



International
Energy Agency

Energy Technology Perspectives 2010: Indian Power Sector

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Scenarios in the Power Paper

ETP2010 Scenarios

■ Baseline scenario:

- Following the World Energy Outlook 2009 Reference Scenario
- World GDP grows by factor 2.75 between 2007 and 2050, India's GDP nearly by factor 8
- Energy prices: Oil USD 120/bbl in 2050, Coal USD 115/tonne

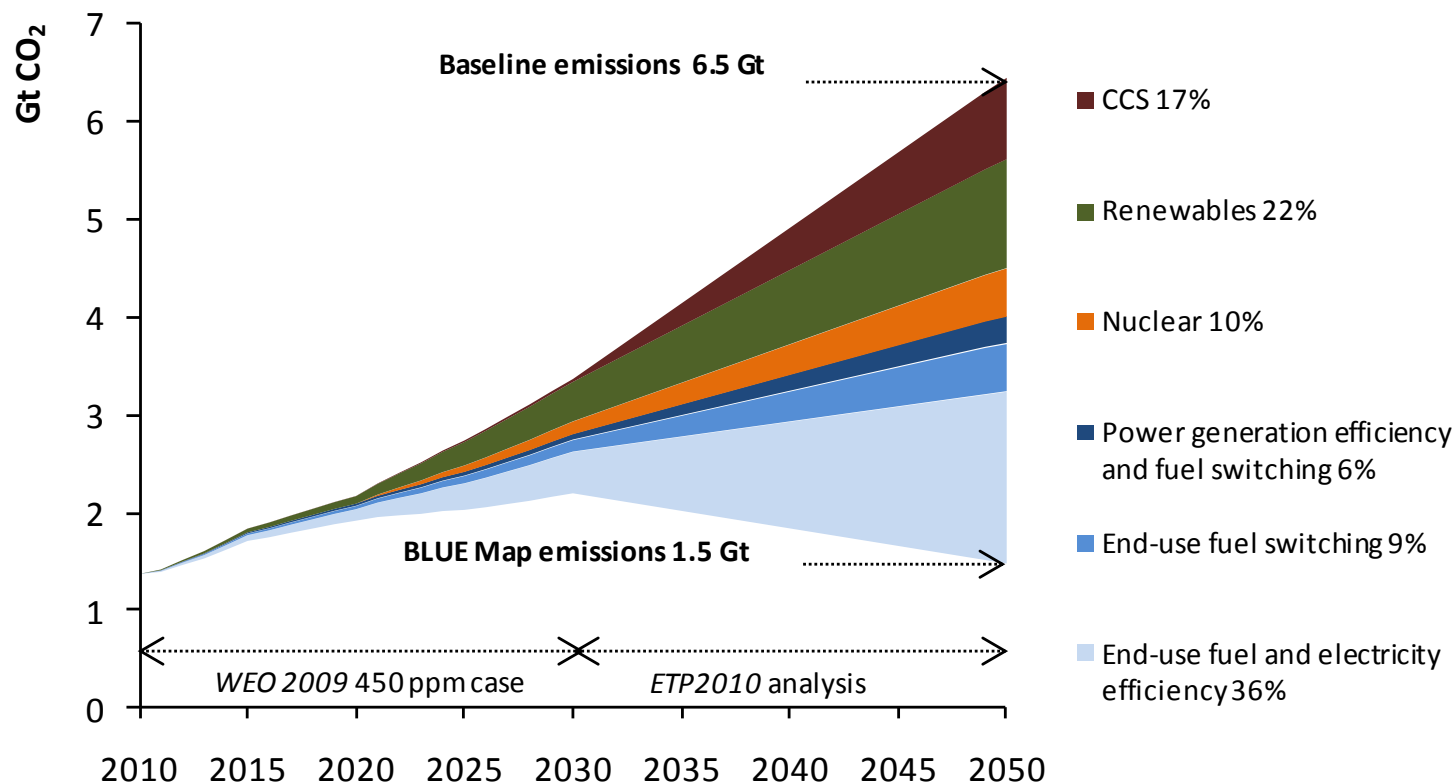
■ BLUE scenario:

- 50% reduction of energy related CO₂ emissions by 2050 compared to 2005
- Options with marginal reductions of up to USD 175/t CO₂ are needed
- Due to uncertainties number of variants being considered

High demand scenarios (BLUE & Baseline)

- GDP growth rate for India averages 6.3% per year to 2050 (8% to 2030) and no CCS

Contributions to CO₂ reductions in India (ETP2010)



CO₂ emissions in BASE more than quadruple between 2007 and 2050. In BLUE, CO₂ emissions in 2050 are 10% higher than in 2007.



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Power Sector Results for India



Main Comments from Review for Power Sector

- **Technology transfer issues**
 - Diffusion of low-carbon technologies in emerging economies discussed in separate chapter in ETP 2010
- **How to achieve the BLUE Map scenario practically?**
 - This type of analysis is beyond scope of ETP 2010, but IEA has developed technology roadmaps on a global level and is planning to release a guidebook on how to build national roadmaps.
- **Economic growth assumptions too pessimistic**
 - Higher growth variants of the scenarios have been included in the working paper.
- **Nuclear capacity too low in 2050**
 - More optimistic assumptions regarding nuclear construction rates included in high demand variant of BLUE scenario.
- **CCS considered not as an option for India**
 - CCS has been excluded as mitigation option in the power sector for the high demand variant.

ETP Scenarios for Indian Power Sector

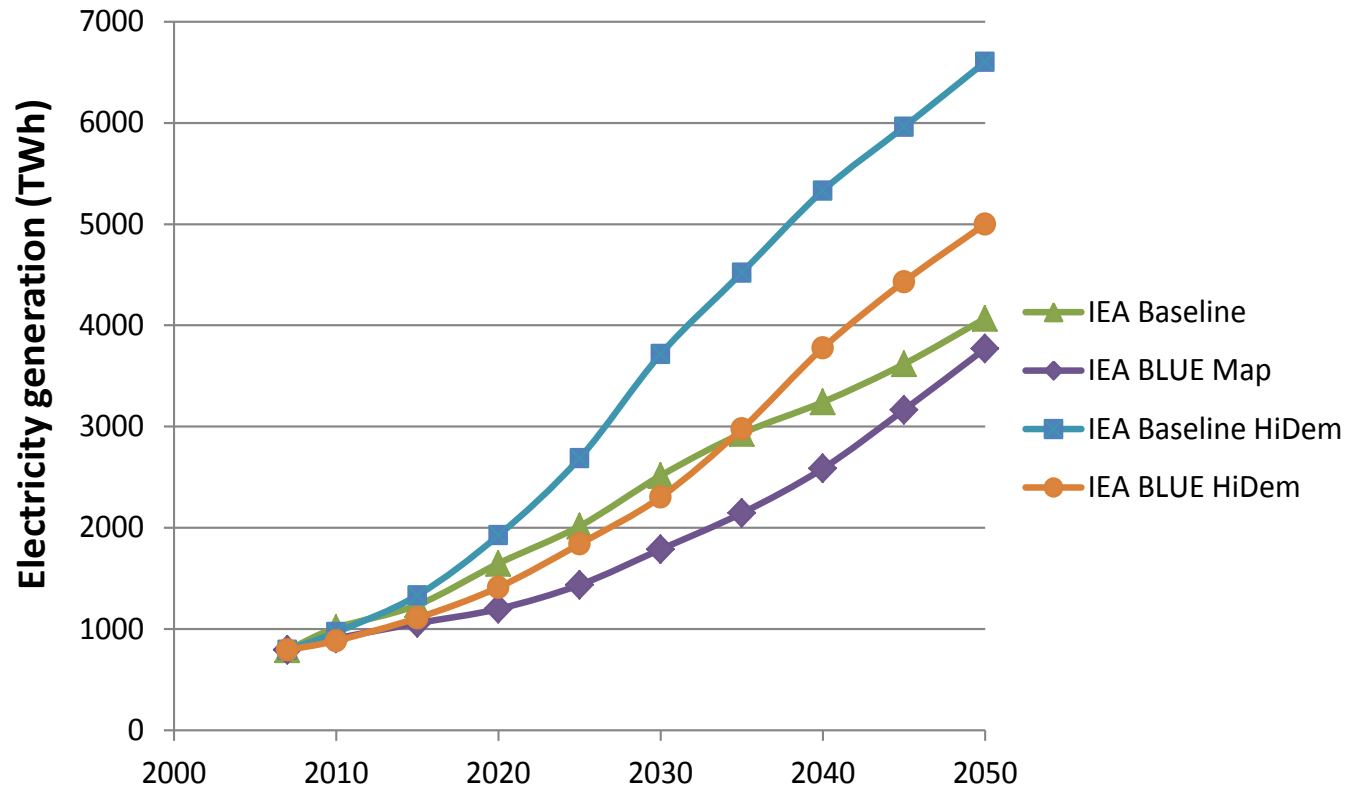
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Scenario	GDP growth rate		Electricity generation in 2050	CO ₂ price in 2050
	2007-2030	2030-2050	TWh	USD/t CO ₂
Baseline	6.3%	3.3%	4062	-
Baseline HiDem	8.0%	4.0%	6606	-
BLUE Map	6.3%	3.3%	3762	175
BLUE HiDem	8.0%	4.0%	5003	175

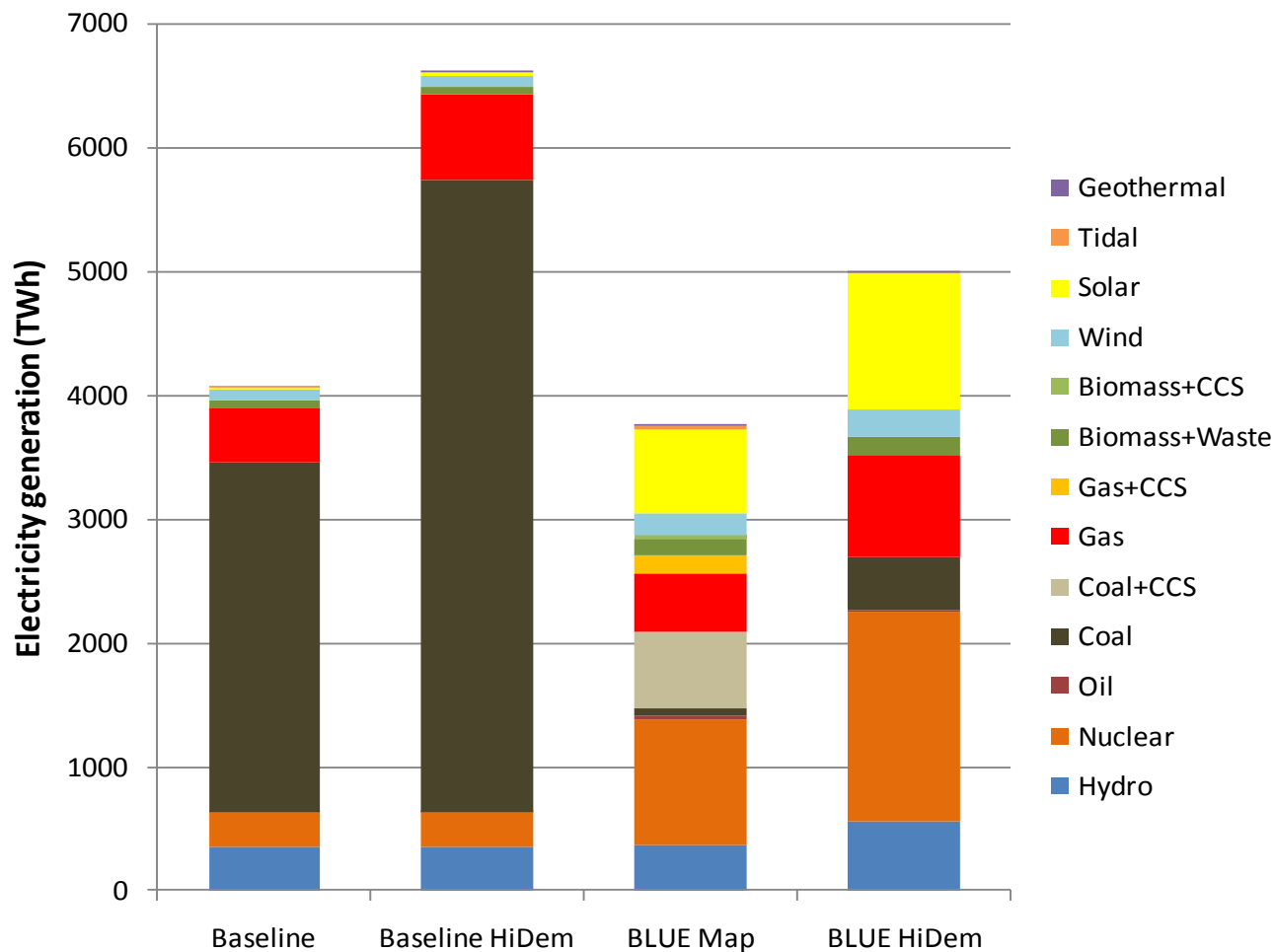


Electricity Generation



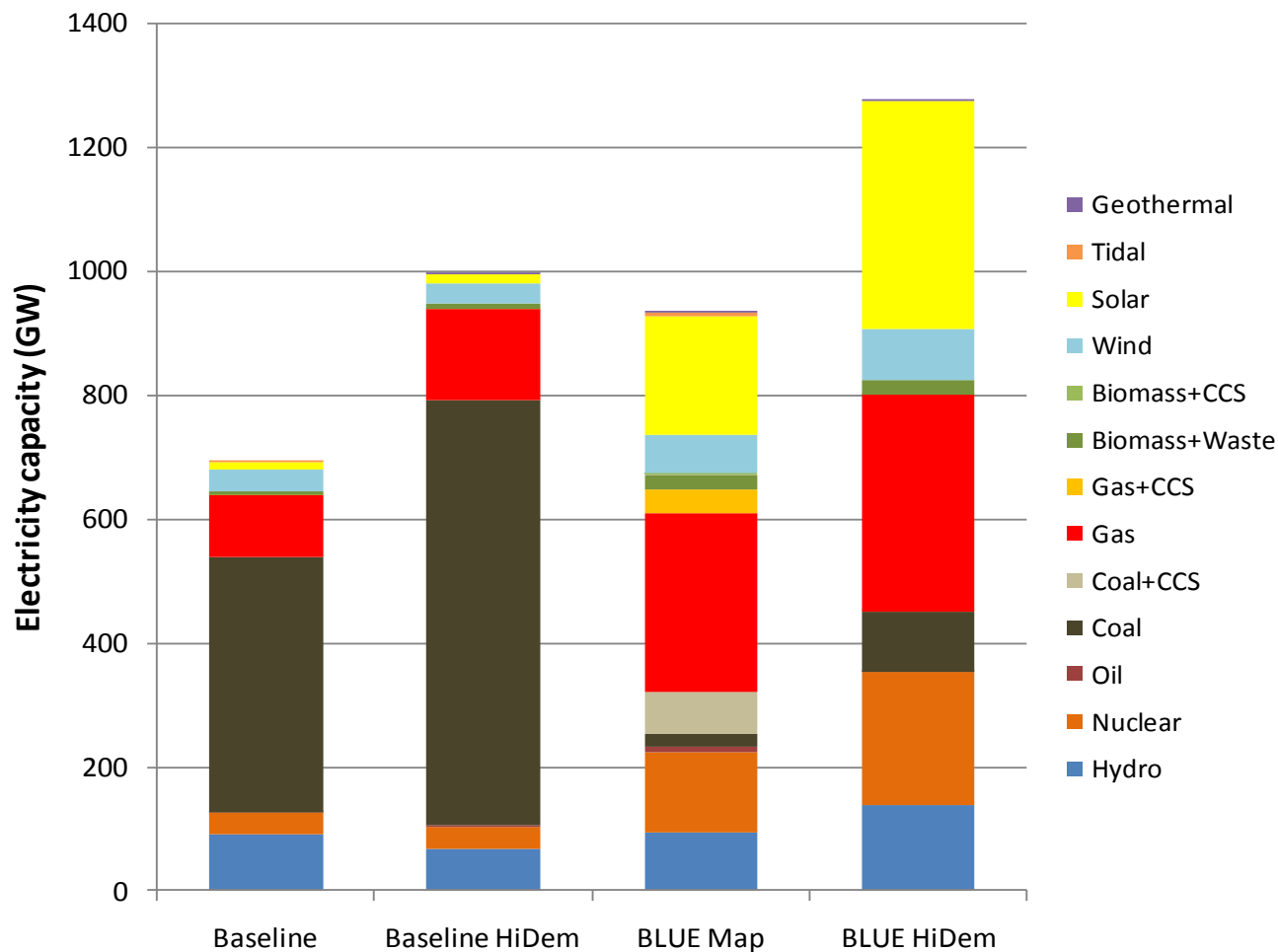
Depending on economic growth assumptions electricity generation grows by a factor of 5 to 8 between 2007 and 2050.

Power Generation in 2050



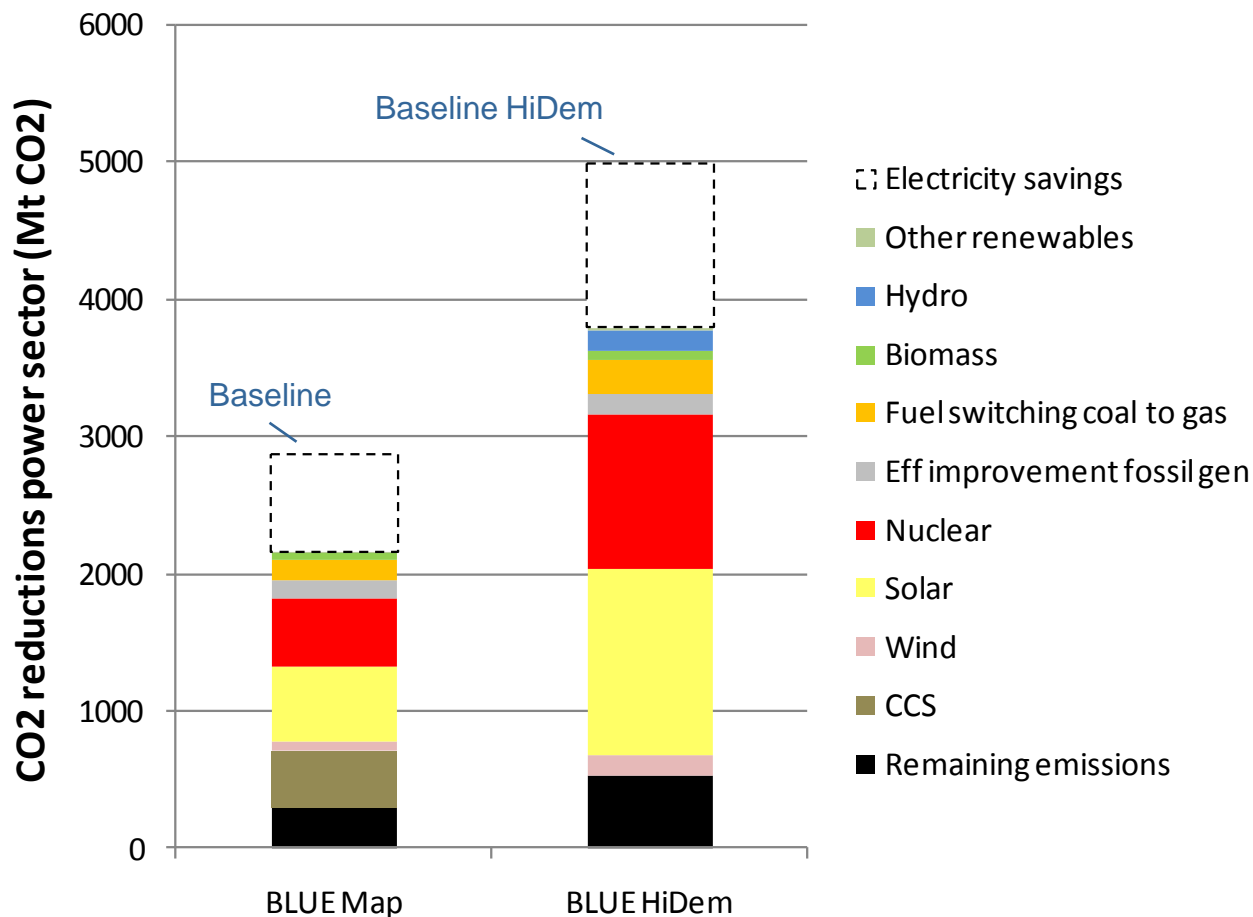
Power sector gets substantially decarbonised in the BLUE scenarios: from 928 g CO₂/kWh in 2007 to 78-98 g/kWh in 2050.

Power Capacity in 2050



Capacity needs in the power sector vary significantly depending on economic growth and climate policy.

CO₂ Emissions Reductions in Power Generation



CO₂ emissions reductions result from reduced electricity use, more renewables and nuclear and the introduction of CCS.

Insights from Analysis of Indian Power Sector

- Electricity demand growth in relative terms much higher than in other regions
- Due to low coal quality indigenous coal not necessarily most economic option compared to import coal
- Indian renewable potential is limited with the exception of solar
- In addition to solar, nuclear and CCS as low-carbon supply options
- Improvement of transmission and distribution efficiencies plus maximisation of end-use efficiency

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Proposed Way Forward on Working Paper

- **Welcome comments from Working Group until the end of October**
 - **ETP2010 now published so these scenarios will not be changed**
- **IEA will incorporate comments and finalise paper by end of November**
- **Publish paper by end 2010**

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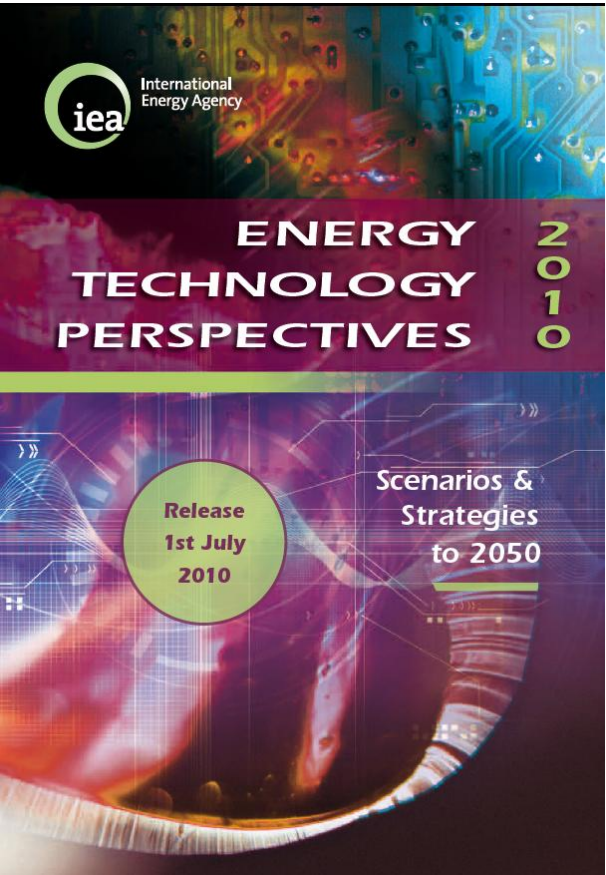
Possible Future Areas for Cooperation

■ Contributions to ETP2012

- Better characterisation of Indian energy resources and power technologies
- Improved regional modelling of the future contribution from different power sector options
- Review of ETP2012 assumptions and drafts

■ Contributions to Roadmaps and Policy Analysis

- Participation in international roadmap meetings and review of drafts
- Developing technology roadmaps for the Indian context, e.g. nuclear, PV, CSP, smart grids
- Contribution to work on best practice policies and measures to achieve a low-carbon transition for the power sector



Thank You!