



Supporting Low Carbon Energy Growth in India: World Bank Role

New Delhi, January 6, 2010



OUTLINE OF PRESENTATION

**A. Bank's Energy Strategy Formulation –
Context, Objectives and Process**

B. India's Energy Development Challenges

1. Energy Needs for Access & Growth
2. Energy & A Low Carbon Economy

**C. The bank's Energy Program in India-
Portfolio & Pipeline**

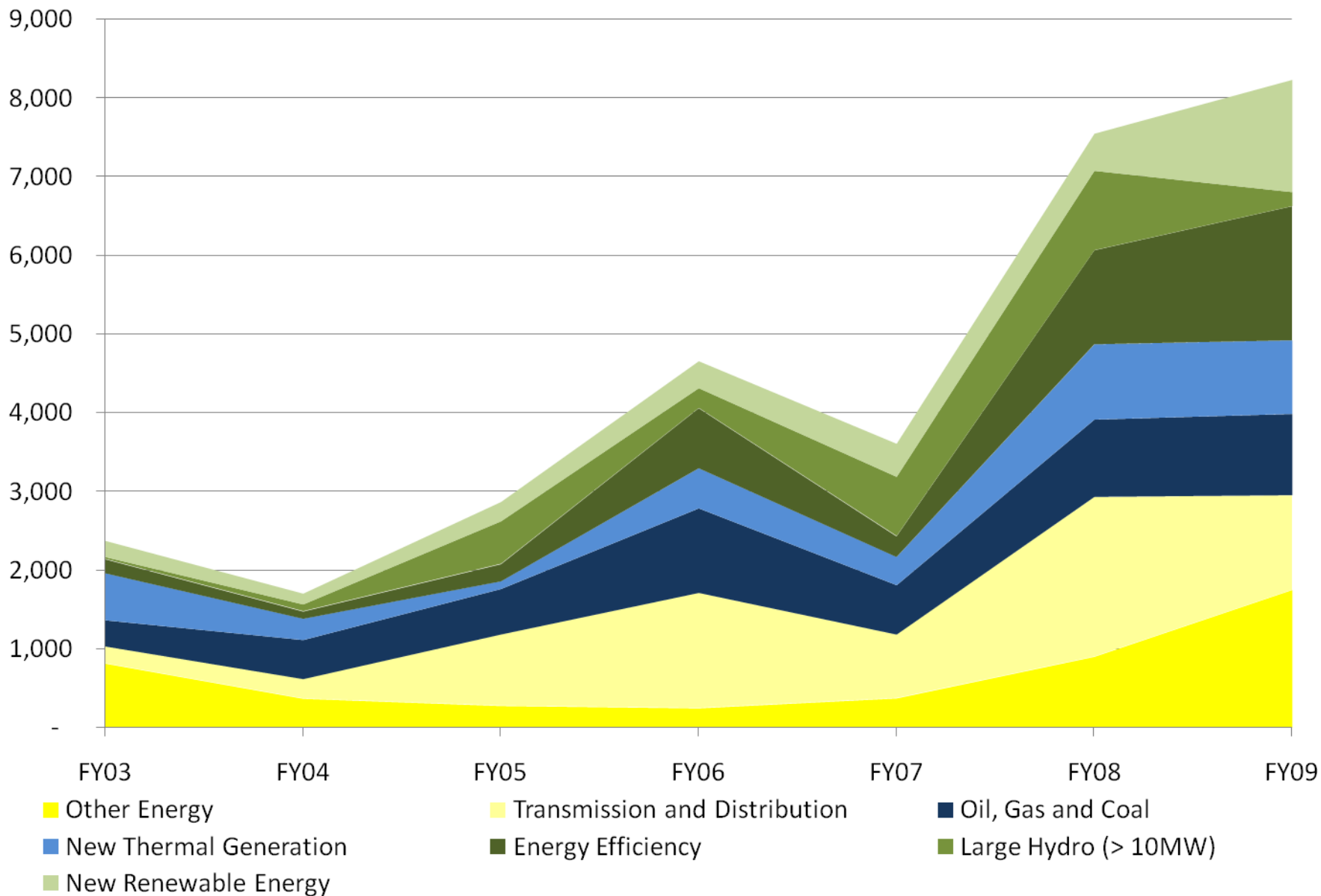
**D. Discussion- Consultation Process &
Initial Feedback on Bank' India Energy
Program**



SECTION A

Bank's Energy Strategy Formulation – Context, Objectives and Process

World Bank Group Energy Financing by Project Type, FY03-FY09





RECENT DEVELOPMENTS AND OUTLOOK – CHANGING EXTERNAL ENVIRONMENT

- ❖ **Widespread electricity shortages and associated high costs of power outages**
- ❖ **Large population without access (1.2–1.4 billion for electricity, more for cooking and heating fuels)**
- ❖ **Rapid urbanization across developing world**
- ❖ **Oil price volatility of 2004-2008**
 - **Diversification, including shift to coal**
 - **Mounting burden of energy price subsidies**
- ❖ **Energy investment disproportionately affected by financial crisis**
 - **Under-investment leading to next energy crisis?**
- ❖ **Evolving financing architecture to address climate change mitigation and adaptation**



TWIN OBJECTIVES AND SUPPORTING PILLARS OF THE ENERGY STRATEGY

Improve operational and financial performance



Improve
access and
reliability of
energy
supplies

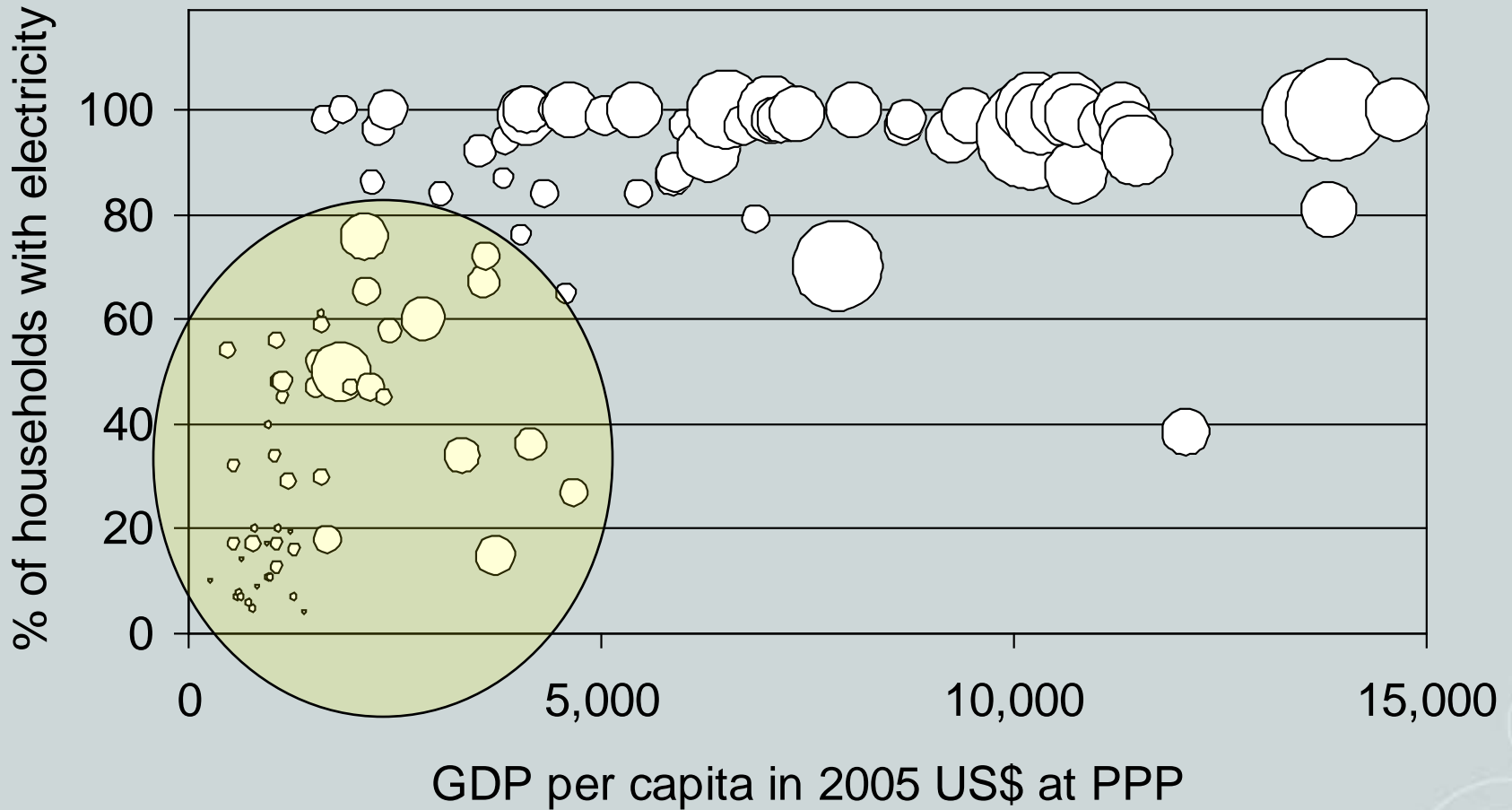
Facilitate shift to
more
environmentally
sustainable energy
sector development



Strengthen governance



IMPROVE ACCESS TO ENERGY



Size of bubble proportional to CO₂ emissions per person



PROPOSED AREAS OF ENGAGEMENT ACROSS ALL COUNTRIES

- ❖ Policy and institutional reforms
- ❖ Cross-border energy trade and regional integration
- ❖ Increased investment in hydropower projects, renewable energy and energy efficiency
- ❖ Transmission and distribution
- ❖ Thermal generation in accordance with DCCSF including coal projects
- ❖ Emergency generation
- ❖ Development projects in extractive industries



LOW-INCOME, FRAGILE, POST-CONFLICT, AND MIDDLE-INCOME WITH LOW ACCESS

- ❖ **Expand supply capacity, improve supply reliability, and increase access. Access to reliable modern energy services will remain #1 priority.**
 - **High cost of power outages slowing down economic development, including some 30 SSA countries with frequent load shedding**
 - **Cross-border trade particularly important for small countries**
 - **Hydropower with focus on integrated water resources management increasingly important**
- ❖ **Will continue to focus on areas with low access in middle-income countries**



LOW-INCOME, FRAGILE, POST-CONFLICT, AND MIDDLE-INCOME WITH LOW ACCESS

- ❖ **Improve affordability by increasing supply efficiency and passing efficiency gains to consumers**
- ❖ **Explore all options: off-grid, cooperatives, pro-poor methods of financing connections, making lifeline rates affordable**
- ❖ **WBG will help build capacity to access financing to make low-carbon alternatives affordable**



MIDDLE-INCOME COUNTRIES

- ❖ **Help address local and emerging global challenges and increase support to innovation and transformation.**
- ❖ **Support commercial-scale renewable energy, supply- and demand-side energy efficiency, and emerging clean technologies and related infrastructure facilities.**
- ❖ **Help leverage carbon finance, private sector financing, and other financing opportunities**



PROCESS

- ❖ **CODE/Board discussion of concept note on July 8**
- ❖ **Consultation Feb. – June 2010**
- ❖ **CODE/Board discussion of draft strategy in fall 2010**
- ❖ **Consultation on draft strategy**
- ❖ **Board discussion in Q3 FY11**



EXTERNAL CONSULTATION

- ❖ **Approach paper, associated annexes, and key reference documents at www.worldbank.org/energyconsultations**
- ❖ **Web-based, VC, and face-to-face**
- ❖ **Informal and public**
- ❖ **Summaries of all public meetings posted on the web**
- ❖ **Country, sub-regional, and regional consultation meetings in the 6 regions**
- ❖ **Private sector**
- ❖ **Three global consultations: Washington DC, Europe, Africa**



SECTION B

India's Energy Development Challenges:

1. Energy Needs for Access & Growth
2. Energy & A Low Carbon Economy



INDIA'S DEVELOPMENT NEEDS ARE MASSIVE AND CHALLENGES IN THE POWER SECTOR SIGNIFICANT ...

456 million living at \$1.25 a day (in 2005, U.S. dollars at PPP).

Increase Access

- At least 400 million without electricity access (vs. 20 million in China in 2008)
- Two-thirds of households rely on biomass for cooking

Improve Efficiency & Governance of Distribution Sector

- 40% AT&C losses; reducing to 15% => \$4.4b addl revenues per year
- Low cost recovery from tariff (82% for FY2007)

Expand & Diversify Power Generation

- Current installed capacity of 145 GW (vs. China's 800 GW)
- Biggest bottleneck to industrial growth and new investment:
 - 60% of firms rely on captive power (vs. 21% in China)
 - Peak Deficit at 16.6%, Energy Deficit at 9.9%,
 - Econ. Cost of Shortages estimated at 7% of GDP

Growing CO2 Emissions

- Power sector represents 50% of India's CO2 emissions (0.5 bt/yr -> 2.3 bt/yr by 2031) 53 % installed capacity and 70-80 % generation from coal-fired plants



GOVT OF INDIA PRIORITIES

(As laid out in 11th Plan and
2008 National Action Plan on Climate Change)

EXPAND GENERATION

- Add about 80,000 MW capacity in 11th Plan
 - including increasing installed hydro capacity by 46% by 2012 (addl. 15 GW)
- Energy Efficiency
 - Rehabilitate and modernize about 27,000 MW of old coal-fired power plants
 - Increase share of supercritical to 20% of new installations in 11th Plan
 - Demand Side Management
- Increase Renewables (SMH, Wind, Biomass) to 10% of installed capacity by 2012 (from current 4%)
- Increase Solar share in energy mix to 20,000 MW by 2020 with 50% CSP

IMPROVE QUALITY OF SUPPLY AND SERVICE

- Expand inter-regional transmission from 10,000 MW to 37,000 MW by 2012
- Upgrade & expand distribution networks & MIS (target 15 % ATC losses)

EXPAND ACCESS TO REACH ALL BY 2012

- With Conventional & Renewable Energy Sources in On/Off-Grid Approaches
- Through Utility, Franchisee, or other Business Models

COMPLY WITH ENVIRONMENTAL AND SOCIAL SAFEGUARDS



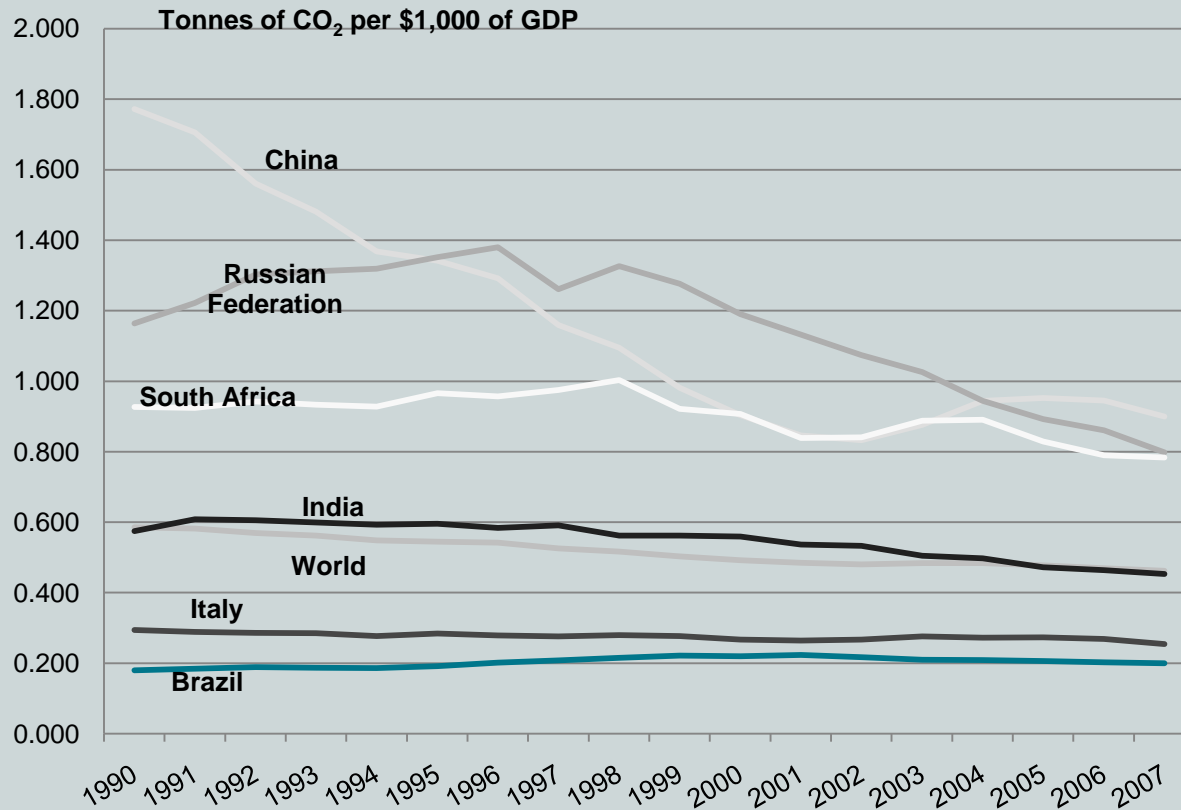
SECTION B. 2

India's Energy Development Challenges

1. Energy Needs for Access & Growth
2. Energy & A Low Carbon Economy



INDIA'S GHG FOOTPRINT IS RELATIVELY MODEST



- India responsible for 4 % of global GHG emissions, compared with ~25 % for both US and China
- Per capita GHG emissions among the lowest at 1.8 tCO₂e - OECD avg. 14; China 4; EU 10; US/Canada 20
- Carbon intensity (CO₂e per unit of GDP, on PPP basis) on par with global average

Carbon Intensity 1990 – 2007

(metric tonnes CO₂/ thousand GDP PPP (US \$ 2000))

source: World Bank 2007



...BUT CO₂ FOOTPRINT WILL GROW WITH DEVELOPMENT...

- ❖ Consistent with India's Integrated Energy Strategy, World Bank study, 'Energy-Intensive Sectors of the Indian Economy - Options for Low-Carbon Development', found that:
 - CO₂ emissions will increase from 1.1 billion in 2007 to:
 - Potentially 4.5 billion tonnes in 2031 under existing plans
 - Potentially 3.7 billion tons in 2031 under an all-out effort to lower CO₂
 - Scen 1: CO₂ intensity declines by 33% by 2031 (19% by 2020)
 - Scen 2: CO₂ intensity declines by 45% by 2031 (30% by 2020)
 - Both scenarios require concerted effort (tech, financial, institutional, policy); 2nd scenario has 14% higher capex with 18% lower CO₂ emissions (mainly from industry & transport)
 - 'Bending' the CO₂ emission curve: Requires replacing 130 GW of coal generation with clean technologies (by 2025)



EVEN WITH ENERGY GROWTH, INDIA'S CONSUMPTION REMAINS FRUGAL BY INTERNATIONAL STANDARDS.....

By 2030-31:

- **Richest third of urban households consume about one third of the EU's average current electricity consumption**
- **Per capita consumption of the industry products is no higher than per capita world production in 2006**
- **Car ownership approaches 86 per 1000, significantly lower than the 300 - 765 per 1000 observed in most high-income countries today**



SECTION C

The Bank's Energy Program in India

- **Portfolio & Pipeline**



BANK ENGAGEMENT: FOCUS ON INFRASTRUCTURE & INSTITUTIONAL DEVELOPMENT

Bank program responds to GoI's sector development strategy underpinned by Electricity Act 2003 and sector policies

Clean Power Generation

- Hydropower projects with 2 public sector companies on 2 river basins (SJVN on Satluj basin in Himachal Pradesh and THDC on Alaknanda basin in Uttarakhand)

Energy Efficiency

- Coal-fired plant rehabilitation with Gencos in 3 States (w/GEF);
- Transmission & Distribution: Haryana Transco (IBRD, TA, CF)
- Demand side management (w/GEF): Chiller EE, SME, BEE

Efficient energy markets & inter-regional power transfer

- Powergrid & Haryana Transco (IBRD); Maharashtra Transco (SNF Loan & TA)
- [Cross-border energy trade: India-Nepal and India-Bangladesh]

Utility governance and quality of electricity distribution services - selected states (including rural areas)

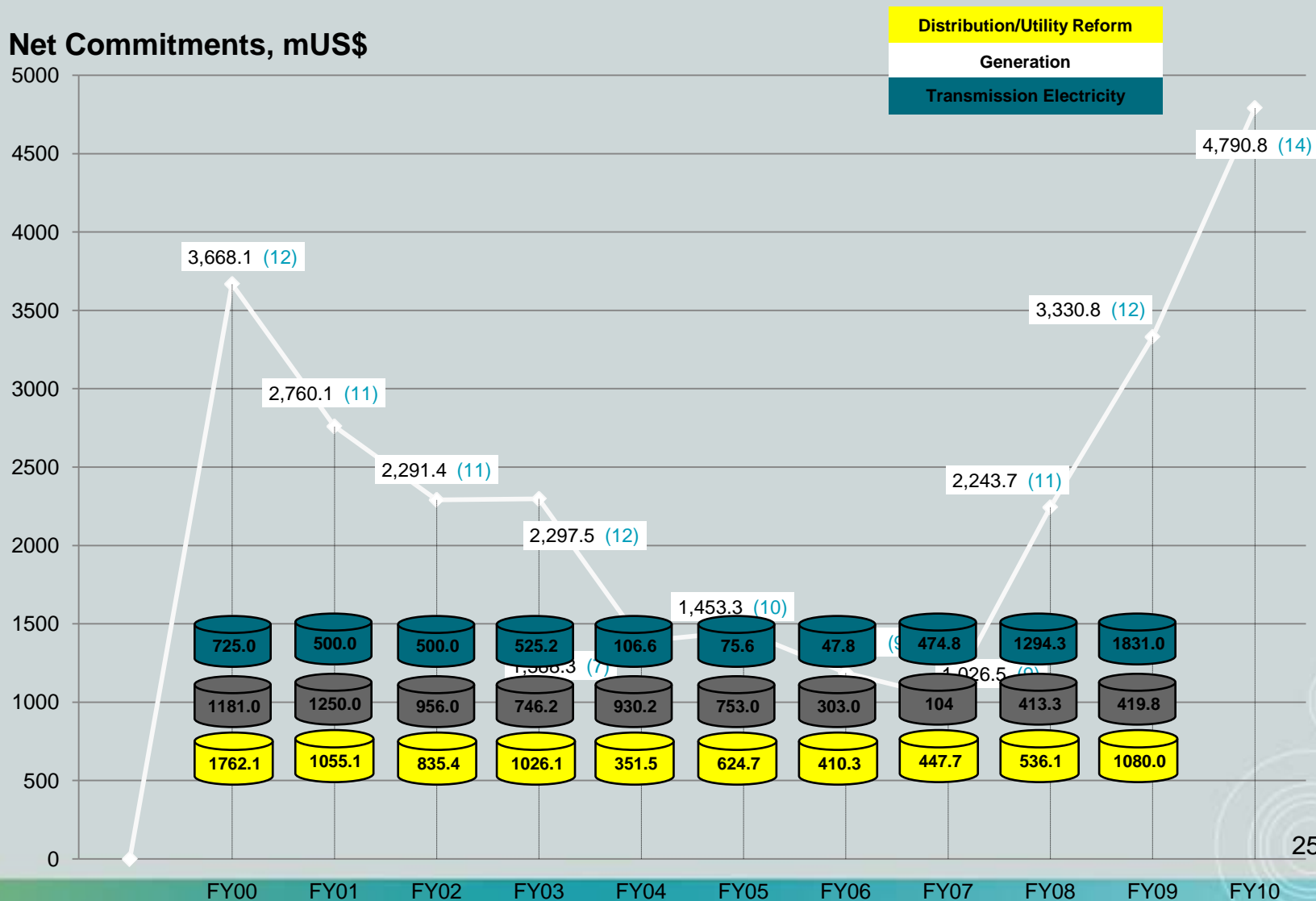
- West Bengal, Maharashtra Discom (TA); Haryana Discom (IBRD & TA)



ENERGY LENDING PORTFOLIO + PIPELINE

Project Name	Board Approval	Revised Closing Date	Age (yrs)	Comm Amt.	Total Disb.	Percent Disb*
Power System Development III	19-Jan-06	31-Jul-11	3.9	400.0	382.4	95.6%
Rampur Hydropower Project	13-Sep-07	31-Mar-13	2.2	400.0	93.6	23.4%
Power System Development IV	18-Mar-08	31-Jul-14	1.7	1,000.0	475.5	47.6%
Coal-Fired Generation Rehabilitation	18-Jun-09	30-Nov-14	0.5	180.0	-	0.0%
Haryana Power System Imp.	4-Aug-09	31-Dec-14	0.3	330.0	0.8	0.3%
Power System Development V	22-Sep-09	30-Jun-15	0.2	1,000.0	-	0.0%
India - Chiller Energy Efficiency - MP	9-Jun-09	30-Jun-14	0.5	1.0	-	0.0%
Chiller Effcy-GEF	30-Jun-09	-	0.4	6.3	-	0.0%
IIFCL	22-Sep-09	30-Sep-15	0.2	1,195.0	3.0	0.3%
PROPOSED (FIRM)						
Vishnugad-Pipalkoti Hydro (444 MW)	Apr 2010			600.0		
Luhri Hydro (700 MW)	Dec 2010			700.0		
SME Energy Efficiency Project (GEF)	Apr-2010			12.0		
Sustainable Urban Transport (IBRD/GEF)	Dec-2009			175.0		

SOUTH ASIA LENDING FOR ELECTRICITY DISTRIBUTION, TRANSMISSION & GENERATION





WORLD BANK PROGRAM... CLEANER POWER GENERATION

Hydropower

- Increase in hydropower capacity of about 1,500 MW (on-line after 2012)
- Raise development & operational practices to international 'good practice' benchmarks in two states and two river basins
- Projects:
 - SJVNL: Rampur (412 MW, FY08) & Luhri (700 MW, FY11)
 - THDC: Vishnugad-Pipalkoti (444 MW, FY10)
 - Himachal Sustainable Development DPL (?)

Solar Power (Thermal and PV applications – in association with IFC):

- Support National Solar Mission under NAPCC
- Promote Concentrating Solar Power (CSP) deployment by helping remove existing regulatory and investment barriers

Other RE Development

- Distributed generation (1-3 MW) for improved rural access and services (RE-based and private sector led);
- Support for RE scale up to 10% of generation by 2012



WORLD BANK INDIA PROGRAM...

ENERGY EFFICIENCY

National
Thermal
R&M
Program
Coordination
with KfW,
USAID Eco-
Asia, ADB

Thermal Power Rehabilitation

- Rehabilitate 640 MW of coal-based thermal power plants to improve their reliability, plant load factor, and fuel efficiency
- IBRD Loan cum GEF grant to state power generation utilities: West Bengal Power Development Corporation Limited (Bandel Unit-5), Maharashtra State Power Generation Co (Koradi Unit-6), Haryana – HPGCL (Panipat Units 3&4)]
- National R&M Program [under development – targeting about 20,000 MW]

Electricity Transmission & Distribution:

- Energy Efficiency/loss reduction is key element of T&D engagement; Utility reform critical for effective demand-side management

Demand-Side Measures (with GEF support):

- Chiller Efficiency; Energy Efficiency in SMEs
- Bureau of Energy Efficiency; Agriculture Pump Sets



WORLD BANK INDIA PROGRAM... NATIONAL & REGIONAL MARKETS

**POWERGRID
(National)**

**National
Electricity Fund
(to support State
Transcos)**

**Coordination
with ADB, KfW
and JICA**

❖ **National & Regional Electricity Markets**

- **Expand transmission capacity both at the national and state levels – to facilitate efficient energy markets, inter-regional power transfer (from 12,000 MW to 37,000 MW by 2012)**
- **Build institutional capacity of state transmission utilities**
- **IBRD Loans to:**
 - **POWERGRID – Model for effective institutional development**
 - **Maharashtra – Sub-National Financing (with IFC)**
 - **Haryana Transo –**
 - **Potential National Electricity Fund (for state transcos)**



WORLD BANK PROGRAM... STATE DISTRIBUTION

**Improving
Distribution
Viability**

**Coordination with
ADB, KfW and
JICA**

❖ **State Distribution Engagement**

- **Improve quality and efficiency of electricity distribution services**
- **Improve level of public confidence in energy and financial management (corporate governance) systems of target utilities**
- **Improve regulatory effectiveness**
- **IBRD loans to Haryana and TA grant to West Bengal, with objectives to develop principles and guidelines to support National Programs like APDRP and RGGVY**



ANALYTICAL PROGRAM – FOCUS ON THE ‘HOW TO’ OF IMPROVING SERVICE DELIVERY AND ENSURE LOW CARBON GROWTH

Org. Transform. & Governance

- West Bengal Power Department and Utilities
- Maharashtra Transmission Company
- Haryana Transmission Company
- Haryana Distribution Company

Regulatory Effectiveness

- Capacity Building of Haryana Regulator
- Partnership with Central Electricity Regulatory Commission
- **Support to capacity building institutions in regulation (CUTS)**

Service Delivery Models

- Framework for Distributed Generation
- Managing Distribution Franchisees
- Improved Electricity Access to Slum Dwellers (Mumbai)

Clean Energy and Energy Efficiency

- Low Carbon Development Study
- River Basin Optimization Study in HP, Uttarakhand
- Investment Climate Assessment in Renewables
- Regulatory Options for EE Rehabilitation Projects
- EE-focused Operations & Maintenance Practices
- Deployment of Concentrating Solar Power in India

In addition, supporting cross cutting reforms through DPLs in AP, HP, Bihar, UP; with power sector as one of main pillars of DPLs



SECTION D

Discussion:

- ❖ Consultation Process – Timeline and Participation
- ❖ Initial Feedback on Bank's India Energy Program



CONSULTATIONS

- ❖ **Bangalore – 16 February 2010**
- ❖ **Delhi -- 24 February 2010**
- ❖ **Sri Lanka, Pakistan and Nepal – via VC 25 February 2010**
- ❖ **Dhaka – 28 February 2010**



Bank's Evolving Program in Context of India's Development Challenges: FOR DISCUSSION

- With goal of expanding and improving energy services for growth and poverty alleviation, focus on areas where **institutional and infrastructure development, combined with policy action**, can potentially put India on a lower carbon path than business as usual

- Possible areas (within resources constraints & development priorities):
 - Shift towards 'cleaner' energy mix – hydro, solar, other renewables
 - Cross-border trade & energy security
 - Energy Efficiency (Supply & Demand Side)
 - Institutional Effectiveness – Resource Development, Service Provision, Regulation, RE and EE
 - Other



WB Support to India's Energy Sector Development