

## Total Cost of Ownership of Electric Vehicles

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Parking Ireland 2011  
Dublin  
10/11/2011



### Overview

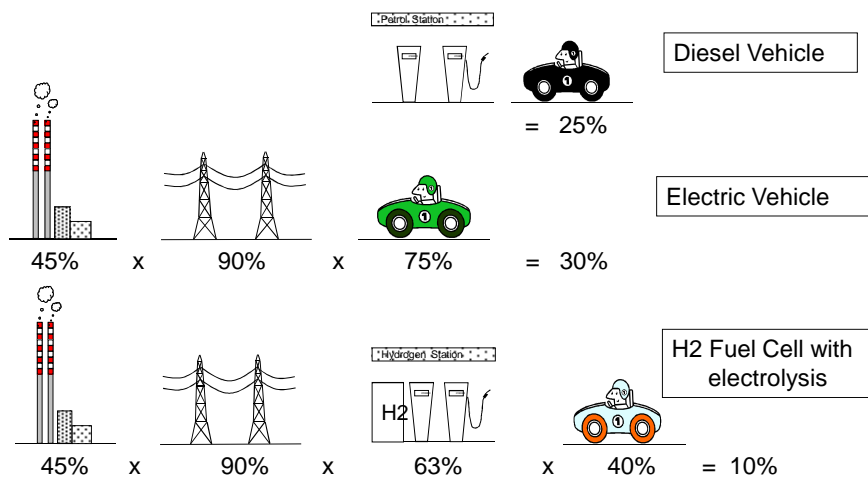
- EVs the Fundamentals
  - EU and National Policies
  - The Prize for Ireland
- A Road Map to 2050 for EVs in Ireland
- What will the price of Oil be....?

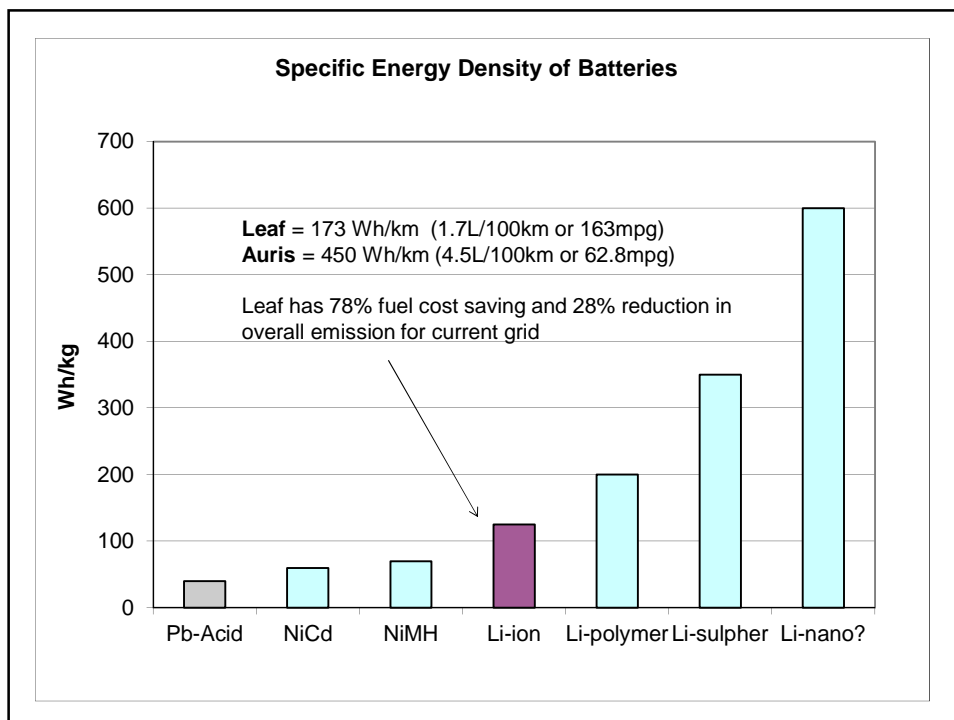
## History of Electric Vehicles

- Robert Anderson built first electric vehicle ~ 1835
- Higher capacity batteries available in 1881
- First commercial applications in 1897 – New York taxi firm
- Range of 18miles / 14mph, no gears, noise or emissions
- Production peaked in US ~ 1912
- Intercity roads improved, **oil discovered in Texas**, fuel prices dropped
- Henry Ford's mass production greatly reduced cost of ownership for Internal Comb Vehicles



## Fuel Cycle Efficiency Illustration





- **The Consumer**

- Is interested in new things
- Cares increasingly about environment
- Worries about the price of petrol
- EVs only for the wealthy? – prestige?
- Surprised by performance
- For the good of Ireland?

- **The Manufacturer**

- Emissions must go from 130g CO<sub>2</sub> to 95g CO<sub>2</sub> by 2020
- 80% fuel cost savings
- Energy density high=> normal size cars
- High torque => great performance, no gear box, smooth acceleration

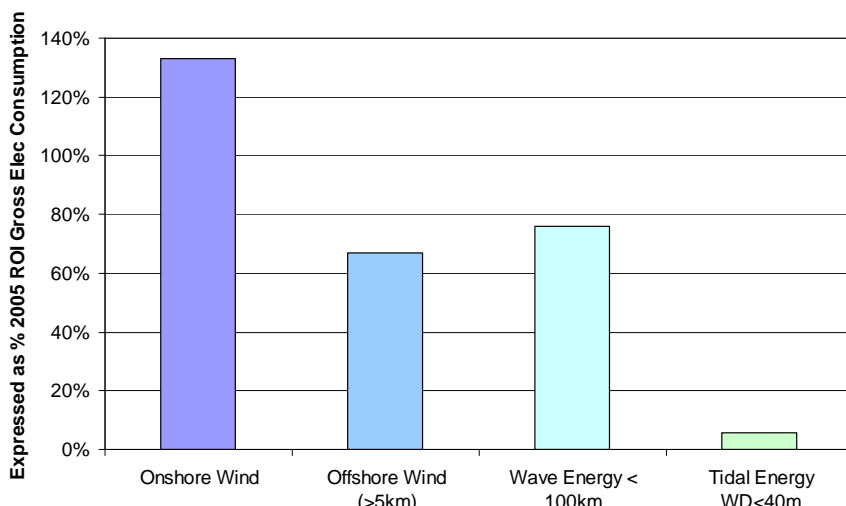


## Carrot and Stick Approach

- **“Carrot”**
  - UN ECE 100 (New European Drive Cycle)
  - Vehicle Labelling Mandatory in EU – Transparency for Consumer
  - Allows Emissions Based Vehicle Taxation
    - 2007 = 28% Diesel
    - 2010 = 63% Diesel
- **“Stick”**
  - Direct EU Regulation on Manufacturers – 95gCO<sub>2</sub>/km for fleet by 2020
  - Carbon Taxes
- (SEAI website “How Clean is Your Car” [http://www.seai.ie/Power\\_of\\_One/Getting\\_Around/HCIYC/](http://www.seai.ie/Power_of_One/Getting_Around/HCIYC/))

Vehicle Information																	
CO <sub>2</sub> emission Super Cycle (g/km)																	
<ul style="list-style-type: none"> <li>≤120 A</li> <li>120+ to 140 B</li> <li>140+ to 155 C</li> <li>155+ to 170 D</li> <li>170+ to 190 E</li> <li>190+ to 225 F</li> <li>225+ G</li> </ul>	133 g/km																
Fuel Use (estimated) for 18,000 Kilometres	600 litres																
Motor Tax for 12 Months	€ 100																
Vehicle Registration Tax (VRT) Rate	12 %																
Environmental Information																	
<p>Agrees on fuel economy and CO<sub>2</sub> emissions which various data for all new passenger car models is available at any point of sale they change directly from the Society of the Motor Industry of Ireland (Society of Motor Manufacturers and Traders). The figures are based on the New European Drive Cycle (NEDC) test cycle. The figures are based on the New European Drive Cycle (NEDC) test cycle. The figures are based on the New European Drive Cycle (NEDC) test cycle.</p>																	
<p>Make: HONDA</p> <p>Model/Version: Civic 06 1.4 I-DSI SE</p>																	
Carbon dioxide emissions (g/km): 133 g/km																	
<p>Fuel Consumption</p> <table border="1"> <tr> <td>Drive Cycle</td> <td>Litres/100km</td> <td>Fuel Type</td> <td>Petrol</td> </tr> <tr> <td>Urban</td> <td>8.9</td> <td>Engine Capacity (cc)</td> <td>1800</td> </tr> <tr> <td>Extra-urban</td> <td>7.8</td> <td>Transmission</td> <td>5speed</td> </tr> <tr> <td>Combined</td> <td>8</td> <td></td> <td></td> </tr> </table>		Drive Cycle	Litres/100km	Fuel Type	Petrol	Urban	8.9	Engine Capacity (cc)	1800	Extra-urban	7.8	Transmission	5speed	Combined	8		
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**Accessible Intermittent Renewable Energy Resource ROI (% of 2005 ROI Gross Electricity Consumption (28TWh))**

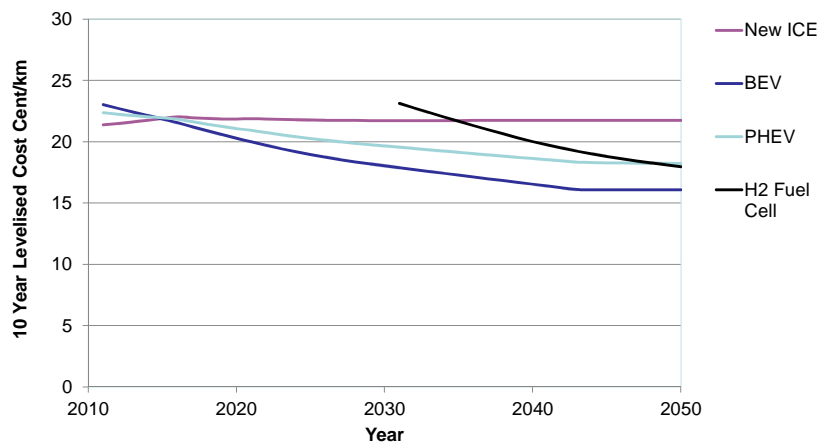


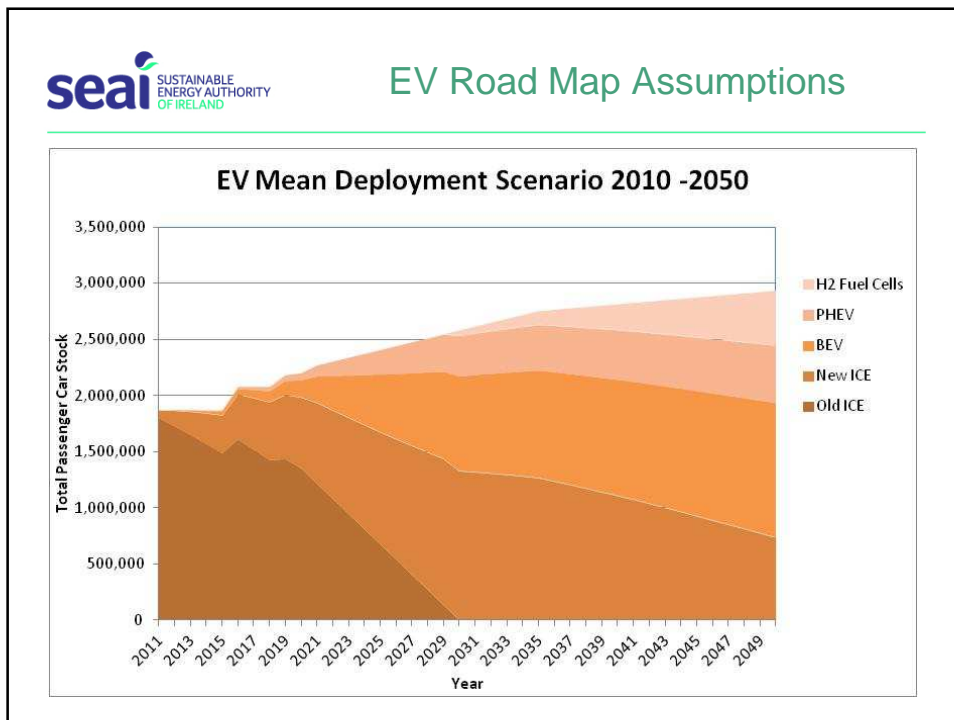
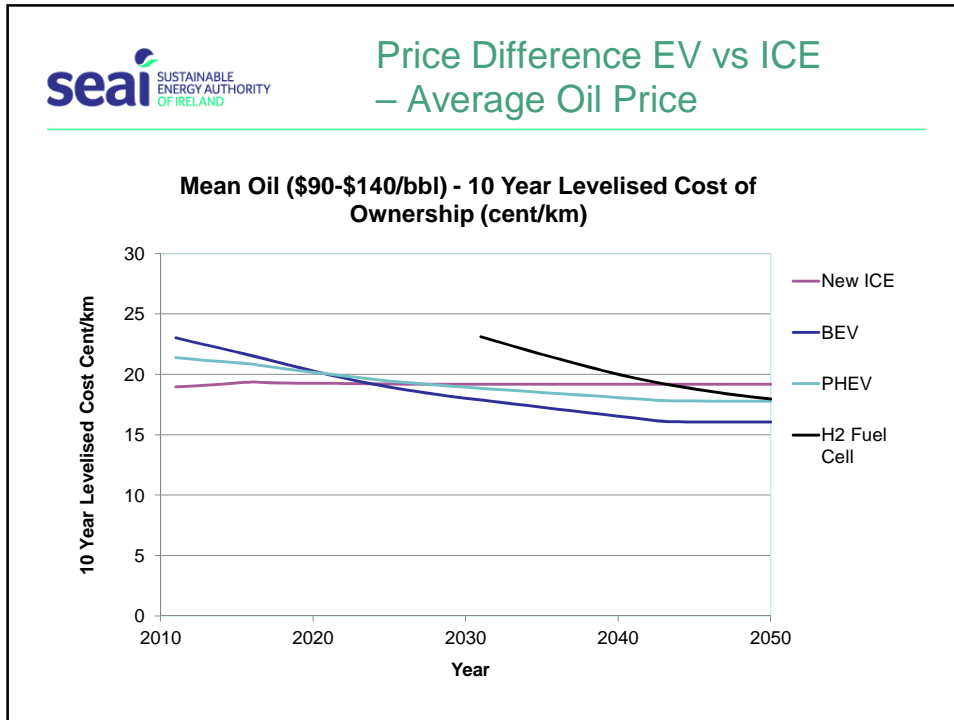
1) SEI "Renewable Energy Resources in Ireland for 2010 and 2020 - A Methodology", Nov 2004; 2) DETI, DPE, Interreg II "Assessment of Offshore Wind Energy Resource", Nov 2000; 3) SEI "Accessible Wave Energy Resource Atlas Ireland 2005", Dec 2005; 4) SEI "Tidal & Current Energy Resource in Ireland", Nov 2005

## EV Road Map for Ireland to 2050

## Price Difference EV vs ICE – High Oil Price

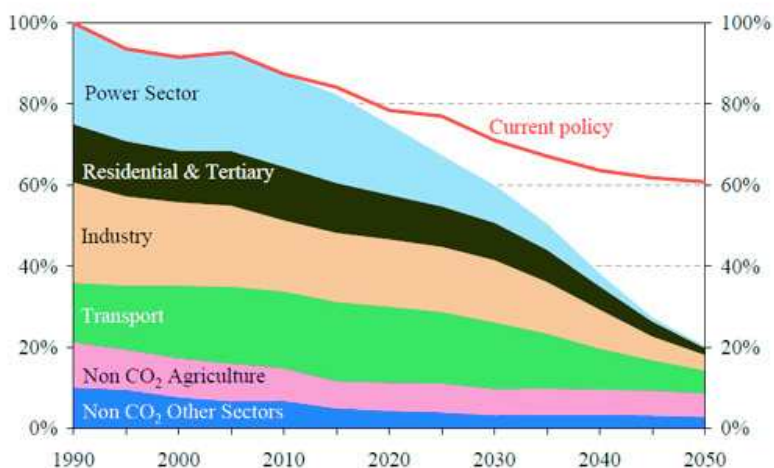
High Oil (\$160 - \$240) - 10 Year Levelised Cost of Ownership (cent/km)





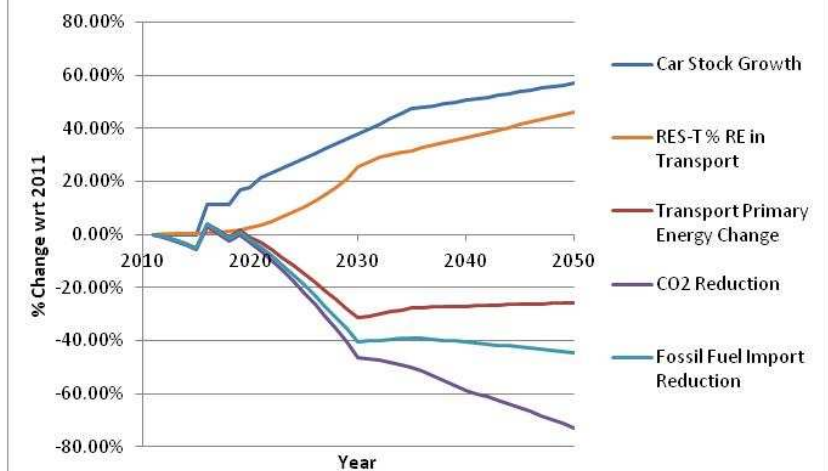
## Assumptions – EU 2050 Roadmap

EU GHG emissions towards an 80% domestic reduction (100% = 1990)



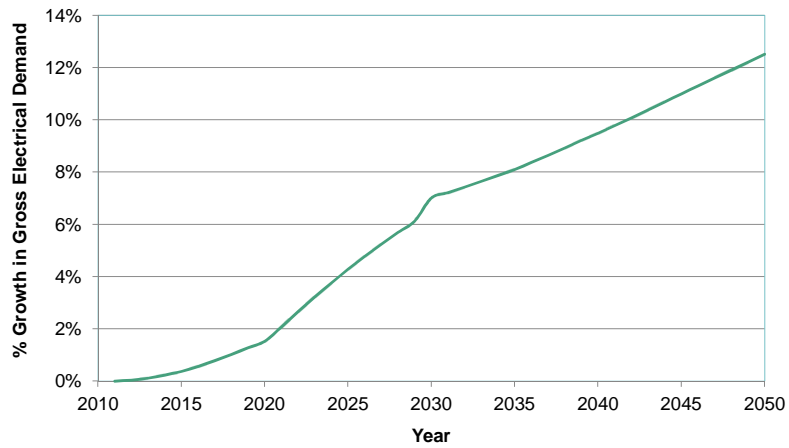
## The Prize for Ireland

EV Mean Deployment Impacts 2010 - 2050



## High Level Impact for Grid Infrastructure

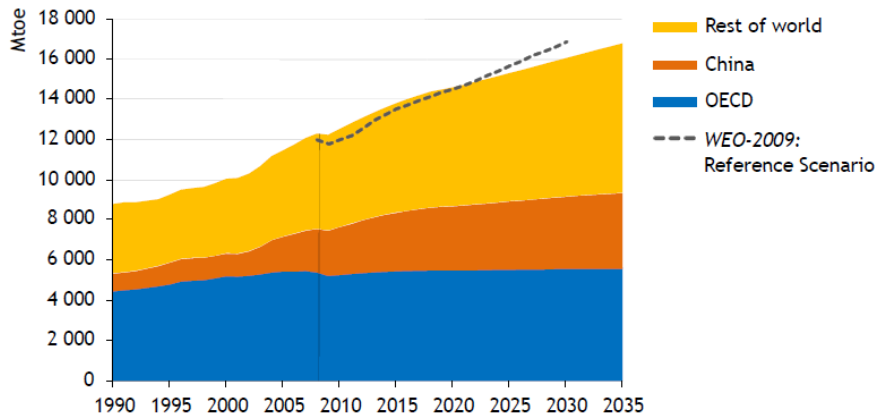
**% Growth in Gross Electrical Demand (additional to Forecast Growth) due to BEV/PHEV/H2 Fuel Cells wrt 2010**



What is the Future Price of Oil  
Likely to be....?

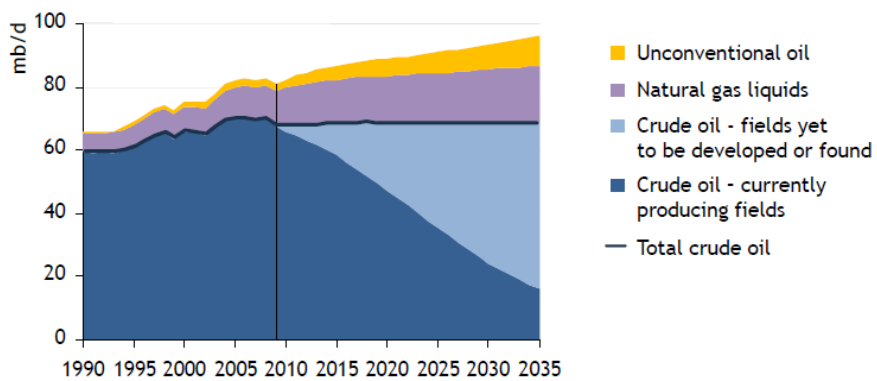
## World Demand for Energy - IEA

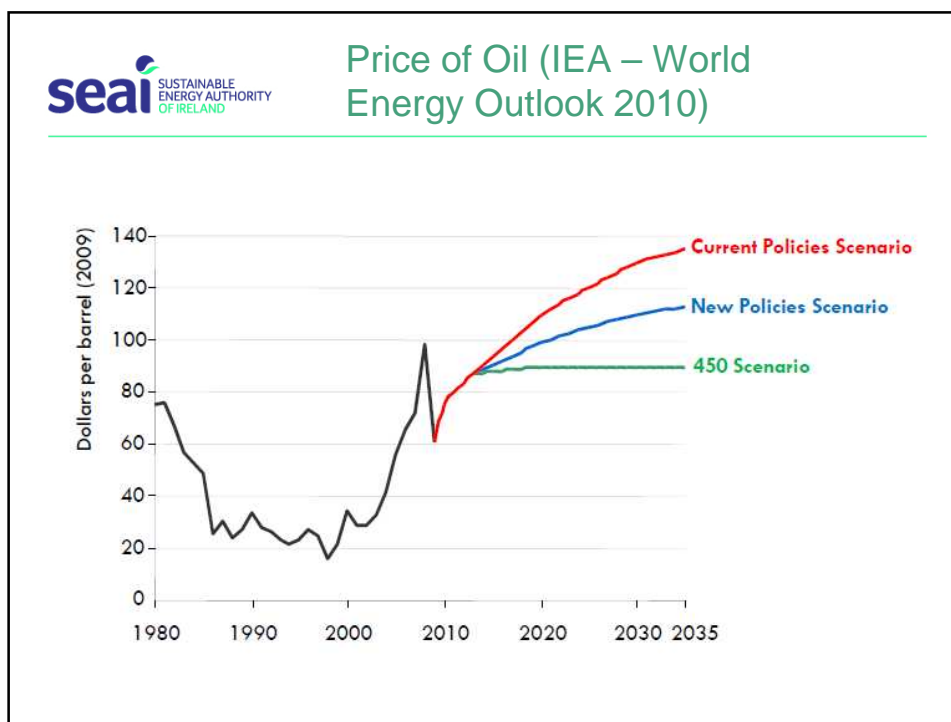
World primary energy demand by region in the New Policies Scenario



## World Oil Production - IEA

World oil production by type in the New Policies Scenario





**seai** SUSTAINABLE ENERGY AUTHORITY OF IRELAND

### Conclusions

- Lithium Batteries hold 3 times the energy of Lead and has longer life
- Ireland's size will suit the range of EVs very well
- EVs offer 80% fuel cost savings and 0 tail pipe emissions
- Ireland could reduce its fossil fuel energy imports by 45% and CO2 emissions by 70% for passenger cars even though the number of cars rise by 60% in 2050.
- The price of oil will rise...
- EV Vehicle Performance Calculator :  
[http://www.seai.ie/Grants/Electric\\_Vehicle\\_Grant\\_Scheme/](http://www.seai.ie/Grants/Electric_Vehicle_Grant_Scheme/)



Go raibh maith agaibh.

Ceisteanna?

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