

Integrated Smart Networks



Climate Change Challenges

EU CO₂%

33%



25%



18%+



33%

Ireland
CO₂%

30%

18%

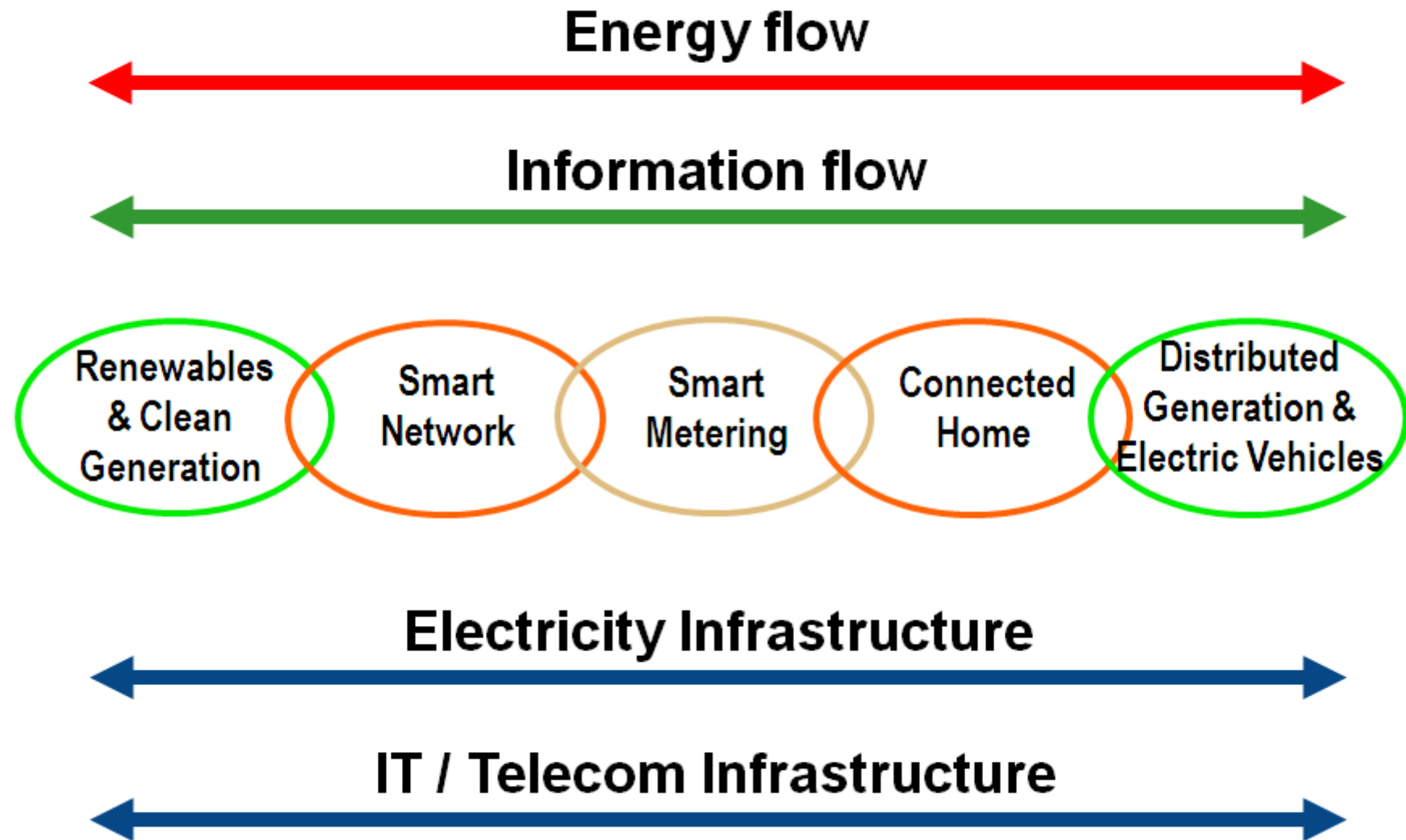
Cleaning up these makes electricity the fuel of choice

ESB STRATEGIC FRAMEWORK 2020

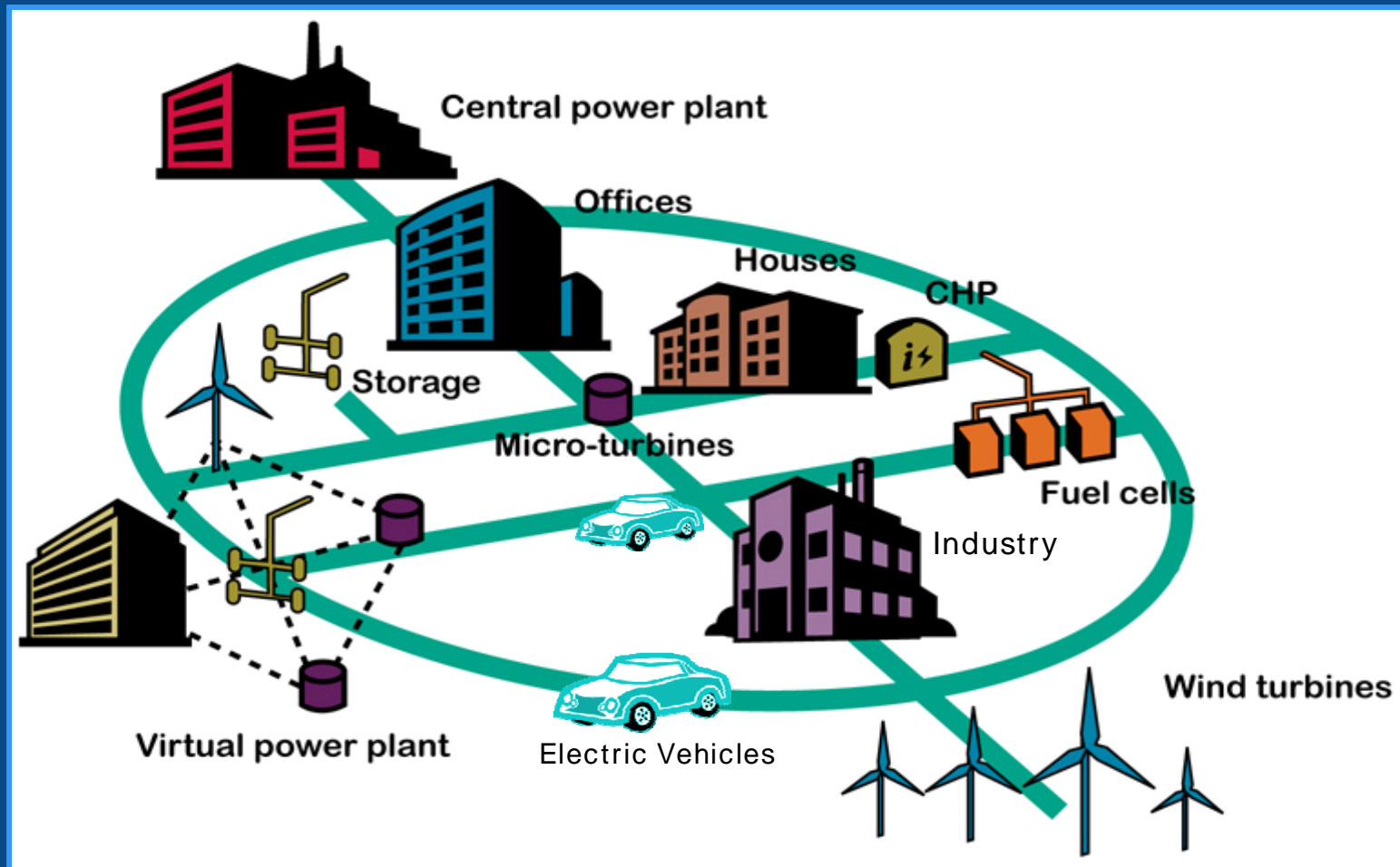
- **World Class Sustainable Networks**
- **A Renewable Business Of Scale**
- **Best Practice Generation Portfolio**
- **Customer Focused Supply Business**
- **Significant International Business**

Net Carbon Neutral By 2035
Leader In Energy Efficiency

Evolving Smart Networks Model



Networks Will Be The Enabler



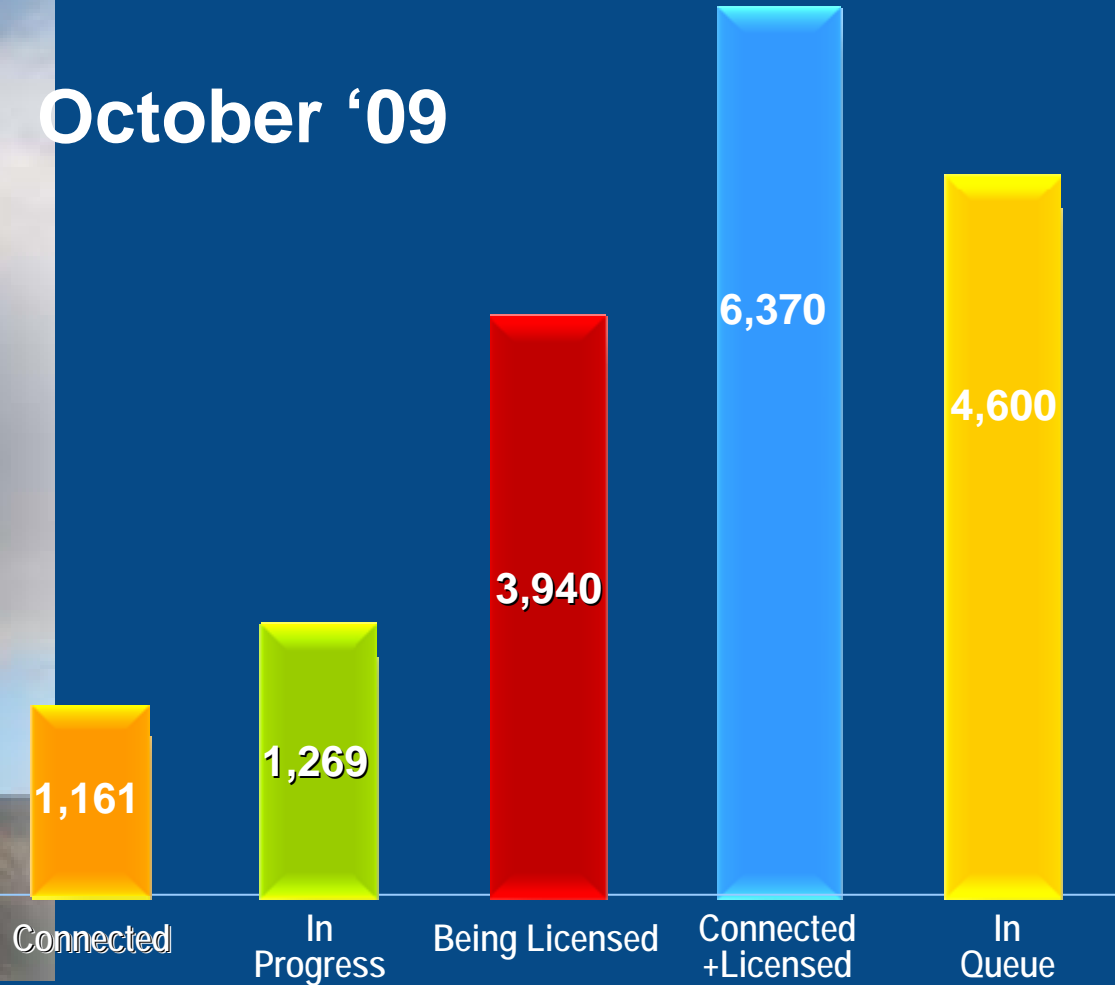
Smarter **Accessible** **Flexible** **Efficient**



Networks

Wind Connections MW

October '09





ESB N / EPRI /ERC Wind Demonstration Project

- **A. Exploration of Voltage / Var control on Distribution connected wind farms**
- **B. Use of voltage regulators to limit voltage rise**
- **C. Single transformer cluster stations for wind farms**

Photo: John Smith

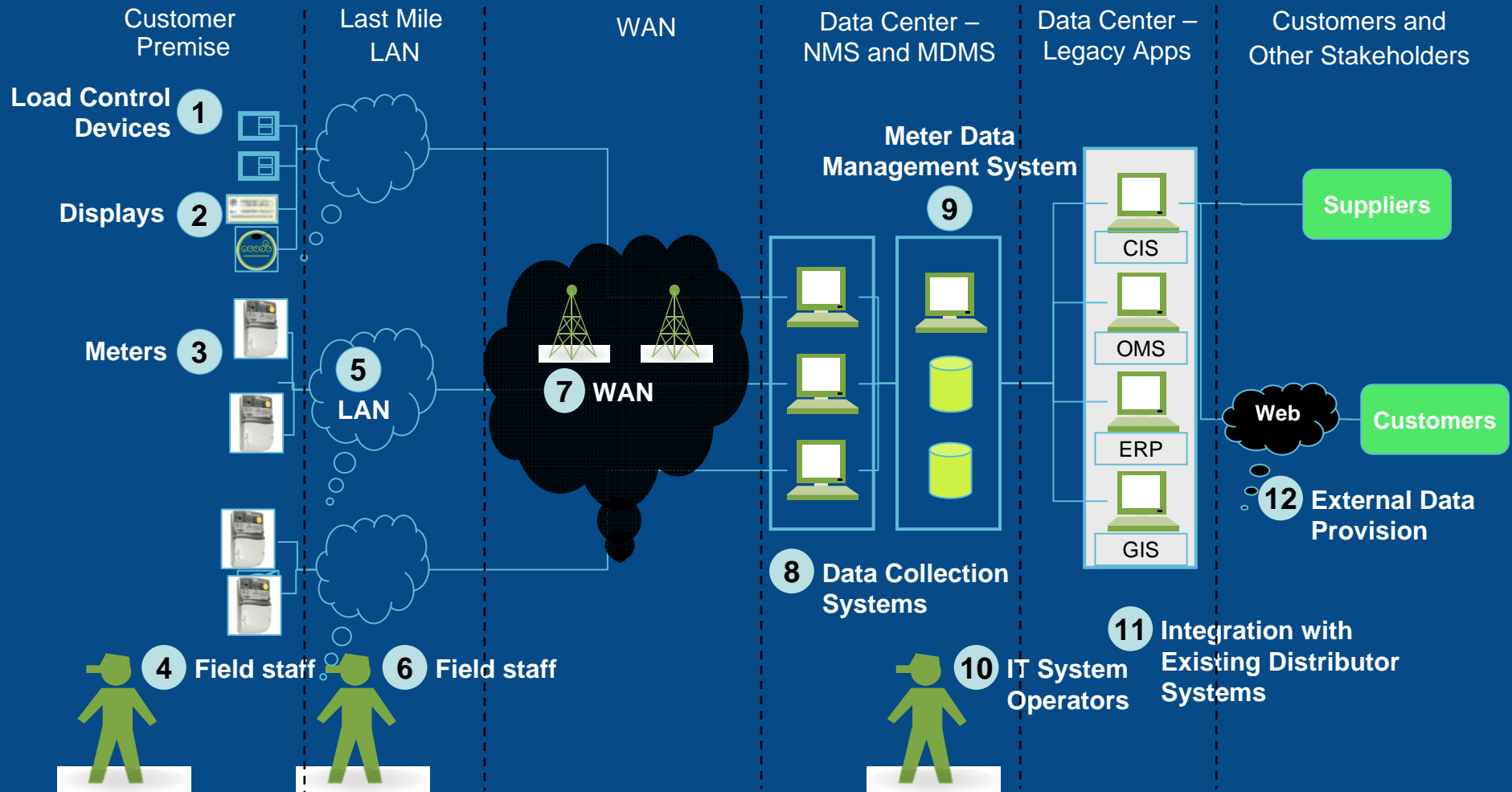
Smart Networks

Green circuits :

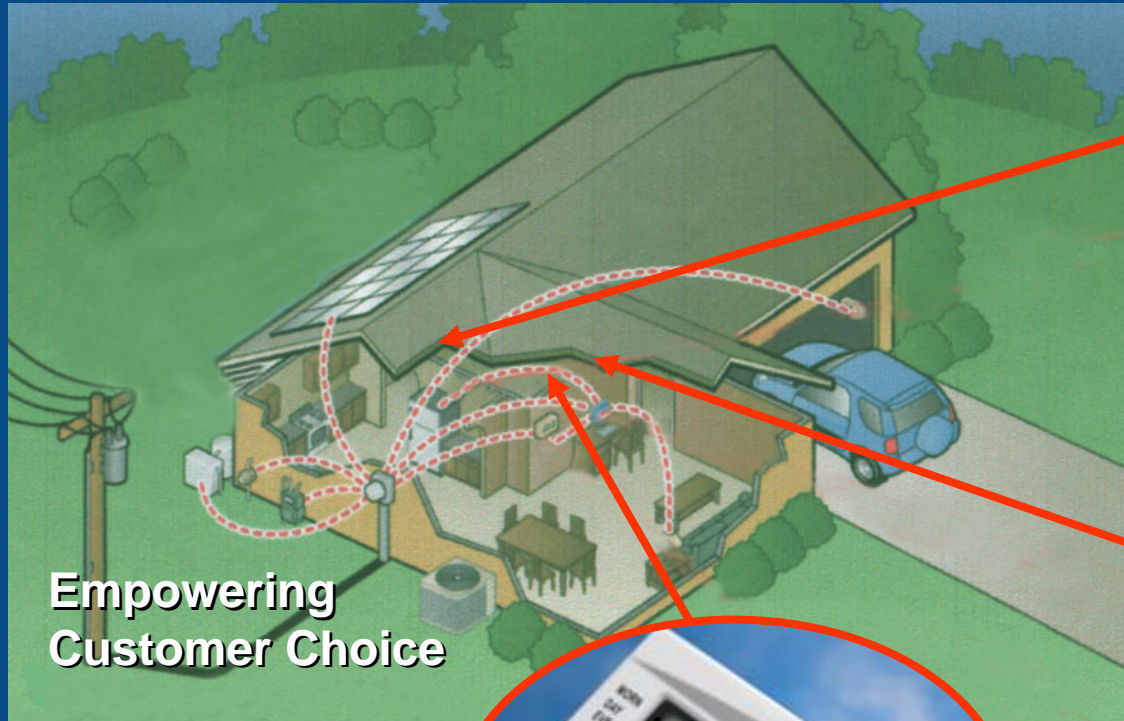
- Self Healing Networks
- **Losses Reduction.**
 - Voltage Upgrading i.e. 20kV Conversion
 - Dynamic re-configuration of networks to minimise losses
 - Re-conductoring
 - Amorphous core transformers
 - Installation of Capacitor banks
 - Lower average supply voltage using line drop compensation



AMI is more than just meters – it's a complex integration of sensors, devices, communications, and software technologies



Connected Home



Empowering Customer Choice

Improve load management through smart thermostats

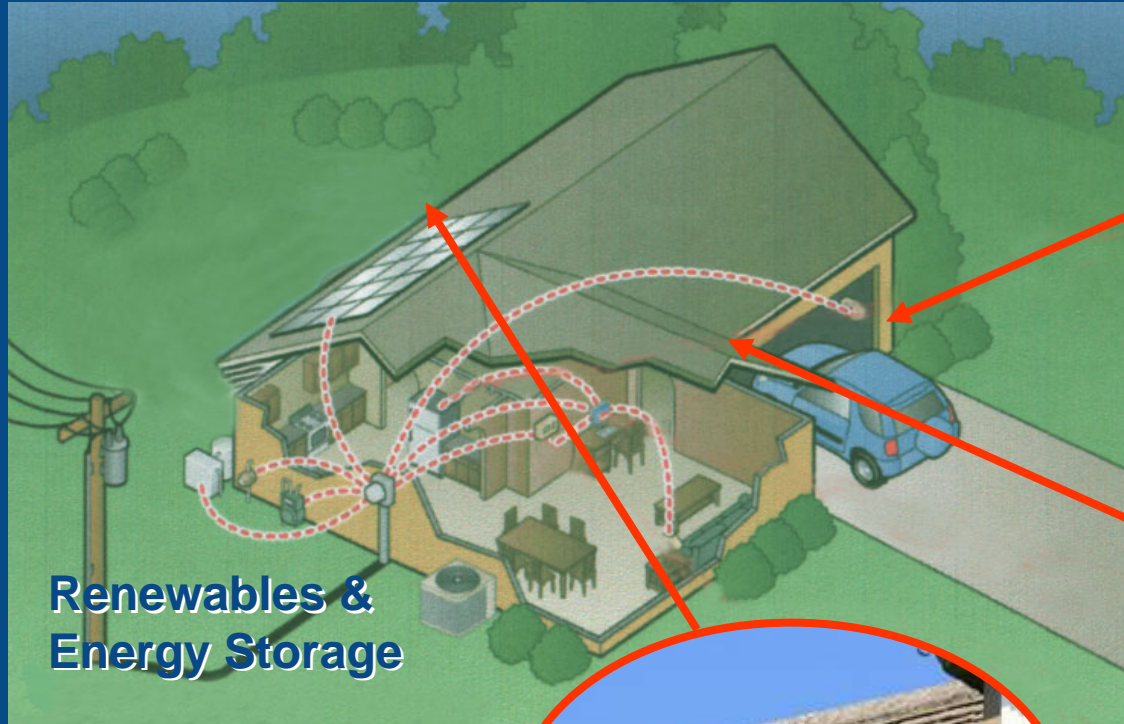


Customer enabled automated response through energy smart appliances



Energy Information drives Energy Conservation & peak lopping

Connected Home



Renewables & Energy Storage



opportunities through Plug-in electric vehicles



Enable micro gen & energy management



Customer Home Storage creates opportunities for increased renewables

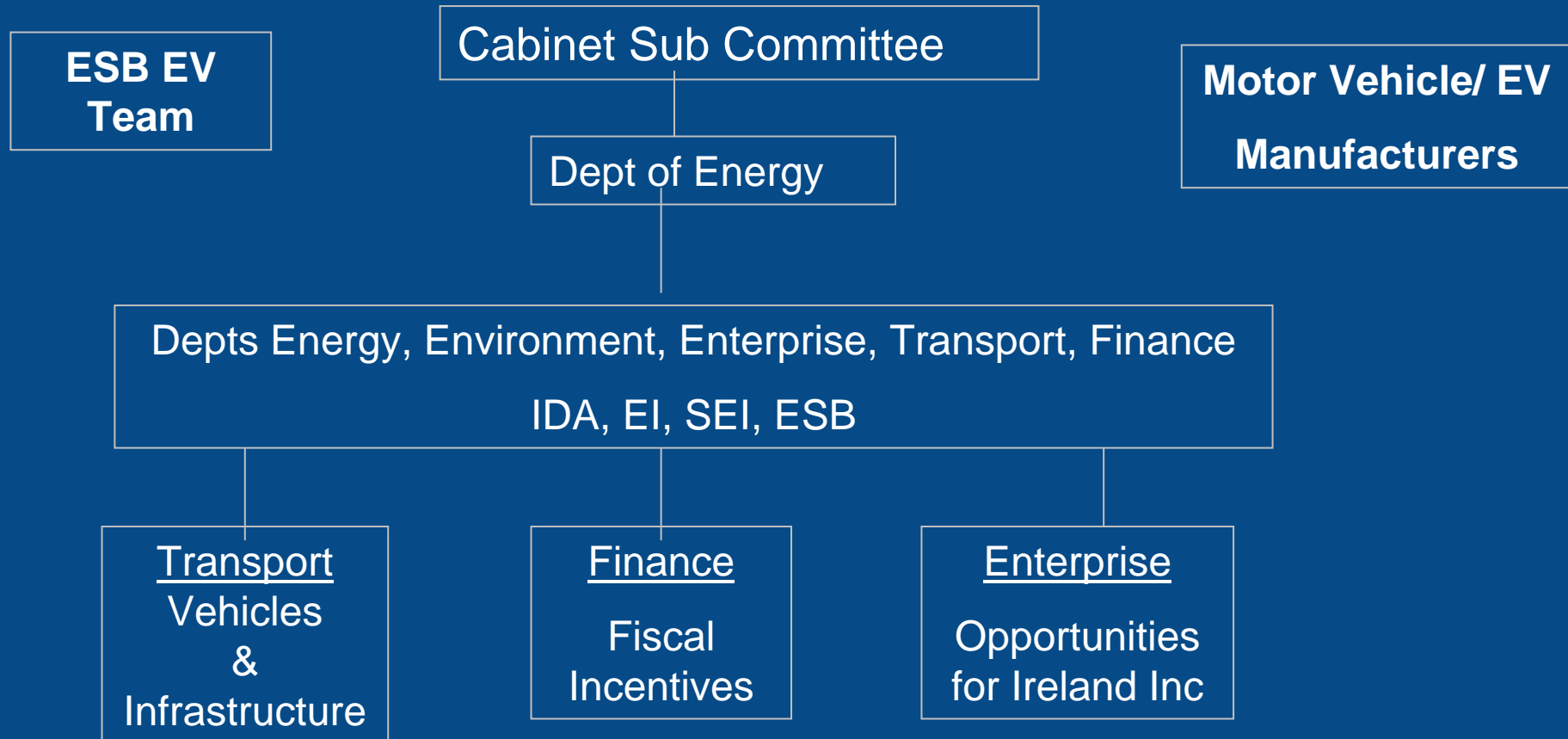
Electric Vehicles Government Targets for 2020

- 10% of all Vehicles will be electric
 - Battery or PHEV
 - 250k vehicles

- 10% of all road transport energy will be renewable



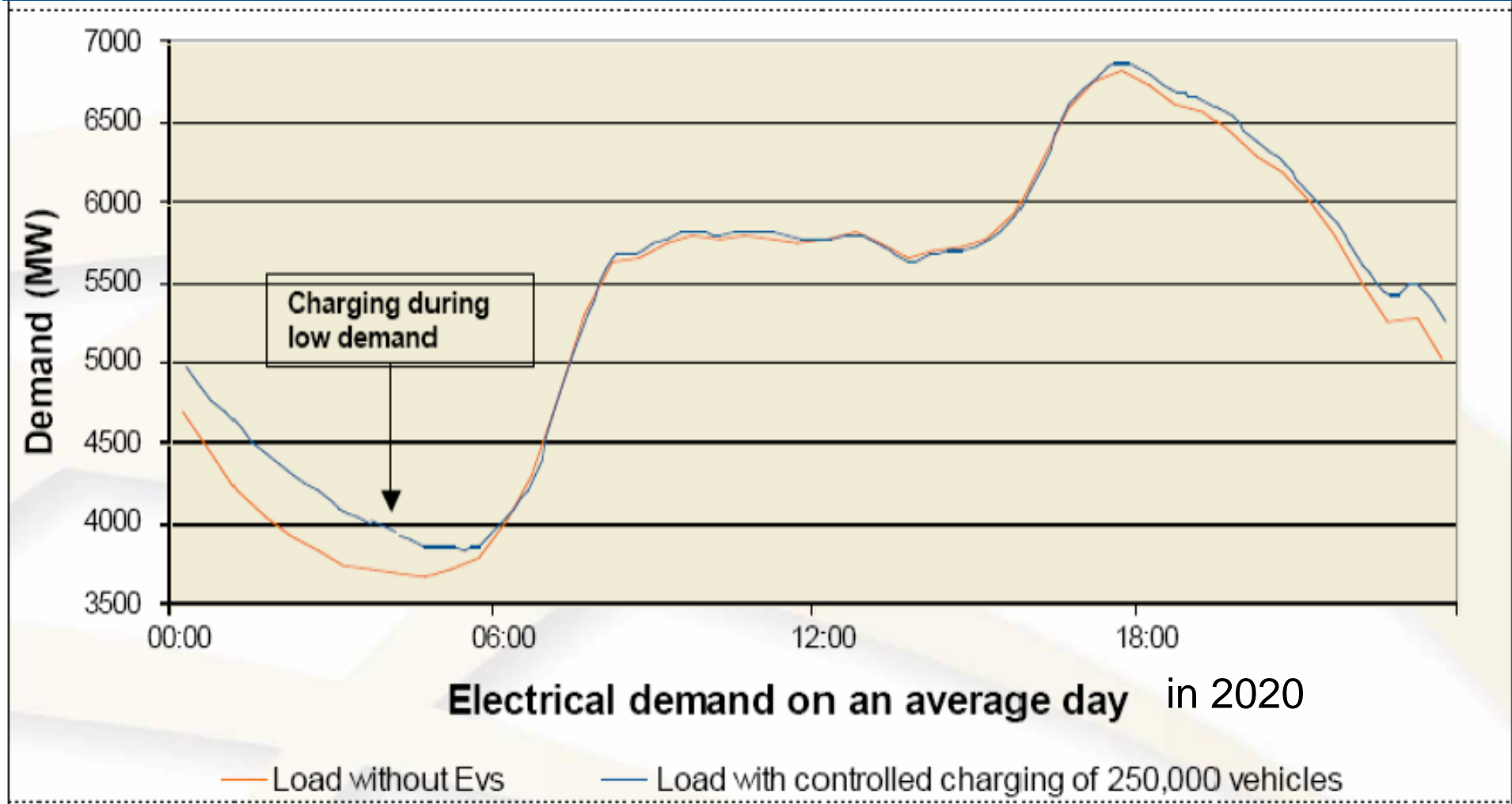
Large Focus on EV !



Issues

- Can the Electricity Grid cope with EVs?
- Are the Batteries up to it?
- Will the Vehicles have sufficient range?
- Will there be affordable vehicles available?
- Will charging infrastructure be available and will it be standard across Europe?
- Are there opportunities for Ireland Inc?

Can the Electricity Grid cope with EVs?



Source: Eirarid

Solving Range Needs

- 86% of Irish work commutes under 50km (return)
- Battery EVs can easily meet most daily needs
- But occasional needs for longer journey both actual and psychological (Range Anxiety)
- Range Extension provided different ways
 - Plug-in Hybrids
 - Battery Electric Vehicles
 - Battery Exchange
 - Fast Charging of Battery



Infrastructure Design Principles

Home charging



Short distance



Normal charging

Charging network

Destination charging



Round trip



Normal & quick charging

Pathway charging



Long distance



Quick charging

Negotiating Supply of Vehicles

RENAULT NISSAN

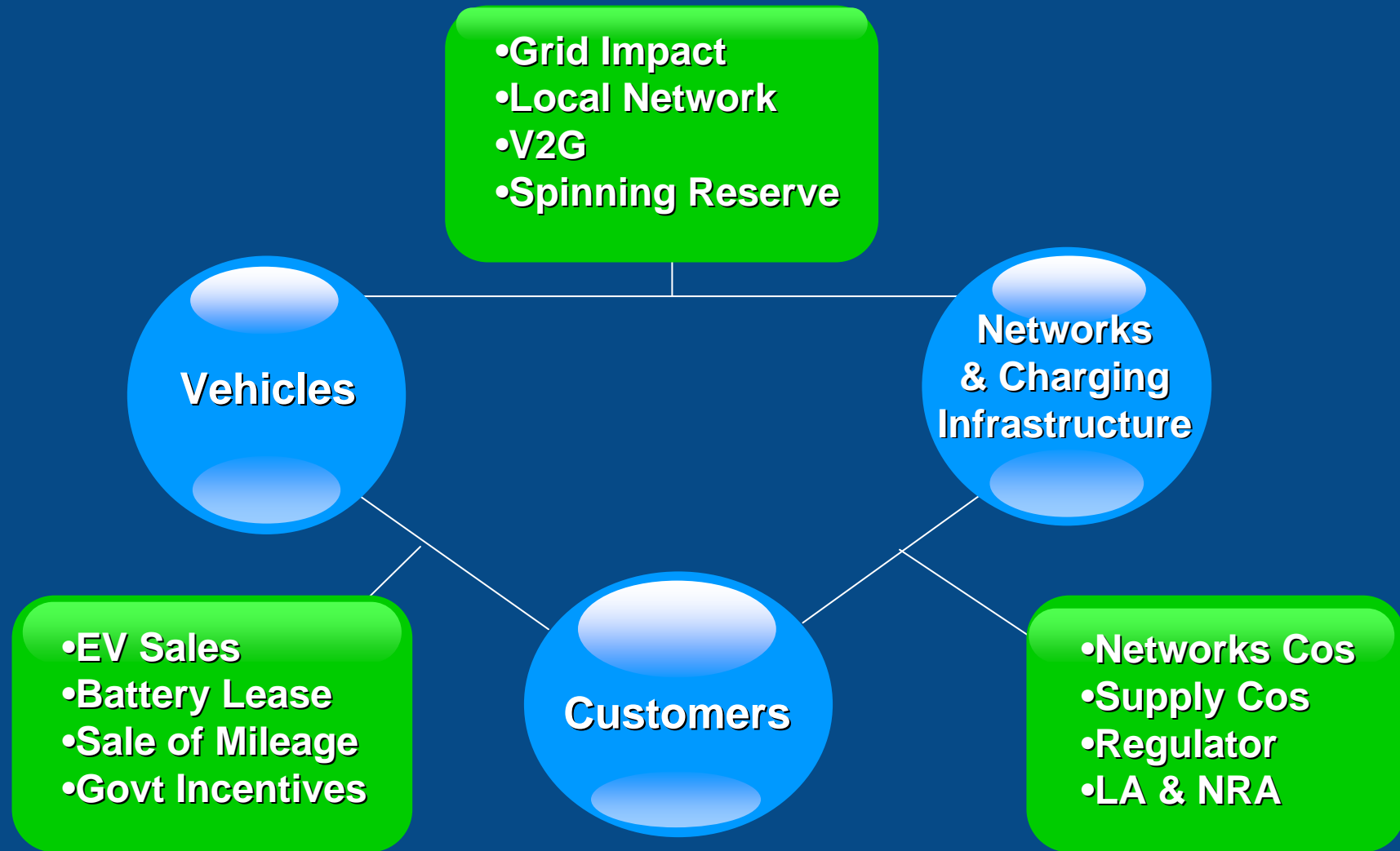
- Non Exclusive Agreement
 - Infrastructure requirements and roll-out
 - Short-term Incentives needed to kick start market
 - Education
 - Supply of Vehicles
- Discussions with other vehicle manufacturers
 - Imminent agreement with some others

Informal EV Standardisation Group

Electric Utilities

Automotive Manufacturers

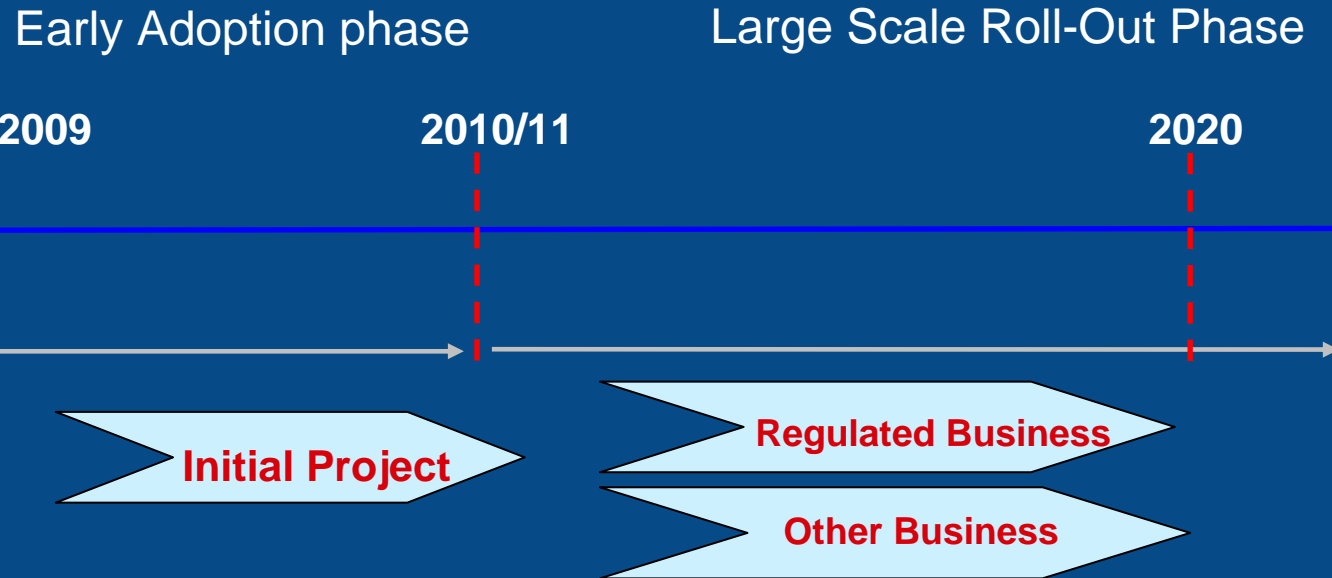




New Relationship Between Electricity and Transport Industries



Electric Vehicle Implementation



- Ensure supply of EV's to Ireland !
- Demonstration: Cars + Charge I/S
- Identify IT /Market System Options
- Link to Smart Networks
- R&D

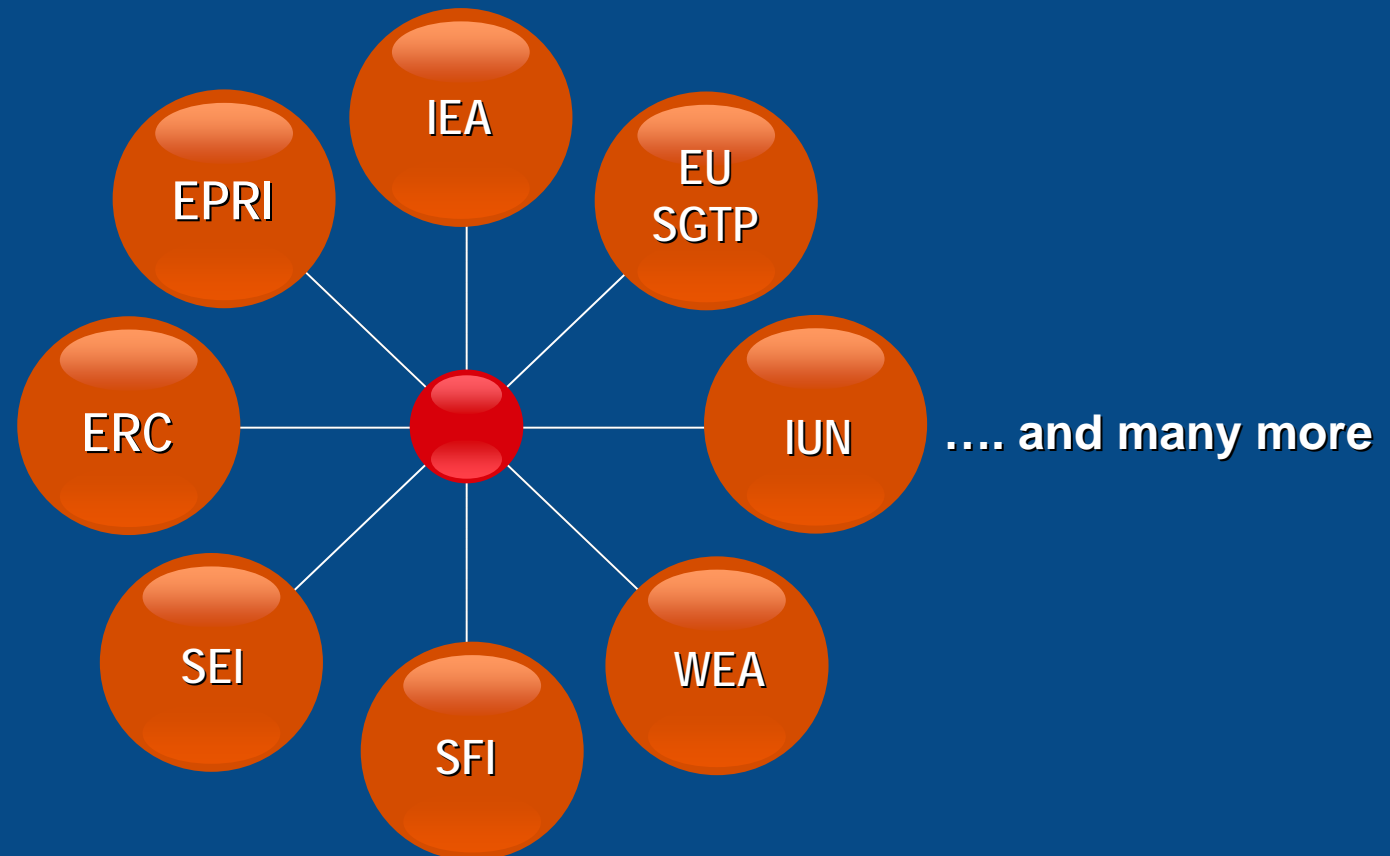
- Secure large scale penetration
- Address scale infrastructure requirement
- Address System Issues - storage/demand



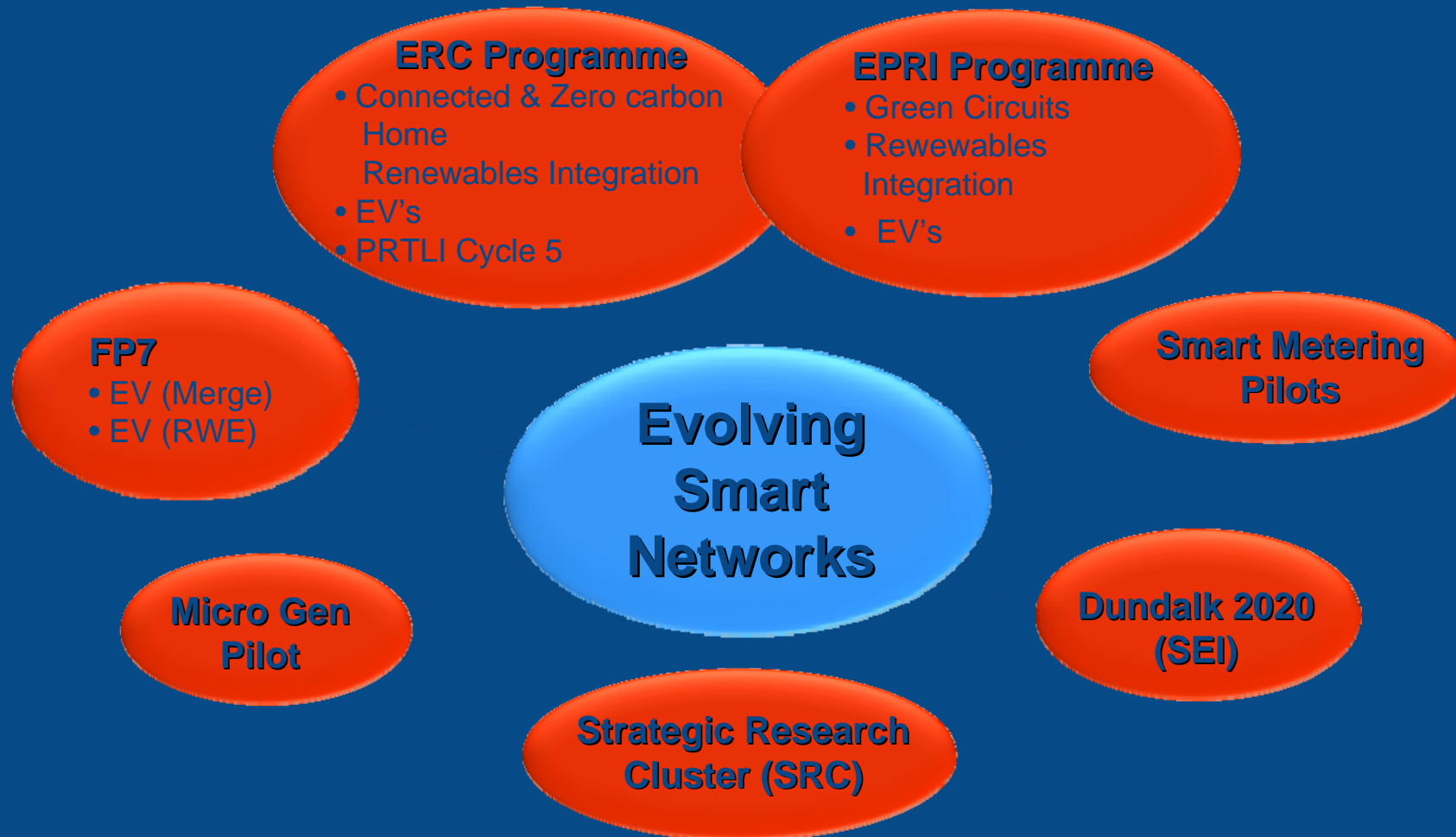
Electric Vehicles Are Back & here to stay !



'Plug' in to International & National Bodies



Smart Networks R&D Projects



Critical Enabler of Smart Networks Strategy

Eirgrid/ESB N – Solving the Challenges Together!

- Eirgrid, ESB N together with wind industry maximising Ireland's wind potential
- Integration of wind (>50% at Dist. Level)
- Utility Management of Heat /EV loads
- Enable market models - customer as "trader"
- Joint research – ERC, SRC, FP7's

Integrated Smart Networks - A new world !

Strategic Challenges & Issues

- Industry leadership and commitment
- Regulatory engagement and support
- Emergence of open standards and interoperability
- Management of IT risks and costs
- Resources and direction to R&D activities
- New industry skill sets and expertise

**An Immense Challenge With Potentially
Huge Benefits for Ireland and Electricity Customers**