Investor Meeting

Wärtsilä Operations & Opportunities in India

Rakesh Sarin
Managing Director
Wärtsilä India
25th June, 2012
1. India macroeconomics & linkage to Wärtsilä business

2. Wärtsilä operations in India

3. Wärtsilä opportunities
India Macro Economics & Linkage to Wärtsilä Business
80% of India is yet to be built

Integration & Execution

Sustainability

Rising Aspirations

Urbanization

Deficit

Growth

Technology

Rising Political will
Reforms / UID

Billion+ People
With 35% saving rate

Globalization
India is the second fastest growing economy in the world
India’s GDP has increased rapidly over the past 15 years from $250 billion to over US$ 1.3 trillion currently

Source: CII/National Accounts
GDP Composition is Undergoing Change

GDP Composition: 1990-91 versus 2011-12

<table>
<thead>
<tr>
<th>Year</th>
<th>Agriculture</th>
<th>Industry</th>
<th>Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990-91</td>
<td>41%</td>
<td>32%</td>
<td>27%</td>
</tr>
<tr>
<td>2011-12</td>
<td>14%</td>
<td>27%</td>
<td>59%</td>
</tr>
</tbody>
</table>

Source: CII/ National Accounts
Domestic Savings Fuelling Investments

Consumption spending by Households and Government, Gross Capital Formation (% GDP)

<table>
<thead>
<tr>
<th>Year</th>
<th>Private Consumption</th>
<th>Government Consumption</th>
<th>Gross Capital Formation</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004-05</td>
<td>59.4</td>
<td>10.9</td>
<td>32.8</td>
</tr>
<tr>
<td>2005-06</td>
<td>58.5</td>
<td>10.9</td>
<td>34.7</td>
</tr>
<tr>
<td>2006-07</td>
<td>58.0</td>
<td>10.3</td>
<td>35.7</td>
</tr>
<tr>
<td>2007-08</td>
<td>57.2</td>
<td>10.3</td>
<td>38.1</td>
</tr>
<tr>
<td>2008-09</td>
<td>58.4</td>
<td>11.0</td>
<td>34.5</td>
</tr>
<tr>
<td>2009-10 PE</td>
<td>57.7</td>
<td>12.0</td>
<td>36.5</td>
</tr>
<tr>
<td>2009-10 QE</td>
<td>57.2</td>
<td>11.5</td>
<td>36.0</td>
</tr>
</tbody>
</table>

Recent decline in savings to GDP ratio has been due to lower savings by the public sector on account of the fiscal stimulus

India’s dependence on foreign savings for financing domestic investments is limited

Indian economy is driven by private consumption

Source: CII/ National Accounts
Fiscal Stimulus is being Reversed Gradually

• Fiscal Deficit for 2011-12 stood at 5.9%, higher than the Budget 2011 estimate of 4.6%.

• Budget 2012 has projected a decline in the deficit to 5.1% of GDP in 2012-13.

• Fiscal Deficit to be progressively reduced to 3.5% by 2013-14.

• However, subsidies on account of high fuel prices may cause a problem.

Source: CII
Rising Importance in Global Trade

Exports and Imports of Merchandise (US $ Billion)

- Both imports and exports contracted in 2009-10 in the aftermath of the global recession.
- However, India recorded a robust growth of 37.6% in exports in 2010-11.
- India’s trade deficit in 2010-11 moderated slightly due to robust growth in exports.

Exports and Imports of Services (US $ Billion)

- Export of services has expanded rapidly at a CAGR of 17% in the last five years.
- India runs a surplus in its services trade as opposed to a deficit in goods trade.

Source: CII
Wärtsilä in India
Wärtsilä has strong presence in India

1200 People
250 Power Plants
3500 MW Power Plants
1500 MW Ship Power

Over 25yrs Active presence
Power Plants MW in India

2011: 3470 MW
MWs under O&M in India

* Includes 503 MW under mobilisation
Delivery Centre India - Khopoli

Manufacturing:
- Auxiliary Manufacturing
- Machine Shop
- Special projects for Navy

Services Workshop
- Reconditioning Activity
- Ship Repair Unit (SRU)

Wärtsilä Land & Sea Academy

Controllable Pitch Propellers

Oil Distribution Box
Wärtsilä Business Opportunities in India
Wärtsilä enhances the business of its customers by providing integrated systems, solutions, and products that are efficient, economically sound, and environmentally sustainable.

Being a truly global organisation with an extensive network, we have the ability to create and supply solutions and large systems, supported by a broad product portfolio.
Solution provider with an extensive product portfolio

Merchant
Offshore
Cruise & Ferry
Navy
Special vessels

Lifecycle services

Total concepts through:
- R&D
- Ship Design
- Product Engineering
- Strategic Purchasing

System deliveries through:
- System Integration Capabilities
- Project Execution Models
- Engineering Services
- Third Party Supplies
India : Maritime Sector

13 major ports, 182 minor / intermediately ports spread over 7212 km coastline
4 large and 28 small and medium sized shipbuilding yards
Shipyards in India

- Bharati Yards in Private Sector
- Bharati Chowgule
- ABG Tebma
- L&T
- ABG
- Mazagon

Yards under Ministry of Defense
- Hoogly Docks
- Planned Yards

Yards under Ministry of Shipping
- Garden Reach
- Shalimar
- Bharati
- Hindustan
- L&T
- Tebma
- Cochin
- Pipavav
- Alcock Ashdown
- Bharati Indian Shipping Limited

- L&T
- Bharati
- Goa
- Chowgule
- Bharati

- L&T
- Bharati
- Garden Reach
- Shalimar
- Hoogly Docks
- Bharati
- Hindustan
- L&T
- Tebma
- Cochin
- Pipavav
- Alcock Ashdown
- Bharati Indian Shipping Limited
Indian Ship Building - Overview

- Indian shipbuilding industry accounts for 1.5% of the global shipbuilding industry

- Shipbuilding in India is quite fragmented. Though there are more than 32 shipyards of various sizes, commercial shipbuilding is controlled primarily by 8 shipyards

- The Industry is not known for volume production; Order books of shipyards varies from small interceptor boats to Warships to large vessels like Tankers and Bulkers

- At present, Indian Shipyards have an order book in the region of € 4.3 billion. Approximately, € 3 billion are export orders, while approx. € 1.3 billion is for domestic shipping companies
Indian Government Maritime Agenda: 2010 - 2020

Total investment USD 36 billion. Major investment areas include:

• Creating port capacity of 3,200 MT to handle traffic of 2,500 MT per year. Improve port performance on par with best in the world.

• Increase India’s share in global ship building to 5% and 10% in ship repairing

• Human resource development in shipping

• Introduction of new Shipbuilding Subsidy Scheme

• Grant of Infrastructure sector status and Strategic sector status to shipbuilding industry

• Shipping Policy: Increase Indian tonnage through necessary policy interventions

• Declaration of new coastal policy

• Promote use of inland waterways for cargo movement

• Tourism
POLICY INITIATIVES

INSA (Indian National ship owners Association) has approached government to give Owner’s Interest Subvention Facility to replace aging ships.

- Reservation of coastal shipping for Indian flagged ships only
- Restoration of the Cargo Support Policy for ships registered in India, under which ships registered in India will be given the first right of refusal for cargo movement of companies
- Possible exemption from Service Tax for coastal shipping following a proposal by Ministry of Shipping to Ministry of Finance
We provide superior value to our customers with our flexible, efficient and environmentally advanced energy solutions, which enable a transition to a more sustainable and modern energy infrastructure.
Wärtsilä is ready to play a big role in Power Sector of India.
Enables transition to Affordable, Reliable and Sustainable energy infrastructure.
Operational flexibility – start up time

5 minutes to full load!

Load % vs. mins graph showing:
- Coal Fired power plant
- Combined Cycle power plant (GTCC)
- Aeroderivative GT power plant (GTSC)
- Industrial GT power plant (GTSC)

Note: Start up times from warm stand-by!

21 June 2012
Operational flexibility - energy efficiency

- Electrical efficiency
  - CCGT's
  - 50%
  - 40%
  - Coal
- Nuclear
  - 30%
- Industrial GT's
- Aero-GT's
- Wärtsilä CC
- Wärtsilä SC

Starting time
- Ramp rate
- Part load oper.

Flexibility
- Low
- Medium
- High
Why Smart Power Generation - Demand Varies Time of the Day & Year…

**SR - Demand Characteristics - January**
- Maximum demand: 26950 MW
- Minimum demand: 18600 MW
- Maximum +ve gradient in one hour: 2730 MW (11.3%)
- Maximum -ve gradient in one hour: 1450 MW (7.1%)

**SR - Demand Characteristics - April**
- Maximum demand: 26500 MW
- Minimum demand: 14300 MW
- Maximum +ve gradient in one hour: 2750 MW (11.6%)
- Maximum -ve gradient in one hour: 1800 MW (6.8%)

**SR - Demand Characteristics - July**
- Maximum demand: 26220 MW
- Minimum demand: 19400 MW
- Maximum +ve gradient in one hour: 2050 MW (8.4%)
- Maximum -ve gradient in one hour: 1560 MW (6.5%)

**SR - Demand Characteristics - October**
- Maximum demand: 26550 MW
- Minimum demand: 17680 MW
- Maximum +ve gradient in one hour: 2900 MW (13.6%)
- Maximum -ve gradient in one hour: 1780 MW (7.3%)
How Smart Power Generation helps avoid Black-outs efficiently

The typical daily load curve

Load (MW)

0 24

Time of the Day

Base Load

Intermediate

Load Following

Peaking

Challenge:
Building adequate generating capacity and the right technology with load following capability to match the demand curve.

21 June 2012
Why Smart Power Generation needed - Electricity Market Trends…

Power generation installed capacity of India increased from 107877 MW in 2003 to 199877 MW

PLF’s of thermal plants have started to decline

Though installed capacity has fallen short of target, but last plan saw a 70% achievement as compared with 50% in the previous plans

There is an increase in the short-term power purchase on the exchange.
Early Indicators – advent of cycling of coal plants

Data Source- NTPC website
Scenario –E] A Hybrid Plant – 80% Coal and 20% Gas vis-à-vis pure coal plants (when cycling is the order of the day)

Hybrid Plant in Actual Situation:
Capacity – 80:20 – Coal : Gas
Price of Gas – 10-15-20 USD/MMBTU

Scenario A – 100% Domestic coal with 75% PLF (considering cycling)
Scenario B – 100% Imported coal with 75% PLF (considering cycling)
Scenario C – 80% Dom. and 20% Imp. coal with 75% PLF (considering cycling)
Scenario D – 70% Dom. and 30% Imp. coal with 75% PLF (considering cycling)
Scenario E – Hybrid Plan - 80% Dom. and 20% Gas @ 10, 15, 20 $/mmbtu with 75% PLF
Scenario E1* – Hybrid Plan - 80% Dom. and 20% Gas @ 10, 15, 20 $/mmbtu with 75% PLF

Need to shift the focus from LEAST VARIABLE COST to OPTIMISED TOTAL COST

* As per new advisory issued by CEA for using 70:30 blend of Domestic and imported coal respectively for coal based power plants
Smart Power Generation in Indian Context

Provides a solution for major issues confronting the power sector:

1. 24x7 reliable power
2. Coal & Natural Gas availability
3. Land acquisition & water crisis
4. Wind & Solar power integration
5. Environment
6. T&D Losses
7. Transmission bottleneck
8. Time for commissioning new capacity
WHY Smart Power Generation?

1. Load shedding

The survey (2009) - How do consumers cope & the price?
21 cities across India & 1500 respondents

VOLL for the country: 289,000cr or 6% of GDP

The investment

100,000 cr invested

The “coping” costs for consumers

Residential

<table>
<thead>
<tr>
<th>Cost</th>
<th>0</th>
<th>1,000</th>
<th>2,000</th>
<th>3,000</th>
<th>4,000</th>
<th>5,000</th>
<th>6,000</th>
<th>7,000</th>
<th>8,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>0</td>
<td>200</td>
<td>400</td>
<td>600</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Commercial

<table>
<thead>
<tr>
<th>Cost</th>
<th>0</th>
<th>1,000</th>
<th>2,000</th>
<th>3,000</th>
<th>4,000</th>
<th>5,000</th>
<th>6,000</th>
<th>7,000</th>
<th>8,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercial</td>
<td>0</td>
<td>200</td>
<td>400</td>
<td>600</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The annual recurring cost

30,000 cr annual cost

- Diesel fuel: 27,937
- Inverter loss: 1,561
- Battery maintenance: 1,581

The "smart" solution

21 June 2012
WHY Smart Power Generation?

2. Coal & Natural Gas availability:

- Brings 6.9% efficiency in overall fuel mix of the country = reduces coal availability problem
- Reduce the expensive gas requirement to one fourth by utilizing the same in Peak Load management plants
- Saves Rs 4,500 Cr in primary fuel cost
WHY Smart Power Generation?

3. Land Acquisition & Water Crisis

- With smaller foot print, potential to save >24000 acres of land
  - Valued at > Rs 6000 Cr
- Negligible water consumption, saves 410MnCu Mn water (equivalent to the annual need of a city like Mumbai)
  - Valued at > Rs 625Cr
WHY Smart Power Generation?

4. Environment

- Optimization of power generation mix with Base Load & Peak Load generation plants (30GW gas based distributed power plants)

- CO$_2$ savings of ~100MnT/yr by end of 12$^{th}$ 5 year plan: Almost 10% reduction, valued at ~ Rs 9,700 Cr

- 100MnT CO$_2$ savings/yr =
  > 82,000MW of Solar
  or,
  > 20,000MW of Solar +
  > 37,000MW of Wind

  generation capacity, valued at over Rs 500,000Cr capital
WHY Smart Power Generation?

5. Wind & Solar power integration in the Grid

- Large mix of wind & solar brings instability in the grid
- This needs quick response plants to balance

21 June 2012
WHY Smart Power Generation?

6. T&D Losses

- Local generation for the peak demand at load centers & local consumption
- ~0.25% savings of total energy consumption
- Valued at Rs 675 Cr
WHY Smart Power Generation?

7. Transmission bottleneck

- Local generation for the peak demand at load centers & local consumption
- Releases >20% of the transmission capacity
- Valued at Rs. 15,900Cr

21 June 2012
WHY Smart Power Generation?

8. Time to the market for capacity addition

- Modular structure
- 12 – 15mths power out from financial close
- Quicker financial close
Economic Value Add: Smart Power Generation

Unrestricted demand (MW) of India - 2016-17 (17th EPS, CEA) (218,209 MW)

Unrestricted demand (MW) of 4 states - 2016-17 (17th EPS, CEA) (73,070 MW)

Divide

Extrapolation factor (2.99)

\[ \frac{242,297 \text{ Bn Kcal}}{101 \text{ Mn Tonnes}} \times 14,212 \text{ Acres} \times 413 \text{ Mn Cu m} \]

Equivalent to Rs. 4,551 Cr of Primary Fuel

Equivalent to Rs. 9,682 Cr of Certified Emission Reduction (CER) or ~18% of India’s current per annum CO2 emission from power sector

Equivalent to Rs. 624 Cr of Industrial Water

Equivalent to Rs. 3,695 Cr of Industrial Land or equivalent to a mid-sized town

Equivalent to Rs. 4,551 Cr of Primary Fuel

Rs. \( \text{14,857 Cr} \)

Rs. \( \text{47,334 Cr} \)

AP, Karnataka, Maharashtra & Punjab
Demand Projection - 18th EPS

Government have not been considered in this Scenario.

Demand Projections as per 18th EPS draft Report to be adopted by 12th and 13th Plan end for the purpose of Generation Planning Exercise are as follows:

Table 3.5

DEMAND ADOPTED FOR GENERATION PLANNING STUDIES

<table>
<thead>
<tr>
<th></th>
<th>Energy Requirement Gwh</th>
<th>Peak Load (MW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016-17 (12th Plan end)</td>
<td>1354874</td>
<td>199540</td>
</tr>
<tr>
<td>2021-22 (13th Plan end)</td>
<td>1904861</td>
<td>283470</td>
</tr>
</tbody>
</table>

After taking into account Demand Side Management and energy conservation measures as proposed by BEE
emission. Details of CO₂ emission for different types of power plants are as follows:

<table>
<thead>
<tr>
<th>Type of Power Plant</th>
<th>Specific CO₂ emission T CO₂/MWh</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal</td>
<td>1.04</td>
</tr>
<tr>
<td>Lignite</td>
<td>1.28</td>
</tr>
<tr>
<td>Gas-CC</td>
<td>0.43</td>
</tr>
<tr>
<td>Gas-OC</td>
<td>0.66</td>
</tr>
<tr>
<td>Gas Engine (Elect only)</td>
<td>0.46</td>
</tr>
<tr>
<td>Gas Engine (CHP)</td>
<td>0.22</td>
</tr>
<tr>
<td>Oil</td>
<td>0.66</td>
</tr>
<tr>
<td>Diesel Eng</td>
<td>0.59</td>
</tr>
<tr>
<td>Diesel OC</td>
<td>0.69</td>
</tr>
<tr>
<td>Naptha</td>
<td>0.61</td>
</tr>
<tr>
<td>Hydro</td>
<td>0</td>
</tr>
<tr>
<td>Nuclear</td>
<td>0</td>
</tr>
<tr>
<td>Wind</td>
<td>0</td>
</tr>
<tr>
<td>Solar</td>
<td>0</td>
</tr>
</tbody>
</table>

Ref: CDM baseline data published by CEA (25-09-08) based on IPCC 2006
Chapter 5

GENERATION PLANNING

The situation in future may be different since Urban India accounts for over half the country’s GDP, and its electricity consumption peaks during the day, and drops significantly at night and on weekends. This demand pattern does not very well suit plants that are built to run on base load. Therefore, this approach of focusing mainly on adding coal-hydro-nuclear base load generating capacity, while necessary, may just not be sufficient during 12th Plan and beyond. Thus, additional parameters which need attention and planning are reliability and flexibility of the power system by creating peaking capacity and reserve margin in our system.
5.2.2 Operational Flexibility and Reliability

With the prevalence of load shedding/power cuts in almost all parts of the country, consumers are being compelled to resort to back up power from inverters and small diesel genets. The amount spent by an average consumer in providing back up power varies from 50 paise to several Rupees per kWhr. The consumers would be more than willing to pay a premium for their power consumption in return for the assurance of 24x7 supplies, which would obviate the need for them to incur the avoidable costs of owning and running back up power sources. This extra price, billed as a “reliability charge” by the utilities, would form the base for procuring “time of day” power from dedicated peaking plants.

The higher price for power from peaking plants must be balanced against the higher efficiency, lower impact on environment and the flexibility made possible by these plants. Also, as peaking plants will operate for shorter duration than base-load plants, the weighted average cost of power drawn as a whole will not be significantly higher.

b) Flexibility of operation

Peaking plants shall be environmentally-friendly and must comply with emission norms, so as to be located close to load centres. They must be able to start up (and stop) instantaneously and ramp up quickly, and in required steps, to match the spike in load. Their efficiency curve must be high and flat at different plant loads. They must be ‘all-season’ plants and use ‘a fuel which is available throughout the year.

Peaking capacity

Peaking capacity also needs to come from quick response power plants. Therefore, foremost, pumped storage hydro plants and hydro plants with storage capacity provide peaking power. Also, gas based/diesel based plants i.e. OCGT and engines are appropriate for peaking power. It is also considered appropriate to have distributed peaking capacity at major load centres in the country, perhaps 2000 MW each at the metropolitan cities to provide quality, reliable and flexible power supply.
Parameters for Peaking Power

In the above, efficiency and rewarding efficiency performance needs special mention during formulation of peaking power policy. As consistent with the nature of Peaking, technology used for meeting such needs should have certain specific characteristics which are listed as under:

- Fast start up & shut down times
- Fast ramp up rate
- Wide load range
- Black start capability
- Unrestricted up/down times
- Fuel flexibility
- Low emissions

In the bidding process for selecting dedicated peaking power plants, a critical evaluation needs to be done on above parameters.

Gas based power plants are amongst the best available options for meeting the peaking power needs. Also as Natural gas is a scarce resource it needs optimal utilization. For gas based peaking power generation, cost of generation would be on higher side if domestic fuel is not allocated. Hence, for gas based peaking power plant, there could be separate allocation of Domestic Natural Gas.

Specific quantity of domestic gas may be allocated for peaking plant for assuring reasonable cost to DISCOMs. Initially introduction of about 2000 MW (in various sizes ranging from 100 –150 MW) dedicated peaking power capacities is envisaged which would need about 2 MMSCMD of natural gas (@ 25% PLF). Such Plants should be located in vicinity of major cities/industrial load centres of the State for deriving the optimum benefits.
Support for peaking

Legislative and policy support required

1. In line with National Electricity Policy, notification of Peaking Power Policy needs to done which provides necessary directives to mandate the State distribution companies to provide universal access to power (by every section of society – rural, urban, agricultural) and unrestricted availability of power to all.

2. It is necessary to mandate the Regulators to implement “load shedding free system” by allowing differential tariff in different times of day or for different users in a phased manner to recover the cost of power.

3. Power purchase from dedicated peaking power plants should be based on an auction system (like Case 2 bidding) with plant characteristics defined in the bid document as:
   - 6 hours/day operation split into multiple starts and stops
   - Capability to start and reach full load within 10 minutes and stop within 2 minutes

CERC could be assigned the task of preparing model bidding document. In the above context, two directives could be issued:

(i) Existing Power Plants designed for base loads shall not normally participate in auction as Peaking power plants. This emerges from

(ii) Also if existing plants are allowed to supply peaking power as well, it may lead to a situation where a generation company defaults in its base-load supply commitments to a distribution company to cater to peaking requirements in some other parts of the country to unduly make profit.
Preventing the unexpected and optimising our customers operations is our shared passion. We serve you whenever, wherever. We provide the broadest portfolio and best services in the industry for both ship power and power plants. We offer expertise, proximity and responsiveness for all customers regardless of their equipment make in the most environmentally sound way.
POWER PLANTS  500 + MW

Thank You