# Managing Electric Vehicle (EV) Fires at Shell Recharge Sites

## Fire Safety Managers Seminar
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**Ng Yichun**
Mobility Singapore HSSE Manager

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# On top of a sizeable global network, Shell Recharge has a dominant presence in Singapore with >1,000 fully public chargers

### On-The-Go Charging

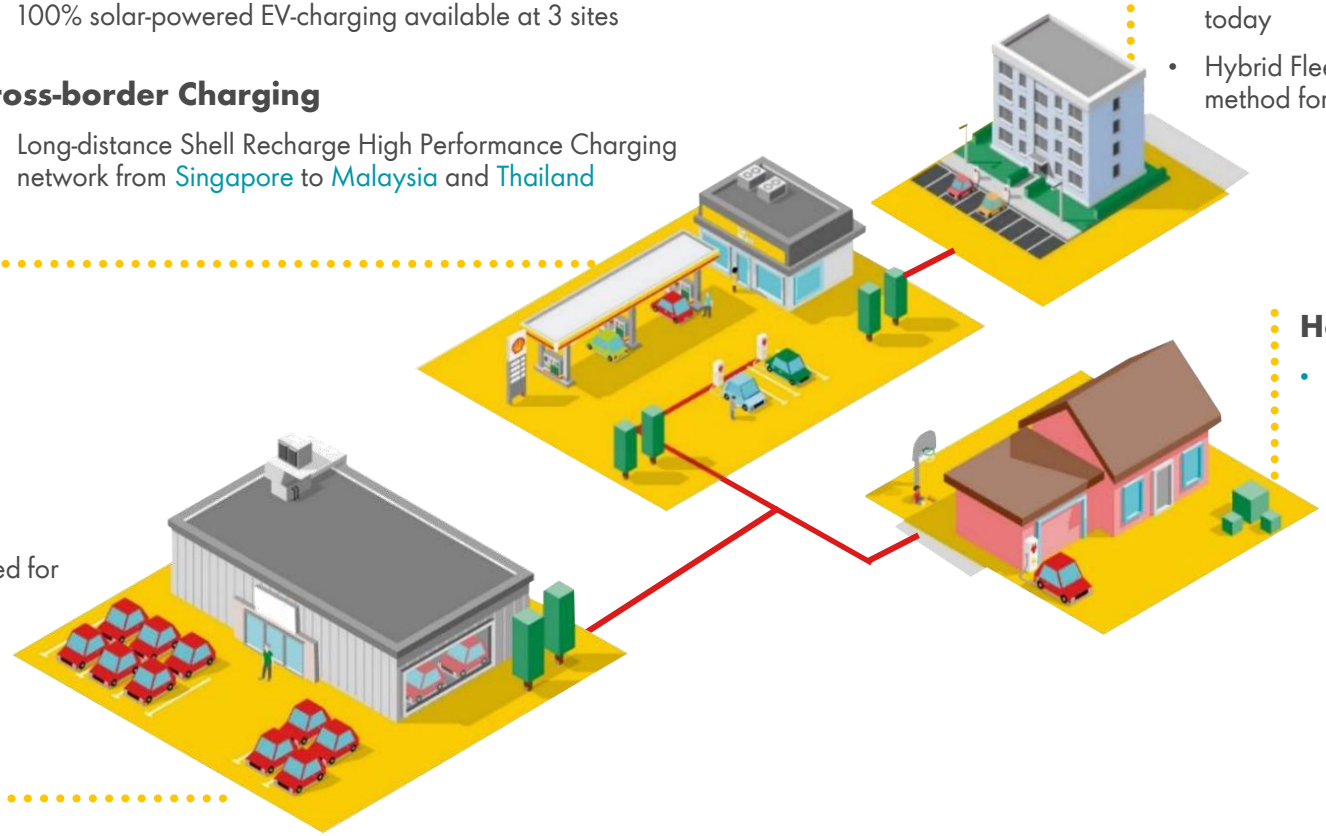
- Over 50% of our service stations are equipped with fast chargers
- 100% solar-powered EV-charging available at 3 sites

### Cross-border Charging

- Long-distance Shell Recharge High Performance Charging network from Singapore to Malaysia and Thailand

### Destination Charging

- Malls, offices, industrial sites, convention centres and more are equipped with slow and fast charging points today
- Hybrid Fleet Card & Shell Recharge App is the payment method for our customers



### Home Charging (Public Housing)

- >1,200 Shell Recharge charging points will be installed across 400 HDB carparks in the North and North East regions of Singapore

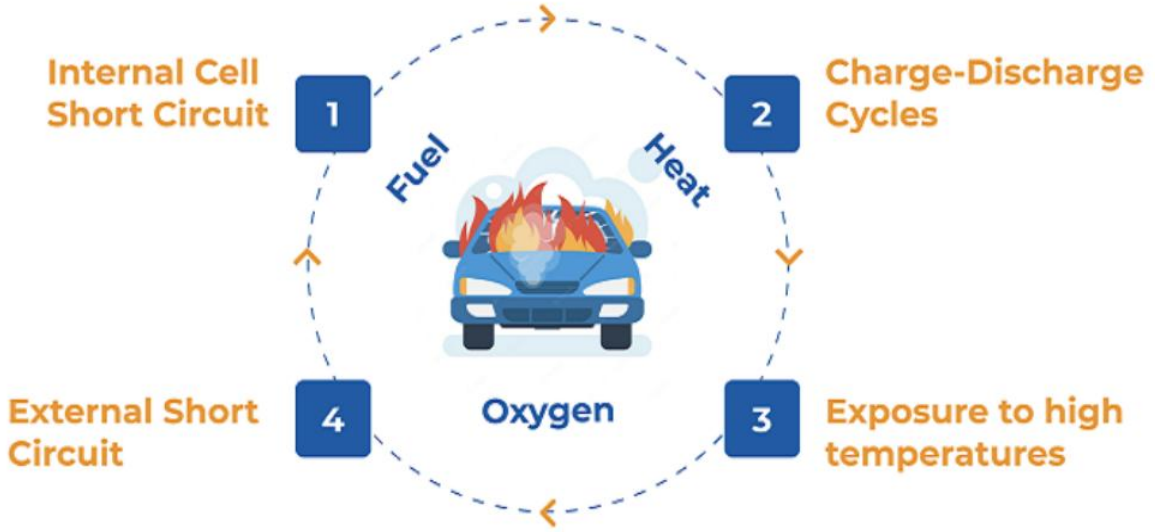
### Depot Charging

- Private Charging
- 960 charge points to be deployed for LTA by 2026

# Causes of EV Fires

Many causes can be attributed to battery pack damage, which exposes internal battery components to each other that are not chemically compatible causing a rapid exothermic chemical reaction leading to a potential fire.

This poses a different kind of challenge as compared to fire involving Internal Combustion Engine (ICE) vehicles (e.g. risk of electrocution and extreme heat from the affected battery if it undergoes thermal runaway).



# From LTA's Electric Vehicle Guide for Drivers: EVs are less likely to catch fire compared to other engine types

- Singapore's vehicle approval regime adopts the international automotive standards like the United Nations Economic Commission for Europe R100 (UNECE R100), which includes tests for both the vehicle body and high voltage battery.
- In addition, EVs are equipped with Battery Management System which ensures that the battery operates within safety limits while charging and discharging, thereby mitigating the risks of electrical, thermal or mechanical failures.
- EV chargers must comply with safety and performance standards under the Technical Reference 25 (TR25) before they can be type-approved in Singapore.
- The EV Charging Act also stipulates proper installation of EV charging facilities and mandates periodic safety inspections.

**Number of vehicular fires**

| | Combustion-engine | | EV | | Electric hybrid | |
|---|---|---|---|---|---|---|
| | Cases | Population | Cases | Population | Cases | Population |
| 2022 | 198 | 884,198 | 2 | 9,093 | 4 | 76,733 |
| 2021 | 152 | 895,270 | 1 | 3,713 | 2 | 65,192 |

Table: STRAITS TIMES GRAPHICS • Source: SCDF, LTA

# Pre-Planning for EV Fires – Guided by TR 25 Technical Reference for Electric Vehicles Charging System and Shell's Internal EV Technical Assurance Process


## Location of parking and charging stations for EVs

- Sufficiently remote from any hazard zones
- Relevant building regulations and requirements
- Considerations on fire suppression systems, proximity to fire hydrants and fire escape routes


## Emergency Stop Device

- At least 3 metres away but within 15 metres of EV charger and its associated parking lot and between 800 millimetres and 1.2 metres above the finished floor level.
- Clearly visible, easily accessible location and clearly labelled


## Emergency Response Plan

# Shell Internal EV Technical Assurance Process Overview

## 1. EV TECHNICAL ASSURANCE PROCESS OVERVIEW

| | Step A: Charging Equipment | Step B: Site Design | | | Step C: Installation, Comissioning & Handover |
|---|---|---|---|---|---|
| | | DAR 1 | DAR 2 | | |
| | | Site layout and design | Routing of Services, Cables & Incoming Feed | End-to-End (E2E) Integration of Electrical Infrastructure – Protection & Control Measures | |
| DESCRIPTION | Equipment manufacturers need to provide:<br>• evidence of third-party independent testing & certification in accordance to International Electrotechnical commission (IEC) standards or equivalents<br>• proof of equipment functionality + additional shell required safety features / options | • Site plans showing safe locations of proposed equipment (including transformer substation, power cabinets etc) along with the site hazardous zone drawings.<br>• Specific layout of charge bay and charging equipment. | Proposed drawings showing routing of electrical cables for both medium voltage (MV) and low voltage (LV) electrical infrastructure. | • This is the electrical validation of the E2E system to ensure the protective devices have been selected correctly and sized properly.<br>• A protection & fault level study or the design calculations (computer generated) for the system performed by a certified electrical engineer, is required for this stage. | Contractor accreditation, and on-site project management to include installation, commissioning and handover. |
| APPLICATION | This step is carried out **once per equipment model** | Assurance of the individual site designs shall be carried out for every project by Market TA3 (BC) in accordance with the mobility E2E process.<br>An additional Peer Review shall be carried out by Global SME as appointed by TA2 for every new "scenario".<br>A "scenario" is defined by having consistent; Country, TA3(BC), L2, Designer, Use case and EVSE OEM. | | | This is part of the proposed assurance process – green banding of contractors & site works management. |
| DONE BY | Global EV TA2 of Delegate | Project assurance = TA3(BC)-EV<br>Scenario assurance = Global SME (appointed by Global EV TA2) | | | Local |

# Guidelines from SCDF for CERT Response during an EV Fire

## CERT Response (Tier 1)

- CERT members must don full Personal Protective Equipment (PPE) with Self-Contained Breathing Apparatus (SCBA)
- Prioritise evacuation of personnel in nearby areas
- Establish a 15-metre cordon radius around the burning vehicle
- Set up water jets (if available and safe to do so) to cool the burning vehicle and surrounding structures/vehicles

## CERT Response (Non-Tier 1)

- Prioritise evacuation of personnel in nearby areas
- Establish a 15-metre cordon radius around the burning vehicle

## What staff can do to assist SCDF?

- Call 995 immediately to report the emergency
- Evacuate all occupants and inform SCDF of the make/model, license plate number and location of the fire (e.g. address, exact spot on EV like bonnet etc.)
- Provide a clear path for emergency vehicles to enter the premises

# Emergency Response Plan
# Manned versus Unmanned Sites

Manned Sites (located within Shell service stations)



Unmanned Sites (not located within Shell service stations e.g. public carparks, shopping malls etc.)


# Fire from EV at Shell Petrol Station (Manned Site)

**Emergency Response Actions:**

- Press the EV Emergency Switch Button located on the EV charger or at the forecourt to switch off electrical supply to Shell Recharge station.
- Call 995 immediately for SCDF.
- Raise the station's alarm by activating the nearest fire alarm call point.
- Assist any injured persons if it is safe to do so.
- Evacuate all customers to designated mustering point and close the station.
- Do not attempt to put out EV related fires.


Station staff are instructed to not to attempt to extinguish a fire that has already fully engulfed the EV as thermal runaway may be in progress.

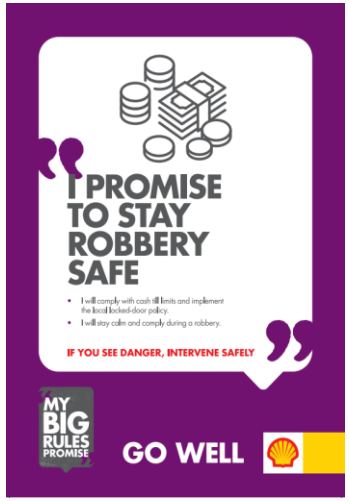
# Regular Emergency Response Exercises

Each Shell Service Station conducts emergency response exercises for various credible scenarios, including EV on fire.

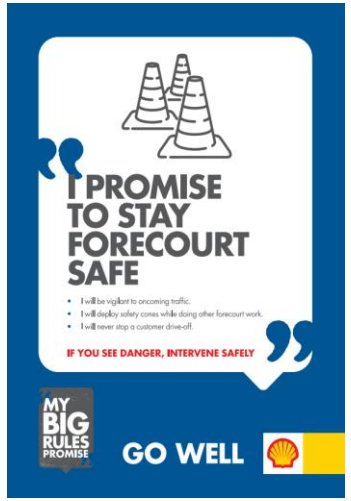
In 2024, Shell collaborated with SCDF to conduct a joint emergency response exercise at Shell Tampines Ave 2 station.

- Tested emergency response actions and interfaces with SCDF.
- Learnings from exercise documented and actions implemented for improvements.

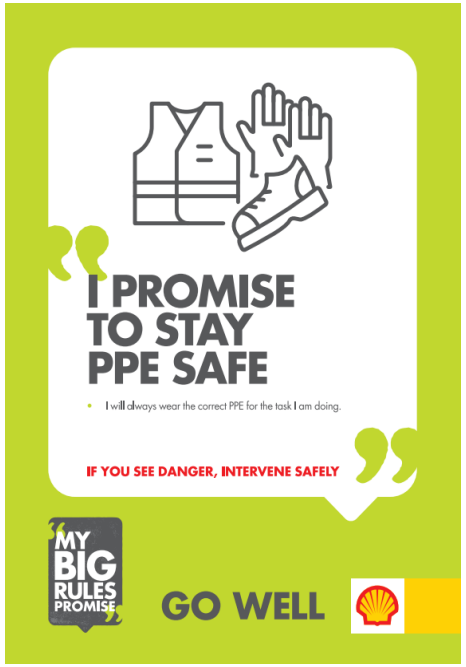

# Training of Staff (Service Champions) at Service Stations









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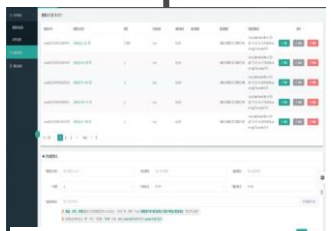
# Use of Intelligent Fire Detection and Alarm Technology in Shell China

- Edge and cloud platforms with real-time video analysis developed by Shell China in collaboration with Sinopec Safety Engineering Institute.
- Algorithms developed for various scenarios such as smoke and flame detection and movement of fire extinguisher.
- Pilot trials and improvements in progress.
- Expected outcomes include early fire detection, reduced reliance on manual monitoring and scalability.

Trial tests of smoke detection

Cloud Service Platform



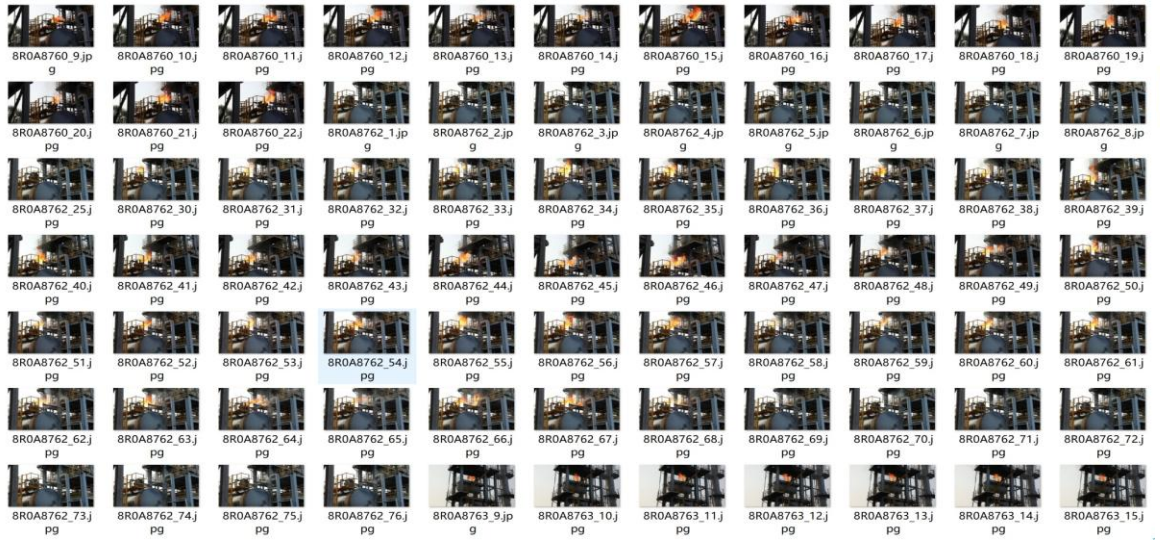
Edge Service Platform

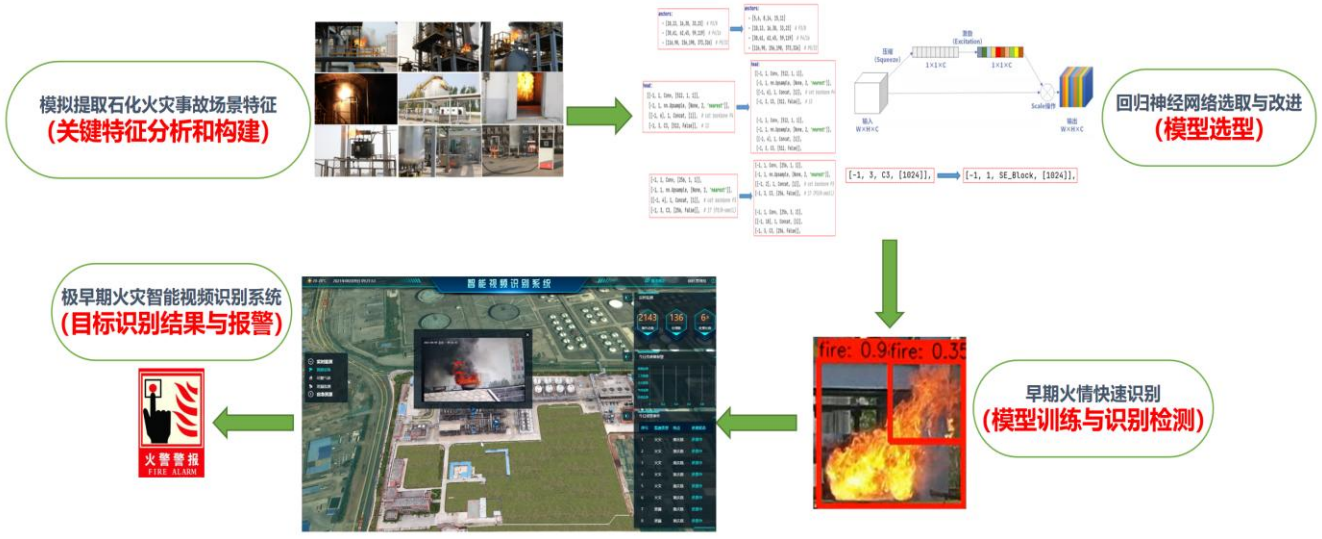
Site Analysis Equipment

# Use of Intelligent Fire Detection and Alarm Technology in Shell China

## Pilot Trial Flame and Smoke Detection Results from Sinopec Safety Engineering Institute

- High compatibility with existing CCTV cameras for early fire risk control.
- In pilot tests: flame detection rate = 100% and smoke detection rate = 83.3%
- Some false alarms due to headlight glare or camera angles.





# Closing


If you're considering installing EV chargers at your building or premises, scan this QR code to submit your contact details and we will be in touch with you as soon as possible.