

Wärtsilä Operations & Opportunities in India

**Rakesh Sarin
Managing Director
Wärtsilä India
1 June, 2012**

1. India macro economics & 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**



Technology

**Rising Political will
Reforms / UID**

Sustainability

Growth

Deficit

Globalization

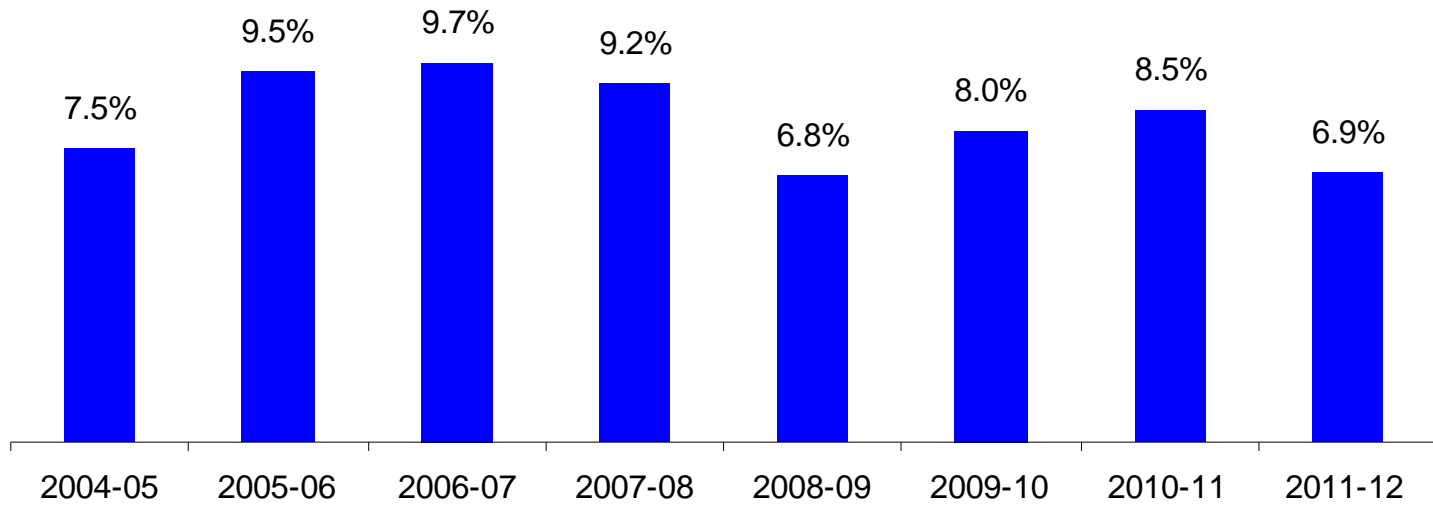
Rising Aspirations

**Billion+ People
With 35% saving rate**

Urbanization

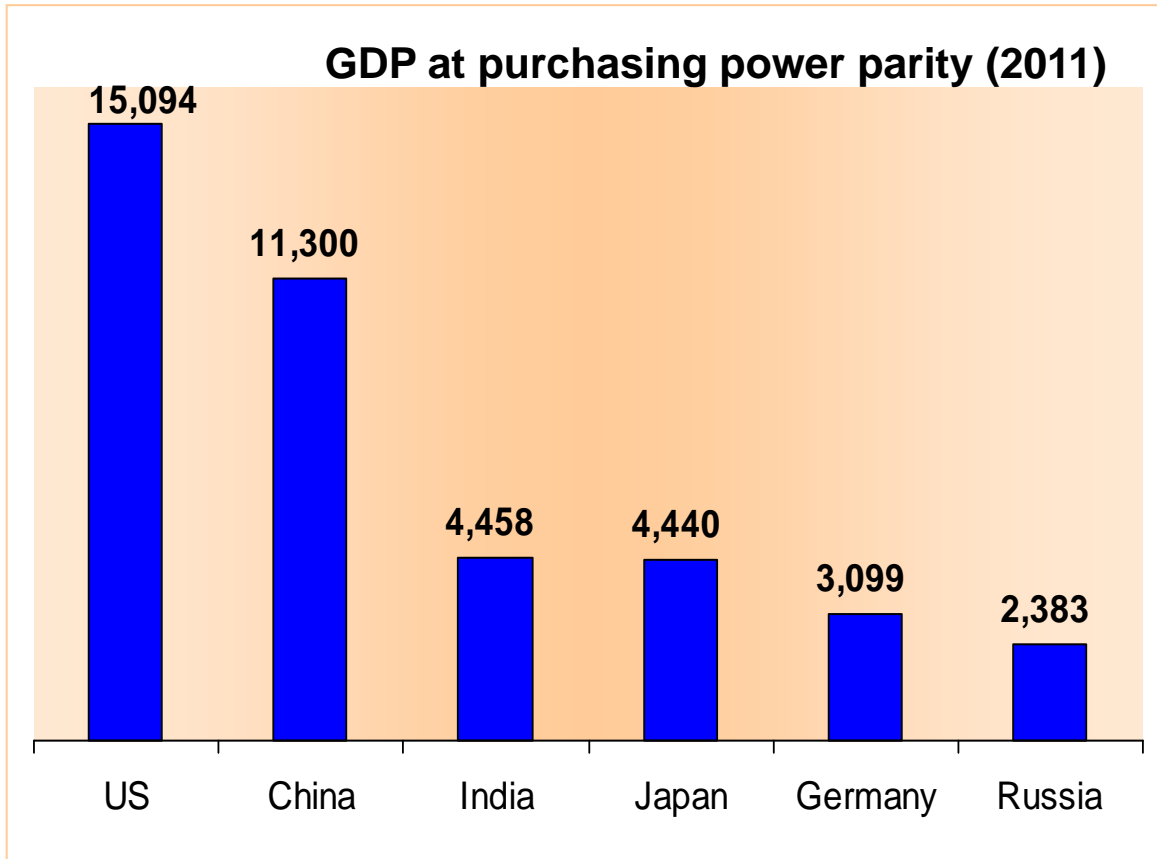
Strong Growth in the Last Few Years

GDP Growth (%)



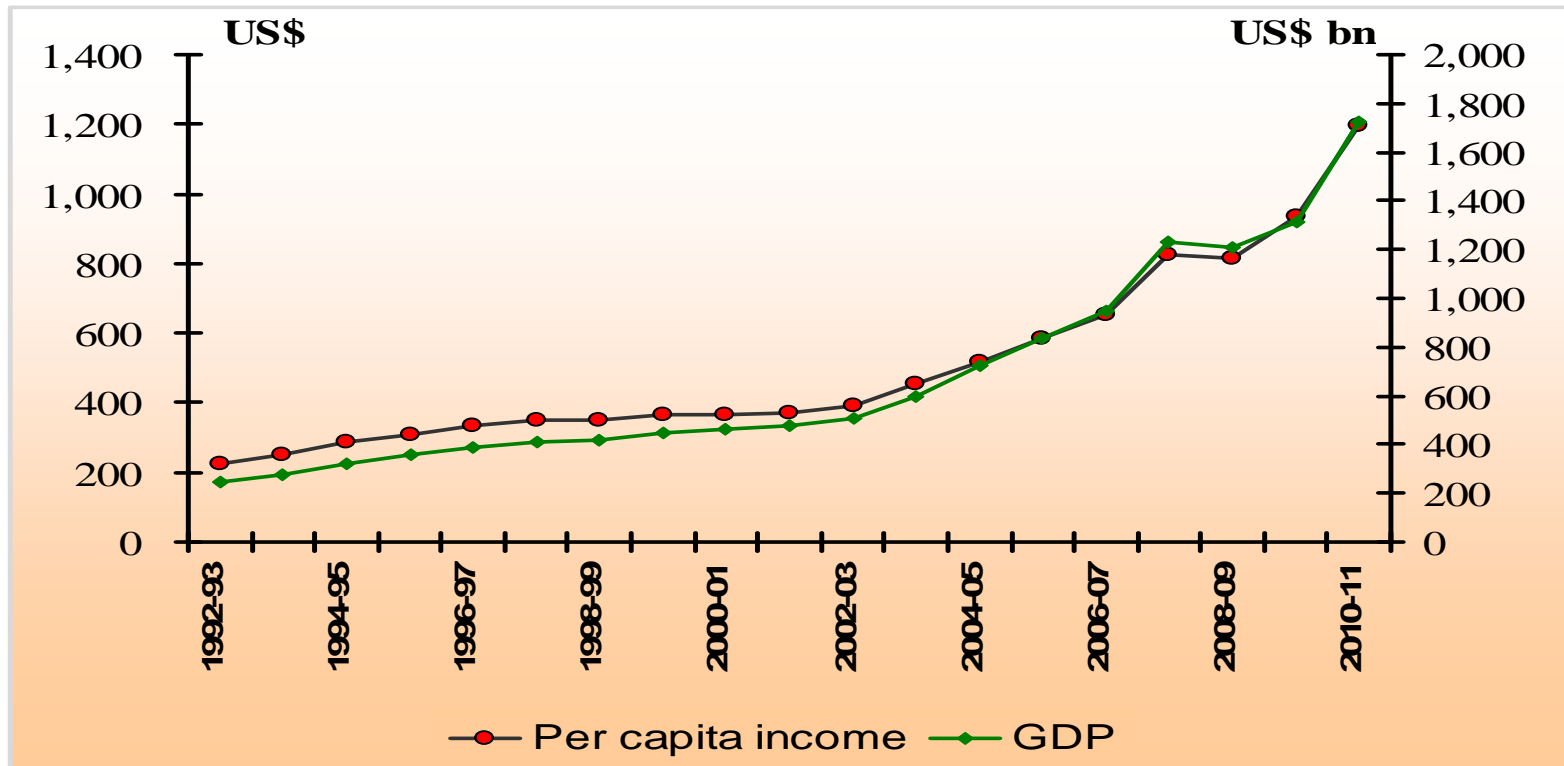
India: A Large Economy

India is the third largest economy in terms of Purchasing Power Parity



Source: CII/ IMF

India: A Rapidly Growing Economy

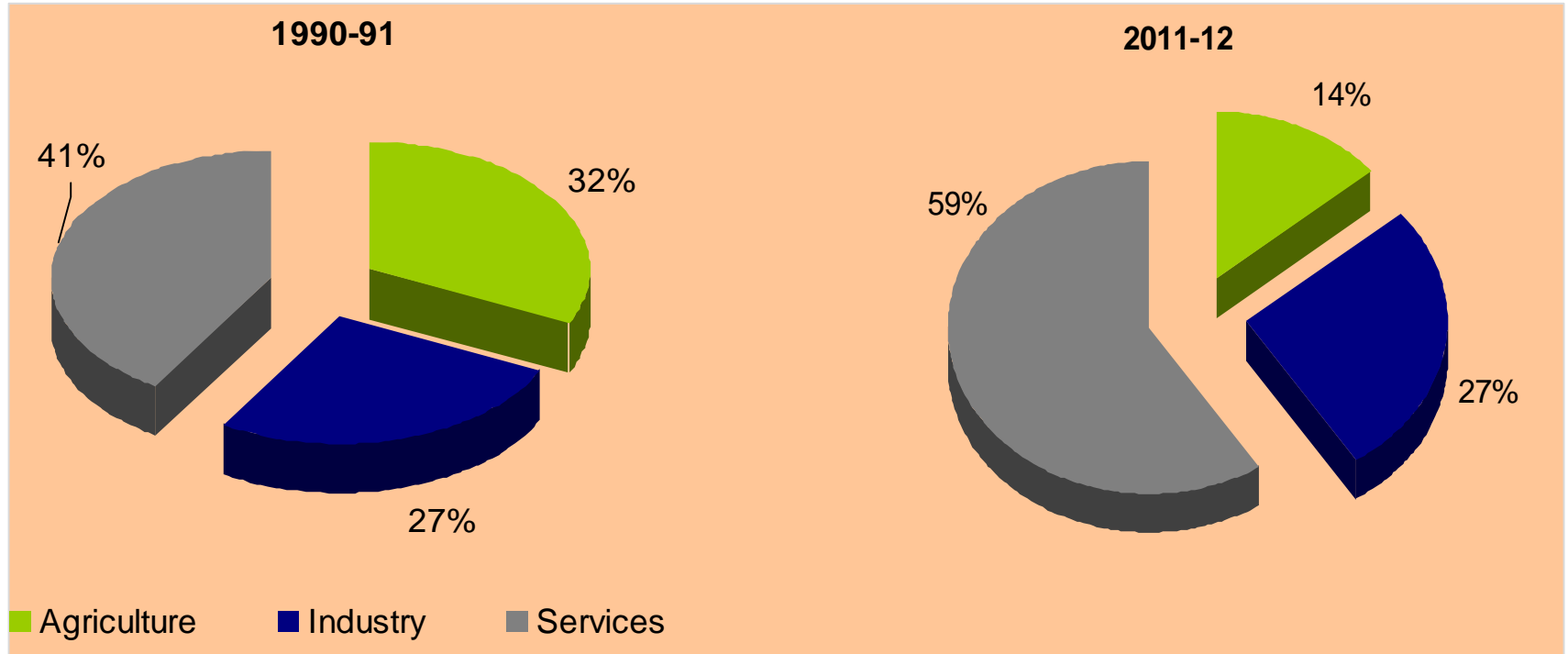


- India is the second fastest growing economy in the world
- India's GDP has increased rapidly over the past 15 years from \$250 billion to over US\$ 1.3 trillion currently

Source:CII/National Accounts

GDP Composition is Undergoing Change

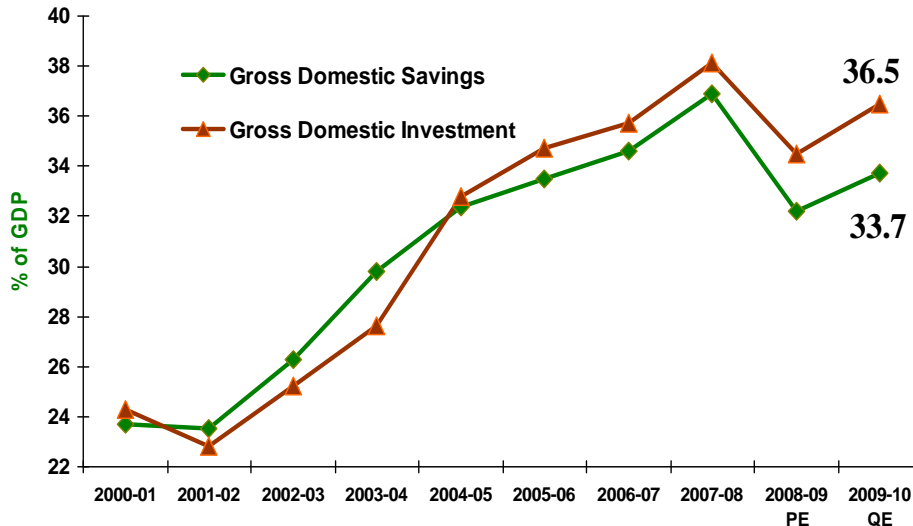
GDP Composition: 1990-91 versus 2011-12



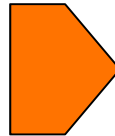
Source: CII/ National Accounts

Domestic Savings Fuelling Investments

Savings and Investments



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



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

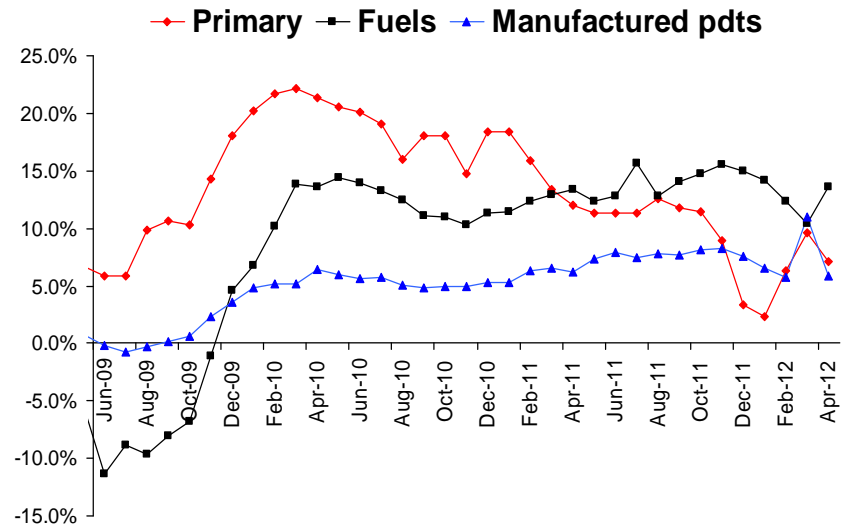
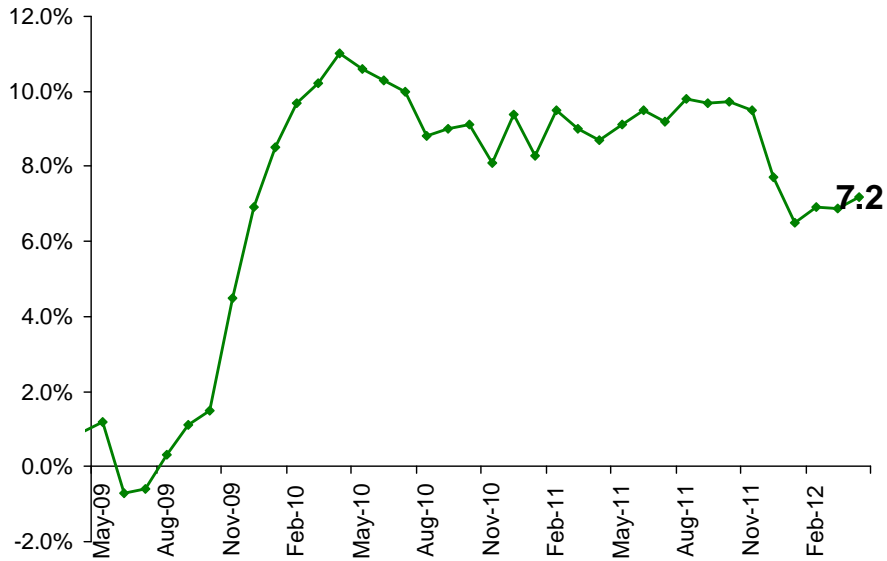
Year	Private Consumption	Government Consumption	Gross Capital Formation
2004-05	59.4	10.9	32.8
2005-06	58.5	10.9	34.7
2006-07	58.0	10.3	35.7
2007-08	57.2	10.3	38.1
2008-09	58.4	11.0	34.5
2009-10 PE	57.7	12.0	36.5
2009-10 QE	57.2	11.5	36.0

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

Indian economy is driven by private consumption

Inflation has been High

WPI Inflation

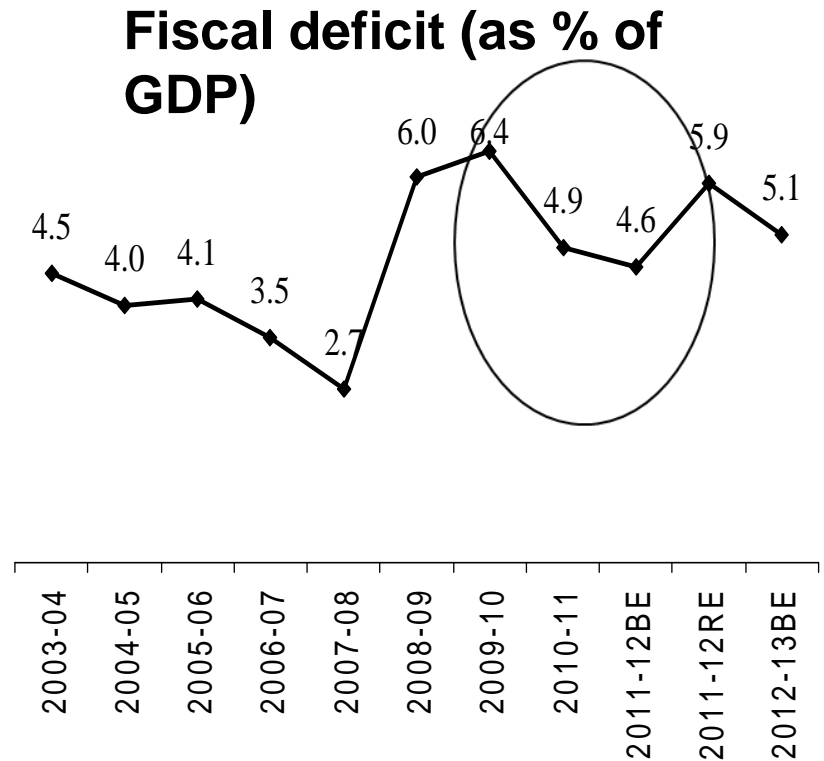


Source: CII/Office of Economic Advisor



Fiscal Stimulus is being Reversed Gradually

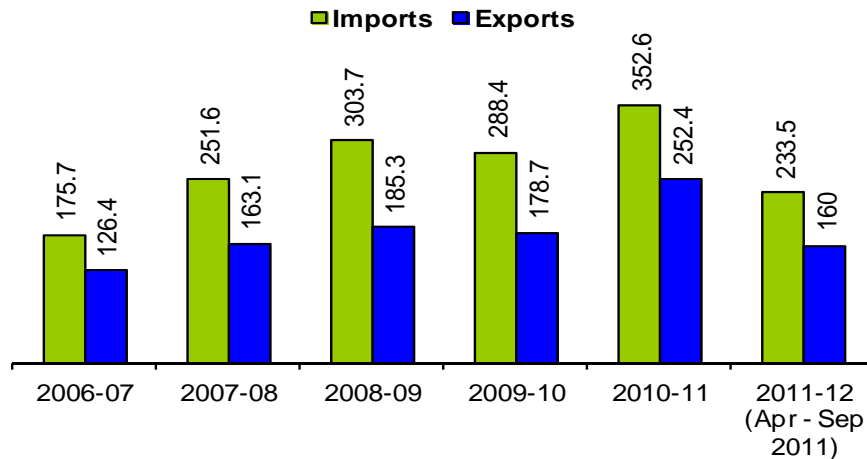
- Fiscal Deficit for 2011-12 stood at 5.9%, higher than the Budget 2011 estimate of 4.6%.
- Budget 2012 has projected a decline in the deficit to 5.1% of GDP in 2012-13.
- Fiscal Deficit to be progressively reduced to 3.5% by 2013-14.
- However, subsidies on account of high fuel prices may cause a problem



Source: CII

Rising Importance in Global Trade

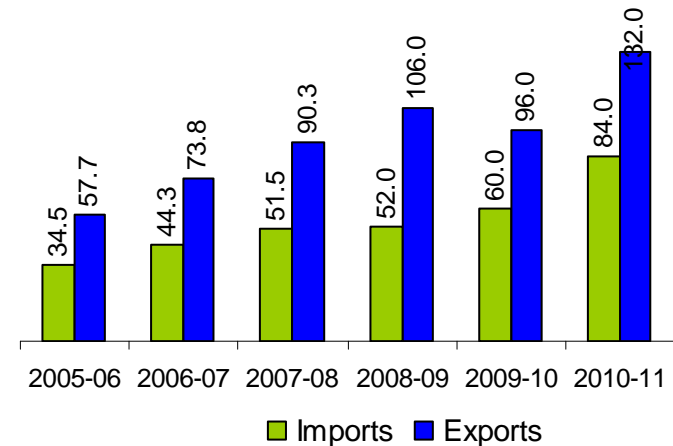
Exports and Imports of Merchandise (US \$ Billion)



- 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.

- 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

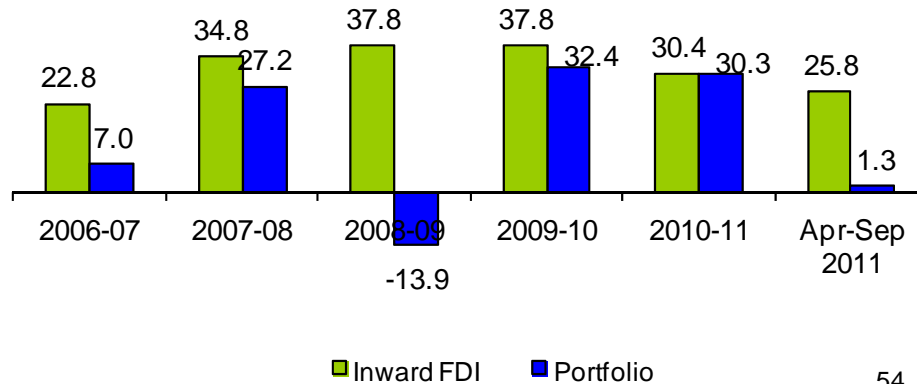
Exports and Imports of Services (US \$ Billion)



Source: CII

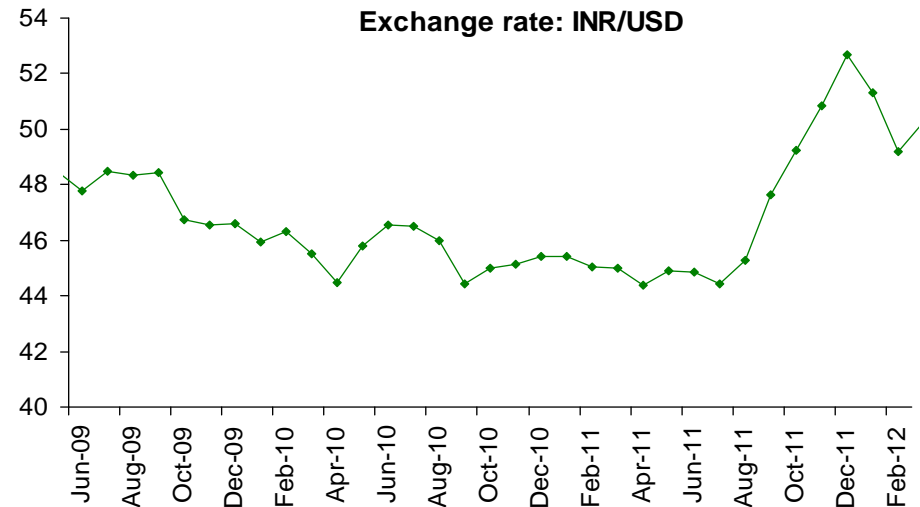
Capital Inflows Volatile

FDI and Portfolio Inflows (US \$ Billion)



- Both FDI as well as portfolio inflows moderated in 2010-11. While FDI has recovered, portfolio inflows remain volatile in the current year.

- The currency has tended to depreciate recently on account of India's current account deficit and the impact of global crises on capital inflows into emerging markets
- The rupee has traded in a band of around Rs. 55 against the USD in May'12



Wärtsilä in India

This is Wärtsilä

**SHIP
POWER**

**POWER
PLANTS**

SERVICES

We live by our Mission, Vision, and Values

Mission

- We provide lifecycle power solutions to enhance the business of our customers, while creating better technologies that benefit both the customers and the environment.

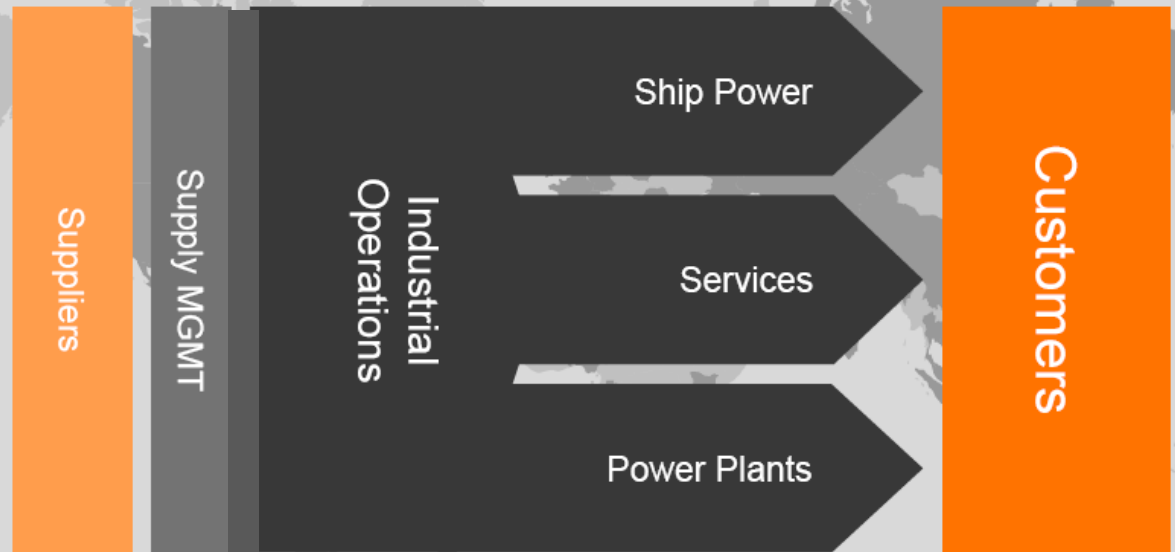
Vision

- We will be the most valued business partner of all our customers.

Values

- Energy – Capture opportunities and make things happen
- Excellence – Do things better than anyone else in our industry
- Excitement – Foster openness, respect and trust to create excitement

Wärtsilä has strong presence in India



1200 **People**

250 **Power Plants**

3500 MW **Power Plants**

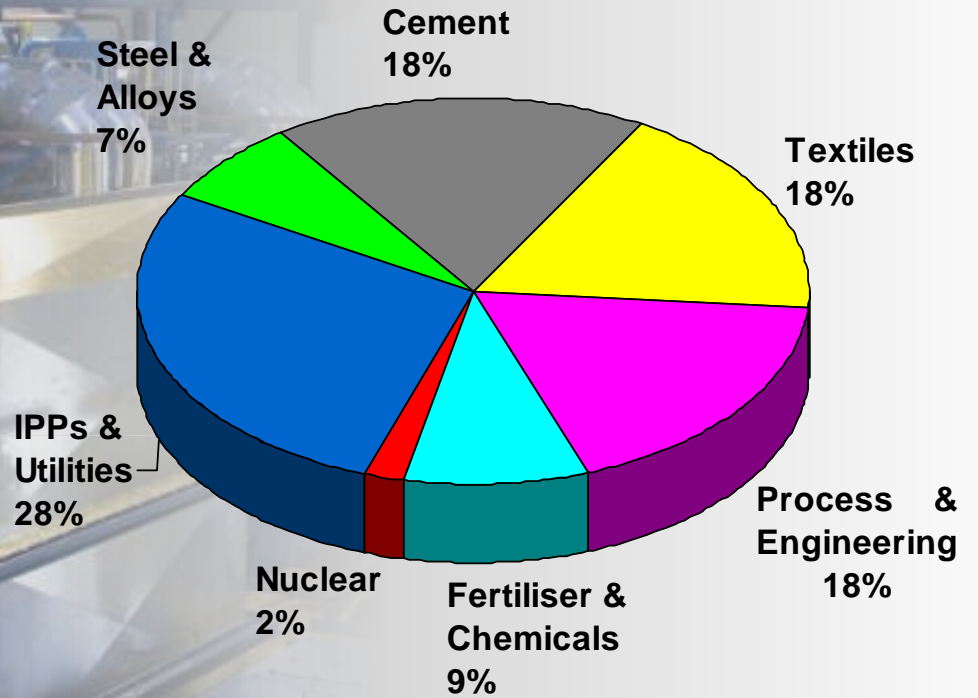
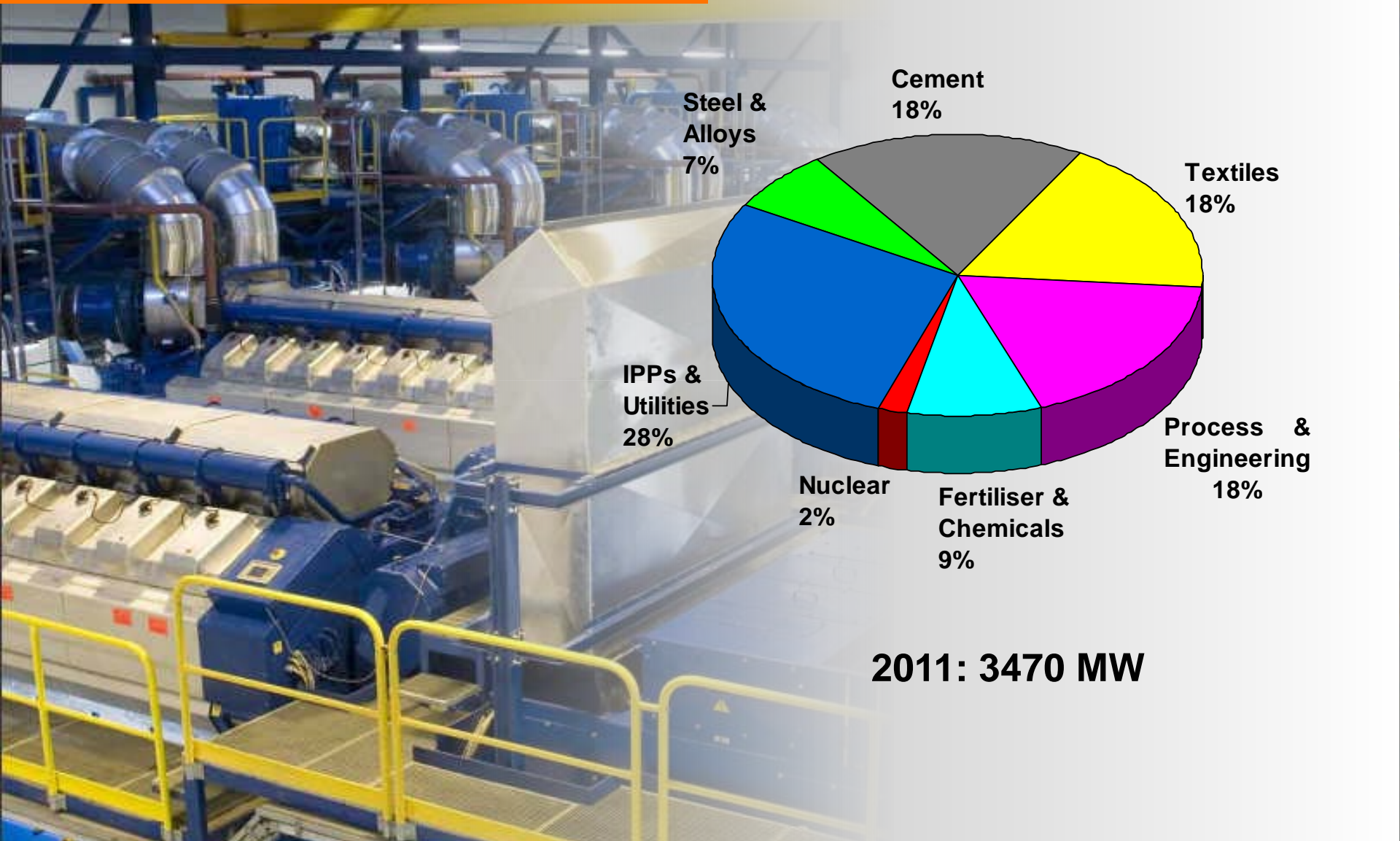
1500 MW **Ship Power**

Over 25yrs Active presence

Offices in India

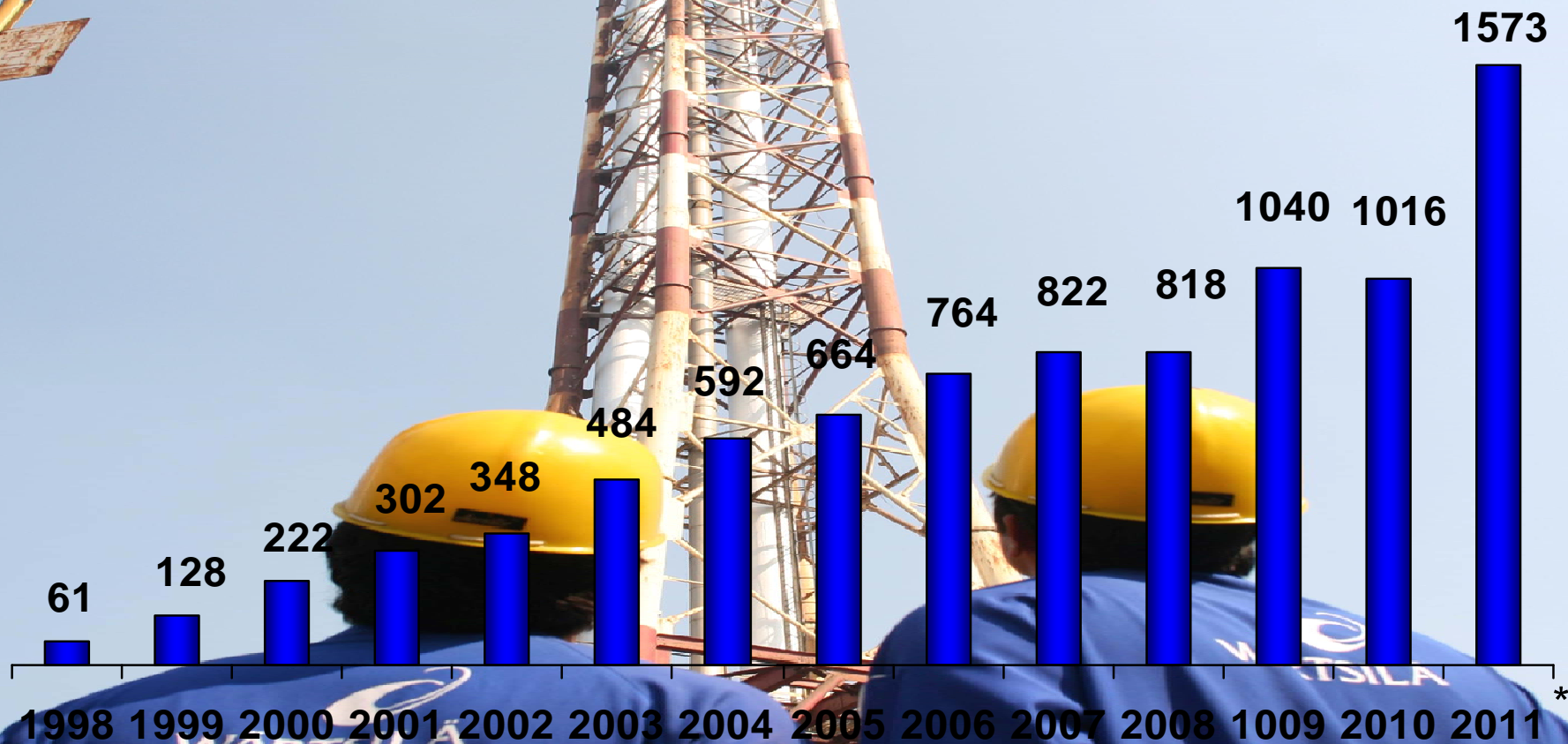


Power Plants MW in India



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



Factory



W70 Power Skid



Controllable Pitch Propellers



Oil Distribution Box

Wärtsilä Business Opportunities in India

Wärtsilä Ship Power

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.



Our growth strategy

Seek further growth through offering lifecycle solutions for ship owners and operators

Be the leading system integrator in the ship building industry with further enhancement in our offering and capabilities

Complement the system integration success with the best product sales and delivery process in the marine industry

Strategic Goal

Be recognised as the leading solution provider in the marine industry



Solution provider with an extensive product portfolio

SHIP POWER



Automation



Power drives



Power distribution



Communication and control



Environmental technologies

Merchant

Offshore

Cruise & Ferry

Navy

Special vessels

Lifecycle services

Total concepts through:

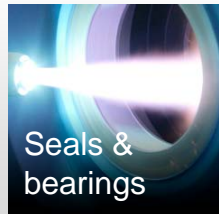
- R&D
- Ship Design
- Product Engineering
- Strategic Purchasing

System deliveries through:

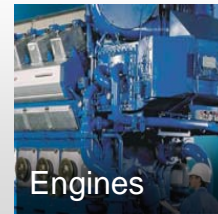
- System Integration Capabilities
- Project Execution Models
- Engineering Services
- Third Party Supplies



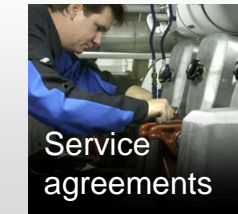
Propulsion



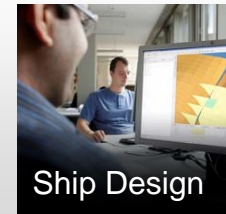
Seals & bearings



Engines

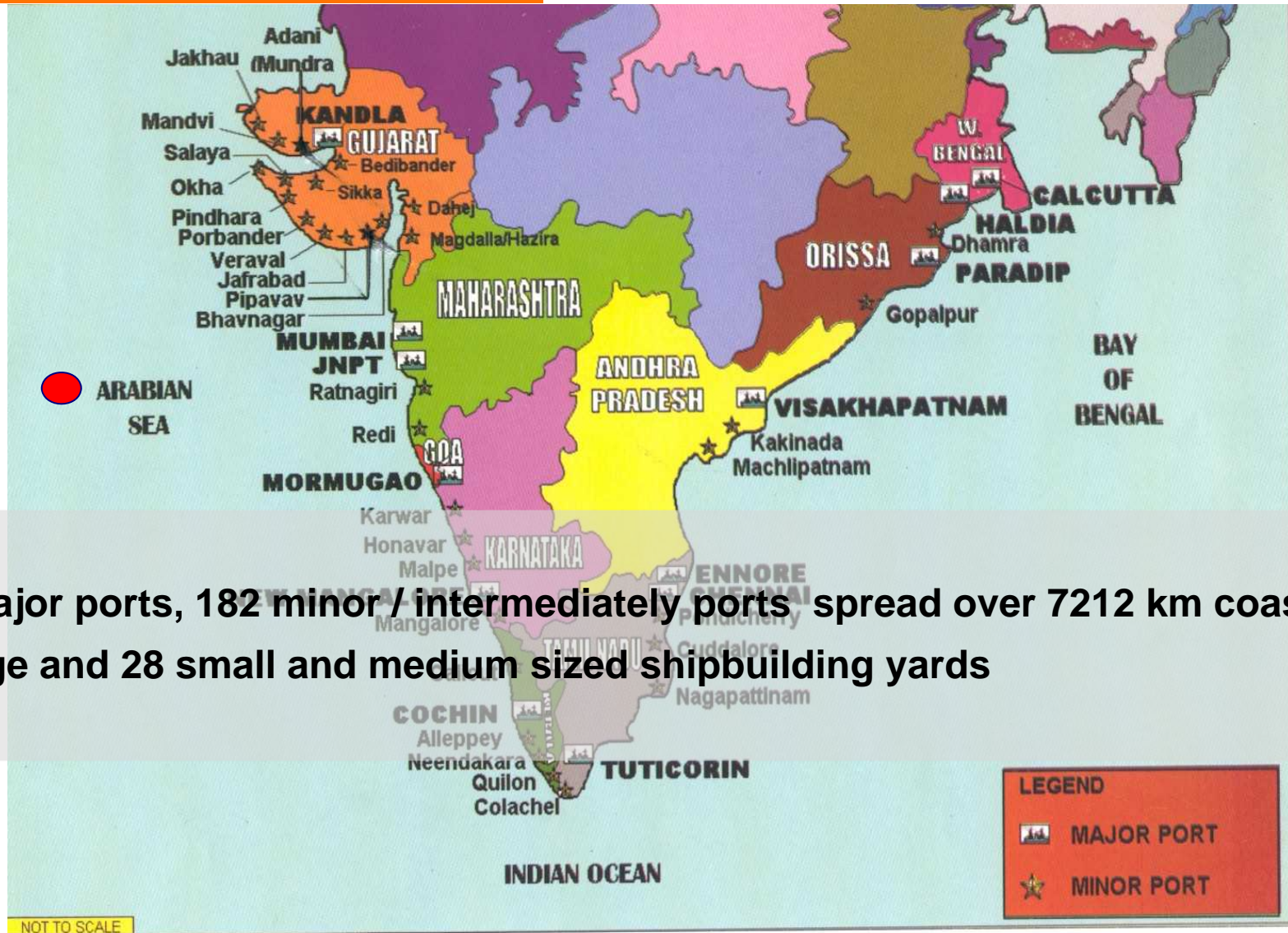


Service agreements



Ship Design

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

- Yards under Ministry of Defense
- Yards under Ministry of Shipping
- Yards in Private Sector
- Planned Yards



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

Indian Govt: Support to Shipping industry

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.

**Wartsila is
ready to play
a big role in
Power Sector
of India**



HELLO INDIA,

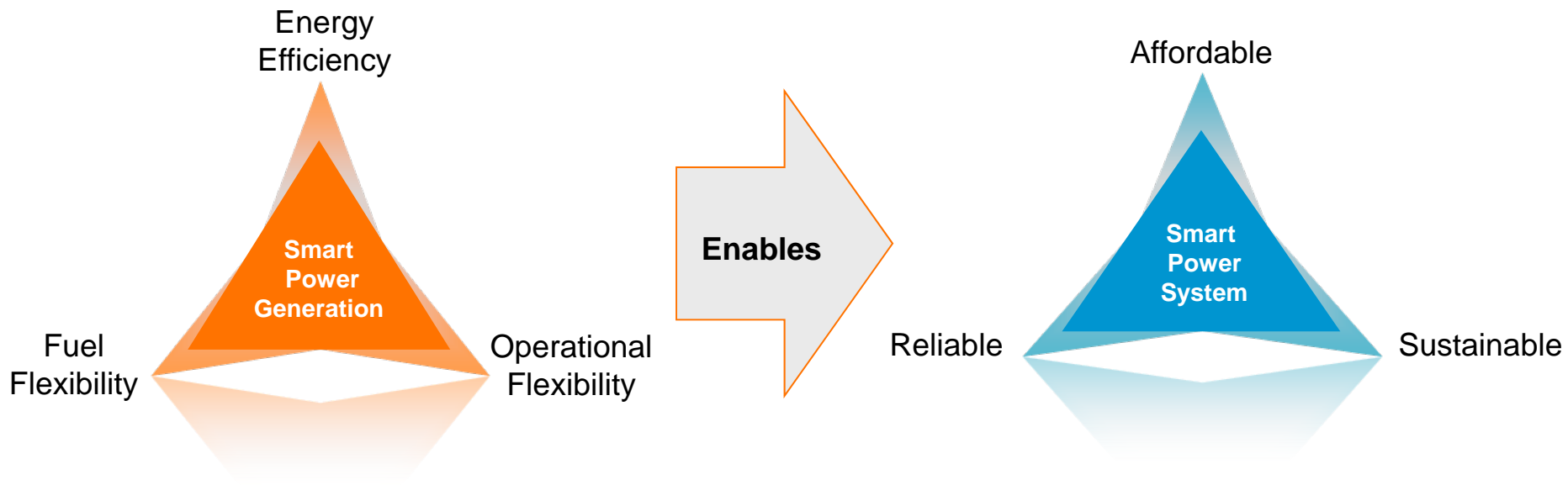
**WHATEVER YOU DECIDE
IN THE ENERGY DEBATE,
SMART POWER GENERATION
IS A PART OF THE ANSWER.**

The transition to a sustainable energy infrastructure requires Smart Power Generation. It is a highly efficient, flexible and economic solution for optimizing power systems. Adding efficient, distributed, gas-fired peaking capacity is a smart and fast move towards a sustainable, affordable and reliable power system. Smart Power Generation is the missing piece of the puzzle. Read more at www.smartpowergeneration.com

ENERGY
ENVIRONMENT
ECONOMY

Smart Power Generation

Enables transition to Affordable, Reliable and Sustainable energy infrastructure.

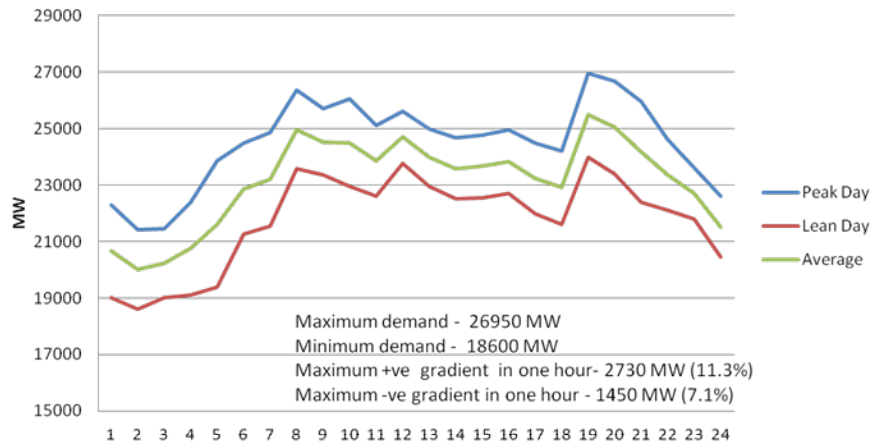


Provides a solution for major issues confronting the Power Sector:

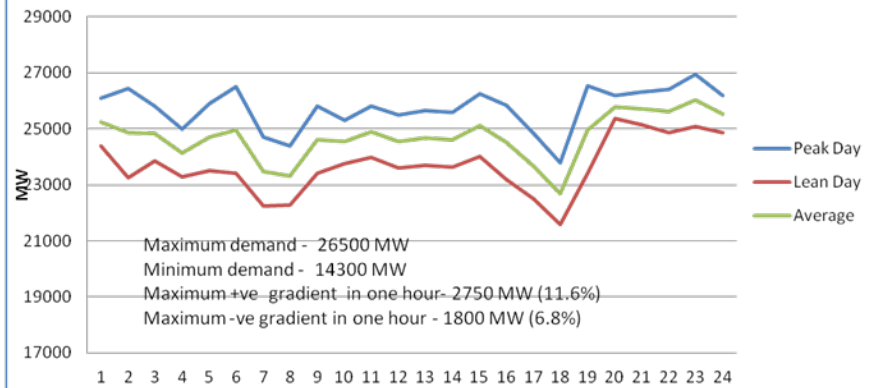
1. 24x7 reliable power
2. Coal & Natural Gas availability
3. Land acquisition & water crisis
4. Wind & Solar power integration
5. Environment
6. T&D Losses
7. Transmission bottleneck
8. Time for commissioning new capacity

Demand Varies Time of the Day & Year...

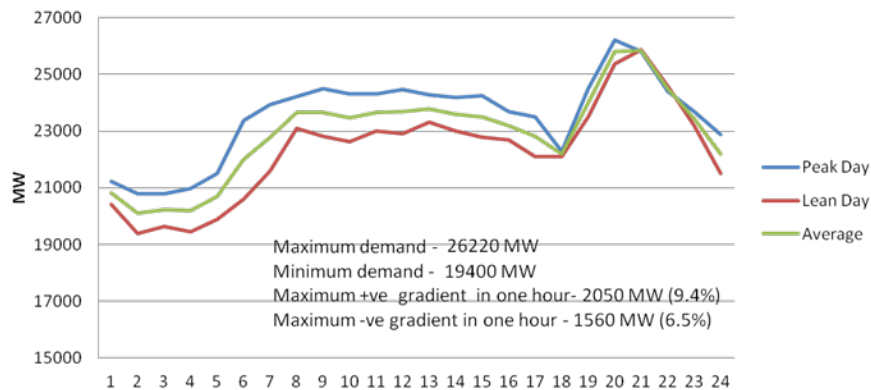
SR- Demand Characteristics - January



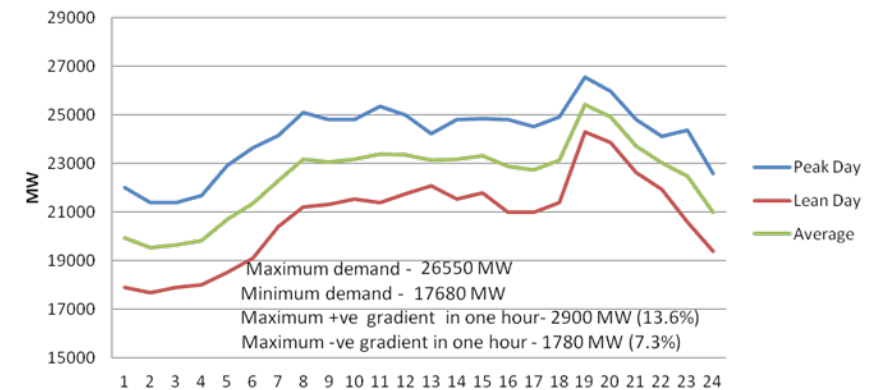
SR- Demand Characteristics - April



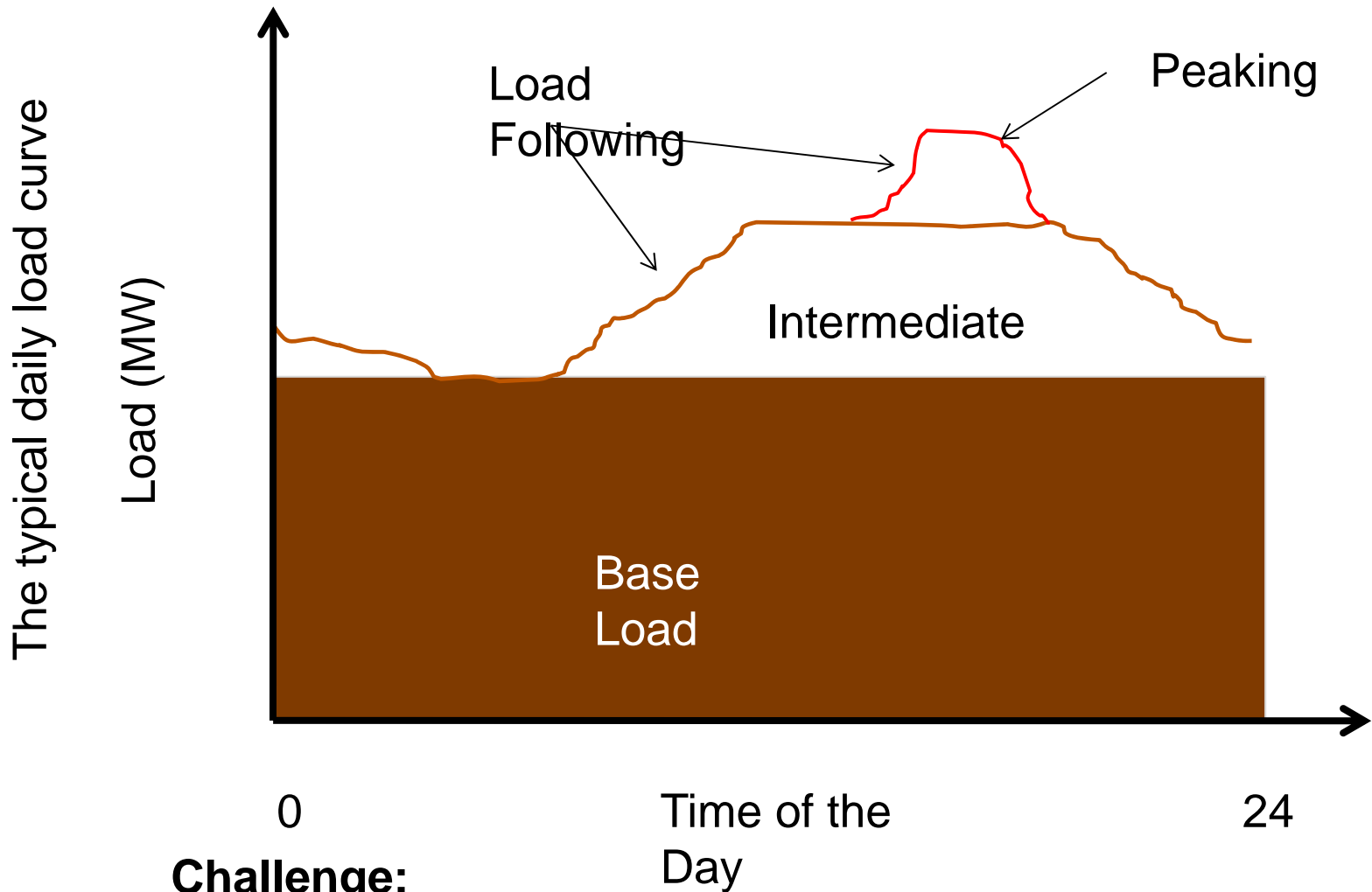
SR- Demand Characteristics - July



SR- Demand Characteristics - October



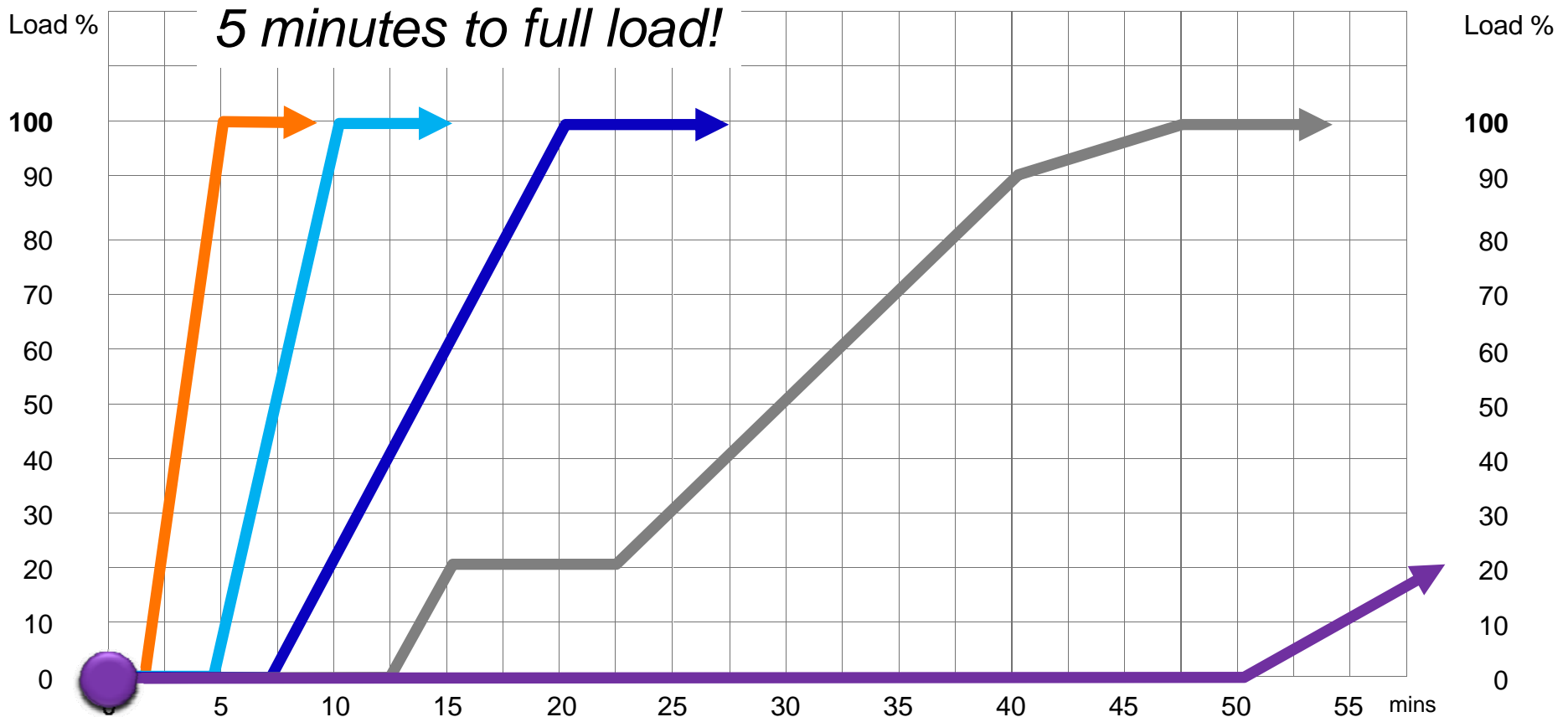
The Black-outs!



Challenge:

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

Operational flexibility – start up time



Coal Fired power plant

Combined Cycle power plant (GTCC)

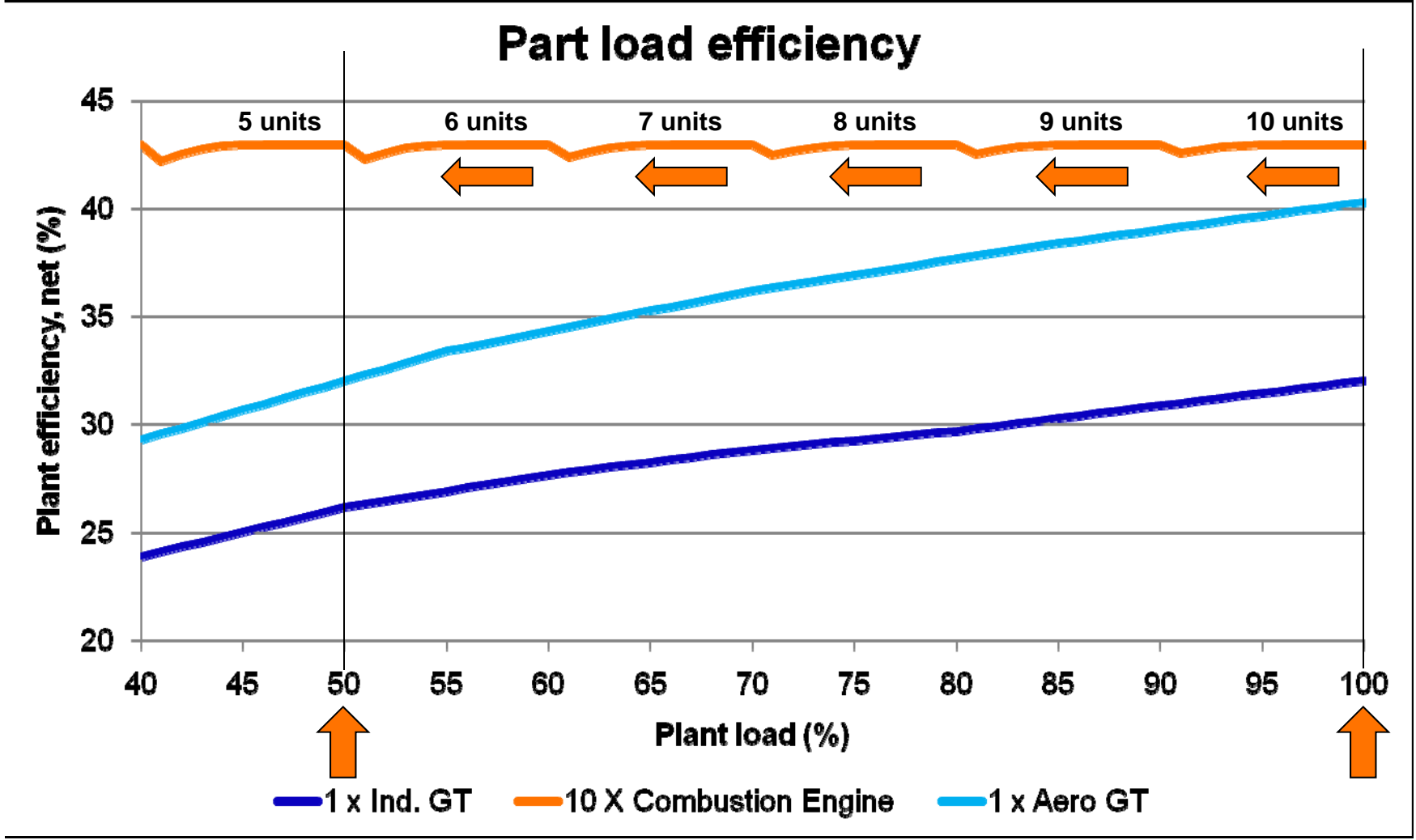
Industrial GT power plant (GTSC)

Aeroderivative GT power plant (GTSC)

Combustion Engine power plant

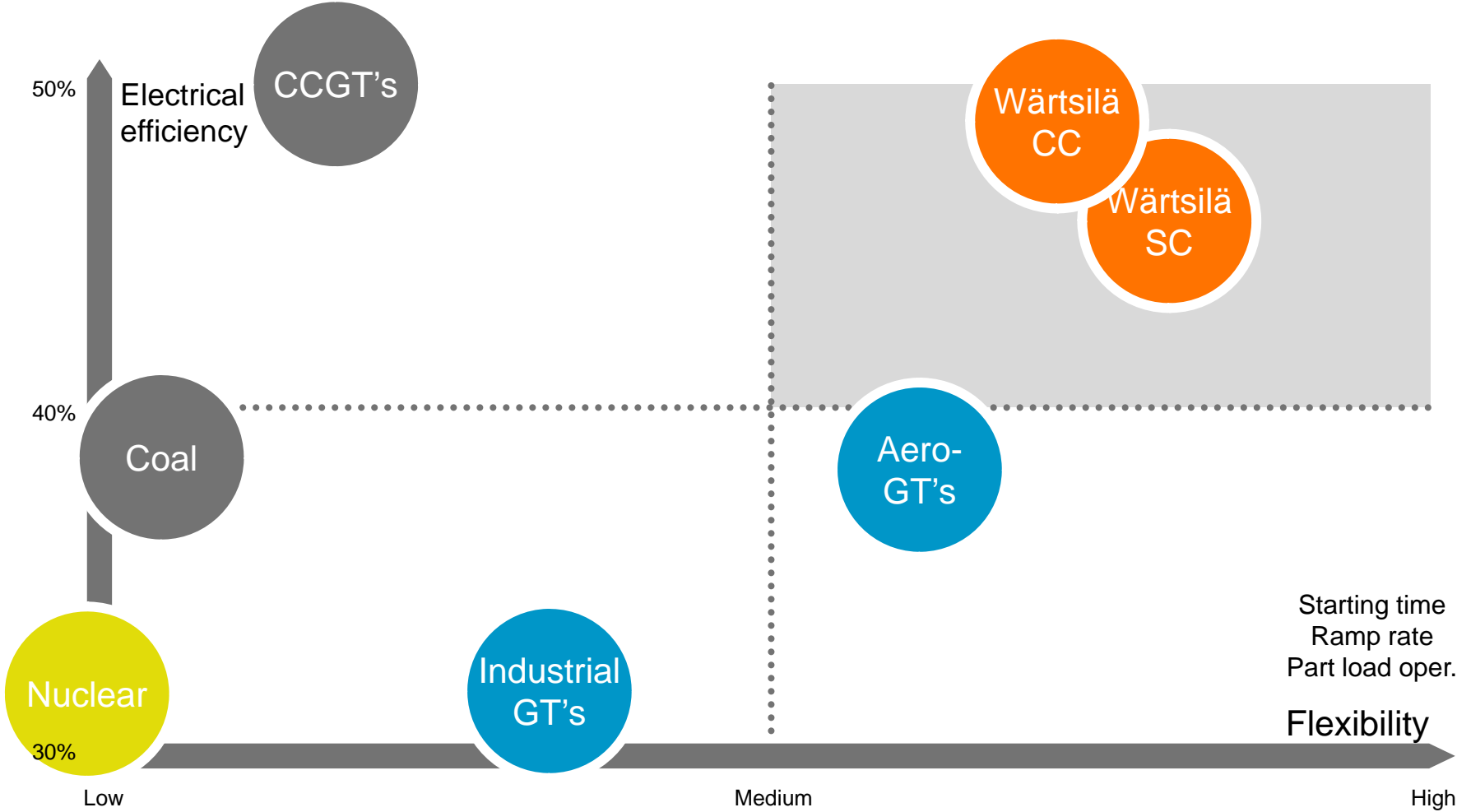
Note: Start up times from warm stand-by!

Operational flexibility – part load efficiency



GT performances by GTPro
15 °C, 10 bar NG

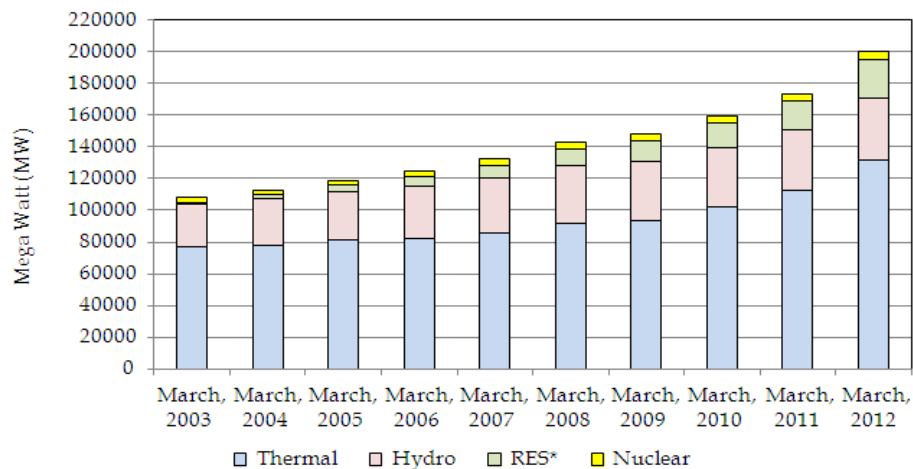
Operational flexibility - energy efficiency



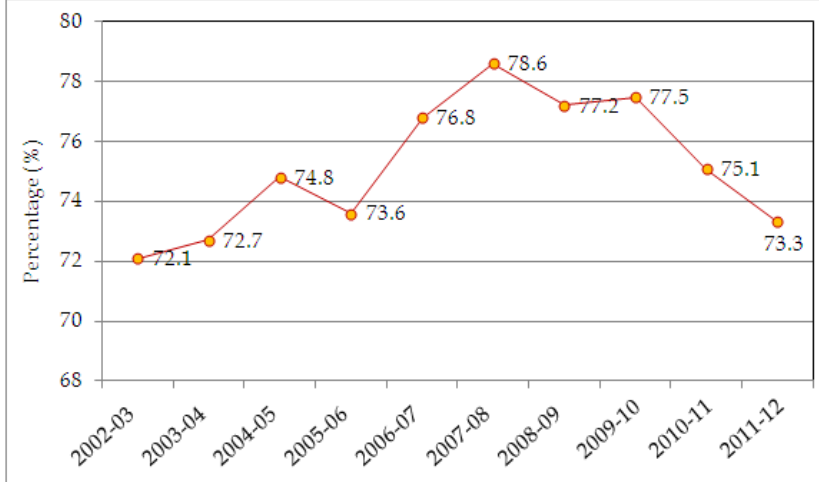
Starting time
Ramp rate
Part load oper.

Flexibility

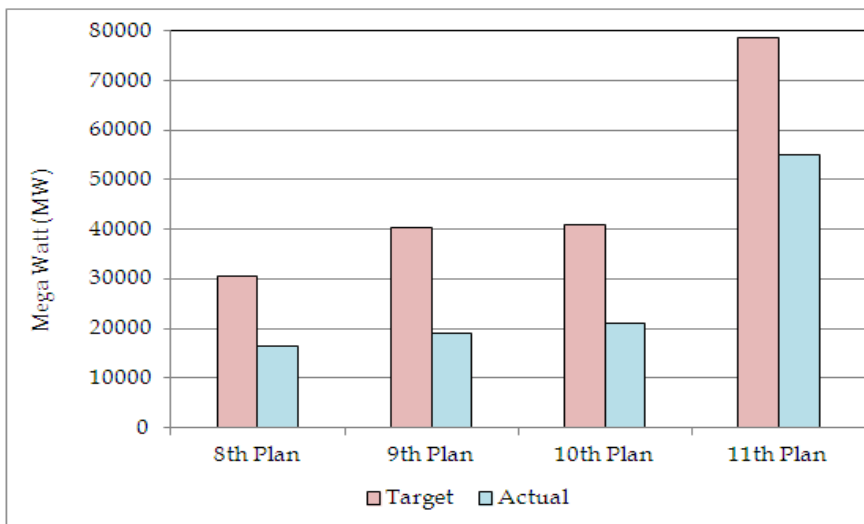
Electricity Market Trends...



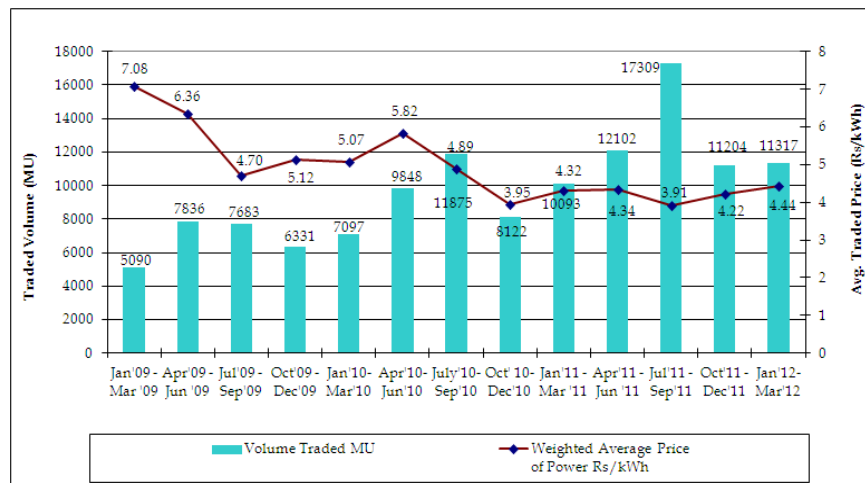
Power generation installed capacity of India increased from 107877 MW in 2003 to 199877 MW



PLF's of thermal plants have started to decline



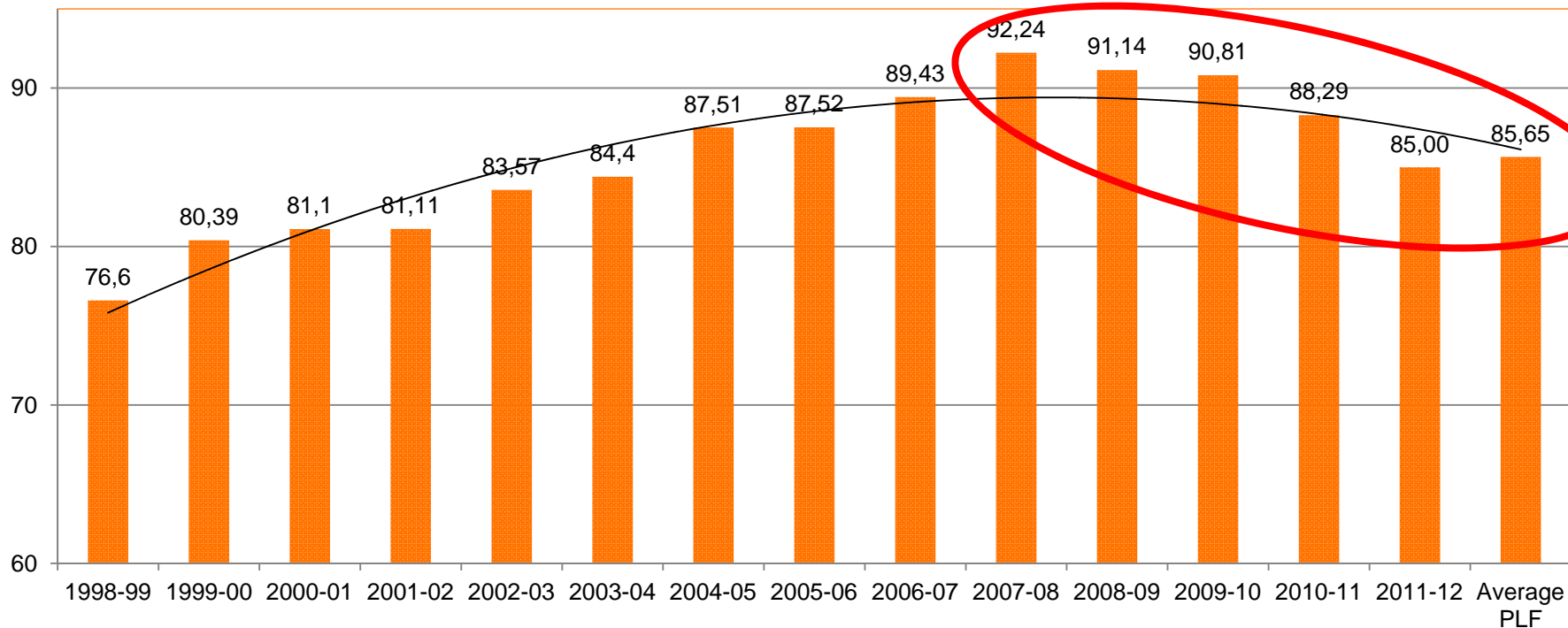
Though installed capacity has fallen short of target, but last plan saw a 70% achievement as compared with 50% in the previous plans



There is an increase in the short-term power purchase on the exchange.

Early Indicators – advent of cycling of coal plants

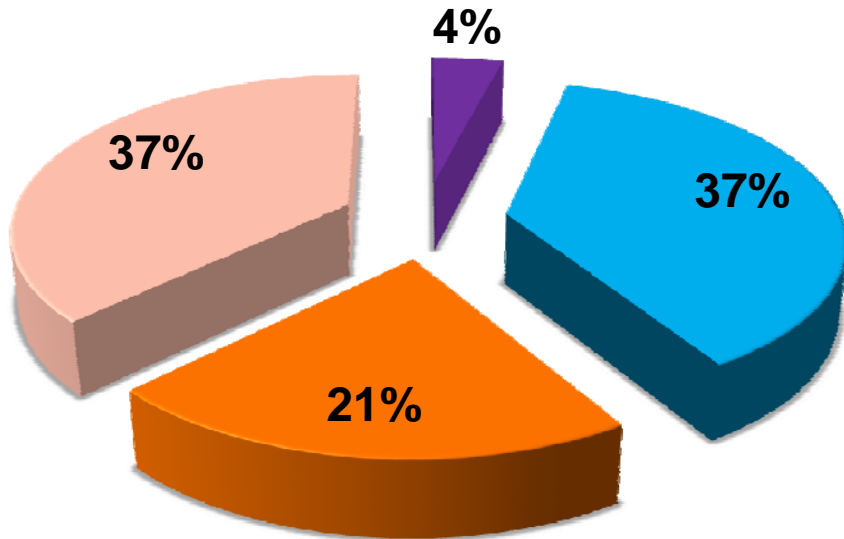
NTPC PLF(%)



Data Source- NTPC website

Reasons for low PLF – 2012

Coal / Lignite based PP

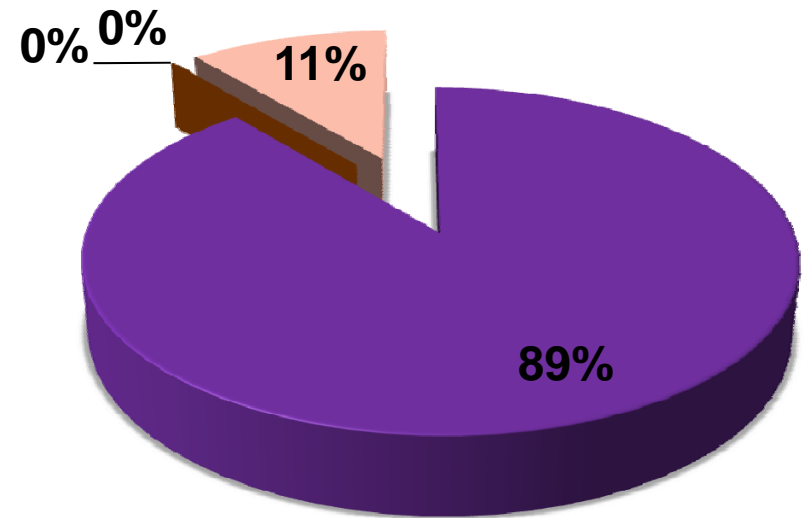


- Low system demand/schedule from beneficiaries
- Forced Outages/ Unscheduled maintenance
- Fuel Supply shortage/quality
- Others*

* closure of units, delay in stabilization, grid disturbances, transmission constraints

Loss – 28754 MUs

Gas Based based PP



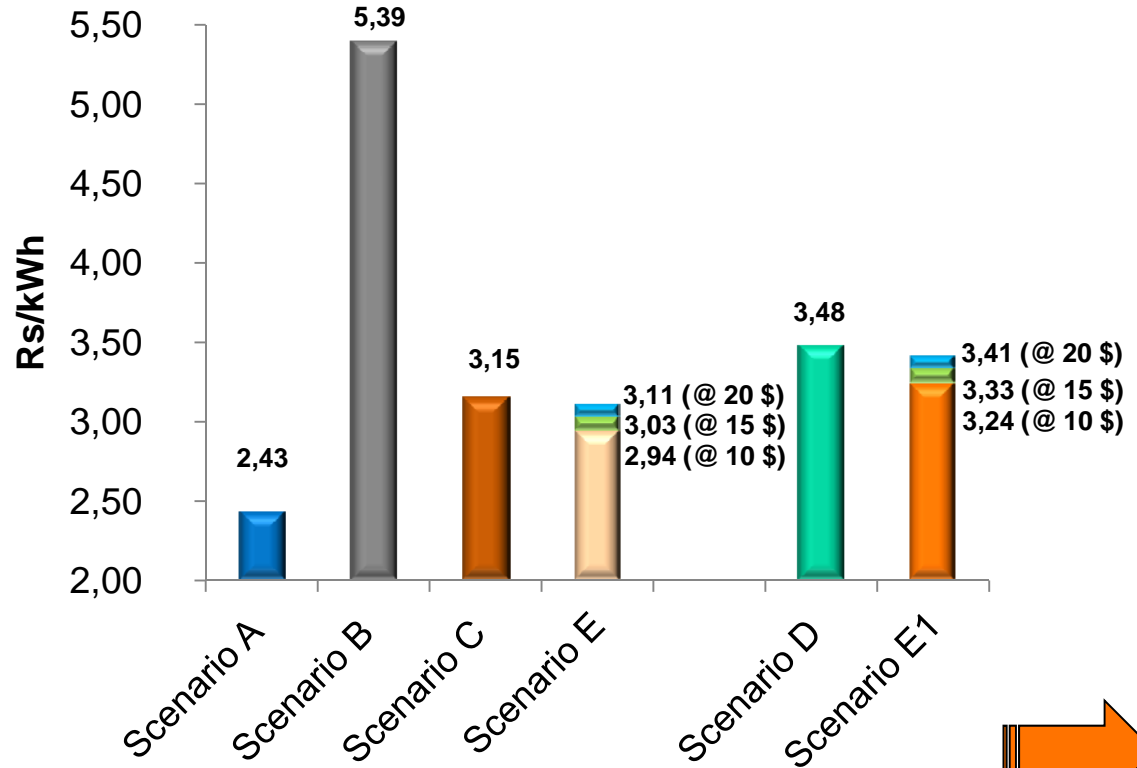
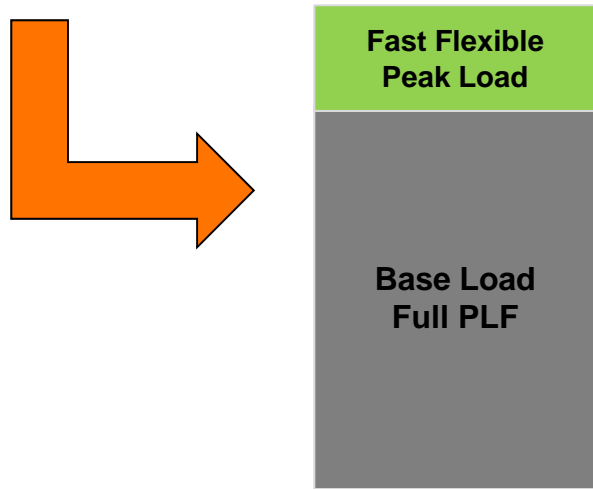
- Low system demand/schedule from beneficiaries
- Forced Outages/ Unscheduled maintenance
- Fuel Supply shortage/quality
- Others*

Loss – 13572 MUs

Note: Analysis based on CEA data

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



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. Environment
5. Wind & Solar power integration
6. T&D Losses
7. Transmission bottleneck
8. Time for commissioning new capacity

WHY Smart Power Generation?

1. Load shedding

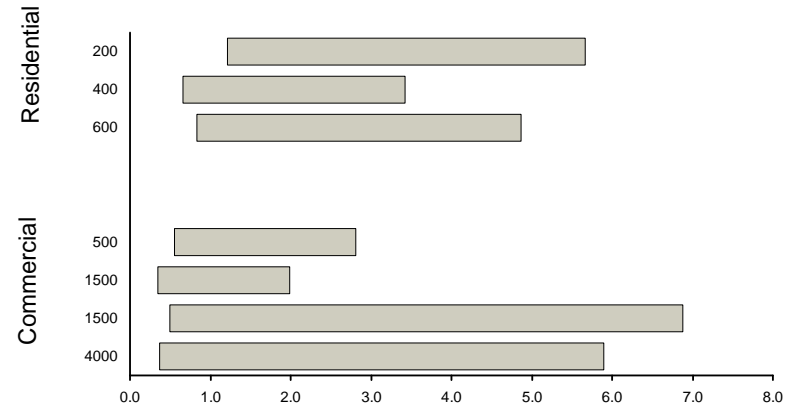
The survey (2009) - How do consumers cope & the price?

21 cities across India & 1500 respondents



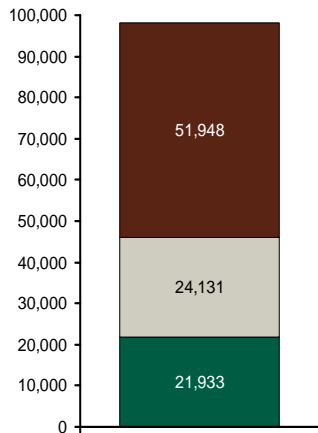
VOLL for the country: 289,000cr
or 6% of GDP

The “coping” costs for consumers



The investment

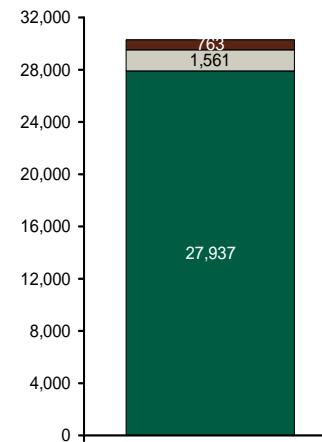
100,000 cr invested



■ inverter ■ battery ■ genset

The annual recurring cost

30,000 cr annual cost



■ Diesel fuel ■ Inverter loss ■ Battery maintenance

WHY Smart Power Generation?

2. Coal & Natural Gas availability:

- Brings 6,9% efficiency in over all 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



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

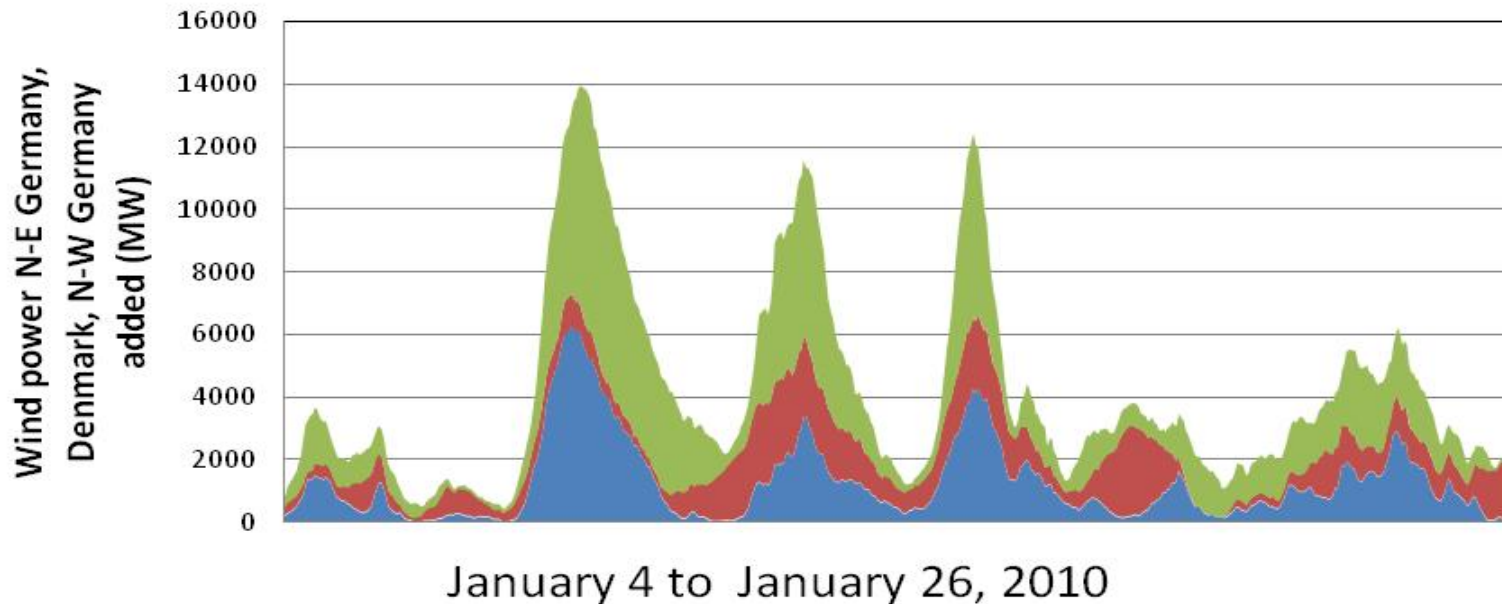
- Optimization of power generation mix with Base Load & Peak Load generation plants (30GW gas based distributed power plants)
- CO₂ savings of ~100MnT/yr by end of 12th 5 year plan: Almost 10% reduction, valued at ~ Rs 9,700 Cr
- 100MnT CO₂ savings/yr =
 - > 82,000MW of Solar
 - or,
 - > 20,000MW of Solar +
 - > 37,000MW of Windgeneration capacity, valued at over Rs 500,000Cr capital



WHY Smart Power Generation?

5. Wind & Solar power integration in the Grid

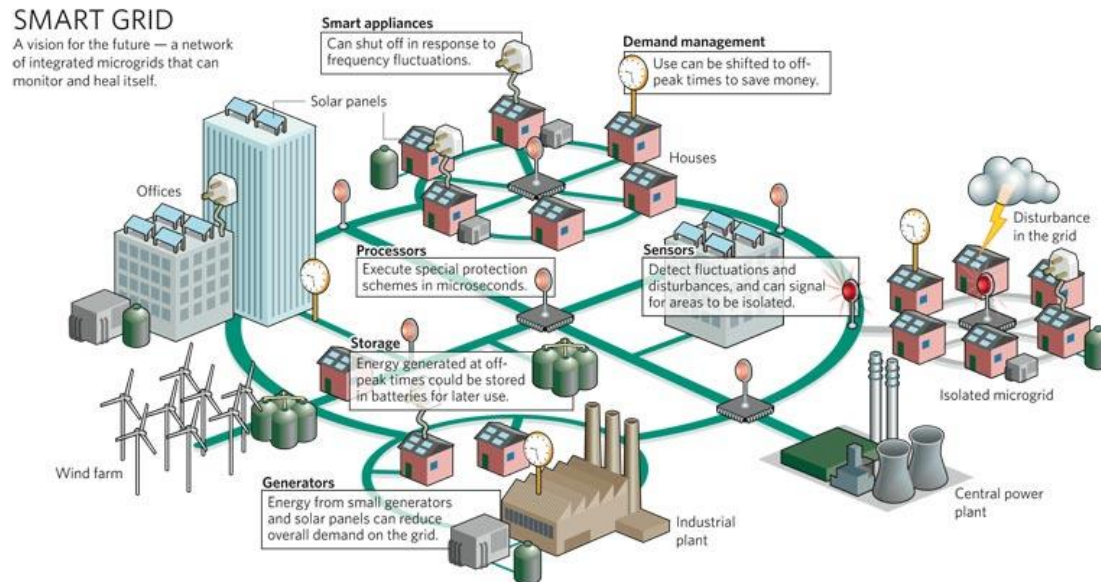
- Large mix of wind & solar brings instability in the grid
- This needs quick response plants to balance



WHY Smart Power Generation?

6. T&D Losses

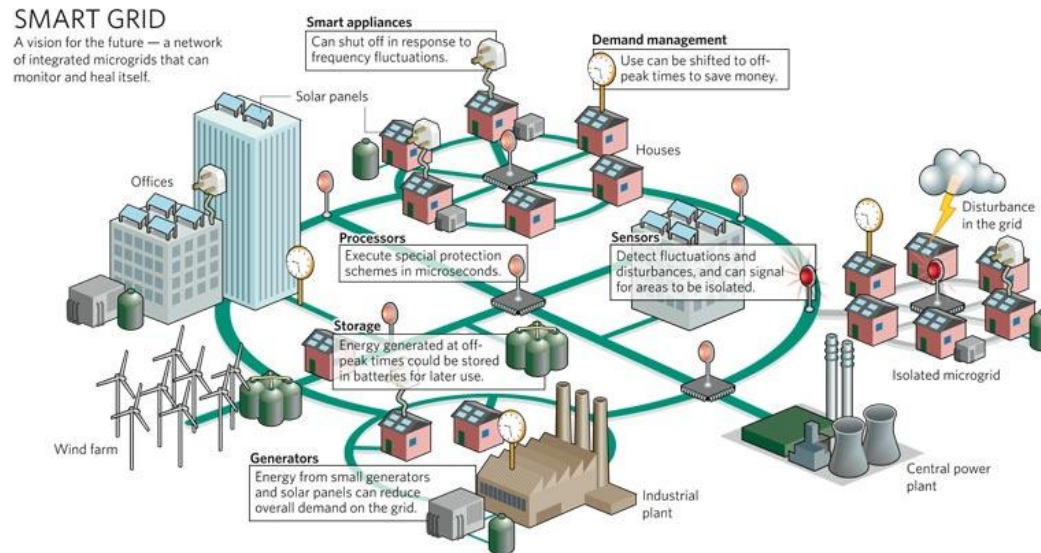
- Local generation for the peak demand at load centers & local consumption
- ~0,25% savings of total energy consumption
- Valued at Rs 675 Cr



WHY Smart Power Generation?

7. Transmission bottleneck

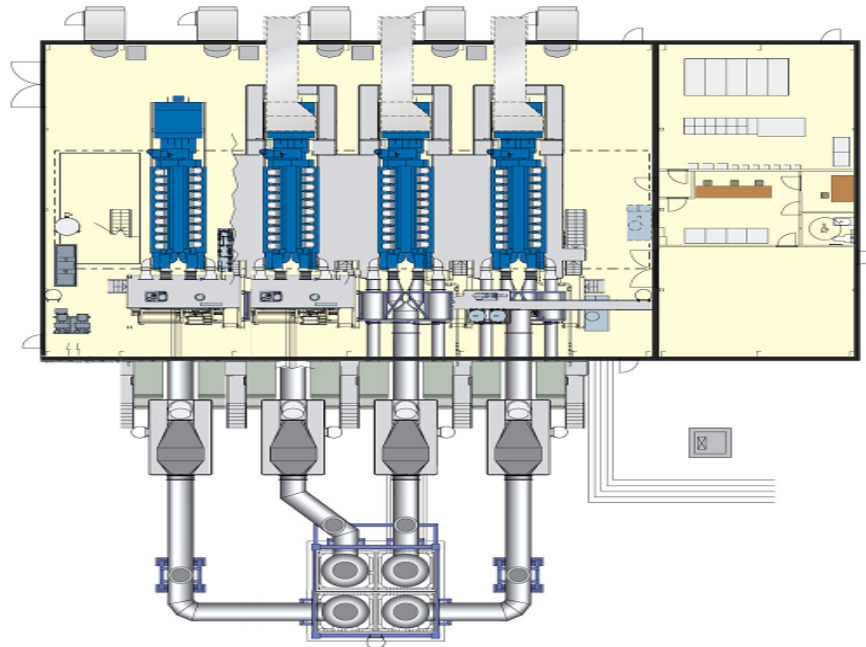
- Local generation for the peak demand at load centers & local consumption
- Releases >20% of the transmission capacity
- Valued at Rs. 15,900Cr



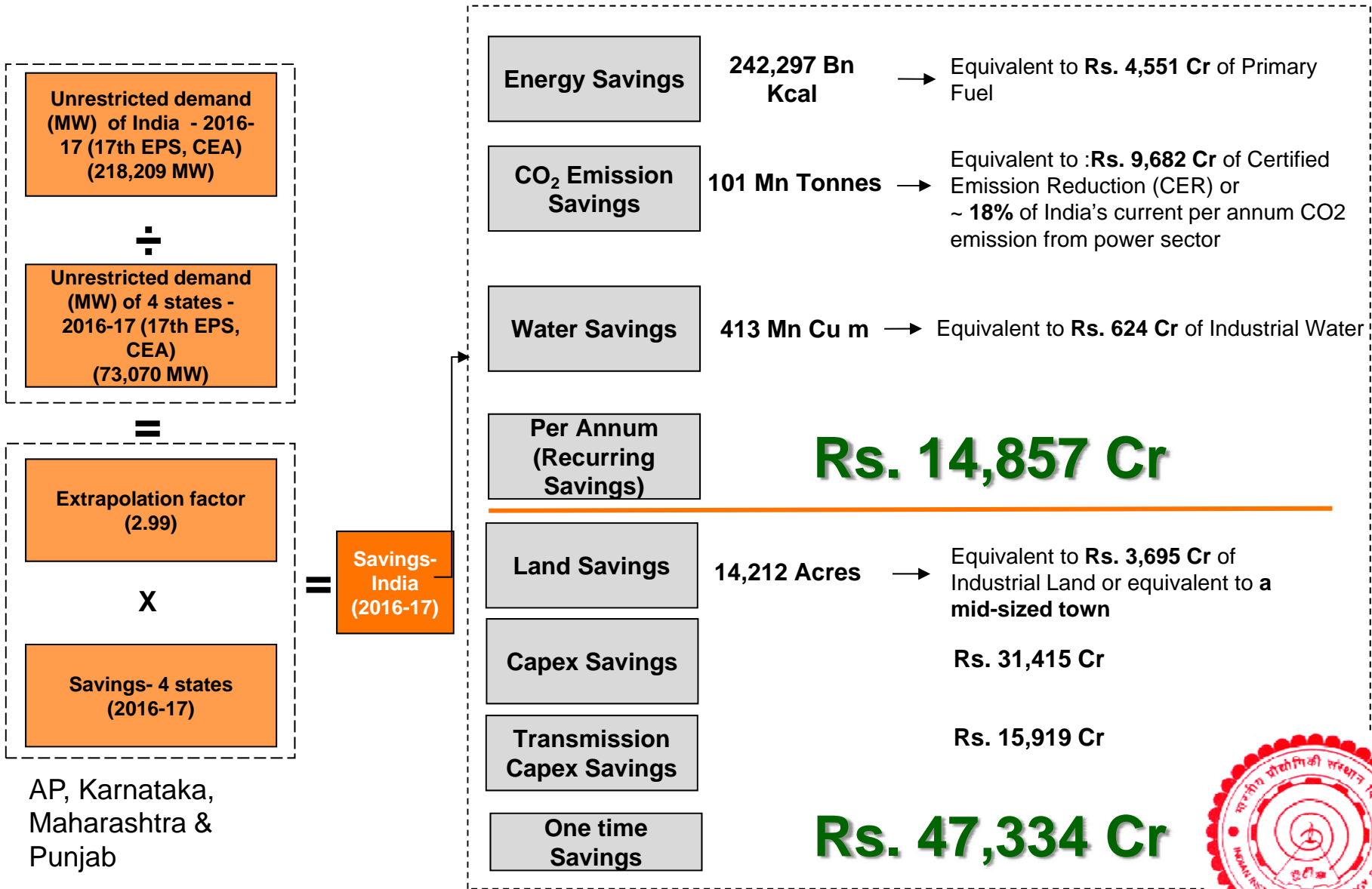
WHY Smart Power Generation?

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



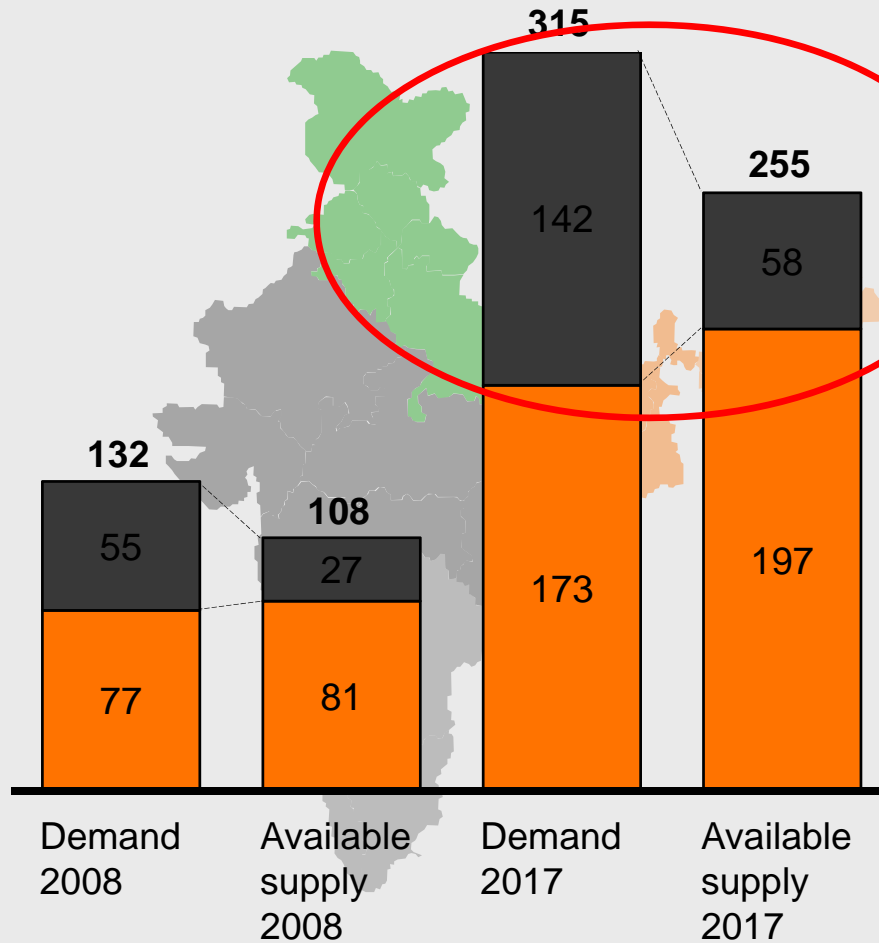
Indian generation mix - future scenario...

Assumptions

- Generation plan achievement
 - 60 GW in XI plan
 - 120 GW in XII plan
- Load profile of demand remains unchanged
- Gas plants and hydro-reservoir plants taken as peaking capacity**
- Availability
 - Base capacity
 - Coal: 90%
 - Hydro-runoff: 55%
 - Nuclear: 75%
 - Peaking capacity
 - 80-90% available during peak, limited by total water availability

Demand vs. available supply*

GW



Base Load
Peaking

* Including captive

** Plants with low load operations and quick start-up & shut-down capability

Source: McKinsey analysis (IRM model); Planning Commission

Deficit in Peak Power Portfolio 2012: Top 10

Sr. No.	STATE	Demand (MW)	Availability (MW)	DEFICIT(MW)	(%)
1	PUNJAB	11000	5488	-5512	-50
2	TAMIL NADU	14224	9575	-4649	-33
3	MAHARASHTRA	21954	18322	-3632	-17
4	UTTAR PRADESH	13947	10630	-3317	-24
5	BIHAR	3607	1225	-2382	-66
6	ANDHRA PRADESH	14721	12357	-2364	-16
7	RAJASTHAN	8482	6644	-1839	-22
8	HARYANA	6839	5192	-1647	-24
9	JHARKHAND	2332	987	-1345	-58
10	MADHYA PRADESH	8462	7555	-907	-11

- 27594

Demand Projection - 18th EPS



Central Electricity Authority

National Electricity Plan U/S 3 (4) of Electricity Act 2003

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

	<i>Energy Requirement Gwh</i>	<i>Peak Load (MW)</i>
2016-17 (12 TH Plan end)	1354874	199540
2021-22 (13 th Plan end)	1904861	283470

After taking into account Demand Side Management and energy conservation measures as proposed by BEE

Emission Data for Plants

emission. Details of CO₂ emission for different types of power plants are as follows:

Type of Power Plant	Specific CO ₂ emission T CO ₂ /MWh
Coal	1.04
Lignite	1.28
Gas-CC	0.43
Gas-OC	0.66
Gas Engine (Elect only)	0.46
Gas Engine (CHP)	0.22
Oil	0.66
Diesel Eng	0.59
Diesel OC	0.69
Naptha	0.61
Hydro	0
Nuclear	0
Wind	0
Solar	0

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 focussing 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.

Generation Planning - some highlights

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
- Un restricted 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 be 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.

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Boiler Turbine Generator



Gas based power plant in India under CM

Largest Wärtsilä Gas Power Plant in India: 104.76 MW gas based power plant in Tamil Nadu



Wärtsilä Dry Dock facility at Paradip (Orissa)

➤ The dock of size 75M X15M X 6M can cater to –

- ❑ Tugs
- ❑ AHTS
- ❑ FPV/IPV's of CG/NAVY
- ❑ Coastal cargos



POWER PLANTS 500 + MW

Thank You

