

Future Energy Networks

ExiST Quarterly Meeting

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Exeter



Introduction

Great Britain's Power System is going through a period of transformative change....

Customer engagement is paramount....

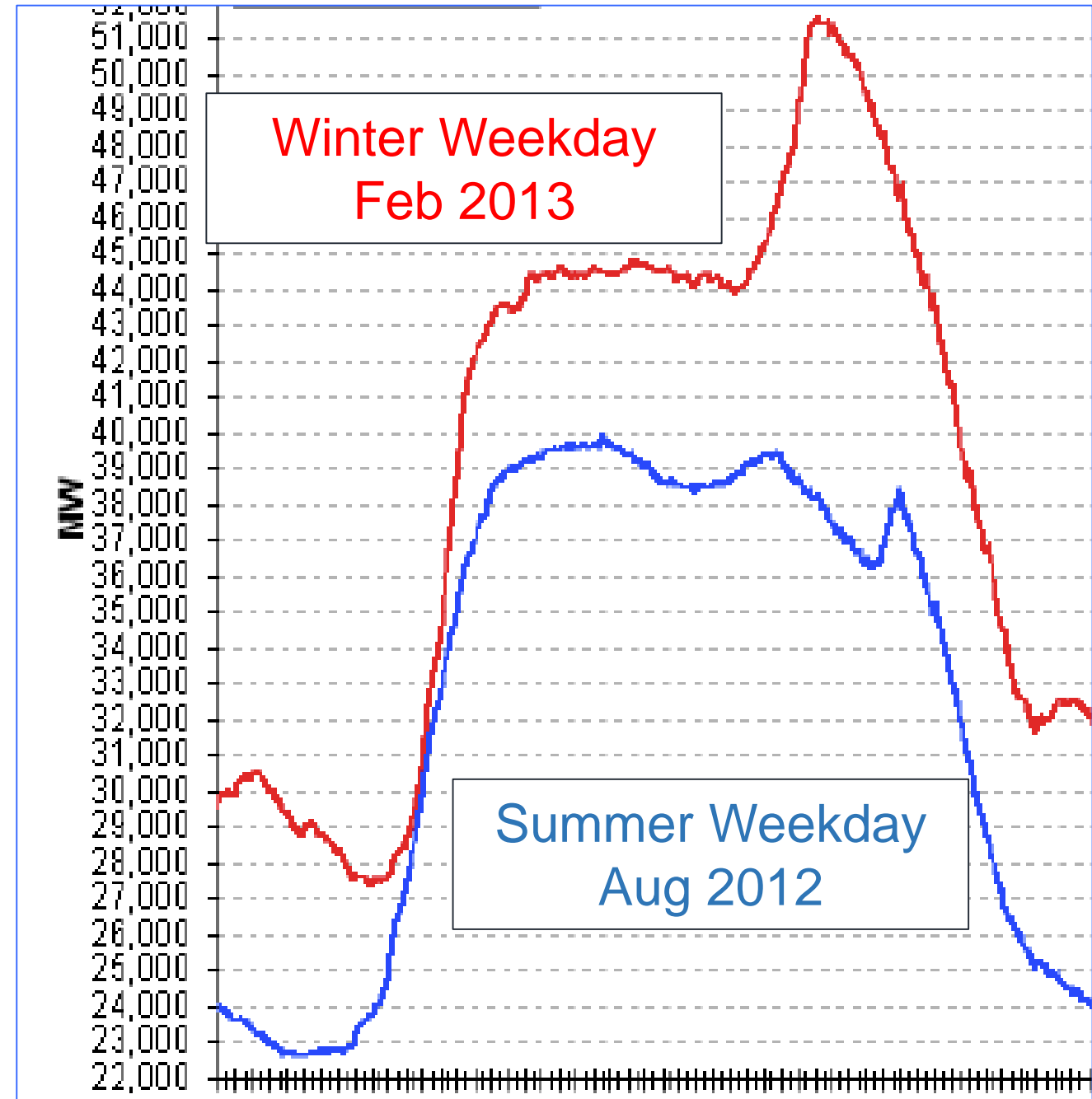
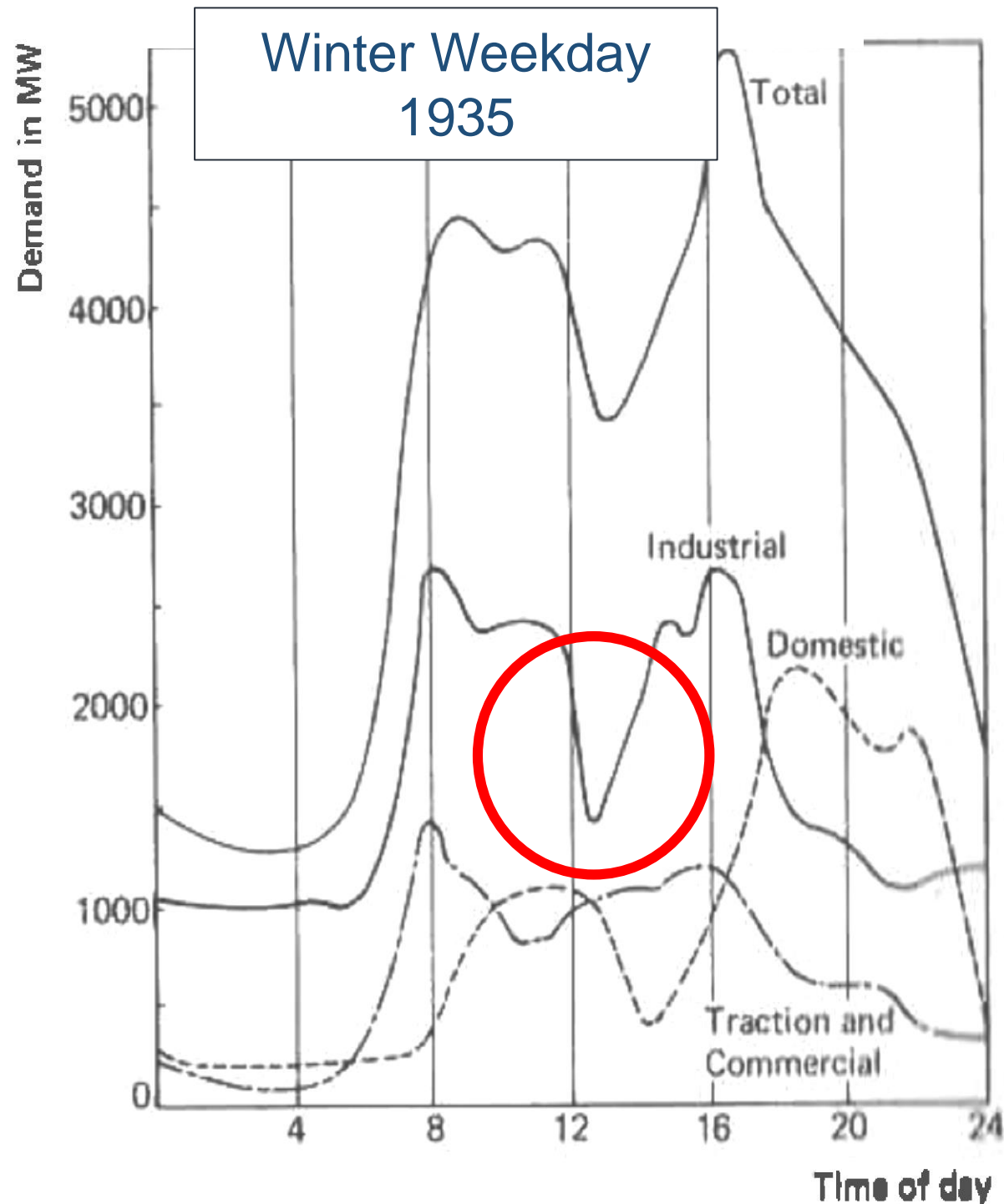
Systems will be more open and data interoperability has to be enhanced....

A whole system perspective is fundamental....

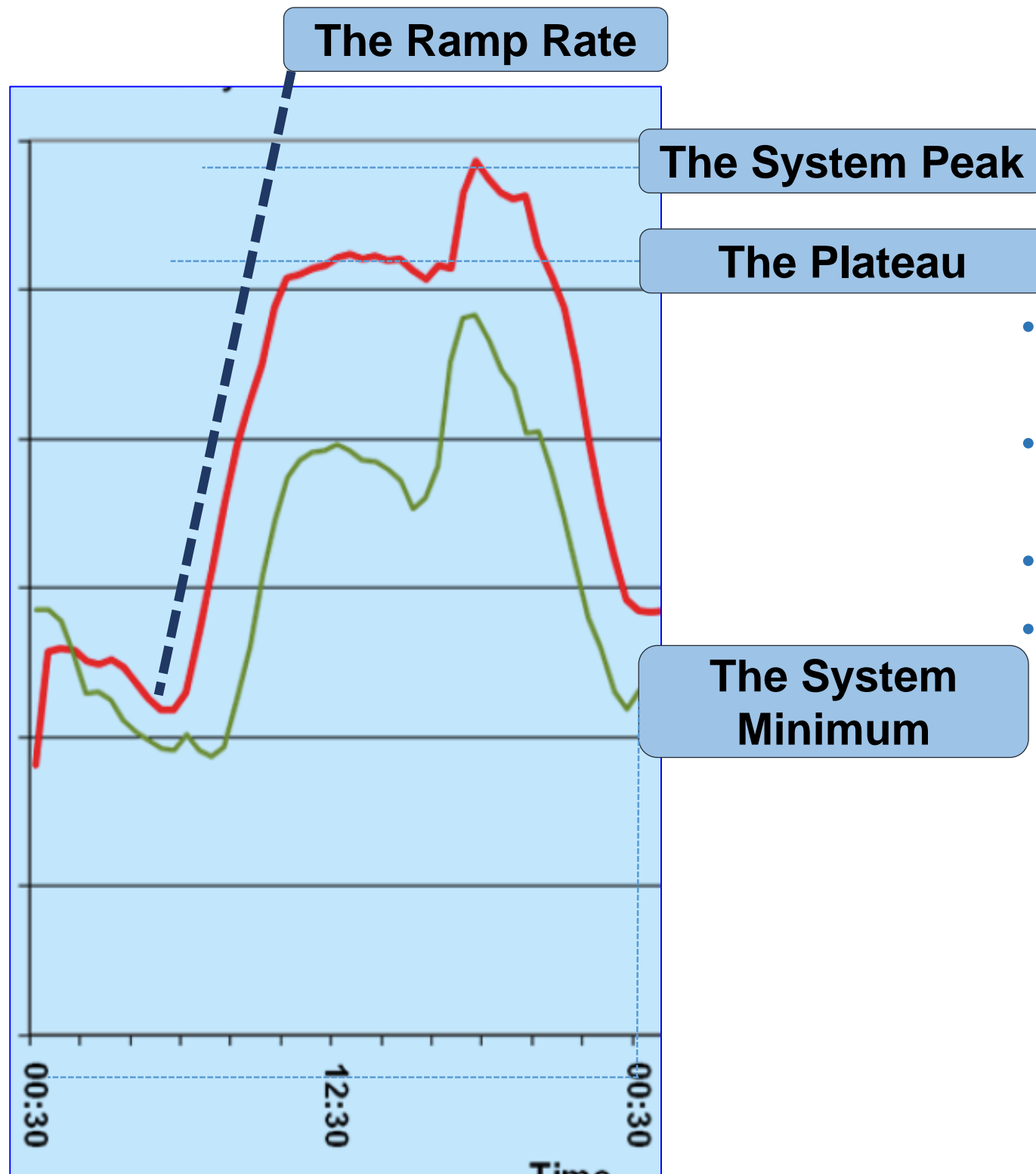
Permission to present material on behalf of the Energy Systems and Transport Systems Catapults is gratefully acknowledged.



Daily Load Curves are Changing...

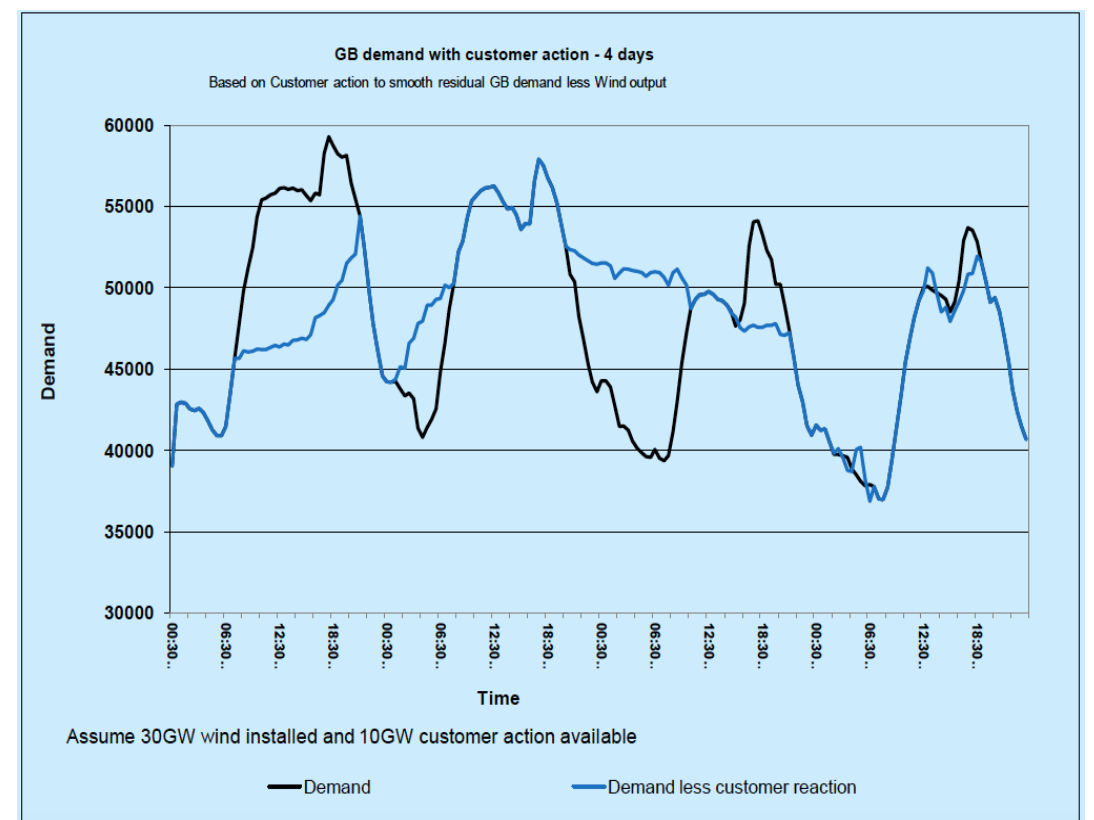


Predictability has been key



Predictable daily and seasonal curves are relied on by Network Operators, Generators, and Suppliers:

- **Peak demands:** often the limiting case for power flows and voltages
- **Minimum demands:** impact on voltages and to determine maintenance and construction windows
- **Plateau demands:** may set peak power flows
- **Ramp rates:** generation scheduling

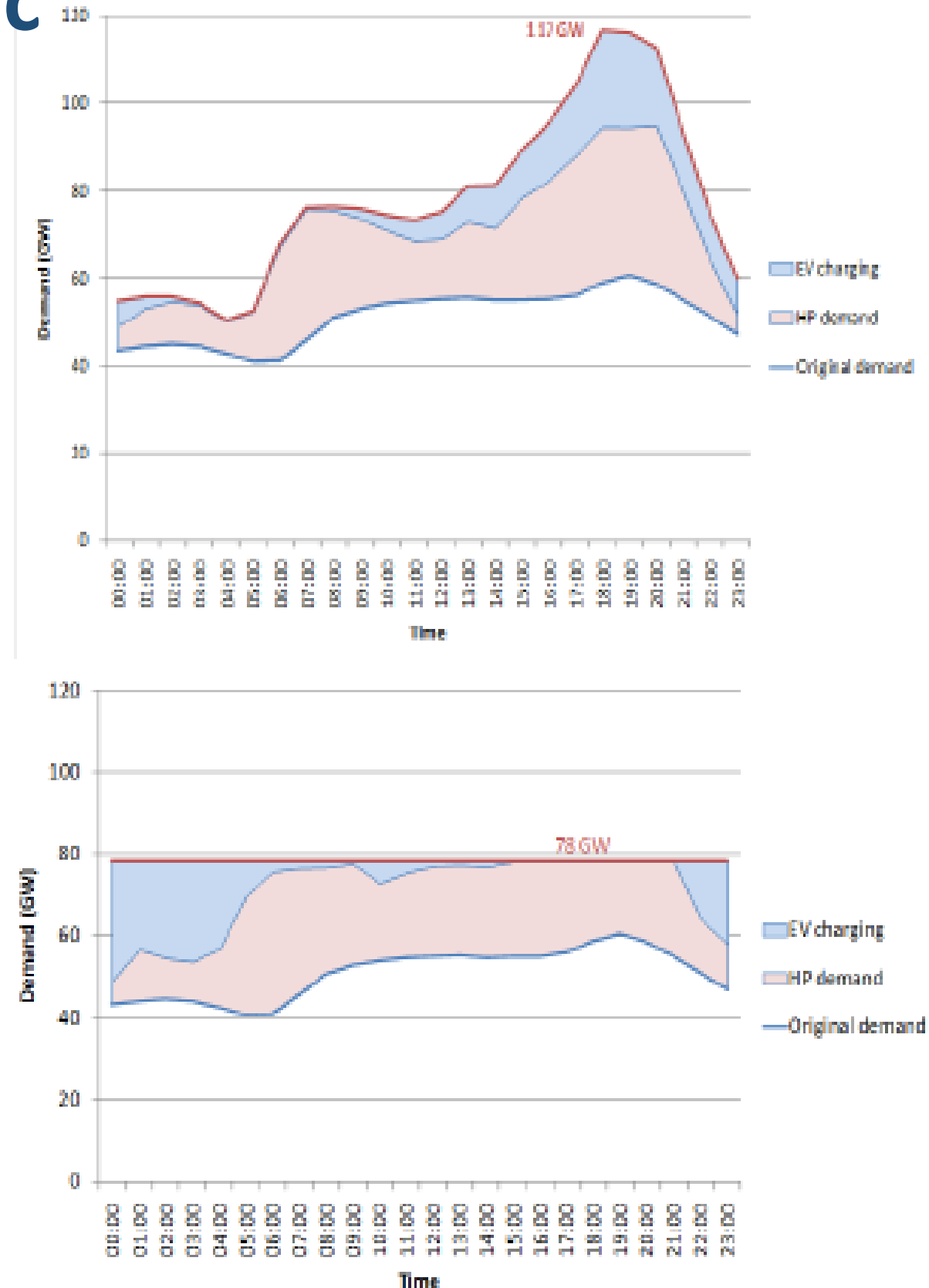


Mass Introduction of Electric Vehicles and Heat Pumps

- How avoid major system reinforcement for 2030 onwards?
- How cope with latent demand following a prolonged outage?
- What technologies, control systems and customer incentives might mitigate the impact of EVs and HPs on peak demand and support system balancing and stability?

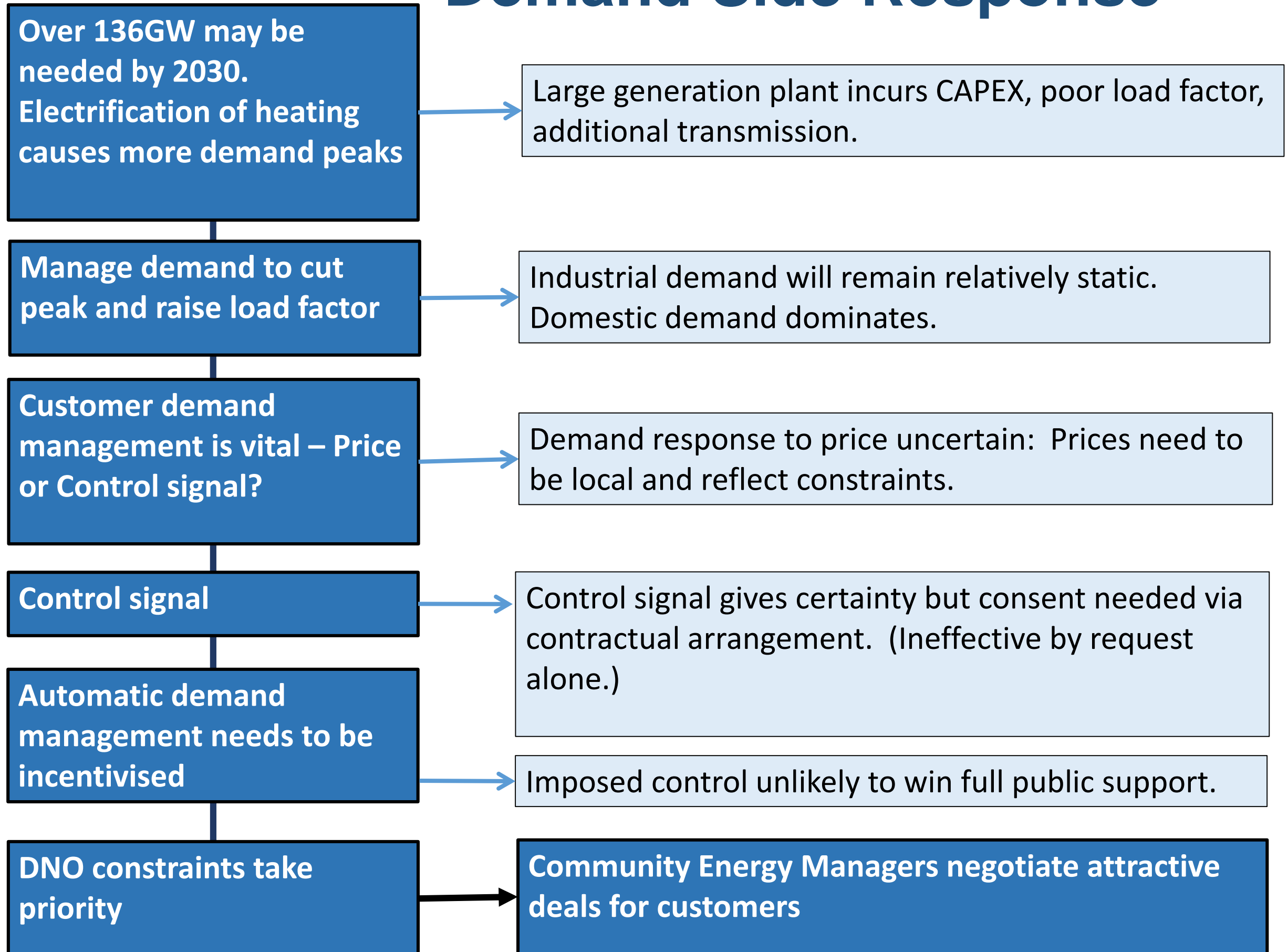
Vehicle to Grid (V2G)?

Vehicle to Infrastructure (V2I)?

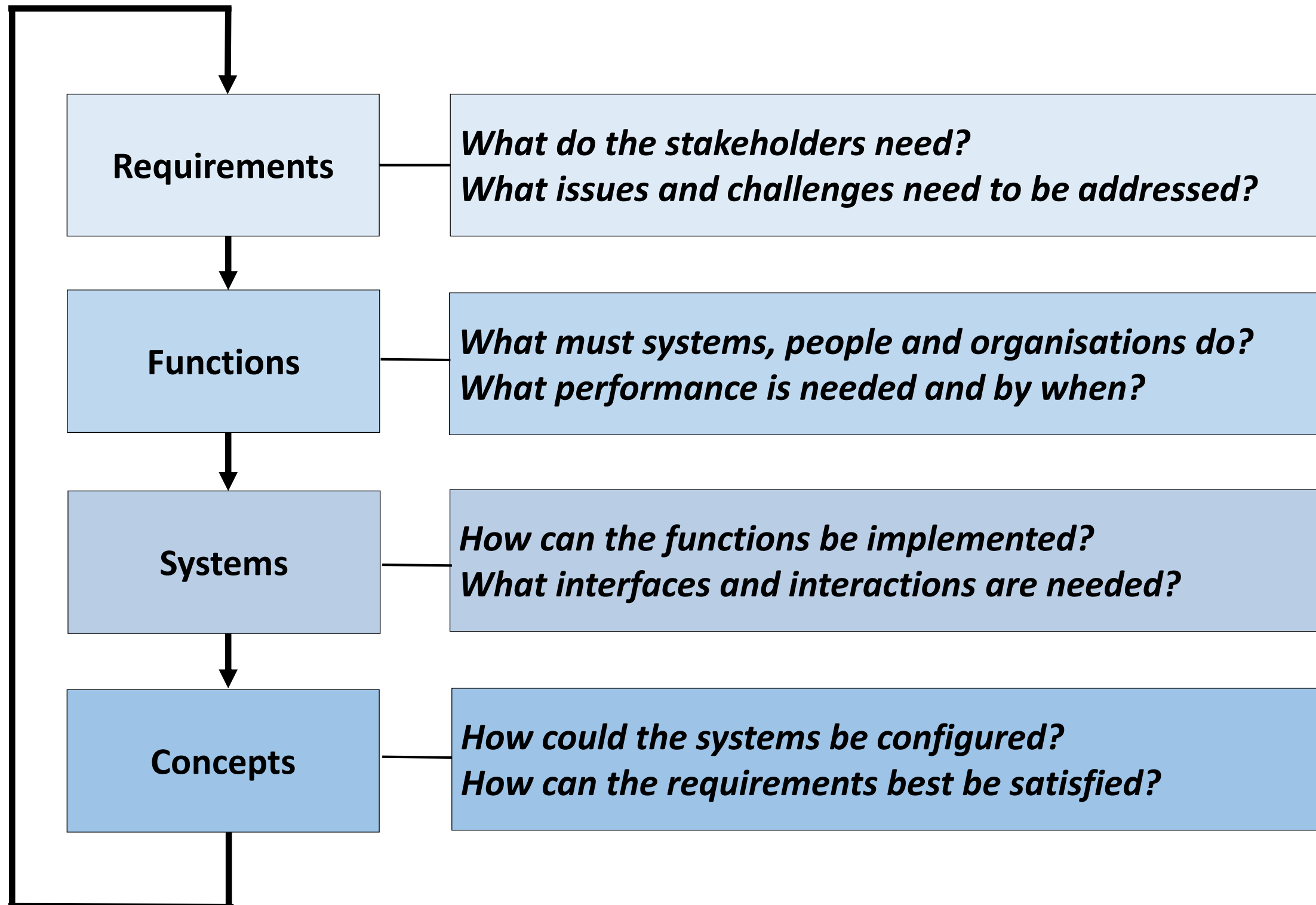


Source: ENA Benefits of Advanced Smart Metering for Demand Response Based Control of Distribution Networks 2000

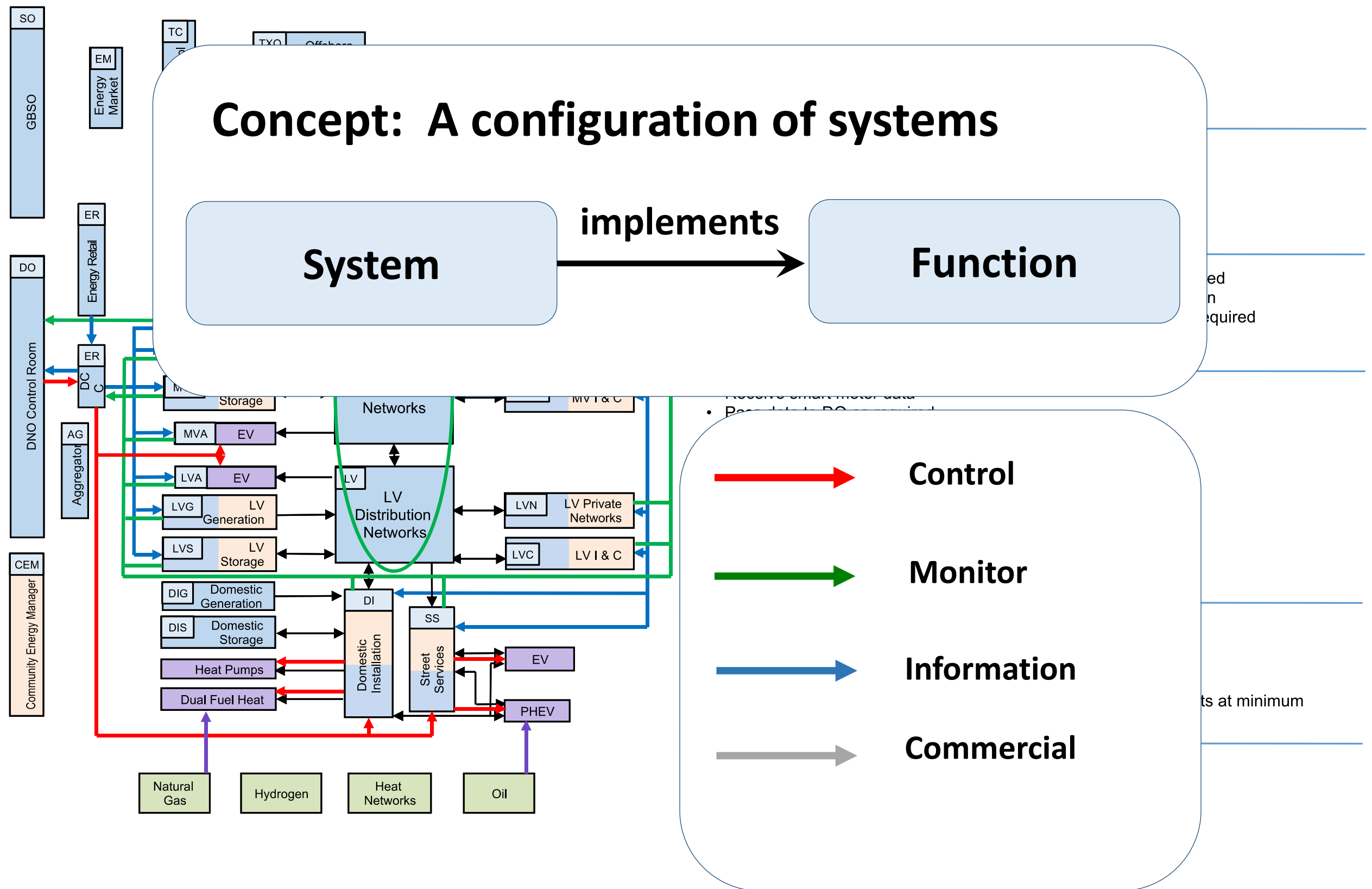
Demand Side Response



An Iterative Approach



Exploratory Concept: Mass Electric Vehicles



[Extract from workshop analysis]

Power System Concepts

Power Sector Adaptation

Power Sector maintains Business As Usual, accommodating incremental development

Evolutionary approach.

Largely reactive to new demands and opportunities. No expectations of early changes in customer behaviour.

Power Sector Leadership

Power Sector provides leadership, engaging with more active consumers. **Development of existing statutory and license obligations. DNOs undertake DSO roles.**

GBSO/DSO coordination for integrated approach to balancing and constraint management.

Customer Empowerment

Power Sector becomes the Facilitator, empowering commercial parties and consumers.

Driven mainly by individual customer and commercial interests. Individual and virtual networks of consumers adopt new business models.

New sector arrangements facilitate the entry of third parties, new services, Edge Technologies.

Community Empowerment

Power Sector expands its Facilitator role, empowering Communities and Smart Cities.

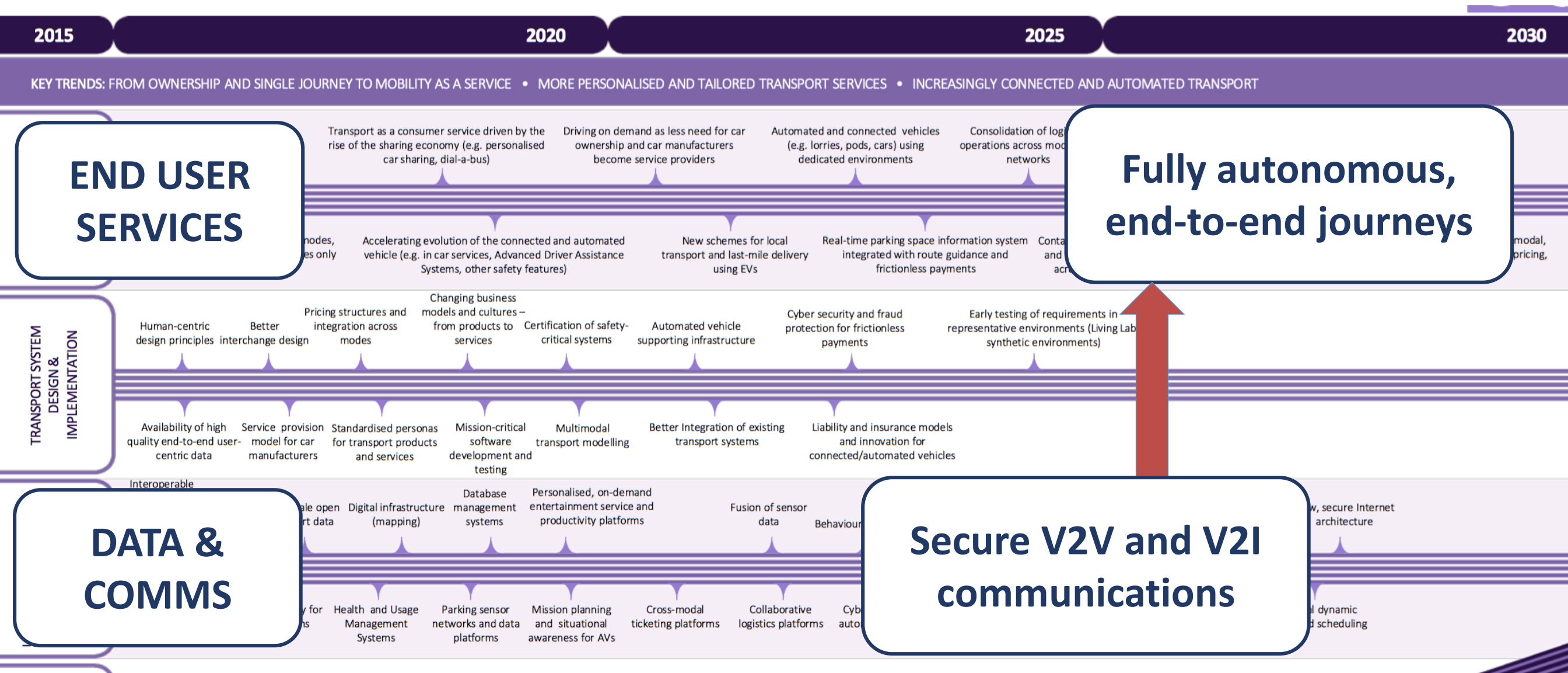
Driven by local community interests and strong growth in 'smart city' infrastructure.

Communities, geographic and virtual, will need flexibility to follow complex agendas.

Part of a wider 'Internet of Things' with greater Peer to Peer engagement, including local markets and services.

TSC Technology Strategy for Intelligent Mobility

(In consultation during Jan16)



Recent Funding Announcements by BIS:

<https://www.gov.uk/government/news/driverless-cars-technology-receives-20-million-boost>

Conclusions

Closing Remarks

- *The Internet of Things is an integral part of the transformations we are looking for across energy, transport and every aspect of our lifestyles*
- *We cannot engage people without the data that allows them to trust:*
 - *The arrangements on offer*
 - *The behaviour of the ‘things’ we need to rely on*

Thank you!