



Moving Towards a Low Emission Power Sector

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“It is evident that the fortunes of the World’s human population for better or for worse are inextricably interrelated with the use that is made of energy resources.”

-M .King Hubbert (1969)



The history of the development and use of energy by mankind is marked by some major milestones which proved to be turning points in human history.

The invention of Steam Engine & Coal



The discovery of oil & gas

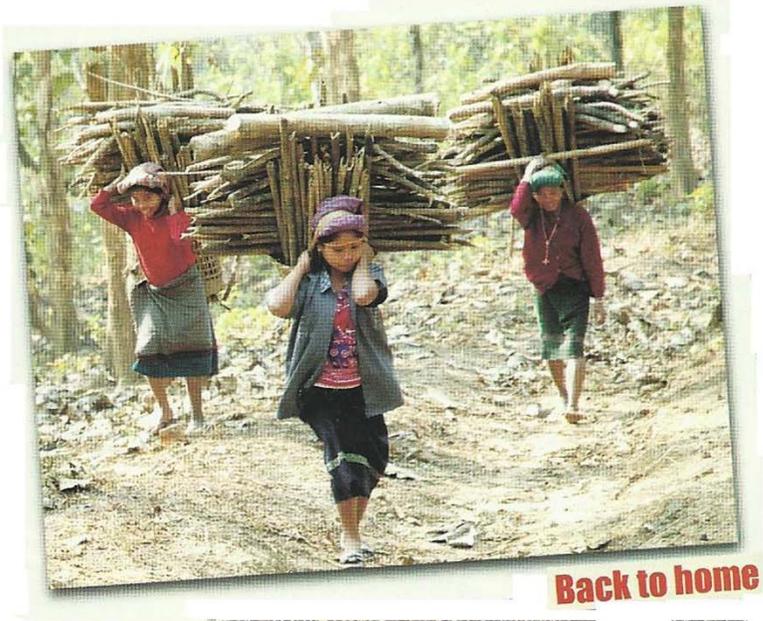


The Invention of Electric Power



- ▶ All are such milestones. In fact, they caused major changes in human civilization.
- ▶ The past two centuries witnessed continuously increasing energy consumption in the world with energy transition.





Biomass



Coal



Oil & Gas

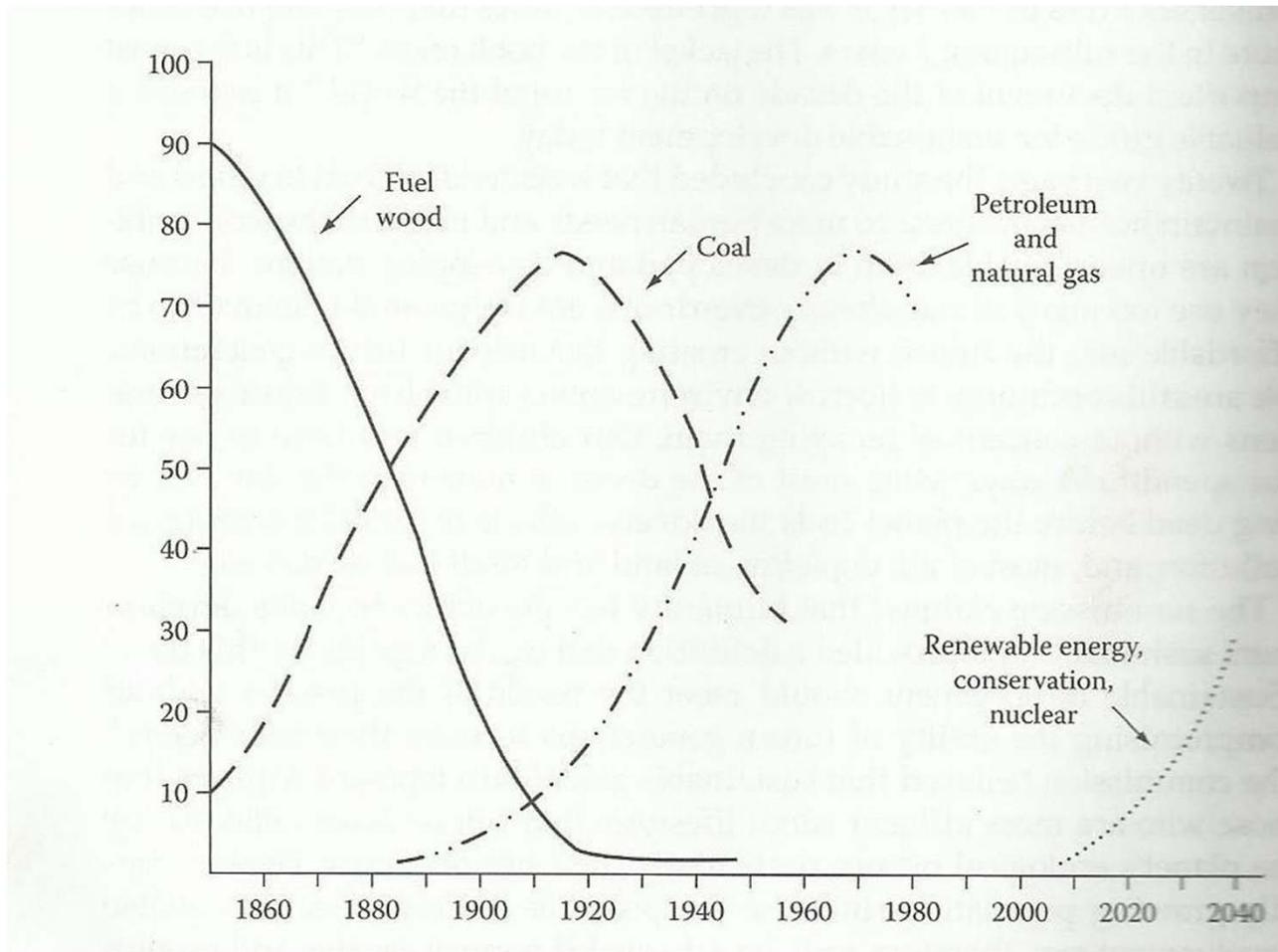


Diesel Engine



Nuclear Power Plant





Transition graph

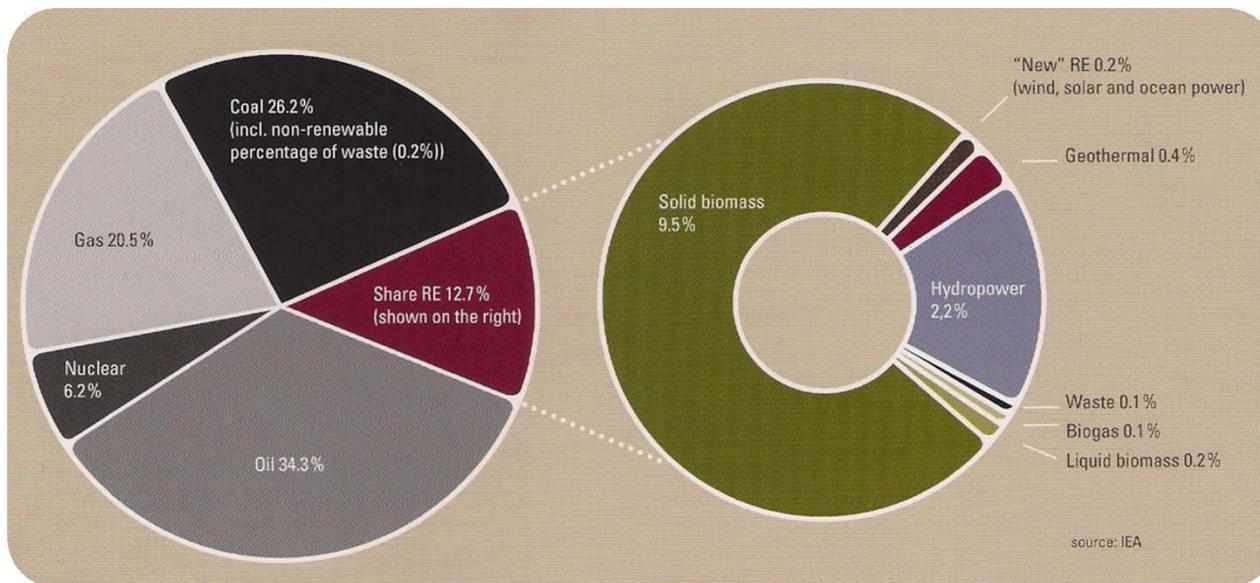


The International Energy Agency (IEA) founded by the organisation for Economic Co-operation and Development has been monitoring energy consumption trends worldwide and publishing reliable statistics.

According to the IEA the total world energy consumption in 1973 was 4675 Million tonnes of oil equivalent (Mtoe) which grow to 8286 Mtoe in 2007.







Structure of Global Energy Consumption



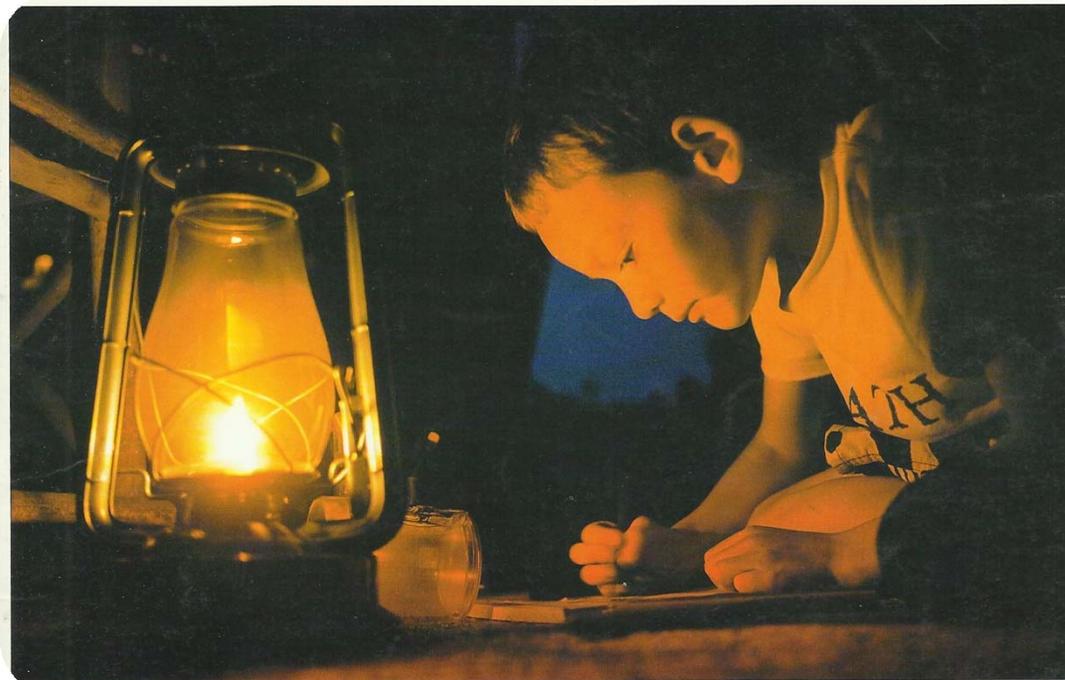
During the past four decades the world has experienced disruptions in oil supply , sharp increases in the prices of fossil fuels and threat to energy security. In addition, the environmental problems associated with fossil fuel consumption have also come to the fore.



The energy crisis facing America and the rest of the World today results from a divergence between the historically increasing energy demand of transportation, building and Industry and the looming decrease in supplies of oil & gas with a concomitant increase in their cost and availability.



In addition almost 2 billion people in the world do not have access to electricity and raising their voice for affordable electricity.



To address this crisis, the world must make a new kind of energy transition, which is quite different from the previous two.

We thought such transition may be towards Nuclear Energy. Electricity generation from nuclear source began in 1954 in the former USSR. However, cost of nuclear energy and safety issues (After the recent Fukushima Accident) kept nuclear energy in the back bench in the recent past.



Other Negative Points:–

- ❖ Nuclear Energy is not totally climate responsive.
- ❖ No new Nuclear Power Plants have been built in United States since 1973.
- ❖ Recently Japan has closed down all of its Nuclear Power Plant (48,000 MW).
- ❖ Germany is gradually phasing out all of its Nuclear power Plants.



As such, it is unlikely Nuclear Power will make any significant contribution in the world Energy basket by the year 2050.

In place of the hope for nuclear Energy, various renewable energy sources have become the hope of the future.



However, at this point of time, it does not appear that any single energy source will take the place of fossil fuels.

Other prospective energy sources:–

- ❑ Energy Conservation.
- ❑ Improvement in Energy Generation.
- ❑ Demand size management.

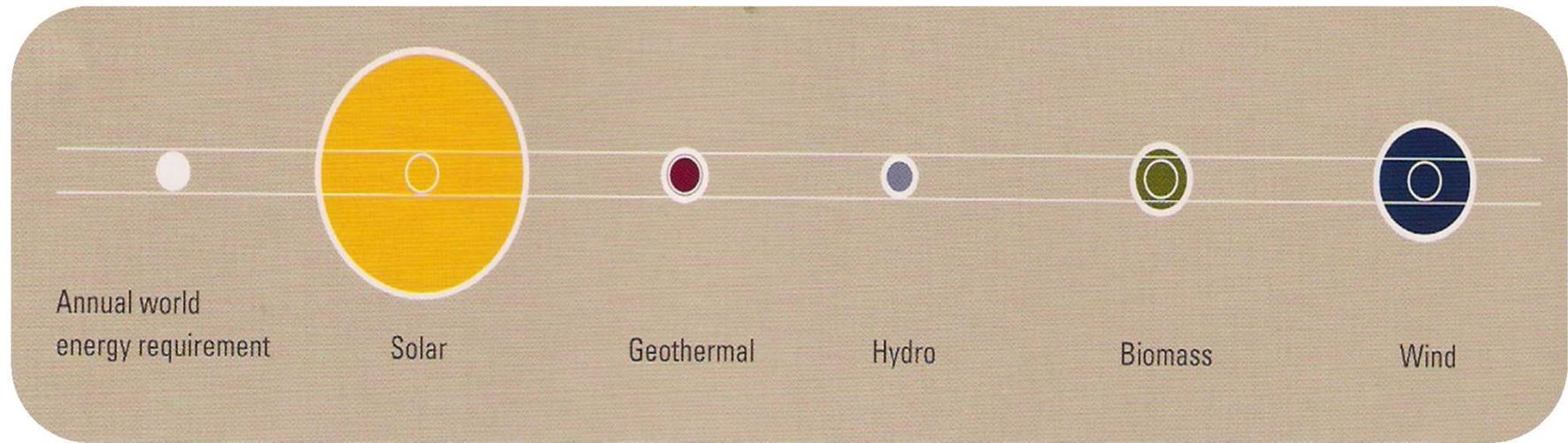




According to UN, future power generation initiatives of the globe shall generally be towards low emission power sector.

According to IEA, the contribution of all renewable sources to global energy consumption increased from 3.7% to 7% between 1973 and 2009.





World wide potential of different renewable energy sources



- Projected World Energy demand in the year 2030-17,014 Mtoe.
- In order to restrict the concentration of Global green house gases to 450 ppm Co₂ equivalent share of Renewables need to be increased from 11.8 % to almost 20%.



Renewable Energy sources have made significant strides globally in the last 20 years and more so in the last 5 years.

Global RE Installed Capacity

<u>YEAR</u>	<u>Installed Capacity</u>
2006	207 GW
2010	300 GW
2011	Close to 400 GW (1350 GW including Hydro)





Wind, PV ,Biofuel are the fastest growing sectors.



Solar PV:

Out of many forms of Renewable Solar PV appears to be very attractive both for developed and developing Countries.

It is expected PV will achieve grid parity world wide in next 3 years.



Already PV based electricity is cheaper than Diesel based electricity in many Countries. According to some projection Roof Based PV will become a mass programme world wide by the year 2016-17.



World average Photovoltaic Production and module cost.



**Present Price of Solar PV
is less than a dollar per
watt.**

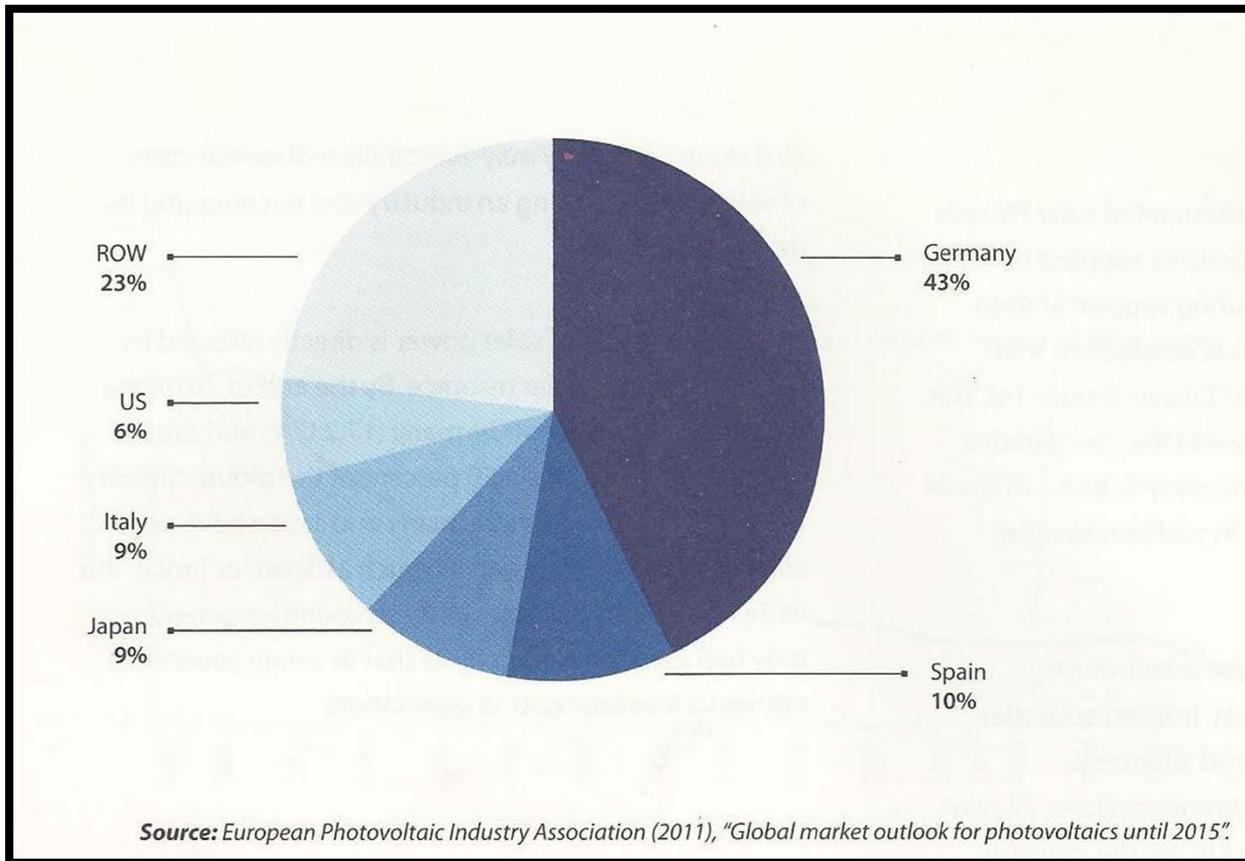
World average photovoltaic production and module cost per watt (1975-2006)

Year	Annual production (MW)	Cost per watt (2007 US \$)
1975	2	99.61
1976	2	78.39
1977	2	58.92
1978	3	41.18
1979	4	32.89
1980	7	27.79
1981	8	21.16
1982	9	17.92
1983	17	14.80
1984	22	12.88
1985	23	10.68
1986	26	8.67
1987	29	6.73
1988	34	7.30
1989	40	7.40
1990	47	7.47
1991	55	7.18
1992	58	6.29
1993	60	5.79
1994	69	5.32
1995	78	5.33
1996	89	5.11
1997	126	5.26
1998	155	4.71
1999	201	4.29
2000	277	4.21
2001	386	3.79
2002	547	3.73
2003	748	3.65
2004	1,194	3.55
2005	1,786	3.70
2006	2,521	3.84

*Note: 2001 and 2003 prices are estimated by
Earth Policy Institute*

*Source: Compiled by Earth Policy Institute with
Worldwatch Institute*

Country share of PV Installation



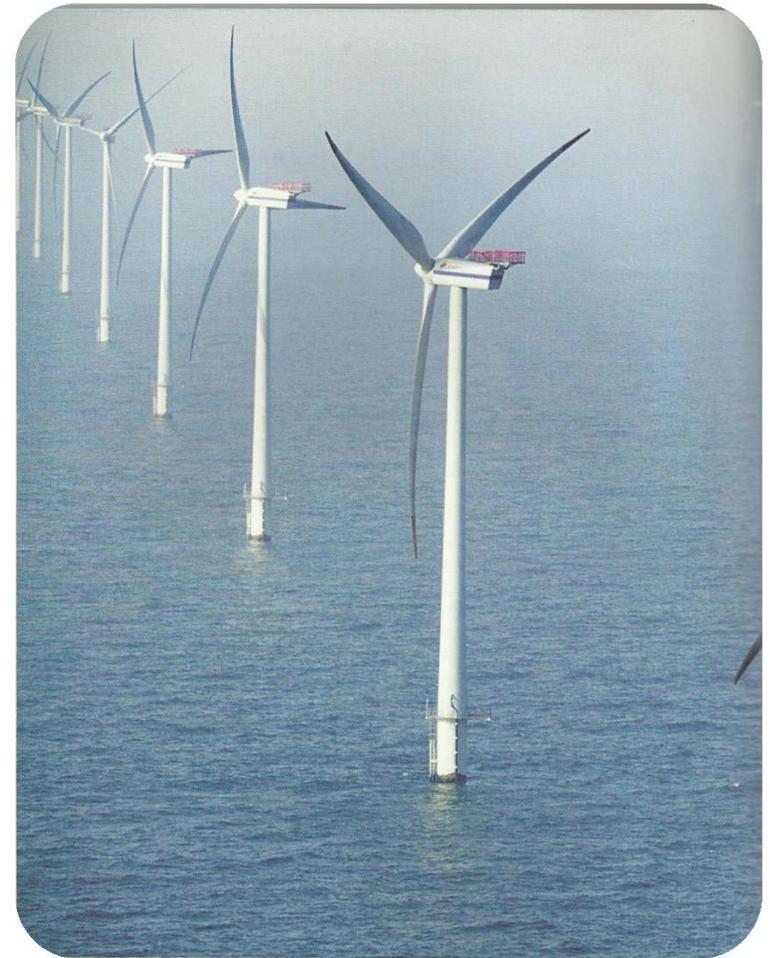
Solar PV Statistic

Global grid-connected solar PV capacity										
Country	Additions (MW)					Total capacity (GW)				
	2006	2007	2008	2009	2010	2006	2007	2008	2009	2010
Germany	845.0	1,270.0	1,950.0	3,795.0	7,405.0	2.9	4.2	6.1	9.9	17.3
Spain	90.0	560.0	2,600.0	145.0	370.0	0.2	0.7	3.3	3.4	3.8
Japan	290.0	210.0	230.0	480.0	990.0	1.7	1.9	2.1	2.6	3.6
Italy	10.0	70.0	340.0	715.0	2,320.0	0.1	0.1	0.5	1.2	3.5
United States	145.0	205.0	340.0	475.0	880.0	0.6	0.8	1.2	1.6	2.5
Czech Republic	–	3.0	60.0	400.0	1,490.0	–	–	0.1	0.5	2.0
France	10.0	10.0	45.0	220.0	720.0	0.0	0.0	0.1	0.3	1.0
China	10.0	20.0	40.0	160.0	550.0	0.1	0.1	0.2	0.3	0.9
Belgium	2.0	20.0	70.0	285.0	425.0	–	0.0	0.1	0.4	0.8
South Korea	25.0	45.0	275.0	170.0	130.0	0.0	0.1	0.4	0.5	0.7
Other EU	20.0	35.0	100.0	180.0	515.0	0.2	0.2	0.3	0.5	1.0
Other World	130.0	80.0	145.0	285.0	865.0	1.2	1.3	1.4	1.7	2.6
Total	1,580.0	2,510.0	6,170.0	7,260.0	16,630.0					
Cumulative						7.0	9.5	16.0	23.0	40.0

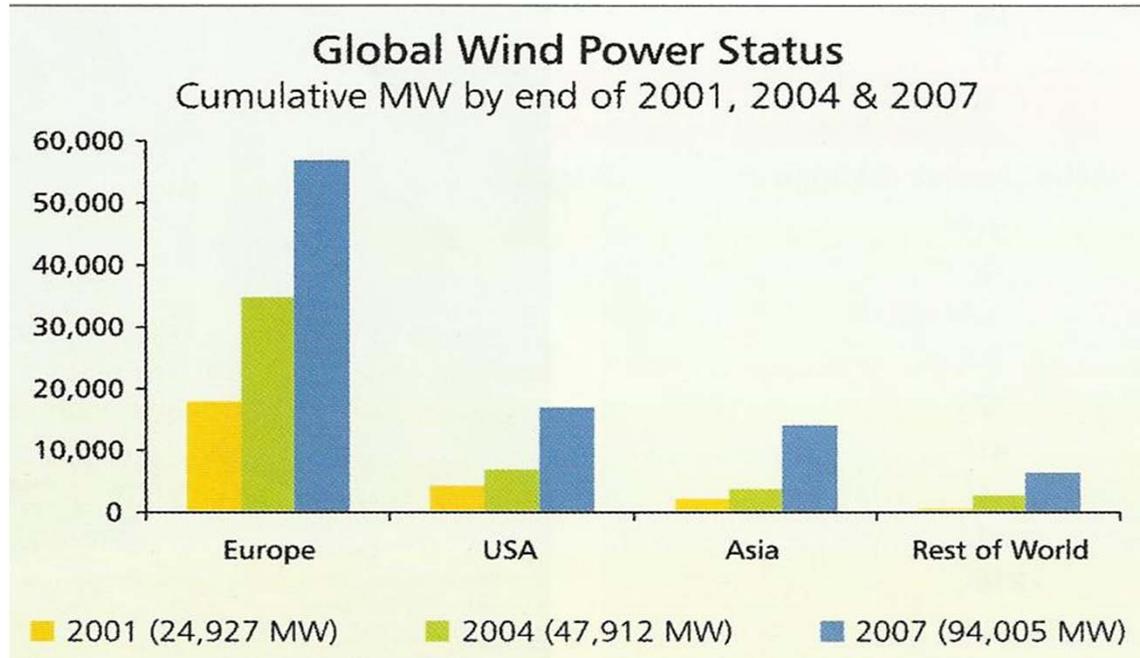
Source: Renewables 2011 Global Status Report by the Renewable Energy Policy Network for the 21st century

Wind Power:

Wind Energy will
Continue to grow and off
shore wind projects will get a
boost in coming days.



Global Wind Power Status:

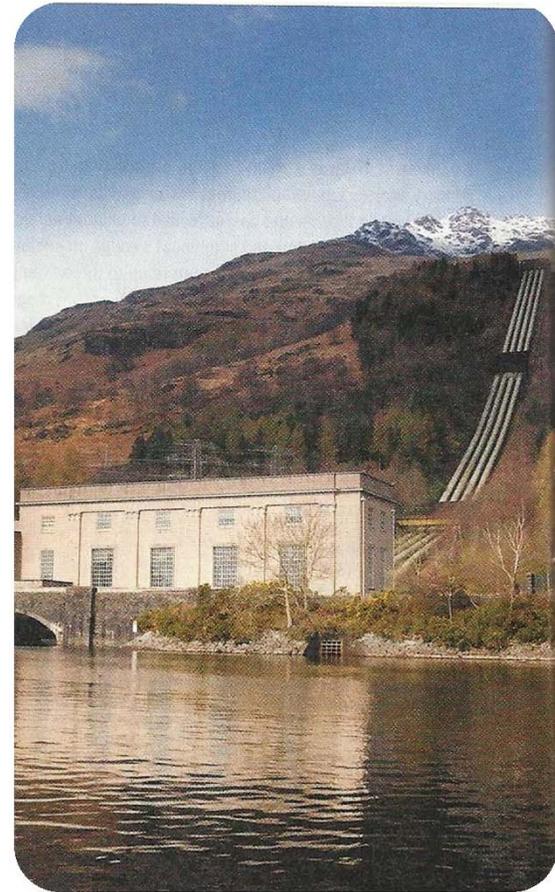


Wind power Installation world wide has crossed 150,000MW by the year 2011.



Small Hydro Power:

Small run of the river Projects is a viable option in terms of providing clean energy at a competitive cost and without implication like habitat destruction or community displacement.

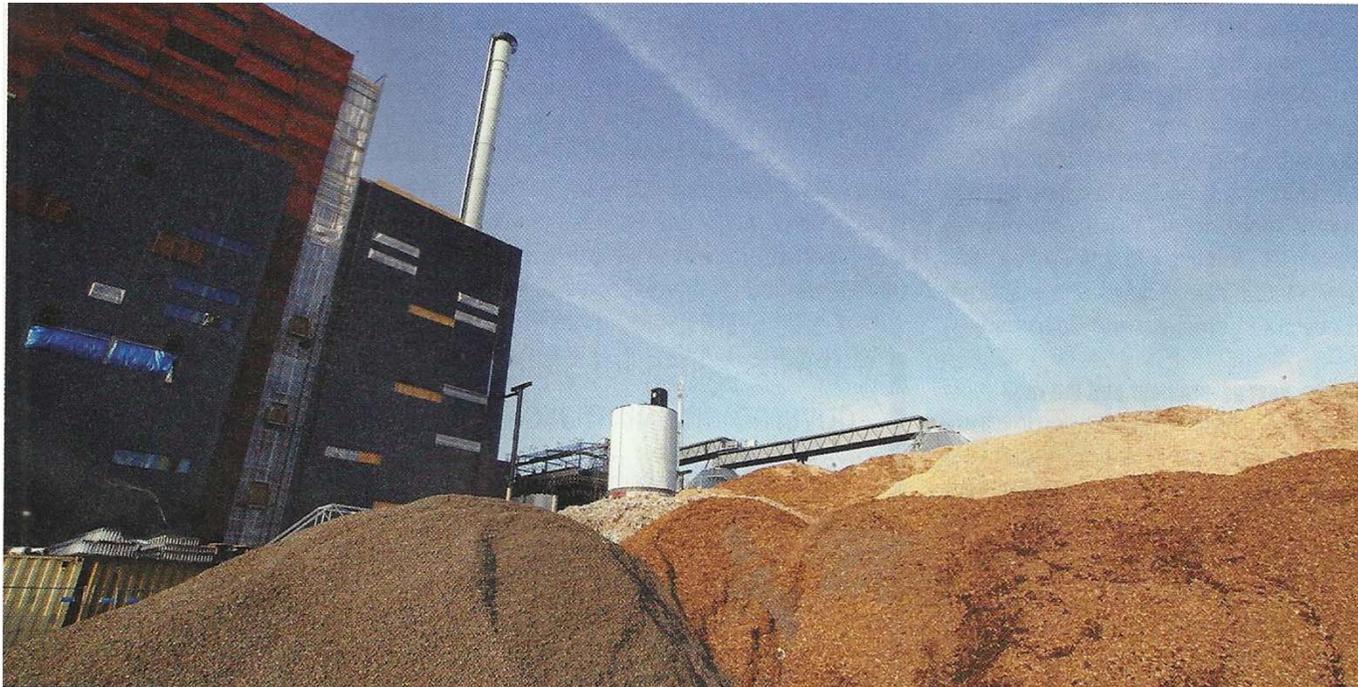


Biomass:

Use of biomass for power generation has already been a viable option world wide.



Island Countries who are dependent on Diesel for their power generation shall soon shift to Biomass based power generation and cross border trade of RE resources will start in place of fossil fuel trading.



Conclusion: The energy choices made in the near future are among the most Important of any choices in human history. The just concluded Rio+20 Summit focused on reaffirming equity and coming up with a bold programme that would ensure energy access for all. This is only possible when we all turn our face towards the almighty sun.



**THANK
YOU**



মাদ্রাস থেকে ফ্রান্সিগো-র দল

বন-৫২

