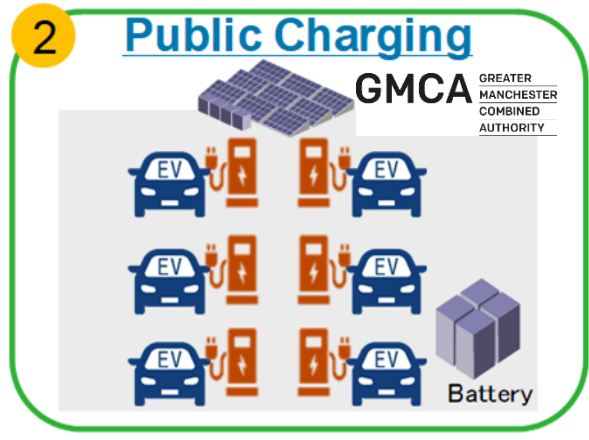
Heating and Storage validation



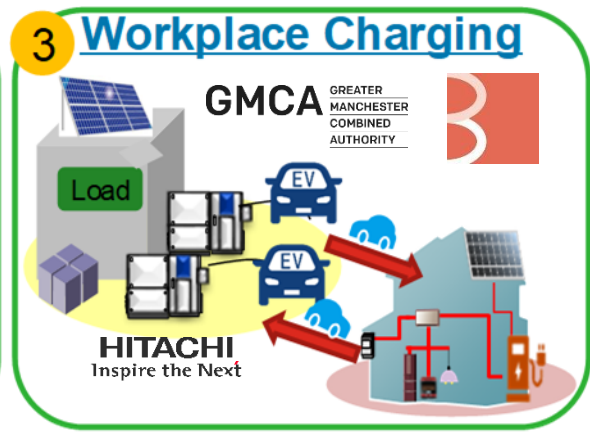
V2G Validation



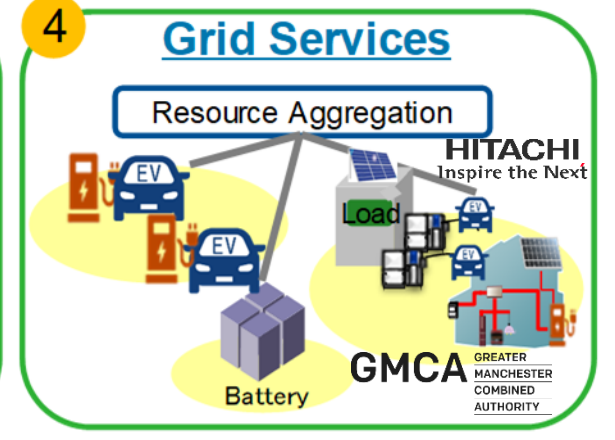
- Behind the meter optimisation
- Buildings as enhanced DER assets



- Ability to turn parked cars into energy resources for GM LEM



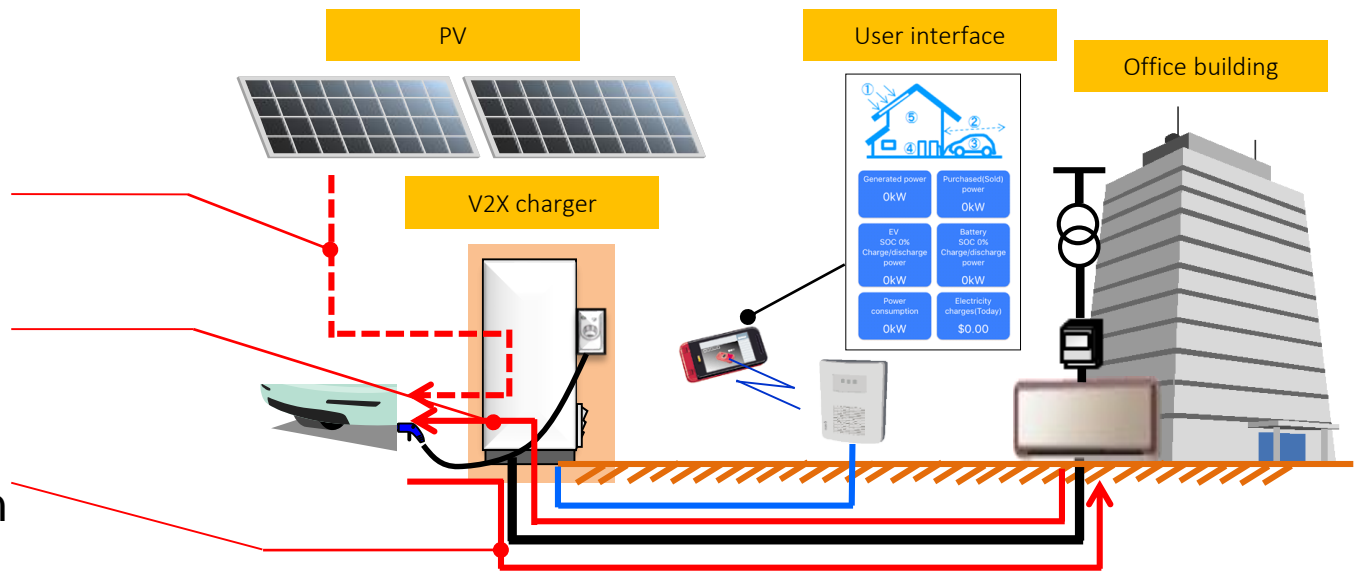
- GM LEM can provide benefits to both employers and employees



- Aggregated resources can provide flexibility services through GM LEM

Vehicle to Building Example:

- PV connection. Maximise utilisation of renewables via V2X charger control
- Charge EV with electricity from the grid leveraging offers through the GM LEM
- Discharge from EV to building via V2X charger to optimise energy consumption



Value Sharing Proposition 1 - EV Fleet Operators - Need a base & have predictable usage



Operator Benefits - £8,000 grant
available/vehicle
Enhanced capital allowance

Sharing Value

- Fleet Operators – Taxi, Private Hire, Logistics Fleets
 - Charging on private landlord location
 - Rapid Charging >50kW
 - Vehicle to Grid
 - Variable pricing
-
- Research to match proposition with operator needs e.g. locations, other services (toilets, café, security)

Value Sharing Proposition 2 – Community Energy across Domestic and Non Domestic settings (Peer to Peer)

- Manchester schools
- LEM connected CE Scheme
- Off-taker profiles
- Handling Spill from off-takers
- FLEX Market access

Assets

PV and Battery

New Vehicle charging

Other generation classes

Value Sharing Proposition 3 – Campus Micro grid

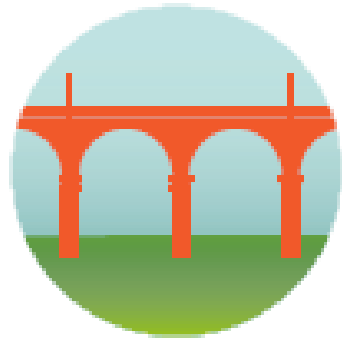
- Inter campus LEM trading
- Off-take from LEM trading
- Trade Spill on LEM
- Flex load case
- Heat Pumps(S)
- Rapids + V2G
- FLEX Market access

Assets

Manchester Science Park

Central charging facility with V2G

Optimised Market



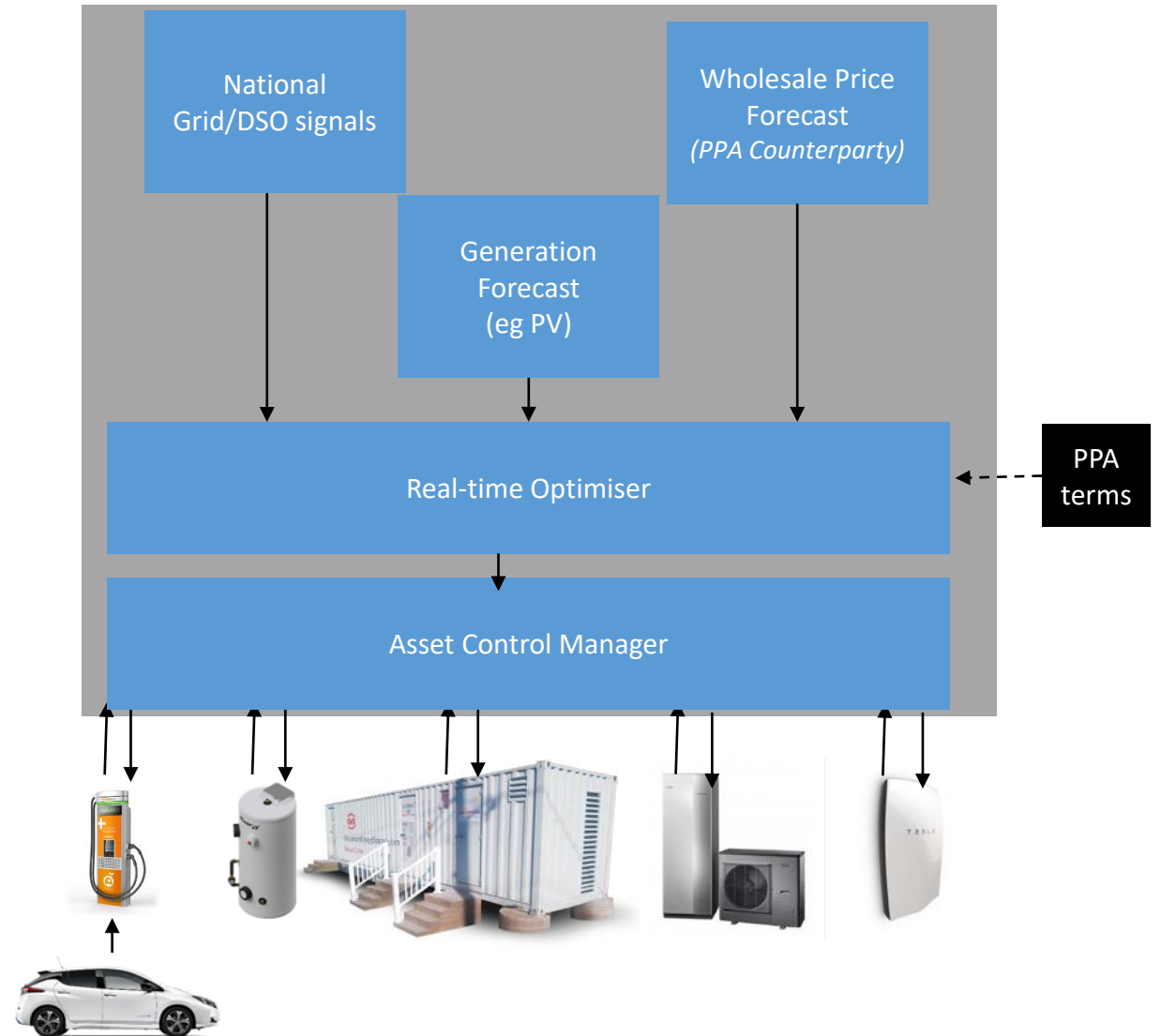
Platform Design

1. Design the requirements for a regional LEM platform, i.e. control, optimisation, dispatch and trade
2. Design the required integration with other local control platforms, particularly those operated by the DNO, who provide constraint management locally and will interface with the national transmission system.

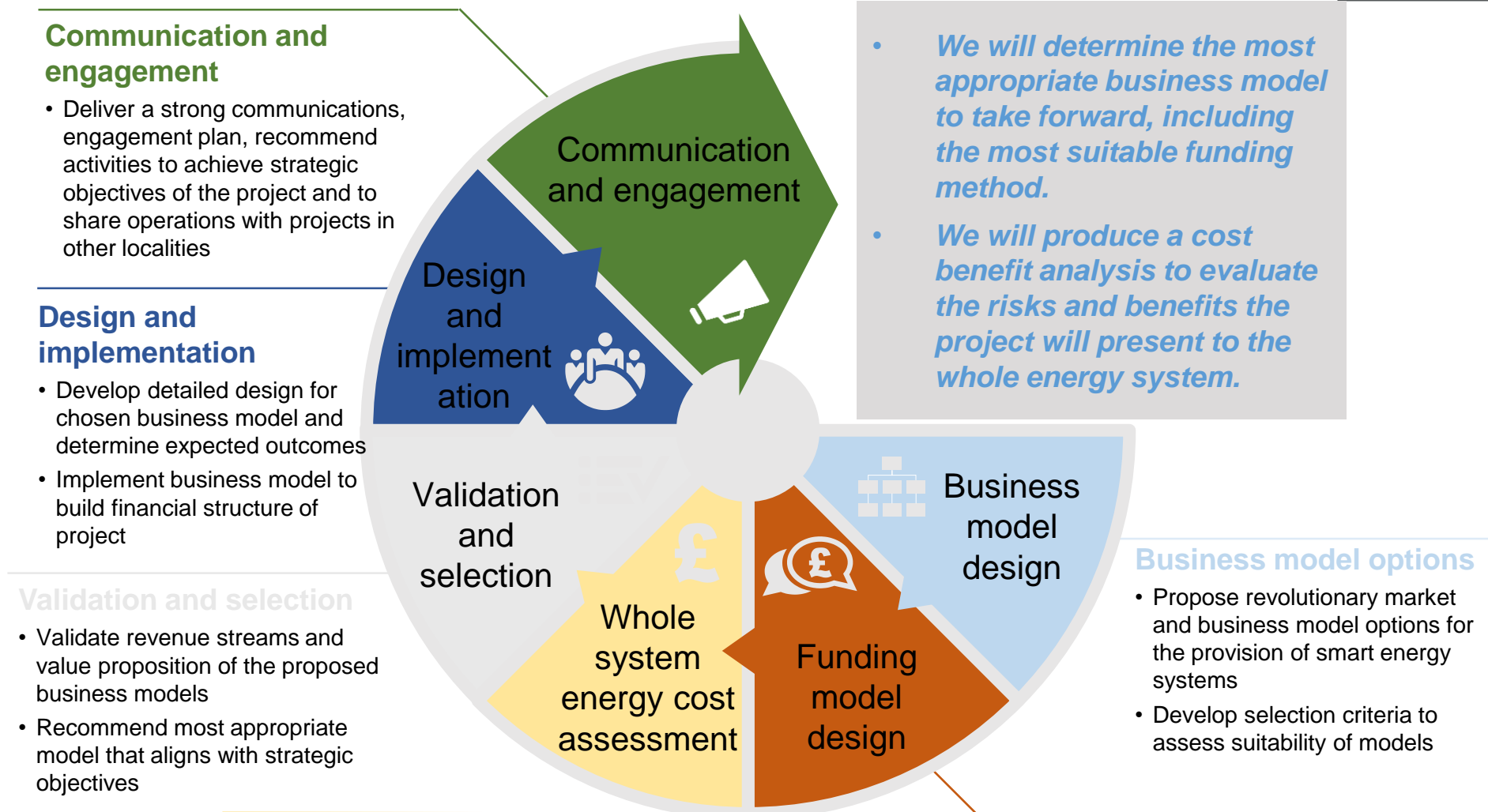
Platform fundamentals

Upside's Virtual Energy Store will aim to demonstrate how the GM LEM will work in practice. Ensuring that geographical network constraints are managed, local generation and supply is maximised and provision of ancillary network services are offered.

1. National Grid/DSO provides local constraint issues.
2. Rolling 24 hour renewable generation forecast (eg PV) for a sleeved PPA to share between GM authorities.
3. Half-hourly updates of wholesale market price forecasts, from the GM LEM PPA counterparty
4. Given forecasts for local constraints, renewable generation, wholesale price and the PPA terms, create an optimal dispatch plan for the selected authority/site.
5. Given the optimized dispatch plan, turn site storage up or down to maximise income for the authority, whilst minimizing imports when generation import is not available
6. Monitor real-time asset behaviour in-order to update forward optimization plan



Investment Ready Validated Business Model



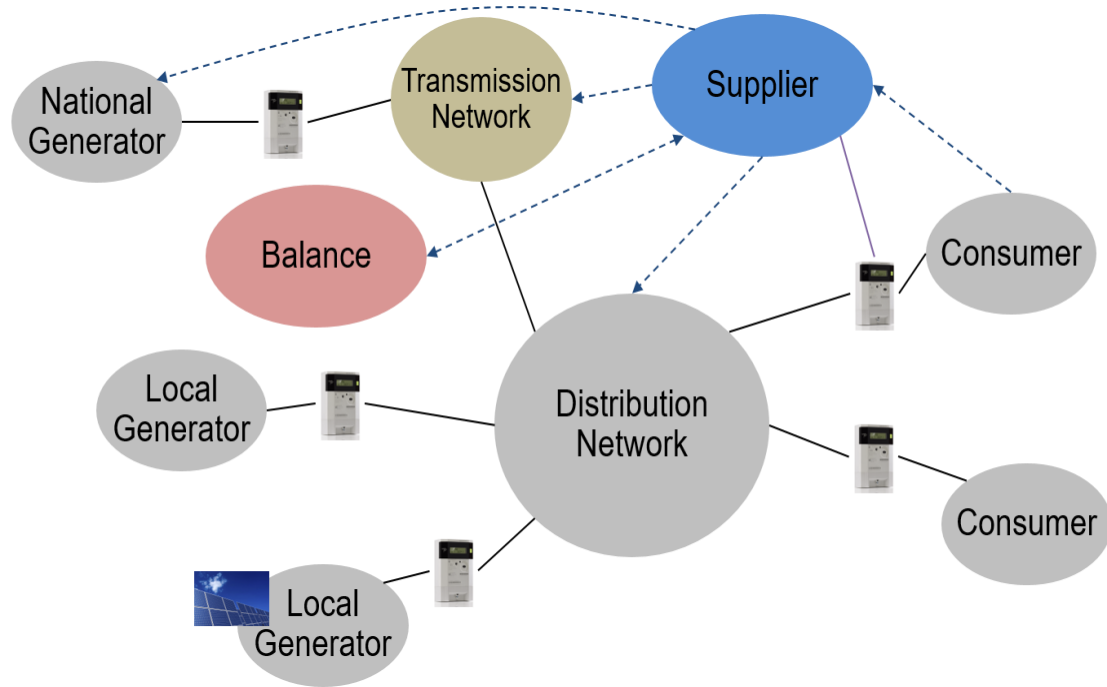
Whole system energy cost assessment

- Perform impact assessments to compare affects of business models on value chain for whole energy system
- Develop financing proposals that share benefits and risks fairly between investors, consumers, utilities and authorities

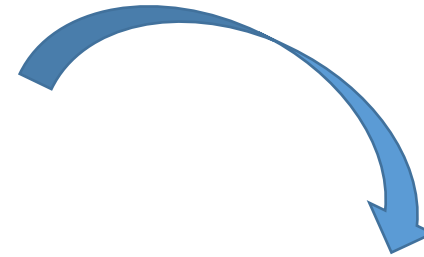
Funding model options

- Investigate possible funding models and structures to finance the project
- Ensure business model will attract finance and investment

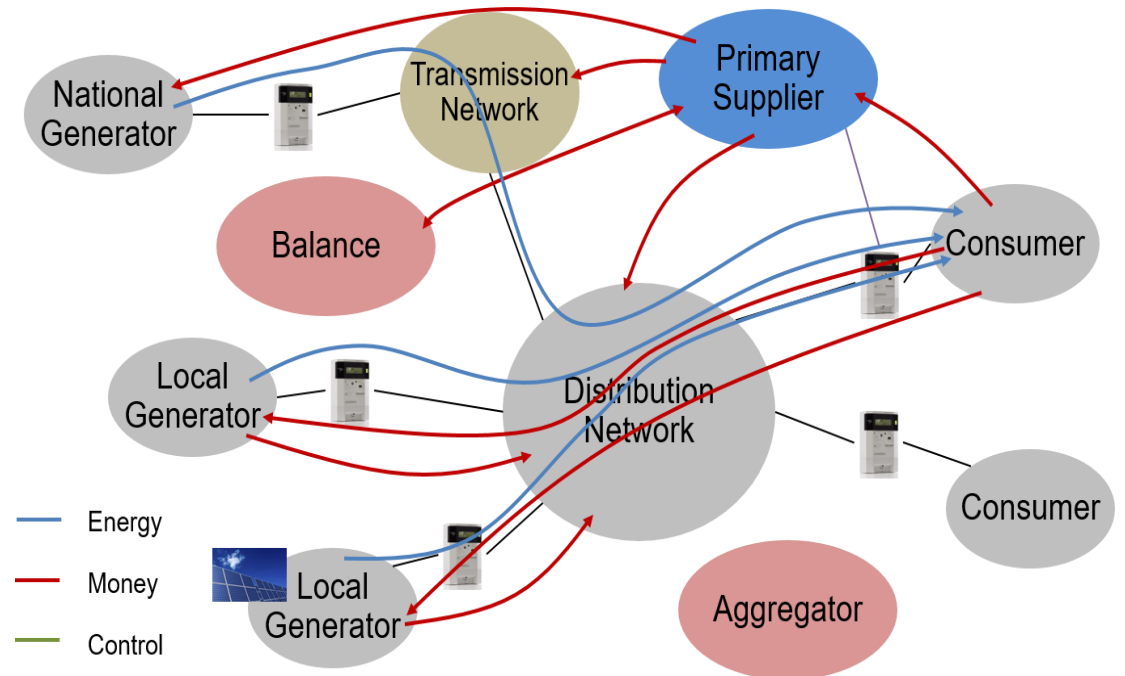
Future.....



Phase 1: Current Commercial Structure



Phase 4: Future Adhoc Trading



- Energy
- Money
- Control

Proposed Consortia



TBC

Advisors



Pioneer City



International followers



