

Shell energy scenarios to 2050

An era of revolutionary change

Beijing December 2008

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energy



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Discontinuities are not that obvious

“Well informed people know it is impossible to transmit voice over waves and that were it possible to do so, the thing would be of no practical value.”

Editorial in The Boston Post c.1865

“I think there is a market for about 5 computers.”

Thomas J. Watson, Chairman of IBM, 1943

“There is no reason for any individual to have a computer in their home.”

Ken Olsen, President of DEC, 1977

“\$10 per barrel might actually be too optimistic. We may be heading for \$5.”

Economist magazine, 1999

Predetermined trends and critical uncertainties

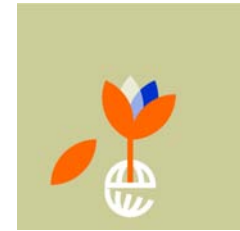
DEMOGRAPHY



RESOURCES



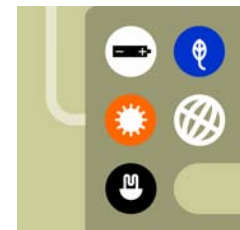
ENVIRONMENT



DEMAND



TECHNOLOGY

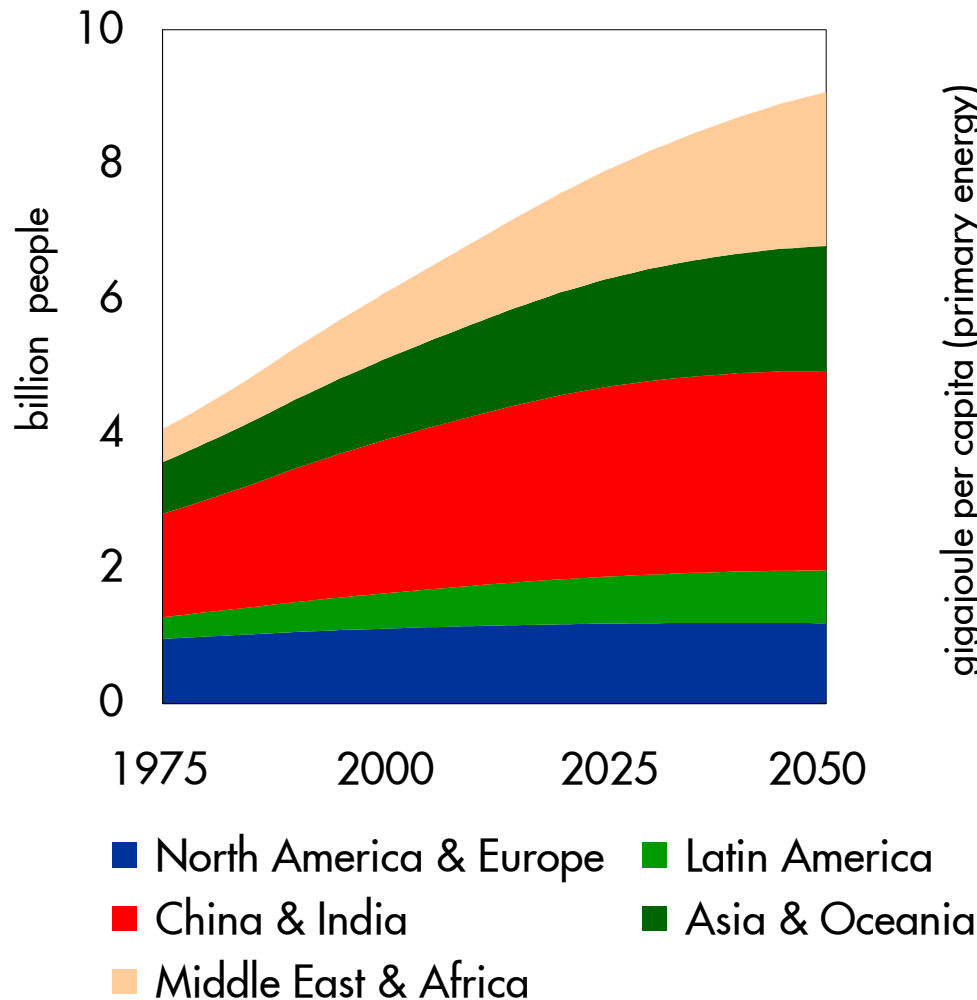


CHOICES

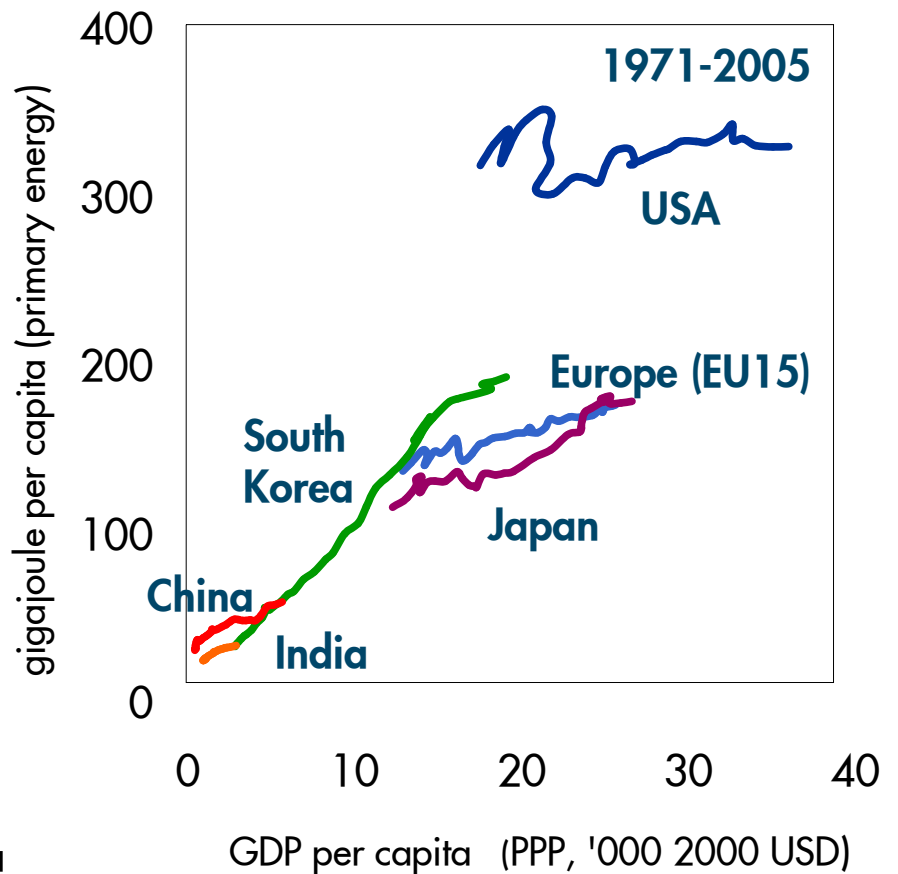


Energy demand driven by the population & prosperity of rapidly growing economies

Population

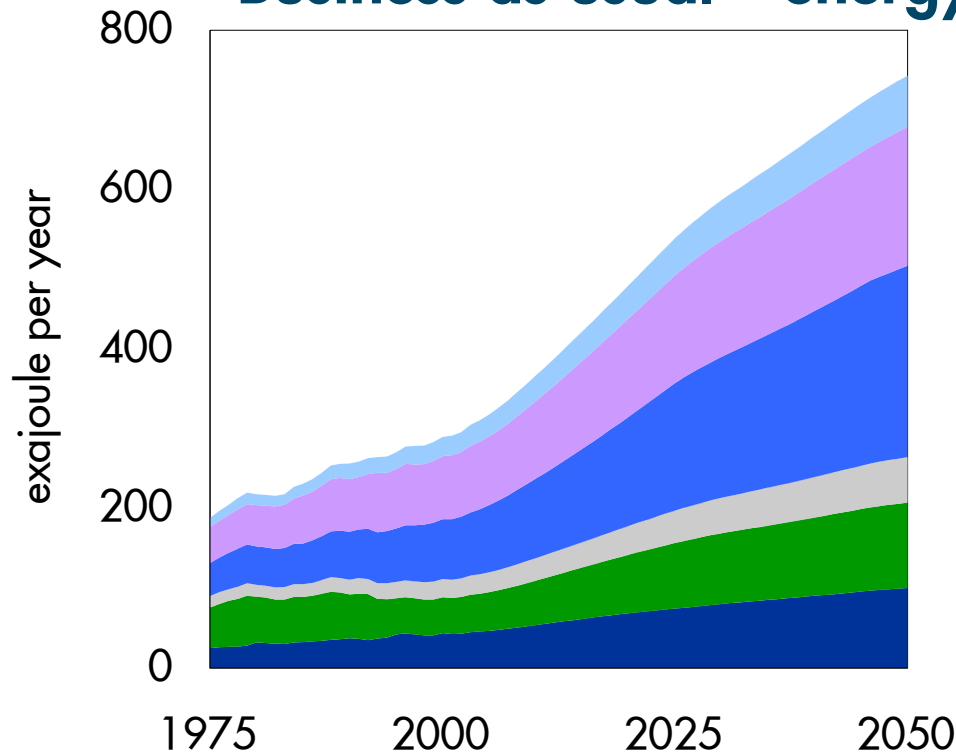


Energy demand per person -History



World energy demand is on track to double by 2050.

“Business as usual” energy consumption by sector



- Heavy industry
- Agriculture & other industry
- Services
- Transport
- Residential
- Non energy use (e.g. petrochemicals)

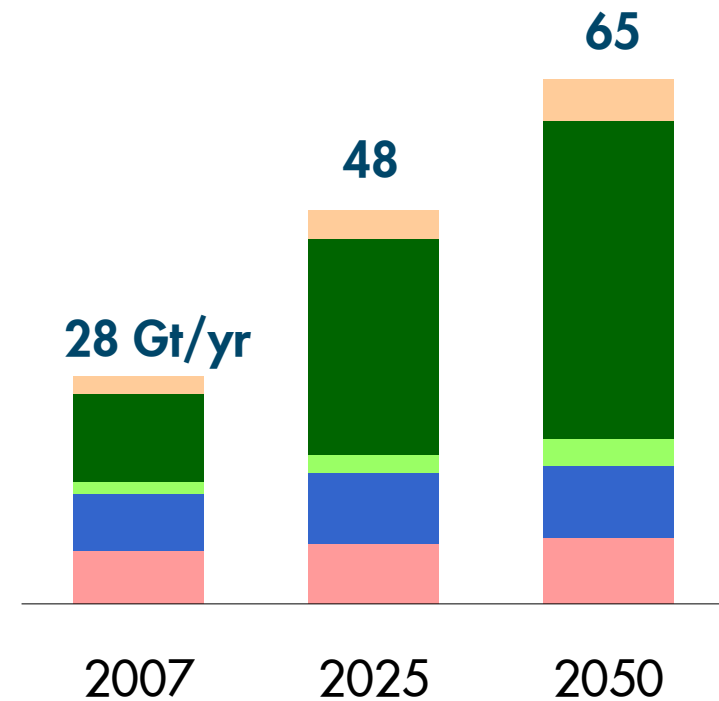
Supply will struggle to keep pace



And environmental stresses will increasingly be at the forefront



In "Business as usual" world, direct CO₂ from energy could rise dramatically



- North America
- Europe
- Latin America
- Asia & Oceania
- Middle East & Africa

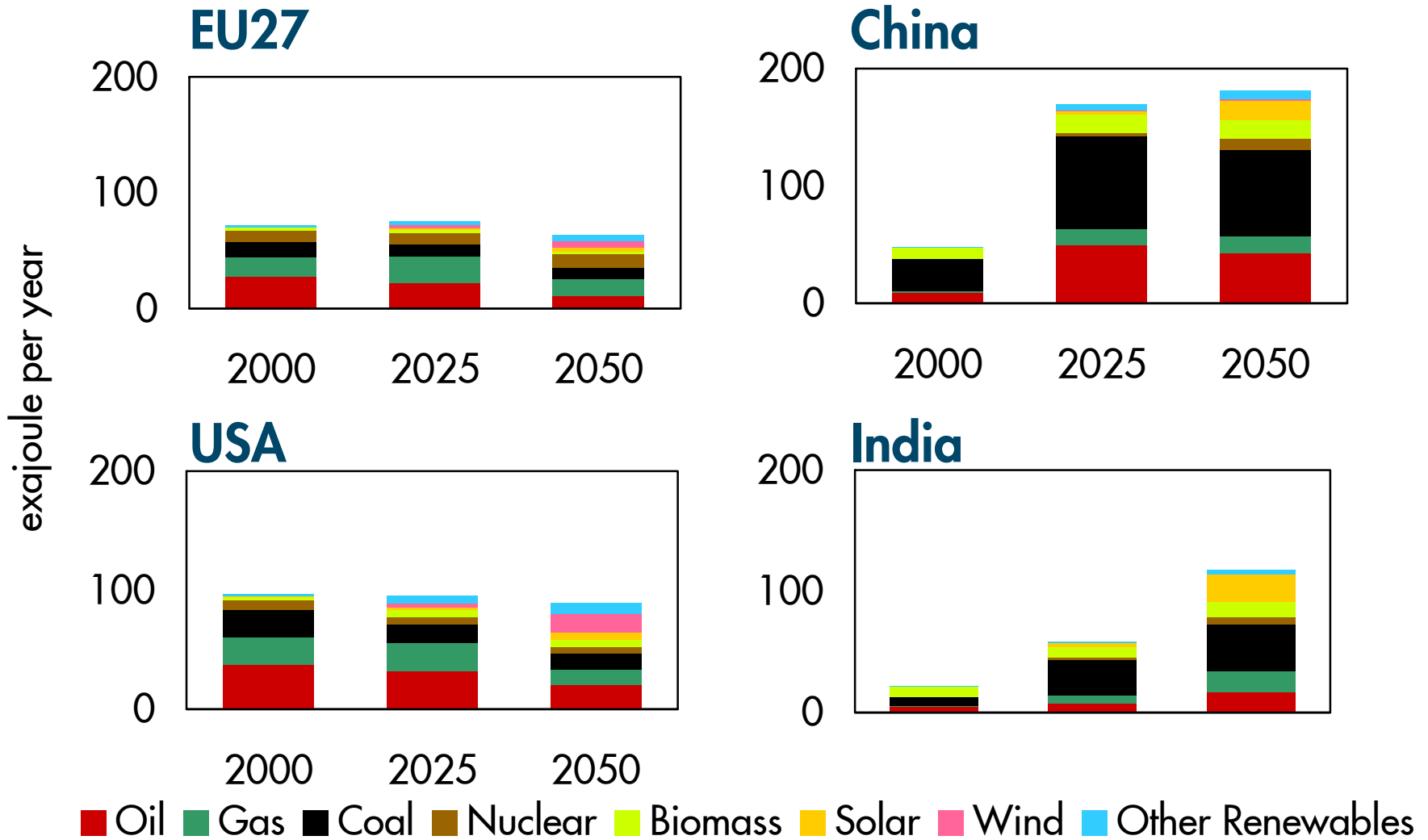
Three hard truths will shape the future of the energy system

- Surge in energy demand
- Supply will struggle to keep pace
- Environmental stresses are increasing



Energy transitions are inevitable

Total primary energy demand (Blueprints scenario)



Source: Shell International BV and Energy Balances of OECD and Non-OECD Countries©OECD/IEA 2006

Shell energy scenarios

Demography



Demand



Environment



Choices



Resources



Technology



National supply focus
and reactive change

BLUEPRINTS
SCRAMBLE

Emerging coalitions
And accelerated change



SCRAMBLE

Scramble - People at the heart of the storylines ... individually and collectively

- People choose the easiest option for them
- Fear is not enough to change behaviours
- Climate change is too difficult
- Delegating action to the state
- Adapt rather than change

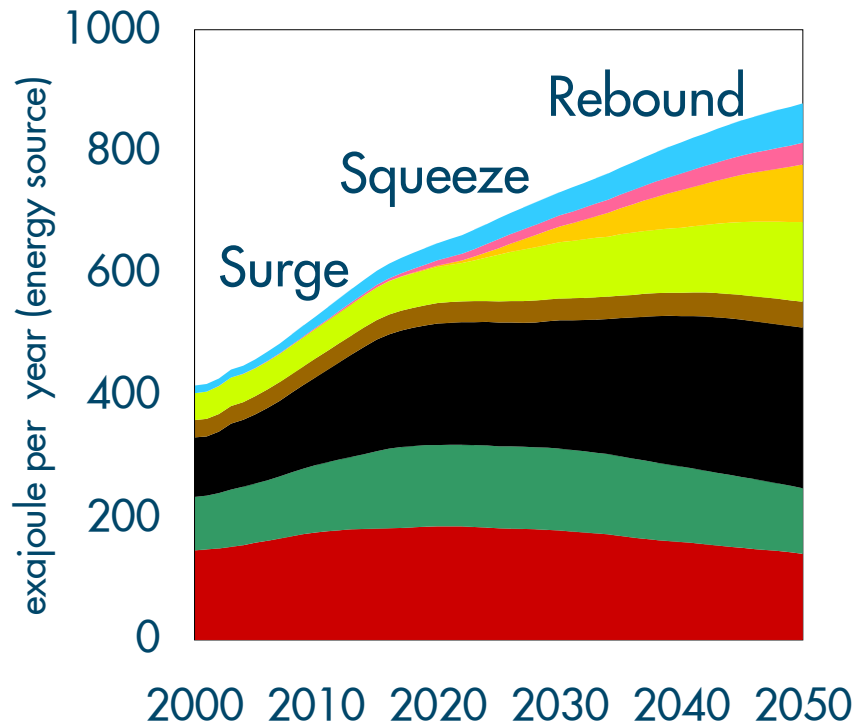


Scramble - Security of supply and fear of losing economic growth



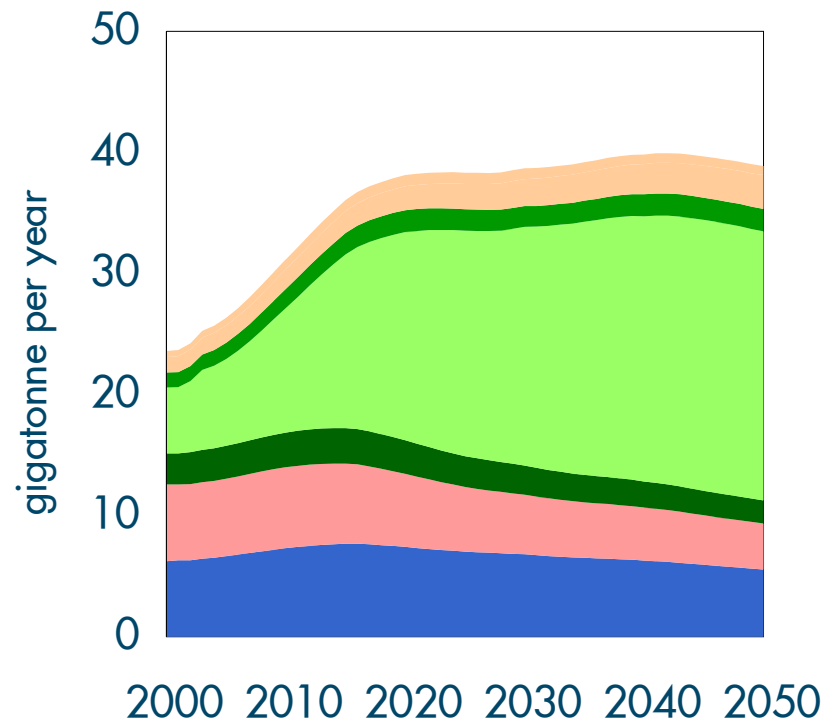
Scramble – supply focus and late responses

Total primary energy demand



- Oil
- Coal
- Biomass
- Wind
- Gas
- Nuclear
- Solar
- Other Renewables

Direct CO₂ emissions from energy



- Middle East & Africa
- Latin America
- Asia & Oceania - Developing
- Asia & Oceania - Developed
- North America
- Europe



BLUEPRINTS

Blueprints - People at the heart of the storylines ... individually and collectively

- Shared interest not altruism
- Adoption through “mainstreaming”
- Trial, error, collaboration and copying success
- Success is emergent, not centrally driven initially

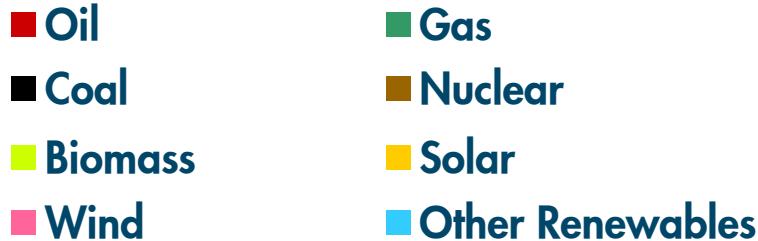
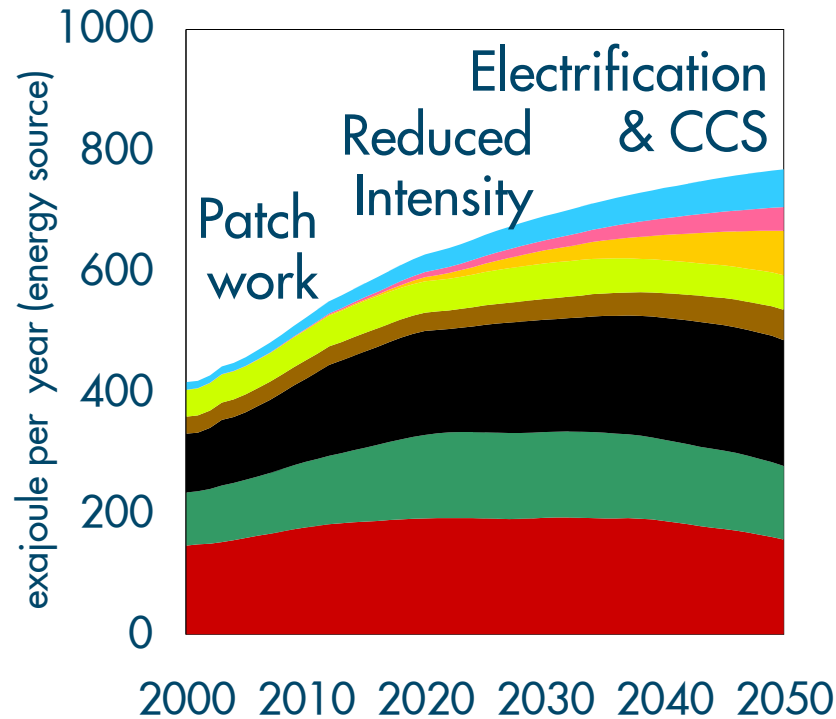


Blueprints – Energy security and sustainability

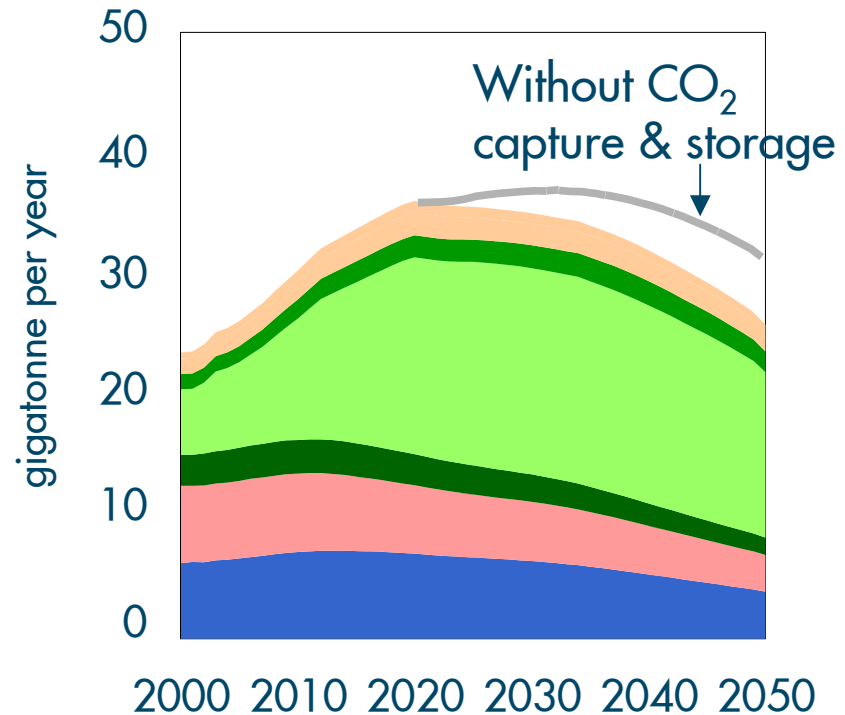


Blueprints - multi-focus and early actions

Total primary energy demand

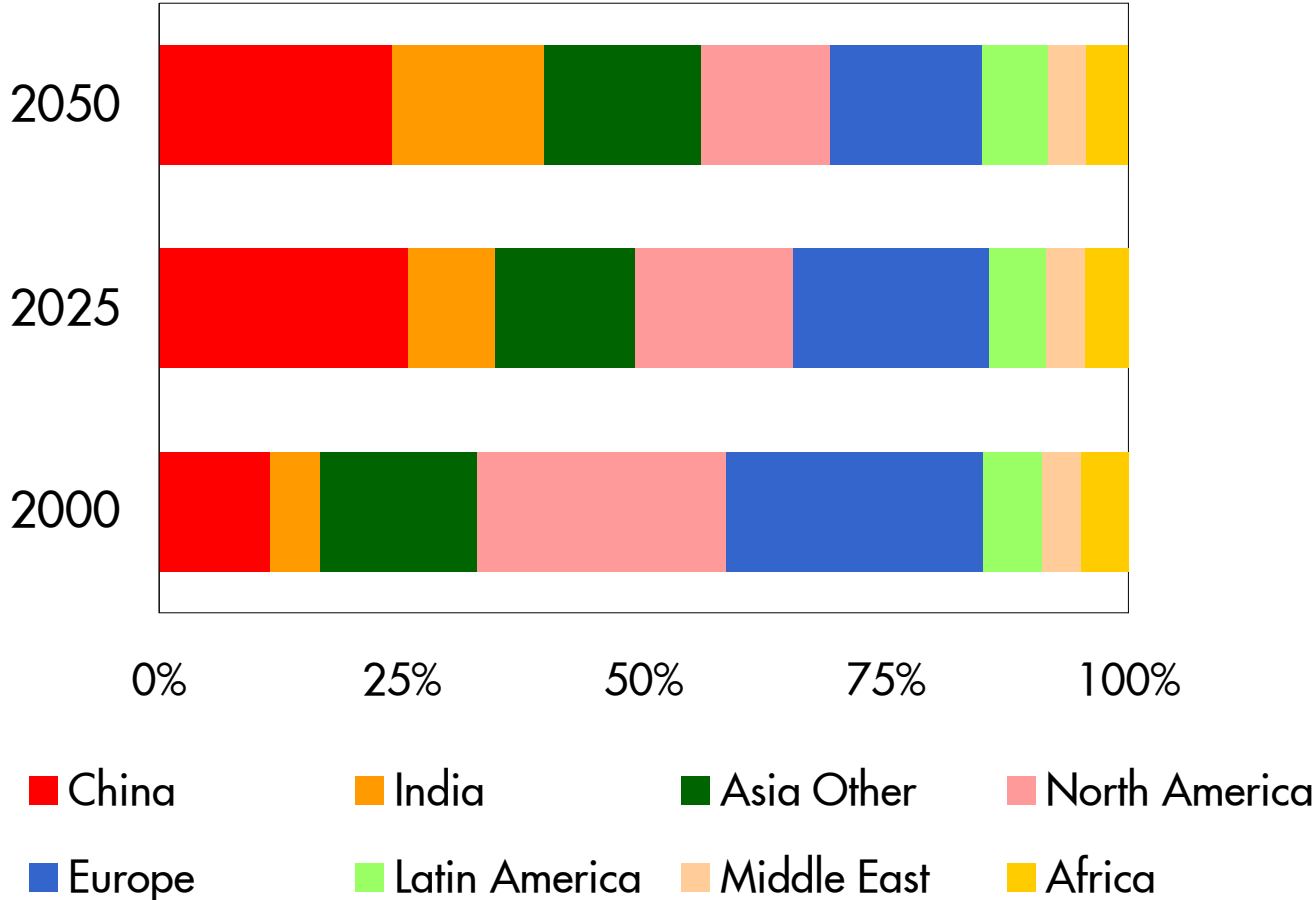


Direct CO₂ emissions from energy



In 2025, in either scenario, China represents >25% of primary energy demand globally

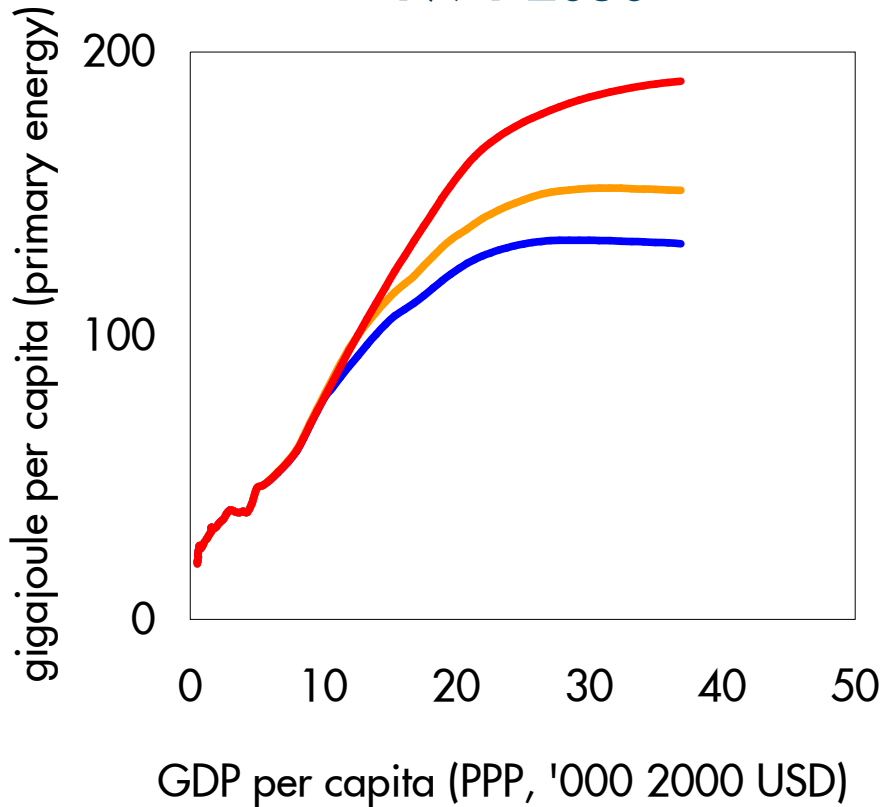
Total primary energy demand **Blueprints** scenario



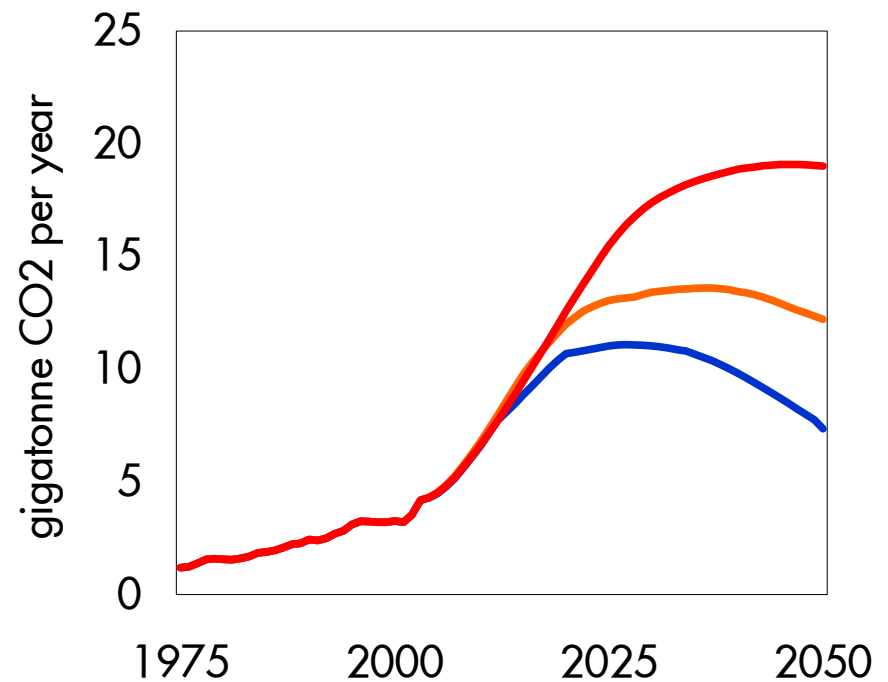
Source: Shell International BV and Energy Balances of OECD and Non-OECD Countries©OECD/IEA 2006

There is growth in both scenarios, but the pathways shape the outcomes of hard truths

China Energy ladder 1971-2050



China Direct CO2 emissions from energy



- Historic pattern
- Scramble
- Blueprints

There are choices to be made and actions to be taken to tackle the challenges

Energy resource diversification



A further shift to natural gas



Nuclear power



Renewables

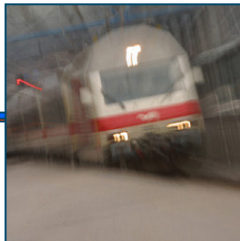


Hydro power



Bio products

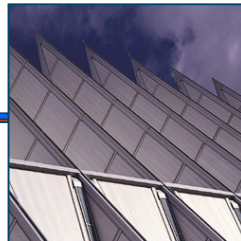
Energy saving, efficiency and environmental protection



Mass transportation



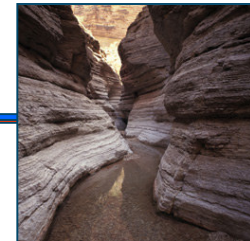
Road transport



Buildings



Low energy appliances



Carbon capture and storage

In summary – what we have learned



- 🌐 The three hard truths are **very** hard
- 🌐 Transition is both inevitable and necessary
- 🌐 Technology plays a major role, but no silver bullets
- 🌐 Political and regulatory choices are pivotal
- 🌐 The next 5 years are critical

Tackling all three hard truths TOGETHER is essential for a sustainable future

CHINA'S POLICIES & ACTIONS

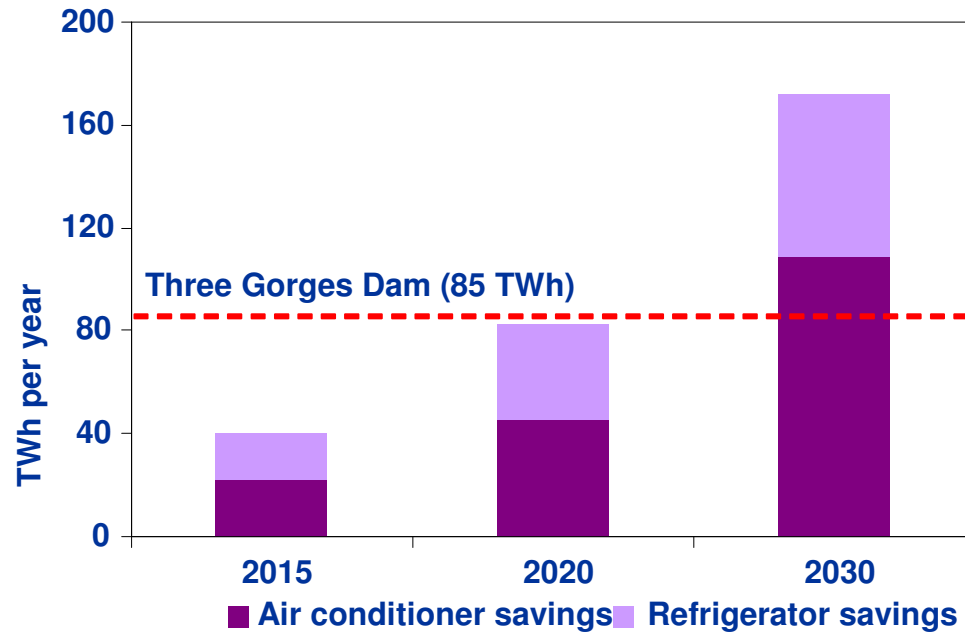
- Adjusting the Economic Structure to Promote the Optimizing and Upgrading of the Industrial Structure
- Making Great Efforts to Save Energy and Raise Energy Efficiency
- Developing Renewable Energy and Optimizing the Energy Mix
- Developing a Recycling Economy to Reduce Greenhouse Gas Emissions
- Reducing Greenhouse Gas Emissions in Agriculture and the Countryside
- Promoting Afforestation and Strengthening the Capacity of Carbon Sinks
- Intensifying R&D Efforts to Deal With Climate Change Scientifically



Source: White Paper: China's Policies and Actions for Addressing Climate Change

ENERGY EFFICIENCY

Electricity Savings from More Efficient Air Conditioners & Refrigerators in the Alternative Policy Scenario



Tougher efficiency standards for air conditioners & refrigerators alone would save the need to build a Three Gorges Dam by 2020

Source: IEA World Energy Outlook 2007

ROLE OF TECHNOLOGY



壳牌·能源之道

我们的工厂里，
有座看不见的
“水库”。

这座世界级规模的中海壳牌石化联合工厂，使用了壳牌独有的苯乙烯/环氧乙烷联产工艺，较传统生产工艺，每年省下至少550万立方米，也就是足足一座小型水库的量。

赵云涛是这套装置的工程师，他喜欢用数字来论证：“每生产1吨环氧乙烷，传统工艺至少要消耗22吨水，而我们的专利工艺呢？只要1吨水就够了！”

壳牌，分享领先能源科技，帮助应对资源挑战。

www.cnocshell.com



壳牌·能源之道

是什么把煤和
丰收
连在一起？

答案就在湖北双环科技股份有限公司的厂区内。在这里，世界上第一套用于生产合成氨的壳牌煤气化装置，源源不断地将黑黝黝的煤块转化成洁净的气体，再制成化肥，送往农田，创造农业的丰收。“用了壳牌煤气化技术，原料就能由昂贵的重油改为国产煤，每年降低生产成本近2亿元！”双环的老总吴党生兴奋地说。

壳牌煤气化技术于2001年引入中国，已授权15家中国企业使用，为中国和客户创造能源保障、环境保护和经济效益的“大丰收”。

振奋人心之处还不止于此，壳牌煤气化技术可以广泛应用于发电、制氢、生产甲醇、燃油等领域。在中国这样的产煤用煤大国，意义尤为深远，使用丰富的国内煤资源替代进口油，不仅显著降低成本，同时

壳牌，分享领先能源科技，帮助应对能源挑战。
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 中海壳牌石油化工有限公司
 CNOC and Shell Petrochemicals Company Limited
 



A PARTNERSHIP IN THE LOW CARBON JOURNEY



- China Council for International Cooperation on Environment and Development task forces:
 - Policy study on energy and environment management for a medium sized Chinese city
 - WBCSD –CCICED Task force of Pathway towards a Low Carbon Economy
- Stockholm Environmental Institute – Chinese 50 Economist Forum low carbon economic policy study

MAKING CHOICES ?

“We should fight the financial crisis and climate change at the same time.”

—Mr. Zhang Ping, Minister of the NDRC

“一方面，我们要加强合作，共同应对金融危机对全球经济的影响；另一方面，我们应继续坚持应对气候变化。”

— 国家发改委主任张平

