THE ELECTRIC VEHICLE LANDSCAPE

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Executive Director
ESB Customer Solutions

October 2018

AGENDA

Energy for generations

- Introduction
- National and European Policy Context
- ESB EV Charging Infrastructure in Ireland
- EV Market Growth
- Evolving Technology
- Planning for the Future

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DEVELOPMENT OF THE IRISH EV SYSTEM

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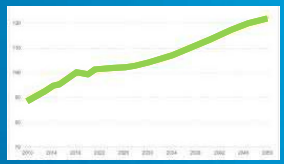
2008 | 2010 | 2014 | 2018

ESB Strategy to 2020

The network roll-out begins

Multiple Stakeholders



EV sales growth

Background of the development of the Irish EV system

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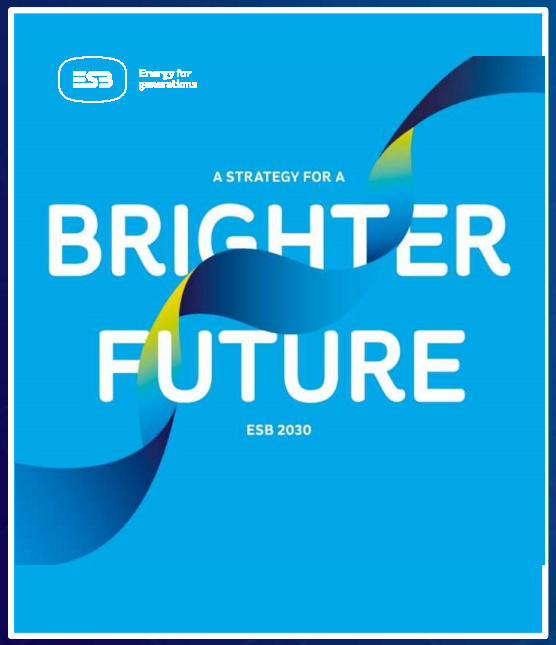
ESB STRATEGY 2030

Energy for generations



STRATEGIC INTENT

Produce, connect & deliver clean, secure and affordable energy

"EV Fast Charging Networks in Ireland and UK"

SUCCESS IN 2030

Develop energy services to meet emerging market needs

"Lead electrification of transport"

"e-Transport services that are fully integrated with the rest of our energy business"

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ELECTRIC VEHICLE POLICY DRIVERS

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Commitment to 1.5°C (from 2°C)

EU Vehicle Emission Regulations

130 g/Km 62(?)

2015 2030

- Programme for Government "Ambition to make Ireland "a leader in the take-up of electric vehicles"
- National Development Plan 2018 – 2027 "No non zero emission vehicles will be sold in Ireland after 2030"…. "at least 500,000 EVs on Irish roads."
- Transition to a Low Carbon Energy Future 2015-2030 Commits to **80%** Reduction in Energy Emissions by 2050

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IRELAND'S GREENHOUSE GAS EMISSIONS

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Carbon intensity of electricity has dropped by 49%, between 1990 & 2014

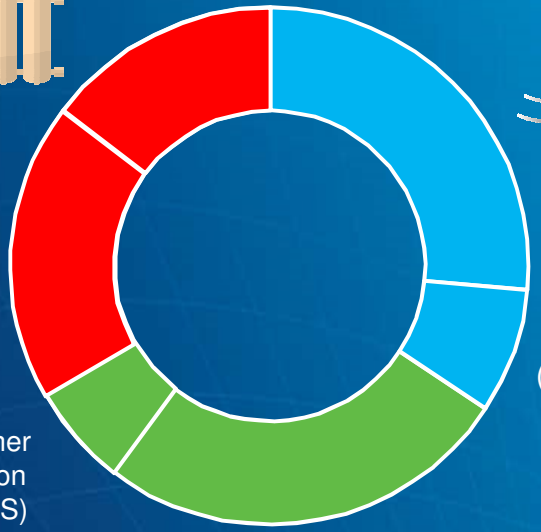
Emissions Trading Scheme (ETS) (35% 16Mt)

Non ETS (67% 42Mt)

15%

19%

19%



Other (ETS) 8%

Other (Non ETS) 6%

33%

Mass electrification of transport is essential if Ireland is to meet its emission targets

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EXISTING ALL ISLAND EV CHARGING NETWORK

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Public EV charging infrastructure

- 50kW Fast Chargers – x 92
- 22kW Standard Chargers – >1,000

- RoI and NI networks allow cross-island travel and provides public EV charging in most communities with >1,500 population

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HOME CHARGING (IRELAND)

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- 2,300 home chargers installed in the pilot scheme by ESB
- 3-7 kW AC (Typically)
- Current SEAI grant for home charger installation up to €600
- Majority of EV drivers recharge at home
- Many EV owners avail of cheaper night rate electricity (~€0.09 / kWh)

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RECENT UPGRADES TO THE ECARS NETWORK

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ESB is committed to maintaining and operating the current charge point network

Eight fast charge points replaced :

- Junction 14, Monasterevin, Co Kildare
- Ballaghaderreen, Co Roscommon
- Ballindine, Co Mayo
- Longford town
- Monaghan town
- Ennis, Co. Clare
- Galway city
- Cork city

Planned fast charger locations (early 2019)

- Cavan, Carlow, Wexford

AC replacements

- 16 AC chargers replaced (high uptimes)

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PROVIDING A FULL ELECTROMOBILITY SERVICE

CUSTOMER EXPERIENCE

ESB Support

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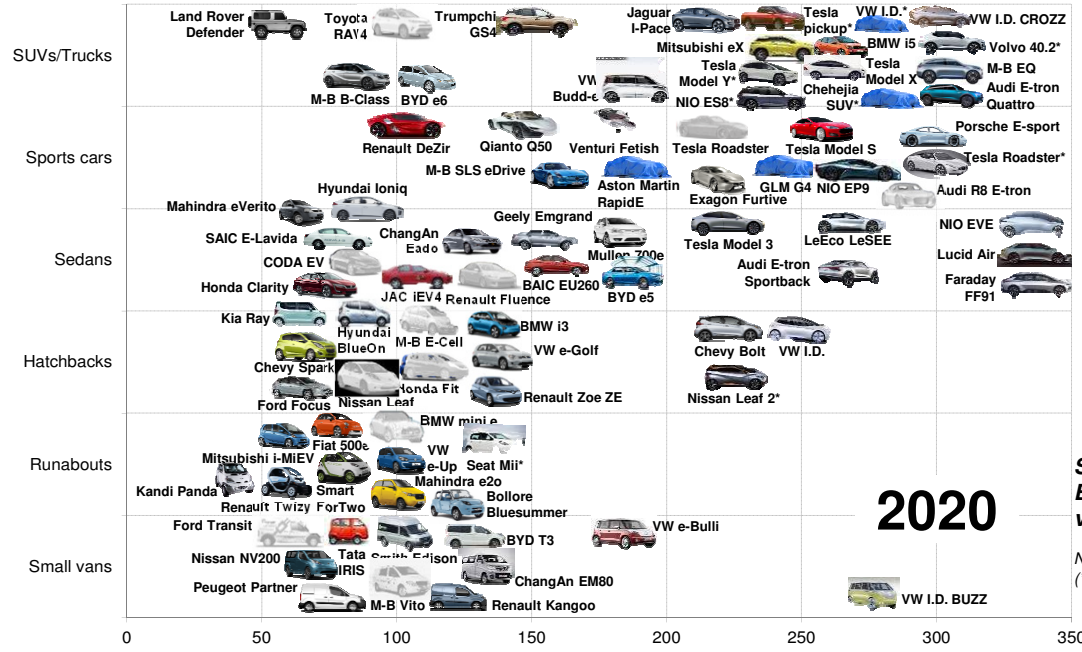
BEV model availability, 2008-20



Source: Bloomberg New Energy Finance, Images various.

Notes: Not exhaustive.
(*) Range is estimate

GLOBAL EV SALES BY TYPE

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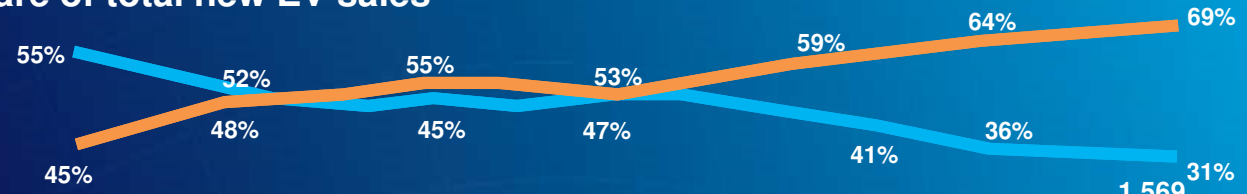
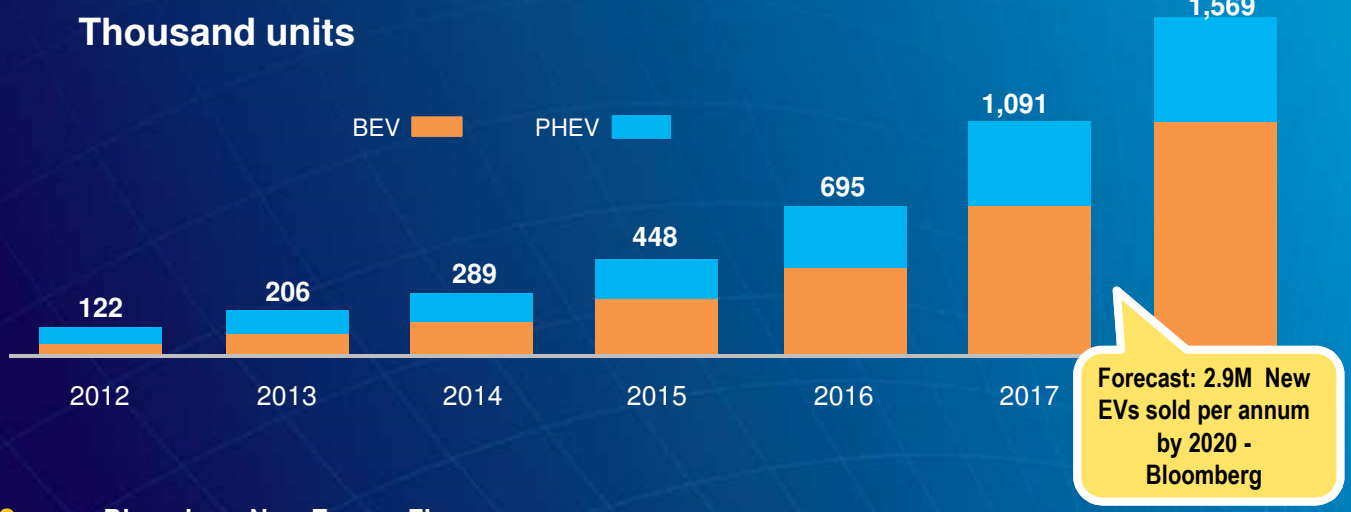
Share of total new EV sales



Thousand units



Source: Bloomberg New Energy Finance

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INITIAL EV INCENTIVES IN IRELAND

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- Up to €5000 grant towards the purchase of a new EV
- Up to €5000 VRT relief on the purchase of a new EV
- Lowest road tax band – EV €120 & PHEV €170
- Accelerated capital allowance for companies who purchase an EV and/or charging equipment

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LOW EMISSION VEHICLE TASK FORCE

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Low Emission Vehicle Task Force (2018)

Chaired by three Government Depts.

Programme for Government set out that it wants Ireland to be *"a leader in the take-up of electric vehicles"* and set up *"a dedicated taskforce to set ambitious and achievable targets"*

Outputs recommended by the Task Force include:

- **Home charge point grant up to €600**
- **Zero BIK for the value of a BEV up to €50,000**
- **Up to a 75% toll reduction for BEVs**
- **Taxi EV purchase grant up to €7,000**
- **SEAI EV promotion – DrivingElectric.ie**

Roinn Cumarsáide, Gníomhaithe ar son na hAeráide & Comhshaoil
Department of Communications, Climate Action & Environment

An Roinn Iompair Turasóireachta agus Spóirt
Department of Transport, Tourism and Sport

An Roinn Tithíochta, Pleanála, Pobail agus Rialtais Áitiúil
Department of Housing, Planning, Community and Local Government

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EV SALES GROWTH TREND IN IRELAND

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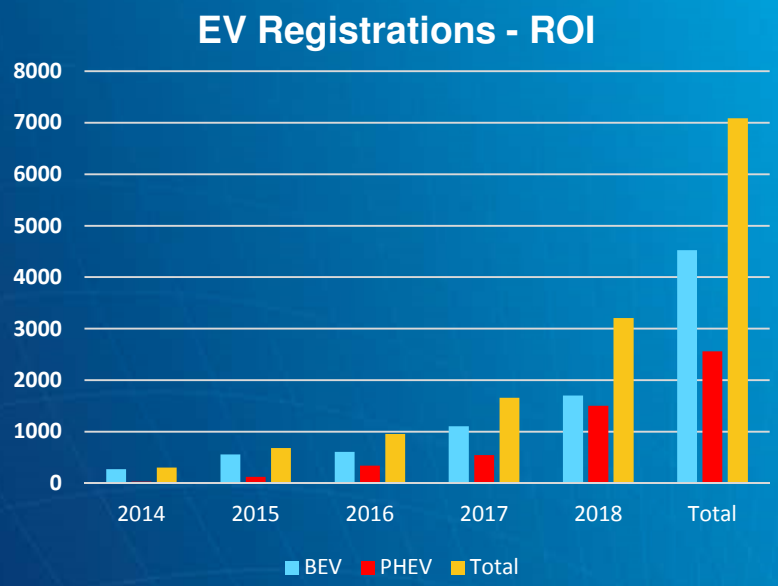
- >7,000 EVs registered in Ireland in total (including imports)
  - 65% BEV
  - 35% PHEV
- ~3,209 registrations this year
- ~1,866 increase in EV registrations compared to the same time last year
- We believe there will be over 15,000 vehicles by the end of 2020
- Government target of 500k by 2030



Figures to the end of September 2018

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INFRASTRUCTURE - THE TREND IN TECH

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- Faster Charging - Higher Power
- 50kW >150kW >350kW chargers
- Quicker charging
- Greater range from each charge
- Multiple chargers at each location

DECREASING BATTERY PRICE

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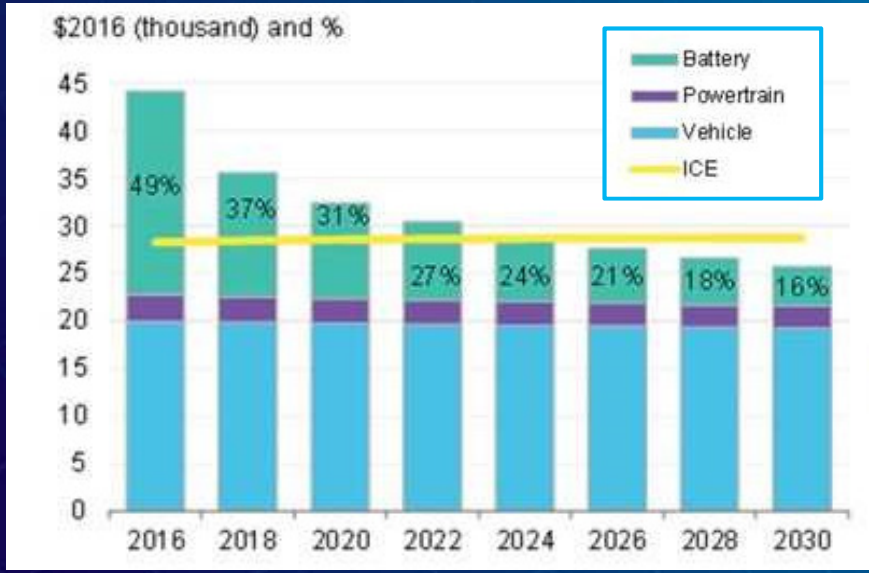
US MEDIUM BEV PRICE BREAKDOWN, ICE PRICE & SHARE OF BATTERY COSTS



Source: Bloomberg NEF,EPA, ICCT, FEV, ONRL, IDL.
Note: Estimated pre-tax retail prices

- Battery prices decreasing significantly
- This will see the manufacturing price of an electric vehicle drop
- The reduced battery prices should see EVs become cheaper than conventional vehicles after 2024

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FUTURE OF EV CHARGE POINTS PILOT NETWORK

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- Agreement between ESB Networks and CRU on the future of the pilot charge point network (Sept 2018)
- Charge points will continue to be run by ESB ecars
- There will be no further regulatory funding for operation, maintenance and replacement of problematic charge points

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FUTURE OF EV CHARGE POINTS PILOT NETWORK

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- Agreement between ESB Networks and CRU on the future of the pilot charge point network (Sept 2018)
- Charge points will continue to be run by ESB ecars
- There will be no further regulatory funding for operation, maintenance and replacement of problematic charge points

- **Fees for use of the EV charging infrastructure will need to be introduced in 2019 to fund the maintenance and development of the network**
- **Following relevant upgrades, fees for use of the fast chargers (50kW) will be introduced in H1 2019 and the AC network in H1 2020**
- **Comprehensive stakeholder engagement will take place prior to the introduction of these fees**

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AN ELECTROMOBILITY VISION

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- No Range or Queuing Anxiety
- Seamless Fuelling
- Visibility & Control
- Reliability as a non-issue

- Cleaner Air
- Decarbonised Transport
- Fuel Imports
- Innovation & Jobs

Infrastructure as Enabler *NOT* a Barrier

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BENEFITS OF A NATIONAL HIGH POWER CHARGING NETWORK

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Benefits

- Facilitate the large scale growth of EVs in Ireland
- Ensure a better experience for EV customers
- Provide multiple chargers at one location
- Reduce queuing at charge point locations
- Remove single points of failure on the network
- Ensure that the latest fast charging cars are accommodated in Ireland

CONCLUSIONS

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- ESB's is committed to the electrification of transport in Ireland
- Decarbonisation of the car fleet is inevitable
- The growth of electric vehicles continues in Ireland but it will be some years before we have numbers of significant scale
- There is no business case at present to provide a national charge point network without financial support i.e. the introduction of fees
- ESB will continue to support the maintenance and repair of the existing infrastructure

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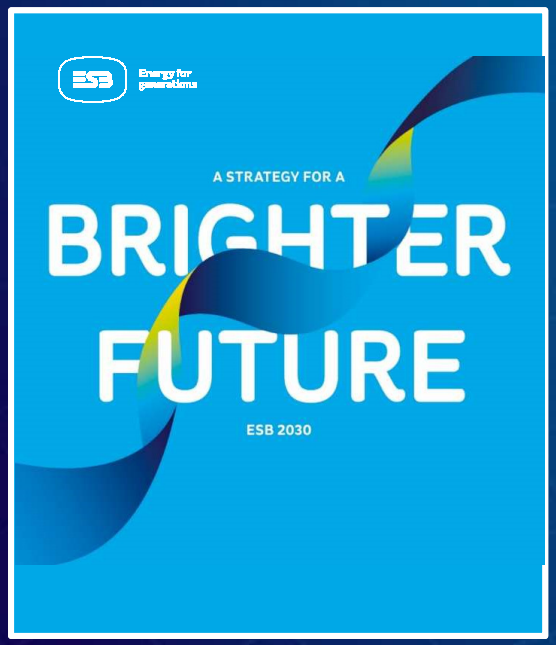
ESB STRATEGY 2030

Energy for generations



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END

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