Sea-port Gateway for Perishables

Cold-chain: Future Plans

STRANDED COLD RECOVERY

India Ports and Shipping Conference

November-2014
New Delhi, India
The largest producer of milk (140 million tons).
Largest producer of mangoes (15 million tons).
Largest producer of bananas (29 million tonnes).
Largest buffalo livestock (105 million), exporting 2.1 million tons in animal products.
Second in fruit (84 million tons) and vegetable production (170 million tons).
Third-largest producer of fish (9 million tons).
Third largest pharmaceutical producer, 8% of global production.
Coastline is more than 7,500 km long.

Interspersed with more than 200 ports.

International cargo: 95% by volume and 75% by value is carried by sea.

Ports capacity 1,247 million tonnes, doubling by 2017.

Railways: 87,087 km, across 7,083 stations and operates more than 18,000 trains every day.

4.2 million km Roads: National Highways - 76,818 km, State Highways - 154,522 km, District Roads - 2,577,396 km, Rural Roads - 1,433,577 km.
not a single perishables gateway!

Containerisation at 20%.

Ports a bottleneck for perishables.
**Consumption Trends**

- GDP USD 1.9 trillion from USD 0.95 trillion in 2006 (+100% in 7 years).
- Spending growth: $991 billion in 2010 to $3.6 trillion by 2020 (5.8% of global consumption, doubling from 2.7%).
- 1,870,000 Consumer Food outlets (2012).

### Increase in consumer class
- Quality & Hygiene consciousness
- Increased Demand for (Cold Chain) Quality Foods
- Rise in income and purchasing power
- Easy consumer credit
- Change in consumer mindset

### India Spends on
- Food and Grocery: 60%
- Others: 17%
- Clothing and Fashion: 10%
- Electronics: 6%
- Beauty and Wellness: 4%
- Furniture and Fixtures: 3%

Source: Boston Consulting & CII, IRIS, MoSPI- Govt of India.
Natural gas is refrigerated to convert into liquid form for purpose of shipping.

Volume is reduced, 1 ship needed instead of 600 ships.

At receiving port, the LNG undergoes regasification process before supply to consumers.

During Regasification energy is shed to environment.
What is Regasification

- Regasification is simply, a **reheating process**.
- Liquefied gas is boiled off or vaporised for ease and safety of end use handling.
- Free source of heat is used - by circulating seawater or blowing atmospheric Air. The transferred cold is discarded, lost back to air.

Almost 500kWh energy/t LNG is used when readying for shipment. Most of this energy can be easily recovered.

- Stranded cold is a zero CO₂ emission energy source at each LNG port terminal in India.
### Existing LNG Terminals in India

<table>
<thead>
<tr>
<th>#</th>
<th>LNG Terminal</th>
<th>Location</th>
<th>Operated by</th>
<th>Capacity (mmtpa)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Dahej LNG Terminal</td>
<td>Gujarat</td>
<td>PLL</td>
<td>10 (15*)</td>
</tr>
<tr>
<td>2.</td>
<td>Hazira Terminal</td>
<td>Gujarat</td>
<td>Shell and Total</td>
<td>5 (7*)</td>
</tr>
<tr>
<td>3.</td>
<td>Petronet LNG at Kochi</td>
<td>Kerala</td>
<td>PLL</td>
<td>5</td>
</tr>
<tr>
<td>4.</td>
<td>Dhabhol LNG Terminal</td>
<td>Maharashtra</td>
<td>RGPPL, GAIL &amp; NTPC</td>
<td>5</td>
</tr>
</tbody>
</table>

- Installed capacity 25 mill metric tons per annum (mmtpa), expanding to 32 mmmtpa.
- Equivalent (stranded cold) energy recovery option of 500-640 Mega watts
# Recycling Cold-energy

- **Generate Electricity via expansion based turbines**
  - Cold energy Power Generation (cryogenic)

- **Desalination plants – CryoDesalination**

- **Cryogenic Air separation – medical & other uses**
  - Dry Ice, CO₂, Nitrogen, Argon, O₂, etc.

- **Direct heat transfer for over-the-fence cold port**
  - Deep Freezing, temp controlled storage – Food processing

- **Operate refrigerated trucks, fork lifts on liquid air**
  - Cryogenic engines, local transport, etc.

- **Facility air conditioning**
LNG regasification procedures allow for all the stored cold energy to be discarded.

Opportunity to recycle this energy is immense and low cost intervention.

To regasify the Liquid Gas (kept at -162°C), seawater is used as source of heat.

Alternately, open air is circulated by blowers to warm LNG into its natural gaseous state.
Capturing Stranded Cold

- Cost of recovering energy minimal, Value extraction maximum
- Port based Cold hub for entire region.
- Special Perishables Gateway status
- Faster Phyto-sanitary clearances, optimising logistics

Create the world’s first Zero CO₂ emission Port facility
Integration opportunity with perishables gateway – clean energy, zero cost refrigeration for temperature controlled operations. Spare for other optimisation.
## Proposed LNG Terminals in India

<table>
<thead>
<tr>
<th>#</th>
<th>Name / Location</th>
<th>State</th>
<th>Operators</th>
<th>Capacity (MMTPA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>LNG Terminal at Paradip</td>
<td>Odisha</td>
<td>GAIL &amp; Paradip Port Trust</td>
<td>4-4.8</td>
</tr>
<tr>
<td>2</td>
<td>LNG Terminal at Dhamra Port</td>
<td>Odisha</td>
<td>IOCL &amp; DPCL</td>
<td>15</td>
</tr>
<tr>
<td>3</td>
<td>Mangalore LNG Terminal Ltd</td>
<td>Mangalore</td>
<td>ONGC, Mitsui of Japan &amp; BPCL</td>
<td>2-5</td>
</tr>
<tr>
<td>4</td>
<td>Ennore LNG Terminal Ltd</td>
<td>Chennai</td>
<td>IOCL &amp; TIDCO</td>
<td>5-10</td>
</tr>
<tr>
<td>5</td>
<td>Mundra LNG Terminal</td>
<td>Gujarat</td>
<td>IOCL &amp; TIDCO</td>
<td>5-10</td>
</tr>
<tr>
<td>6</td>
<td>LNG Terminal at Pipanav</td>
<td>Gujarat</td>
<td>Swan Energy</td>
<td>3</td>
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<tr>
<td>7</td>
<td>LNG Port at Kodinar</td>
<td>Gujarat</td>
<td>Shapoorji Pallonji &amp; HPCL</td>
<td>5</td>
</tr>
<tr>
<td>8</td>
<td>LNG Terminal at Okha</td>
<td>Gujarat</td>
<td>L&amp;T and GSPC</td>
<td>5</td>
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<tr>
<td>9</td>
<td>LNG Terminal at Gangavaram</td>
<td>Andhra Pradesh</td>
<td>PLL &amp; GPL</td>
<td>5</td>
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<tr>
<td>10</td>
<td>LNG Terminal at Kakinada</td>
<td>Andhra Pradesh</td>
<td>GAIL, APGIC, Shell</td>
<td>3.5-5</td>
</tr>
<tr>
<td>11</td>
<td>Krishna Godavari Terminal at Kakinada</td>
<td>Andra Pradesh</td>
<td>VGS Group, Cavallo Energy, Exmar</td>
<td>3.6</td>
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<tr>
<td>12</td>
<td>LNG Terminal at Kochi</td>
<td>Karnataka</td>
<td>PLL</td>
<td>2.5</td>
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<tr>
<td>13</td>
<td>LNG Terminal at Haldia</td>
<td>West Bengal</td>
<td>Hiranandani Group</td>
<td>4</td>
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<tr>
<td>14</td>
<td>LNG Terminal at East Midnapore</td>
<td>West Bengal</td>
<td>Hiranandani Group</td>
<td>4</td>
</tr>
<tr>
<td>15</td>
<td>LNG Terminal at Digha</td>
<td>West Bengal</td>
<td>HEECPL, a subsidiary of H-Energy</td>
<td>8</td>
</tr>
<tr>
<td>16</td>
<td>LNG Terminal at Jaigarh</td>
<td>Maharashtra</td>
<td>H-Energy Gateway Private Limited</td>
<td>10</td>
</tr>
<tr>
<td>17</td>
<td>LNG Terminal at Dighi Port</td>
<td>Maharashtra</td>
<td>Hiranandani Group</td>
<td>8</td>
</tr>
<tr>
<td>18</td>
<td>LNG Terminal at Sikka</td>
<td>Gujarat</td>
<td>RIL</td>
<td>5</td>
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</tbody>
</table>
Supported by GoI

- Low interest Fund of Rs 5000 crores (WIF)
- Credit linked subsidy at 35% (upto 50%) for cold-chain infrastructure
- Investment linked 150% tax deduction
- Automatic route for 100% FDI in cold-chain projects, ECB route open
- Service Tax exemption: warehousing or transporting of agriculture produce
- Access to National Clean Energy Fund

Infrastructure subsidy - Ministry of Agriculture, MoFPI
धन्यवाद

Thank You

National Centre for Cold-chain Development

राष्ट्रीय कोल्ड-चेन विकास केंद्र

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