



**Asia-Pacific
Economic Cooperation**

Advancing Free Trade
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Energy Efficiency Policy Workshop: Developing Fuel Economy Regulations

Hong Kong, China | March 2019

APEC Energy Working Group

June 2019

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Workshop Summary Report

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Introduction

This document is a summary report of the APEC Energy Working Group (EWG) Workshop: Developing Fuel Economy Regulations, held on 18th March 2019, at the Regent Kowloon Hotel, Hong Kong, China. Delivered by APERC and Retyna, it took place as a supplementary event to the APEC Expert Group on Energy Efficiency and Conservation (EGEE&C) 53rd Meeting.



Photo: Some of the participants at the Workshop: Developing Fuel Economy Regulations

The Energy Efficiency Policy Workshops are part of the EWG Peer Review of Energy Efficiency (PREE). They aim to promote “high-performance” energy efficiency policy measures in developing economies in the APEC region by:

- » Delivering capacity-building in energy efficiency policy
- » Providing examples of effective energy efficiency policy
- » Enabling the sharing of information and experiences among APEC economies
- » Providing travel support for travel eligible economies

The key objectives of the PREE are to:

- » Share information on energy efficiency performance, as well as policies and measures for energy efficiency improvement
- » Explore how energy efficiency goals could be effectively formulated in each APEC economy under review, taking into account the diversity of the strategies and circumstances of individual economies

- » Monitor progress toward attaining energy efficiency goals and the implementation of action plans. The monitoring process serves to identify recommendations that require more focus
- » Improve capability on energy efficiency policy across APEC member economies
- » Help economies that are still in the early stages of establishing energy efficiency action plans

PREE achieves these objectives by undertaking a broad review of energy efficiency policies and measures in economies and providing recommendations on how these policies and measures might be improved.

This project aims to provide capacity-building support for the following beneficiaries:

- » Attendees of the EEP Workshop (mainly government officials with policy or programme implementation responsibilities, but may include researchers, academics and other experts) and their respective economies benefit from their improved capability to generate effective policy that results in reduced emissions, increased economic competitiveness, and reduced costs
- » APEC economies can also benefit from PREE through APERC's results dissemination efforts such as the summary report and Workshop presentations. The widespread understanding of energy efficiency measures recommended in PREE in the APEC region can help to achieve the energy efficiency goals of APEC as a whole
- » In the long term, businesses and consumers benefit indirectly from lower energy costs, improved energy efficiency policy and programmes, and reduced carbon and noxious emissions

Participating Economies and Organisations

There were 41 participants in the Workshop from nine APEC economies:

- » Chile
- » Hong Kong, China
- » Indonesia
- » Japan
- » New Zealand
- » Chinese Taipei
- » Thailand
- » USA
- » Viet Nam

Representatives of the following organisations participated in the Workshop:

- » APEC Sustainable Energy Center
- » Asia Pacific Energy Research Centre (APEREC)
- » Bureau of Energy, Chinese Taipei
- » CLP Power Hong Kong Limited
- » China National Institute of Standardization
- » Coordinating Ministry for Economic Affairs, Indonesia
- » Electrical and Mechanical Services Department, Hong Kong, China
- » Energy Efficiency and Sustainable Development, Viet Nam
- » Fuel Technology Limited, New Zealand
- » Industrial Technology Research Institute, Chinese Taipei
- » Ministry of Economy, Trade and Industry, Japan
- » Ministry of Energy, Chile
- » Ministry of Energy, Thailand
- » National Association of Regulatory Utility Commissioners (NARUC), USA
- » Retyna Limited, New Zealand
- » The Hong Kong and China Gas Company Limited
- » The Hong Kong Electric Company Limited
- » Transport Department, Hong Kong, China

Workshop Opening Session

The Workshop was opened by Mr Vy Ek Chin, Assistant Director, Electricity and Energy Efficiency at the Electrical and Mechanical Services Department (EMSD), Hong Kong, China. EMSD were the hosts for the Workshop and provided valuable assistance with the organisation and running of the Workshop from a practical viewpoint.

Opening remarks to the Workshop were provided by the Chair of the APEC Expert Group on Energy Efficiency and Conservation, Mr. Pengcheng Li, China.

An introduction to the Energy Efficiency Policy Workshop series, the topic of vehicle fuel economy regulations, and the Workshop agenda was delivered by Mr Hugh Marshall-Tate of the Asia Pacific Energy Research Centre (APEREC). The Workshop topic of “Developing Fuel Economy Regulations” covers the following aspects:

- » Testing protocols
- » GHG emissions
- » Vehicle fuel economy policy
- » Policy drivers
- » Policies in APEC economies
- » Advanced Vehicles

The agenda for the Workshop is included as Appendix 1, and Mr Marshall-Tate’s presentation is included as Appendix 2.



Photo: Mr Vy Ek Chin opens the Workshop: Developing Fuel Economy Regulations

Session 1: Context for Vehicle Fuel Economy Regulations

Transport CO₂ emissions in APEC 2000-50

Presenter: Alexey Kabalinskiy, APERC

The first presentation in Session 1 provided the transport sector greenhouse gas emissions context for APEC economies. Since 1971 road transport emissions have increased three-fold in line with total CO₂ emissions. In 2016 China and the US were responsible for nearly two-thirds of APEC's transport emissions.

APEC/APERC has modelled three scenarios of transport emissions through to 2025: Business-As-Usual (BAU); APEC target (TGT) driven by APEC goals of reducing energy intensity and increasing renewables; and 2 Degrees Celsius (2DC) based on the International Energy Agency (IEA) *Energy Technology Perspectives*.

Under BAU, transport sector emissions continue to grow and conventional fuels dominate, despite a 12% decline in gasoline consumption.

For the TGT scenario, the transport use of electricity and biofuels are roughly double that under BAU, and gasoline declines by 43% and diesel by 31%. This results in a plateau of fuel demand and CO₂ emissions falling to 2005 levels. This is achieved through improved fuel economy policies, mode switching, improved public transport, use of hybrid technologies and natural gas fuels.

With the 2DC scenario, there is a significant increase in electricity for transport of 81% over BAU, biofuels have a lower increase of 13%, and gasoline declines by 74% and diesel by 58%. Uptake of electric vehicles and hybrids, 80% of APEC residents having access to quality public transport and alternative fuels for freight contribute to limiting transport sector emissions towards a 2°C future.

The full presentation is included as Appendix 3.

Overview of the suite of policy measures to improve vehicle fuel economy

Presenter: Elizabeth Yeaman, Retyna Limited, New Zealand

This session summarized the policy options for improving vehicle fuel economy. There is a wide variation in fuel economy even within vehicles of the same class. Vehicle electrification provides a step change in energy efficiency of vehicles, as well as fuel/energy switching.

Having reliable vehicle fuel economy data/CO₂ emissions data for vehicles underpins all policy measures. Vehicle fuel efficiency/CO₂ standards create market push and encourage manufacturers to supply lower CO₂ vehicles in the market. Fiscal incentives create market pull and encourage vehicle buyers to demand more efficient vehicles from the market. Policies such as vehicle fuel economy labelling and other information and market programmes provide support but are insufficient on their own to make a significant difference to fuel economy.

Corporate average standards are the norm internationally, and can be based on CO₂ emissions, fuel consumption or energy consumption. These standards encourage manufacturers to make, sell and promote lower CO₂ vehicles, including electric vehicles. Such standards have typically delivered a 30-50% reduction in CO₂ emissions to date.

One of the strongest policy measures yet is countries signalling that they will ban the sale of Internal Combustion Engine (ICE) vehicles by a certain year. The earliest ban is coming in 2021 in Costa Rica, with China signalling a ban from 2040.

The full presentation is included as Appendix 4.

Question: Is there any distribution problem or effect?

Answer: Yes, there are some distribution issues associated with subsidies policies. For example, some wealthy people who can afford expensive electric cars can be seen as being subsidised by less-well off people who need bigger vehicles but cannot not afford expensive technologies. In the long term, if you want to pull the subsidies out, the market can crash, people might lose confidence in the technologies and stop buying those vehicles. So it is very important to signal when the subsidies will end and plan a gradual phase out. Also, for people who are less well off, there are some other mechanisms government can use to support them.

Question: Are there any examples of designing a feebate scheme? We have difficulty setting up the benchmark for surcharges.

Answer: Very good modelling is important, and you need to analyse the pros and cons. The reality is you have to try and see and be prepared to adjust it.

Session 2: Vehicle fuel economy policies in APEC economies

Chile's path to develop fuel economy standards

Presenter: Luz Ubilla Bórquez, Ministry of Energy, Chile

Chile is introducing energy efficiency standards for light vehicles with the aim of achieving a 20% reduction in CO₂ emissions by 2025. The fuel efficiency of light vehicles in Chile is significantly worse than countries with fuel efficiency standards in place.

The metric for the standard will be energy efficiency in kilometers per liters of gasoline equivalent and its equivalence in grams of CO₂ per kilometer. The standards are being developed jointly by the Ministries of Energy and Transport.

In setting the standard two years of fuel efficiency data were examined for all vehicles in Chile. Vehicle model data was also checked to ensure that there were models available that could meet the standard without additional costs in all light vehicle market segments.

Chile already has vehicle fuel efficiency labelling in the light and medium duty vehicle sectors. It is now investigating labelling of buses, and has established a technical protocol to obtain energy consumption data from urban public transport buses in the city of Santiago.

The full presentation is given in Appendix 5.

Question: Santiago recently introduced 200 electric buses. Is this a central government initiative, or one from the City of Santiago?

Answer: The decision was made by the bus companies and the central government supported this initiative.

Test protocols underpinning fuel economy regulations: the transition to Worldwide Harmonised Light Vehicle Test Procedure (WLTP) and its inclusion in CO₂ policies

Presenter: Andrew Campbell, Fuel Technology Ltd, New Zealand

Vehicle fuel emissions and fuel consumption testing protocols have over time resulted in a divergence of the test results from "real world" results, which has undermined policy efforts to improve vehicle fuel efficiency and reduce CO₂ emissions.

Development of the Worldwide Harmonised Light Vehicle Test Procedure (WLTP) is an initiative of the UN ECE GRPE (Working Party on Pollution and Energy) with inputs from wide-ranging economies. It is a better approximation of real world driving conditions, has stricter test conditions, considers vehicle "special equipment" and different power trains, including electric vehicles.

WLTP is being introduced in the EU from 2018. In APEC economies, Japan has introduced a modified version from late 2018, in the Republic of Korea from 2021, and in China for emissions from 2021. The change to WLTP has implications for vehicle fuel economy standards policies and fiscal measures. Fuel consumption labelling is yet to catch up with the changes to WLTP.

The full presentation is given in Appendix 6.

Question: How does the new protocol address the issue of GHG intensity of the electricity used by electric vehicles?

Answer: It doesn't. It only reports the kilowatt-hours that are consumed.

Question: Vehicles' performances are different under different climate conditions. Does it mean the test data needs adjustment?

Answer: The testing entity needs to provide good and detailed information on how to interpret the information, including the testing conditions of the test results.

Question: Are there standards for the testing input fuels?

Answer: Yes, there are specific standards for test fuels.

Panel discussion with Sessions 1 and 2 speakers

Moderator: Elizabeth Yeaman, Retyna Ltd, New Zealand

Question for Alexey Kabalinskiy:

We are expecting more autonomous vehicles in the future. There are also some potential disruptions coming up that may change how often vehicles are driven and numbers of vehicles on the road. How is your transport model looking at the potential disruptions?

Answer:

Japan has announced the launch of self-driving services in 2020 during the Olympics. In terms of the modelling, we have identified six types of vehicles, including man-driven and unmanned. We found out there is a great deal of uncertainty about how this is going to play out in the long term. Unmanned vehicles can be used in a lot of different ways, and many studies have shown that there will be a great deal of uncertainty around that. Therefore, our model adopts a more conservative approach for the unmanned vehicles.

Question for Luz Ubilla:

Earlier you mentioned Santiago city purchased 200 electric buses. What is the role of the electricity companies in this?

Answer:

Two electric companies own the electric buses and have built the charging stations. They lease the buses to the operators of the public transport routes..

Question for Andrew Campbell:

How do plug-in hybrid electric vehicles perform through the WLPT as plug-in hybrid electric vehicles have many user-driven variables, including situations in which they are hardly ever charged? For short distances, they can just use the electricity available, while for longer distances the proportion of electricity used for the journey is much less.

Answer:

A plug-in hybrid vehicle has the opportunity to get electricity from an external source. In this case, one of the WLTP tests provides its all- electric range. This is done by taking a driving cycle and identifying its pure electric range starting with a fully charged battery. This means that people know what the likely range is before they switch to gasoline.



Photo: Panel discussion at the Workshop

Session 3: Facilitating low emission vehicles in APEC economies

Wide scale promotion of low emission vehicles for HKC – challenges and opportunities

Presenter: Ir. Raymond CHOI, Hong Kong Power Company, Hong Kong, China

As at the end of 2018, 2% of private cars (over 10,000 EVs), 1% of government vehicles and 0.5% of franchised buses in Hong Kong, China are electrified. From 2009 the economy has provided free electric vehicle charging and today there are over 2,000 EV public chargers, with around 500 of these being fast chargers. HK Electric's own vehicle fleet is 40% electric.

Some aspects of Hong Kong, China are ideally suited for EVs due to its reliable electricity system and typical daily travel distances for cars and buses are easily achievable with today's EV technology. The city has created a blueprint for a low-carbon smart city.

However, there are also challenges, particularly the predominance of parking in high-rise buildings and multi-storey car parks where the building owners and other tenants must give permission for charger installation.

Hong Kong, China has put in place a number of incentives to continue to encourage the uptake of EVs including: tax concessions, a HK\$300 million Pilot Green Transport Fund, funding for EV bus purchase, and design concessions for new developments with EV charging. The economy is also considering ceasing first registration of private diesel cars.

The decarbonisation of the electricity system in the economy is continuing with greater use of natural gas and other low carbon generation. Future technologies including autonomous driving, shared vehicles and V2G will continue to help facilitate vehicle electrification in Hong Kong, China.

The full presentation is provided in Appendix 7.

Developing Strategies for EVs: Case Study from the Philippines

Presenter: Andrew Campbell, Fuel Technology Limited, New Zealand

Disruption is coming fast in the transport sector due to cheap communications and data, advances in battery technology reducing battery cost, shared vehicle ownership and autonomous vehicles. Change is also coming in the electricity sector enabling management of the electricity supply network in new ways and with new participants. The speed at which electric vehicles can be charged is also increasing.

Different economies rely on different types of transport vehicles. While light duty passenger cars dominate in economies like Norway and New Zealand, in many Asian economies it is bikes, motor scooters and tuk-tuks/trikes that provide the majority of trips, along with public transport.

The Department of Energy in the Philippines is responsible for a project that aims to deploy 3,000 e-trikes by May 2019. The e-trikes are manufactured in the Philippines using automotive-grade lithium

ion batteries. They are targeting first- and last-mile public transport journeys and will also help remove polluting 2-stroke trikes from the streets.

In developing any electric vehicle project, it is important to consider every stage of the electric vehicle life, from design and certification, through supply, re-sale and in-service requirements such as charging, servicing, repair and emergency response in case of accident, and eventual retirement and recycling.

Over the last 4 years, the APEC Automotive Dialogue, Energy Working Group and Transportation Working Groups have developed and workshopped the APEC EV Roadmap. It has identified further areas for work including: recycling protocols, cybersecurity, emergency response protocols, interoperability, and standards for 2- and 3- wheel EVs like the Philippines e-trikes.

Economies looking to facilitate electric vehicles need to consider: supporting the research and development of batteries and EVs, ensuring there is an interoperable EV charging network, collaboration to support impacts to the grid, and ensuring regulatory predictability and transparency.

The full presentation is given in Appendix 8.

Growth of electric vehicles in New Zealand

Presenter: Elizabeth Yeaman, Retyna Limited, New Zealand

Currently around 85% of electricity generation in New Zealand is from renewable sources. This means that EVs can deliver an 80% reduction in CO₂ emissions in comparison with gasoline vehicles.

The NZ Government's EV programme does not include direct purchase price subsidies, but does have some fiscal support. There is a contestable fund which provides financial support to first mover projects, in particular transport sectors, and to support an interoperable nationwide charging infrastructure. This has seen projects like EV car share, e-taxis, e-buses, EV couriers, e-trucks and ultra-fast charging of buses deployed. There is now 95% state highway coverage with 50kW DC fast chargers every 75km.

New Zealand's light vehicle fleet is heavily reliant on used import vehicles from Japan, and this is also the case for EVs. The majority of EVs in the economy are used imports at a capital cost comparable to used gasoline vehicles imports, and their numbers have doubled every year such that EVs are now around 2% of new entrants to the light duty vehicle fleet.

New Zealand has a very open, competitive and permissive electricity market. This has seen some companies offering electricity tariff rates for EV owners, and others offering rates to retail customers which change every half-hour with the wholesale market. As a result, the majority of EV owners are willing to charge overnight, when it is cheapest, grid productivity is improved and CO₂ emissions are lowest. Electricity retail pricing innovation is an enabling platform for future aggregated, managed EV charging.

The full presentation is given in Appendix 9.

Question: You mentioned the retail suppliers can provide different rate plans in New Zealand?

Answer: Yes, and it is not just in peak hours. For example, some companies set up and offer one hour of free power a day off-peak (they call it the Hour of Power), and consumers nominate in advance when it will be. This allows people to use more power in the off-peak time rather than peak time. Some other companies offer variable pricing on a half-hourly basis to household consumers.

Session 4: Workshop – Facilitating EVs and other very low carbon vehicles

Session 4 was an interactive breakout session to generate ideas and priorities for how fuel efficient vehicles and EVs can be facilitated within APEC economies.

The participants were divided into four groups (based on first letter of given name) and asked to discuss the following topics in turn:

- » **Status:** What is the status of vehicle fuel economy policies and policies facilitating low carbon vehicles in your economy?
- » **Barriers:** What are the barriers to introducing or updating policies in your economy?
- » **Priorities:** Identify the top three activities that could be undertaken to progress policies in your economy
- » **APEC facilitation:** Identify any activities that APEC could have a role in advancing

Each group then reported back to the Workshop participants as a whole on their key ideas.



Photo: One of the breakout session groups discussing ideas

Group 1 report back

» **How APEC can help us?**

We suggest APEC can propose standards for electric vehicle charging stations, infrastructure, battery and testing methods. Currently each economy has different testing methods, and having standards could facilitate mutual recognition.

» **What can be done in our economy to boost fuel efficient vehicles?**

Standardization, incentives and subsidies, as well as infrastructure support. For example, when we replaced the diesel taxis with LPG taxis in Hong Kong, China, we subsidized the oil company so they built LPG fuelling stations.

Electric vehicle reliability and quality are also very important. If the vehicles are not reliable and the quality is not good, this will affect the users' impression of electric vehicles. For example, on a small island Peng Hu in Chinese Taipei, the government had a pilot EV project. The project chose certain families to have free use of electric motorcycles for two years. After two years, all these users chose not to use the electric motorcycles because there were no repair stations to fix the motorcycles when they had problems.

Group 2 report back

» **What can APEC do?**

For EV users, one of the most common issues we have experienced is that we do not have the capability to service the batteries. This could mean expensive battery replacements. We suggest APEC establish standards for EVs, including EV safety requirements, EV battery replacements and essential EV parts. This would significantly help APEC economies to use more EVs.

» **Issues in the economies**

In Chile, charging stations for EV are not free of charge, while, in Hong Kong, China currently charging stations are free as part of promoting the use of EVs. However, Hong Kong, China needs to consider if they will still continue to provide free power for EVs in the long term. Also, most of the buildings in the economy are high-rise buildings, with parking lots in the basement. It would be difficult to build EV charging stations inside these high-rise buildings, and this is one of the issues the economy is facing when promoting the greater use of EVs.

Group 3 report back

» **Issues in economy**

In Viet Nam, the main transport vehicle is the motorcycle, which will be banned by 2030. In order to achieve this target, the Viet Nam government released a Guideline last year, requesting that the private sector provides fuel consumption data of the vehicles they owned because most vehicles are now in private sector ownership. This data will help the government have a better understanding of current fuel consumption as they prepare to achieve the target in 2030.

Thailand has released a number of policies to promote the use of EVs. For example, the government has proposed reducing the vehicle tax for EVs from 8% to 4%, and further to 3%. Also in 2016, a labelling scheme that targets cars and light trucks was introduced. The electricity companies in Thailand charge very high demand charges that make it difficult to commercialise EV buses outside of sponsored demonstrations.

Hong Kong, China also injected a huge amount of funding for EV promotion, including pilot projects on electric buses, hybrid minibuses and electric minibuses. The most critical problem that the economy has now is the scarcity of land. If we want to build an electric transport system, we need to build a certain number of depot charging stations for the electric buses and electric minibuses. However, the current priority for the economy's government is building homes for people rather than building depots for EVs. This makes using hybrid buses and hybrid minibuses a more feasible solution in the mid-term.

Group 4 report back

» **Policies in Hong Kong, China to promote EVs**

There are several policies and schemes that are already been implemented in Hong Kong, China including a voluntary labelling scheme for vehicles, which is a great help for consumers to understand the fuel consumption when purchasing vehicles.

Another is the development of LPG taxis. The government does not impose any tax for LPG, so that taxi drivers and passengers can both benefit from a low cost fuel.

Hong Kong, China also has tax incentives for EV purchase meant to encourage more people to buy EVs.

» **Challenges in Hong Kong, China**

There are not enough charging facilities for EVs in Hong Kong, China. What APEC can do is to line up some investors to facilitate the EV charging infrastructures in the economy. For example, the investors can build an EV charging building, so the cars can go in and they can charge and have their vehicle maintained at the same time.

Summary

Some common themes emerged from these sessions and included:

- » Difficulty of providing charging infrastructure for EVs in dense cities with high-rise buildings
- » Getting permission to install EV charging in apartment buildings due to difficulty in allocating costs for the electricity
- » Need to create a sustainable business-model for EV charging
- » Many Asian countries generate electricity from coal-powered charging stations which reduces the CO₂ benefits of EVs
- » Lack of capability for servicing EVs and EV batteries
- » APEC's role is seen as one leading standardization.

