eCar Ireland Project
Data Analysis and Objectives

Data Sim Summer School
Hasselt University
July 15th 2014
Introduction – ESB, Ireland and Senan McGrath

<table>
<thead>
<tr>
<th>ESB</th>
<th>Senan McGrath</th>
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<tbody>
<tr>
<td><strong>Largest electrical utility in Ireland</strong></td>
<td><strong>Chief Technology Officer, ESB eCars</strong></td>
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<td><strong>Power stations in UK</strong></td>
<td><strong>Chairperson, Eurelectric EV Task Force</strong></td>
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<td><strong>Vertically integrated but legally separate parts to the Group</strong></td>
<td><strong>IEA, Fast Charging Working Group</strong></td>
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<td><strong>Only Distribution Company</strong></td>
<td><strong>EC Expert Group on Future Transport Fuels (electricity)</strong></td>
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<td><strong>Strong competition in generation and retail of electricity</strong></td>
<td><strong>Executive Board Member</strong></td>
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<td><strong>International consultancy Business</strong></td>
<td><strong>Green eMotion Project, Mobi.Europe Project</strong></td>
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**ESB eCars**

- Division of ESB set up to provide national EV infrastructure
- Currently designing EV infrastructure pilot and medium/long term EV strategy for Dubai

**Senan McGrath**

- Primary Degrees in Electrical Engineering and Business (Marketing).
- Comfortable with Economic analysis and have Transport Mgt experience but not in Transport Engineering analysis.
Sectoral share of non-ETS in 2020

- Agriculture: 46%
- Transport: 29%
- Industry & Commercial: 10%
- Residential: 13%
- Waste: 2%
- Energy - non-CO2: 0%

Slide Courtesy of EPA Ireland
Renewable Strategy – Transport

Goal 4 – More sustainable Transport through biofuels and electrification

- Increase % Biofuels within limits outlined in EU directives
- Continue current incentives for EVs in 2012 and review thereafter
- Ensure continued roll-out by ESB of EV charging infrastructure
- Pursue necessary EU regulation and standards
Ireland’s Investment in Wind Generation

MW

5090

1694

Connected Dec 2013

Connected + Contracted Dec 2013

Expected 2020

System peak

Minimum Night demand 2013

50% Wind Connected to Distribution System

2004 MW

4726 MW

4000 MW

6000 MW

2004

2013

2014

2015

2016

2017

2018

2019

2020

2021

2022

2023

2024

2025

2026

2027

2028

2029

2030
Wind Generation as % of System Demand
Monday 5th April 2010

Source: Eirgrid
European Targets

Variable Non-Synchronous Renewable Generation

* Based on analysis of National Renewable Action Plans (NREAPs) as submitted by Member States

Slide courtesy of Eirgrid (Irish TSO)
Incentivising the Portfolio: Market Signals

**Future Direction**

Financial Mix will move to higher capital & lower variable cost technologies

Incentivise performance to obtain the plant mix that matches the system requirements and achieves the policy objectives

Slide courtesy of Eirgrid (Irish TSO)
Electricity Demand Forecast

- Make generation more efficient by filling ‘night valley’
- No major increase in peak demand
CO2 Emissions

Fleet Tailpipe emissions
2010 2015 2021
150 g/km 130 g/km 95 g/km

Electricity Generation

Irish Grid average in 2011
130 g/km

EU Grid average in 2009
56 g/km

WIND
0 g/km
EV Charging Infrastructure in Ireland

**HOME / WORK**
- 6 – 8 hours
- AC 1Φ 16A Mode 3 Type 2/ fixed cable

**PUBLIC/ Destination**
- 1 - 6 hours*
- AC 3Φ 32A Mode 3 Type 2

**FAST/ On Route**
- 80% in 20 minutes
- DC 50kW AC 3Φ 63A Mode 3 Fixed cable

*Depending on car
Project Status - Infrastructure Update

May 2014 Status
- AC Public Charge Points: 801
- Fast Chargers: 57

Final Project Targets
- AC Public Chargers: 1,000
- Fast Public Chargers: 100

Northern Ireland
- AC Public Charge Points: 320
- Fast Chargers: 14

EU TEN-T (First EU Country)
- 50% Funding for Chargers on main interurban routes & modal hubs
TEN-T UK & Ireland (RCN) – 2013/2014

2012 TEN-T Ireland –Northern Ireland
- 46 Fast Chargers on island

Rapid Charge Network Consortium
- Nissan, VW, BMW, Renault
- ESB, (Ireland)
- Newcastle, UK  Gov Dept for Transport

74 Fast Chargers
- 2 routes North-South (M6) and East-West (M62)

Linking Belfast & Dublin thru UK to North Sea Ports
Interoperability Activity

Green eMotion (DG-Move)
- IRL, DE, FR, DK, SW, IT, ES, EL
- Market place & clearing House

Mobi.Europe (DG-Connect)
- IRL, NL, PT, ES
- Bilateral deals & mobile phone

GB and NI and IRL
- 8 UK PIPS Whitelists & PAYG

EMI$^3$ e-Mobility Group
- All of above + Auto OEMs + Hubject + anyone interested
Netherlands & Great Britain
EVs Charging in Ireland
Utilities in EPRI EV Distribution Impact Collaborative

USA 14;
Canada 4
Europe 1 (ESB)
Distribution Smart Grid Roebuck Downs
Network Reconfiguration

Extended network to 74 Customers

Existing LV Circuit 54 Customers
Worst Case Scenario

1-phase Voltage CPOC_C71

- Voltage (pu)
- EV Penetration (%)

- 0.9 pu
- From END
- From START

0.93
0.92
0.91
0.9
0.89
0.88
0.87
0
10
20
30
40
50
60
70
80
90
100
Smart Charging

- Fully Integrated Back-office system for managing EV charging business irrespective of market or business model
- Enterprise Ireland SME cluster

EVEO 22kW Chargers

M2C Smart Home/Work Place Charger & Associated Technology

JTM Portable Charger

Apps for EVs

Carra –
Installation Maintenance & Maintenance Management Systems

Transpoco – Data logging
Planned Smart Grid Features

Frequency Response
- Via TSO Command
- Automatic (re-introduce inertia)

Virtual Spinning Reserve
- Request
- Tracking
- Settlement

DSO/Scada integration
- CP Grouping by Transformer
- Integration with OMS System
Data Available

Customer Data
- Buyers of EVs (Name & address)
- Make and model bought
- Dealer involved
- RFID card number issued
- Almost 100% agreement to use of data and participation in surveys

National (Macro) Data
Proposed H2020 Project (thru Phase 1) with Norway, Netherlands, Portugal, UK, Spain, Ireland, Switzerland(?)
- National Vehicle & EV Sales
- Car OEM Sales Activity
- Incentives
  - Subsidies, Fiscal Incentive, Non Fiscal Incentives

Static Charge Point (CP) Data
- CP type (AC/ DC, kW)
- Location (Longitude / Latitude coordinates)
- Micro location (on-street, supermarket car park etc)

Dynamic Charge Point (CP) Data
- RFID card used = car & driver
- Charging events incidence
- Charging events duration
- Charging events kWh
Analysis Required

Market Information
• Who are the buyers of EVs
• What motivated the purchase
• What information was relevant
• Where & How was information obtained
• How important is electronic media and social networks

Objective of Analysis
• How should EVs be better promoted
• What incentives work best
• What recommendations should be made to policy makers

Charging Infrastructure
• How much Public CPs (AC/DC) used
• When are they used
• What is typical usage
• Who uses CPs (e.g. 80% by people who live within X km)

Objective of Analysis
• What’s important in planning CP location
• Are more CPs needed and what type
• Where should future CPs be located
• Can probable queues be identified
• Does infrastructure support greater use of EVs
Ideas from Day 1

• **Salvatore Rinzivillo**
  
  • Use of driver iPhones Apps to obtain roaming geographical data (rather than car data loggers) to easily gather travel data. Provide web page for drivers to complete journey and activity information

• **Theo Arentze**
  
  • Consider Ettema 2014 (in situ measurement of affective experiences) to gather driver attitudinal information on “Range Anxiety” and how it is affected by positive or negative experiences with public chargers (working or not)

• **Natalia Andrienko**
  
  • Explore use of Visual Analytics to disseminate data on charge point usage
Thank You

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