International Perspectives on Electric Vehicles
examples and best practices

Bert Witkamp, AVERE
EVIA Unity in Sustainable Mobility, December 5th, 2016
Sandton, South Africa
Zero Emission Vehicle (ZEV) Mandate

- Currently, ten states (including California) are implementing the ZEV regulations, including the 15-percent sales target in 2025
  - California, Connecticut, Maine, Maryland, Massachusetts, New Jersey, New York, Oregon, Rhode Island and Vermont
  - Released multi-state ZEV action plan in May 2014
  - Province of Quebec joined in November 2016

Source: http://www.zevfacts.com/zev-mandate.html
ZEV Mandate Evolves Over Time And Depends on the Model Year of the Cars Sold

- **Model Year 2011-2017**
  - Credits based on complex formula (mostly range)
  - Affects Chrysler, Ford, General Motors, Honda, Nissan, Toyota

- **Model Year 2018**
  - Requirements increase 3x
  - Travel provision disappears
  - Credits per vehicle decrease
  - Affects Hyundai, Kia, Mazda*, Mercedes, Subaru*, VW, Jaguar / Land Rover*, Mitsubishi*, Volvo*

- **Model Year 2025**
  - 15.4% new vehicles sold must be ZEV
  - 33 million vehicles

<table>
<thead>
<tr>
<th>Model Year</th>
<th>ZEV Credit %</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018</td>
<td>4.5%</td>
</tr>
<tr>
<td>2019</td>
<td>7%</td>
</tr>
<tr>
<td>2020</td>
<td>9.5%</td>
</tr>
<tr>
<td>2021</td>
<td>12%</td>
</tr>
<tr>
<td>2022</td>
<td>14.5%</td>
</tr>
<tr>
<td>2023</td>
<td>17%</td>
</tr>
<tr>
<td>2024</td>
<td>19.5%</td>
</tr>
<tr>
<td>2025</td>
<td>22%</td>
</tr>
</tbody>
</table>

Source: https://www.arb.ca.gov/msprog/zevpreg/zevtutorial/zev_tutorial_webcast.pdf
## Electric Vehicle Charging Infrastructure & Market Support

### Current Utility Activities and Governmental Action

<table>
<thead>
<tr>
<th>State</th>
<th>Government action</th>
</tr>
</thead>
<tbody>
<tr>
<td>State of Washington</td>
<td>Bill allows utilities to rate base charging infrastructure with an additional 2% return on equity allowance</td>
</tr>
<tr>
<td>State of Oregon</td>
<td>Senate bill orders utilities to create TE programs, rate basing infrastructure and offering rebates</td>
</tr>
<tr>
<td>State of Utah</td>
<td>Bill allows utilities to spend up to $2M annually on EV infrastructure</td>
</tr>
<tr>
<td>Province of Ontario</td>
<td>$20M grant program for 500 stations (200 DC FC and 300L2) at 250 locations with 24 private host partners</td>
</tr>
</tbody>
</table>
Green GDP is now a key government goal

Main performance requirements to government officials:

- Green GDP
- Technology innovation
- Societal stability
The smog in Beijing
Policy for tackling traffic congestion and air pollution: car license plates granted by lottery or auction

- Beijing has about 5 millions vehicles on road
- Allow 200,000 new vehicles registered per year by lottery
- No restriction on license plates of electric cars!
Government policies for promoting EV

- No restriction for EV license plate registration
- Allow to drive every day
- Subsidy to development and purchase
- Encourage EV for government owned cars
- Push build charging stations
- New vehicle manufacturing permits now only granted to manufacturing new energy vehicles
## Charging Infrastructure in Ireland

<table>
<thead>
<tr>
<th>Type of Charger</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal power recharging points (public) 22kW</td>
<td>628</td>
</tr>
<tr>
<td>Normal power charge points (Public) Single phase 7kW</td>
<td>26</td>
</tr>
<tr>
<td>High power recharging stations (Public) 43 – 50 kW many with multiple plugs</td>
<td>71</td>
</tr>
<tr>
<td>Normal power recharging points 3.3kW (Public)</td>
<td>107</td>
</tr>
<tr>
<td>Normal power recharging points (Private) 3.3 kW</td>
<td>1900</td>
</tr>
</tbody>
</table>

- Interoperable with Northern Ireland
- Most towns with a population of 1500 or more have at least one charge point
- Financed by regulatory, private and EC project funding

ESB eCars POWERING A LOW CARBON FUTURE TODAY
CURRENT INCENTIVES

• €5000 grant towards the purchase of a new EV & PHEV
• Up to €5000 VRT relief on the purchase of a new EV
• Up to €2500 VRT relief on new PHEVs
• Lowest road tax band – EV €120 & PHEV €170
• Free home charge point for the first 2000 EVs
• Public charging has been free since 2010
• Accelerated capital allowance for companies who purchase an EV and/or charging equipment
• Irish Rail and some councils offering free parking
• Low Emission Vehicle Task force to be set up
RANGE OF PASSENGER EVS AND PHEVS FOR SALE IN IRELAND

2015
14 EVs and PHEVs

Nissan Leaf
Renault Zoe
Renault Twizy
Renault Fluence
BMW i3
BMW i8
BMW x5
Mitsubishi Outlander
Volvo V60
VW eGolf
Porsche Cayenne
Porsche Panamera
Audi A3 etron
VW Golf PHEV

Issues in Ireland

- Need for more short term incentives
- Many vehicles high end and expensive
- Few 100% EV options
- Lack of public awareness
- Small market and production is going else where
- Waiting for new technology
- No incentive for dealerships to sell EVs – harder sell

2016
20 EVs and PHEVs

Nissan Leaf
Renault Zoe
Renault Twizy
Renault Fluence
BMW i3
BMW i8
BMW 3 Series*
BMW 2 Series*
BMW X5
Mitsubishi Outlander
Volvo XC90*
Volvo V60
VW Golf PHEV
VW Passat Saloon*
Porsche Cayenne
Porsche Panamera
Audi A3 etron
Mercedes S Class*
VW eGolf
Audi Q7 PHEV*

*New to the market in 2016
THANK YOU

FIRST NATIONAL WIDE, FULLY INTEROPERABLE ELECTRIC MOBILITY SYSTEM IN OPERATION
MOBI.E
USER CENTRIC MOBILITY
CHOICE MANAGEMENT

NATION WIDE
COMPETITION
FULL INTEROPERABILITY
OPEN

FULL INTEROPERABILITY AND COMPETITION
MULTIPLE RETAILERS
MULTIPLE OPERATORS

NATIONAL WIDE
CROSS COUNTRY “ROAMING” SHORT TERM

OPEN SYSTEM
TECHNOLOGY COMPATIBILITY
OPEN INTEGRATION PROTOCOLS
MOBI.E MODEL
BUSINESS INTEROPERABILITY AT WORK
MAIN DRIVER OF ELECTRIC MOBILITY
LARGE SHARE OF RENEWABLE ENERGY

ELECTRICITY PRODUCTION 2014

- Imports: 2.8%
- Natural Gas: 1.8%
- Solar: 10.5%
- Biomass: 22.1%
- Wind: 23.7%
- Fossil-Fueled Cogeneration: 29.4%
- Coal: 5.4%
- Small hydroelectric: 3.0%
- Large hydroelectric: 1.2%

SOURCE: APREN

ELECTRICITY FROM RENEWABLE SOURCES
62.7% in 2014
Up from 39.1% in 2003
By 2020, electric car charging network aim is to cover all municipalities and cities, traffic junctions, core and comprehensive network routes for ports, railway stations, airports and primary roads.
Incentives and future prospects on alternative fuel in road traffic

• Incentives to buy BEV/PHEV are indirect and direct tax benefits (due to smaller consumption and emission).
• Fuel has high tax in Finland. Vehicle use is also taxed based on CO2 emissions. Less consumption and emissions will mean less cost for car users.
• In 2011-2015 there was subsidy for enterprises to buy EV vehicles or build charging positions. 432 enterprises made use of the subsidy.
• Government has set a target in Finland: Use of renewable fuel in road traffic is 40 percent in year 2030. In 2050 road traffic should use near 100%, electric, hydrogen or biofuel.
• Share of biofuel should be 20 percent in 2020.
Future prospects on alternative fuel in road traffic

- New cars using alternative fuel (CNG, EV, Hydrogen)
UK Government changes

Department for Transport
Office for Low Emission Vehicles
Department for Business, Energy & Industrial Strategy

Competitions, R&D, Incentives, Energy Issues, Comms, Infrastructure, H2 & Supply Chain

John Hayes - DfT
Nick Hurd - BEIS
# Amended car grant levels

<table>
<thead>
<tr>
<th>CO2 Emissions (NEDC)</th>
<th>Grant Categories</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;50g CO2/km</td>
<td></td>
<td>£4,500</td>
<td>£2,500</td>
<td>£2,500</td>
</tr>
<tr>
<td>10-69 miles (16-111 km)</td>
<td></td>
<td>£2,500</td>
<td>£60,000</td>
<td>£60,000</td>
</tr>
<tr>
<td>50-75g CO2/km</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>70 miles+ (112 km)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20 miles+ (&gt;32 km)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Price Cap**

- Category 1: £4,500
- Category 2: £2,500
- Category 3: £60,000

**Notes**

- <75g CO2
- 10-70+ miles range
- >60 mph top speed
- 35% off an eligible car
City scheme: the power of ‘soft’ measures

£40m Go Ultra Low Cities

Nottingham is a Go Ultra Low City
ULEVs can use 13.6 miles of bus lanes in low emission corridor through city centre
Up to 195 new public fast chargers
ULEV Business support package including ‘try before you buy’ option

Milton Keynes is a Go Ultra Low City
Opening 20k parking bays for free to all ULEVs
Use of all bus lanes – same priority at lights as buses
EV Experience Centre in city centre

London is a Go Ultra Low City
New chargepoint delivery partnership providing single port of call
8 ‘Neighbourhoods of the Future’ to normalise ULEVs
Car Club strategy to have 1m members by 2025

Bristol is a Go Ultra Low City
Opening 3 High Occupancy Vehicle lanes to ULEVs
4 rapid charging hubs in key locations with up to 30 Rapids
Proposals for a Clean Air Zone
Infrastructure: UK State of Play

+900 43/50 kW rapids
Largest rapid network in Europe
96% of MSAs have 1 – 6 rapids

£30m+ Chargepoint infrastructure

+ 10,000 publicly available chargepoints (3, 7 and 22kW)
+ 70,000 domestic chargepoints installed
6 major network operators, including UK SMEs
8 strong regional networks attracting increasing private investment
+750 chargepoints to be installed by GUL Cities

Highways England £15m:
Commitment to ensure that you will never be more than 20 miles from a charging point on 95% of the SRN
Research & Development

£100m+ Research and development

- OLEV and Innovate UK joint competitions. £100m to 2020.

- Competition launched September 2015 encouraging companies to propose innovative ideas to cut vehicle emissions.

- March 2016 £38.2m awarded for ULEV research to over 130 car manufacturers, technology companies and research centres across UK.

- More competitions to be announced.
E-mobility in The Netherlands

Sonja Munnix
Senior advisor
Netherlands Enterprise Agency

EAFO workshop Oslo 2009 2016
Dutch vision

Why do the Dutch invest in electric vehicles?

- Contributes to the economic position of The Netherlands
- Energy Security
  - Less dependent on oil
  - Electric vehicles are more efficient
  - Smart charging: energy storage, V2G and reduce grid investments
- CO$_2$ reduction
Fiscal measures 2016

• Vehicle purchase tax
  - € 0 until 1 gr CO₂/km
  - € 6/gr 1- 79 gr CO₂/km
  - € 69/gr 80 - 106 gr CO₂/km, up in levels until € 476/gr > 174 gr CO₂/km

• Vehicle circulation tax
  - Exemption for ZEVs
  - Half tariff for PHEVs until 50 gr CO₂/km
  - Normal tariff is € 400 to € 1,200 (depending on fuel, weight and address)

• Reduction of taxation for private use of company car
  - 4% BEV, 15% PHEV (until 51 gr CO₂/km)
  - Others 21/25% of catalogue value added to income before taxes

• Environmental investment rebate
• Various local and regional incentives
Some Dutch challenges until 2020

- Increase of public charging infrastructure
- Focus on BEV and less on PHEV (and results on registrations)
- More electric kms driven by PHEVs
- Development of consumer market
- Development of 2nd hand vehicle market
- Support Dutch companies to reach green growth through e-mobility
- ...
E-mobility sector

Vehicles and boats

Components

ICT

Smart mobility

Charging infrastructure & roaming
Project smart grids and EVs (2)

- Project ‘LomboXnet’
- In June 2015, the first V2G charging pole was officially opened in a neighbourhood in the city of Utrecht
- Showcasing the use of batteries of electric cars for energy storage
- Smart solar charging
Sustainable transport goals

- New registered cars zero emission in 2035
- All cars capable for zero-emission in 2050
- In 2050: 60% less CO₂ emission (1990)

- Sustainable Fuel Vision
- National Energy Agreement for Sustainable Growth
E-mobility ambitions

- 2020: 10% newly registered cars have e-drivetrain
- 2025: 50% newly registered cars have e-drivetrain  
  - of which 30% is BEV
- Nationwide network of charging points
- 2020: 10,000 FTE in EV sector

➢ Written down in Green Deal Electric Driving 2016 - 2020
Green growth through e-mobility

In 2014, electric driving added an estimated 3,200 jobs (FTE), €820 million in production, and €260 million in added value to the Dutch economy.

Source: CBS Statistics Netherlands/DOET/Netherlands Enterprise Agency
The Norwegian EV Policy & Market

Erik Lorentzen, Senior Adviser
Norwegian EV Association
erik@elbil.no
www.elbil.no
Market share passenger cars 2016

Gasoline 29%

Diesel 31%

Hybrid 11%

Plug-in hybrid 14%

Battery electric 15%

Source: OFV, 31. October 2016
Top selling BEV models Jan-Nov 2016

- VW e-Golf
- Nissan LEAF
- BMW i3
- Tesla Model S
- Renault ZOE
- Mercedes-Benz B-Klasse
- Kia Soul
- VW e-Up
- VW e-Up
- Tesla Model X
- Nissan Evalia
Norwegian EV policy

• No purchase taxes
  (extremely high for ordinary cars)
• Exemption from 25% VAT on purchase and leasing
• Low annual road tax
• No charges on toll roads or ferries
• Free municipal parking
• Access to bus lanes
• 50% reduced company car tax
Electric cars spread all over Norway

NORWEGIAN EV MARKET SHARE 2015 (22 %)

- Troms: 11%
- Finnmark: 6%
- Svalbard
- Nordland: 18%
- Nord-Trøndelag: 16%
- Sør-Trøndelag: 27%
- Oppland: 14%
- Hedmark: 13%
- Akershus: 24%
- Buskerud: 19%
- Oslo: 29%
- Østfold: 15%
- Vestfold: 22%
- Aust-Agder: 22%
- Vest-Agder: 23%

Norwegian EV Association
Charging infrastructure

• Public tenders for national fast charging network by Enova

• Double multistandard fast charging stations every 50 km on all main roads in Norway (7 500 km)

• Finished by end of 2017
Most electric car owners charge at home and starts with full battery every morning

Norwegian EV owner survey 2016: Where do you charge on a daily or weekly basis?
Charging station database - NOBIL

• Publicly owned database for charging stations
• Idea is to collect all information about charging infrastructure in a central database
• Free use of data (maps, apps, navigation systems)
• Clean Power for Transport → EU level
Worlds largest fast charging station
Oslo bus lane
Norwegian EV policy and market

• Statistics and policy: www.eafo.eu
• Norwegian EV Association: www.elbil.no
• Nordic EV Summit 2017: February 7th and 8th, 2017
The Capital Region of Denmark

- 29 municipalities
- 31% of all inhabitants in Denmark (1.72 million)
- 27% of all light duty vehicles (LDV) in Denmark (~ 800,000)
- 70% of all commuters live in detached houses

- 90,000 households have two cars

With an EV range of 100 km:
- 85% of all commuters can use EVs
- 95% with workplace charging
2016 ACTIVITIES
Joseph Beretta
150 members at the heart of the industrial sector of electric mobility

- Automotive OEM
- Automotive suppliers
- Energy suppliers
- Charges systems suppliers
- Universities and research centers
- Organizations and service providers of electro mobility
- Publics institutions
- Users of electric vehicles
- Mobility operators,......
Regional associations members of « réseau Avere-France »
Municipalities’ engagement for the deployment of public charging infrastructures 50M€ is allocated by government

EV car sharing or renting:
- Autolib Paris, Bordeaux, Lyon
- Auto bleu Nice,

Bonus & super bonus to buy EV (M1 & N1)
- 2012 5000€
- 2013 7000€
- 2014 6300€
- 2015 6300 + 3700 = 10000€
- 2016 6300 + 3700 = 10000€
- 2017 6000 + 4000 = 10000€ *

2017 bonus 1000€ for electric scooters *

*: to be confirm on 15/12/2016
Private actors plan to develop 20,000 to 30,000 by 2018

- Bolloré 16,000 7kW charge points 2016-2019
- CNR 52 quick charge points 2015-2017
- EDF (SODETREL) 200 quick charges on motorway 2015 à 2017.
The French and electric mobility

A survey by Ipsos for l’Avere-France an Mobivia Groupe

September 2016
40% of French drivers are ready to buy an Electric car.
For French people EV is:

94% Innovative
91% Environment friendly
88% Affordable
80% economical to use
72% safe
To Buy EV I want:
72% same price than gasoline car
72% a range of 300km
62% a charge station around my home
THE ELECTRIFICATION INITIATIVE OF THE VOLKSWAGEN GROUP

- Goal: to position Volkswagen as a driving force behind the expansion of electro-mobility; e-car to become a new hallmark of the Group
- >30 new pure-electric vehicles by 2025
- Annual unit sales of 2 to 3 million e-cars by 2025, equivalent to 20–25 percent of total sales
BATTERY TECHNOLOGY TO BECOME NEW COMPETENCY AT VOLKSWAGEN

- Review of strategic options initiated
- Anticipated own e-fleet requirements in 2025: around 150 gigawatt hours of battery capacity per year
EV’s: Utilities biggest business opportunity

Full scale transition to electric drive in Europe and USA:
- Smart charging is needed (charge at right moment)
- Better asset utilisation = lower cost
- V2G technologies and business models will give additional benefits

Electrification of transport is a perfect fit with REN:
- REN produces mostly electricity
- REN produces intermittently and need storage & backup

- “Electrification Is Our Biggest Opportunity”
- “Electric Utilities Need Transportation Electrification”

*Edison Electric Institute on Transportation Electrification*

- 160 million vehicles can be powered solely from existing off-peak generating capacity

*Pacific Northwest National Laboratory*
COP21: systems transformation

Which way: dead end road or the right way?

• « Moonshot » policies needed ?!
• Next 5 years policies need to be adapted to reach COP21 targets: these may be drastically more ambitious than today’s!

COP21 is largest business opportunity the world has seen since...

Paul Polman (Unilever) at Climate Action Summit, May 2016:
“(companies) not acting will soon become dinosaurs”
“financial markets have to get involved (and divest from fossil fuels)”
“this is the moment to do it, we need jobs and interests are low”
Thank You

bert.witkamp@avere.org