



Smart Mobility and New Energy

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Christopher LUK
Head, Intelligent Systems

Automotive Platforms and Application Systems (APAS) R&D Centre



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About APAS...



Since **2006**
Established by **Innovation and Technology Commission (ITC)**
Hosted by **Hong Kong Productivity Council (HKPC)**



80+
On-going
Projects



150+
Completed
Projects



80+
Patent Granted



Project Sum
>\$700M



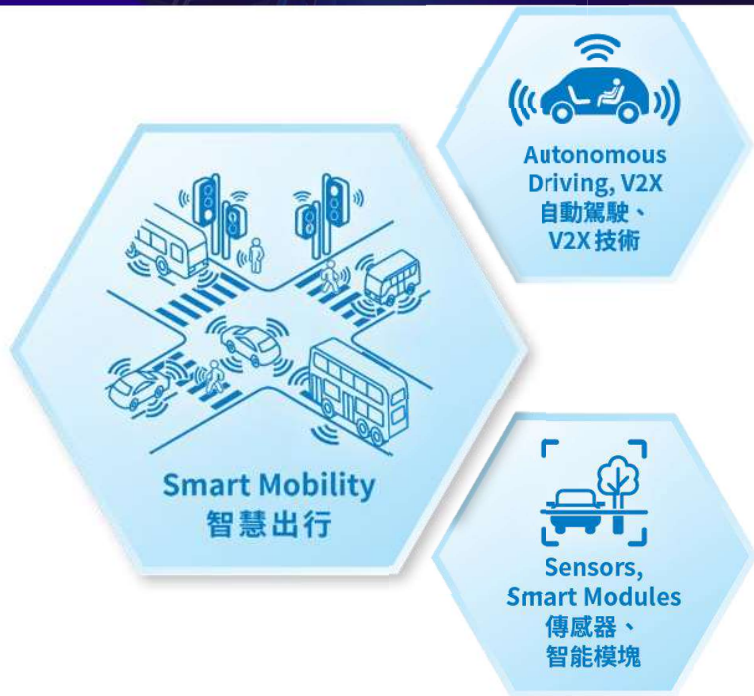
New Energy Game Plan



Hong Kong
Innovation
and
Technology
Development
Blueprint



APAS' Technology Roadmap - Mobility



Autonomous E-tractor



Mobility Robots: MiniMover family



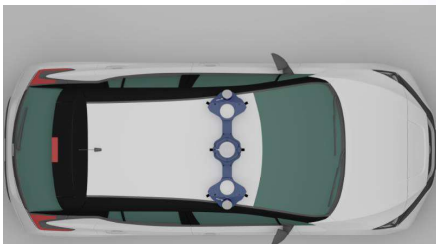
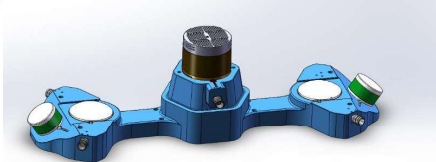
Fault Tolerant Steer-by-Wire System



Autonomous Driving R&D Platform



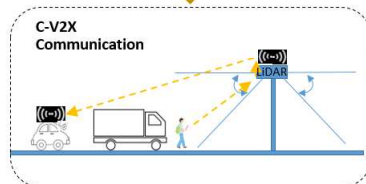
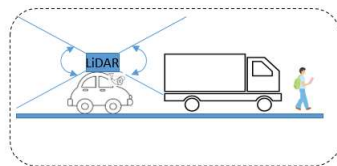
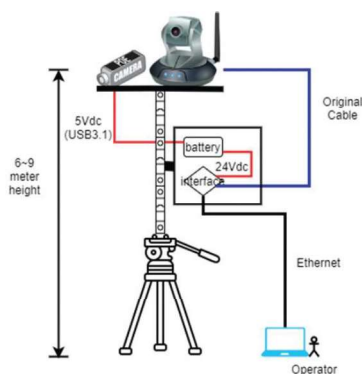
Mobility - 2nd Generation Robotaxi



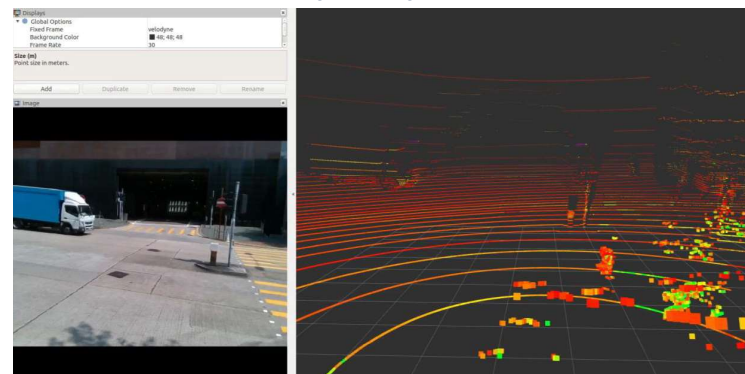
- Dedicated designation for right hand autonomous driving vehicle
- Drive-by-Wire System in compliance with ISO26262 Functional Safety Standard
 - Steer-by-Wire
 - Break-by-Wire
 - Accelerate-by-Wire
 - Lighting-by-Wire
- 5G C-V2X Compatible
- HK local customised autonomous driving HD Map
- Autonomous Vehicle-in-Loop simulation platform
- Robotaxi-hailing apps and cloud server management programs

Mobility - Roadside LiDAR and V2X Technologies

- Autonomous driving
 - Realise real-time traffic information collection
 - Active objects identification and safety control to improve the safety
- Manual driving
 - Improve safety through sending safety warnings by V2X system



Roadside Lidar with bird view perception for activity safety control



Mobility - Thermal Imaging and sensor fusion for AV



Major Benefits

- Living object detection and recognition in low light or foggy weather
- Save time and cost autonomous vehicle safety testing and algorithm development

Application Area

- Living object detection and recognition in low light or foggy weather
- Autonomous driving perception capability enhancement
- Patrol and safety inspection in the night/low-light environment
- People counting without privacy concern



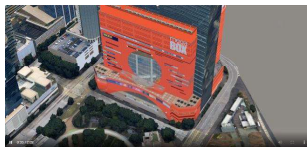
Mobility - High-Definition 3D Map Construction



Vehicle based sensor
scanning system



3D Mesh Model of the
traffic environment



Navigation Data Info



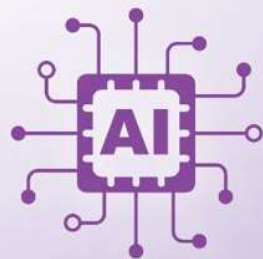
Autonomous Vehicle HD 3D Map
Sha Tin Tai Chung Kiu Road



Scenario Creation

- Construct section of Nathan Road in HD 3D
- Unique Hong Kong feature of right-hand drive
- Run simulation of pedestrian crossing in path of autonomous vehicle in various weather conditions
- Simulation can evaluate the vehicle path and avoidance system of actual AV in a simulated environment
- Can be used to verify AV software before movement permit is granted





Intelligent Systems
智能系統



Artificial Intelligence, HMI
人工智能、人機互動



Connectivity, Big Data
連接、大數據

Remote Automatic Parking System



Drowsiness-Fighter



Smart Taxi Meter



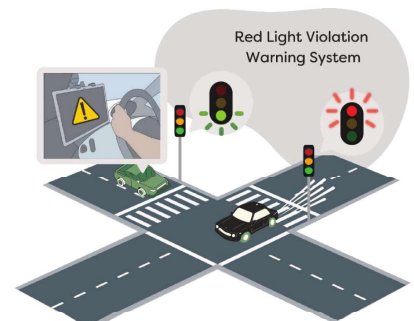
Red Light Violation Prediction System using Image Processing



AI - Red Light Violation Warning System



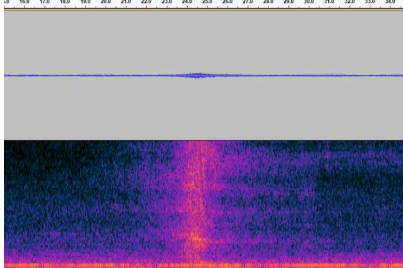
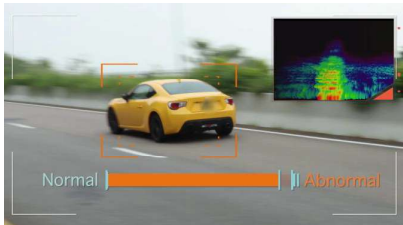
- Roadside traffic safety monitoring and warning system
- Prediction for red light violation
- Purely image processing
- Low-cost and easy to set up



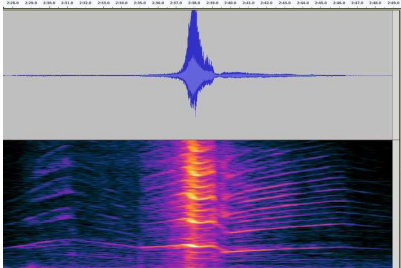
AI - AI Based Car Exhaust Noise Detection



- First of AI vehicle exhaust noise detection in the world
- Combine Audio and Visual AI for detection



Normal Vehicle



Modified Vehicle

Application Area (Audio AI)

- Preventive maintenance for vehicles
- Robotic system abnormality detection

AI - Remote Automatic Parking System



Improve parking efficiency, accuracy, safety and maximise space utilisation



- Precise 3D mapping
- Obstacles detection and avoidance
- Path planning
- Parking lanes detection
- Vehicle localisation



(A) Front entering Straight car-park space



(B) Rear entering S-shaped (parallel) parking



(C) Rear entering L-shaped parking

AI + Autonomous - Smart Autonomous Electric Transporter



Standard Version



Major Benefits

- Full Autonomy for indoor and outdoor operation with High payload and gradeability
- Flexible movement within narrow or confined area
- Trajectory Path Planning
- Obstacle Avoidance



Autonomous Technology

- Multi-sensor fusion for environment perception



360°

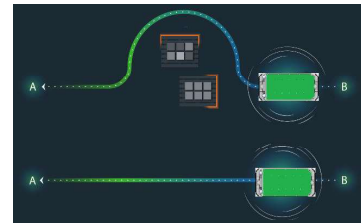
Large Version



Application Area

- Logistics, Factory, Warehouse and Hospital
- Movement of machinery, medical supplies, or hospital bed within confined area
- Movement across different building within large scale assembly factories

- Auto navigation with **AI**

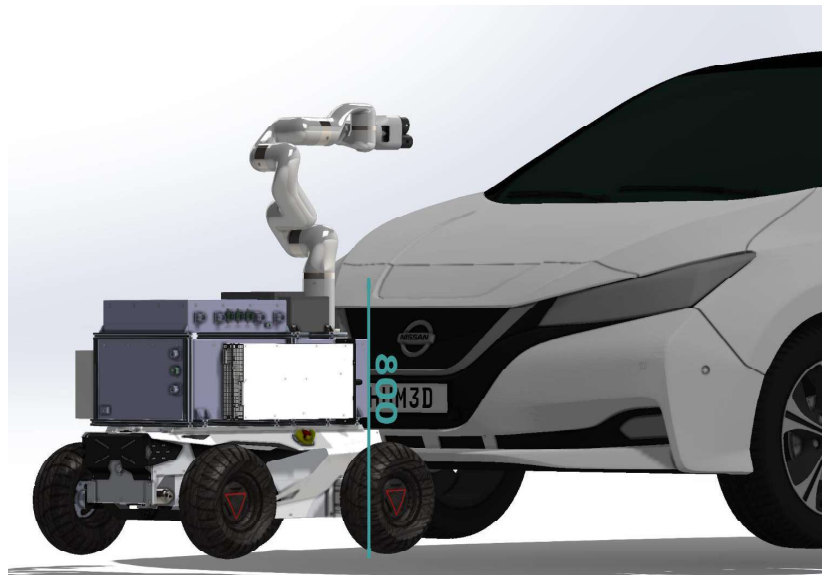


AI + Autonomous - Charging Robot



Autonomous mobile platform with battery package and robot arm to charge the EV automatically

Parameters	Requirements
Mobile Platform Autonomous Driving	Automatic navigation, auto obstacle avoidance
Mobile Platform Charging	Manual/Auto-charging
Moving Direction	Forward / Reverse / Turning
Communication Protocol	TCP/IP, Modbus
Positioning & Navigation Method	Laser scanning and SLAM based
Safety Device	Emergency button / Laser collision detection
Charging Interface	IEC Type 2
Autonomous Mobile Platform Payload	120-150kg
Moving Speed	0~1m/s
Energy Storage Capability	17kWh
Robot Arm Operation Accuracy	+/- 1mm
Size	Approx. 500 (W) x 700 (D) x 1200 (H) mm



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Green Transportation
綠色運輸



Chargers,
Energy Storage
充電站、能量儲存



New Energy
Vehicles
新能源汽車

Smart Mobile EV Charger



Hydrogen Fuel Cell-electric
Off-grid Charger



Pantograph Charging Station



Swappable Battery



New Energy – Electric Minibus



300kW Pantograph High Power Charging Station & Pure Electric Minibus

- 6 to 8 times faster than the 50kW charger
- Compliance with CCS OppCharge Protocol
- Solution for busy commercial vehicles operation

Gminnovations
GREEN MOBILITY



Swappable Battery Pure Electric Minibus

- Low entrance floor
- Battery swap: 7 minutes
- Passengers counting
- Seat-belt monitoring
- Fleet operation center



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New Energy – Electric Commercial Vehicles

12-Metre Plug-in Hybrid Electric Coach

- Pure electric driving mode: Zero emission
- 50% fuel saving compared with Diesel
- Capable for continuously operation without recharging (Diesel refill)
- Solution for busy commercial vehicles operation



gm innovations
GREEN MOBILITY

16-tonnes Pure Electric Truck

- Range: 200km per charge
- Charging: 1 hour battery charging time with 180kW off-board charger
- Gradient: Up to 20% with Localised PMSM and Automatic Transmission gearbox
- Chassis system: Universal design principles across Diverse Applications



環境保護署
Environmental Protection Department

香港廢物處理業協會
HONG KONG WASTE DISPOSAL INDUSTRY ASSOCIATION

Single-deck Pure Electric Bus

- Bus body: Lightweight, made of T6 grade aluminum
- Driving safety: Smart driving system
- Fleet management: Vehicle Data Cloud Network Platform



香港國際機場
HONG KONG INTERNATIONAL AIRPORT

香港防癌會
HONG KONG ANTI-CANCER SOCIETY
Since 1963

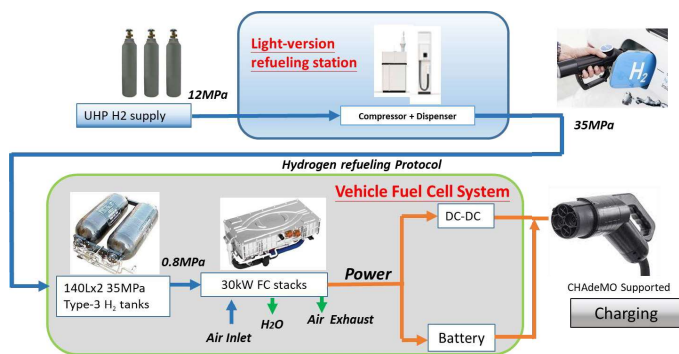
中國動力
China Dynamics

New Energy - Hydrogen Application



PEM fuel cell technology platform for EV mobile charging system

- Power output: 30kW
(Highest known power output fuel cell in Hong Kong)
- Commissioning: Deliver electrical power for EV charging with Hydrogen fuel cell
- Hydrogen refilling: 35MPa high-pressure system



35MPa Hydrogen Filling Station

PEM Fuel Cell Charger

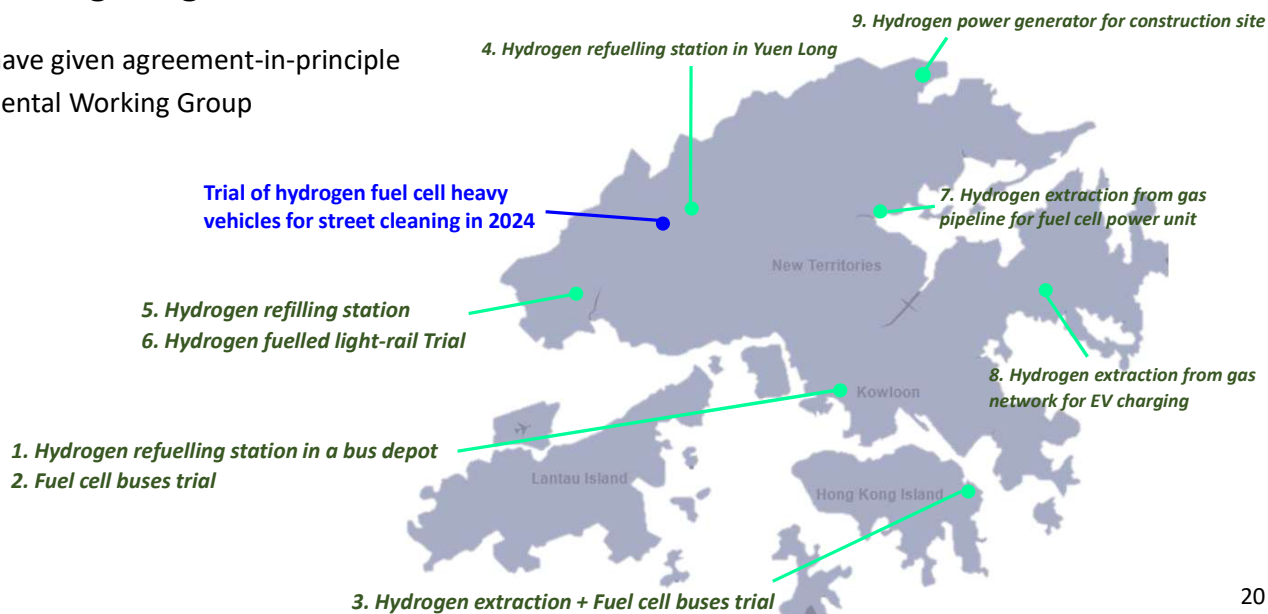


Recent Progress on Hong Kong Hydrogen Development



Trial Projects in Hong Kong

- 9 Trial Projects have given agreement-in-principle by Interdepartmental Working Group





香港氢能經濟發展報告及問卷調查結果

Hong Kong Hydrogen Economy Report and Survey Result

Oct 2023



Background and Objectives



Background

Clear Air Plan for Hong Kong 2035 to reducing carbon emissions and eventually Carbon Neutrality in 2050;

Exploring different types of zero-carbon energy and related technologies;

Hydrogen can play a key role as resilient and sustainable energy;

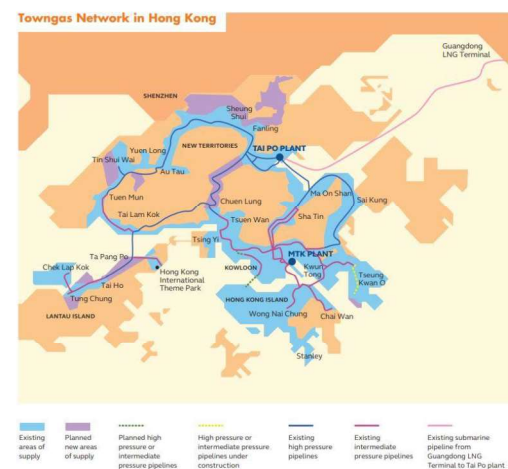
Disregarding of raw source of Hydrogen, Hong Kong has advantage over other cities that Hydrogen mixture distribution network throughout Hong Kong.

Objectives

Market analysis on current status of Hydrogen production, distribution, applications and impact on related industries in Hong Kong and other economies and countries;

Explore potentials, limitations and recommendation of using Hydrogen in Hong Kong;

Understand awareness, readiness, acceptance, and potential concerns on Hydrogen-related development among industrial stakeholders.



Methodology of Study



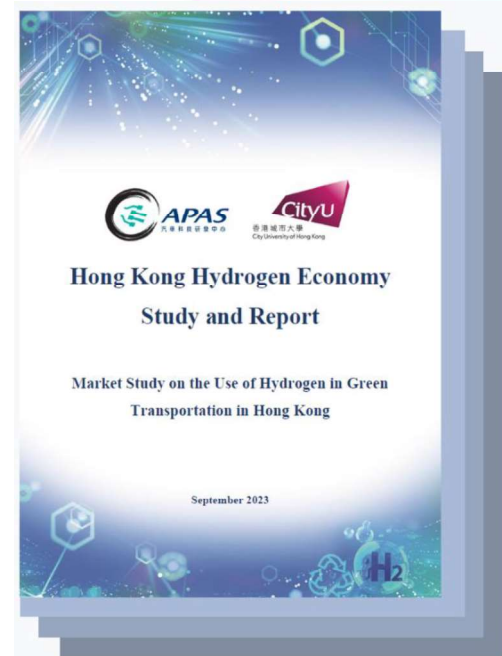
Conduct data research regarding global Hydrogen technologies;

Review recent activities in Hydrogen adoption, potentials and limitations in Hong Kong;

Conduct market survey with local key stakeholders (88 Responses)

- *To collect their views and concerns on Hydrogen adoption;*
- *To find out status of awareness, readiness, acceptance and potential concerns on hydrogen-related development among industrial stakeholders;*

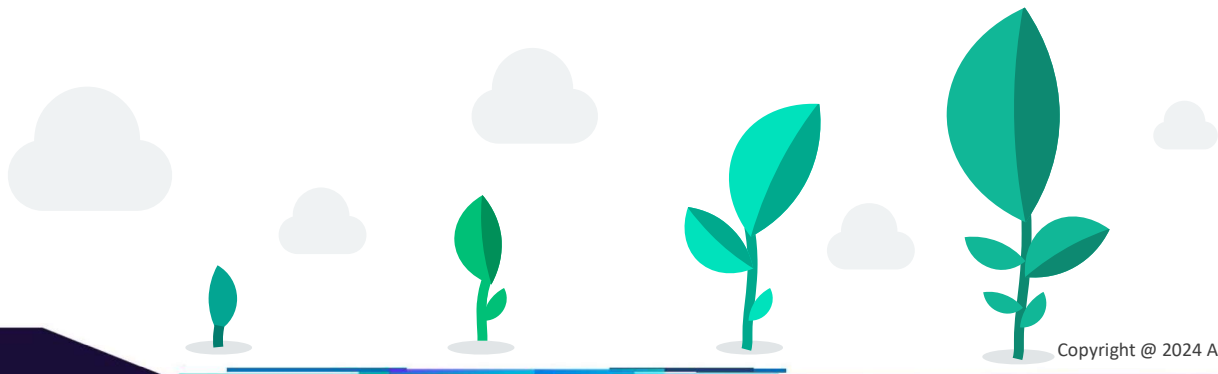
Provide recommendations to facilitate the development of Hydrogen economy in Hong Kong.



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Potentials in Application of Hydrogen in Hong Kong

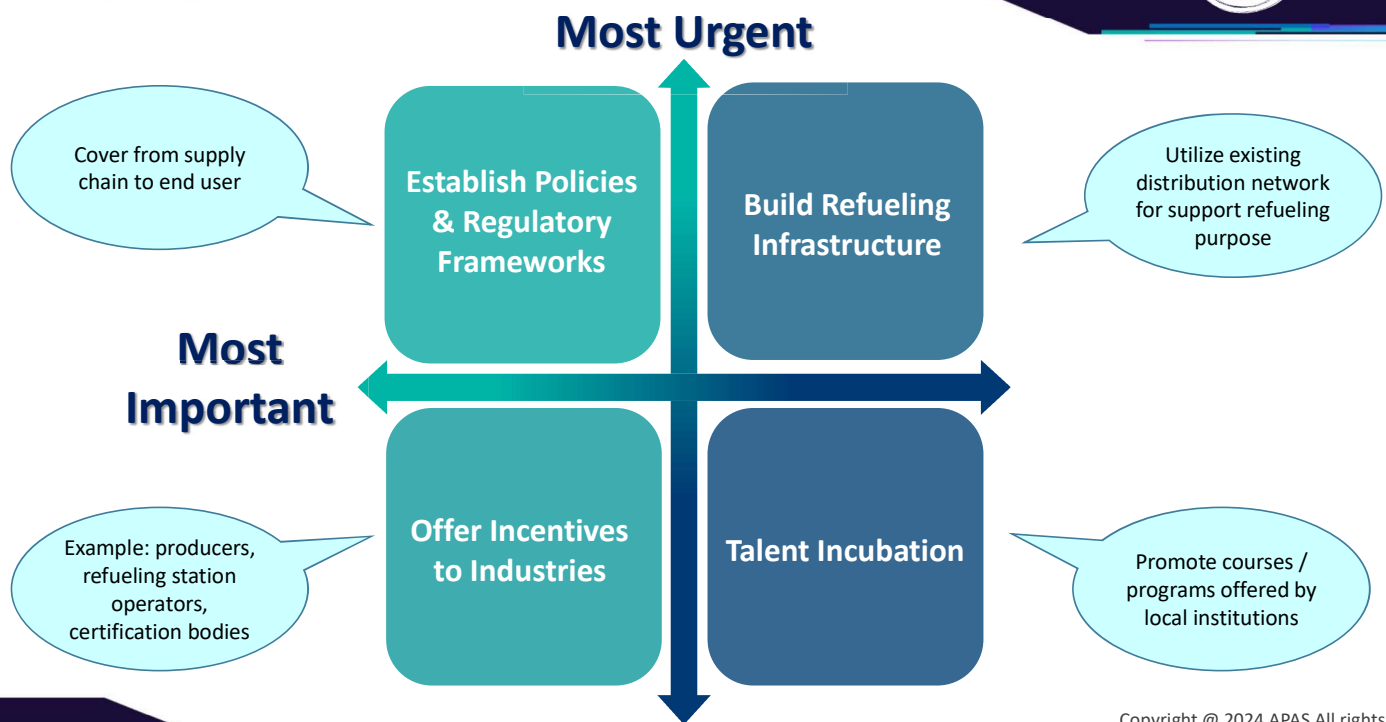
- Use Hydrogen in domestic ferries and intermediate-distance ferries;
- Apply Hydrogen combustion as source of energy in power stations;
- Use Hydrogen as fuel for Remote Area Power Systems, e.g. building sites;
- Develop Hydrogen refueling infrastructure from existing Towngas network (3,700km) across Hong Kong.



Limitations in Hong Kong

- Price of Hydrogen remains high compare with fossil fuel. A typical bus will need 20+ kg per fill to sustain reasonable range (300 – 400km);
- High cost of Hydrogen transportation from remote production site;
- Lack of refueling infrastructure and facilities;
- Lack of comprehensive regulations on utilization, transportation and storage of Hydrogen;
- Lack of large-scale use of Hydrogen by Industry Players in Hong Kong
 - √ Lack of scale means cost is high;
 - √ Insufficient motivation or incentive to use Hydrogen as fuel.







Christopher LUK



Dr. Louis YU

THANK YOU