



**Renewable Energy &
Energy Efficiency: Issues and
Challenges**

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Objective


Renewables & energy conservation are a world-wide booming markets. Why?

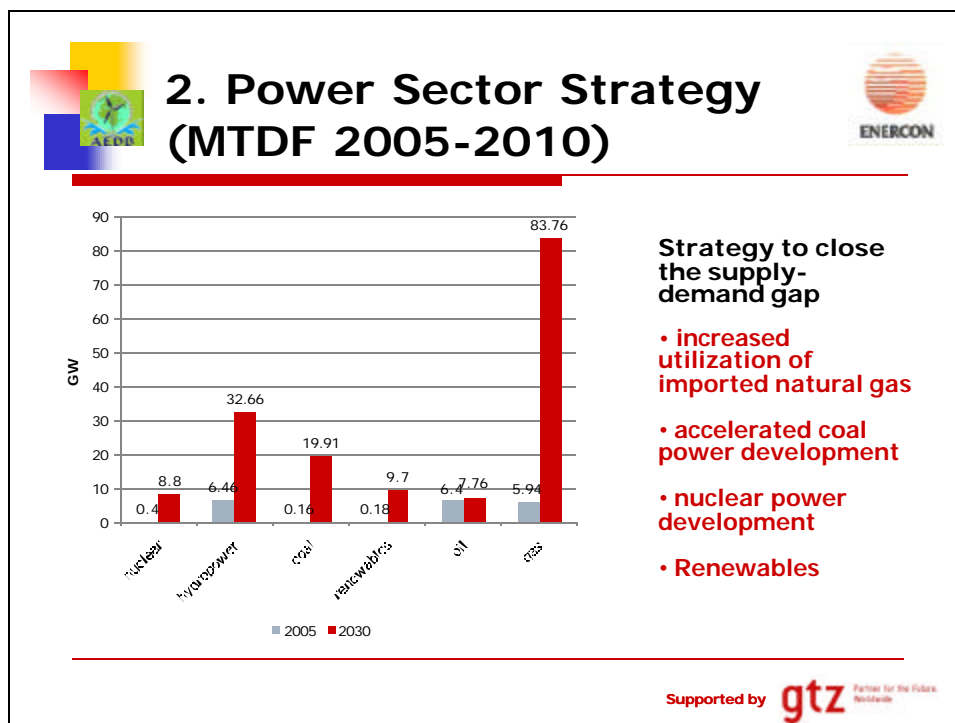
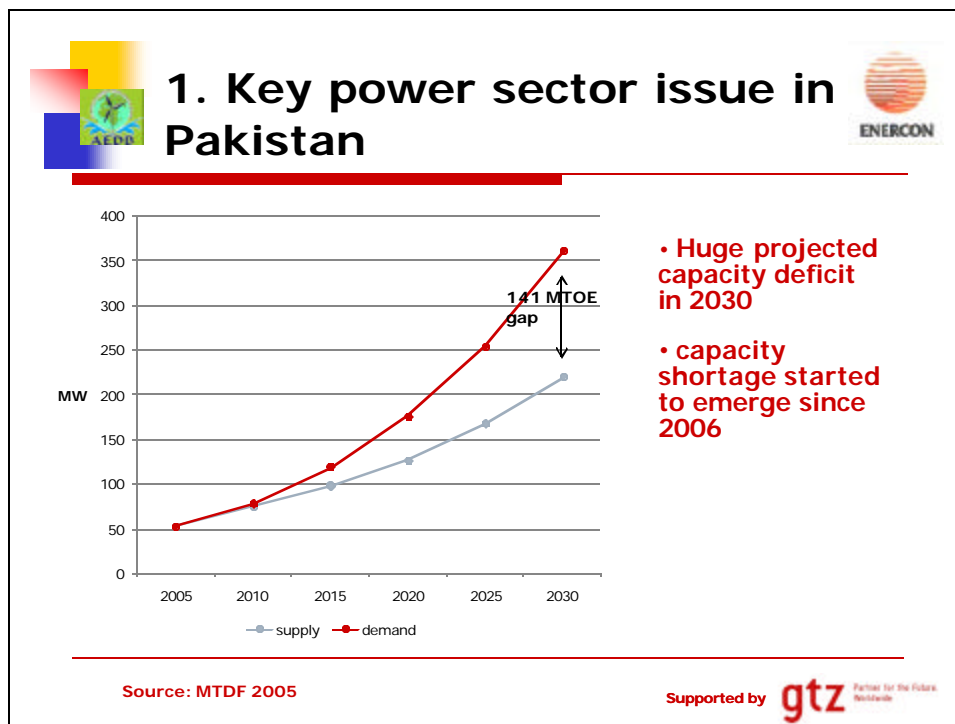
Bankers and the Investors are interested in:



- Mitigating risks and volatility of markets
- Comparing Return of Investment and discount rates (the rate usually assesses risks) of different options in the energy sector
- Future returns on RE and EE in a short term- and long term perspective

Governments also ask those questions with regard to any strategic investment.

Governments are – in particular – interested in (macro-) economic not only in financial values and indicators.


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3. Comments on Power Sector Strategy


- **High dependence of fossil fuel and nuclear energy**
 - Risks associated with these fuel sources are high
- **Renewable energy target**
 - 5% in 2030
- **Renewable energy might be the least-cost option** if external costs and risks are included
- **Energy efficiency**, despite being recognized now: its potential contribution in meeting energy demand **has not been properly evaluated and integrated in long-term Power Sector Strategy**


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4. Risks – the Bankers Benchmark

- **Nuclear Energy**
 - Political acceptability, safety and health risks, waste disposal risk, future – generation risk, high cost option; considerable subsidies
- **Natural gas**
 - Supply disruptions, volatile prices, storage and transport risks
- **Coal**
 - Political acceptability, environmental hazards, storage and transport risks
 - International price is increasingly indexed to oil prices; Climate change related risks


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5. Opportunities in Pakistan and related risks




- **Wind energy**
 - Potential of 50,000 MW against target development of 9,700 MW or only 19 % > *Climate change risk*
- **Hydropower**
 - Potential of 45,000 MW (conservative estimate) > *Climate change risk*
- **Geothermal**
 - Resource has not really been assessed, potential could be high
- **Solar energy**
 - Estimated potential of 70,000 MW and not only suited for remote rural electrification > *low risk*
- **Biomass**
 - Bagasse- 400 MW; waste-500 MW per major city; biogas: ~~potential for small- and large scale should be high~~

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6. Benefits of renewable energies



RE benefits


- Savings on domestic fossil fuel
- Foreign currency savings on imported energy
- Reduction of environmental emissions

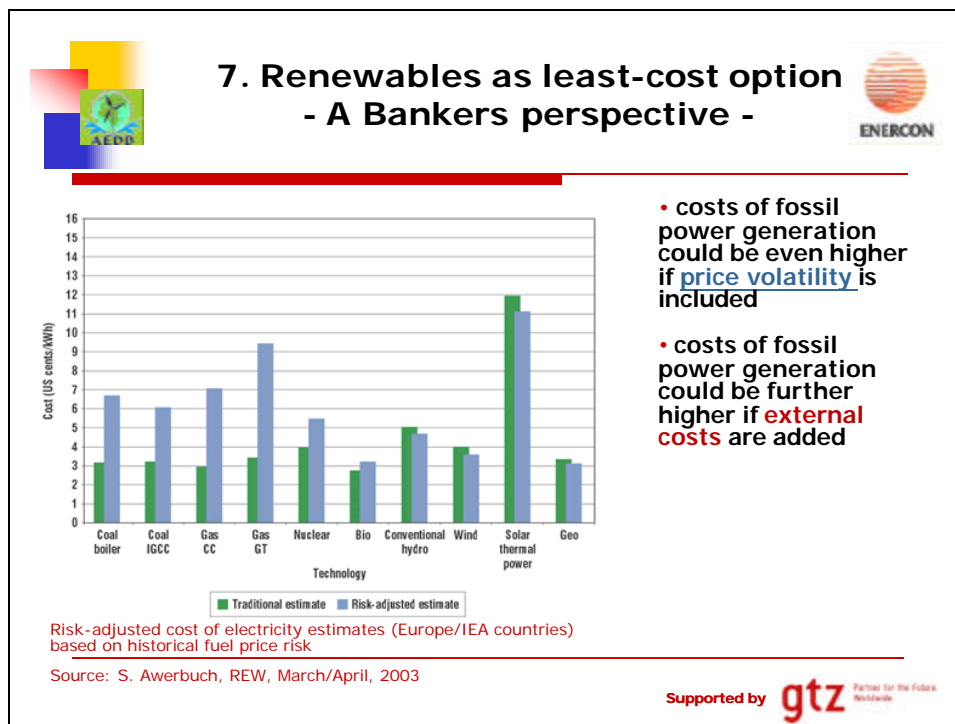
RE decentralized

- Reduce losses in transmission and distribution
- Regional employment
- Less concentrated target for illegal action

- Fuel diversification and reduction of price volatility risks
- Employment generation
- Stimulation of local manufacturing industries

Employment per kWh generated resp. saved as an indicator to assess different energy options ??

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8. Energy efficiency

Electricity intensity

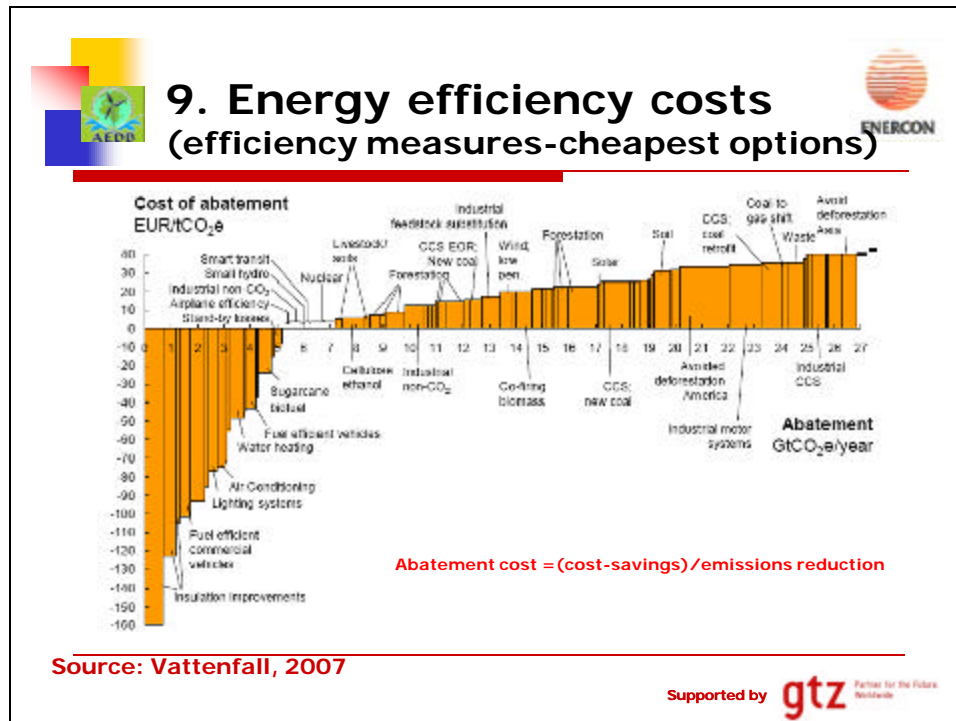
- India = 0.26 kWh/\$
- Pakistan = 0.28 kWh/\$ (2004 data)

Energy intensity in Pakistan could be reduced through no-, low- and considerable **energy efficiency investment**

Electricity savings

- If electricity intensity of Pakistan approaches to that of India
- Potential savings of more than 7.2 GWh (2004)
- Equivalent capacity savings of around 918 MW (load factor of 90%)
- REEE example: Textile Unit electricity savings for only 3.3 USc/kWh

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10. Emerging global concern: impact of climate change

Climate impact on power provision (Western regions US):



- Under the warmer climate scenarios, average temperature will increase by 5.2 degrees Celsius by the year 2050 over the baseline temperature (extreme conditions). This warmer temperature will increase the demand for electricity by more than 9%.
- To reliably meet the increased peak load, approx. 34 GW of additional generating capacity will need to be installed.

What does warmer and drier climate mean for Pakistan?

- increase of electricity demand ??
- less hydropower generation ??
- Is the climate change reality really assessed under risks??

Source: Argonne National Laboratory, 2008

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10 a. Emerging global concern: Rising Supply - Demand Gap

Forecast: Till 2050 world wide energy demand will increase by another 70 to 100 % causing further increase of oil, gas- und electricity costs

However: World Oil Production will peak soon or even peaked already


Source: Argonne National Laboratory, 2008



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11. Options for Pakistan


Short to medium term	Long-term
<ul style="list-style-type: none">• Energy efficiency<ul style="list-style-type: none">• Replication of <u>success stories in industry & commercial sectors</u>• Initiation of market transformation of efficient household appliances• Renewable energy<ul style="list-style-type: none">• Decentralized systems (in addition to large-scale projects)	<ul style="list-style-type: none">• Energy efficiency<ul style="list-style-type: none">• Market transformation of energy savings equipment• Decouple Energy Consumption and Economic Growth• Renewable energy<ul style="list-style-type: none">• Additional grid-connected projects• Decentralized systems for remote areas

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12. Challenges for GoP

- **Increase private investments on RE beyond the current policy target of at least 5%**
 - Establishment of regulatory and incentive frameworks (feed-in-tariff, etc) for all renewables
 - Develop strategy and action plan for local RE manufacturing and for other renewables
- **Mainstream EE in achieving Power Sector Strategy objectives**
 - Assessment of EE potential and its contribution to meeting long-term energy sector objectives
 - Establish regulatory and incentive frameworks (codes, standards, labeling, financing, etc) promoting EE market transformation
 - Facilitate market development of EE products and services
- **Increase RE & EE stakeholder awareness and strengthen capacities**

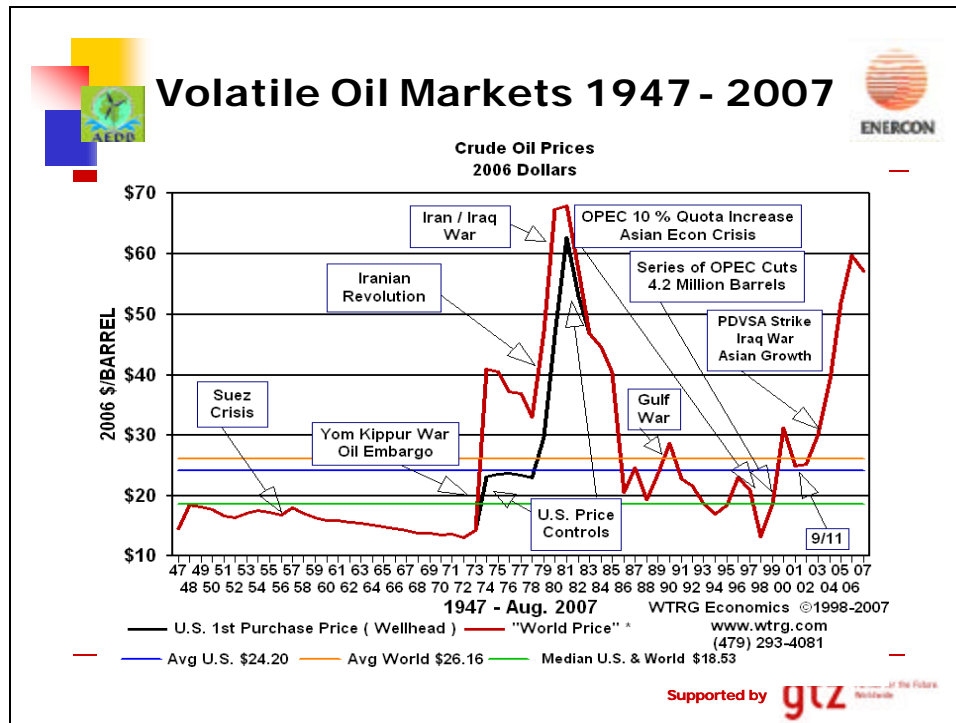
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• Thank You



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Costs of Super Gau



Deutsche Atomkraftwerke unterscheiden sich in ihrer technischen Konzeption vom Tschernobyl-Reaktor. Nach einem Super -GAU bei uns werden die radioaktiven Ablagerungen auf die Region von wenigen hundert Kilometern begrenzt bleiben, dort jedoch im Vergleich zur Situation um Tschernobyl viel stärker ausfallen. Die Tschernobyl-Katastrophe hat gezeigt, dass die Fläche dauerhafter

Evacuation area: 10 000 km2 in a radius of approx. 200 km
weit reichen kann. Durch Tschernobyl mussten mehr als 500 000 Menschen auf Dauer ihre Wohnungen und Häuser verlassen. Bei der etwa 10-fach dichteren Besiedlung Deutschlands müssen bei uns mehrere Millionen Menschen umgesiedelt werden. Und wie im Falle von Tschernobyl müssen dann im Sperrgebiet alle Städte und Dörfer, Fabriken, Betriebe, landwirtschaftliche Anwesen, alle Arbeitsstellen und Verdienstmöglichkeiten und alle kommunalen und sozialen Infrastrukturen aufgegeben werden. Die Prognos-Studie im Auftrag des Bundeswirtschaftsministeriums und andere fundierte Untersuchungen beziffern die Schadenshöhe eines

Super-GAU in Germany would mean damage of 2,500 bis 5,500 Billion Euro
für Gesundheits-, Sach- und Vermögensschäden: das ist das 10- bis 20-fache des jährlichen Bundeshaushaltes. Würde man für eine Fläche von 10 000 km2, die in einem atomaren Sperrgebiet in Deutschland den Besitzern entzogen würde, einen sehr niedrigen Quadratmeterpreis für Grund und Boden von nur 50 Euro ansetzen, ergäbe das schon einen Vermögensschaden von 0,5 Milliarden Euro.

German nuclear Powerstations are only insurance up to , 2.5 Billion Euro


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Real Cost Nuclear (1)

... the fact that nuclear-generated electricity is very expensive. Despite more than \$150 billion in federal subsidies (US) over the past 60 years (roughly 30 times more than solar, wind and other renewable energy sources have received), nuclear power costs substantially more than electricity made from wind, coal, oil or natural gas. This is mainly due to the cost of borrowing money for the decade or more it usually takes to get a nuclear plant up and running.


Remarkably, this inconvenient fact does not deter industry officials from boasting that nuclear is the cheapest power available. Their trick is to count only the cost of operating the plants, not of constructing them.


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Real Cost Nuclear (2)

For example, a nuclear power plant typically costs at least \$2 billion. If that \$2 billion were instead spent to insulate drafty buildings, purchase hybrid cars or install super-efficient lightbulbs and clothes dryers, it would make unnecessary seven times more carbon consumption than the nuclear power plant would. In short, energy efficiency offers a much bigger bang for the buck. In a world of limited capital, investing in nuclear power would divert money away from better responses to global warming, thus slowing the world's withdrawal from carbon fuels at a time when speed is essential.


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Textile Factory Karachi




- ✍ **Total Investment Cost (Rs) = 10.05 million**
- ✍ **Total Saving (Rs) = 6.9 million**
- ✍ **Pay back period = 18 months**
- ✍ **Total Natural gas saving = 676, 470 m³**
- ✍ **Total Electricity Saving = 255,555 kWh**
- ✍ **kWh saved : 3.3 US cent / kWh**


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11. Challenges for GoP



- Participate in global investment in new renewable capacity which (annual) grew annually from \$40 (2005) to 71 billion in 2007
- Wind power dominates new capacity investment (~47% share), with solar PVsecond (~30%) and solar hot water third (~9%).
- However The wind power industry has experienced supply chain difficulties due to booming demand
- Solar PV production worldwide in 2007 is estimated at 3.5–3.8 GW, up from 2.5 GW in 2006 and 1.8 GW in 2005.
- Participate in global Policy targets which exist in at least 66 countries worldwide, including 22 developing countries,
- At least 60 countries worldwide now have some type of renewable energy promotion policy, including 23 developing countries.
- At least 37 countries and 9 states/provinces have adopted feed-in policies, more than half of which have been enacted since 2002.

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