ESB Networks 2025

Smart Grids,

IEA Dublin 2012

Looking to the Future

ESB Networks

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About ESB Networks

- Distribution for Republic of Ireland
  - Supplying every home in the country
- Asset Owner Transmission & Distribution
- Part of ESB Group (€12Bn Inc. Northern Ireland Electricity)
- €7Bn ROI Network Assets

	IRELAND
POPULATION (Million)	4.1
ELECTRICITY CUSTOMERS(Million)	2.24
PEAK DEMAND (GW)	5,090
TOTAL NETWORK(KW)	177,000
TRANSFORMER POPULATION	249,00
Average DOMESTIC USE (kWh)	5500

The Journey To Date

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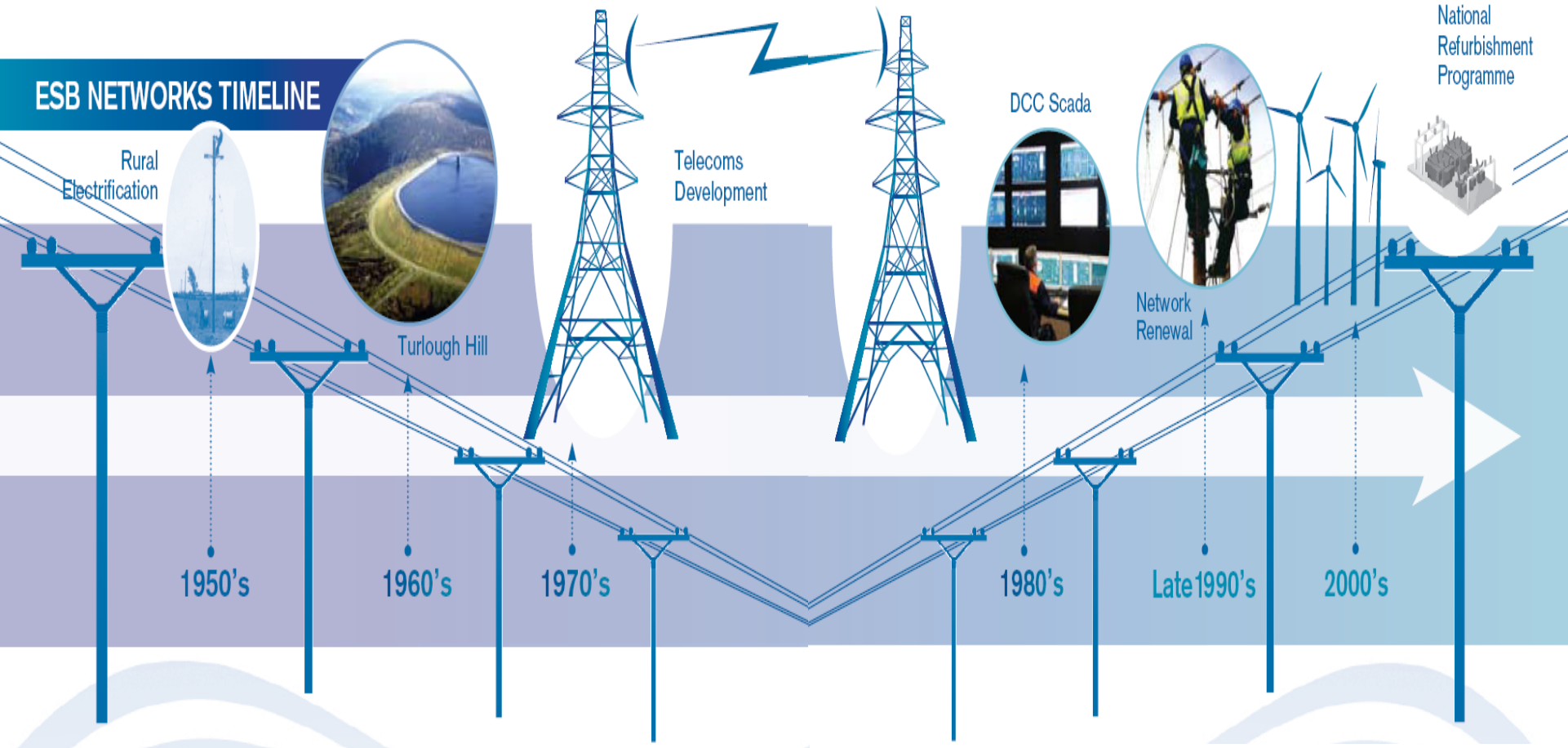

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Modernisation of The National Electricity Network

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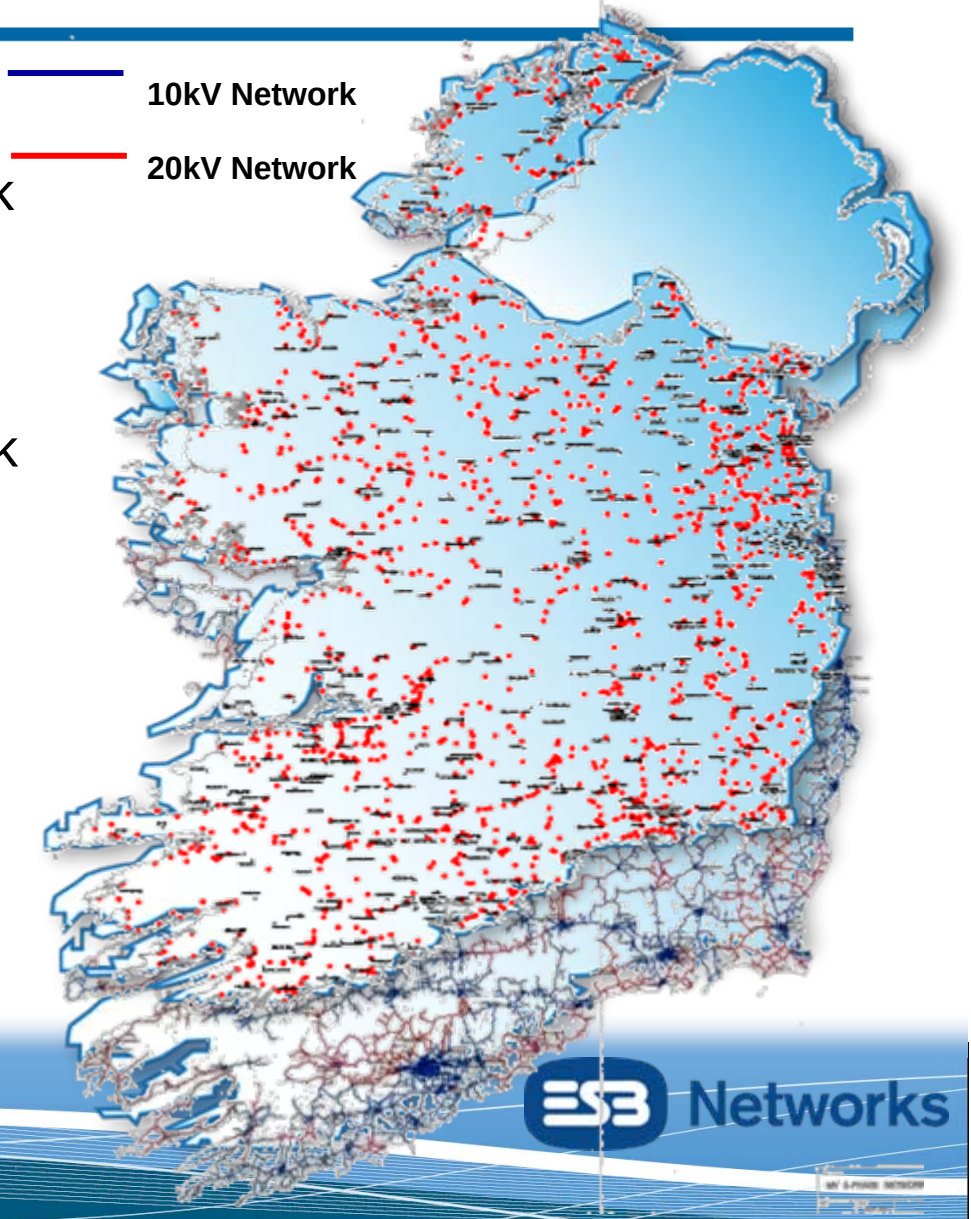
2025

- Renewal of 90,000KM of MV Network
- Conversion of 40,000km to 20kv Operation
- Remote visibility & Control of Network is essential and expanding
- These devices are a real stepping stone to a Smart Electricity Network



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Underpinned by Comprehensive IT & Asset Management Systems

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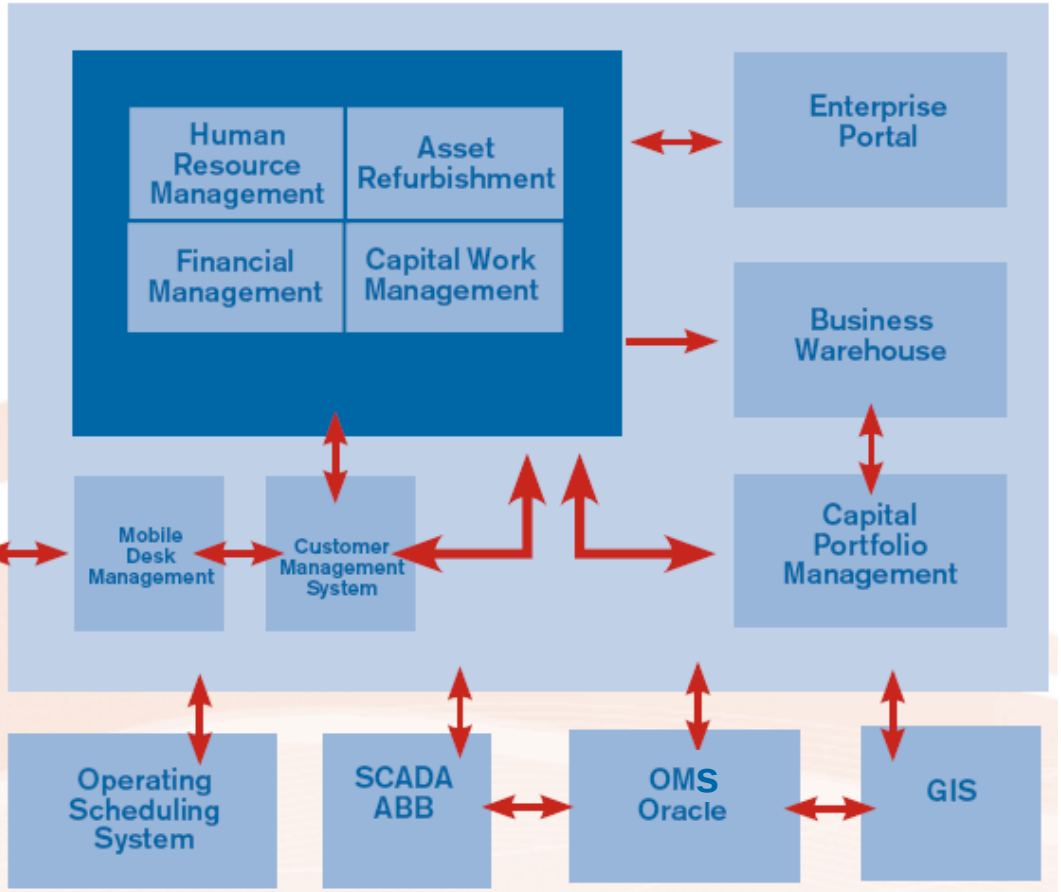
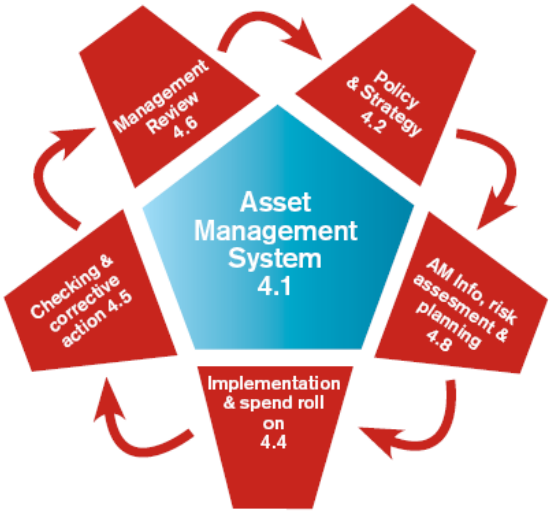


PAS 55 STRUCTURE



Achieved the PASS 55 accreditation – International reference standard for the optimal management of physical assets, providing the definition of good practise in the whole life management of assets.

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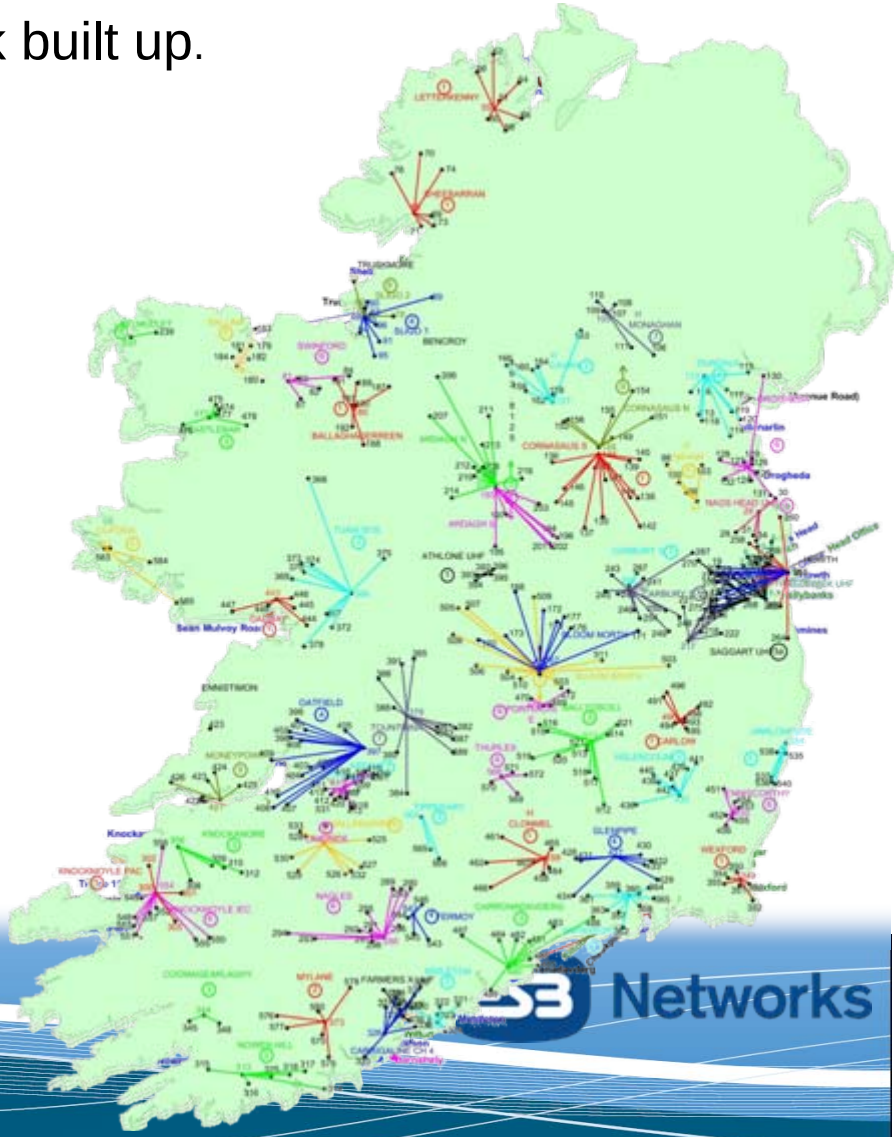
… & a Growing Telecommunications Infrastructure

ESB Networks 2025

- Extensive telecommunications network built up.
  - Fibre:
    - 2,500Km(24-288 cores)
  - Microwave Radio
    - Over 100 links
  - Polling Radio
    - >500 Sites
- Developments Underway
  - Fibre extension,
  - Microwave Upgrade
- Research & Development Planned
  - IP Operational Network Migration



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ESB Networks – Already getting smarter!

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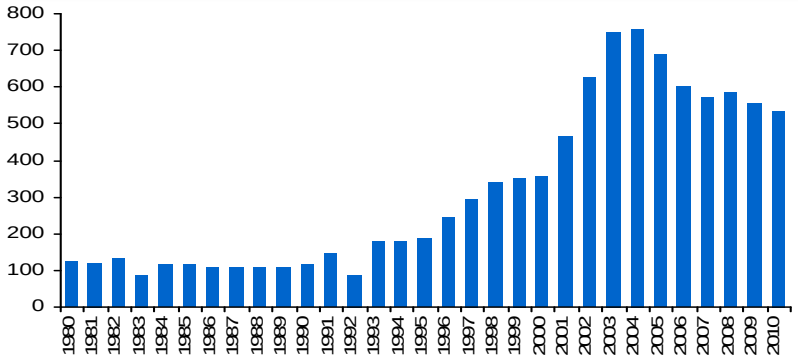
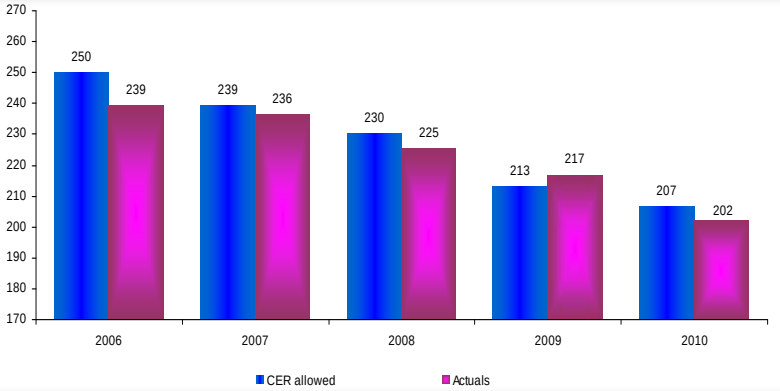
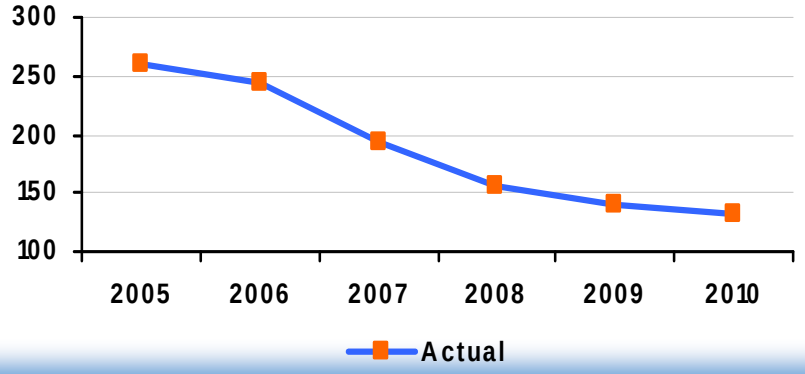
Capital Investment (€m)



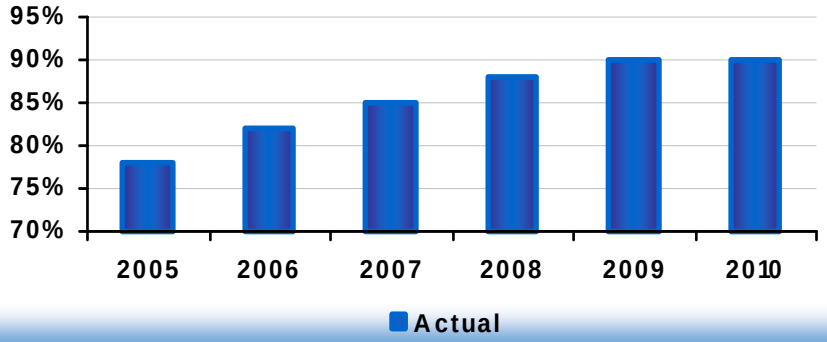
Operational Costs



Customer Minutes Lost Trend



Customer Satisfaction Trend



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Drivers of Change in Electricity Distribution

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EU Targets on Energy Efficiency

- 20% reduction in green house gas
- 20% improvement in Energy Efficiency,
- 20% increase in Renewable Energy
- EU Directives -> Smart Metering

Implications for Ireland's Electricity Sector

- 40% Renewables,
- 10% Vehicles fuelled by Electricity,
- Smart Meter programme
- Network Losses reduction

ESB Strategy

- World Class Sustainable Networks
- A Renewable Business of Scale
- Best Practise Generation Portfolio
- Customer Focused Supply Business
- Significant International Business

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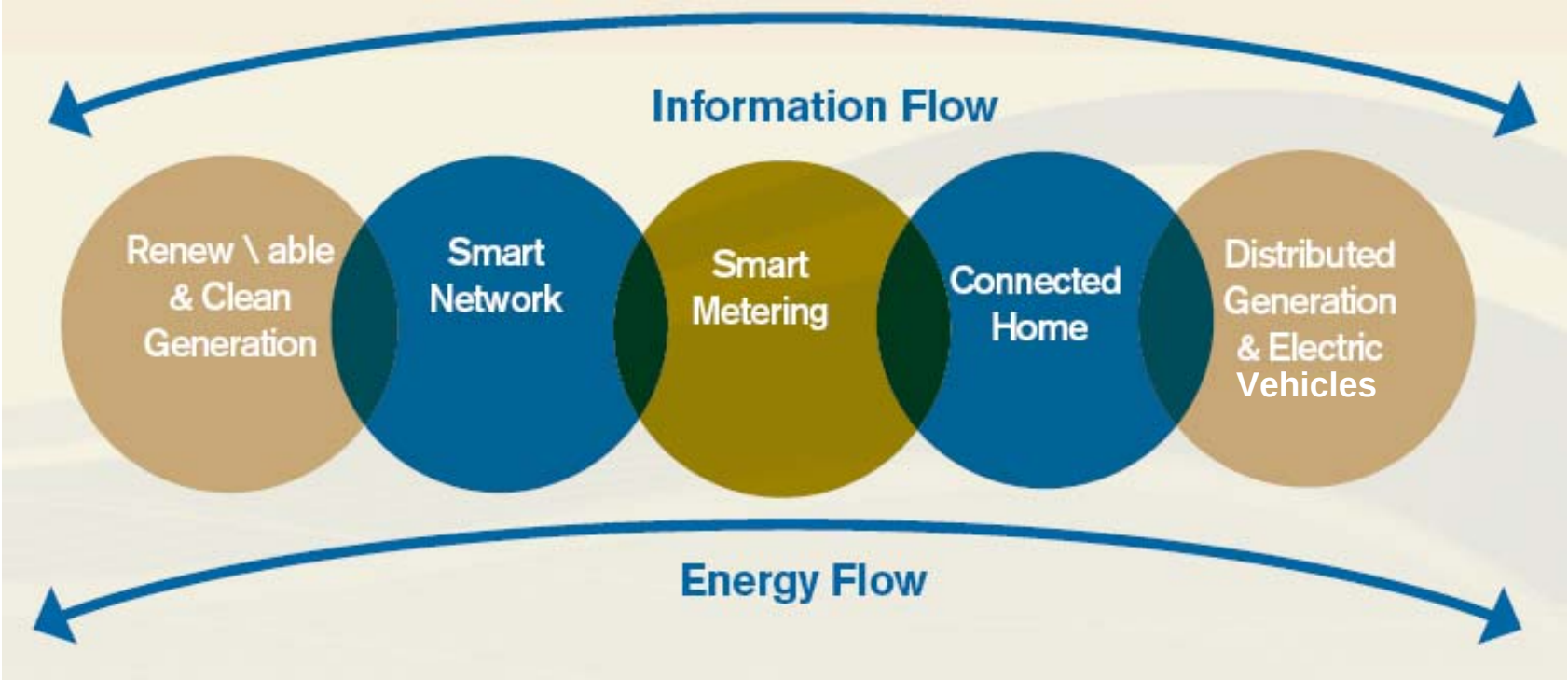
ESB Networks Integrated Future
Smart Networks Model

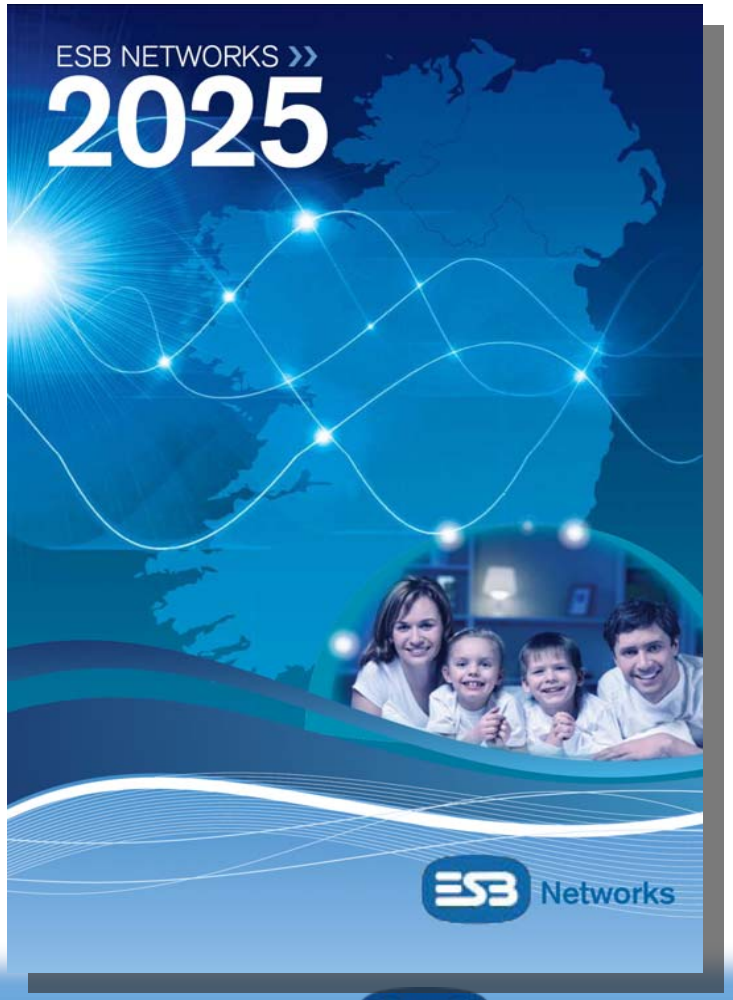
ESB Networks 2025



Developing Smart Networks for 2025

ESB Networks 2025

- Define the ultimate goals
- Provide a focused R&D path
- Enable long term planning
- Ensure value of smart investment
- Consider participants and provide for inclusion
- Define and enable KPIs
- A living plan delivering a better tomorrow!



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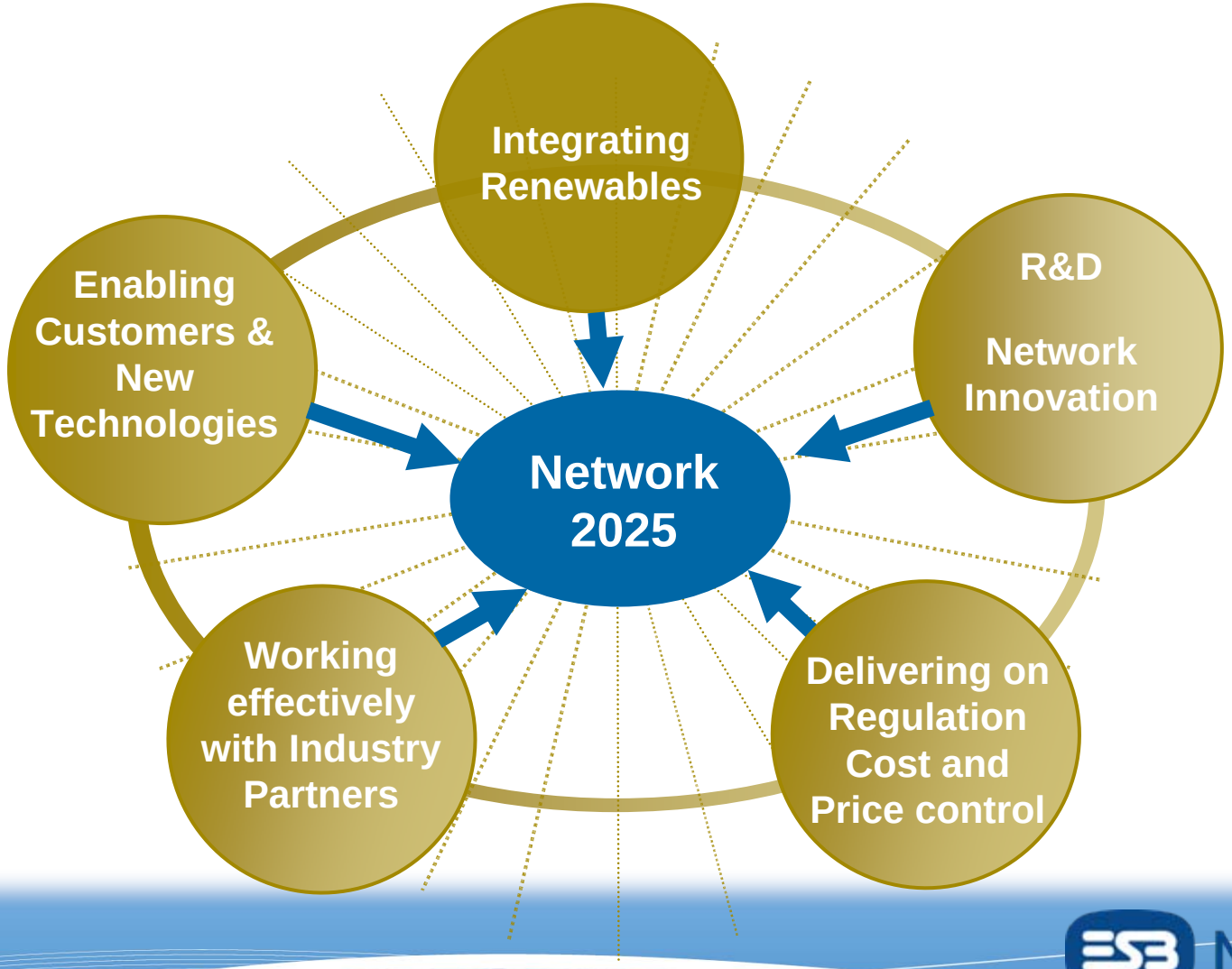
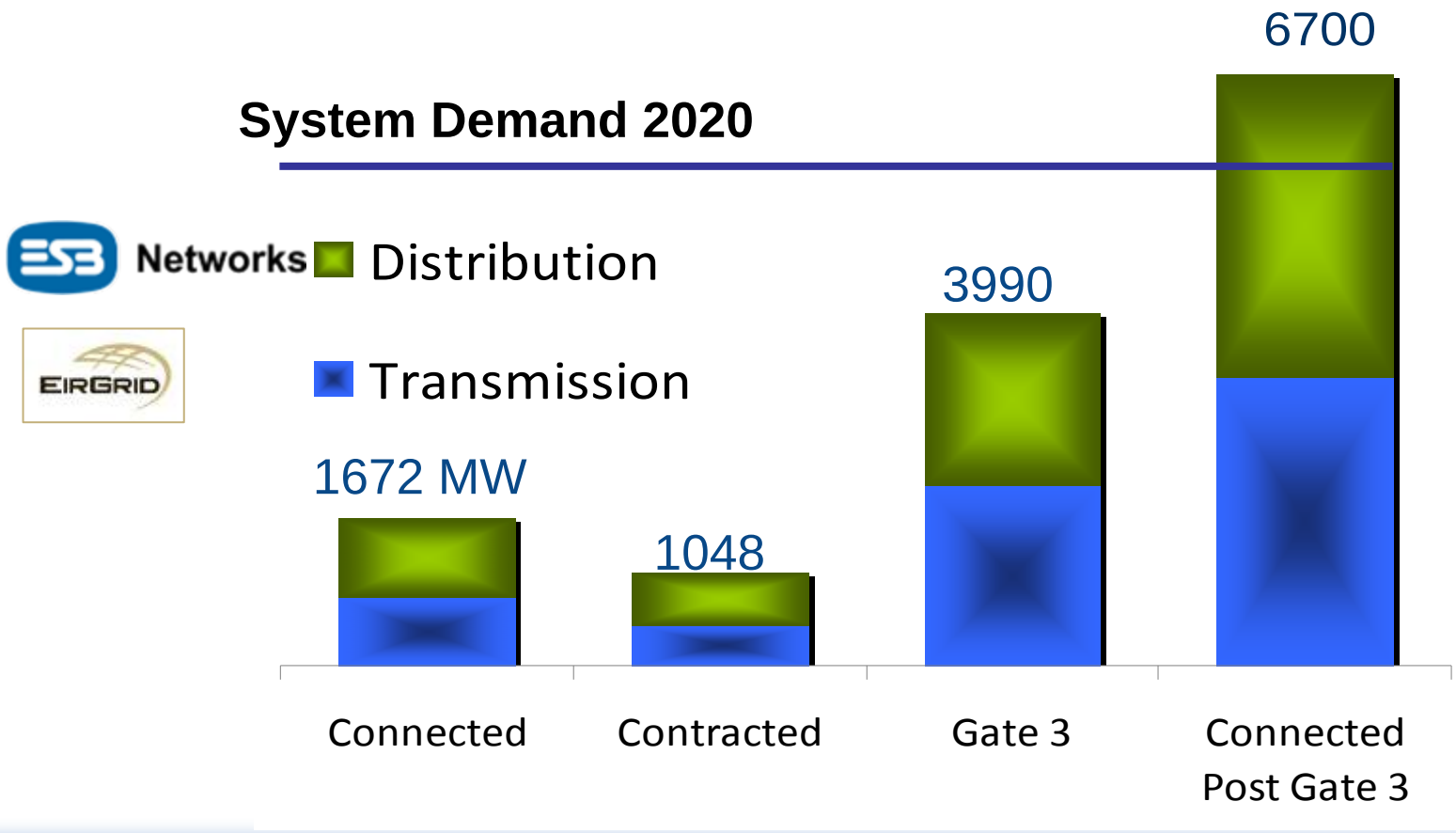
Key Enablers towards 2025

ESB Networks 2025



Wind Connections MW 2012



ESBN Wind R&D Projects Completed

- Exploration of Voltage/VAr control on Distribution-connected windfarms
- Use of voltage regulators to limit voltage rise
- Single/Fewer transformer cluster stations for windfarms

Integrating Renewables

ESB Networks 2025

» enable over 5,000 MW of wind Generation capacity to supply the Irish grid – with over

2500MW

on the Distribution System

» help industry meet Irish targets of

500MW Ocean and

200MW of Tidal Energy by 2020, enabling technology development, connection and demonstration

- **Minimise generation connection costs through innovative but secure connections**
- **Minimise the impact of renewables on voltage quality using the dynamic reactive capabilities of wind farms**
- **Facilitate active management of DSO System to vary system configuration and operation to maximise hosting capacity**
- **Facilitate maximum levels of active Customer Load Management, matching flexible customer loads to variable Generation**
- **Target is 5000MW by 2025**

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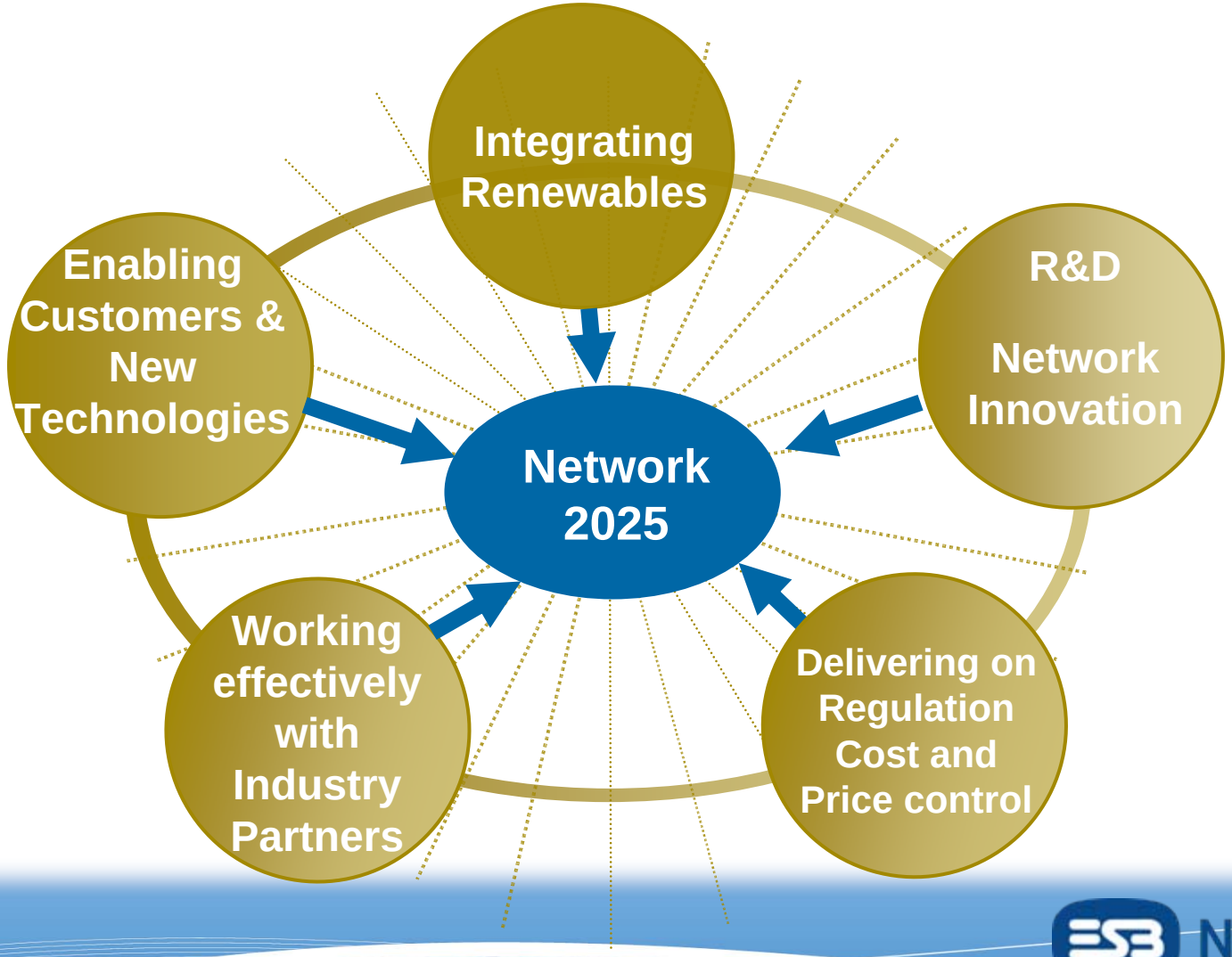
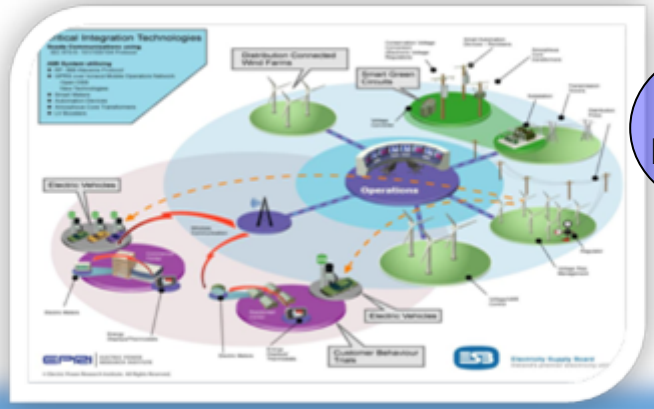
Key Enablers towards 2025

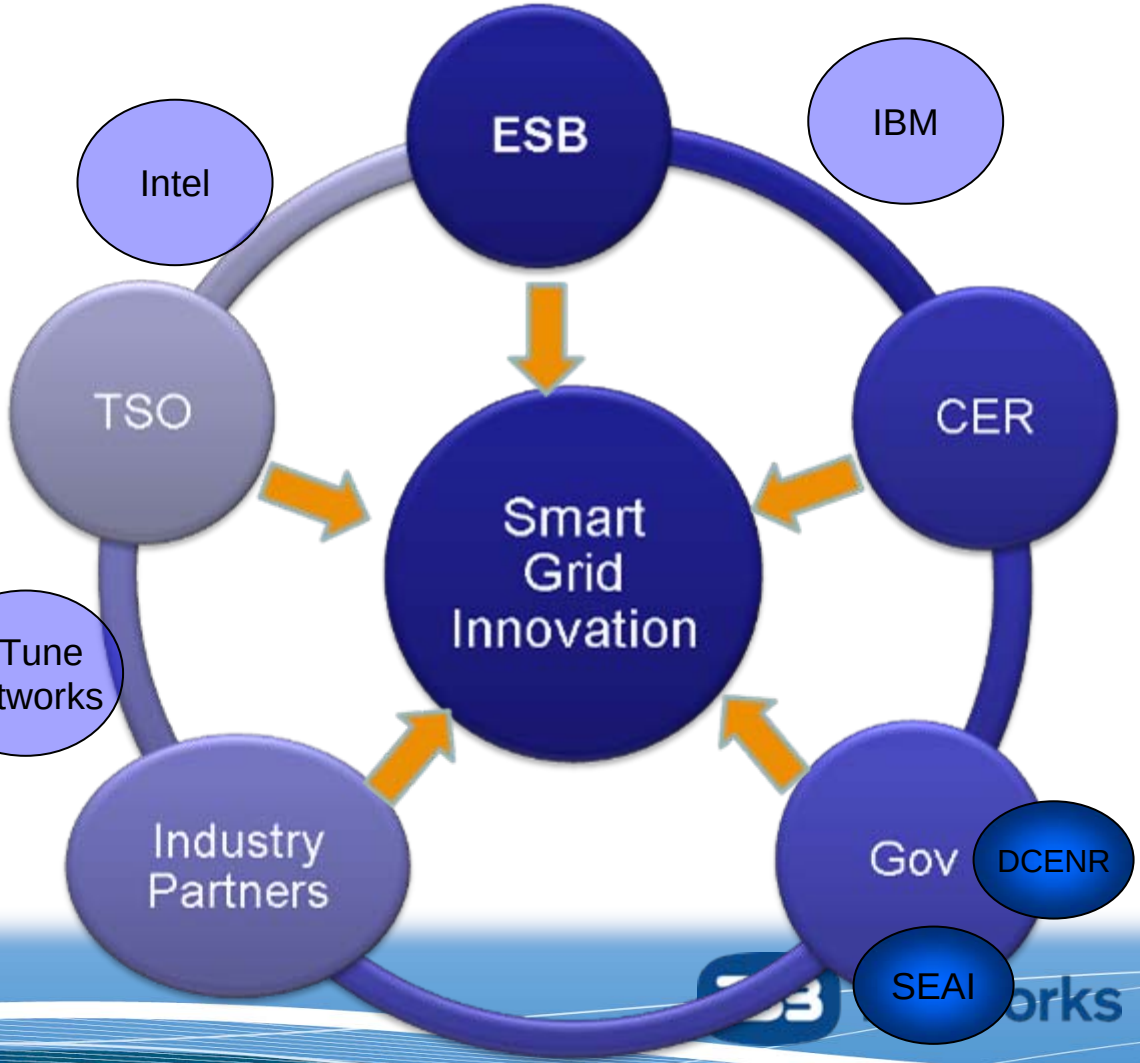


Collaborative Research Focused on Common Goals

ESB Networks 2025



In Tune Networks



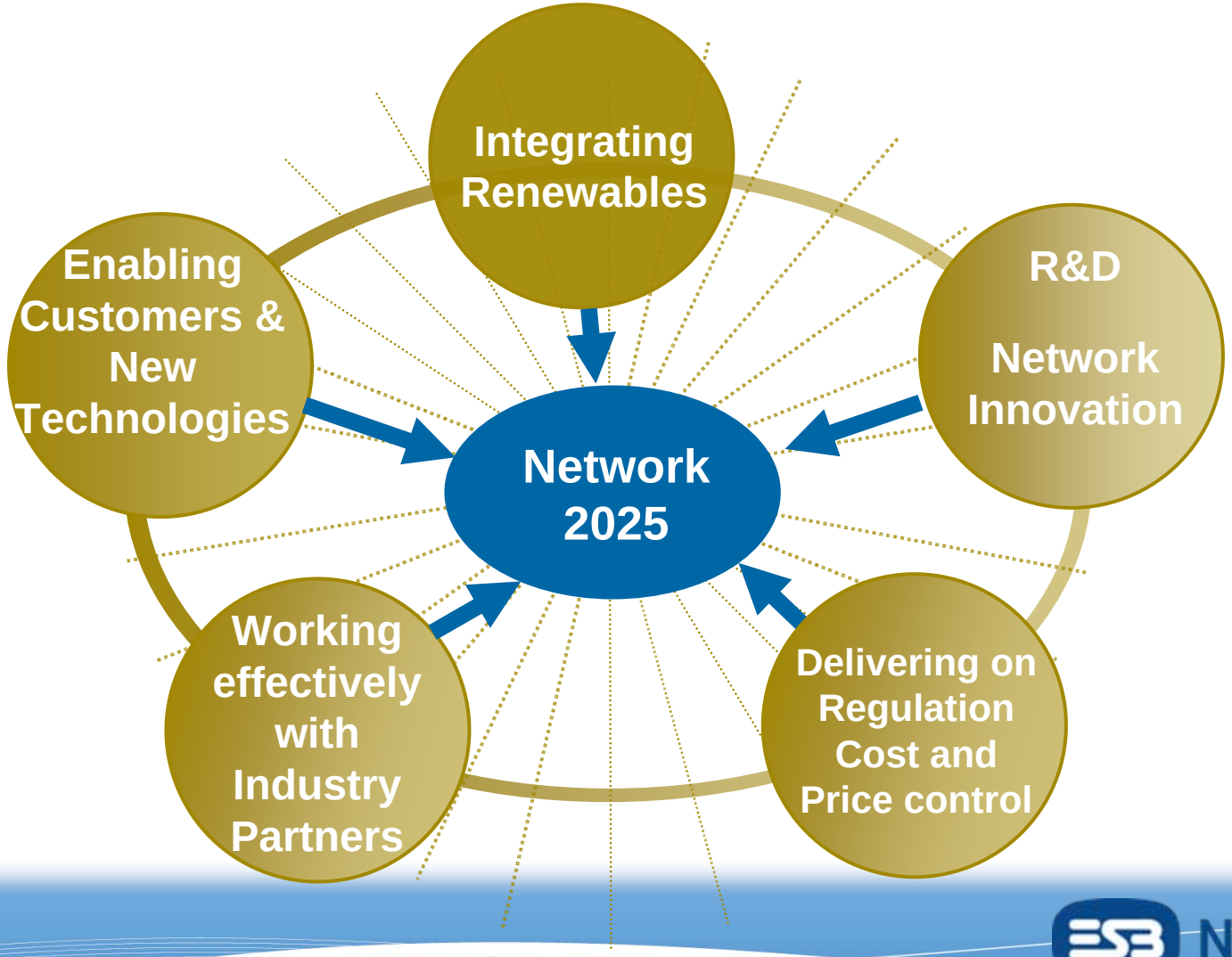
Working With Partners

ESB Networks will work with:

- **The CER to ensure the best interest of all Irish electricity customers and users are met.**
- **The TSO to manage more complex distribution and transmission system interdependence**
- **The Irish Government and SEAI to develop environmental strategy**
- **Academia and Industry to progress Innovation.**
- **The Irish Wind Energy Association and other key stakeholders**
- **Suppliers to facilitate new products and services**

Key Enablers towards 2025

ESB Networks 2025



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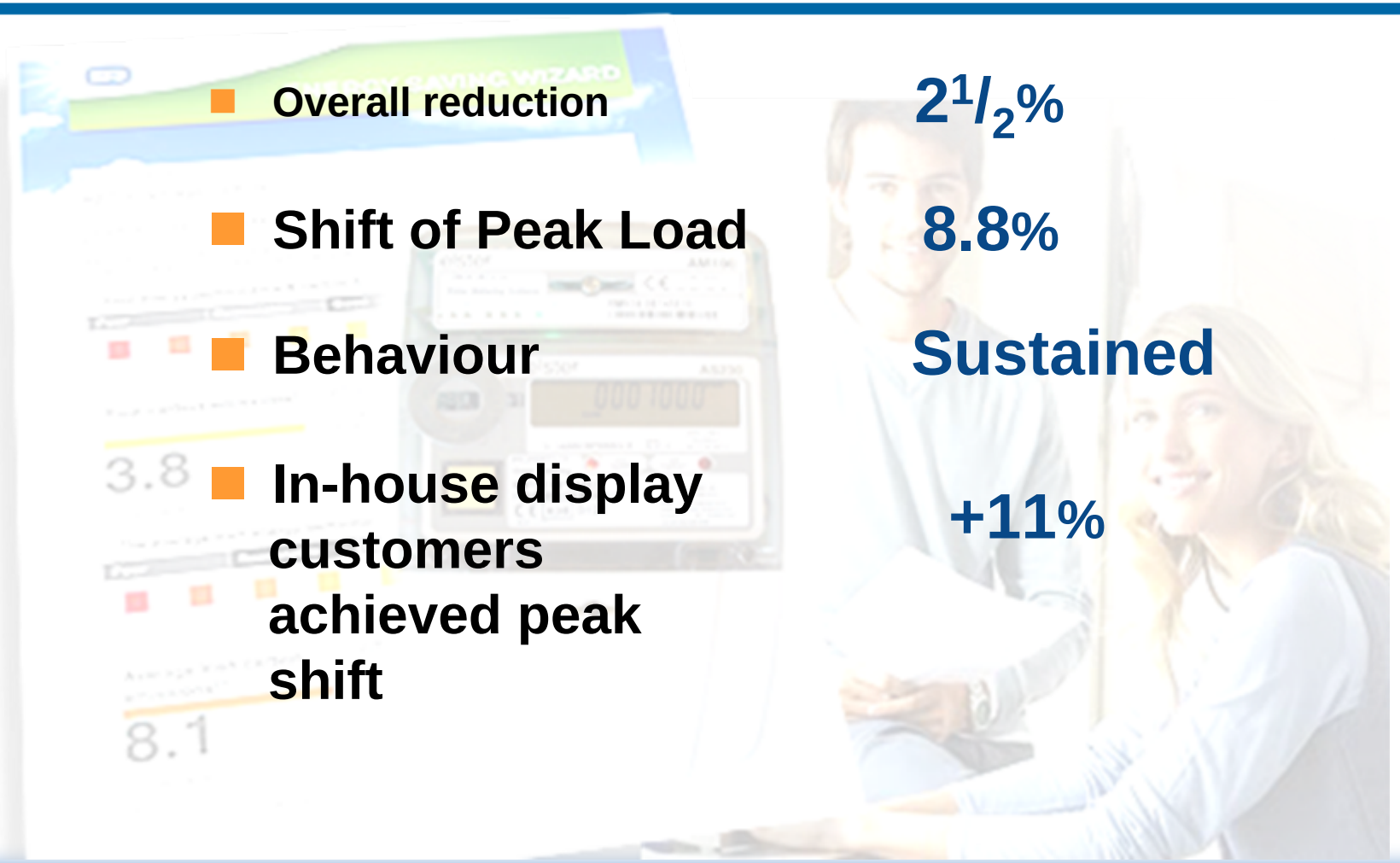
Smart Meter Customer Behaviour Trial

Results

- Overall reduction — $2^1/_2\%$
- Shift of Peak Load — 8.8%
- Behaviour — Sustained
- In-house display customers achieved peak shift — +11%



Enabling Customers & New Technologies – Smart Metering

ESB Networks 2025

Energy Measurement

- Half-hourly profile data
- Different tariffs and registers including Import, export and watt-less

Condition monitoring

- Power outages and voltage
- Tamper alerts

All data to be collected from the meter at least once per day

Operations

- Remotely and locally operable switch
- Controllable circuit for storage heating

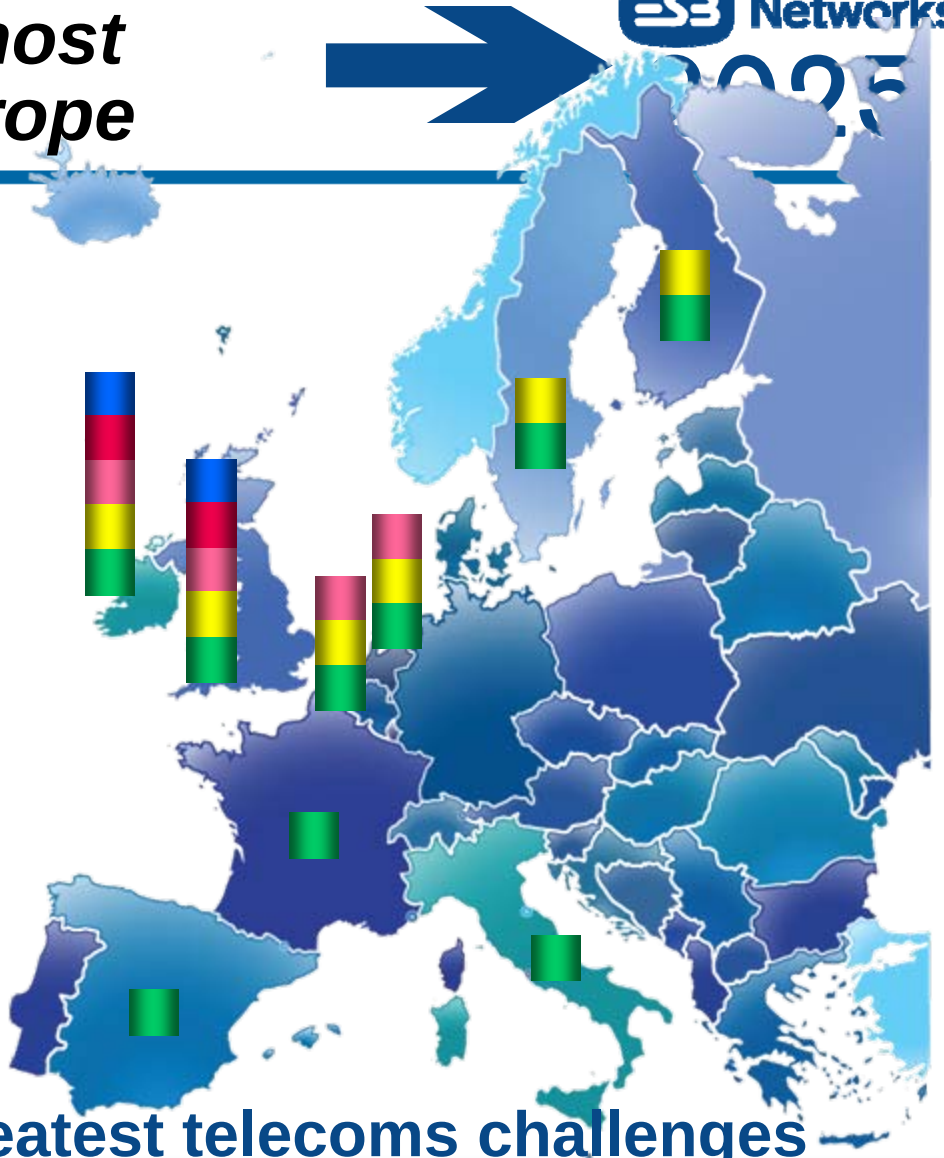
Technology

- Integrated Communications module will provide and manage a Home area network and act as a hub for gas
- Strong Encryption and Security mechanisms

ESB Networks

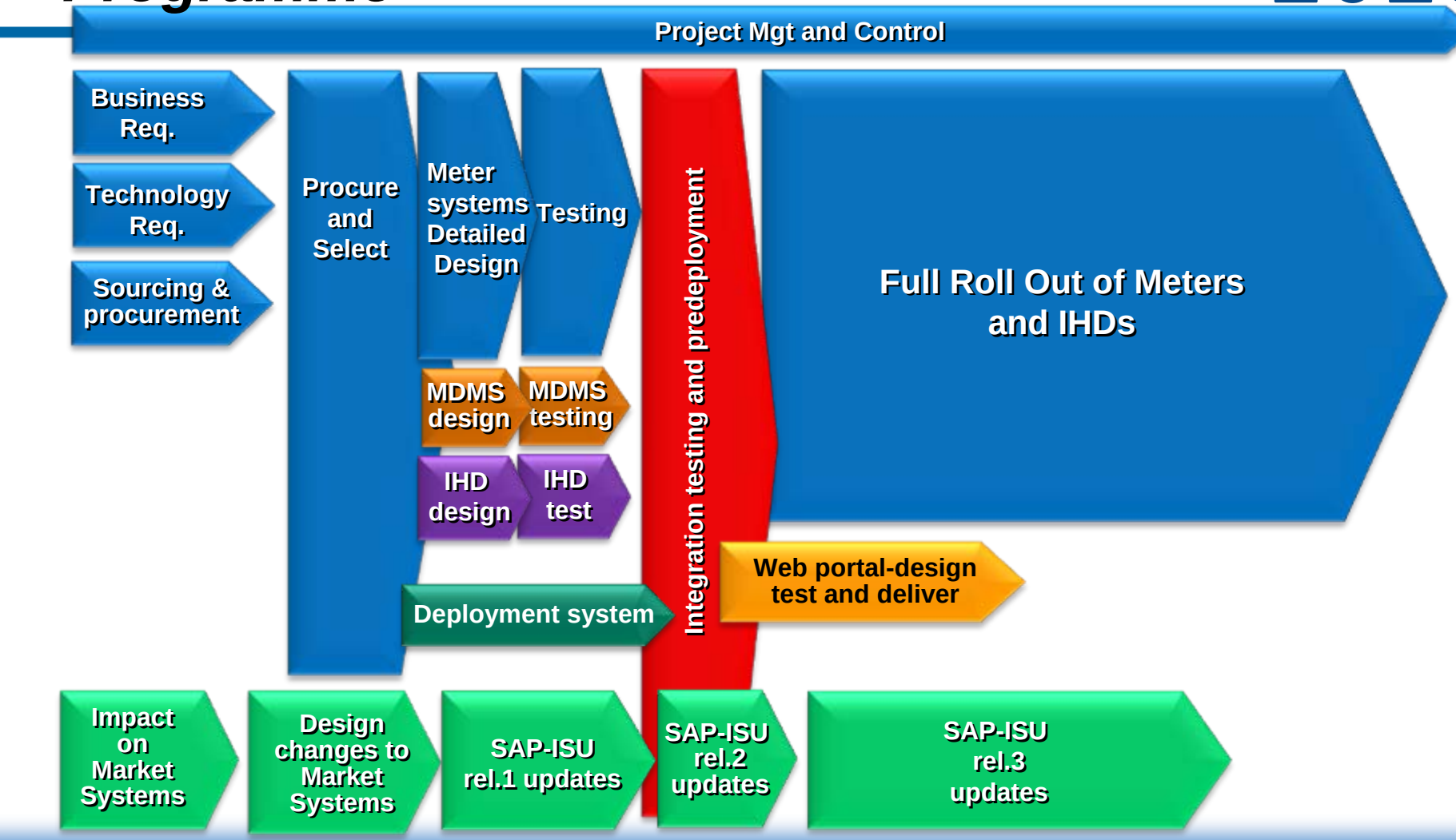
We will have one of the most ambitious roll outs in Europe

- IHD for all
- Embedded HAN
- Integrated with Gas Meter
  Consumption available to home
- Daily profile reading
- Automatic Meter Reading
  Continuity mgt support
  Remote meter operation
  Event monitoring
  Remote tariff configuration



We have some of the greatest telecoms challenges

Complex Implementation Programme



Ecar Ireland Programme

ESB Networks 2025

- EV targets 2020:
  - 10% of all vehicles electric
  - 10% of all road energy transport will be renewable
- Supply of electric cars
  - MOU signed with Renault-Nissan
  - MOU signed with Mitsubishi
  - MOU signed with PSA
  - MOU signed with Toyota
  - Other MOUs in the pipeline
- Government incentives
  - €5000 grant
  - Zero VRT
  - Lowest road tax band
  - Accelerated Capital Allowance (Businesses)
- ESB is rolling out the infrastructure

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Charging infrastructure

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Home charging

Public charging

Workplace charging

Fast charging

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Commercial Hosting Locations

ESB Networks 2025

- Service Stations
  - Topaz
  - Maxol
  - Gulf Oil
  - Great Gas 24
  - Texaco
- Retailers
- Retail Parks
- Park and Ride
- Business Parks
- Commuter Stations

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Charge Point Status

ESB Networks 2025

160 + Public Charge Points

100 + designed, awaiting delivery

270 Home / Workplace Charge Points

- **400+ TOTAL TO DATE**
- 1500 Public Charge Point Target

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Other Project Partnerships

- EPRI Smart Grids
  - EV on Distribution Network
- Northern Ireland Plugged-in-Places
- Green eMotion
  - Largest European project
- Enevate
  - Fleets
- Mobi.Europe
  - ICT
  - Ireland, Amsterdam, Portugal, Spain
- Plus others

Enabling Customers & New Technologies – Electric Vehicles

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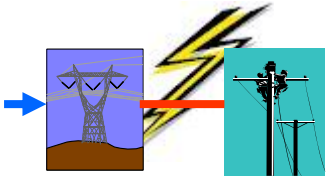

Electricity Faults

Traffic

Weather

Personal Diary Data

Real Time Electricity Prices

Cloud

HEMS

Smart EVSE

Car CANbus

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Electric Vehicle Field Trials

- Impact Assessment on existing residential LV distribution network
  - 1 Feeder with 72 Customers
- Most testing network conditions
- Simulation Tools being developed

Vehicle Charging Times

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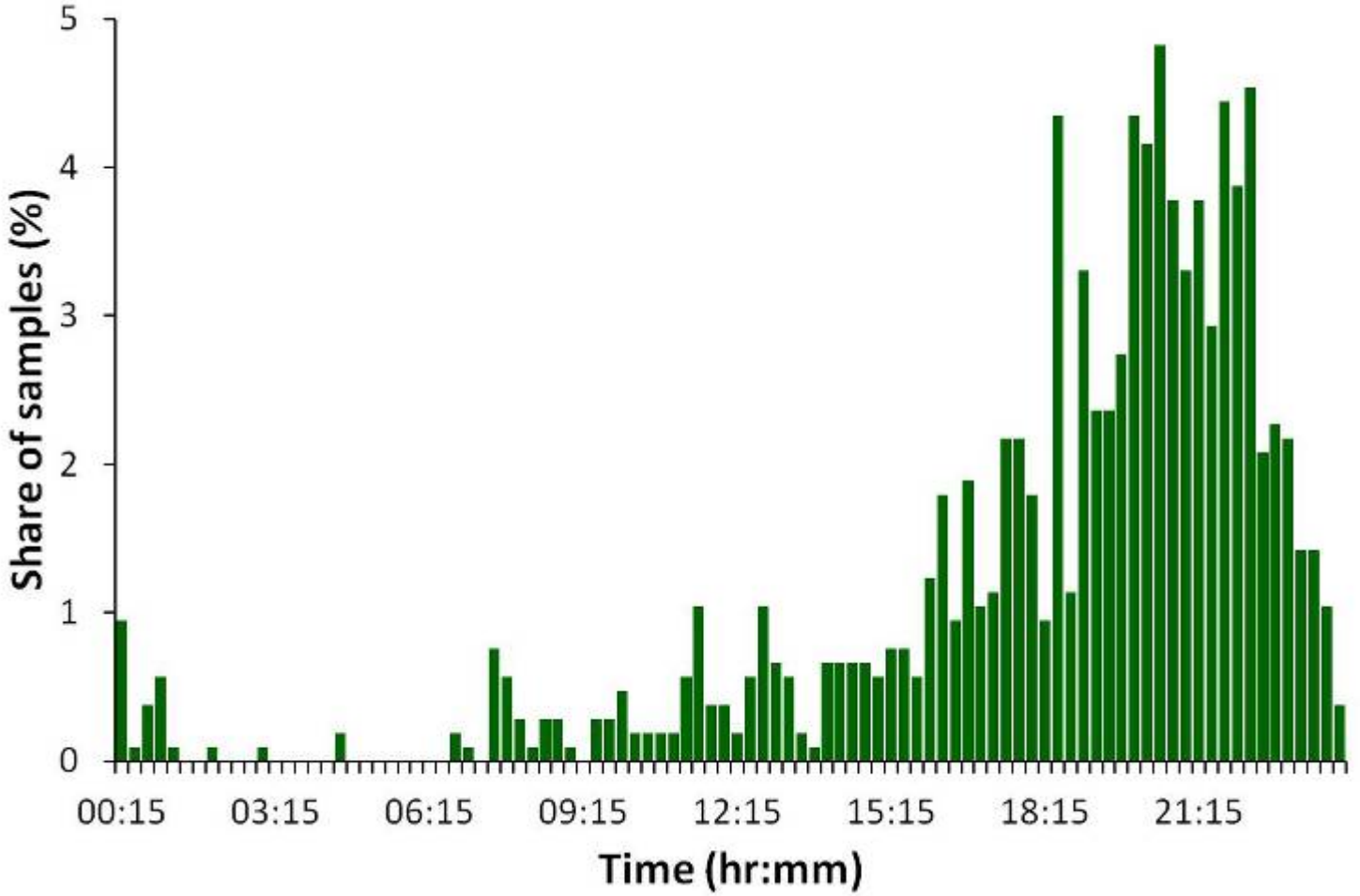

Customers & New Technology

ESB Networks 2025

Install over
2.2 Million
Smart Meters in all Irish homes and businesses by 2018

Helped Irish customers reduce consumption by **2.8%** by using Smart Meters real time information

Government target of EV penetration by 2020 **10%**
250,000 vehicles

Delivered by:

- **Working with the CER and the Industry & customers to design a Smart Metering solution that meets Ireland's needs**
- **Learning from other countries Smart Meter Implementations**
- **Delivering a well managed and efficient Smart Meter Roll out programme**
- **Enabling Electric Vehicles though delivering charge points to facilitate their introduction**
- **Delivering R&D to deliver solutions to minimise the Network Investment and maximise the benefits of Electric Cars**

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Key Enablers towards 2025

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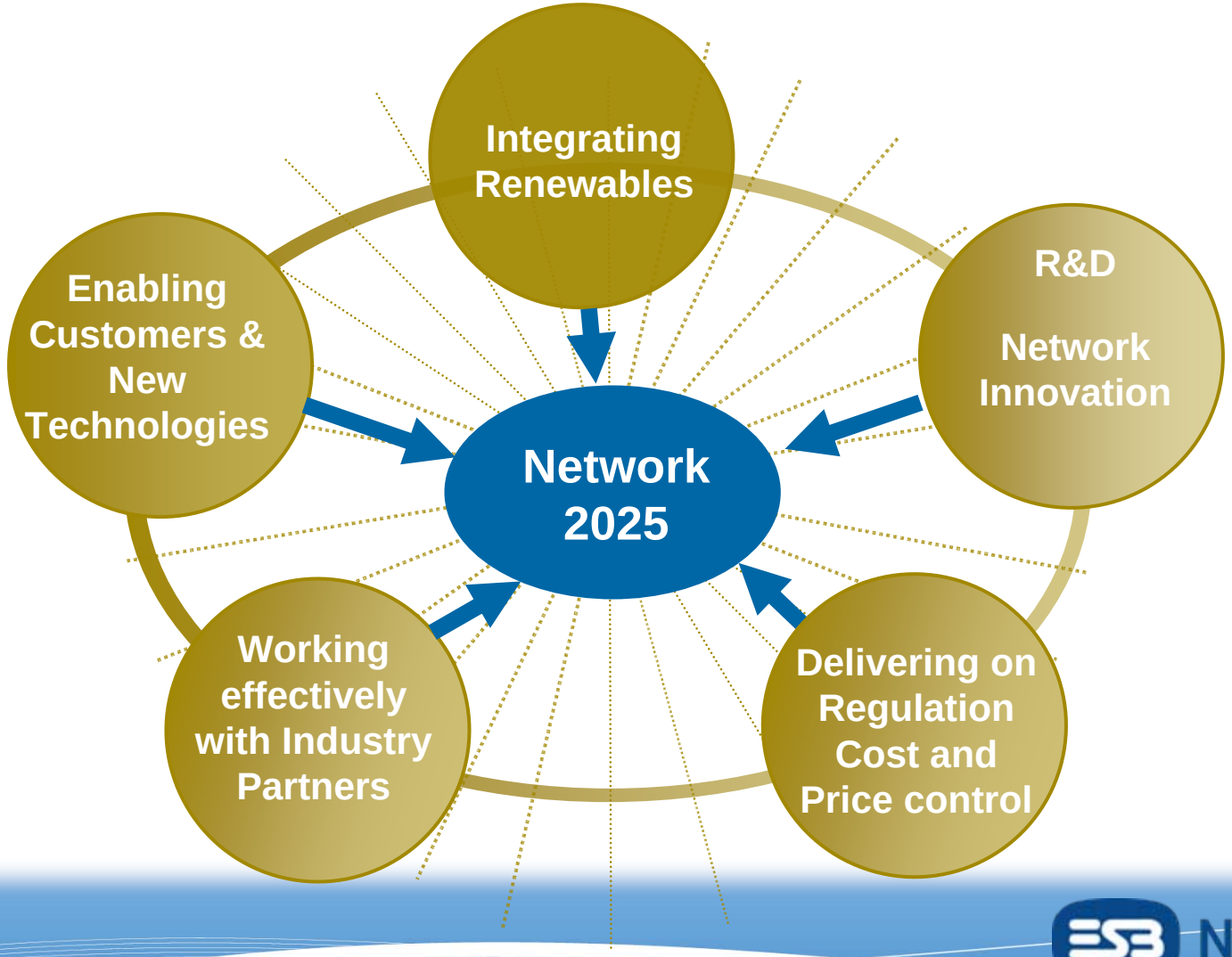

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R&D Strategy & Networks Innovation

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- Summary of R&D projects Focus to date
  - Self Healing Network – Automation
  - Closed Loop Pilots
  - Dynamic Sectionalising
  - Voltage Conservation Reduction
  - Low Loss Transformers
  - 20kV Conversion
  - Innovative Protection and Fault Diagnostics
  - Power Check App
  - Wireless Telecoms Trials

Innovative Network Operations

ESB Networks 2025

Customer power loss due to faults will be reduced to less than 100 minutes per year – **80%** reduction on 2001-2005 levels

99% of Networks will be within Voltage Standard

Through Innovation and Excellence in Operations, electricity consumption will be reduced by up to 3% independent of customer action

Delivered by:

- **Increased Remote Operational Sensors from 2,000 ->13,000**
- **Developing a Communications Infrastructure to enable Dynamic Control**
- **Nationwide deployment of Self Healing Network**
- **Reducing load by 3% though Innovation and excellence in Operation**
- **Efficiently integrating data from 2.2m smart meters to benefit operation optimisation**

IT System Landscape post Smart

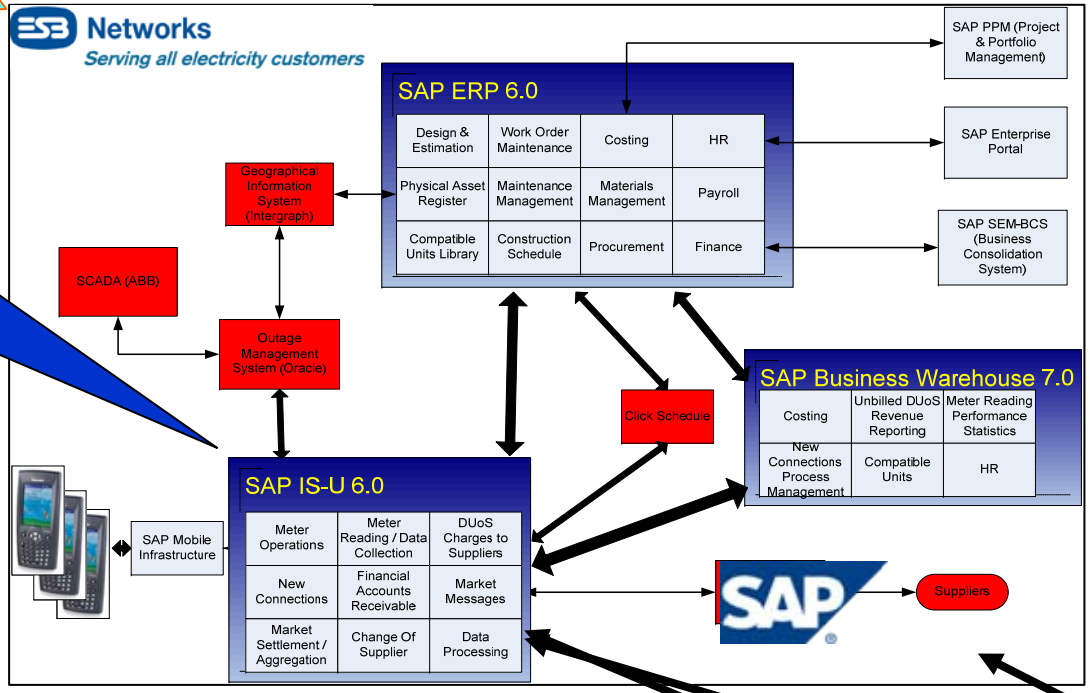
Renewable & Clean Generation | Smart Network | Smart Metering | Connected Home | Distributed Generation & Electric Vehicles

Asset Management Changes

- Vastly Increased no. of assets and sensors to manage
- Impacts on SAP ERP, Scada, OMS, GIS etc.

SAP IS-U Changes

- Distributed Generation will Impact Meter Configuration and ultimately Market Settlement processes



Big Data and Implications

- New Systems
- New Processes
- New Data Repository
- Event Management
- SAP BW Status
- End Game – collection and interrogation of all "Smart Data" to enable Smart Grid Benefits to be delivered

New Mobile Solutions

SAP Business Objects Toolsets

SAP IS-U Changes

- Upgrade Enhancement Pack 6
- Switch on AMI Functionality
- Meter Asset Management
- Meter Reading Processes
- Change DUoS Billing Tariffs
- Market Message Chnges
- Market Settlement Changes

SAP Process Integration

Charge Point Payment and Management Systems

Home Area Network

Meter Data Management

Supplier Web Portal

Key Enablers towards 2025

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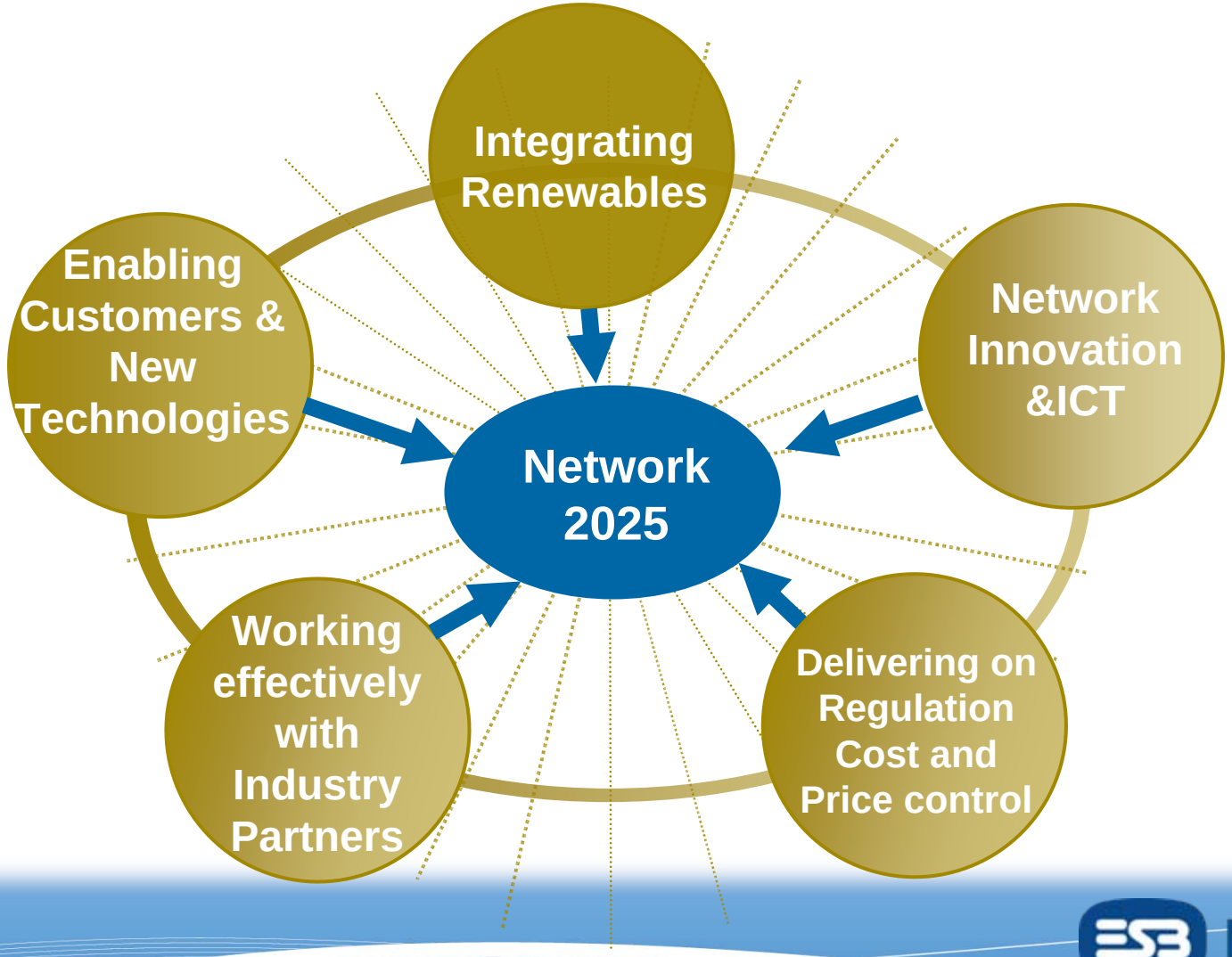

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Delivering Efficiently within & Regulation targets

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Environmental Directives

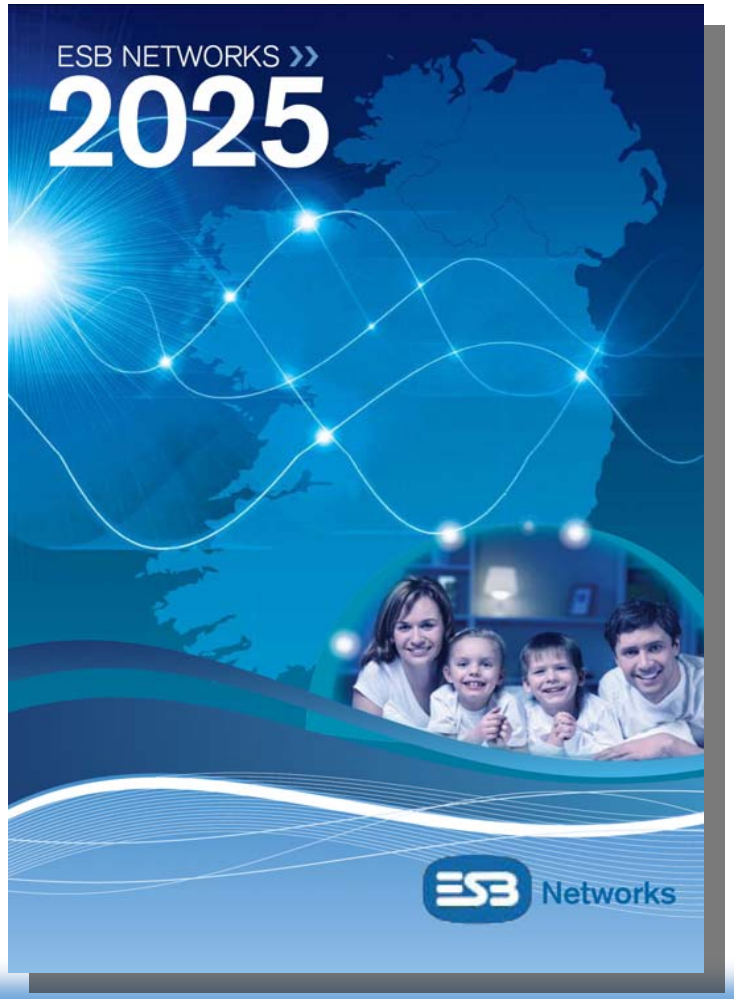
- Deliver on Climate Change Goals
- Build Network Efficiently
- Leverage new initiatives
- Facilitate Renewables

- Deliver on Service
  - Top Quality Electricity Infrastructure
  - Deliver R&D to enable the implementation of fully researched initiatives.
  - Continually reduce the number and duration of customer supply interruptions

- Deliver Investment Efficiently
  - Delivering on a Comprehensive 5 year Plans –
  - Continual improvements and R&D

Developing Smart Networks for 2025

ESB Networks 2025



- Integrating Renewable Generation
- Partnership Across The Industry
- Smart Operations And Telecoms
- Customers And New Technology
- Delivering On Price And Regulation

ESB Networks

Thank You