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The 27th INTERNATIONAL ELECTRIC VEHICLE SYMPOSIUM & EXHIBITION
BARCELONA
17th-20th November 2013

Norway's electric vehicle deployment success. A historical review including plans for fast charging stations covering all of the country - by 2015.

Harald N Røstvik
Professor, Architect MNAL.

Bergen School of Architecture, Norway
and
Sivilarkitekt Harald N. Røstvik AS,
Kirkegt 3, 4006 Stavanger, Norway.
hnr@telnett.no

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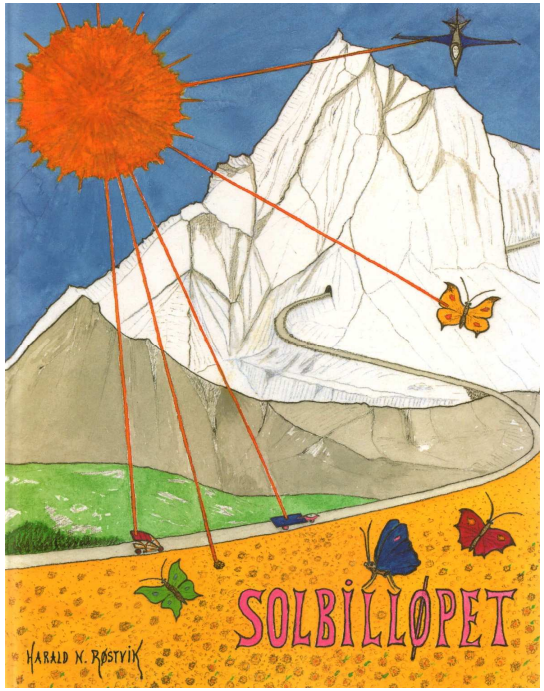
INTRODUCTION

- The history of electric vehicle dissemination in Norway is a successful one due to clear and predictable incentives.
- It's 5 million inhabitants are already one of the biggest electric vehicle user nations in the world.
- The number of vehicles recently passed 15.000.
- Mutual benefits can develop between the transportation and the building sector as cheap renewable fuels like solar energy being on the verge of becoming globally competitive.
- This paper offers a historical review, studies the obstacles that have been overcome and points at a way forward.
- There are lessons learnt. The question is: What's next?

THE STORY

- The Norwegian Electric Vehicle story got momentum in the middle of the 1980ies when Tour de Sol – the solar electric races invented by solar engineer Josef Jenny and developed and led by Urs Muntwyler - was arranged annually from 1985 to 1993.
- I used to travel there to see solar vehicles cross the snow capped Swiss Alps in February every year. It was beautiful and so inspiring.



THE STORY

- In Norway I motivated a few friends to come along to Switzerland for the 1989 race.
- Until then the Norwegian press had not been interested.
- Since my friends were famous all of the major Norwegian press suddenly wanted to travel to Tour de Sol, Bern Switzerland……
- They gave us wide coverage.
- And we gave the Norwegian oil Government a hell of a beating for lack of sustainability incentives in their policies. We imported a car.

From left : Morten Harket a-ha lead singer, the Author and Frederic Hauge, Bellona. In the electric vehicle Magne Furuholmen also a-ha. Photo: The Sunshine Revolution.

THE STORY

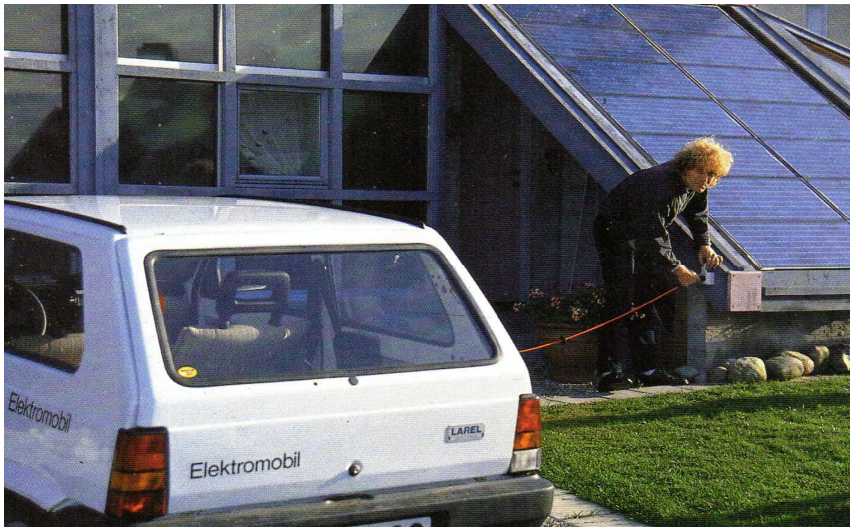
Frederic Hauge «tanker» sin el-drevne Fiat fra solhuset Channelles solcellepanel. Jan Arne Vold fra TVP står for videoopptake mens Harald Røstvik bivånre det hele.

Full «tank» fra stikkontakten

AV STEIN HALVOR JUPSKÅS og EGIL ERIKSSON (foto)

Videoinnspilling i Stavanger i går. I hovedrollen: Norges eneste elektromobil. For en gangs skyld bladet sist lørdag viste at el-bilen også er et suverent fremkomstmiddel i miljømessig sammenheng. Andre miljøalternativer på drivstoffsiden, som propan, metanol og gass kommer mye dårligere til småkjøring i nærheten av hjemmet. Ny teknologi, blant annet på batteri-siden, gjør at denne kjørelengden nå minst kan tredobles.

Arkitekt Røstvik har fått i oppå Motorveien, tankende o skudds-elkraft fra husets solc paneler. Bilen eies av Bellona Røstvik og av to ikke helt ukj østlendinger ved navn Magne ruholmen og Morten Harket.



I had films made where we coupled the transportation and the building sector using solar electric buildings I did design as a tool to charge electric cars.

Source: Award winningfilm “The Sunshine Revolution (1992).

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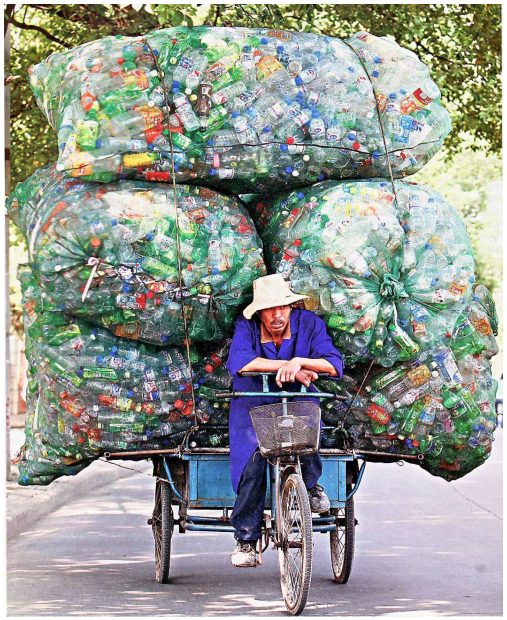
THE STORY

In the real world - there are few luxury cars,
so our design response must be relevant.
I wanted to respond to this challenge.



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THE STORY

The Butterfly solar taxi tested out in Sri Lanka.

Stoltenbergs elbiltaxi

mandag 09. september 2013 15:17 | Hans Håvard Kvisle

Statsminister Jens Stoltenberg har fått ros og ris for sitt taxistunt i valgkampen. Hva som er glemt, Stoltenberg startet sin sjåførkarriere i en el-taxi.

Stoltenbergs taxi-video har vært kritisert fordi den var fabrikkert av et Ap-vennlig reklamebyrå, og noen av passasjerene ble betalt for å sitte på. Likevel, det har vært en kjempesuksess som har gått verden rundt.

Hva få vet, statsministeren har en skikkelig hang-up på å kjøre andre i taxi. Han er en skikkelig Drosje-Jens. Går vi cirka femten år tilbake i tid, valgte han en særdeles miljøvennlig drosjevariant. En sol- og vindrevet "tuk-tuk", påtenkt til bruk i solrike u-land.

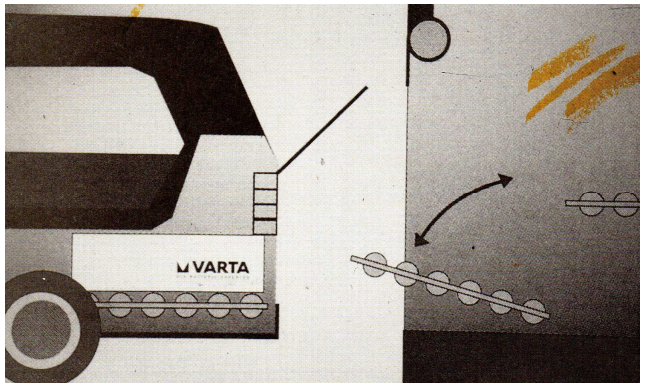
Uten å nøle tok Stoltenberg med konstruktørene Harald N. Røstvik (sivilarkitekt, professor og solenergiekspert) og Peter Opsvik (industridesigner) på tur. Han var også litt drosjefreidig i trafikken. Fotgjengerfeltet ved regjeringskvartalet ble passert på langs.

Prime Minister Stoltenberg's Taxi-stunt 15 years ago

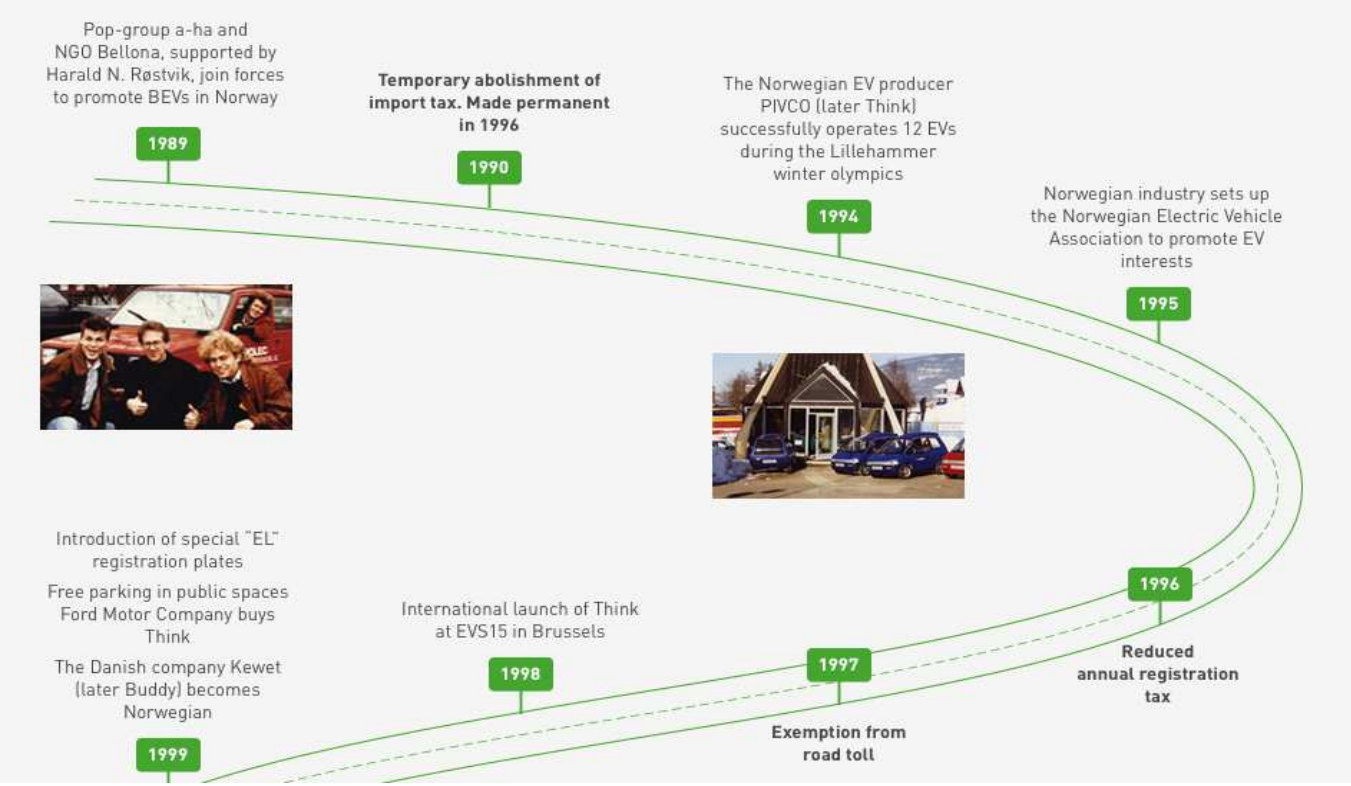
THE STORY

- This resulted in a range of EU projects in Stavanger:
- ELCIDIS, SAGITAIRRE and several IEA projects related to urbanism, transportation and built form.

- In an electric bus project Neoplan/Varta exchangeable batteries were tested out in Stavanger and elsewhere and working very well as early as in 1994 (the same year as the Lillehammer Olympics).



THE STORY



www.evnorway.no

THE STORY

INCENTIVES

- 1990: Temporary abolishment of import tax.
- 1994: The first electric bus in regular traffic in Scandinavia is put into regular operation by SOT in Stavanger.
- 1996: Reduced annual registration tax.
- 1996: Permanent abolishment of import tax.
- 1997: Exemption from road toll.
- 1998: ELCIDIS project (EU) establishes numerous free charging and parking spots in Stavanger & elsewhere.
- 2000: Reduced company car tax.
- 2001: Zero VAT.
- 2003: Access to bus lanes in the Oslo region.
- 2005: Access to bus lanes extended nationwide
- 2009: Free access to road ferries.
- 2011: Buddy goes bankrupt but is resurrected.
- 2011: Think goes bankrupt again and stay down.

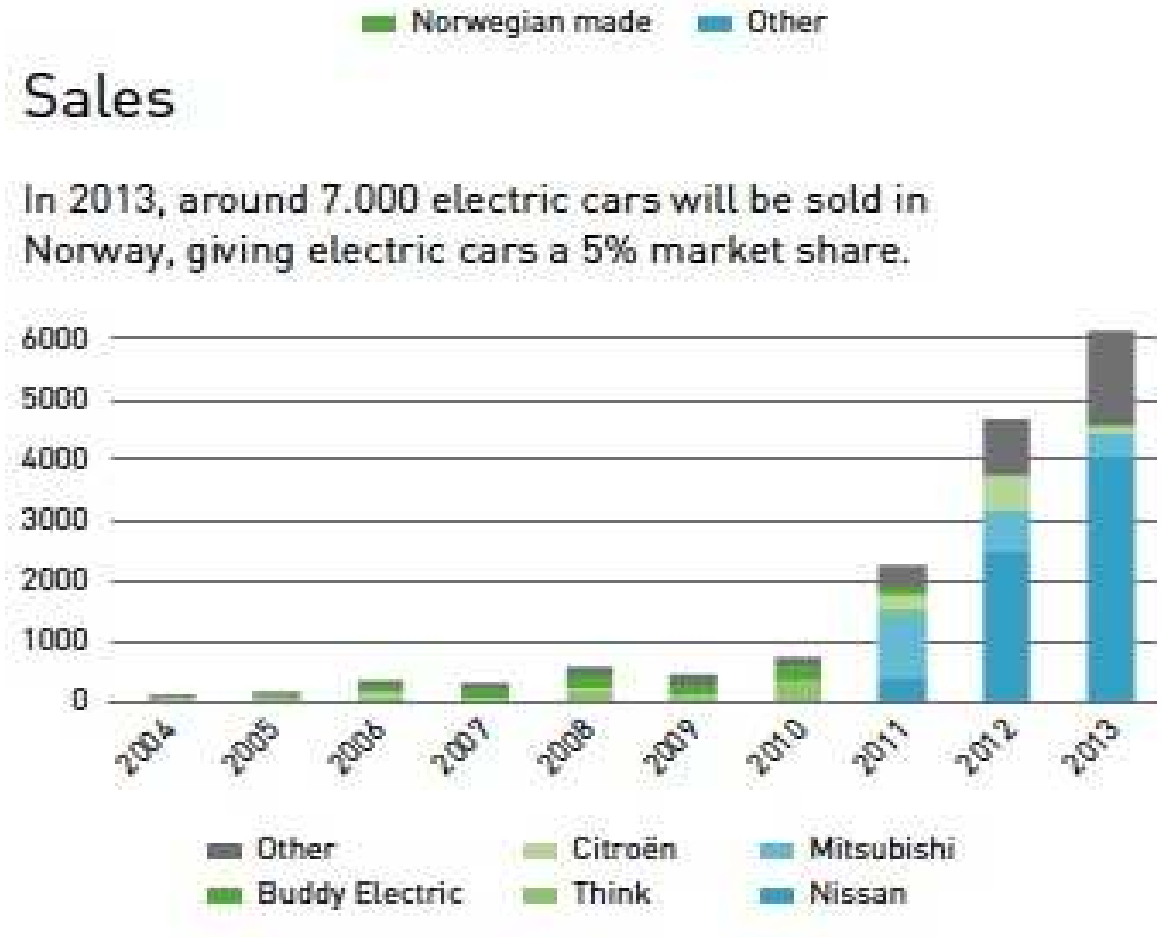
OBSTACLE ONE:
BIASED GOVERNMENT VEHICLE DEVELOPMENT BACKING

- Think had a great potential in the eyes of the Norwegian authorities and received generous backing, but was too early into the EV market, its now seems.
- Think's main advantage was the body – hundreds of components were imported.
- Think became too expensive and had no national service system. People got tired of promises. This damaged the trust in EVs. It went bankrupt almost four times.
- Buddy – on the other hand - still lives.
- **TODAY THE VEHICLE AVAILABILITY OBSTACLE IS REMOVED AS A RESULT OF IMPORTED ELECTRIC CARS.**

Think – drowned in money and sank four times.

Buddy – quietly survives.

The solar Butterfly aiming at the third world city market, Received practically no backing.



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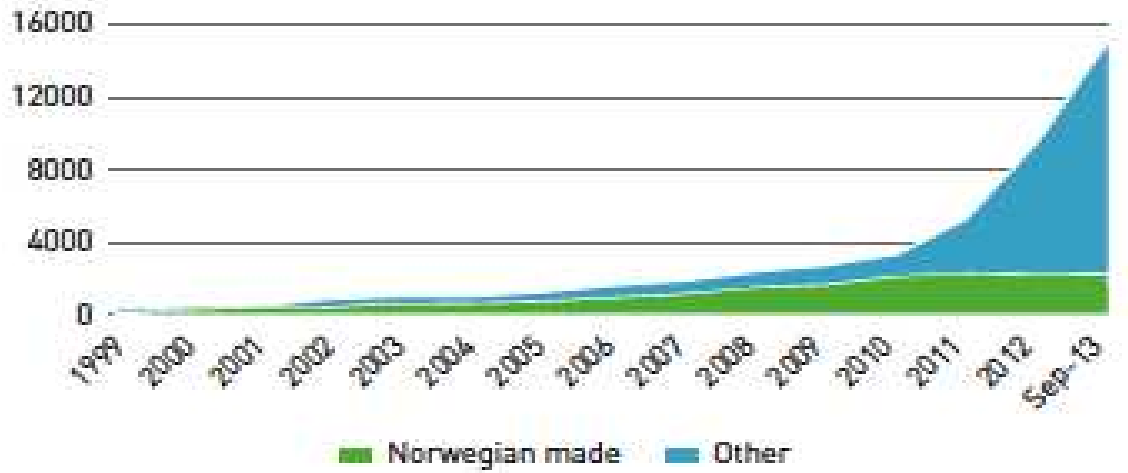
Volume

By the end of September 2013, over 15.000 electric cars are registered in Norway. In 2012, Norway was the World's 5th largest volume market for EVs. In terms of market share, Norway was in a global league of its own. Over 3% of all cars sold in 2012 were electric.



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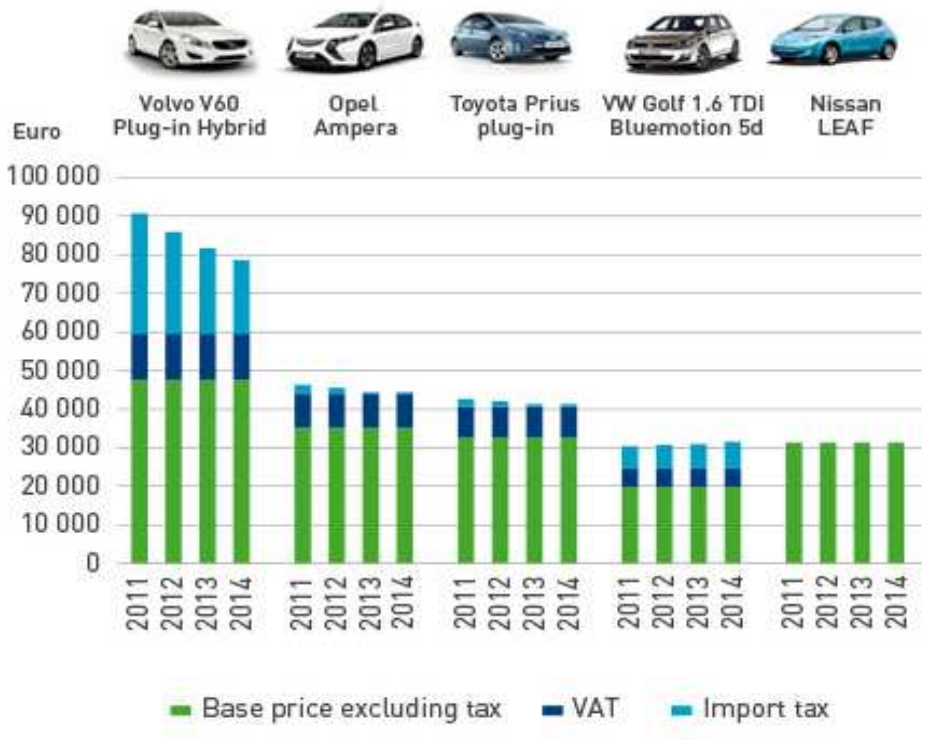
Purchase price development for selected cars in Norway, 2011-2014

BEVs are completely tax exempt. Same base priced used for all years to show effect of taxation changes



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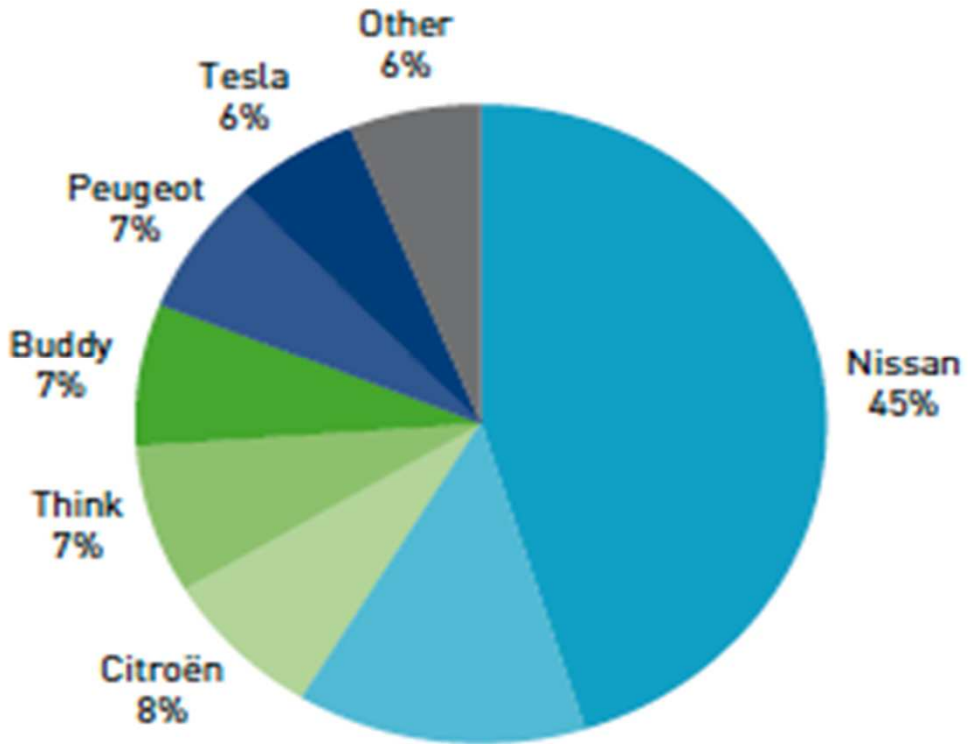
Other
6%
Tesla
6%
Peugeot
7%
Buddy
7%
Think
7%
Citroën
8%
Nissan
45%

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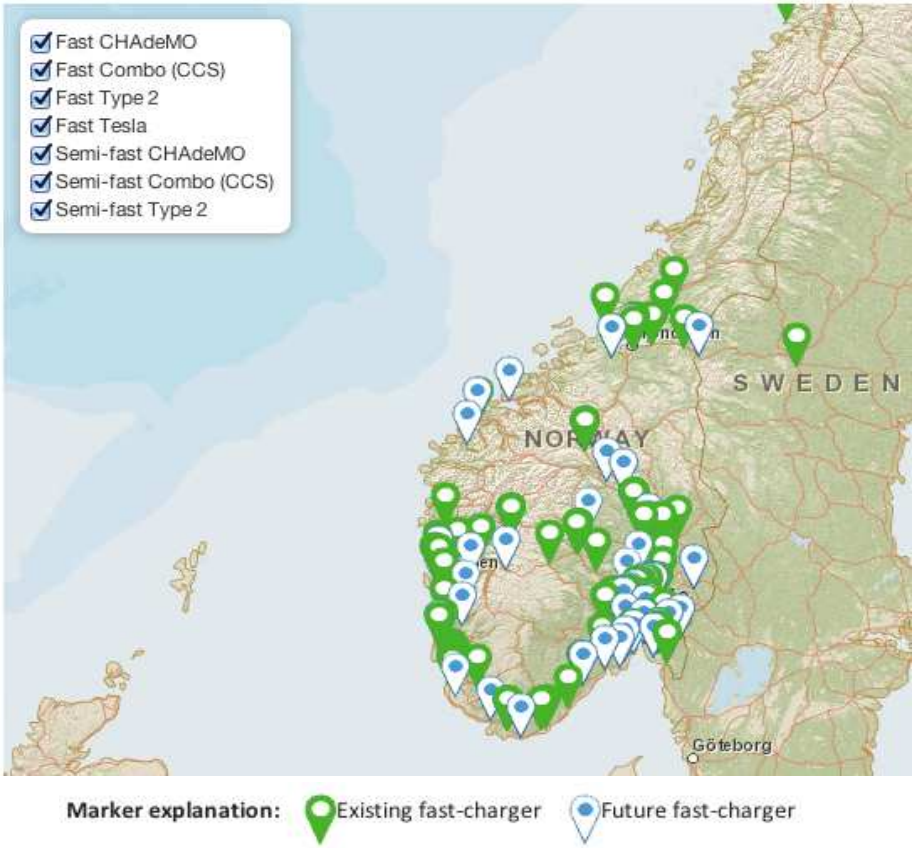
OBSTACLE TWO:
CHARGING STATIONS

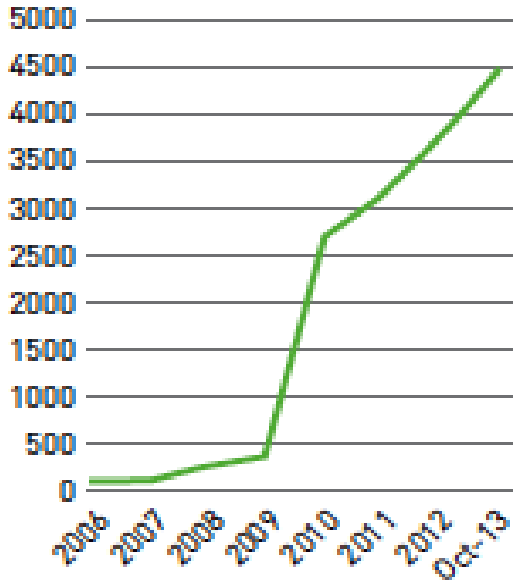
- We see an explosion in ordinary and in fast charging stations in Norway now.
- TRANSNOVA is supporting and coordinating the prolification of charging stations at a high speed so that soon one can drive electric almost anywhere in Norway South of Trondheim.

- **TODAY THE CHARGING OBSTACLE IS ABOUT TO BE REMOVED.**

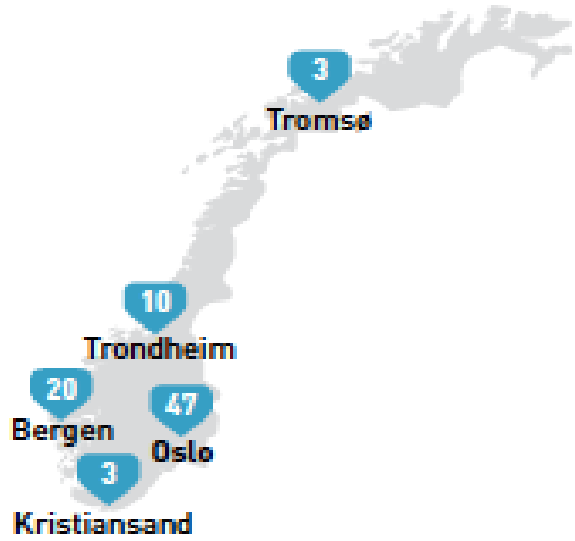
Overview of existing and future fast-charging stations



Total charging points



CHAdeMO fast charging points



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OBSTACLE THREE:
THE FUEL

- Norway's huge hydro power production is 130 to 140 TWh/yr = 98% of electricity in Norway.
- Running all private cars in Norway electric would demand only 5 TWh/yr (Lavutslippsutvalget.)
- Germany's solar pv electricity production was 18 TWh in 2011 and growing fast.
- On April 18 2013 solar PV and windpower delivered over 50% of all the electricity used in Germany on a weekday and midday.
- The cost of solar PV fell by 90% from 2006 to 2013. The sales of solar PV grew 70% from 2007 to 2013, in spite of the financial crisis.

LCA – PRODUCTION AND DRIVING

Livssyklus CO2-utslipp

Bilmodell*	Tesla S	Nissan Leaf	Land Rover Discovery TDV6	BMW 520i	VW Passat 1,6 TDI	VW Golf 1,4 TSI
Nordisk strøm-mix						
CO2 produksjon g/km	156	72	81	52	45	38
CO2 kjøring g/km	25	21	282	190	138	132
Sum CO2 g/km	181	93	363	242	182	170
EU strøm-mix						
CO2 produksjon - bil g/km	156	72	81	52	45	38
CO2 pr. km kjøring W2W	129	110	282	190	138	132
Sum CO2 g/km	285	182	363	242	182	170
Estisk strøm-mix						
CO2 produksjon - bil g/km	156	72	81	52	45	38
CO2 pr. km kjøring W2W	207	176	282	190	138	132
Sum CO2 g/km	363	248	363	242	182	170

*Basert på 150.000 km kjørelengde, Kilde: http://www.fueleconomy.gov/feg/evsbs.shtml

Kilde: Finansavisen og US Department of Energy

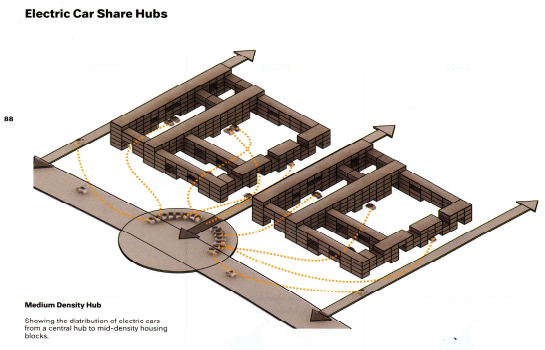
Many studies of CO2 from fossil fuelled cars versus electric are ignoring the development towards cleaner energy. They only evaluate today's situation

THE DIRTY ELECTRICITY OBSTACLE IS CRUMBLING. WITHIN FIVE YEARS SOLAR ENERGY COMPETES WITH TRADITIONAL SOURCES IN GERMANY, UK, FRANCE, ITALY AND SPAIN.

OBSTACLE FOUR:
MERGING VEHICLES AND BUILDINGS

- This resulted in a range of EU projects in Stavanger:
- ELCIDIS, SAGITAIRRE and several IEA projects related to urbanism, transportation and built form.

- In an electric bus project Neoplan/Varta exchangeable batteries were tested out in Stavanger and elsewhere and working very well as early as in 1994 (the same year as the Lillehammer Olympics).



WHOLISTIC URBAN DESIGN WILL REMOVE THIS OBSTACLE. BUILDINGS AND CARS CONNECT.

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Nissan Leaf og Tesla Model S sørger for tidenes elbil-salg

Nissan Leaf, Tesla Model S and others behind the record-breaking electric vehicle sales of all times. Over 20 years of electric vehicle incentives in Norway have in 2013 resulted in electric cars having become the bestsellers:

- November — Approximately 17 000 electric vehicles in Norway.
- August — 6% of all cars sold were electric.
- September — Tesla S the most sold car of all models.
- October — Nissan Leaf the most sold car of all models. 716 cars and 5,6 %.

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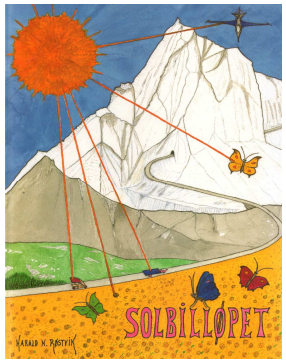
SUMMARY 1
OVERNIGHT SUCCESS?

- "Overnight" success normally takes at least 15 years.
- Here we are – 25 years after the first import.
- An electric car type sell more than any other car type.



1985
Tour de Sol

1989
First import

2013 - October
Nissan Leaf most sold car type in Norway

SUMMARY 2
HOW DID IT COME TO THIS?

- Environmental consciousness.
- The *IN* box was filling up.
- Individuals teaming up with electric vehicle and other organisations plus industry manufacturing vehicles.
- Strategic understanding.
- Politicians that listened and understood.

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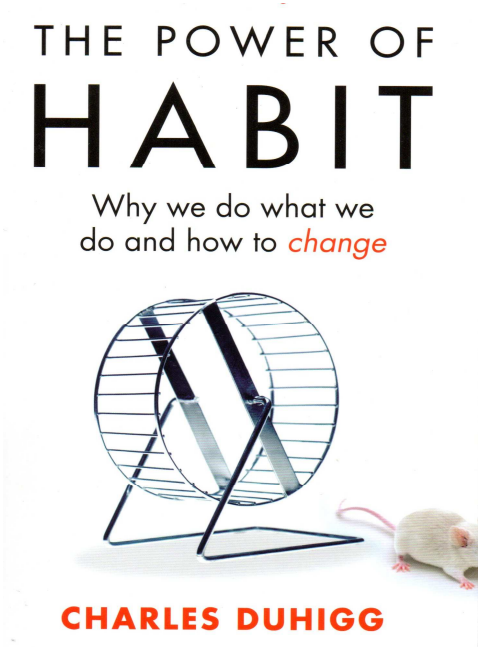
SUMMARY 3
A REPLICABLE MODEL?



- As regards incentives to change habits:

  YES! (And Norway can afford them!)
- As regards creating national industry:

  NO!
- Focusing so much on one manufacturer, putting all the "eggs" into one basket only, turning it into a hero even before it could sell anything with profit, was a disaster. Don't learn from it!
- Instead - learn from the Swiss example. They distributed the eggs into many baskets and the result is a fine supplier industry.

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THAT'S IT - THANKS !

SOURCES:

- Røstvik: The Sunshine Revolution (1992) SunLab
- www.evnorway.no
- www.transnova.no
- www.elbil.no

IN ADDITION TO PEOPLE ALREADY MENTIONED, THANKS ALSO TO:

- **Rune Haaland** (one of the two Bellona-founders).
- **Thor Erik Museus** (my EVS 24 Vice Chairman).
- **Peter Opsvik** (for designing The Butterfly with me).
- **Arne Fjørtoft** (Venstre-politician that also came to Bern in 1989).
- **The EVS organisation** (which still keeps growing in its 44th years).
- **The Norwegian Press** (for being so easily tricked in 1989).
- **Photo credits**: The Sunshine Revolution.

LET's KEEP ON LOOKING – FOR SOLUTIONS !

Harald N Røstvik
Professor, Architect MNAL.

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