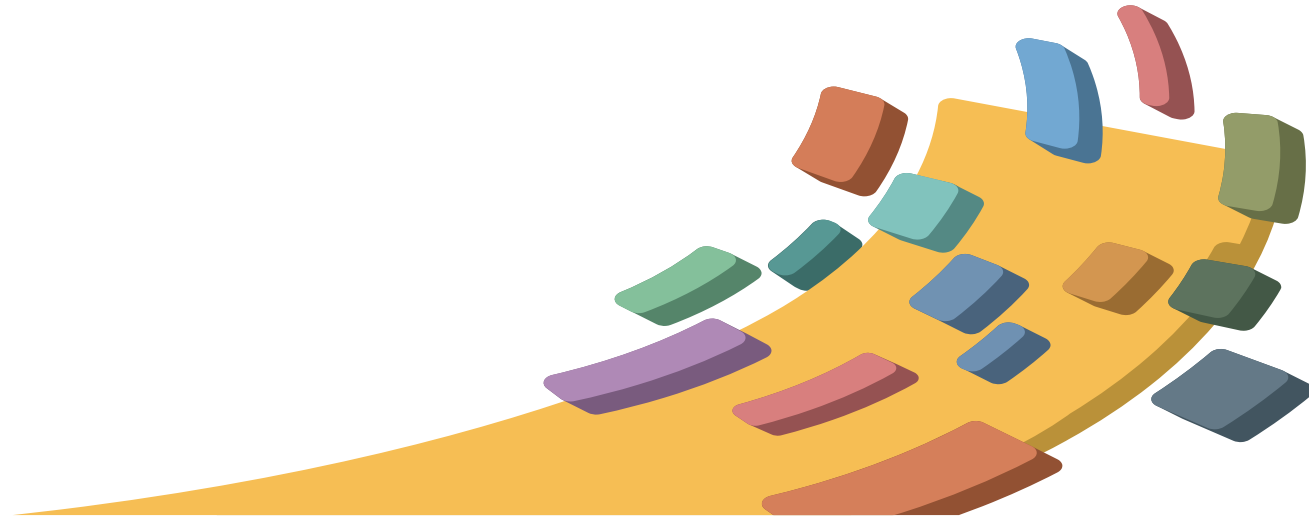


**ERC- Emergency Response Centre/  
EFFF – Enhanced Fire Fighting Facilities**



# Agenda :

- **Emergency Response Centre (ERC)**  
Background  
Limitations
- **Enhanced Fire Fighting Facilities (EFFF)**  
Alternate approach  
Risk Assessment Matrix  
Basic Parameters  
Indicative Equipment List  
Capex/Opex



## Back Ground - M.B. Lal Committee recommendation

- M.B. Lal Committee was constituted by MOPNG in 2009 to investigate Jaipur Fire accident. The committee, in its report dated 29.01.2010 has recommended for **setting up Emergency Response Centres (ERCs)** across the country, with advanced firefighting equipment & trained manpower available with them, wherever there is a cluster of locations of different Oil & Gas Marketing Companies (OGMCs).

## Background – Proposed Location of Initial ERC Concept

Initially 22 ERCs were envisaged, out of which 6 were to be set up on pilot basis

Oil and Gas Marketing Companies identified locations of **05 ERC, one each by IOCL, BPCL, HPCL, GAIL & ONGC** at places where land is available with the industry.

IOCL : Jaipur

BPCL : Manmad

HPCL : Vizag

GAIL : Pata (Dibiyapur)

ONGC : Hazira

➤ The proposed site for Jaipur ERC was the old IOCL Terminal at Sitapura, Jaipur.

# Background – Initial Concept of ERC

- Each ERC shall **cater to Level 3 emergencies (Disaster)** in OGMC clusters.
- **Level 3 Emergencies : Major Fire incidents at** Oil & Gas Installations involving multiple Oil/ Gas storage tanks or large bunded areas, **Major leakage** at POL/LPG/Gas Pipeline locations.
- **ERCs to be Self-sufficient** to respond and manage fire / emergencies.
- Every ERC to **cater to emergencies at locations situated within 300 kms from ERC.**
- Respond to fire/other emergencies at **affected locations within 5-6 hours of incident.**
- The ERC would be **equipped with advanced firefighting equipment**, other specialized resources including trained manpower.
- **Capex** estimated by consultant was approx Rs.~ 500 cr per ERC and Opex Rs ~20 Crore per ERC per annum

# Background-Largest Risk under Jaipur ERC

| <b>Location Name</b>                             | <b>Location type</b>              | <b>Location Name</b> | <b>Petroleum Storage Quantity (TKL)</b>              |
|--|-----------------------------------|----------------------|--|
| IOCL Pipeline Installation, Chaksu (Near Jaipur) | Pump station with Crude Tank Farm | Chaksu               | 360 TKL<br>(06 tanks @ 79 Mtr dia. each tank 60 TKL) |

# Background- Locations under Jaipur ERC

- The 102 number of OGMC locations, situated within a distance of 300 Km from Jaipur ERC, falling under Jaipur ERC response area were in Jaipur, Bharatpur, Ajmer, Chittorgarh, Jhunjhunu, Mathura, Ghaziabad, Faridabad, Delhi, Gurugram, Rewari, etc.

| Location type         | IOCL     | BPCL | HPCL | GAIL | ONGC | Total |
|-----------------------|----------|------|------|------|------|-------|
| Aviation Fuel Station | 2        | 3    | 1    | --   | --   | 6     |
| LPG Bottling Plant    | 8        | 4    | 5    | --   | --   | 17    |
| Lube Plants           | 1        | 1    | --   | --   | --   | 2     |
| Pipeline Location     | 36* (03) | 9    | 9    | 7    | --   | 61    |
| Terminal/ Depot       | 6        | 3    | 7    | --   | --   | 16    |
| Total                 | 53 (20)  | 20   | 22   | 7    | 0    | 102   |

# Background- Limitations of ERC concept

- **Response Time**

- ✓ More than 5-6 hours for location situated outside Jaipur

- **Water Source**

- ✓ Sourced from near by Water bodies ( max. distance 21 Km)

- ✓ Round the year availability

- ✓ Logistical Challenges

- **Uniform Risk Assessment : No differentiation based on**

- ✓ Cumulative storage / type of operations /cluster –standalone locations

- **High Capex & Opex**

# Background- Limitations of ERC concept

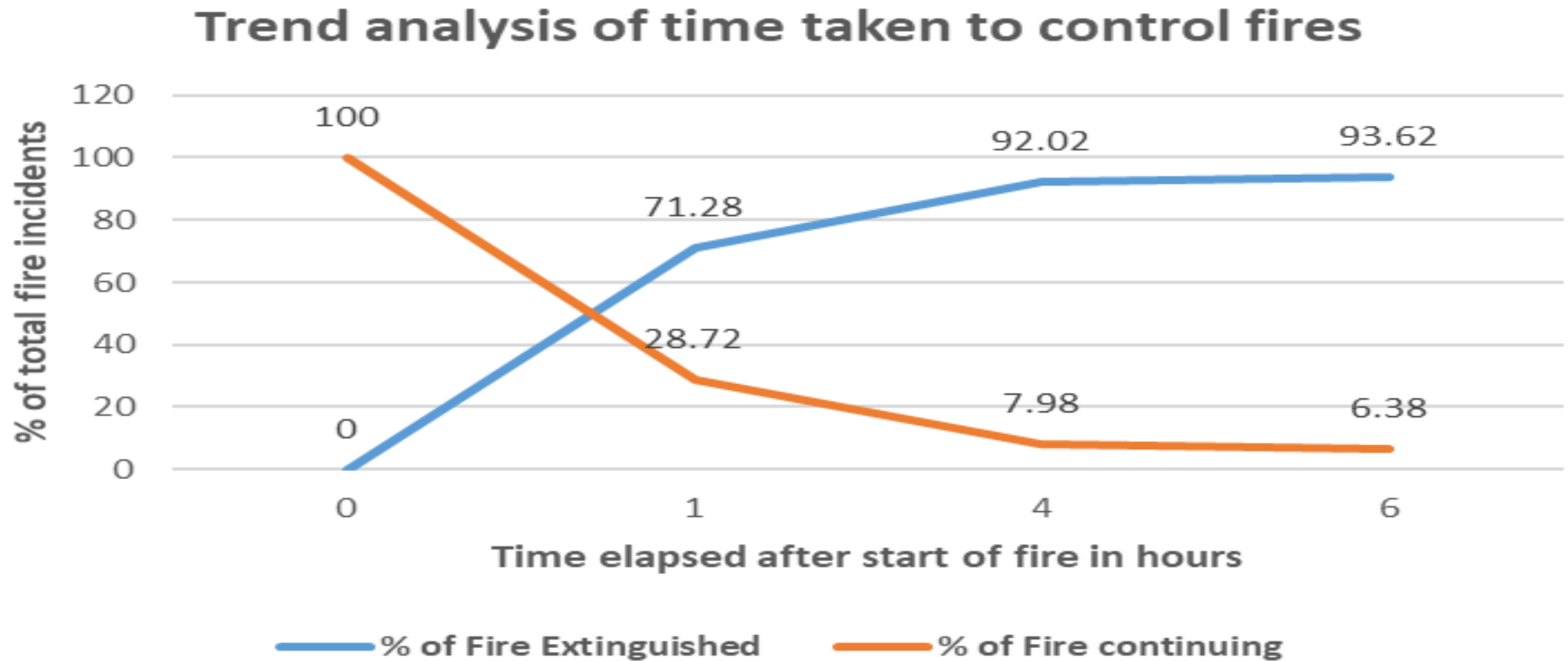
- In 41st Safety Council meeting held on 21st May 2024, members observed that ERC as a solution needs to be reassessed since better and cheaper alternatives have since become available and a review is warranted so that any potential infructuous expenditure is avoided
- MoP&NG constituted an eight-member Industry Committee to **“Assess effectiveness of the earlier proposed ERC and evaluate options/alternatives including ERC to improve fire fighting response in Oil and Gas installations in the country”**

# Fire incident in last 16 Years (April 2009 to March 2025)

| Down Stream             | Total      | Less than 1 hour | 1 to 4 Hour | 4 to 6 Hour | More than 6 Hours |
|-------------------------|------------|------------------|-------------|-------------|-------------------|
| Refineries              | 70         | 59               | 8           | 0           | 3                 |
| <b>Terminals/Depots</b> | <b>22</b>  | <b>15</b>        | <b>3</b>    | <b>0</b>    | <b>4</b>          |
| LPG Plants              | 11         | 9                | 2           | 0           | 0                 |
| Pipelines               | 21         | 14               | 6           | 0           | 1                 |
| Others                  | 2          | 1                | 0           | 0           | 1                 |
| Total Down stream       | 126        | 98               | 19          | 0           | 9                 |
| Upstream                | 62         | 36               | 20          | 3           | 3                 |
| <b>Total</b>            | <b>188</b> | <b>134</b>       | <b>39</b>   | <b>3</b>    | <b>12</b>         |

**Terminals/Depots are more vulnerable for fires exceeding 4 hrs duration**

# Trend analysis of time taken to control fires



# Alternative Approach

|          | Objective   | Critical Factors  |
|----------|---|---|
| <b>1</b> | <b>Prioritization of locations</b>                                      | <ul style="list-style-type: none"><li>• Risk Matrix of the locations basis storage, proximity, incident history for the type of locations</li></ul>   |
| <b>2</b> | <b>Control a fire emergency and prevent its escalation to Level-III</b> | <ul style="list-style-type: none"><li>• Design criteria</li><li>• Type of equipment &amp; Technology</li><li>• Location of response resources</li><li>• Operating Model &amp; Response time</li></ul> |
| <b>3</b> | <b>Optimize cost</b>  | <ul style="list-style-type: none"><li>• Hybrid model of owned and shared facilities</li><li>• Combination of new and augmented facilities</li><li>• Operating model</li></ul>                         |

# Alternative Approach - EFFF

## M.B.Lal Recommendation:

Wherever there is a cluster of terminals of different companies, an Emergency Response Centre equipped with advanced fire fighting equipment viz. fire tenders and trained manpower shall be considered on cost sharing basis or on outsourcing basis.



## Classification of Cluster:

### Proximity to other oil installations

- Proximity Cluster- Adjoining /across road
- Spread Cluster - Within 10 Km radius
- Isolated locations - Beyond 10 km radius

# Alternative Approach – EFFF - Risk Assessment Matrix

## Selection of Cluster:

| S.No | Cumulative storage (in TKL) | Standalone Location |        |      | Spread Cluster |        |      | Proximity Cluster |        |      |
|------|-----------------------------|---------------------|--------|------|----------------|--------|------|-------------------|--------|------|
|      |                             | Probability         | Impact | Risk | Probability    | Impact | Risk | Probability       | Impact | Risk |
| 6    | More than 300               | 3                   | 5      | 15   | 3              | 5      | 15   | 4                 | 5      | 20   |
| 5    | 200 to 300                  | 3                   | 4      | 12   | 3              | 4      | 12   | 4                 | 5      | 20   |
| 4    | 150 to 200                  | 3                   | 3      | 9    | 3              | 3      | 9    | 3.5               | 4      | 14   |
| 3    | 100 to 150                  | 2                   | 3      | 6    | 2              | 3      | 6    | 3                 | 3      | 9    |
| 2    | 50 to 100                   | 2                   | 2      | 4    | 2              | 2      | 4    | 3                 | 2.5    | 7.5  |
| 1    | Less than 50                | 2                   | 2      | 4    | 2              | 2      | 4    | 2                 | 2      | 4    |

Note: (1) Score 0-2: Very Low Risk (2) Score 3- 4: Low Risk (3) Score 5-9: Medium Risk (4) Score 10-14: High Risk (5) Score 15-19: Very High Risk (6) Score 20-25: Extreme Risk

### 1. Extreme Risk

- Proximity Cluster >200 TKL

### 2. Very High Risk

- Spread Cluster/Isolated locations > 300 TKL

### 3. High Risk

- Proximity Cluster 150-200 TKL
- Spread Cluster/Isolated location >200 TKL

# EFFF- Proposed Priority Cluster

## Proximity Clusters (Product Terminal)

|    |            |     |               |
|----|------------|-----|---------------|
| 1. | Kandla     | 7.  | Bijwasan      |
| 2. | Manmad     | 8.  | Irumpanam     |
| 3. | Vijayawada | 9.  | Visakhapatnam |
| 4. | Manglia    | 10. | Paradip       |
| 5. | Jalandhar  | 11. | Ennore        |
| 6. | Loni       | 12. | Panipat       |

## Spread Clusters (Product Terminal)

|     |        |     |        |
|-----|--------|-----|--------|
| 13. | Kanpur | 14. | Haldia |
|-----|--------|-----|--------|

## Proximity Clusters (Crude Oil Terminal )

|     |        |     |         |
|-----|--------|-----|---------|
| 15. | Mundra | 16. | Vadinar |
|-----|--------|-----|---------|

1. Marketing Clusters, in the vicinity of refineries, can be considered for extended support from Refineries
2. IOCL's Crude Oil Terminals at Chakshu and Viramgam have capacity >300 TKL. IOCL may review firefighting facilities at these locations for enhancement if required

# EFFF- Proposed Parameters

- Tank fire - Full surface fire in a floating roof tank (roof sinking scenario) or full surface fire in a fixed roof tank with roof dislodged are most critical contingencies
- Foam application rate in full surface fire considered as **9.75 lpm/m<sup>2</sup>**
- Uniform cooling of tank considered @ **3lpm/m<sup>2</sup>**
- Foam application rate, duration and cooling of adjacent tanks are most critical to control escalation of an emergency in Terminals.
- Availability of sufficient quantity of foam and water and uninterrupted application to effectively quench a fire is also critical ( Foam concentrate for **95 minutes**)
- Approximate response time - **40 minutes** after receipt of intimation

# EFFF- Proposed Parameters

| S. No. | Criteria  | Existing  | Proposed  |
|--------|---|---|---|
| 1      | Definition of Contingency Scenarios for determining Foam and fire water storage/ flow rate etc. | <p>On installation basis –</p> <ol style="list-style-type: none"> <li>1. Two simultaneous major fires (without roof sinking case)</li> <li>2. Single full surface fire (roof sinking case) on largest floating roof tank</li> </ol> | <p>Two additional contingency scenarios on cluster basis –</p> <ol style="list-style-type: none"> <li>1. Full surface fire (roof Sinking case) on the largest cone/floating roof tank in biggest location and simultaneously one other major fire (non roof sinking case) at other than the biggest location</li> <li>2. Same as above except locations reversed</li> </ol> |

# EFFF- Proposed Parameters

| S. No. | Criteria  | Existing  | Proposed   |
|--------|---|---|--|
| 2      | Foam Application rate for full surface fire roof sinking case   | 8.1 lpm/m <sup>2</sup> of oil burning surface   | 9.75 lpm/m <sup>2</sup> ≤ 60 m dia tank<br>12 lpm/m <sup>2</sup> >60 m dia tank  |
| 3      | Foam discharge duration for full surface fire roof sinking case | 65 minutes  | 95 minutes   |
| 4      | Cooling of tanks in the same dyke for exposure protection       | Within R+30 M – 3 lpm/m <sup>2</sup><br>Beyond R+30 m – 1 lpm/m <sup>2</sup> of shell surface | 3 lpm/m <sup>2</sup> for all tanks in the same dyke as the tank on fire  |
| 5      | Fire water flow rate for supplementary stream                   | 4 single hydrant Outlets<br>(hydrant outlet at 36 m <sup>3</sup> /hr)                         | 4 single hydrant outlets and 1 HVLR<br>(hydrant outlet at 36 m <sup>3</sup> /hr and monitor at 228 m <sup>3</sup> /hr<br>Total: 372 m <sup>3</sup> /hr.) |

# EFFF- Foam Application Rate & Duration & Cooling rate



**Foam application rate  
= 9.75/LPM/m<sup>2</sup>**

**Clause 6.8 – OISD-STD 116 (2025)**  
(Derived considering a multiplication factor of 1.5 to compensate for losses on basic foam application rate of 6.5 lpm/m<sup>2</sup> as per NFPA-11)



**Foam application rate  
= 9.75/LPM/m<sup>2</sup>**

**NFPA-11 (2024)**

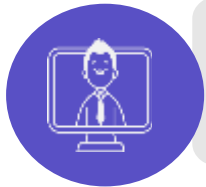
Derived considering a multiplication factor of 1.5 as per Clause 5.2.4.2.1.2, on the basic foam application rate of 6.5 lpm/m<sup>2</sup> as per table 5.2.4.2.2, to compensate for potential foam losses due to wind and other ambient conditions as stated in Clause 5.2.4.2.1.1)



**Foam application rate  
= 12/LPM/m<sup>2</sup> for tanks  
dia. above 60 m**

**BS-EN -13565 -2 (2018)**

As per Table D-2 and clause 4.1.2  
Foam application Rate is 12LPM/m<sup>2</sup>



**Foam application Duration  
= 95 Minutes**

**Clause 6.8 along with note OISD-116**

Considering 65 minutes as per Clause 6.8 (ii) plus 30 minutes as per advisory in relevant note to Clause 6.8 to keep additional foam compound for extended 30 minutes for full surface fire scenario



**Cooling rate – Uniform 3LPM/m<sup>2</sup>**

Water flow calculated for exposure protection for tanks located within the same dyke area at a rate of 3 lpm/m<sup>2</sup> of tank shell area

# EFFF- Indicative Equipment of EFFF

|                         | Item   | Qty (no's)  |                          | Item  | Qty (no's)  |
|-------------------------|--|-------------|--------------------------|---|-------------|
| <b>Mobile Equipment</b> |  |             |                          |   |             |
| 1                       | Vehicle Mounted BIS/UL/FM Listed variable flow Remote Operated HVLR (2000-4000-6000) or (4000-6000-8000) gpm capacity                            | 2           | 12                       | Industrial grade drone (UAV) with high-resolution optical and thermal imaging cameras   | 1           |
| 2                       | Vehicle mounted Foam Nurser of 10 KL Capacity fitted with 4500 LPM deck Water cum foam monitor with online (Self adjusting) variable flow nozzle | 3           | 13                       | VHF Sets  | 4           |
| 3                       | Vehicle mounted Hose laying and rewinding machine  | 1           | 14                       | PPE , Other communication facilities  | As required |
| 4                       | 12-inch flexible hoses of 500 m length each  | As required | <b>Foam system</b>       |   |             |
| 4                       | Portable WCFM (2000- 4000) GPM   | 4           | 15                       | AR-AFFF atmospheric storage tank of net capacity 21KL MOC SS 304 Min thk-6mm  | 3           |
| 5                       | Foam Tender - 10 KL (4KL water +6KL Foam) with 1000 GPM remote operated water cum foam monitor.  | 1           | 16                       | Motor Driven Gear Foam pump with capacity 66m3/hr @ 120 MLC for topping up Foam Nurers & Pumps for topping up of tanks  | 2           |
| 6                       | SCABA  | 4           | 17                       | Foam concentrate AR-AFFF @ 3%   | As required |
| 7                       | Fire proximity Suit  | 5           | <b>Fire Water System</b> |   |             |
| 8                       | Quick attack monitor nozzle (750 LPM)  | 4           | 18                       | Fixed 400 mm dia IS 3589 pipeline from EFFF location to each of the cluster location up to one point in the licensed area along with necessary isolation facilities | As required |
| 9                       | Quick multi-purpose nozzle (900 LPM )  | 4           | 19                       | Additional Fire water storage tank  | As required |
| 10                      | Fire Hose 63 mm  | As required | 20                       | Additional Fire engine  | As required |
| 11                      | MEFG (1200 LPM)  | 4           |                          |   |             |

# EFFF- Proposed Parameters

- EFFF will be located at the biggest location by storage volume in the cluster
- EFFF to be created as a common user facility or on joint ownership basis
- Capital costs to be shared equally by participants
- EFFF will have fixed, mobile equipment, communication facility, PPE and consumables like foam and water
- Total staff for EFFF - 16 trained fire personnel, 4 in each shift. In case of emergency all to report.
- Estimated CAPEX - in the range of ₹50–75 crore per EFFF
- Annual OPEX - approx. ₹1.5 crore per EFFF

# EFFF- Proposed Parameters

- Foam/ Water requirement to be recalculated basis norms proposed. If existing facilities not sufficient then additional to be created as new or by augmentation under EFFF
- Fire water tankages of all the installation in the cluster to be interconnected with proper isolation and protocol
- EFFF fire water pump house whether new or augmented will be connected at least up to one point in all the installations by permanent piping for HVLR purpose from where it can be connected thru flexible hoses
- Proposed primarily for cluster of terminals for the downstream industry

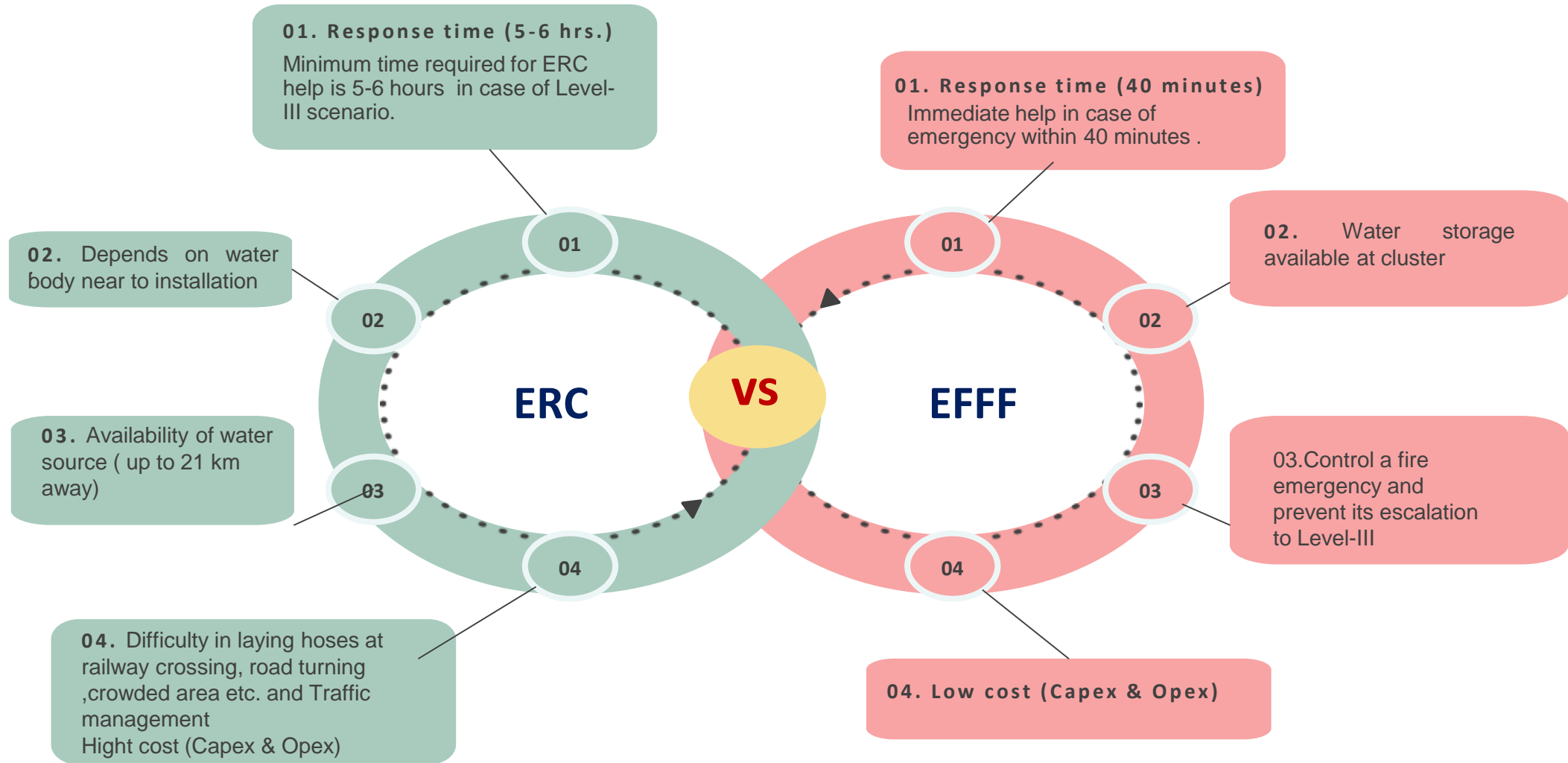
# EFFF- Management of EFFF

- EFFF located at the biggest location and installation in-charge of that location will be EFFF in-charge and will be responsible for creation, upkeep & emergency readiness of EFFF. EFFF crew will report to him.
  
- **Cost sharing structure :**
  - All capital and normal operating expenses to be shared equally
  - In case on an incident, all expenses for providing assistance from EFFF including consumables and for damage caused any to EFFF equipment to be paid by organization where incident has occurred
  - EFFF to be a separate cost center with proper accounting of expenses and documentation

# EFFF- Way Forward

- EFFF Proposal was presented in the 43<sup>rd</sup> Safety Council Meeting dt 07.10.2025
- The Safety Council, after deliberations, unanimously accepted and approved the proposal for establishing Enhanced Fire Fighting Facilities
- OMCs (IOCL, HPCL & BPCL) should initiate actions as proposed in the Committee report
- Other downstream oil companies including joint ventures/private companies having major terminal/ tank farms can also join the EFFF arrangement of OMCs on cost sharing basis, if their terminals/ tank farms are in the close proximity of the priority clusters

# Old ERC concept Vs New Concept

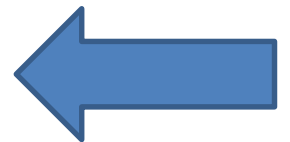


**Thank You**

# Background- Cost details (ERC - Jaipur)

| SN. | Particulars  | Estimated Project Cost<br>(Rs in crore) |
|-----|--|---|
| 1   | Land   | -                                       |
| 2   | Equipment (including duties/ taxes)  | <u>298.29</u>                           |
| 3   | Civil work   | 37.54                                   |
| 4   | Fixed firefighting system, HVAC  | 4.69                                    |
| 5   | Instrumentation & Control systems  | 9.18                                    |
| 6   | Electrical   | 5.52                                    |
| 7   | Additional water tanks   | 24.50                                   |
| 8   | Miscellaneous Expenses (Consultancy, Construction Period Expenses, Furniture, amenities, Statutory etc.) | 13.87                                   |
| 9   | GST@18% (excluding SI No.2)  | 17.16                                   |
| 10  | Subtotal (1 to 10)   | 410.75                                  |
| 11  | Design allowance @ 5% of SI No 10  | 20.54                                   |
| 12  | Contingency @ 5% of SI No 10   | 20.54                                   |
| 13  | CER (2% upto ₹ 100 crore + 1.5% for ₹100 crore-₹500 crore)   | 7.27                                    |
| 14  | Subtotal with contingency & CER (10 to 13)   | 459.10                                  |
| 15  | Interest during construction (IDC)   | 27.14                                   |
| 16  | Total Project Cost (gross- incl. contg., CER & IDC) [14+15]  | 486.24                                  |
| 17  | Less: ITC available  | 2.29                                    |
| 18  | <b>Project cost (net of ITC) [16-17]</b>   | <b>483.95 (Say 484)</b>                 |

| Equipment    | Cost in<br>(INR Cr) |
|--------------|---------------------|
| Indigenous   | 123.74              |
| Imported     | 174.55              |
| <b>Total</b> | <b>298.29</b>       |



# Assessment of Response time of ERC

- As per concept of ERC, two teams will start from ERC on receiving the message from affected location,
  - Initially both teams will travel towards the affected location .
  - After reaching closer to the location , 1<sup>st</sup> team will head towards the affected location, while the 2<sup>nd</sup> team will head towards nearest identified water body for making arrangement for pumping of water from water body to the affected location through fire hoses . 1<sup>st</sup> team after reaching the affected location shall position fire fighting equipments to be in readiness for fire fighting .
- **Minimum time required to start fire fighting by ERC team will be sum of time required by 1<sup>st</sup> team to reach the affected location and time required by 2<sup>nd</sup> team for pumping the water from water body to affected location.**

# Assessment of Response time of ERC

- To have realistic assessment of the time that will be required by ERC Jaipur team to respond to Level 3 emergency at various locations covered under ERC at Jaipur, **following assumptions have been considered:**
- **Average speed of ERC Fire fighting vehicles is considered @ 25 Km/Hr.**
  - ERC vehicles come under category of heavy vehicles and will move in convoy.
  - Speed of ERC vehicles will depend on terrain, traffic density & condition of road. Further , weather and visibility conditions during monsoon & winters seasons will also impact travel speed.
- **Average time taken by 2nd team to start pumping of water to affected location**
  - Activities involved in pumping the water from nearest water body to the affected location :
    - Reaching the water body & making action plan for deployment of pumping equipment.
    - Unloading of equipments & lowering of submersible pumps into water body & connection with portable Gensets for operation.

# Assessment of Response time of ERC

- Laying of 12” Super Large Dia Hose (SLDH) from water body to the affected location with Hose laying vehicle. Length of Fire fighting hoses to be used : 250 metre (big hoses – 72 nos) & 50 metre (small hoses – 60 Nos)
- Interconnection of hoses from water body to the affected location with multi plug coupling.
- Booster pump will be connected @ every 3.0 Km laying of fire hose.

**In view of all the above-mentioned activities, it can be safely assumed that 2nd team will require minimum one hour for every 4 km of Fire fighting hose laying (1 Km hose will be laid in 15 minutes ) before starting pumping of water .**

**Considering all the above-mentioned factors, a realistic time assessment for ERC team to start fire fighting operations at affected IOCL locations covered under ERC Jaipur ERC shall be **9 hours to 17 hours** to start firefighting operations at locations situated outside Jaipur.**

# Sourcing of Water

- ERC fire fighting capabilities & response time are dependent on availability of water body in the vicinity of affected location
- At many locations (e.g. Bharatpur, Chittorgarh, Jhunjhunu) there is no perennial source of water near IOCL locations and as such there is no utilization of ERC for these locations.
- Consultant has envisaged usage of 3x30,000 LPM Hydraulic Submersible Pump and 3 x 30,000 LPM Booster pumps for pumping of water from water body to affected location .

# Sourcing of Water

- The maximum flow rate considered is 5400 KL/Hr. @ distance of 3.5 Km and minimum flow rate considered is 900 Kl/Hr. @ distance of 21 Km from Waterbody .
- **Availability of sufficient water in the waterbody to pump water at the above-mentioned flow rate throughout the year particularly in summer season might be a difficult .**
- **Further , pumping of water from water body to affected location through 300 mm dia flexible fire hoses does not appear to be a feasible option in view of the following challenges :**
  - Difficulties in laying Hoses across railway lines, road turnings, crowded areas, bridges etc.
  - Traffic management by local administration from water body to site of fire.
  - Reserved corridor for hose laying vehicle from water body to site of fire would be difficult to be maintained for hours throughout the fire fighting.

