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Fire Safety Asia Conference
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Fire Safety & Emergency Management: The Way Forward

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"Fighting the Pulau Bukom Fire – SCDF's Experience"

SCDF
The Life Saving Force

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- About Pulau Bukom and Incident Site
- The 32-hour fire
- Challenges, Operational Response and Lessons Learnt

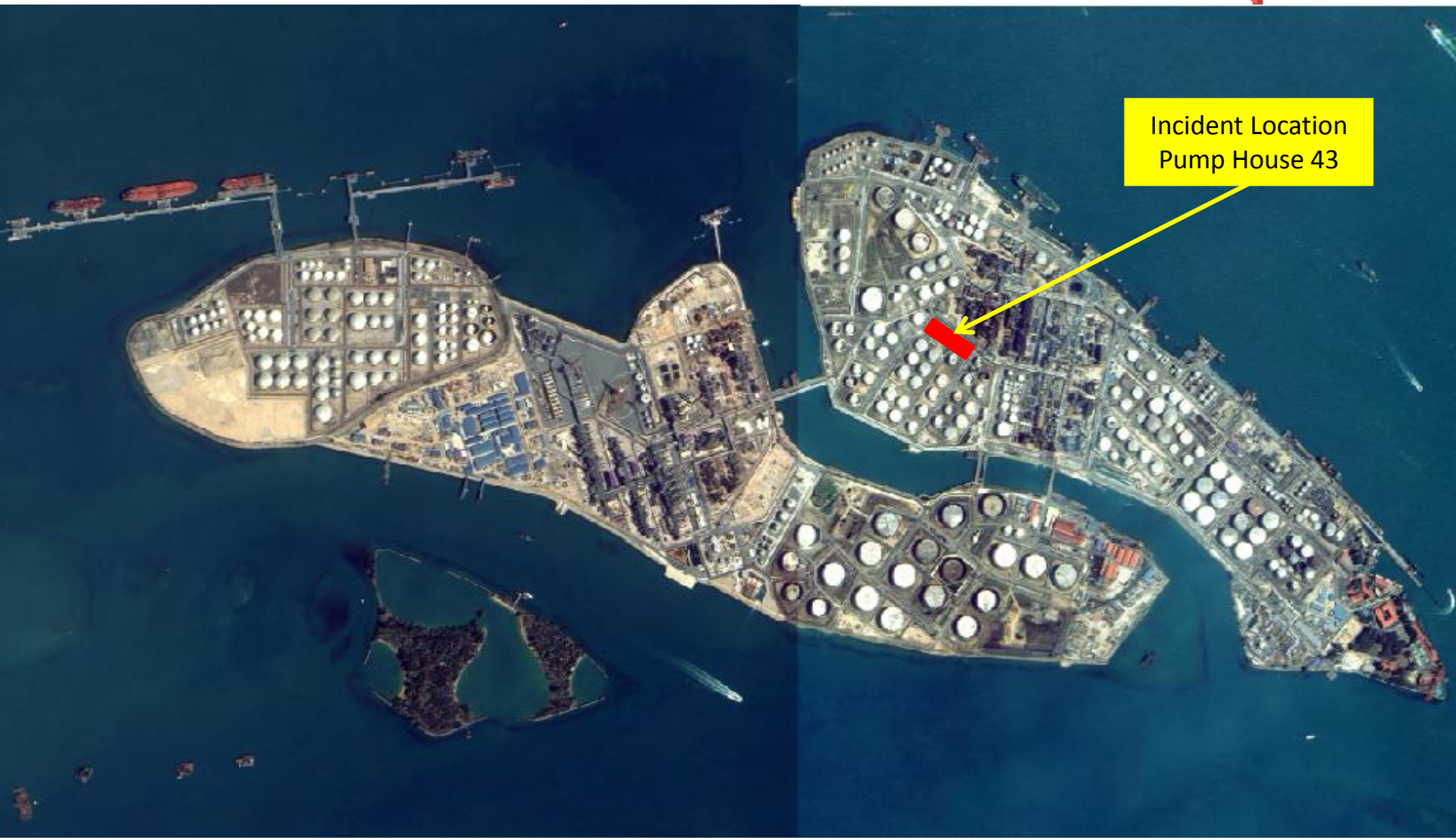


About Pulau Bukom

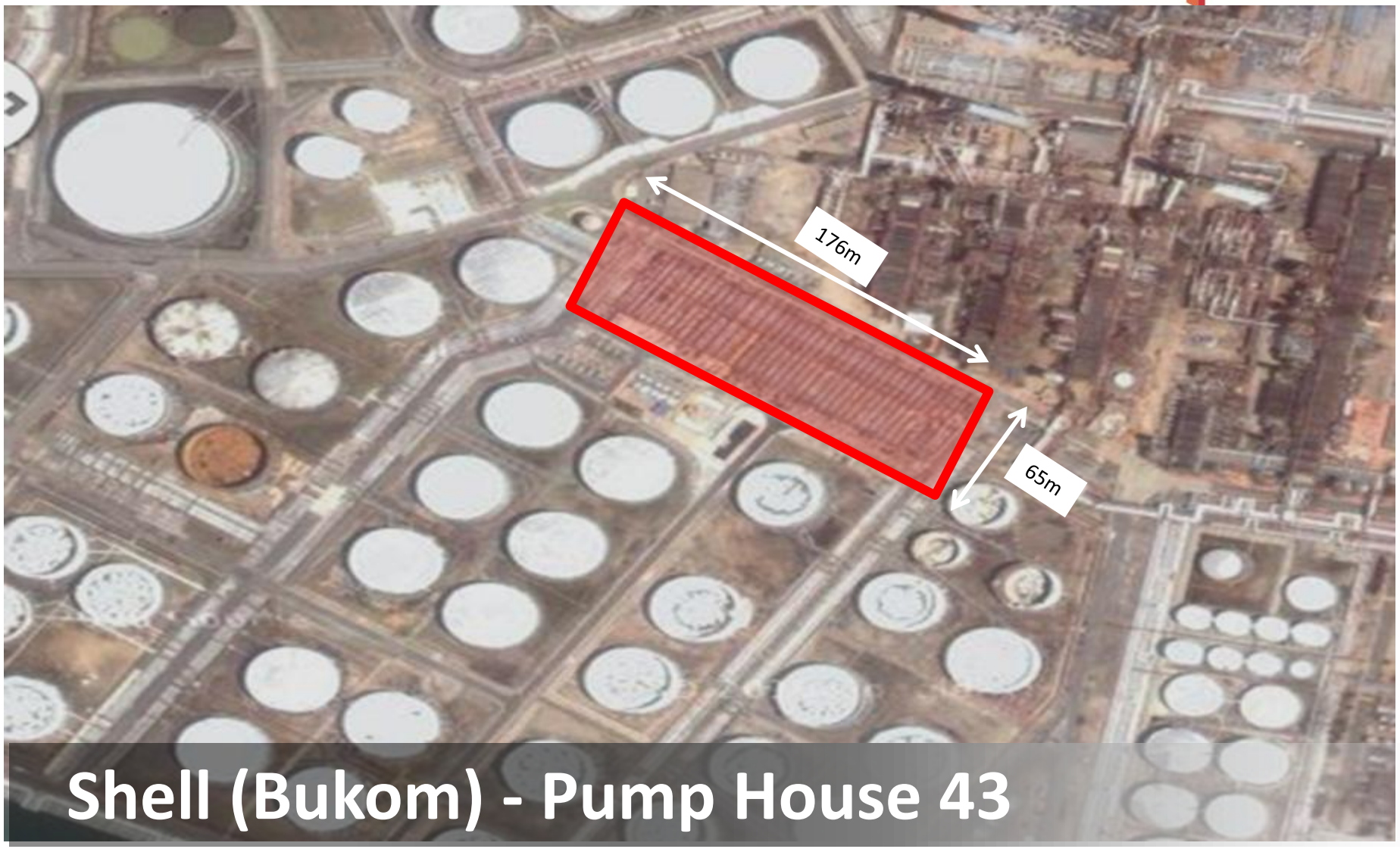
- Southern island of Singapore
  - 243 hectare
  - 5.5 km southwest
- Petroleum tank depot as early as 1891
- Singapore's first oil refinery in 1961



Pulau Bukom



Incident Site



Shell (Bukom) - Pump House 43

Pump House 43



Initial Scale of Fire

- **On 28 Sep (Wed) at 1315 hrs, fire broke out at west side of PH 43**





Situation Under Control

- **Extensive application of foam for several hours brought fire under control**



1st Escalation



Fire Fighting Continued

- **Following retreat from PH43, fire fighting forces were reorganised**



Situation Under Control

- On the morning of Day 2, one spot of fire remained in the middle of the pump house



2nd Escalation



Fire Fighting Continued

- **Mitigation efforts continued at 3 spots of fire at west, middle and east of PH43**





32 Hours Later…

- **All fires were fully extinguished**



KEY CHALLENGES

Offshore Island

- **Accessibility**
- **Insertion and movement of forces**



Complex Operating Terrain



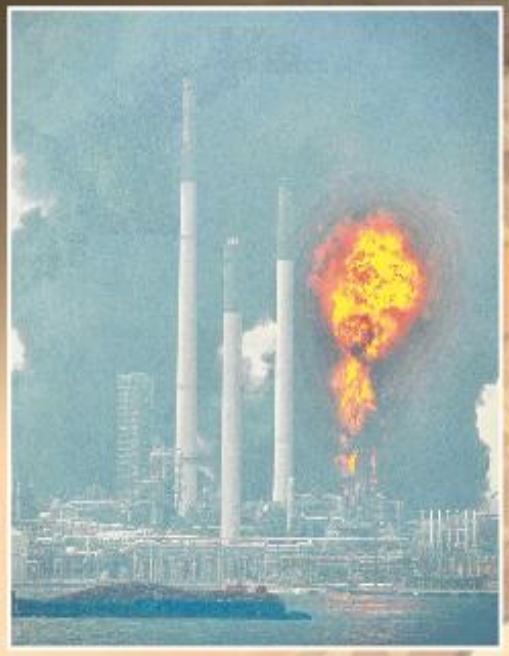
Surrounding Risks



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Fighting the Bukom blaze

How the fire at Shell's oil refinery was put out



A fireball caused by the second surge last Thursday at the Pulau Bukom refinery as seen from Pasir Panjang Road.

1.53pm: SCDF arrives and sets up large water jets to cool structures or extinguish fires. Foam is also being used to combat the blaze. They also create "water curtains" to cool and protect tanks containing hydrocarbons.

3 **6.35pm:** The fire escalates into a larger inferno, forcing firefighters out of the area.

4 **Sept 29, 11.45am:** The fire surges again, this time engulfing an area of the pump house containing liquefied petroleum gas. The heat is so great that four SCDF vehicles are badly damaged.

5 **2.40pm:** Firefighters finally bring the blaze under control.

WATER JETS

PUMP HOUSE 43

DAMAGED VEHICLE

TANKS CONTAINING HYDROCARBONS

NOTE: Not drawn to scale

SOURCE: SCDF

GRAPHICS: MIKE M DIZON TEXT: FRANCIS CHAN PHOTO: JOYCE FANG

Sudden Escalations



Prolonged Operations

- 32 hours of fire fighting
- 2 days of post-fire fighting operations
- 4 days of contingency standby on Bukom

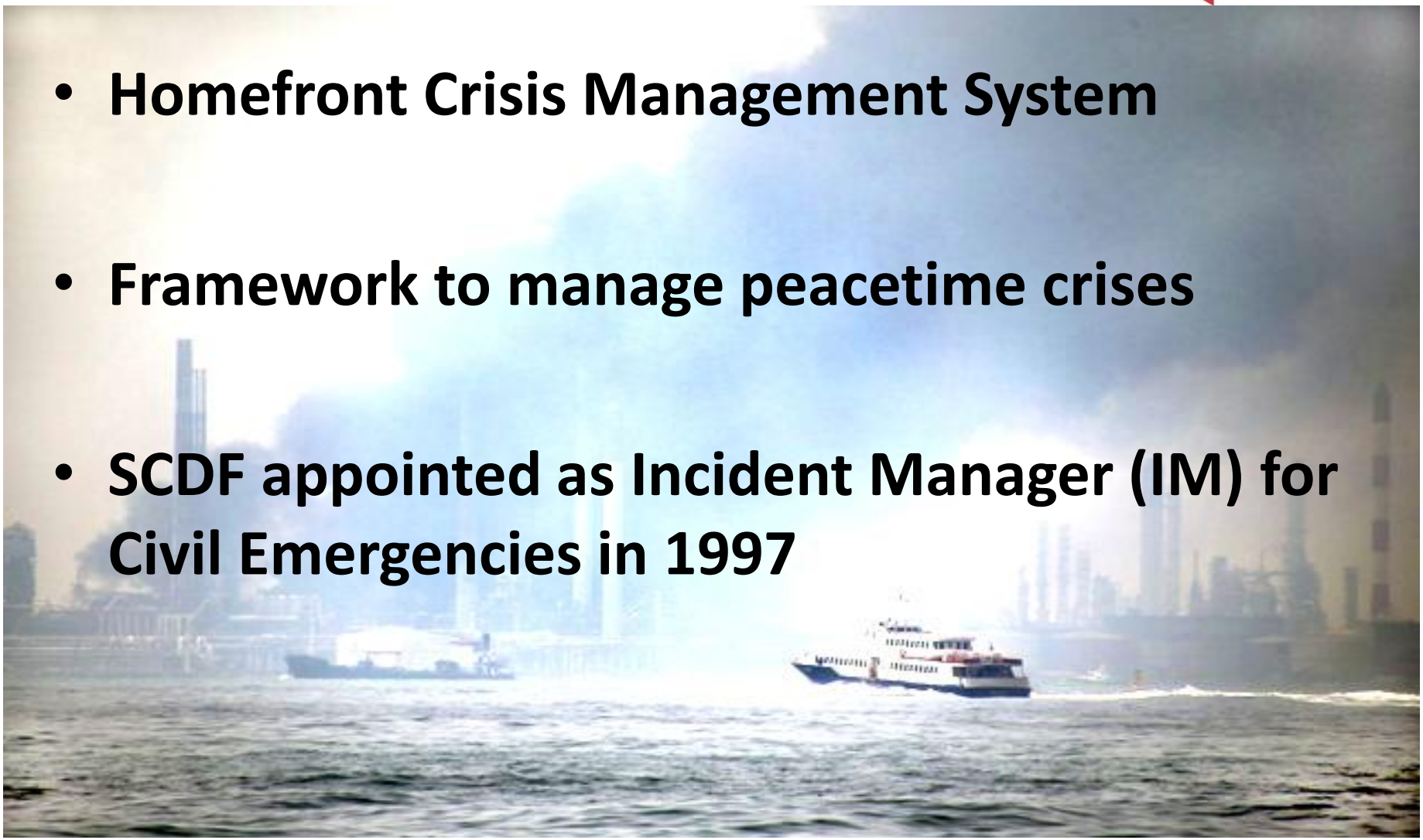






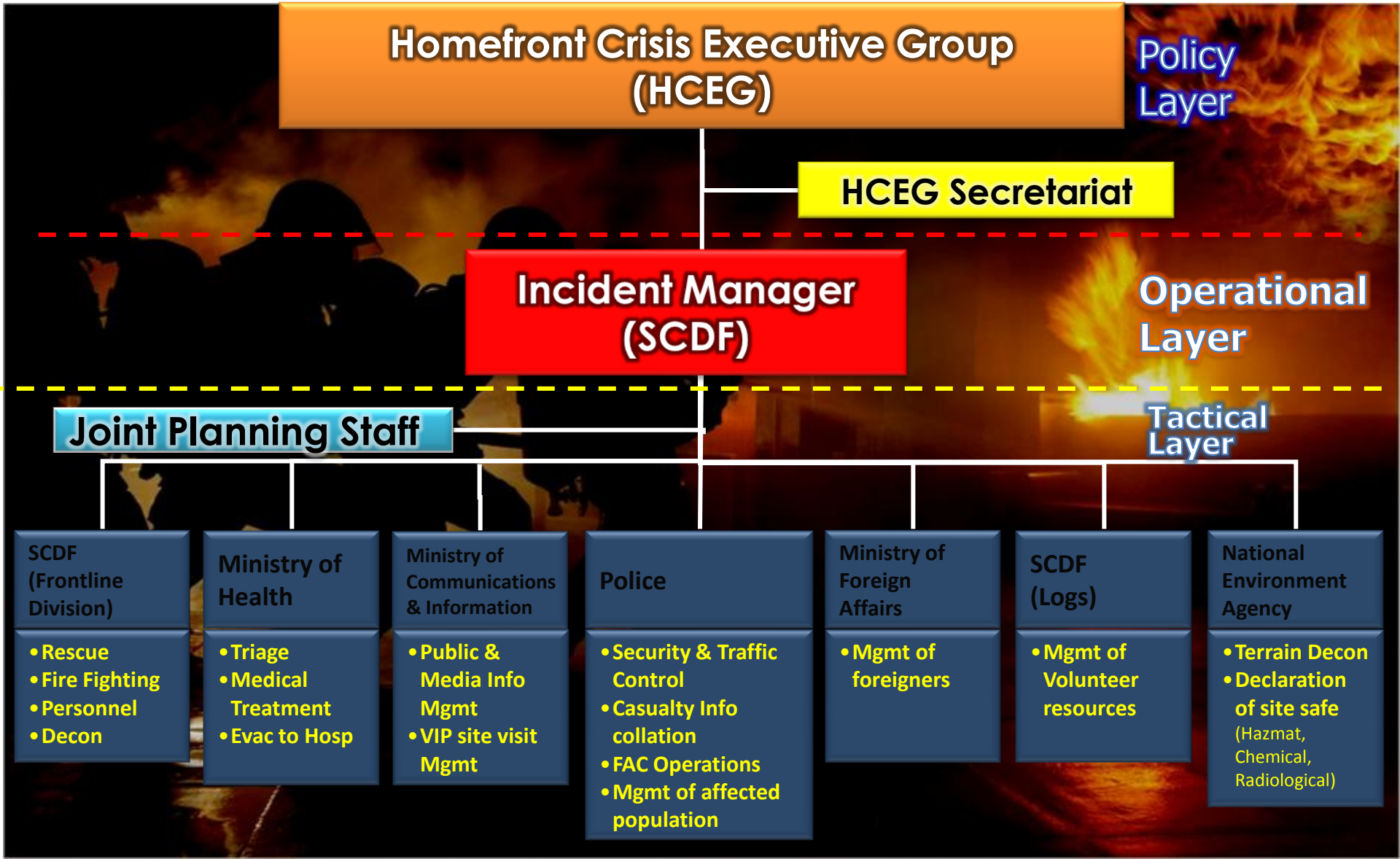
OPERATIONAL RESPONSE

Incident Management



- **Homefront Crisis Management System**
- **Framework to manage peacetime crises**
- **SCDF appointed as Incident Manager (IM) for Civil Emergencies in 1997**

Incident Management Framework



WoG ACTIVATION & INCIDENT RESPONSE

RELATED AGENCIES

Activation via SCDF's ARMS (2)



Activation (2)

Response (3)

995 Call to HQ SCDF Control Room

Incident occurs (1)





Incident Site

Fire Stations

Reinforcements

Div FCV and Tact HQ

Response (4)



Fire & Support Appliances
Ambulances
(Basic Task Force & Enhanced Task Force)

Despatch (3)

Graduated Response Concept

PHASE I Initial Response	PHASE II Enhanced Response	PHASE III Ops Civil Emergency (CE)
Company Emergency Response Team (if available) **Basic Task Force** **Fire Station Commander as Incident Manager**	**Enhanced Task Force** **Deployment of support appliances and Division Forward Command Post** **Division Commander as Incident Manager**	**Declaration of Ops CE** **Full set up of TACT HQ, MOH DSMC and various control points** **Commissioner SCDF as Incident Manager**





Build up of Forces

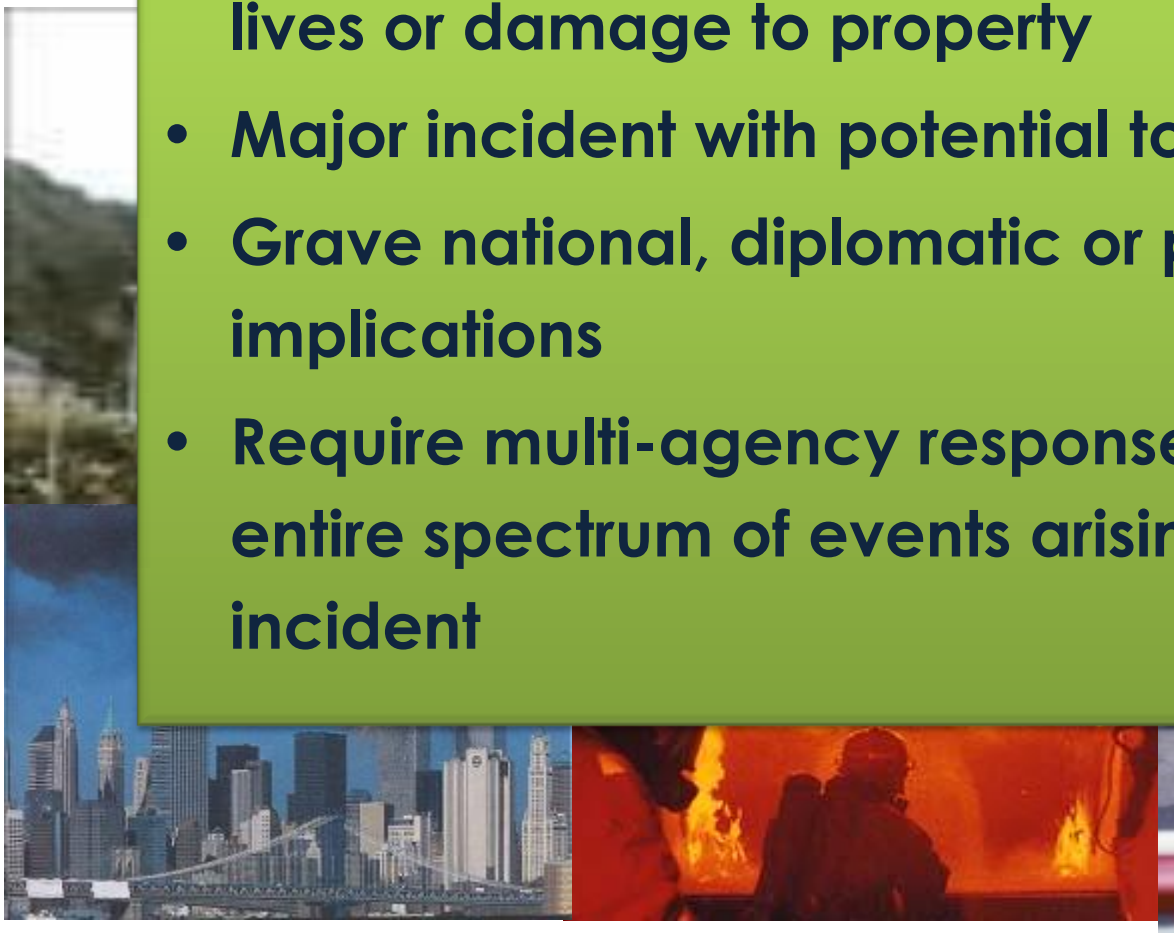
Operations Civil Emergency

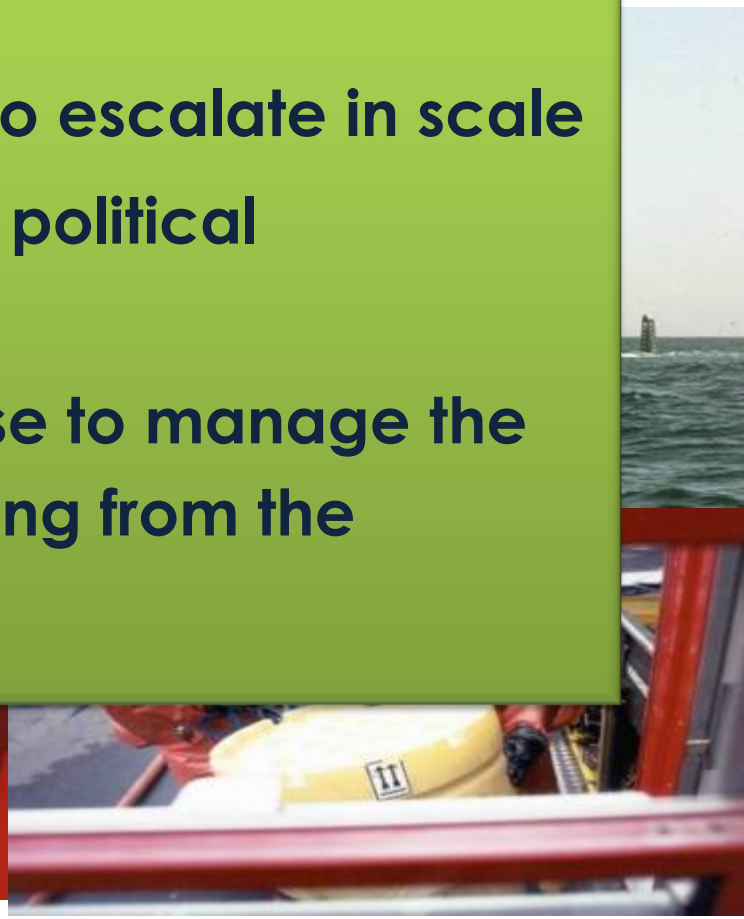
- **Operations Civil Emergency Plan (Ops CE)**
  - **National Plan for Major Disasters**
  - **Pre-determine agency roles and functions**
- **Agencies who have a role to play organized into Joint Planning Staff (JPS)**



Civil Emergency

- Sudden incidents involving large-scale loss of lives or damage to property
- Major incident with potential to escalate in scale
- Grave national, diplomatic or political implications
- Require multi-agency response to manage the entire spectrum of events arising from the incident





OPS CE Plan - Key Scenarios



- Structural Collapse
- Aircrash
- Hazmat Incidents
- Acts of Terrorism involving Chemical, Biological, Radiological and/or Explosive (CBRE) agents
- Accidents related to radioactive materials
- Major fires

Agencies involved in Civil Emergencies

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- Ministry of Foreign Affairs (MFA)
- National Environment Agency (NEA)
- Energy Market Authority (EMA)
- Public Utilities Board (PUB)
- Singapore Armed Forces (SAF)
- Singapore Police Force (SPF)
- Ministry of Education (MOE)
- Housing Development Board (HDB)
- Building Control Authority (BCA)
- Immigration & Checkpoint Authority (ICA)
- Ministry of Social and Family Development (MSF)
- Ministry of Culture, Community and Youth (MCCY)
- Ministry of Communications and Information (MCI)
- Ministry of the Environment and Water Resources (MEWR)

- Civil Aviation Authority of S'pore (CAAS)
- S'pore Mass Rapid Transit (SMRT)
- S'pore Bus Service Transit (SBST)
- Maritime Port Authority (MPA)
- Land Transport Authority (LTA)
- Info-Communications Development Authority (IDA)
- Singapore Tourism Board (STB)
- Defence Science Organisation (DSO-NL)
- Singapore Power (PowerGrid)
- Singapore Power (PowerGas)
- People's Association (PA)
- Monetary Authority of Singapore (MAS)
- Ministry of Transport (MOT)
- Ministry of Health (MOH)

Shell (Bukom) Fire Incident - 2011

- Ops CE was activated after the first escalation
- Forward deployment of Tactical Command HQ of SCDF
- Joint Planning Staff activated to assist IM
- IM framework and prompt support from relevant agencies were key to the success of operation

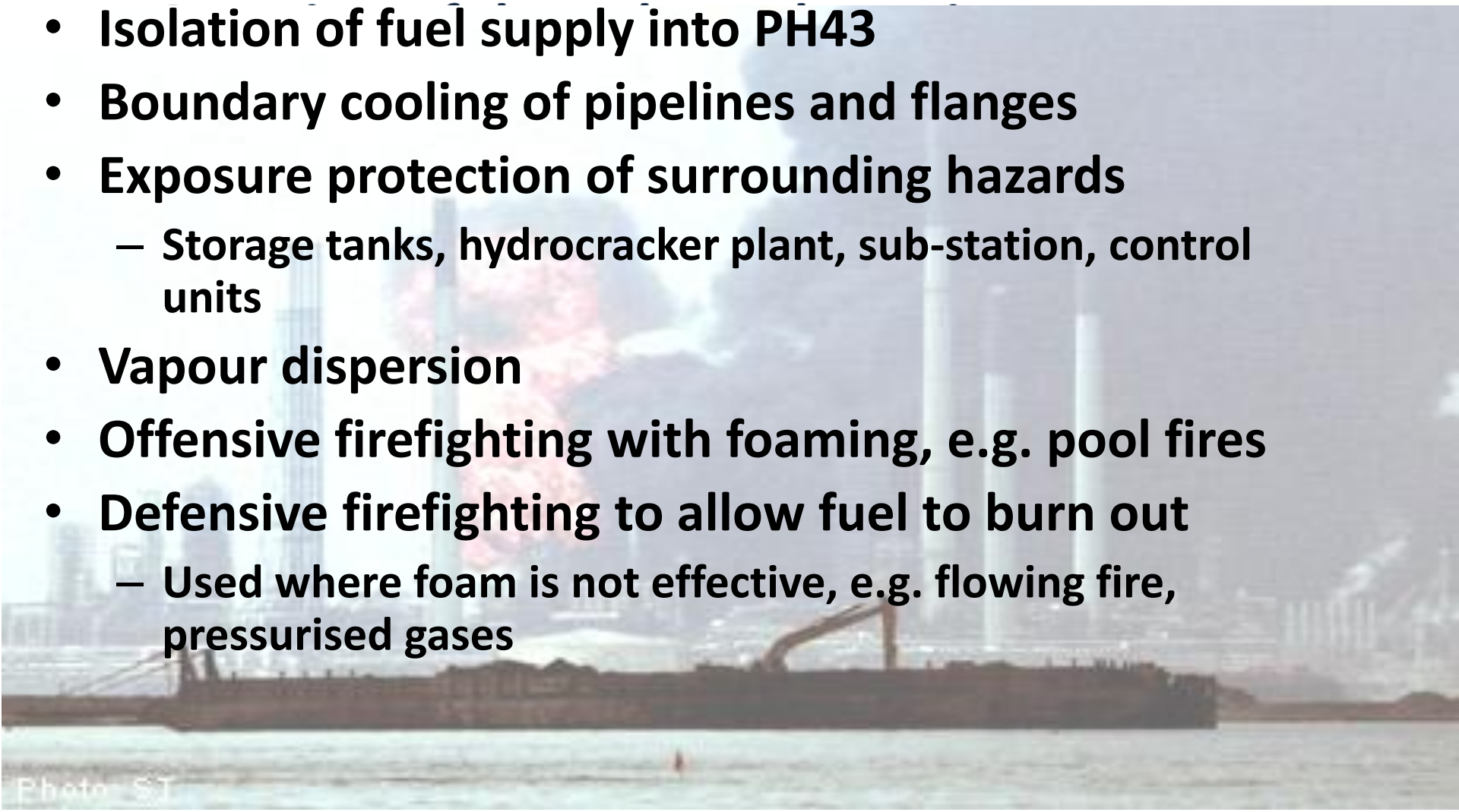


Incident Management

Related Agency	Key Role & Responsibility
Police	Security cordon, management of road and marine traffic and personnel evacuation
Army	Aerial reconnaissance and seaward movement of troops, equipment and vehicles
Maritime Port Authority of Singapore	Assist to control marine traffic and monitoring/mitigation of pollution at sea by run-off
National Environment Agency	Risk assessment, advise on pollution control issues and weather conditions and impact on operations

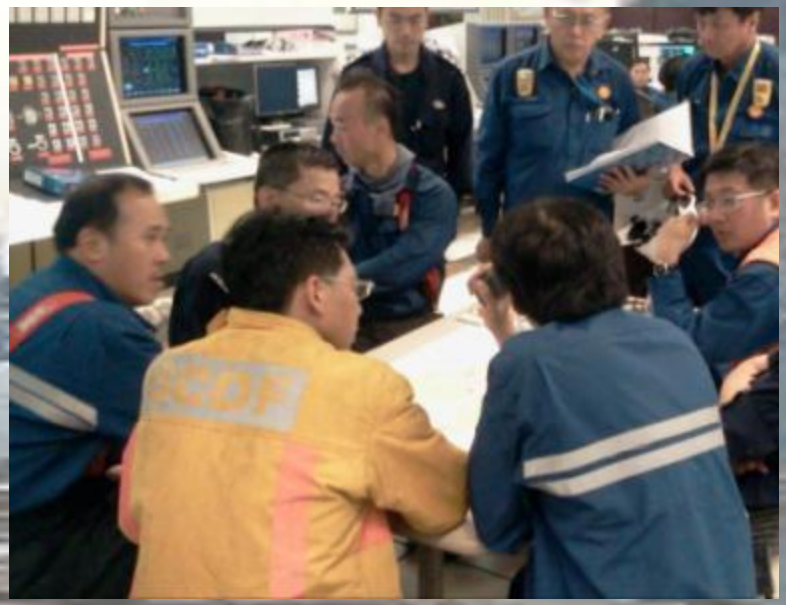
Response Strategies

- Isolation of fuel supply into PH43
- Boundary cooling of pipelines and flanges
- Exposure protection of surrounding hazards
  - Storage tanks, hydrocracker plant, sub-station, control units
- Vapour dispersion
- Offensive firefighting with foaming, e.g. pool fires
- Defensive firefighting to allow fuel to burn out
  - Used where foam is not effective, e.g. flowing fire, pressurised gases



Close Engagement with CERT

- **Regular discussion on strategy and tactics to be adopted with Shell Management and in-house CERT throughout the incident**





Mutual Aid

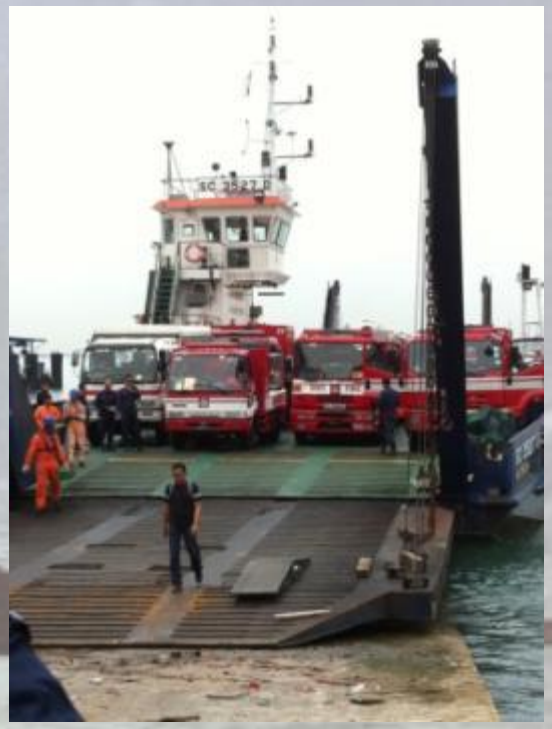
- **Mutual aid mechanism worked well**
- **First batch of mutual aid resources arrived about 3 hours after activation**



Contingency Planning

- **Pre-incident contingency planning enabled effective response**
  - **Smooth transport of personnel, more than 30 appliances and logistical supplies to Bukom**





On-Site Command Post

- **Badminton court at Shell club house was converted to 'all-in-one' on-site Command Post**
  - **Staging, resource**
  - **Rehab, logs & comms support**











In Summary

- **Safety is paramount**
- **Importance of in-house response plan, trained and competent CERT, regular exercises to validate plans**
- **Close cooperation and coordination with key govt agencies during incidents**

Conclusion

- **Consequence management framework and systems have proven to be effective**
- **CERTs play a vital role in emergency response**
- **Authorities and industries must continue to work closely together to ensure emergency preparedness**



THANK YOU