Alliance for
Rural
Electrification
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Policy, Incentives and Regulation for the Promotion of Renewable Energy in Europe




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USAID/USEA Global Workshop on Grid Connected Renewable Energy

Overview

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- Access to energy and the Alliance for Rural Electrification
- EU Policy Framework for the promotion of renewable energy
  - Objectives for 2020
  - Instruments
- Selected Policy Schemes in EU member states:
  - Germany
  - Spain
  - United Kingdom
- Facts and figures
- Developments of system prices and generation costs

Electricity in the world: The figures

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Worldwide 1,6 billion people with access to electricity in their homes
Of those, 1.340 million live in rural areas

Electricity Access 2005

	Population million	Population with electricity Million	Population without electricity Million	Electrification rate %	Urban electrification rate %	Rural electrification rate %
Africa	891	337	554	37,8	67,9	19,0
Developing Asia	3.418	2.488	930	72,8	86,4	65,1
Latin America	449	404	45	90,0	98,0	65,6
Middle East	186	145	41	78,1	86,7	61,8
Developing Countries	4.943	3.374	1.569	68,3	85,2	56,4
Transition Economies and OECD	1.510	1.501	8	99,5	100,0	98,2
World	6.452	4.875	1.577	75,6	90,4	61,7

43,6% of rural population within developing countries have no access to electricity

The Alliance for Rural Electrification

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- International network of private firms and organisations involved in renewable energy projects in developing countries.
- ARE provides a platform for exchange among experts, and for the promotion of technological and financial solutions for rural electrification with renewable energy.
- We communicate these solutions to all stakeholder involved in energy policy in developing countries (World Bank, governments, agencies etc).
- Project experience demonstrates the need for long-term support mechanisms to ensure the maintenance of renewable systems.

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Political Objectives

- **Environment:** Effective and inspiring contribution to mitigate climate change
- **Security:** Increase Europe‘s energy security (heavy dependency on imported oil and gas)
- **Economy:** Boosting the green economy (technological leadership, jobs, export earnings)

Operational Objectives

- 20-20 by 2020.
  - 20% share of renewable energies in EU energy consumption by 2020
  - 20% reduction of greenhouse gases (up to 30% if there is an international agreement commiting other developed countries)
  - 20% reduction primary energy consumption
- 22,1% of total electricity consumtion from RES by 2010
- 5,75% for the contribution of biofules to the transport sector consumption by 2010 and 10% by 2020

EU Policy Framework for the promotion of renewable energy

EU level defines the objectives to be reached, while leaving Member States sufficient flexibility to implement it in the way that suits their particular national circumstances /views best.

Main EU members instruments:

- Feed-in Tariff (FiTs)
- Premium Feed-in Tariff
- Tradable Green Certificates (TGC)

Overview : Main instruments

Feed-in Tariff:

Mandatory purchase of all RE from the generator at a fix price for long-term (10 to 20 years)

Market risk removed from the energy producer.

Premium Feed-in Tariff

Generators compete in the electricity spot market and receive an additional price premium

Tradable Green Certificates (Quotas)

Suppliers are obliged to source a fix share from renewables by buying renewable certificates from generators in a paralel market

The green certificates sales generate the additional subsidy.

Germany: Overview

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- FiTs for Renewable Electricity for 20 years differenciated by source and size
- Degressive level of FiT (annually 8-9 %)
- Utility companies pass the costs over to electricity consumers
- PV: Rooftop installations account for lionshare of capacity
- Special tariffs for wind sites in order to increase efficiency
- German Development Bank grants soft loans to individuals
- PV investments costs can be depreciated over 20 years

Source: EREC

Germany: The Figures (1)

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Feed-in Tariff	Rooftop								Ground-mounted installations	
	≤ 30 kW		> 30 kW		> 100 kW		> 1.000 kW		All sizes	
	Degression rate	ct/kWh	Degression rate	ct/kWh	Degression rate	ct/kWh	Degression rate	ct/kWh	Degression rate	ct/kWh
2008		46,75		44,48		43,99		43,99		35,49
2009	8%	43,01	8%	40,91	10%	39,58	25%	33,00	10%	31,94
2010	8%	39,57	8%	37,64	10%	35,62	10%	29,70	10%	28,75
2011	9%	36,01	9%	34,25	9%	32,42	9%	27,03	9%	26,16

Direct costs for end consumer in 2008: 4,2 bio. €

Source: EREC

Germany: The Figures (2)

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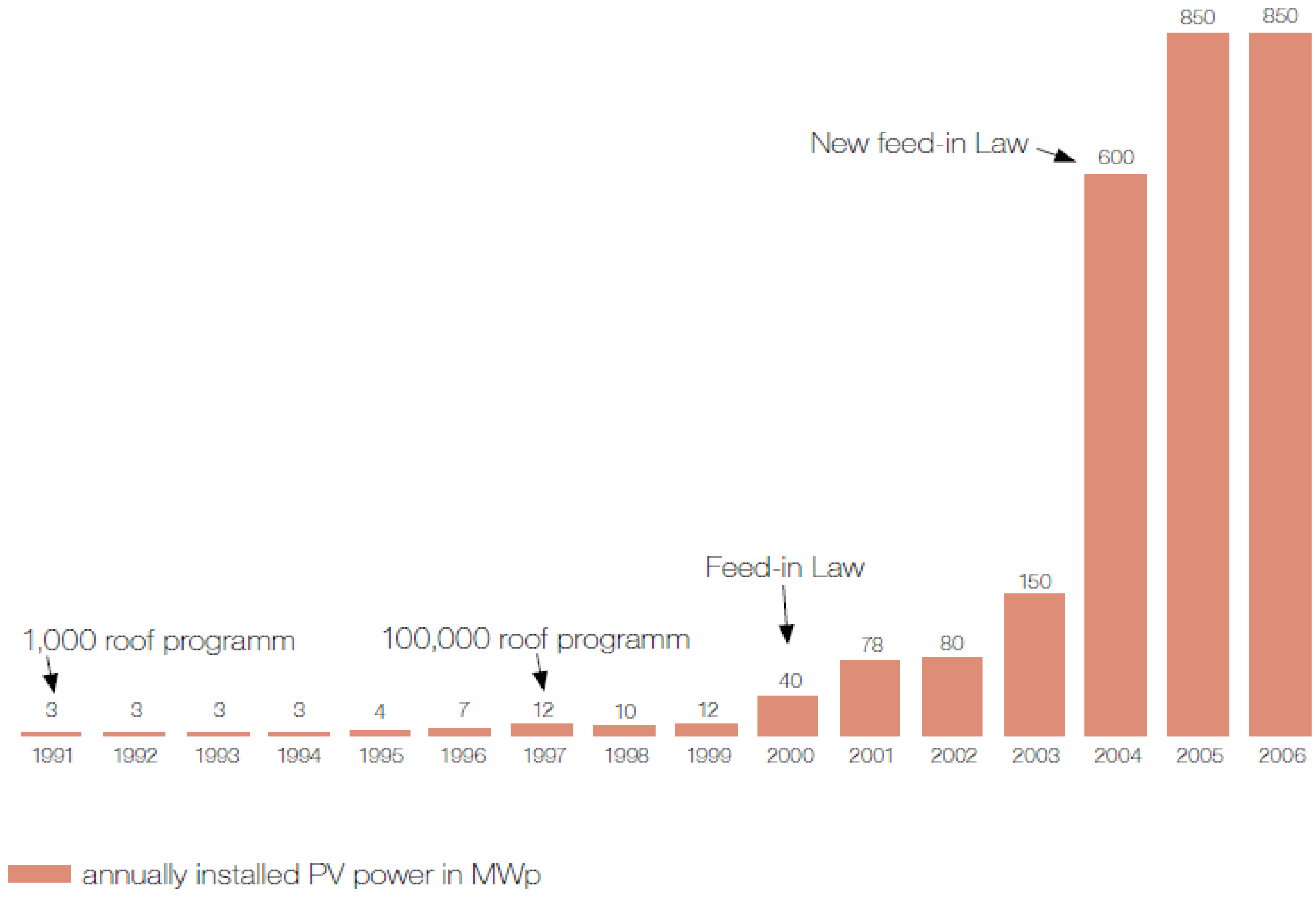

Source: EREC

Feed in tariffs: Pros and Cons

- Income redistribution: Subsidy to houseowners and individual companies paid by the electricity consumer or taxpayer.
- Total amount of subsidy difficult to control (Spanish example)
- The scheme ensures investor security, is simple to administrate and can be flexibly applied to different technologies and sites.
- Windfall profits: Limited ranking of projects according to their efficiency
- Private household ownership changes mindset of people as regards renewable energy, possible „spill overs“ to energy use (efficiency)
- Large scale use leads to economies of scale (+ learning curve) in production and more investment in R&D (process and product innovation)

Spain: Two options model

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- Wind energy: Producers can choose between fixed FIT or premium on electricity price with upper and lower limits (market price plus premiums)
- Premium on electricity price 2,93 ct
- Large installations of mainly wind and hydro are encouraged to use the premium FIT market by setting lower limits closer to the fix FIT price than upper limits:

	Fix FIT	Premium upper limit	Premium lower limit
Wind	7.3228	8.4944	7.1275
Hydro	7.0200	8.5200	6.5200

United Kingdom: RE Quotas for Utility Companies

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- Renewables Obligation. Electricity producers present Renewable Obligation Certificates to state agency (Ofgem)
- Utility companies source a share from their power sales from renewables, under penalty payment (buy out fund) if not (34.30 GBP 2007): Currently 9,7%, in 2015 15.4%
- Three options for utility companies:
  - Own generated ROCs
  - Purchase from others generators
  - Paying penalties

United Kingdom: Quotas and ROC prices

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Obligation period	%age of Supply	Price buy out fund (£/MWh)	Effective Price per Unit (p/kWh)
1 April 2002 to 31 March 2003	3.0	£30.00	0.09
1 April 2003 to 31 March 2004	4.3	£30.51	0.13
1 April 2004 to 31 March 2005	4.9	£31.59	0.15
1 April 2005 to 31 March 2006	5.5	£32.33	0.18
1 April 2006 to 31 March 2007	6.7	£33.24	0.22
1 April 2007 to 31 March 2008	7.9	£34.30	0.29
1 April 2008 to 31 March 2009	9.1	£35.76	0.33
1 April 2009 to 31 March 2010	9.7	£37.19	
1 April 2010 to 31 March 2011	10.4		
1 April 2011 to 31 March 2012	11.4		
1 April 2012 to 31 March 2013	12.4		
1 April 2013 to 31 March 2014	13.4		
1 April 2014 to 31 March 2015	14.4		
1 April 2015 to 31 March 2016	15.4		

Quotas: Pros and Cons

- Utility companies choose most efficient RE generation
- Utility companies may postpone investments into RE „to last minute“ or may accept penalty payments (at least temporarily)
- Energy policy is not locked in
- Quotas which do not differentiate between technologies promote only the most efficient ones (hence no technological boost for the others)
- No mainstreaming of technologies in society

Renewable Energy in the EU: The figures

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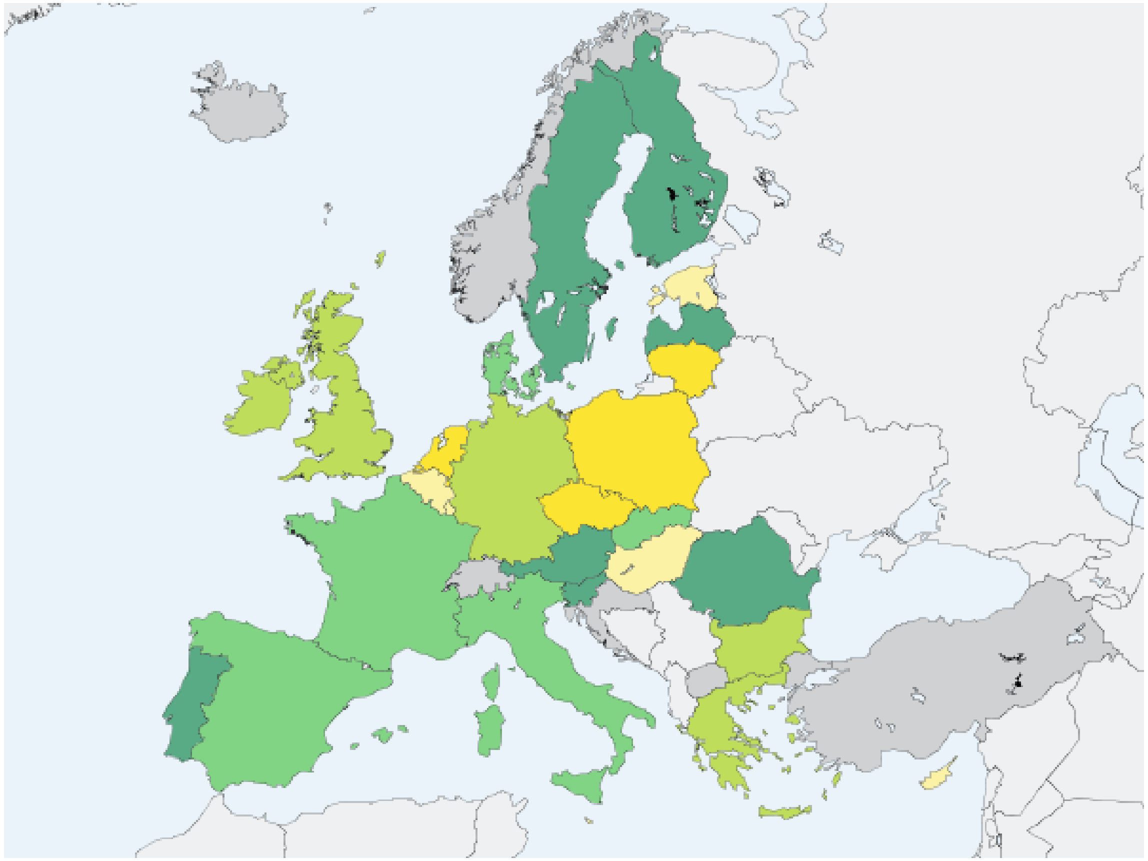
Electricity generated from renewable sources

% of gross electricity consumption



Legend (Data 2010)

3.6 - 6.0
6.0 - 9.0
9.0 - 20.1
20.1 - 31.0
31.0 - 78.1
N/A

Minimum value:3.6 Maximum value:78.1 eu25:21.0 eu15:22.0

Source: EuroStat

Status quo and ambitions

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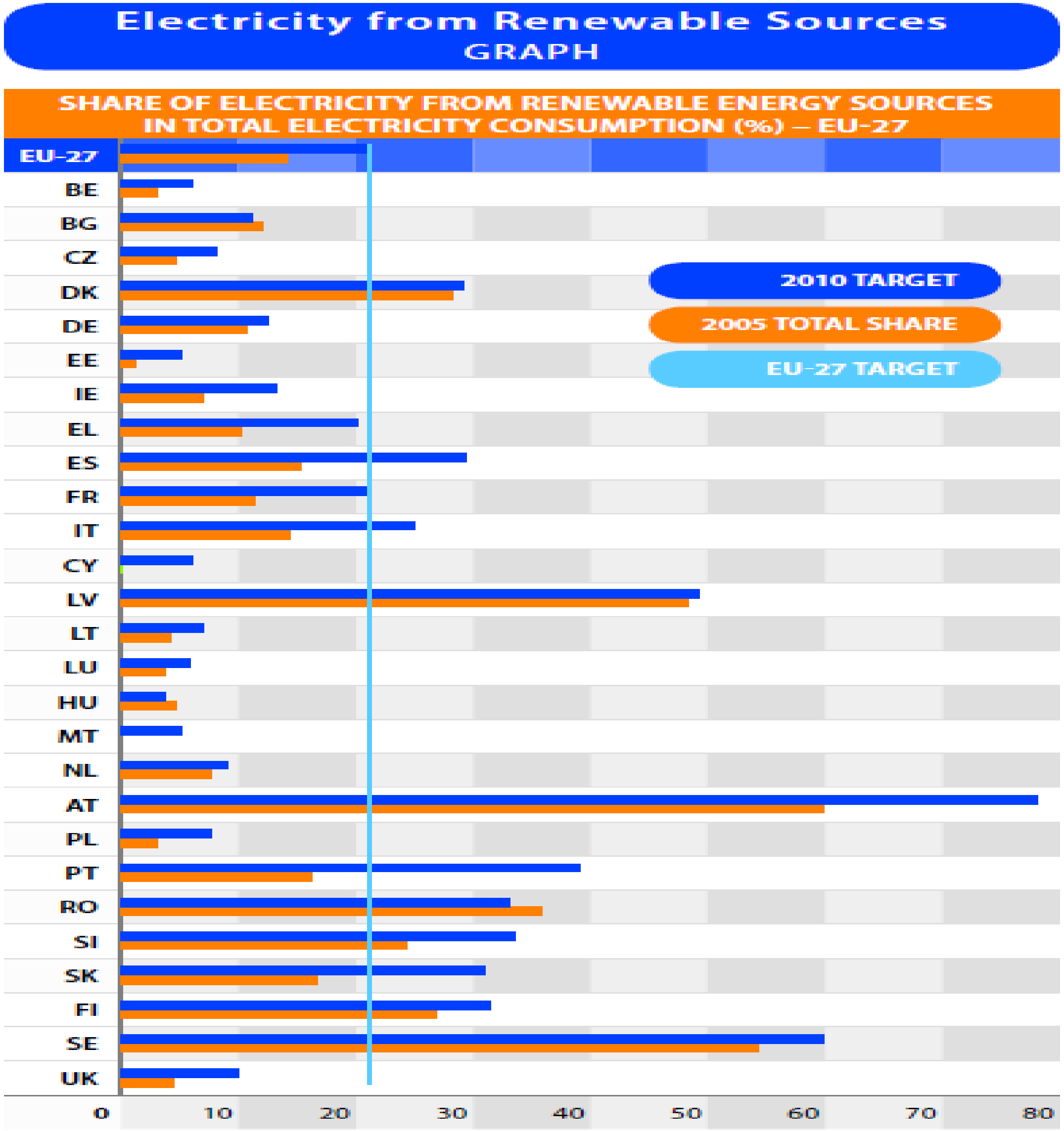

- 14% EU average (20% goal)
- Austria (AT), Latvia (LV), and Sweden (SE) rely on large scale hydro production
- Denmark (DK) instead relies on wind and biomass

Source: EREC

Development of system prices and generation costs: 2008 Predictions...

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Energy Technologies for Power Generation · *Moderate Fuel Price Scenario* · *High Fuel Price Scenario*

Energy source	Power generation technology		Moderate: Production Cost of Electricity (COE) State-of-the-art 2007 €$_{2005}$/MWh	Moderate: Projection for 2020 €$_{2005}$/MWh	Moderate: Projection for 2030 €$_{2005}$/MWh	High: Production Cost of Electricity (COE) State-of-the-art 2007 €$_{2005}$/MWh	High: Projection for 2020 €$_{2005}$/MWh	High: Projection for 2030 €$_{2005}$/MWh
Natural gas	Open Cycle Gas Turbine (GT)	-	65 ÷ 75 [b]	90 ÷ 95 [b]	90 ÷ 100 [b]	80 ÷ 90 [b]	145 ÷ 155 [b]	160 ÷ 165 [b]
	Combined Cycle Gas Turbine (CCGT)	-	50 ÷ 60	65 ÷ 75	70 ÷ 80	60 ÷ 70	105 ÷ 115	115 ÷ 125
		CCS	n/a	85 ÷ 95	80 ÷ 90	n/a	130 ÷ 140	140 ÷ 150
Oil	Internal Combustion Diesel Engine	-	100 ÷ 125 [b]	140 ÷ 165 [b]	140 ÷ 160 [b]	125 ÷ 145 [b]	200 ÷ 220 [b]	230 ÷ 250 [b]
	Combined Cycle Oil-fired Turbine (CC)	-	95 ÷ 105 [b]	125 ÷ 135 [b]	125 ÷ 135 [b]	115 ÷ 125 [b]	175 ÷ 185 [b]	200 ÷ 205 [b]
Coal	Pulverised Coal Combustion (PCC)	-	40 ÷ 50	65 ÷ 80	65 ÷ 80	40 ÷ 55	80 ÷ 95	85 ÷ 100
		CCS	n/a	80 ÷ 105	75 ÷ 100	n/a	100 ÷ 125	100 ÷ 120
	Circulating Fluidised Bed Combustion (CFBC)	-	45 ÷ 55	75 ÷ 85	75 ÷ 85	50 ÷ 60	95 ÷ 105	95 ÷ 105
	Integrated Gasification Combined Cycle (IGCC)	-	45 ÷ 55	70 ÷ 80	70 ÷ 80	50 ÷ 60	85 ÷ 95	85 ÷ 95
		CCS	n/a	75 ÷ 90	65 ÷ 85	n/a	95 ÷ 110	90 ÷ 105
Nuclear	Nuclear fission	-	50 ÷ 85	45 ÷ 80	45 ÷ 80	55 ÷ 90	55 ÷ 90	55 ÷ 85
Biomass	Solid biomass	-	80 ÷ 195	85 ÷ 200	85 ÷ 205	80 ÷ 195	90 ÷ 215	95 ÷ 220
	Biogas	-	55 ÷ 215	50 ÷ 200	50 ÷ 190	55 ÷ 215	50 ÷ 200	50 ÷ 190
Wind	On-shore farm	-	75 ÷ 110	55 ÷ 90	50 ÷ 85	75 ÷ 110	55 ÷ 90	50 ÷ 85
	Off-shore farm	-	85 ÷ 140	65 ÷ 115	50 ÷ 95	85 ÷ 140	65 ÷ 115	50 ÷ 95
Hydro	Large	-	35 ÷ 145	30 ÷ 140	30 ÷ 130	35 ÷ 145	30 ÷ 140	30 ÷ 130
	Small	-	60 ÷ 185	55 ÷ 160	50 ÷ 145	60 ÷ 185	55 ÷ 160	50 ÷ 145
Solar	Photovoltaic	-	520 ÷ 880	270 ÷ 460	170 ÷ 300	520 ÷ 880	270 ÷ 460	170 ÷ 300
	Concentrating Solar Power (CSP)	-	170 ÷ 250 [d]	110 ÷ 160 [d]	100 ÷ 140 [d]	170 ÷ 250 [d]	130 ÷ 180 [d]	120 ÷ 160 [d]

Source: European Commision

…and more recent developments

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- In 2008 wind was the most dynamic energy source, adding 8,4 GW in EU and 8,3 GW in US (worldwide 27 GW)
- Wind energy has become a highly competitive technology. Generation costs below 0,1 €/kWh reality.
- In 2008 PV capacity achieved a record level of 4,87 GW in Europe, US 0,34 GW (worldwide 6 GW).
- PV module prices have decreased by 30-50 % in recent months. Generation costs below 0,20 €/kWp are possible.
- 1 $ production cost per kWp is not a dream any more

Global Electricity Generation

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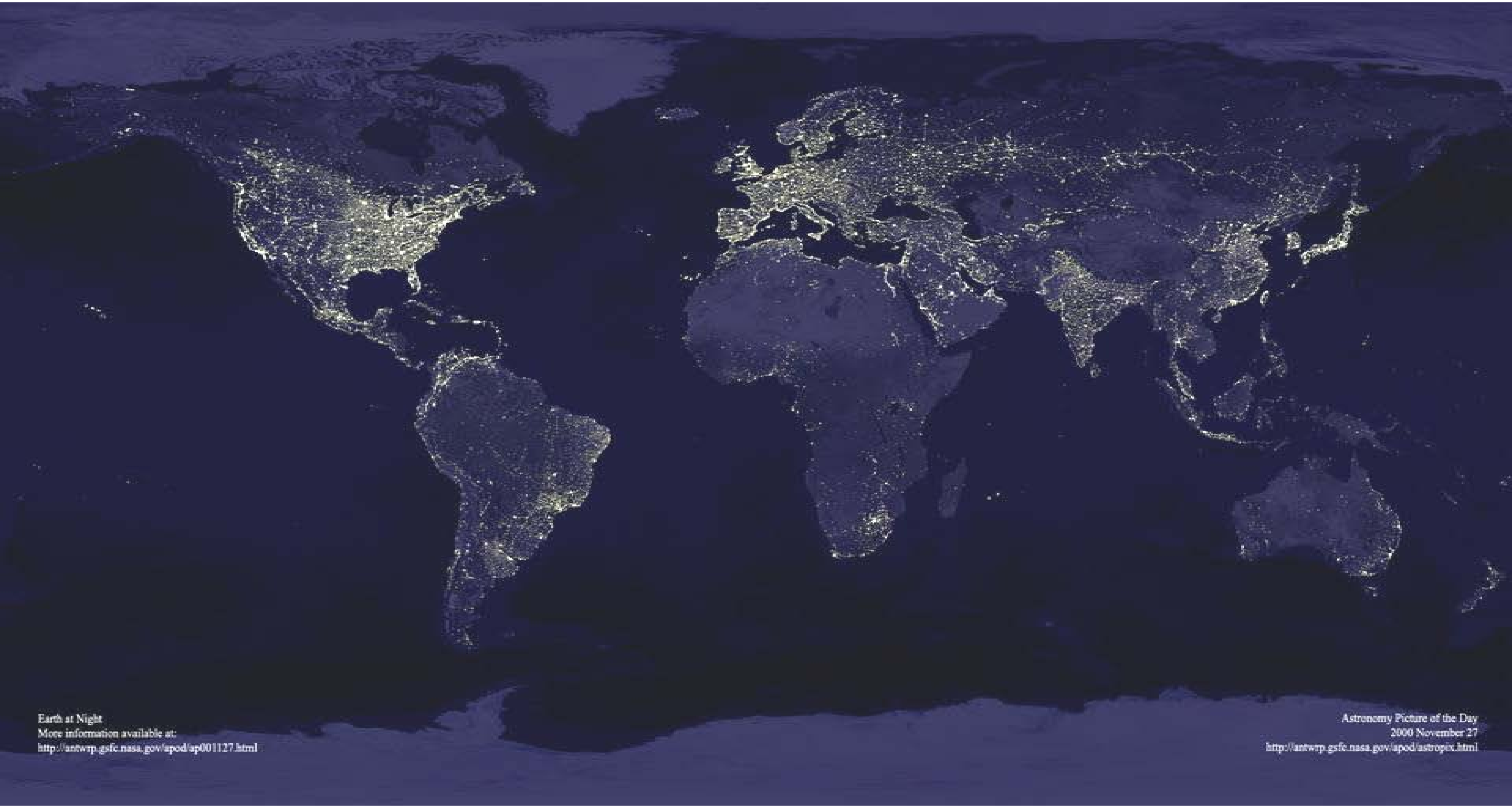

World Irradiation Map

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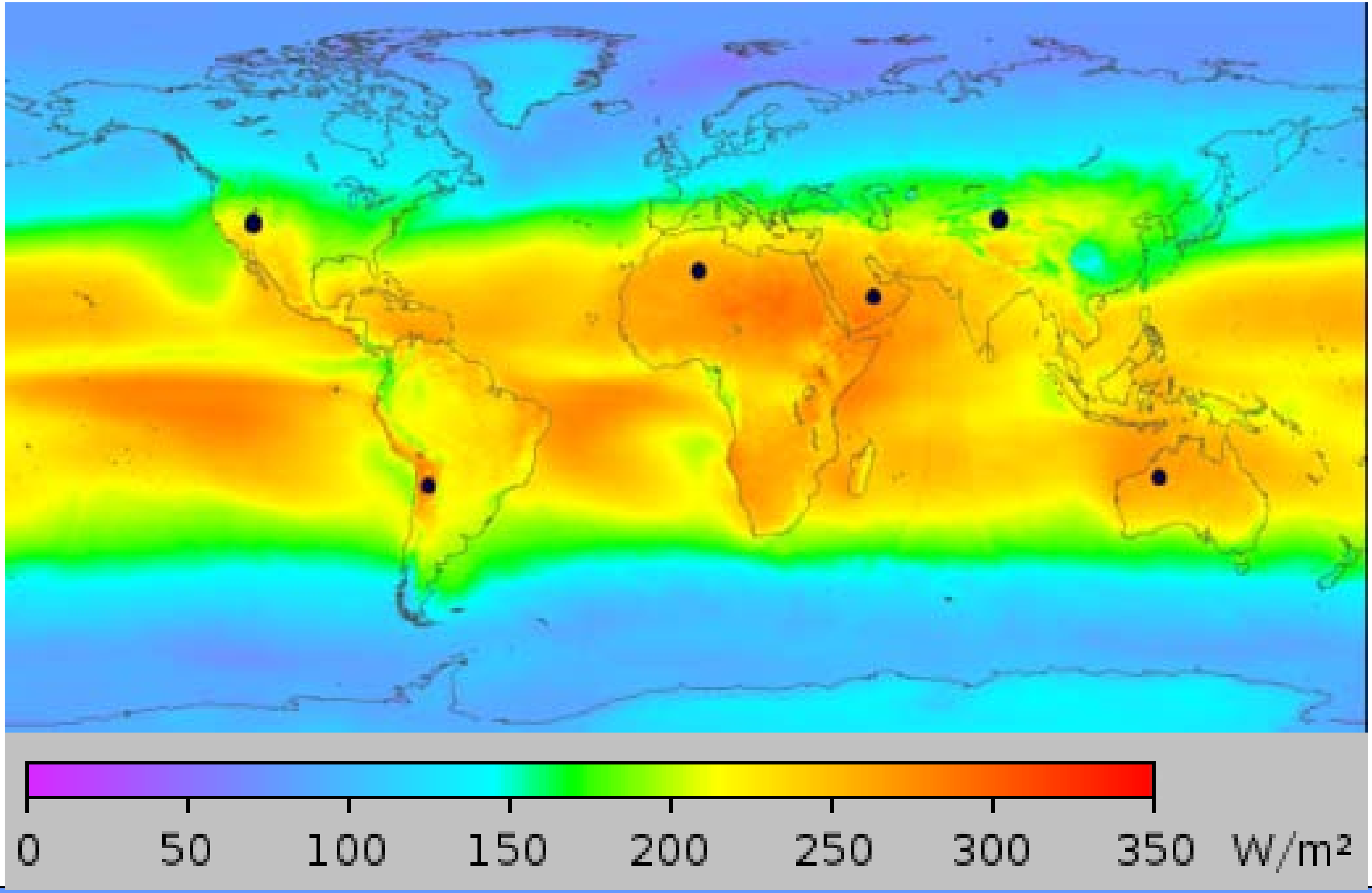

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Thank you very much!




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