ELEKTRISCHE VOERTUIGEN 20 - 01 - 2011

INTERNAL VERSION

Electric vehicles – International initiatives and best practices

VBO-FEB Colloquium –
Voertuigen van de Toekomst

Yves Bonnefont

Brussels EXPO, Brussels

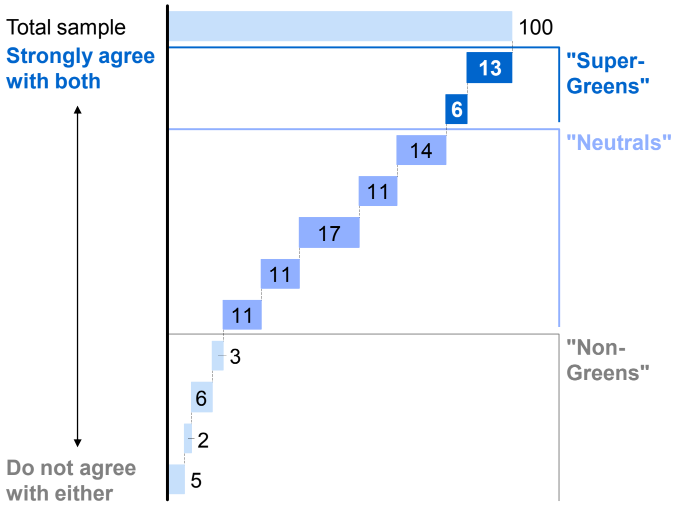
20 January 2011

Today's discussion on international initiatives and best practices

- **Back to end-users expectations and behaviours**
- **What is being done around the world – selected examples from national and city programs**
- **"Lessons learnt" and best practices**

A significant demand already exists for low emissions vehicles US example

% of respondents



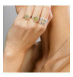
Level of agree-ment with the statements

- "Climate change is an urgent problem that needs to be addressed right now"
- "I'm very concerned about climate change"

SOURCE: McKinsey EVMC team

Potential early adopters have multiple rationale New York and Shanghai examples

(x%) Early adopters as share of new car buyers

City and type of early adopter		Attitudinal values	
New York	 **Green Auto Aficionados** *"[In addition to fuel savings,] it is powerful to say you're part of something good"*	▪ Status and brands are important ▪ Willing to pay for green products	20%
	 **Simple Greens** *"I love the greenness. The only problem would be the cost. It sounds amazing"*	▪ Fascination for green products ▪ Open to new technologies/products	
	 **Progressive Pragmatists** *"I love it because I don't have to stop at the gas station ... you can [charge] while you're sleeping"*	▪ Affinity to green products ▪ Functional and pragmatic driven ▪ Convenience seeking	
Shanghai	 **The Trendy** *"I hope my electric car catches the eyes of others"*	▪ Status and brands are important ▪ Willing to pay for green products to distinguish positively	30%
	 **Running-cost Sensitive** *"I would be willing to pay a premium for cars with lower driving cost"*	▪ Affinity to green products ▪ Very cost sensitive	

SOURCE: McKinsey EVMC team

Adoption can be strongly influenced by multiple public policy levers

Most preferred public policy levers to strengthen EV adoption (consumer perspective)

NOT EXHAUSTIVE

€ Monetary levers
♥ Non-Monetary levers

New York – % incremental effect on EV adoption

♥	EV preferred lanes	2.3
€	3.000 $ tax credit	2.2
♥	10 charging spots within 1-2 blocks of home	1.4
♥	One month trial lease period	1.3
♥	"Green" electricity service	1.2
♥	City will plant tree for first 5,000 EV adopters	0.8
♥	Charging spots at central locations	0.7
♥	10 charging spots by nearest park/school	0.7
€	Free unlimited Metro-card for 1 year	0.6
€	Free rental car for 10 days over 2 years	0.6
♥	Free half-day EV school	0.5
€	Free charger installation at home garage	0.5
€	Free AAA/towing service anywhere in city	0.5
♥	"Time of use" charging with off-peak rates	0.5
♥	City declares goal of x% for EV in government fleet	0.5

Shanghai – % consumers in favor

€	Purchase price subsidy	57
♥	EV-only travel speed-way lanes	57
♥	Designated parking spots at charging stations	53
€	Free Shanghai license	51
€	Purchase or consumption tax reduction	45
♥	No lanes or travel region limitation	45
♥	EV only commercial garages or parking slots	43
♥	Free public parking	38
♥	Dedicated street parking	31
€	Free tolls	27
♥	EV only garages/parking spots inside community	23
€	Insurance fee reduction	22
€	Maintenance free extension	20
€	Free charging facility installation	16
€	Electricity cost reduction	16

SOURCE: McKinsey EVMC team

Especially France and China have set very ambitious targets for EV-sales

(X%) xEV share of total fleet size 2020[3], in %

	France	China	Germany	USA	Rest of world	
xEV share	6,1%	5,5%	2,3%	2,2%	1,5%	
Electric vehicles (fleet size 2020) Million units	2	12[1]	1	3[1]	6[2]	Σ 24
National support programs in Mio. EUR	2.150	3.400	615	22.250	N/a	
	▪ 50.000 EVs ▪ Charging infrastructure ▪ Leasing models	▪ 10 pilot regions ▪ 10.000 EVs ▪ EV R&D	▪ Earmarked aids for application oriented research	▪ Investment program ▪ EV-Infra-structure	▪ Israel: reduction of Tax ▪ Charging infrastructure	
Monetary Customer subsidies EUR, per vehicle	5.000	6.850-13.700[4]	70-100	5.650-9.400	17.200 (Denmark)	
Non-monetary subsidies Examples	▪ Designated parking spots at charging stations	▪ Free Shanghai license	▪ N/a	▪ Access to EV preferred lanes ▪ Parking and charging	▪ Norway: EVs can use bus and taxi lanes	

1 Target 2015 extrapolated according to forecast OWL Energieimpuls 2 Targets of smaller countries plus 1% of fleet size 3 IHS Global Insight forecast
4 widely differs by region and city

SOURCE: IEA McKinsey

France released a major plan with 14 key measures to boost the development of xEV

Boost xEV user demand	Develop charging infrastructure	Support the development of key players
▪ Secured **5,000 € bonus on car purchase** (<60 g CO2) ▪ **No transport tax** on electricity for xEVs, equivalent to an other 4,000€ over car life cycle ▪ **Administration and semi-public sector** to order **100,000 EV before 2015** ▪ City of Paris to launch **car sharing program** - Autolib	▪ **No economic incentives** – All parking constructed after 2012 to be equipped with slow charge capable plugs – By 2015, company car parks to provide access to charging equipments – In collective housing, installation of charging plug can not be opposed ▪ **Electricity pricing to include premium** to finance network investment	▪ **Subsidies and preferred loans to support investment in batteries and xEV design and manufacturing**

SOURCE: Literature/ Press search, McKinsey analysis

25 pilot cities receive support as part of the Chinese government plan for 500,000 xEVs on the road by 2015 …

NOT EXHAUSTIVE

xEV Pilot Cities – Examples of master plan support

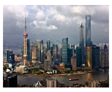
Changchun

- RMB 40,000 private **xEV purchase subsidy**
- Exploring two financing models – **car and battery leasing**
- Focus on **private cars and taxi markets**
- Plan to build **charging infrastructure by 2012** (15 stations and 5,000 AC poles)

Hefei

- RMB 20,000 private **xEV purchase subsidy**, but more **focus on car leasing model**
- Launched **battery leasing model for public transportation**
- Built **5 large charging stations in 2010**

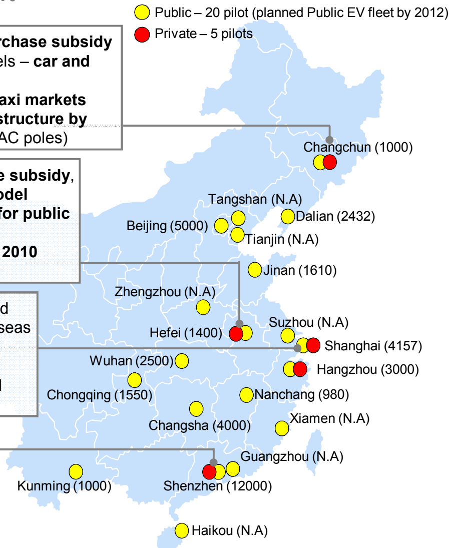
Shanghai



- **Establish energy innovation center** and attract key component players from overseas
- Private **xEV purchase subsidies** (RMB 20,000 for PHEV, RMB 50,000 for BEV)
- Built **400 poles in residential areas and roadside, 10 large stations in 2010**

Shenzhen

- Private **xEV purchase subsidy** (RMB 30,000 for PHEV, RMB 60,000 for BEV)
- **Subsidies for electricity usage cost**
- **BYD E6 pure battery EVs** launched as part **of taxi fleet** (May 2010)
- **250 charging stations to be built by 2012**



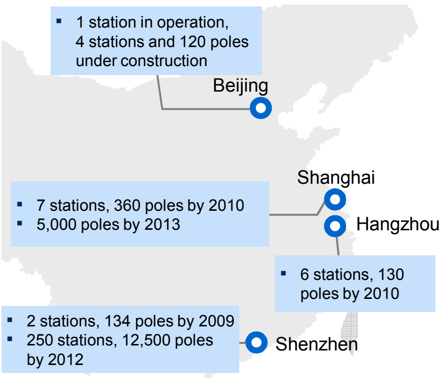
1 City bus, taxi, official car, environmental sanitation, post and other public service vehicles (HEV, BEV, Fuel cell vehicles with min. 5% fuel saving for PV & light CV and min. 10% fuel saving for buses)

SOURCE: Press search, local industry journal, e.g. AUTOMOBILE & PARTS, annual reports

… that also plans for building a nationwide charging network by 2020

NOT EXHAUSTIVE

Grid and city governments join force to build charging network in major cities …



State Grid's plan for EV charging Network

Facility type	Num. of facilities by 2010	Num. of facilities by 2015	Num. of facilities by 2020
Charging station	75	~4,000	~10,000[1]
Charging poles	6,209	~3 mln	~5 mln

Issues and challenges:

- Charging industry standard is still under discussion, causing multiple tech specs of charging facilities
- Need more coordination from government to avoid over-investment
- Chinese consumers need more piles in residential area and on the road side to charge their EV at night

1 For reference: by 2008, China has roughly 90,000 petrol stations

The newly formed Electric Vehicle Industry Alliance will become a new driving force for standards

SASAC formed an China EV industry alliance

- China's State-owned Assets Supervision and Administration Commission of the State Council (SASAC) has formed an alliance of 16 Chinese government-owned businesses
- Alliance is aiming at unifying EV standards and speeding up research and development
- The non-profit group has a startup budget of about $186m, ramping up to spend $14.7b on EV development over the next ten years

Alliance consists 16 state-owned enterprise

- **Alliance are consisted of 16 state-owned enterprise and subdivided into 3 committees**
  - Electrical vehicles
  - Battery
  - Charge infrastructure and service

Germany – National development program has set a target of 1 million electric vehicles by 2020, with the current focus on the support of development of the xEV industry

ILLUSTRATIVE

The main goal of the e-Mobility plan is to encourage research and development, market preparation and launch of xEVs (supply-side) …

- **EUR 500 mln fund (2009-11) as part of national program** supporting applied e-mobility research, on industry and R&D
- The plan is designed as a **long-term approach for the next 10 years** (covering BEVs, PHEVs, REEVs, excluding HEVs, fuel cell/ oxygen cars)
- **Multiple innovation alliances receiving additional federal funding, > EUR 250 mln** on focused topics, e.g. batteries, vehicle components, infrastructure, etc.
- "Electric Mobility in Pilot Regions" – **130 million EUR to 8 region pilot projects**, e.g. Berlin with 100 Mercedez-Benz/ SMART BEVs and 500 charging stations

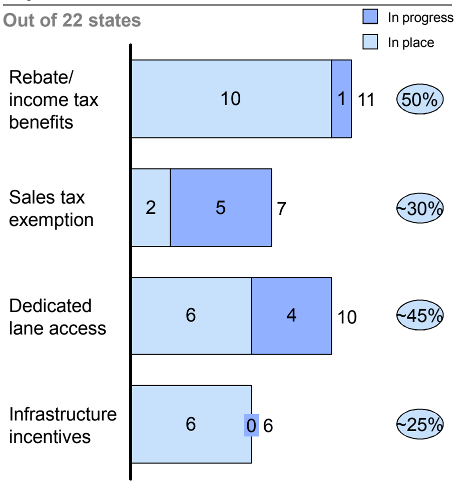
… Rather than boosting xEV demand in Germany given (sofar) only limited xEV user subsidies

- **Sofar only limited tax exemptions granted to xEV users**
  – **Annual circulation tax exemption** for xEV for 5-year period, subsequently 50% tax level compared to conventional ICEs
  – **New registration tax exemption** for vehicles emitting less than 120g CO2/km (110g from 2012 and 95g from 2014)
  – Total xEV tax exemptions in range of ~50-100EUR per year
- **To support bringing electric cars to market, Federal government reviewing a program to create incentives for sale of 100,000 electric cars**

SOURCE: Literature/ Press search, McKinsey analysis

Besides Federal incentives, individual States across US are aggressively promoting EV adoption

Key measures



State specific examples

- **California** – Rebate system (USD 5,000 for BEV; USD 3,000 for PHEV; USD 1,000 for motorcycles/ NEVs) in addition to Federal government subsidy
- **Washington** – 65% sales tax exempt for BEVs, 0.3% for PHEVs
- **California** – Car pool lane access for BEVs
- **New York** – Car pool lane access for BEVs/ PHEVs
- **Oklahoma** – Credit coverage for 75% of charge station cost
- **Colorado** – 20% rebate for EV charging installation
- **California** – Utilities offering discount rates for off-peak hour residential vehicle charging

SOURCE: Press search, Plug-in America; McKinsey analysis

~USD 300 million Clean City Recovery Act Award from Department of Energy focusing on 25 city projects

Examples of key State city initiatives

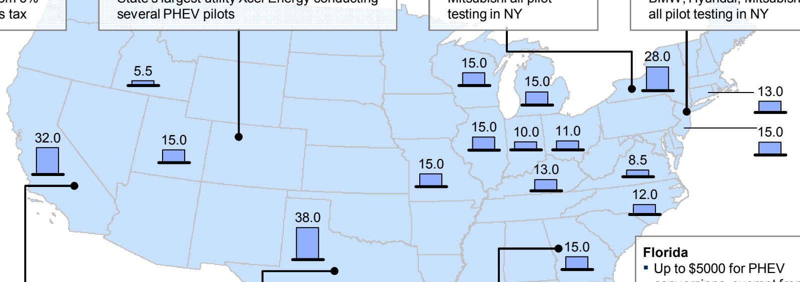
DOE grant[1]
(USD millions)

Washington
- Sales tax does not apply to qualifying hybrids and electric vehicles are exempt from 6% state sales tax

Colorado
- Up to $5000 private purchase subsidy, income tax credit totaling 75-85% of the cost premium for BEV or PHEV up to $6000 and 20% rebate for EV charger installation
- State's largest utility Xcel Energy conducting several PHEV pilots

New York
- Proposed tax exemption and carpool lane access
- BMW, Hyundai, Mitsubishi all pilot testing in NY

New Jersey
- Up to $4000 private purchase subsidy and sales tax exemption in BEVs
- BMW, Hyundai, Mitsubishi all pilot testing in NY



Florida
- Up to $5000 for PHEV conversions, exempt from most insurance surcharges and carpool privileges
- Florida utility company launches program with Silver Spring for EV smart charging pilot

California
- Up to $5000 private purchase subsidy, discounted charging rates and carpool privileges
- Two-year pilot program by ECCOtality for 1000 Nissan LEAFs

Texas
- Sales tax exemption and income tax credits in progress
- Nissan LEAF tour and plan to deploy 400 L3 charging stations

Georgia
- Income tax credits up to 20% of hybrid vehicle purchase ($5000 maximum), income tax credit for business purchase of EV charger and carpool lane access

1 Grant is Clean Cities Recovery Act Awards by Federal Department of Energy DOE (~ USD 300 millions, 25 projects)

SOURCE: DOE; McKinsey analysis

London city is committed to being electric car capital of Europe

Partnerships
- **£60M in public and private funds** to promote EV in London city, shared among
  - Car manufacturers
  - London borough councils
  - Greater London Authority (GLA)
  - Energy & infrastructure suppliers
  - EV users

Infrastructure
- **Infrastructure of 25,000 charging points (incl. fast charge) by 2015 to support 100,000 vehicles**
  - 500 on-street, 2,000 off-street public car parks
  - 22,500 in partnership with businesses (employers' car parks, retail/leisure outlets, etc.)

Regulation
- **20% of new parking places must have EV charging points**
- **City fleets to include xEVs** e.g. 1,000 BEVs in GLA fleet by 2015

Incentives
- **Car purchase grant** of up to £5,000
- EV owners will receive **parking incentives**
- Commuters will receive **congestion charge discounts** (worth up to £1,700 /year)
- Borough Councils receiving £60,000 to **co-fund charge points**

Source: City websites, industry publications

"Lessons learnt" and best practices derived from country plans

- No clarity on wining technology, **plans should focus on desired outcome (e.g. low emission) not technology**
- **Purchase incentives will be helpful** to make xEVs cost of ownership equivalent to ICE before technology matures – **technology maturity is the ultimate goal**
- **Non-monetary incentives and measures** can be very impactful and **should be part of the plans**
- **Professional fleets** are a sweet spot for xEVs – they **should be a key target of the plans**
- **Home and company car park charging is critical for the take-off** of the xEV market
- **Public infrastructure re-assures EV adopters**, hence is an important driver for early adoption uptake

Source: McKinsey