



CALL FOR PROPOSAL : CONVERSION OF INTERNAL COMBUSTION ENGINE OR BATTERY ELECTRIC VEHICLE INTO HYDROGEN FUEL CELL VEHICLE

BACKGROUND

Malaysia as a Party to the United Nations Framework Convention on Climate Change (UNFCCC) ratified the Kyoto Protocol in 2002 and the Paris Agreement in 2016. Under the Paris Agreement, Malaysia communicated the country's Nationally Determined Contributions (NDC) intending to reduce 45% GDP emissions intensity by 2030 relative to the emissions intensity from its base year 2005. This consists of a 35% reduction on an unconditional basis and a further 10% conditional upon receipt of climate finance, technology transfer and capacity building from developed countries.

International Energy Agency reported that global energy-related CO₂ emissions reached a significant high of 33.1 Gt CO₂ in 2018. Robust economic growth resulted to increased energy consumption which leads to significant CO₂ emissions mainly from fossil fuel combustion such as coal, oil and natural gas.

As reported in IEA CO₂ Emissions from Fuel Combustion, OECD/Paris, 2018, Malaysia's total CO₂ Emissions recorded at 216.8 Million tonne in 2016, the third highest among ASEAN countries after Indonesia and Thailand. The country also ranked the second highest emissions per capita (6.93 Tonne CO₂ per capita) among ASEAN countries. The National Grid Electricity emission factor for Peninsular Malaysia is 0.585 tonnes CO₂/MWh in 2017. The Government of Malaysia has made announcement of 20% renewable energy target by 2025. From 2025 onwards, Malaysia will experience strong growth of Renewable Energy (5.6% CAGR) with Hydrogen to complement RE as alternative energy carrier.

Malaysia ranks in the third place among ASEAN countries of CO₂ emissions (62.8 million tons; 29.05%) in transport sector. 29.05% of CO₂ emissions in Malaysia is above the global average CO₂ emissions (24%). All these statistics showed that there is an urgent need for Malaysia to reduce down the carbon emission, particularly within the transport sector. Mobility in Malaysia consumes 37% of Final Energy Consumption, contributes to 29% of greenhouse gas emissions and growing costs RM 89.9 billion in annual fuel consumption expenditure.

Zero emission vehicles such H₂-FCEV and EV have important role to help to achieve the desired target. With improvement on grid emission factor, the technology application is more relevant than ever.

There are only 3 active FCEV model for passenger car in the world, Toyota Mirai, Honda Clarity and Hyundai Nexa. The market supply is relatively very low compared to the potential market demand. There are more than 12 million cars registered on Malaysian road and with additional of more than 500,000 units being added to annually.

Study shown there are many untapped energy potentials in Malaysia. Evolving H₂ production technology and H₂ storage technology, Green Hydrogen is within the reach in near future. First



production site already available in Kuching Sarawak, using electrohydrolysis from electricity drawn from sustainable resources.

INTRODUCTION

Malaysian Green Technology & Climate Change Centre (MGTC) is a government agency under the purview of the Ministry of Environment and Water (KASA). MGTC portfolio includes strategizing climate actions, leading inter-ministerial collaborations, promoting uptake of green technology innovations across industries and raising awareness among the general public on sustainability development and climate change. The sustainable energy department is pursuing collaboration with various local government agencies, institute of higher learnings, research institutions, industry players, trade missions and investors to further embark on hydrogen energy production, storage and application in key economic sectors including electricity, industry and transportation sub-sectors.

This project aiming specifically on the demand side, on populating Malaysian road with Zero Emission Vehicles displacing the polluting and inefficient vehicles. H₂-FCEVs only produce H₂O and electricity. Vehicle drivetrain conversion is deemed the lowest cost and potentially highly viable option to achieve the population volume. To date, there are around 30,000 EV and PHEV active in the market. These vehicles are already equipped with the right electrical architecture, namely, the inverter, electric - drive system, and adequate electric motor capacity. Some other hybrid models that capable of full electric -drive even for short range can also fit to this purpose. The strategy is to couple the H₂-FCEV system to replace or complement the deteriorated HV batteries in the EVs or even Hybrid.

The design to be road-worthy in mind as the full implementation will require the approval of the Authorities for road-worthiness and safety JPJ Engineering acceptance. In parallel, the necessities on the relevant regulation will also be addressed together with MGTC.

REQUEST FOR PROPOSAL

Malaysia Green Technology and Climate Change Centre, is seeking proposal from institutions of higher learning, research institutions, industry players, trade missions and investors both from local and international organization, in the area of conversion of internal combustion engine of battery electric vehicle into hydrogen fuel cell vehicle. The proposal should address the following priority areas of interest:

- 1) Conversion of Internal Combustion Engine to Hydrogen Fuel Cell Vehicle
- 2) Conversion of Battery Electric Vehicle to Hydrogen Fuel Cell Vehicle
- 3) Hydrogen Refuelling System



- 4) Model selection (or group of models)
- 5) Basic specification of the critical components or KIT with country of origin indication
- 6) Basic design architecture
- 7) Requirements for support from MGTC as the Government Agency
- 8) Demo unit (cost and timeline)
- 9) Deployment strategy and business plan.

This request for proposal is to increase the involvement of Federal and State government agencies, local authorities, private organization, institute of higher learnings, industry players, trade missions and investors in accelerating hydrogen economy in Malaysia through investment and active participation in cooperative research, development and commercialization projects with MGTC. There is no limit on the maximum number of proposal submission.

Proposal should be no more than six pages in length (using this template), and must include the following:

- 1) Proposed System and System Major Components
- 2) Proposed Site and Logistic
- 3) Capital Budget (RM)
- 4) Operating Budget (RM)
- 5) Project Team Organization and Function
- 6) Potential Project Partners
- 7) Potential Hydrogen Capacity (tonnes of Hydrogen)
- 8) Energy Requirement for Hydrogen Compression, Liquefaction and Refuelling in Solid State formation

GENERAL PROVISION

1. All submitted proposals by various entities shall be treated as strictly confidential
2. The interested parties may send more than one proposal for MGTC consideration
3. MGTC shall form an Internal Committee to evaluate each proposal based on priority of the projects and compliance of criteria to the government related policies on green technology and climate change and sustainable development goals. Potential spill over impacts to the economy sectors value chain, carbon emission reduction and green jobs creation shall also be considered as evaluation criteria
4. Maximum five successful proposals would be invited to submit full techno-economic and environmental feasibility study report and detailed project costing
5. MGTC shall have no obligation on financial or otherwise to all submissions. However, those successful proposals may receive partial grants from relevant agencies for full proposals development



6. MGTC shall recommend on binding agreement or signing of MoU on collaboration with the successful parties for joint submission of proposals for local or international funding

DEADLINE FOR SUBMISSION

Proposals are due by Friday, 30th October, 2020, at 5 p.m. Malaysia Time

Malaysian Green Technology & Climate Change Centre

(formerly known as Malaysian Green Technology Corporation) (462237-T)

No.2, Jalan 9/10, Persiaran Usahawan, Seksyen 9, 43650 Bandar Baru Bangi, Selangor Darul Ehsan, MALAYSIA

T: +603 8921 0800

F: +603 8921 0801

More information can be found at www.greentechmalaysia.my. The proposal and any technical inquiries should be directed to hydrogeneconomy@greentechmalaysia.my