Update on Electric Vehicle (EV) Test-Bed Programme

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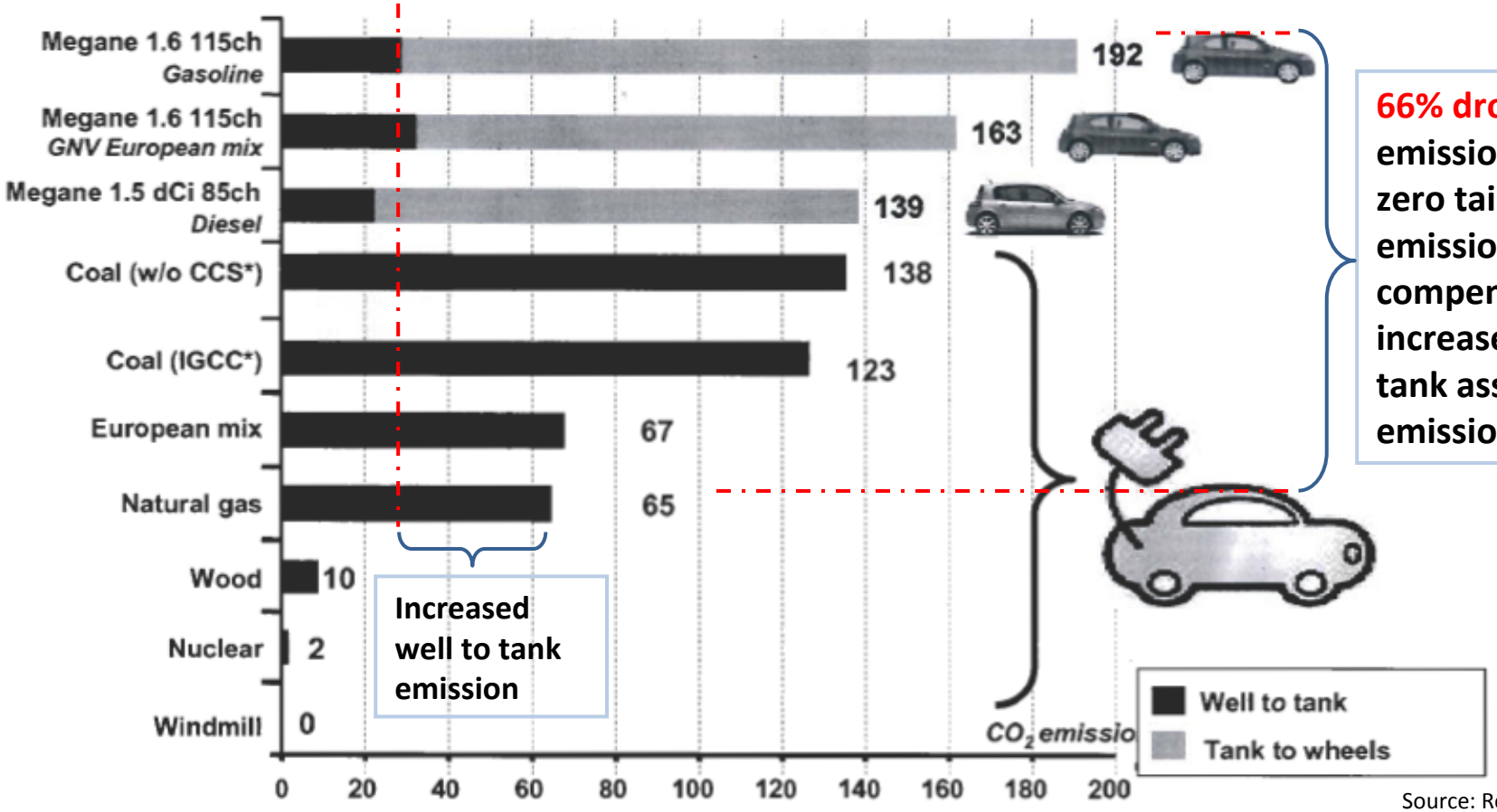
A*STAR EDB SINGAPORE ENERGY MARKET AUTHORITY Land Transport Authority Ministry of the Environment and Water Resources MTI National Climate Change Secretariat HOUSING & DEVELOPMENT BOARD SPRING singapore Enabling Enterprise

- Key considerations behind EVs test-bedding
- Objectives of EVs test-bed
- Updates on the EV test-bed
- TIDES-Plus Incentive Scheme
- Conclusion

EV Test-Bed was set up to evaluate 4 key issues

Huge market in Automotive Industry	• EVs could potentially become a huge market, potentially reshaping the automotive supply chain. Singapore has the capabilities to succeed in sizable niches mainly in R&D and services.
Suitability of EVs	• Evaluate suitability of the EVs for fleet and private use in terms of range, capabilities, required infrastructures, economics.
Impact on Singapore	• Measure impact on Singapore in terms of pollution reduction (including additional electricity required) and benefits (gencos earnings, R&D capabilities, industry development, skills, carbon tax savings) vs. costs (infrastructures, inefficiencies).
Test EV charging system	• Test an EV charging system adapted to Singapore context, including back end settlement mechanisms for the payments and obtain data on usage patterns of infrastructures to make recommendations on deployment.

EVs have the potential to reduce CO_2 emissions in Singapore

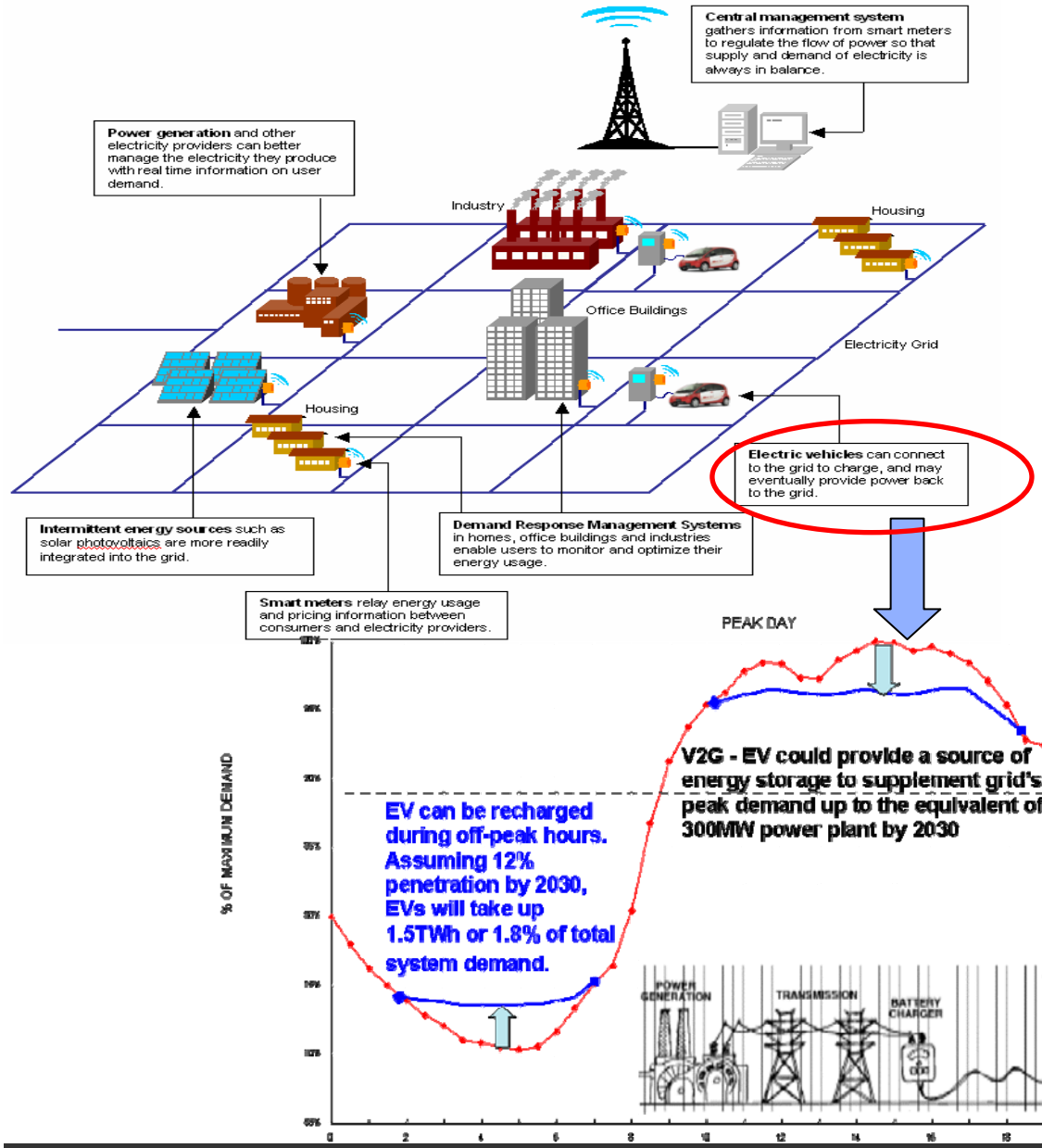


66% drop in carbon emissions due to zero tail pipe emission from EVs compensating for increased well-to-tank associated emissions

Source: Renault-Nissan

- EVs are 3x more efficient than their ICE equivalents
- Just 2% EV penetration by 2020 is enough to bring 4% reduction in total carbon emissions (300 kt/year)for the land transport sector (as compared to 2008 level)

EVs can contribute to better power system performance



- Integrating with the IES Project, the EV can act as a smart appliance that interacts with the grid. In particular, dynamic data exchange between the smart grid and the EVs can help to optimise grid capacity. For example, EVs can be charged during off-peak hours, and can also sell electricity back to the grid during peak periods

Objectives of the EV Test-bed Programme

1 Infrastructure & business model

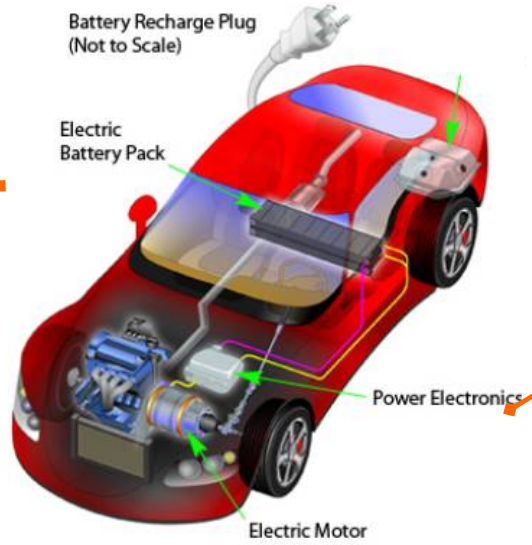
Power charging mechanism, business model, vehicle to grid technology, etc.

2 Feasibility of EVs

Cost-benefit analysis for various vehicle segments e.g. commercial and passenger use & the impact on environment, etc.

3 Policy and Planning

Recommend policy changes such as revised Green Vehicle Rebates, incentives, regulations,
Establish standards & codes (fuel and emission efficiency, charging methods), TR 25:2010.



4 Research and Development

Battery materials, power electronics, electric motors, light weight materials, etc.

5 Industry development

Develop new industry related to EVs in R&D, Component manufacturing, battery management systems, telematics, etc.

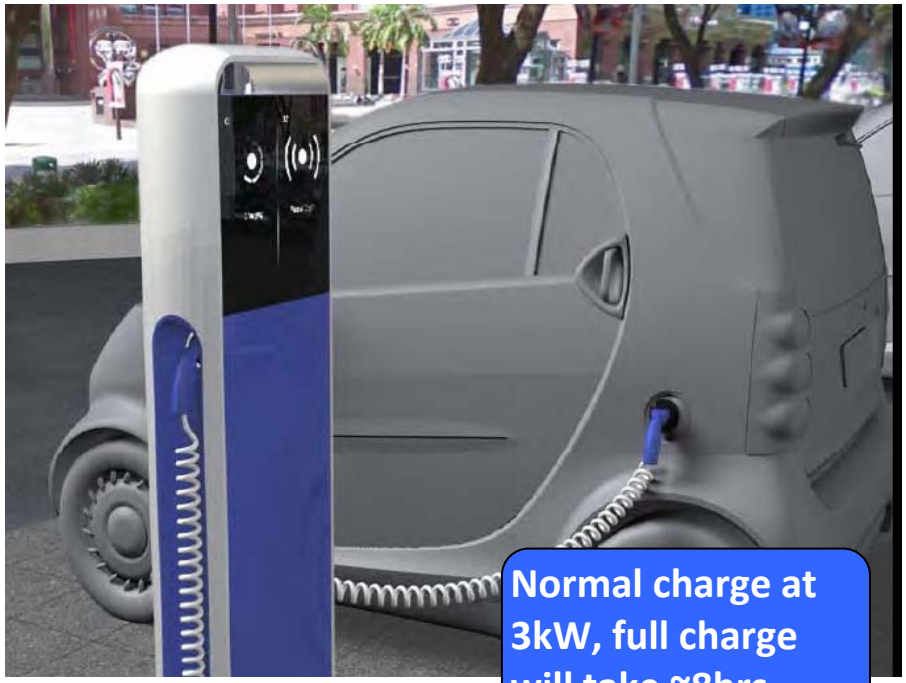
Updates on the EV test-bed – Supply of EVs

- Up to 25 Mitsubishi i-MiEVs will be delivered by 2011

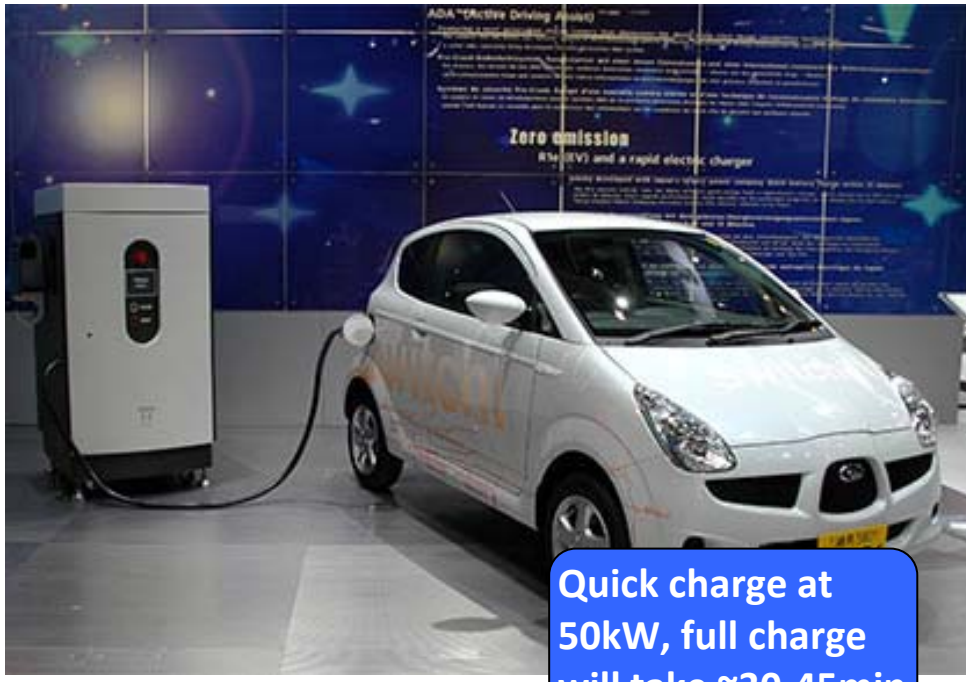
- MOU with Renault-Nissan. Expected delivery of vehicles in 3Q - 4Q 2011

- Currently in discussions with other auto makers.

Updates on the EV test-bed - Public Charging Infrastructure



Normal charge at 3kW, full charge will take ~8hrs.



Quick charge at 50kW, full charge will take ~30-45min

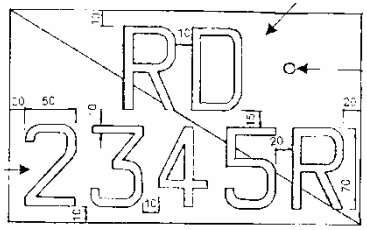
- The EV Taskforce has appointed Robert Bosch (SEA) Pte Ltd as our Charging Service Provider (CSP) to roll out 60 normal charging stations and 3 quick charge stations in tandem with the roll out of EVs for the EV Test Bed.
- The normal charging stations will be distributed on a 1:1 ratio to be sited either near the users' home or office location.
- The CSP will get in touch with the users after demand and date of delivery is confirmed.

Updates on the EV test-bed – EV Cost Benefit Analysis (CBA) Study

- One of the aims the EV test-bed is to evaluate the cost, benefits and feasibility of adopting EVs in Singapore. The results will allow the EV Taskforce to consider policies on whether or not to facilitate a larger scale adoption of EVs in the future.
- As part of the CBA study, a market survey will be done to assess the readiness of Singapore's market for EVs and gain a sense of the willingness-to-pay price estimates of potential buyers of EVs
- A consultant would be appointed in Q1 2011 to spearhead this CBA study.

Transport Technology Innovation and Development Scheme (TIDES-Plus)

- Objectives
  - Attracting and nurturing high value, knowledge-based manufacturing and research activities in Singapore



- Eligibility
  - Companies' vehicles must be used for the sole purpose of conducting research and development, including test-bedding activities
  - Application to be submitted to EDB and LTA; subject to renewal after 6 years, up to a maximum of 10 years.

- License
  - Vehicles approved will be issued with "Special Purpose Licences"

Example of BMW X3

Usual cost: S$213,370 **With TIDES: S$91,480** **Savings: 57%**

Conclusion

- The current test-bed is essential for us to to gain “real-life” experience and build credibility in the EV space and will have to be carefully designed to test key assumptions: vehicles operability/ cost, charging infrastructure requirements, suitability of the business model, driving experience and barriers to adoption.

- The main challenge in getting the test-bed going is in getting users to take up EVs when the price of EVs is currently much higher than their equivalent ICEs. For purposes of the test-bed, the Taskforce is trying to bring down the cost of EVs through TIDES+.

- The first batch of EVs will be essential in understanding consumers’ acceptance of Singapore, the level of penetration of EVs at current and proposed level of incentives as well as the level of infrastructure deployment required to meet the expected demand from EVs in the coming years.