# ESB NETWORKS

**ESB Networks developments in new Technology and SmartGrids**

***SmartGrid Technology Europe 2010***

**Anthony Walsh** BE, MIE, MBA, C.Eng.
**Specification Manager,**
**ESB Networks**

ESB Networks

www.esb.ie/esbnetworks

# Presentation Overview

- ESB Strategy to 2020
- What we look for in procuring new technologies
- How we implement this Strategy
- Samples of New Technologies being trialled
- Strategic Challenges & Issues For 21st Century Networks

# ESB Strategic Framework – Five Core Pillars

**"Be a world leading commercially successful and environmentally responsible utility"**

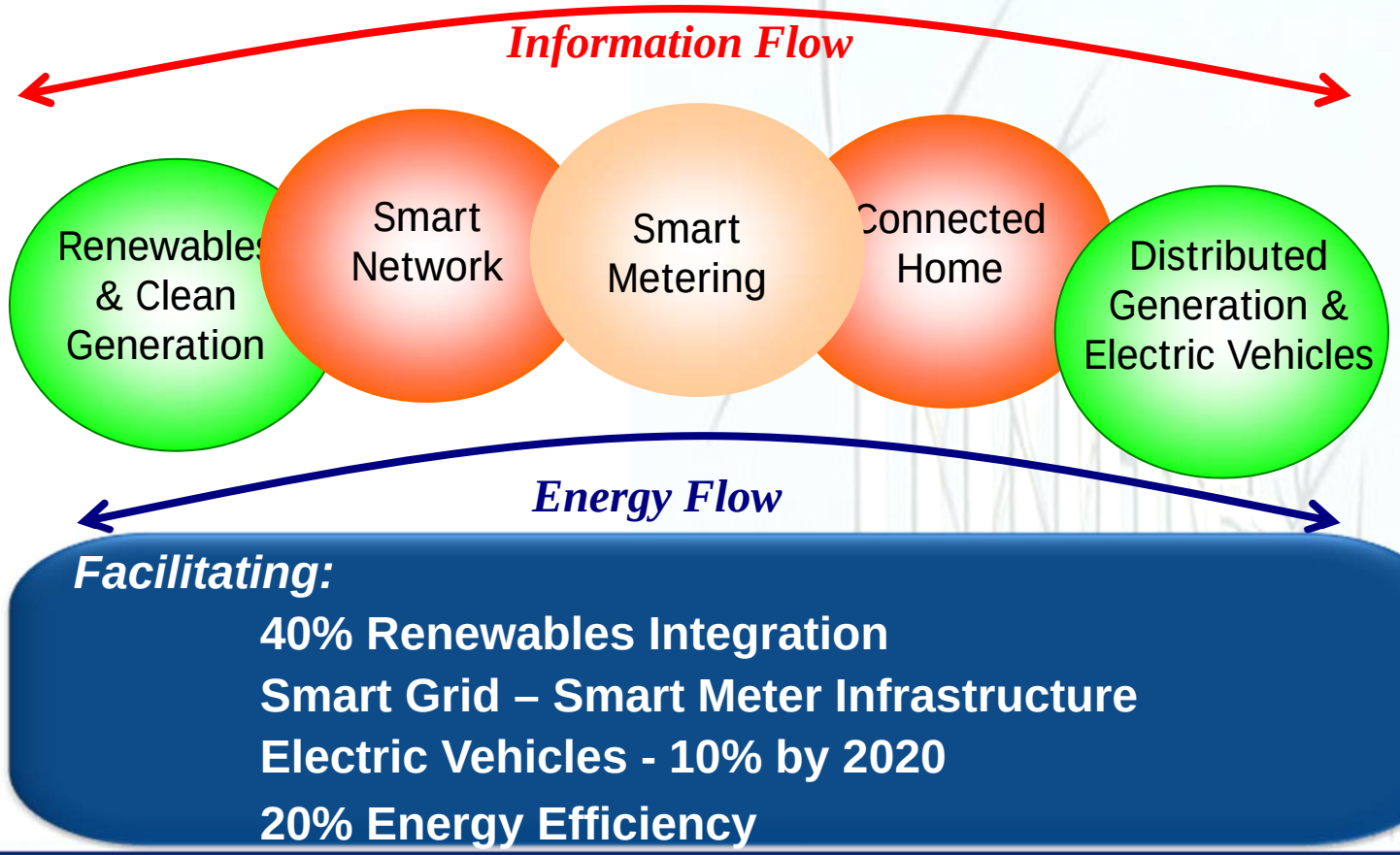
| Renewables business of scale | Sustainable Generation | Sustainable Networks | Customer-Focus | International Growth |
|---|---|---|---|---|
| **33%** renewables by 2020 | Asset disposal | Deliver infrastructure | Energy Services for customers | UK – 3000 MW |
| 1400 MW Wind | Clean Coal / CCS | Smart meters | | Europe – 1600 MW tolled plant |
| 150MW Ocean | | Smart Networks | | Clean Tech Investment €200m over 5 years |
| | | Electric Vehicles | | |

## Sustainability Programme
## National Leadership in Environmental Sustainability

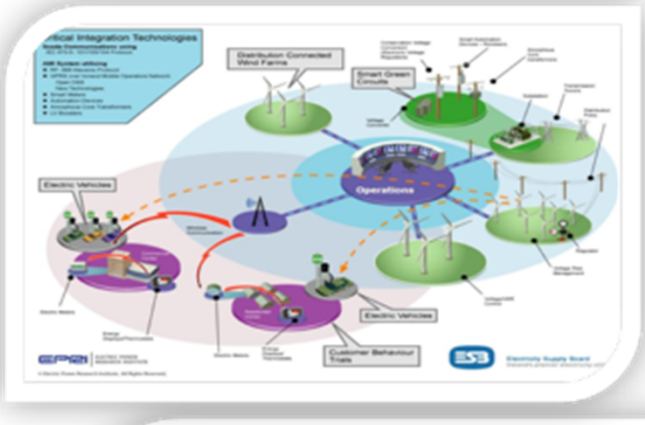
ESB will be exemplary in the management of its internal business in terms of environmental impact and energy efficiency

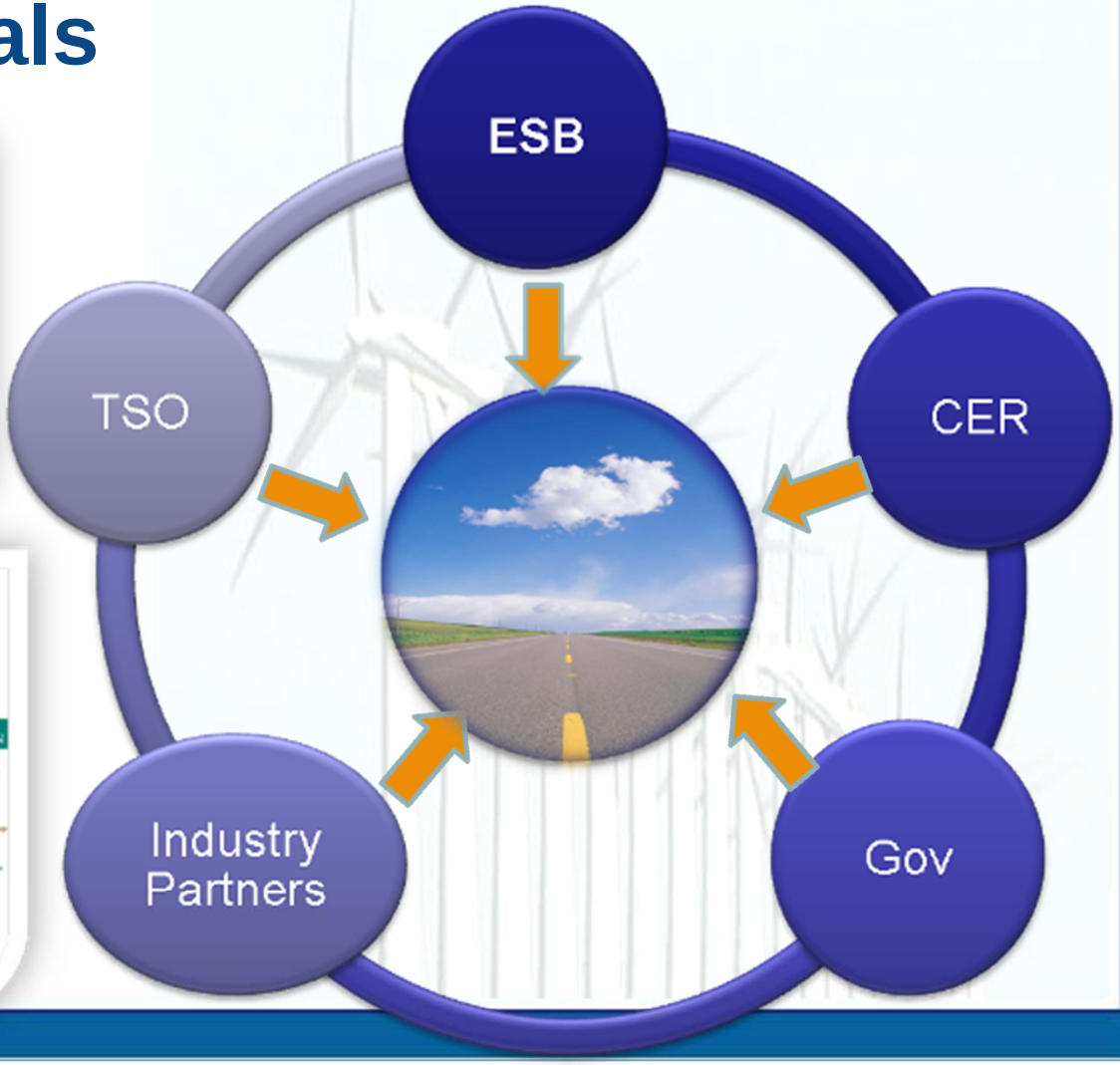
**Performance & Reporting** ⟷ **30%** reduction in **internal carbon footprint** by 2012 ⟷ **Staff Engagement**

# ESB Integrated Smart Networks Model

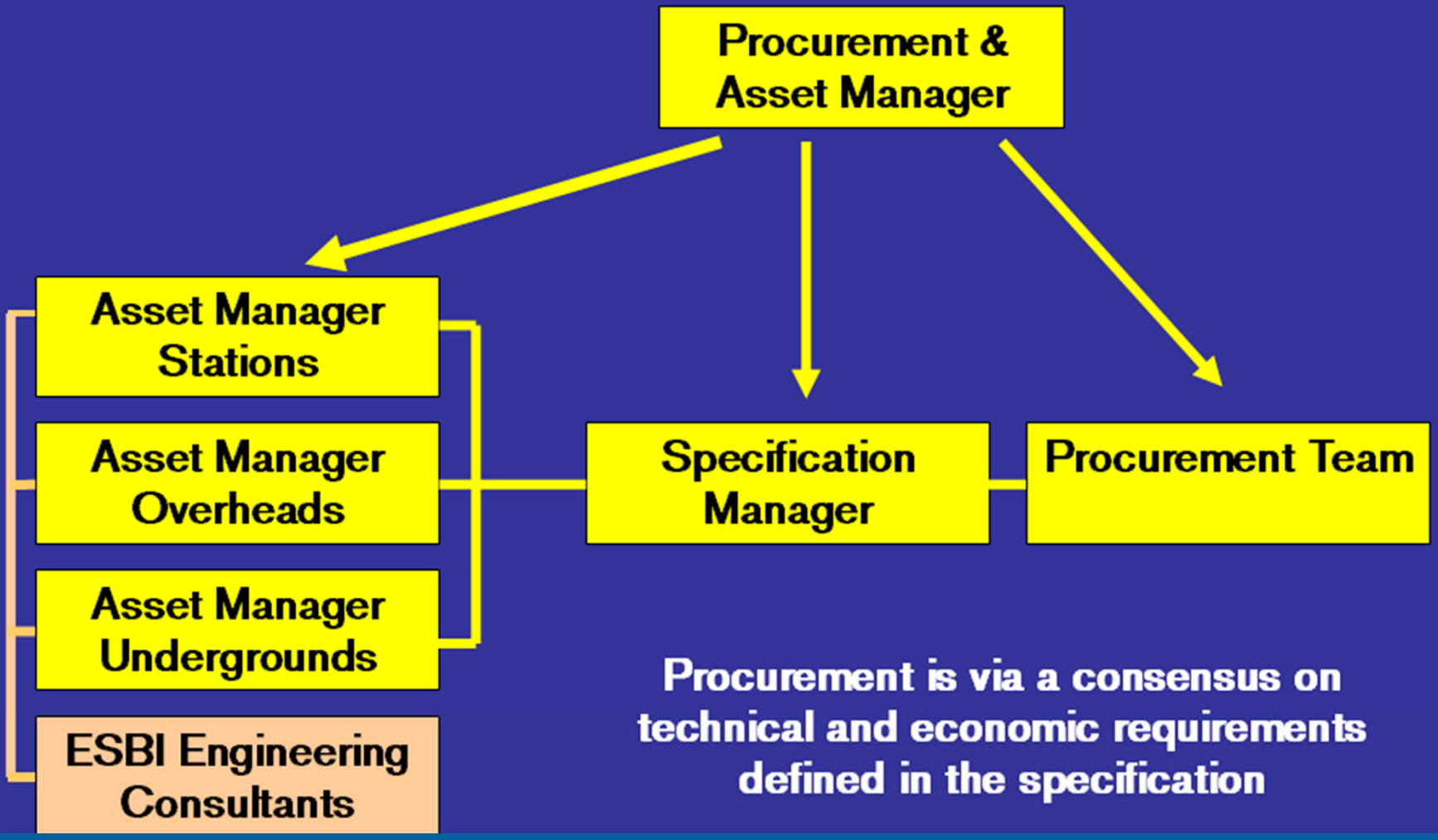


# Collaborative Research Focused on Common Goals

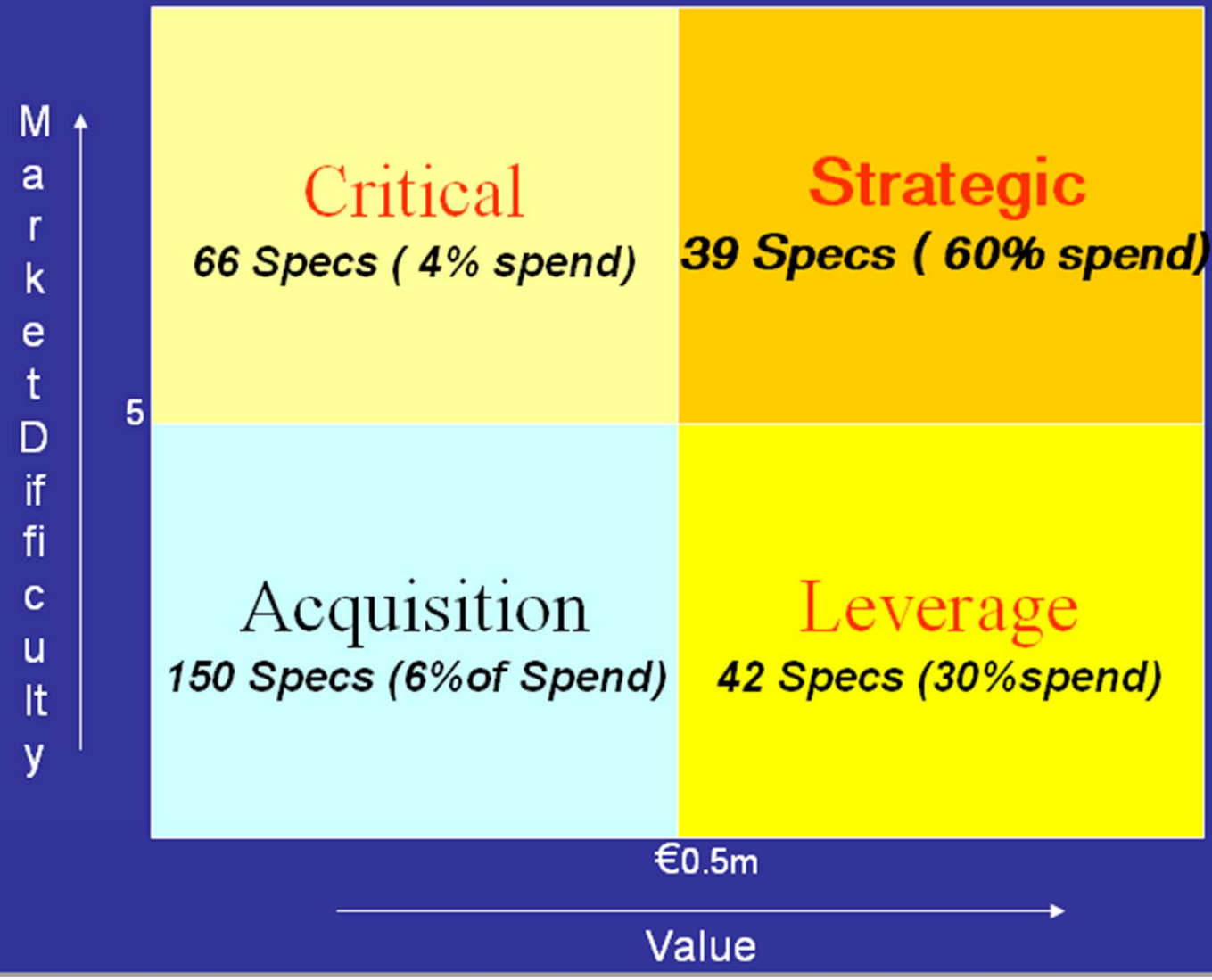


# Procurement Structure Surrounding Specifications



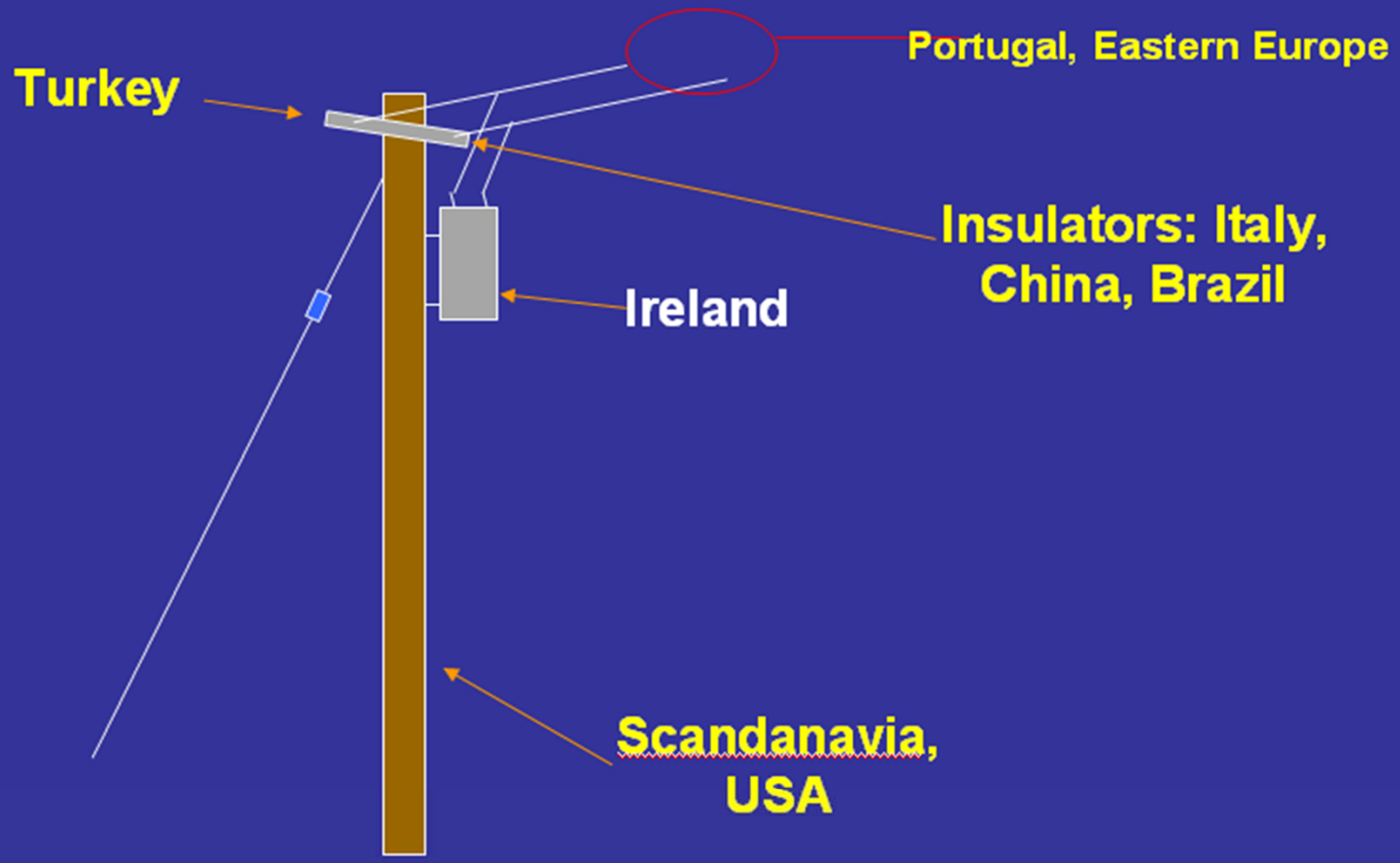
## Portfolio Analysis – c.300 specifications



## Worldwide Sourcing based on IEC Standards

## e.g. Single Phase Pole Mounted Transformer

# Global Sourcing



# Specification Management

- Efficient, Economic, Effective – these are the watchwords!
- Consider Whole of Lifetime cost in both Specification and in Contract evaluation – ( Capitalisation Issues! - Losses and Challenger Technology)
- Work with Suppliers - review Functional Specifications and make changes
- Look at what other utilities are doing
- Rationalise range of Stock items usually find several that are close substitutes and same price. Look at logistics – savings often overlooked here!
- Fundamentally how and why products are used – eliminate features or use new products
- Ask why certain features are required – because it was in the last Spec?
- Asset Managers and Buyers need to be on same Team – no sub-optimising

# What do utilites really want from Suppliers?

- ## High Reliability and Quality

➢ these are often assumed to be available and to reach an acceptable threshold from all Suppliers. The cost of poor Quality and Reliability is a multiple of the total purchase price so it is critical.

- ## Good Track Record in other Utilities

➢ If another well know utility already uses the product this is very reassuring, and indicates that Quality, Reliability, Performance and effectiveness are likely to be acceptable.

- ## Low Total Cost of Ownership

➢ Unless the utility is dysfunctional (or about to be sold!) this is a critical feature. An item of plant may cost €6,000 say and another €10,000, but the civil works costs of altering an existing building to accommodate the larger €6,000 unit may be €8,000, so that the cheaper overall unit is the €10,000 one.

- ## Security of Supply

➢ Utility must be satisfied that the products can be provided on time and in the volumes required.

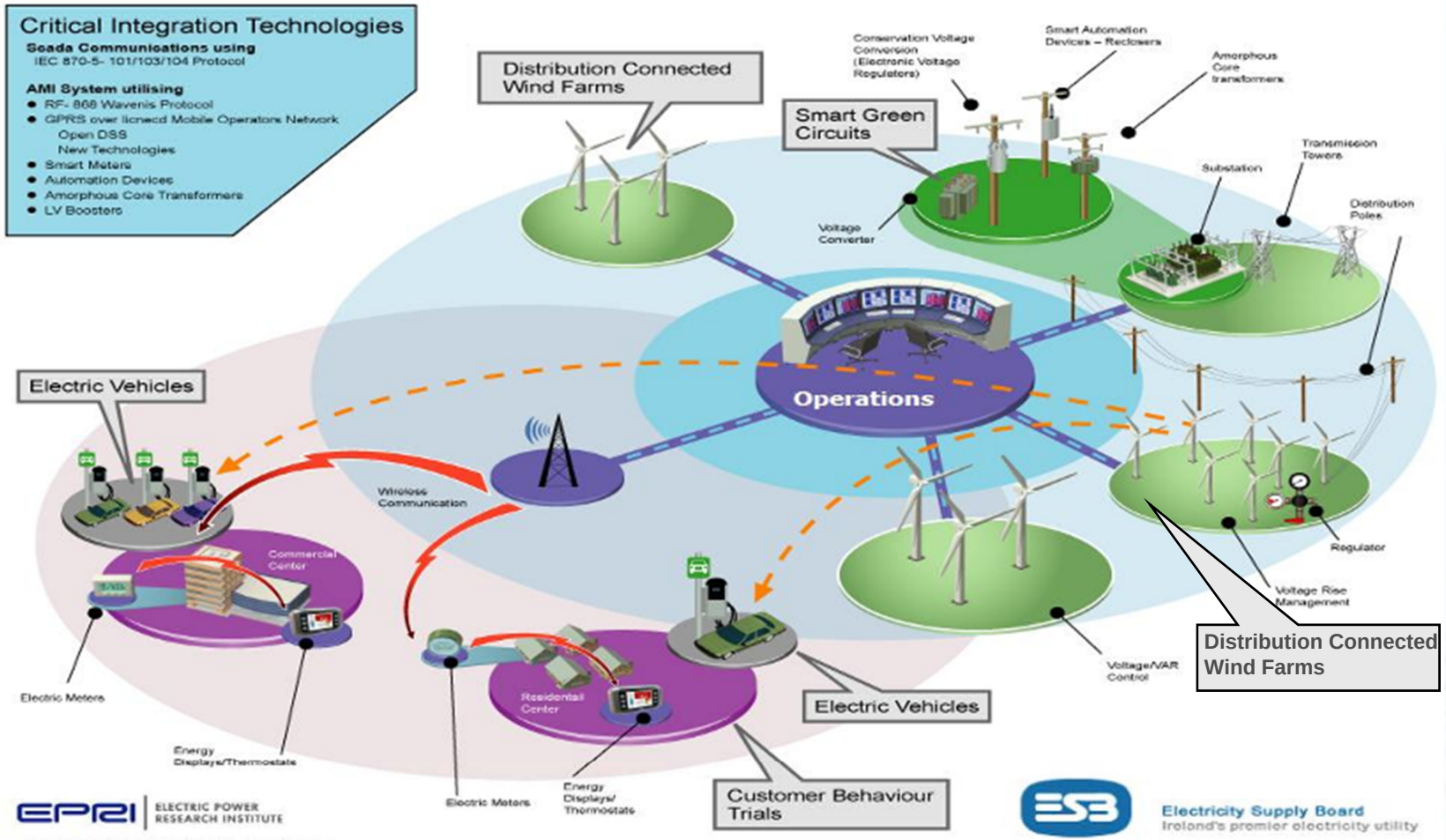
# How is doing business with a utility different?

- ## Long time perspective
  - Utility cables last 100 years, Transformers 30-60 years, Overhead lines 40 years. So when a utility buys - 'it's not for Xmas, it's for life'.
- ## Long Memories
  - Utility staff tend to move between jobs in the utility, not outside. So memories of poor service are very long and are embedded in the organisational memory. So doing business with a utility does not involve any 'strokes'.
- ## Decisions by Consensus
  - Products have impacts on many stakeholders within the utility each of whom has influence on the decision. So decisions tend to effectively be via consensus, although this consensus may be from a detailed cost/benefit analysis.
- ## Investment Appraisals
  - Utilities are engineering organisations and tend to prefer that the answer is worked out numerically – product benefits if expressed in money help arrive at the answer and are welcomed.
- ## Starting Out?
  - Conferences can be good, technical answers, involvement with R&D group doing utility pilot. Obviously anything that solves a problem is welcomed!

## Consideration of changes:

1. Save significant money
2. Only take worthwhile risks
3. Keep all required quality and features of existing product
4. Be able to revert to way things were done before

# ESBN/EPRI Smart Grid Demonstration Project



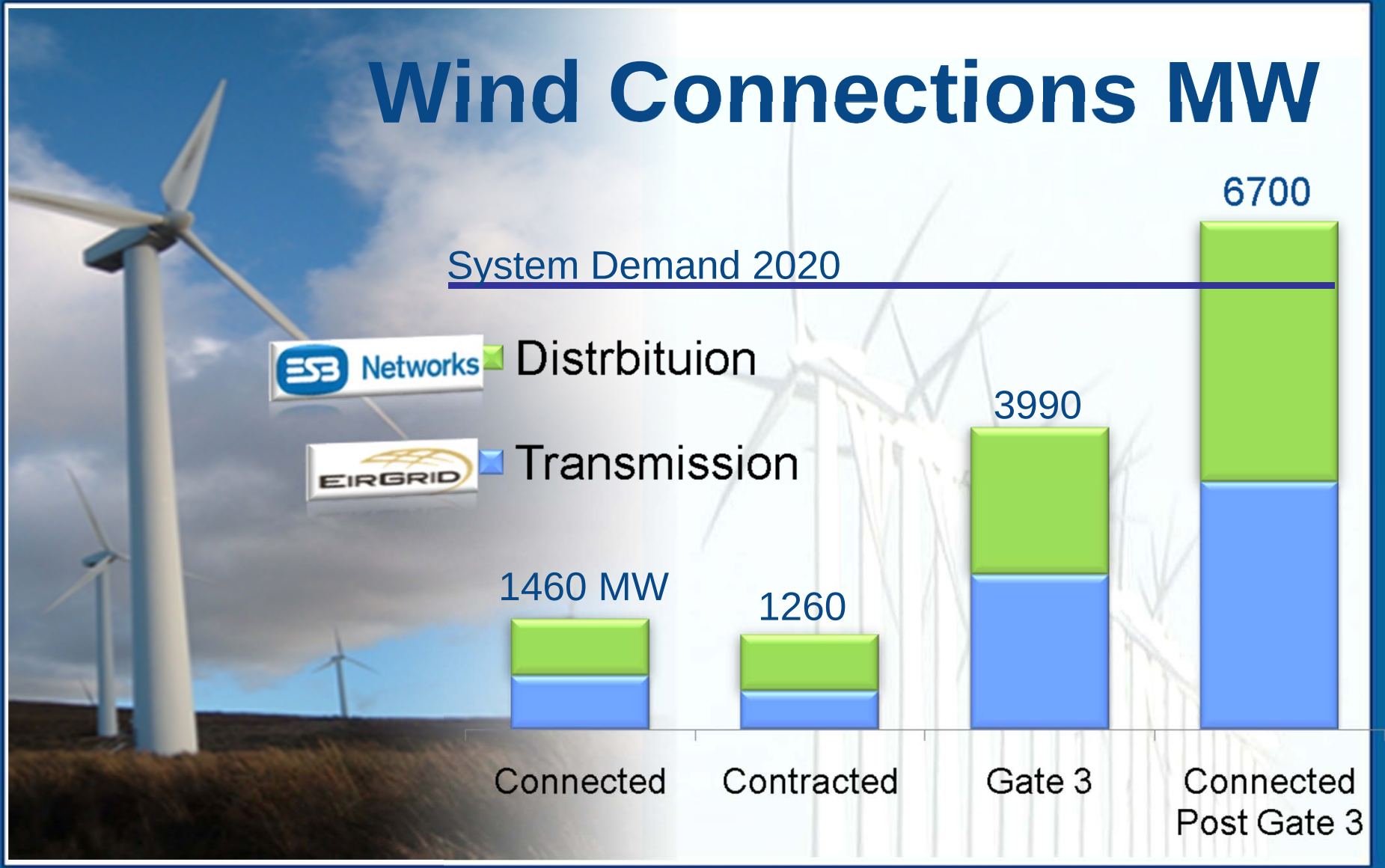

ESB Networks

www.esb.ie/esbnetworks

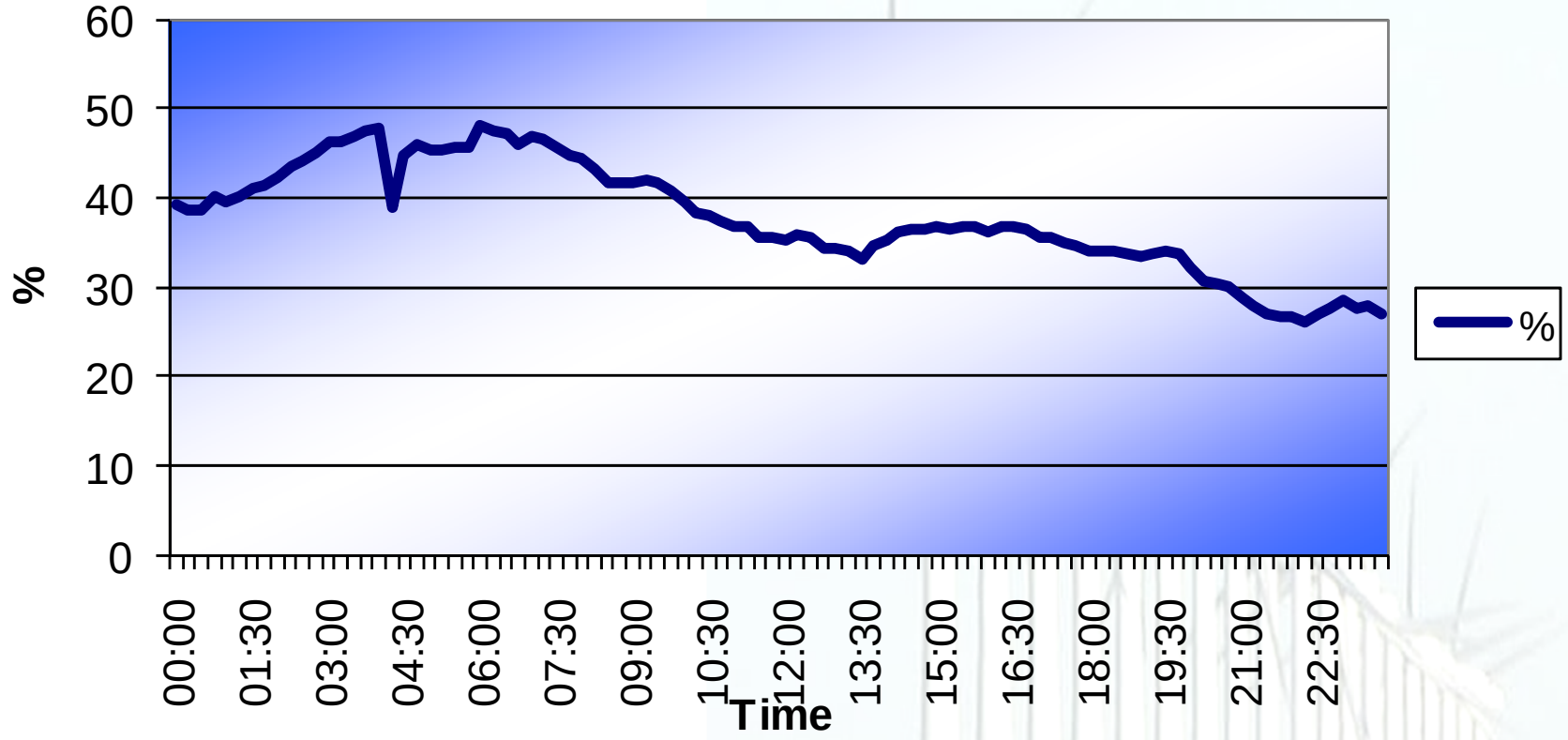
# ESB-EPRI Smart Grid Demonstration Project

- ***Wind Generation***
- Smart Meter Customer Behaviour Trials
- Electric Vehicles
- Smart Green Circuits

# Wind Connections MW



# Wind generation as % of system demand
## Monday 5th April 2010



# ESB/EPRI Wind Demonstration Project

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

# ESB-EPRI Smart Grid Demonstration Project

- Wind Generation
- ***Smart Meter Trials***
- Electric Vehicles
- Smart Green Circuits

# Customer Behaviour Trial Scope


Objective is to '**Assess impact of SM on peak demand & overall energy use**"

- 6,400 customers
  - Installation complete June 2009
  - 4800 Domestic
  - 1600 Business
- One year profile data per customer (at least 6 actual months) for benchmark period
- Up to one year of stimuli
- Real Tariffs applied to Real customers
- Suppliers to be given daily validated half hourly data each day
- Final conclusions by CER based on ESRI National Business Case Study Q1 2011

# Stimuli & Sample Size

| | Residential Tariffs- Charges | | |
|---|---|---|---|
| Tariff | Night | Day | Peak |
| **Tariff A** | 12.0 | 14.0 | 20.0 |
| **Tariff B** | 11.0 | 13.5 | 26.0 |
| **Tariff C** | 10.0 | 13.0 | 22.0 |
| **Tariff D** | 9.0 | 12.5 | 38.0 |
| **Weekend** | 10.0 | 14.0 | |



| | Numbers on Bi-Monthly Detailed Bill | Numbers on Monthly Detailed Bill | Numbers on Bi-Monthly Detailed Bill + IHD | Bi-Monthly Detailed bill + Overall Load Reduction | Total |
|---|---|---|---|---|---|
| **Tariff A** | **333** | **335** | **338** | **333** | **1,339** |
| **Tariff B** | **125** | **127** | **126** | **124** | **502** |
| **Tariff C** | **334** | **336** | **332** | **336** | **1,338** |
| **Tariff D** | **126** | **130** | **123** | **125** | **504** |
| | | | | **Control group** | **1,137** |

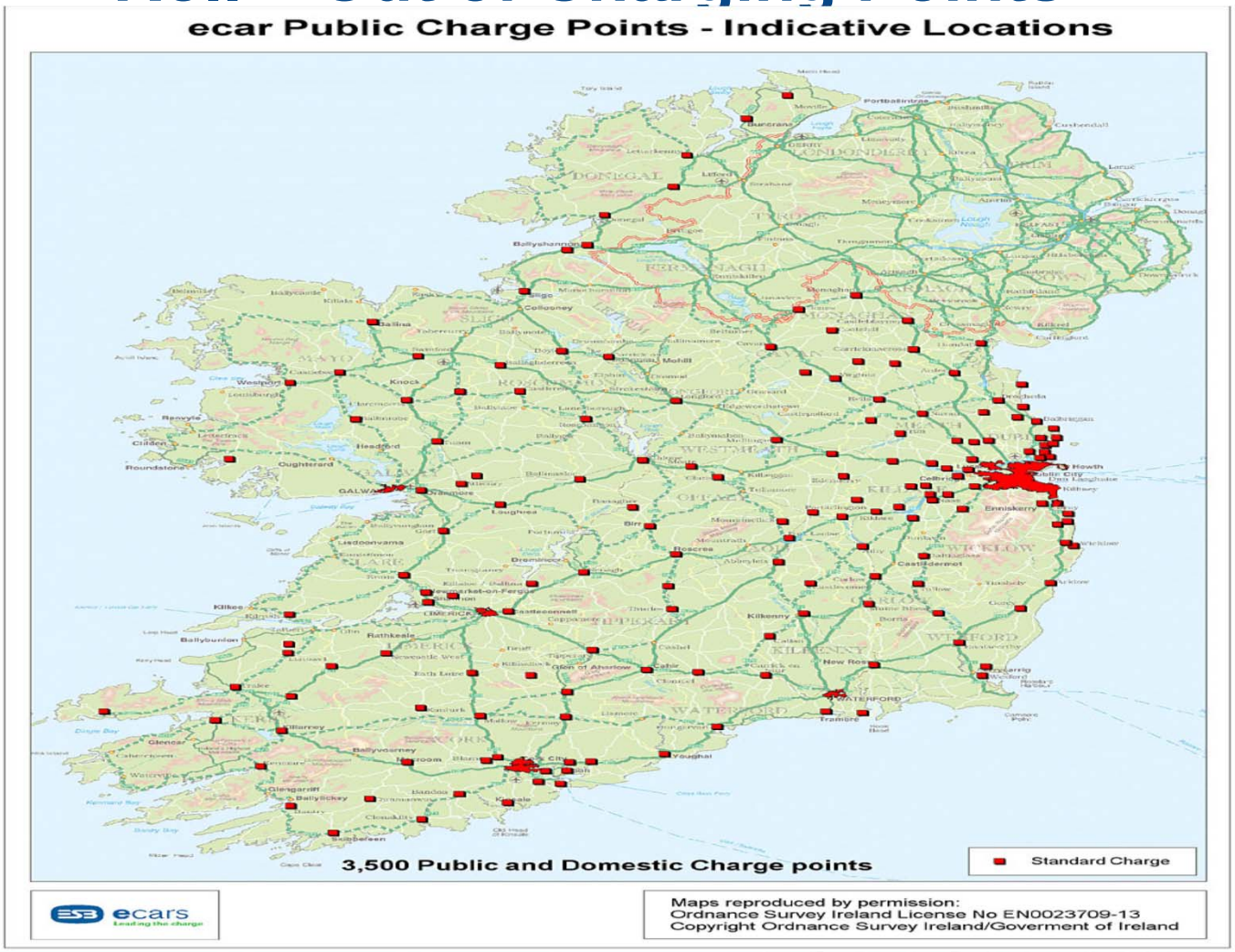
# ESB-EPRI Smart Grid Demonstration Project

- Wind Generation
- Smart Meter Trials
- ***Electric Vehicles***
- Smart Green Circuits



Minister for Energy with CEO ESB, with positions for national plan for 3,500 EV Charging Points by 2011

# Roll – Out of Charging Points



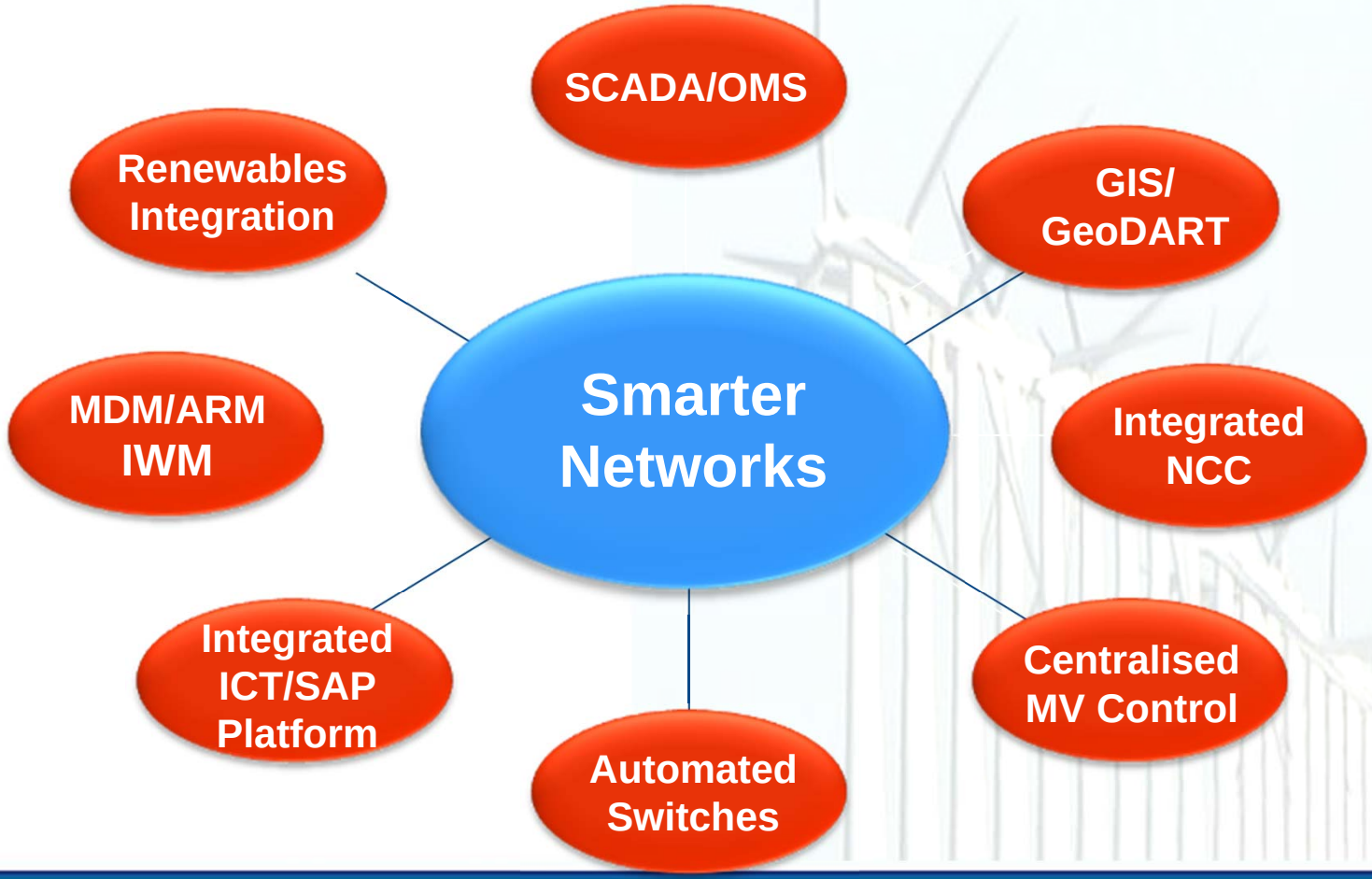
# ESBN/EPRI EV Project Objectives


- Assess capacity of LV Network for EV
- Assess potential barriers to future Vehicle to Grid
- Assess possibility of using EV as ballast load for WIND,
- Assess potential impact of faster charging on LV network by using Smart Meters to share charging capacity

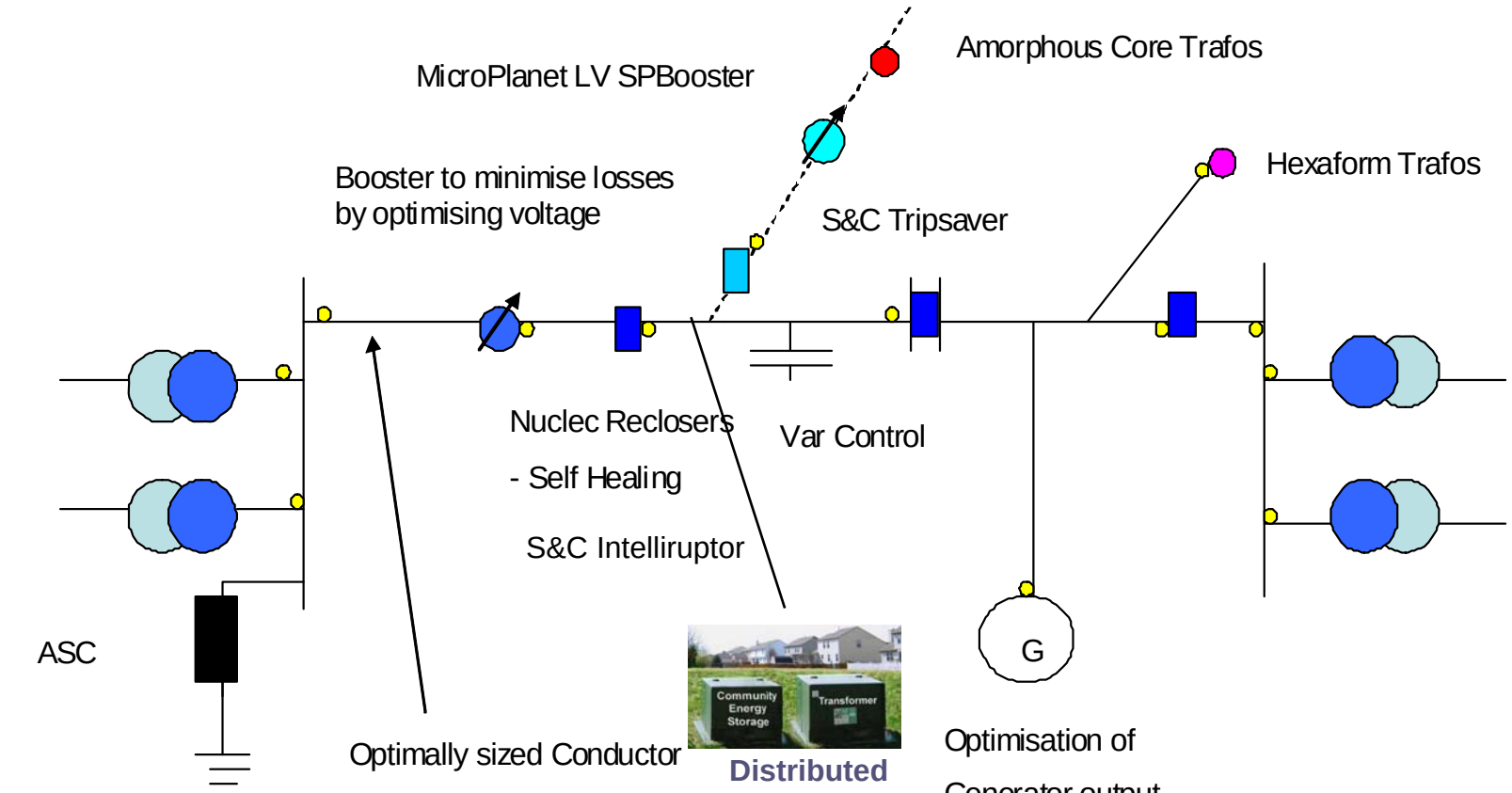
# ESB-EPRI Smart Grid Demonstration Project

- Wind Generation
- Smart Meter Trials
- Electric Vehicles
- ***Smart Green Circuits***

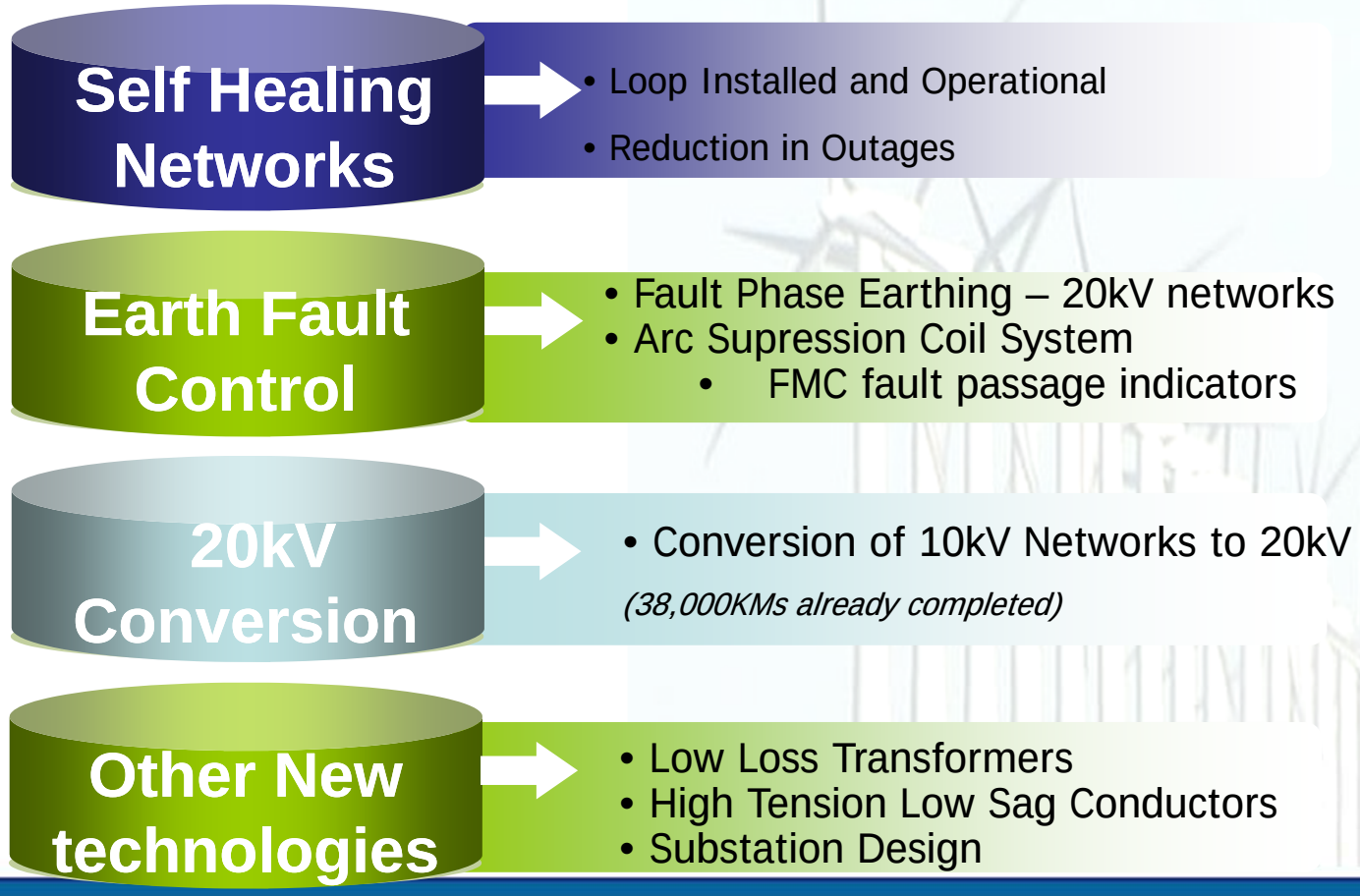
# Smarter Networks
# Building Blocks Already Underway



# Smart Green Circuit Demo

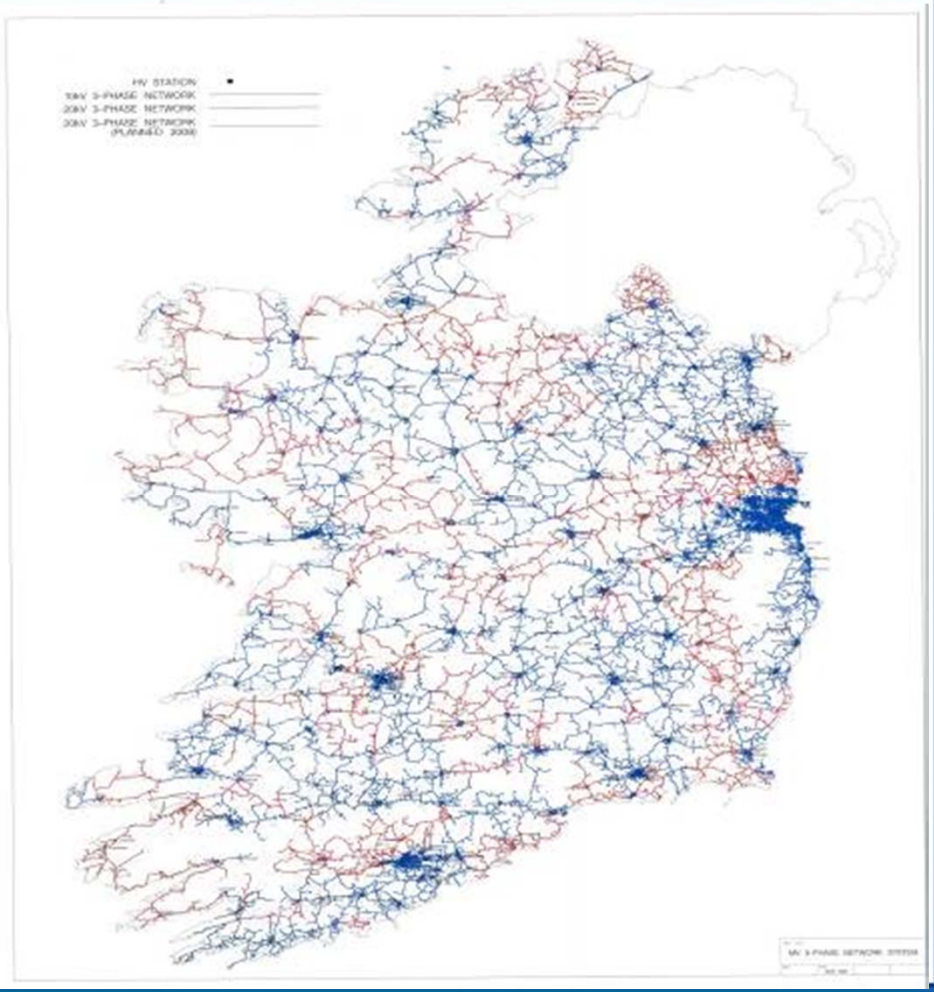


# Sample Network Innovations



# 20kV Conversion Programme

- Reduce Network Losses by 75%
- Capacity increased x 4 for Lines & x 2 for Cables. 20kV equipment costs about same as 10kV.
- Cost/kVA capacity significantly lower at 20kV than 10kV.
- Voltage related quality improved generally x 4, e.g. volt drops, S/C levels, harmonics, etc.
- Saving of 350,000 tons of CO2 per annum when completed



# Other New Network Technologies Adopted

New Low Loss Transformer Stock

- Amorphous Core Transformers
- Hexagon Transformers

High Tension Low Sag

- Increased Capacity
- Renewables Facilitation

New Substation Design

- Outdoor GIS Equipment
- SCS Control

# ESB Networks IT Landscape 2009 (NITA - €100m)

Completed

Work in Progress

SAP Applications

SAP R/3

IWM

Enterprise Portal

Business Warehouse (BW )

Mobile Data Mgt

IS-U

Capital Portfolio Mgt (xRPM ) IWM

**IS-U**
- Meter Operations
- Meter Reading
- DUoS Billing
- Change of Supplier
- Data Aggregation

**Business Warehouse**
- Management Reporting

**Enterprise Portal**
- Transaction updates
- Userability

**SCADA**
- Remote Switching
- System Operation Mgt
- Alarms/Event

**OMS**
- Outage Management
- Call Centre support
- Event

**GIS**
- Plotting/ Network Diagrams
- Network connectivity
- Centre Site Updates

**Areas**
- Customer Appointment Mgt
- Call Centre support
- Daily Scheduling

Areas Replacement CLICK Schedule

SCADA ABB

OMS Oracle

GIS

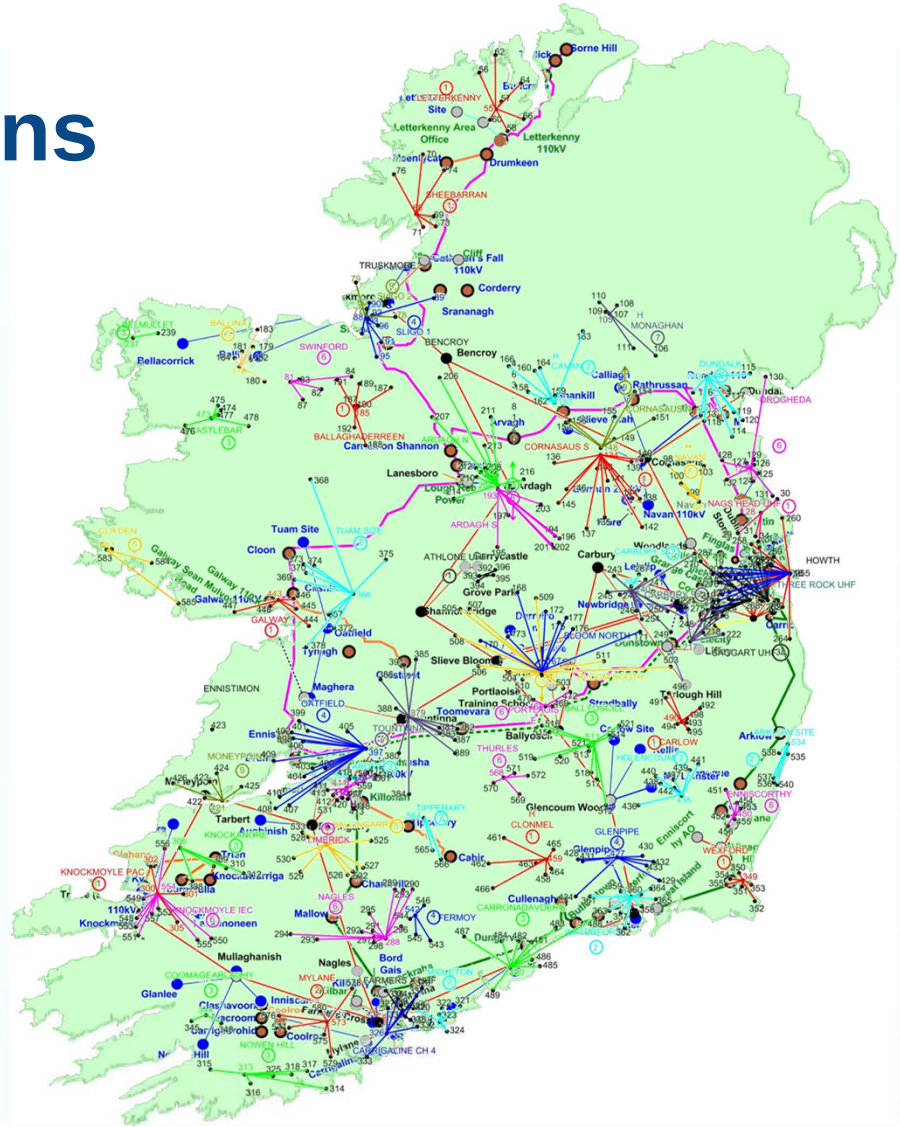
DFIS | Geolas | Geodart | Mapinfo | WebFramme Viewer

ESB Networks

www.esb.ie/esbnetworks

# Extensive Telecommunications Network

- Fibre Network
- Microwave Radio
- Poling Radio
- Other
  - Power Line Carrier PLC
  - Operational Telephony OPTEL
  - Mobile Radio




ESB Networks

www.esb.ie/esbnetworks

# Strategic Challenges & Issues

- Challenging and exciting times ahead for the Electrical Utility Industry
- Major focus on sustainability world wide
- Electricity will be the fuel of the future in replacing dependence on fossil fuels with Wind.
- 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**