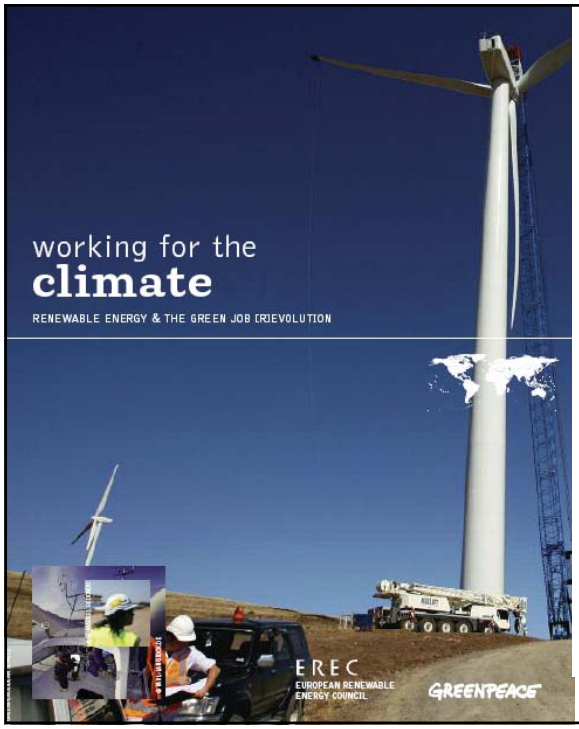

Global launch:
September 2009
Australia

Greenpeace International
Sven Teske

For all Energy [R]evolution scenario details go to:
www.energyblueprint.info

Energy Policy targets:

- Rapid fossil fuel phase-out
- Only proven technology will be used
- Achieve global climate target with a parallel nuclear phase-out
- Equity and fairness, sustainable economic growth

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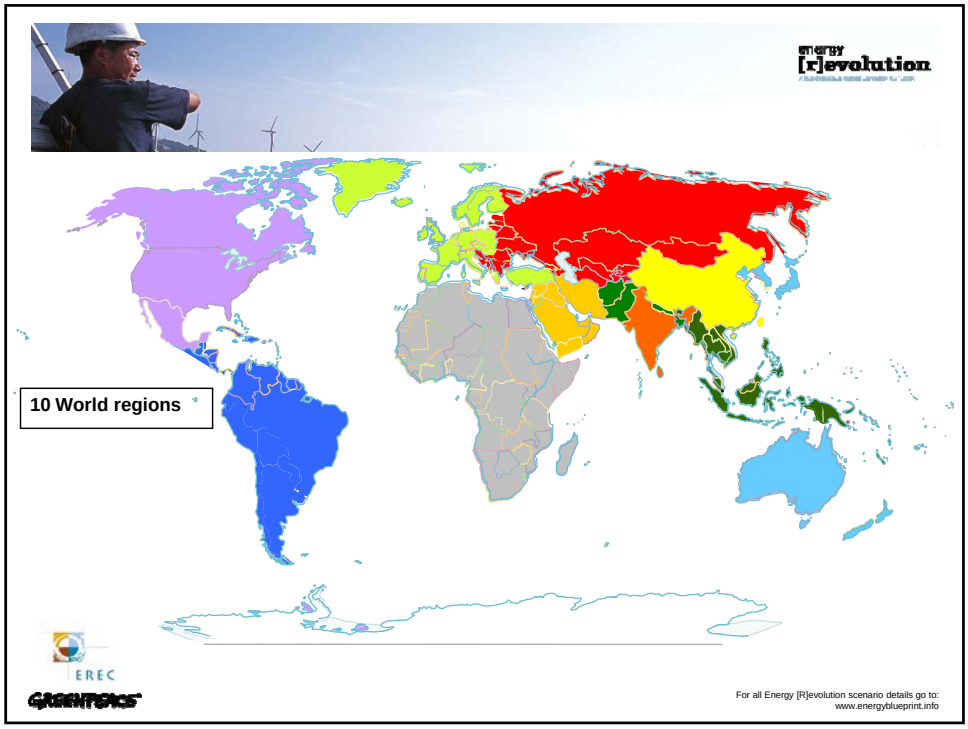
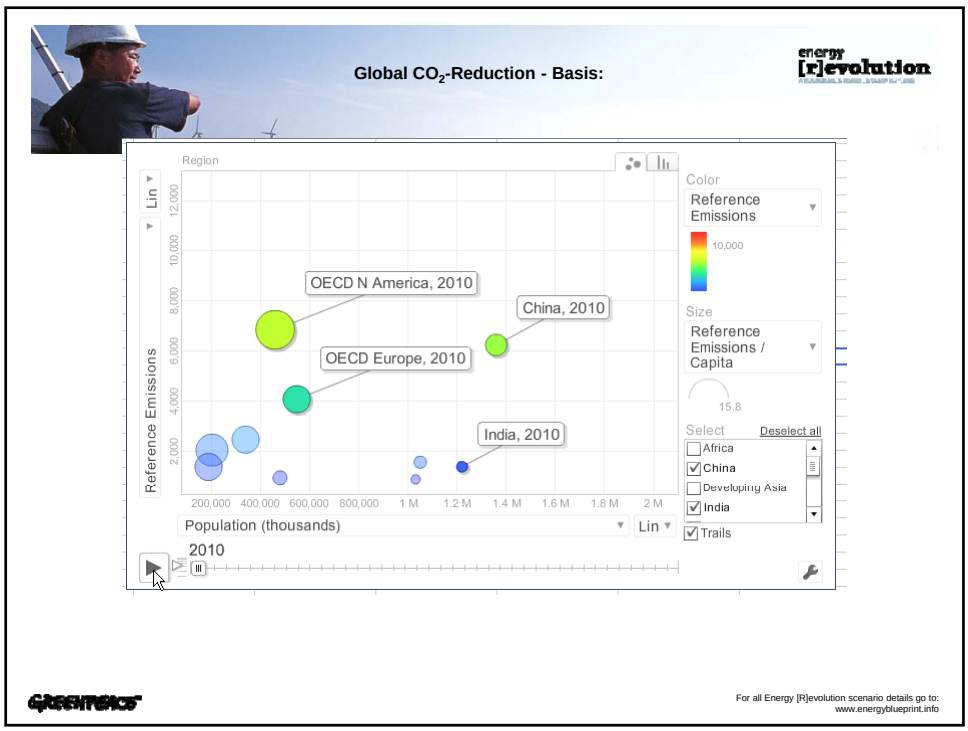
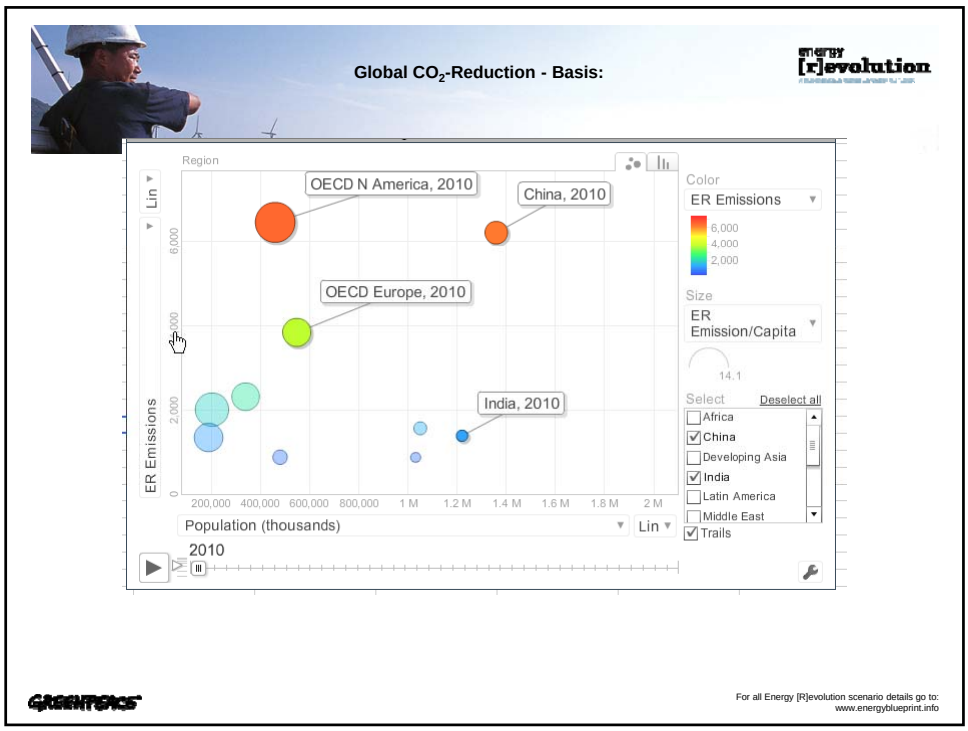
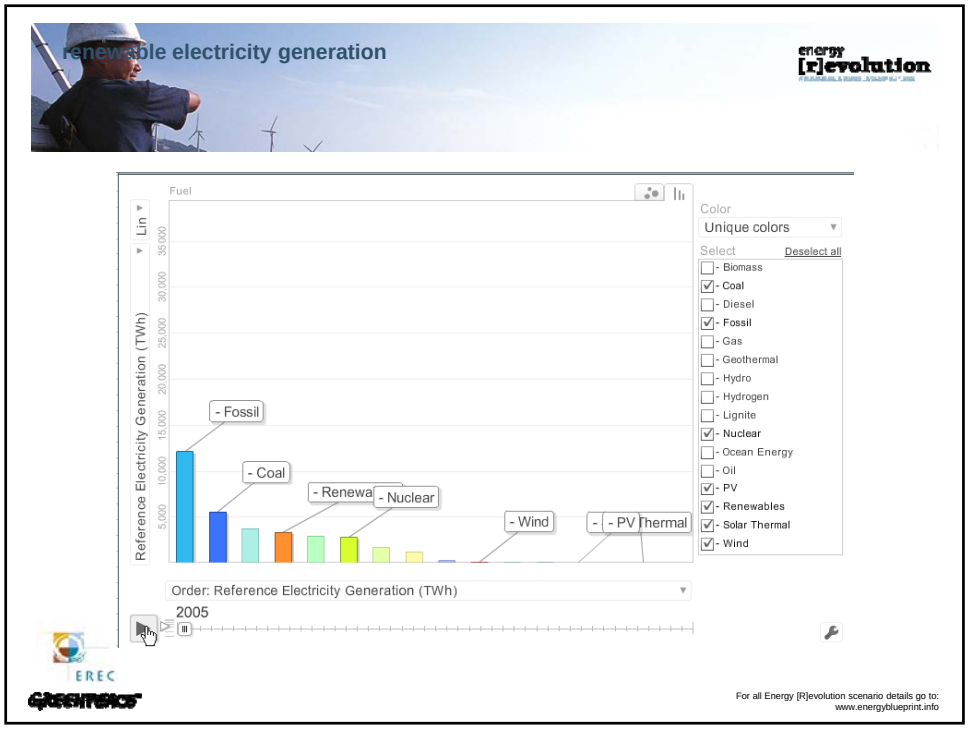

energy [r]evolution
10 World regions
EREC
For all Energy [R]evolution scenario details go to:
www.energyblueprint.info


Global CO_2-Reduction - Basis:
energy [r]evolution
Region
Lin
Reference Emissions
12,000
10,000
8,000
6,000
4,000
2,000
OECD N America, 2010
China, 2010
OECD Europe, 2010
India, 2010
200,000 400,000 600,000 800,000 1 M 1.2 M 1.4 M 1.6 M 1.8 M 2 M
Population (thousands)
Lin
2010
Color
Reference Emissions
10,000
Size
Reference Emissions / Capita
15.8
Select
Deselect all
Africa
China
Developing Asia
India
Trails
For all Energy [R]evolution scenario details go to:
www.energyblueprint.info


Global CO_2-Reduction - Basis:
energy [r]evolution
Region
OECD N America, 2010
China, 2010
OECD Europe, 2010
India, 2010
Lin
ER Emissions
6,000
4,000
2,000
0
200,000 400,000 600,000 800,000 1 M 1.2 M 1.4 M 1.6 M 1.8 M 2 M
Population (thousands)
Lin
2010
Color
ER Emissions
6,000
4,000
2,000
Size
ER Emission/Capita
14.1
Select
Deselect all
Africa
China
Developing Asia
India
Latin America
Middle East
Trails
For all Energy [R]evolution scenario details go to:
www.energyblueprint.info


Renewable electricity generation
energy [r]evolution
Fuel
Lin
Reference Electricity Generation (TWh)
35,000
30,000
25,000
20,000
15,000
10,000
5,000
- Fossil
- Coal
- Renewa
- Nuclear
- Wind
- PV Thermal
Order: Reference Electricity Generation (TWh)
2005
Color
Unique colors
Select
Deselect all
- Biomass
- Coal
- Diesel
- Fossil
- Gas
- Geothermal
- Hydro
- Hydrogen
- Lignite
- Nuclear
- Ocean Energy
- Oil
- PV
- Renewables
- Solar Thermal
- Wind
EREC
For all Energy [R]evolution scenario details go to:
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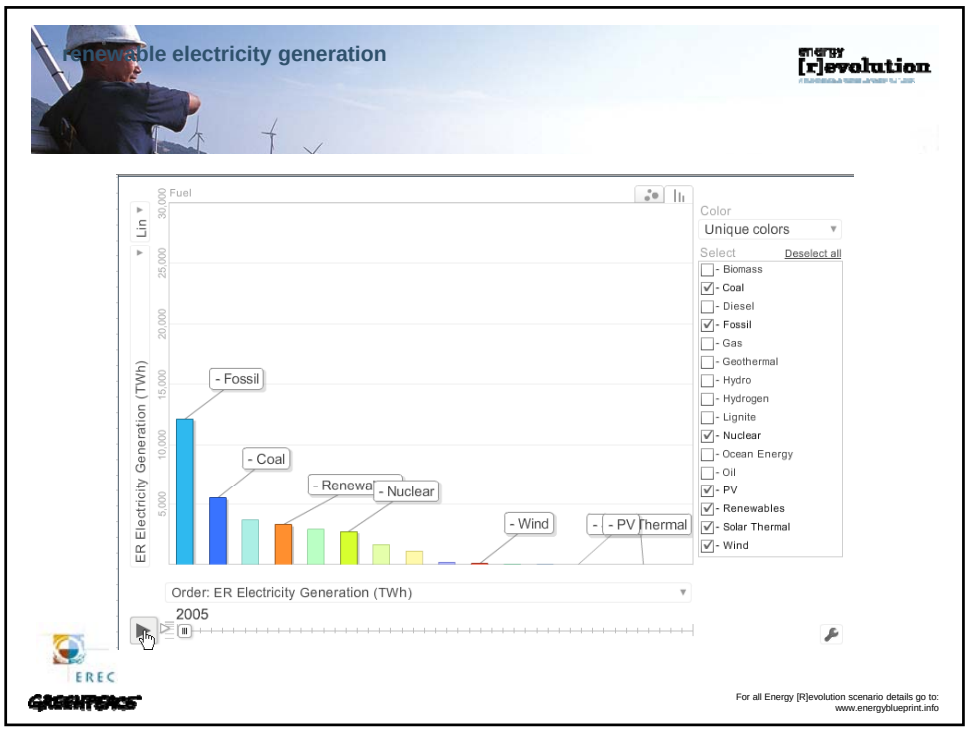
renewable electricity generation
energy [r]evolution
Fuel
Lin
ER Electricity Generation (TWh)
30,000
25,000
20,000
15,000
10,000
5,000
- Fossil
- Coal
- Renewa
- Nuclear
- Wind
- - PV Thermal
Color
Unique colors
Select
Deselect all
- Biomass
- Coal
- Diesel
- Fossil
- Gas
- Geothermal
- Hydro
- Hydrogen
- Lignite
- Nuclear
- Ocean Energy
- Oil
- PV
- Renewables
- Solar Thermal
- Wind
Order: ER Electricity Generation (TWh)
2005
EREC
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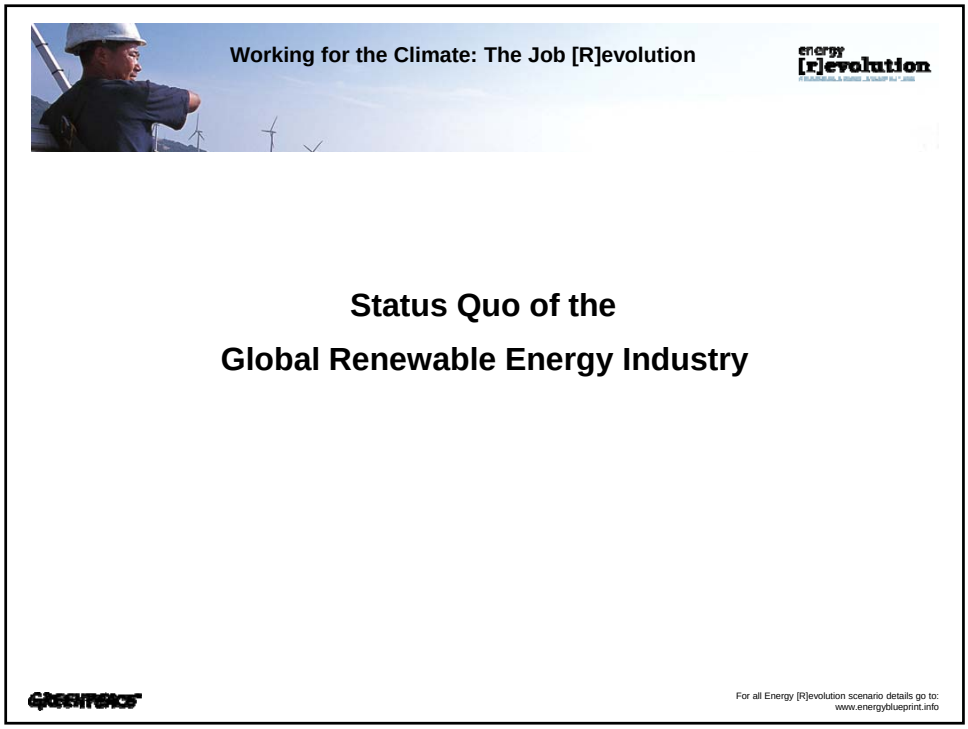
www.energyblueprint.info


Working for the Climate: The Job [R]evolution
energy [r]evolution
Status Quo of the
Global Renewable Energy Industry
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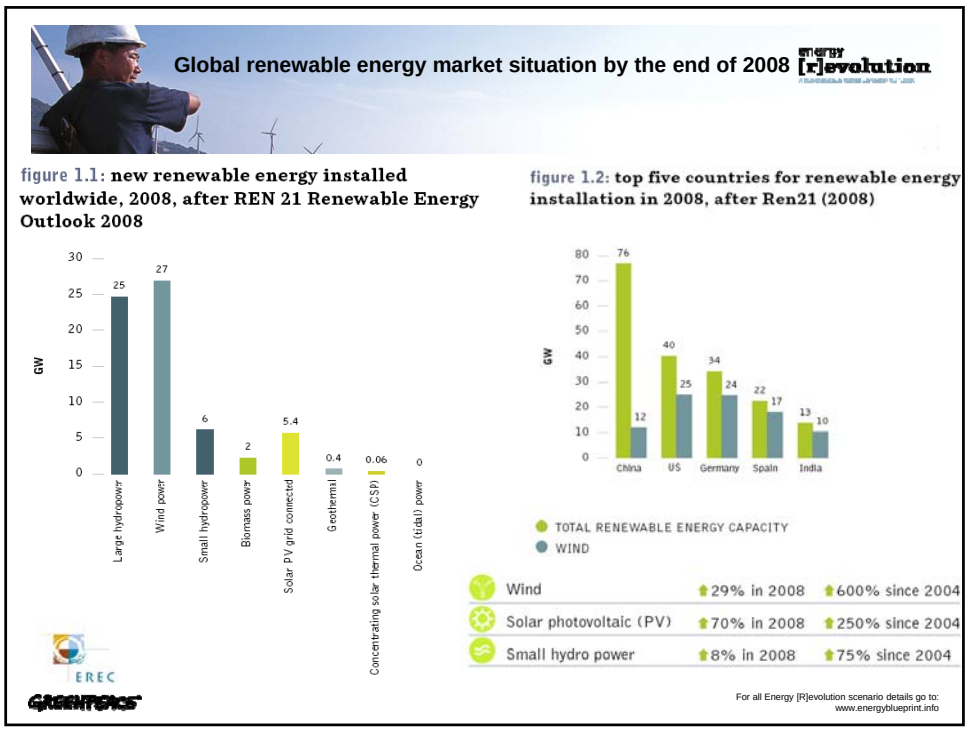
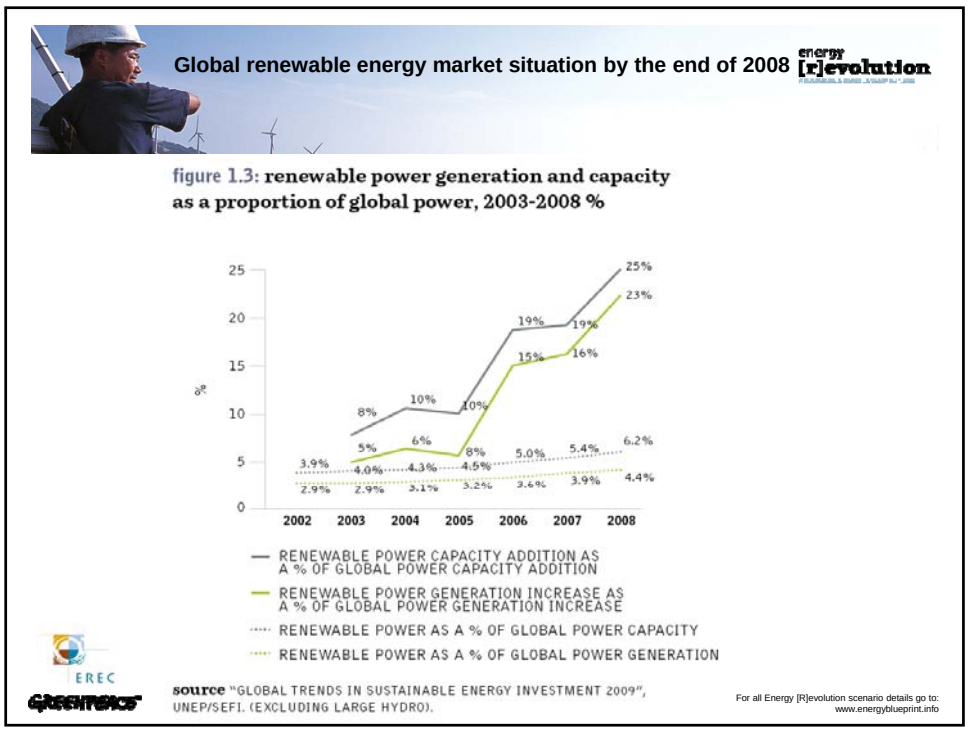
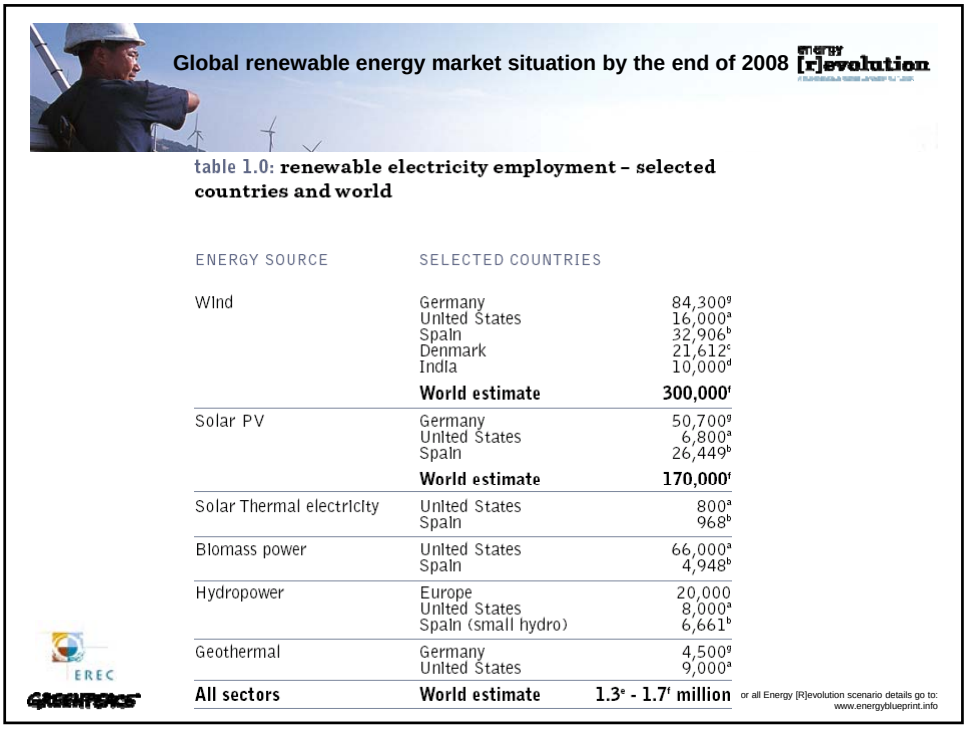

Global renewable energy market situation by the end of 2008
energy [r]evolution
figure 1.1: new renewable energy installed worldwide, 2008, after REN 21 Renewable Energy Outlook 2008
GW
30
25
20
15
10
5
0
25
27
6
2
5.4
0.4
0.06
0
Large hydropower
Wind power
Small hydropower
Biomass power
Solar PV grid connected
Geothermal
Concentrating solar thermal power (CSP)
Ocean (tidal) power
figure 1.2: top five countries for renewable energy installation in 2008, after Ren21 (2008)
GW
80
70
60
50
40
30
20
10
0
76
12
40
25
34
24
22
17
13
10
China
US
Germany
Spain
India
TOTAL RENEWABLE ENERGY CAPACITY
WIND
Wind
29% in 2008
600% since 2004
Solar photovoltaic (PV)
70% in 2008
250% since 2004
Small hydro power
8% in 2008
75% since 2004
EREC
Greenpeace
For all Energy [R]evolution scenario details go to:
www.energyblueprint.info


Global renewable energy market situation by the end of 2008
energy [r]evolution
figure 1.3: renewable power generation and capacity as a proportion of global power, 2003-2008 %
%
25
20
15
10
5
0
25%
23%
19%
19%
15%
16%
10%
10%
8%
8%
6%
6.2%
5.4%
5.0%
5%
4.5%
4.4%
4.3%
4.0%
3.9%
3.9%
3.6%
3.4%
3.2%
3.1%
2.9%
2.9%
2002
2003
2004
2005
2006
2007
2008
RENEWABLE POWER CAPACITY ADDITION AS A % OF GLOBAL POWER CAPACITY ADDITION
RENEWABLE POWER GENERATION INCREASE AS A % OF GLOBAL POWER GENERATION INCREASE
RENEWABLE POWER AS A % OF GLOBAL POWER CAPACITY
RENEWABLE POWER AS A % OF GLOBAL POWER GENERATION
EREC
Greenpeace
source "GLOBAL TRENDS IN SUSTAINABLE ENERGY INVESTMENT 2009", UNEP/SEFI. (EXCLUDING LARGE HYDRO).
For all Energy [R]evolution scenario details go to:
www.energyblueprint.info


Global renewable energy market situation by the end of 2008
energy [r]evolution
table 1.0: renewable electricity employment – selected countries and world
ENERGY SOURCE
SELECTED COUNTRIES
Wind
Germany 84,300[g]
United States 16,000[a]
Spain 32,906[b]
Denmark 21,612[c]
India 10,000[d]
World estimate 300,000[f]
Solar PV
Germany 50,700[g]
United States 6,800[a]
Spain 26,449[b]
World estimate 170,000[f]
Solar Thermal electricity
United States 800[a]
Spain 968[b]
Biomass power
United States 66,000[a]
Spain 4,948[b]
Hydropower
Europe 20,000
United States 8,000[a]
Spain (small hydro) 6,661[b]
Geothermal
Germany 4,500[g]
United States 9,000[a]
All sectors
World estimate 1.3[e] - 1.7[f] million
EREC
Greenpeace
or all Energy [R]evolution scenario details go to:
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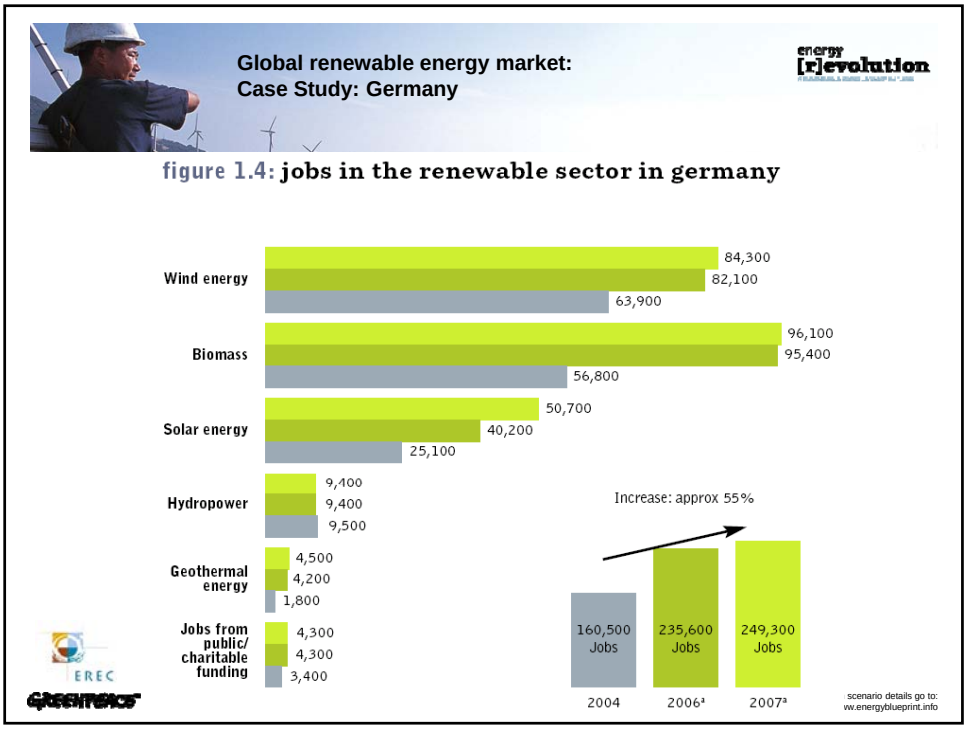
Global renewable energy market:
Case Study: Germany
energy [r]evolution
figure 1.4: jobs in the renewable sector in germany
Wind energy
84,300
82,100
63,900
Biomass
96,100
95,400
56,800
Solar energy
50,700
40,200
25,100
Hydropower
9,100
9,400
9,500
Geothermal energy
4,500
4,200
1,800
Jobs from public/ charitable funding
4,300
4,300
3,400
Increase: approx 55%
160,500 Jobs
235,600 Jobs
249,300 Jobs
2004
2006[a]
2007[a]
EREC
Greenpeace
scenario details go to:
ww.energyblueprint.info

Methodology

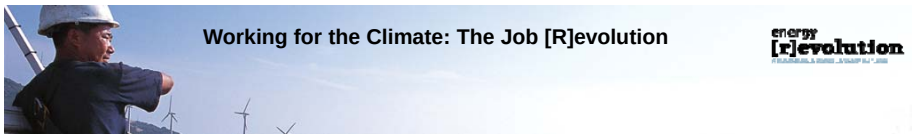

figure 2.3: **Methodology overview**

MANUFACTURING (FOR DOMESTIC USE)	=	MW INSTALLED PER YEAR	×	MANUFACTURING EMPLOYMENT FACTOR	×	REGIONAL JOB MULTIPLIER	x	% OF LOCAL MANUFACTURING
MANUFACTURING (FOR EXPORT)	=	MW EXPORTED PER YEAR	×	MANUFACTURING EMPLOYMENT FACTOR	×	REGIONAL JOB MULTIPLIER		
CONSTRUCTION	=	MW INSTALLED PER YEAR	×	CONSTRUCTION EMPLOYMENT FACTOR	×	REGIONAL JOB MULTIPLIER		
OPERATION & MAINTENANCE	=	CUMULATIVE CAPACITY	×	O&M EMPLOYMENT FACTOR	×	REGIONAL JOB MULTIPLIER		
FUEL SUPPLY (NUCLEAR, OIL, DIESEL, BIOMASS)	=	ELECTRICITY GENERATION	×	FUEL EMPLOYMENT FACTOR	×	REGIONAL JOB MULTIPLIER		
FUEL SUPPLY (COAL)	=	ELECTRICITY GENERATION + NET COAL EXPORTS	×	REGIONAL FUEL EMPLOYMENT FACTOR	×	% OF LOCAL PRODUCTION		
FUEL SUPPLY (GAS)	=	ELECTRICITY GENERATION + NET GAS EXPORTS	×	FUEL EMPLOYMENT FACTOR	×	REGIONAL JOB MULTIPLIER	x	% OF LOCAL PRODUCTION
JOBS IN REGION	=	**MANUFACTURING**	+	**CONSTRUCTION**	+	**OPERATION & MAINTENANCE (O&M)**	+	**FUEL SUPPLY**
JOBS IN REGION 2010	=	**JOBS IN REGION**						
JOBS IN REGION 2020	=	**JOBS IN REGION** × TECHNOLOGY DECLINE FACTOR						
JOBS IN REGION 2030	=	**JOBS IN REGION** × TECHNOLOGY DECLINE FACTOR						

table 2.5: **summary of employment factors for use in global analysis**

FUEL	CONSTRUCTION, MANUFACTURING & INSTALLATION *Person years/MW*	OPERATION & MAINTENANCE *Jobs/MW*	FUEL *Jobs/GWh*	MAIN REFERENCE
Coal	14.4	0.10	Regional factors used	NREL (JEDI model)
Gas	3.4	0.05	0.12	NREL (JEDI model)
Nuclear	16	0.32	0.0009	Derived from US and Au industry data
Biomass	4.3	3.1	0.22	EPRI 2001, DTI 2004
Hydro	11.3	0.22		Pembina 2004
Wind (onshore)	15.4	0.40		EWEA 2009
Wind (offshore)	28.8	0.77		EWEA 2009
PV	38.4	0.40		EPIA 2008A, BMU 2008a
Geothermal	6.4	0.74		GEA 2005
Solar thermal	10	0.3		EREC 2008
Ocean	10	0.32		SERG 2007/ SPOK ApS 2008
Energy efficiency	0.29 Jobs /GWh (adjusted to 0.23 Jobs/ GWh for 2010)			ACEEE 2008

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Key Results

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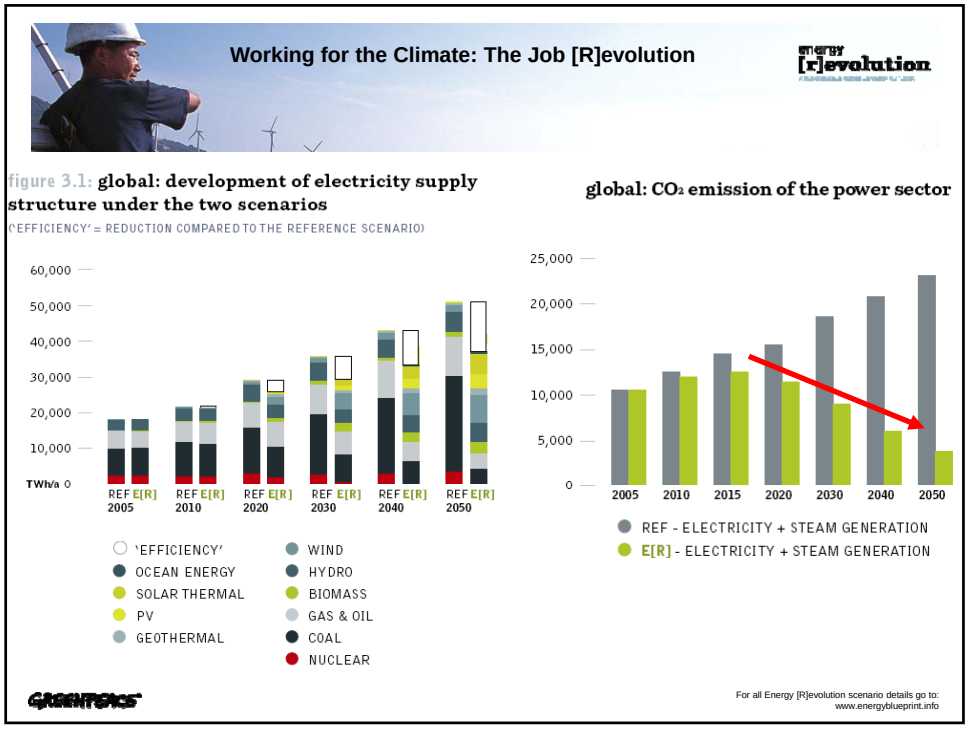
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energy [r]evolution
figure 3.1: global: development of electricity supply structure under the two scenarios
('EFFICIENCY' = REDUCTION COMPARED TO THE REFERENCE SCENARIO)
60,000
50,000
40,000
30,000
20,000
10,000
TWh/a 0
REF E[R] 2005
REF E[R] 2010
REF E[R] 2020
REF E[R] 2030
REF E[R] 2040
REF E[R] 2050
'EFFICIENCY'
OCEAN ENERGY
SOLAR THERMAL
PV
GEOTHERMAL
WIND
HYDRO
BIOMASS
GAS & OIL
COAL
NUCLEAR
global: CO2 emission of the power sector
25,000
20,000
15,000
10,000
5,000
0
2005
2010
2015
2020
2030
2040
2050
REF - ELECTRICITY + STEAM GENERATION
E[R] - ELECTRICITY + STEAM GENERATION
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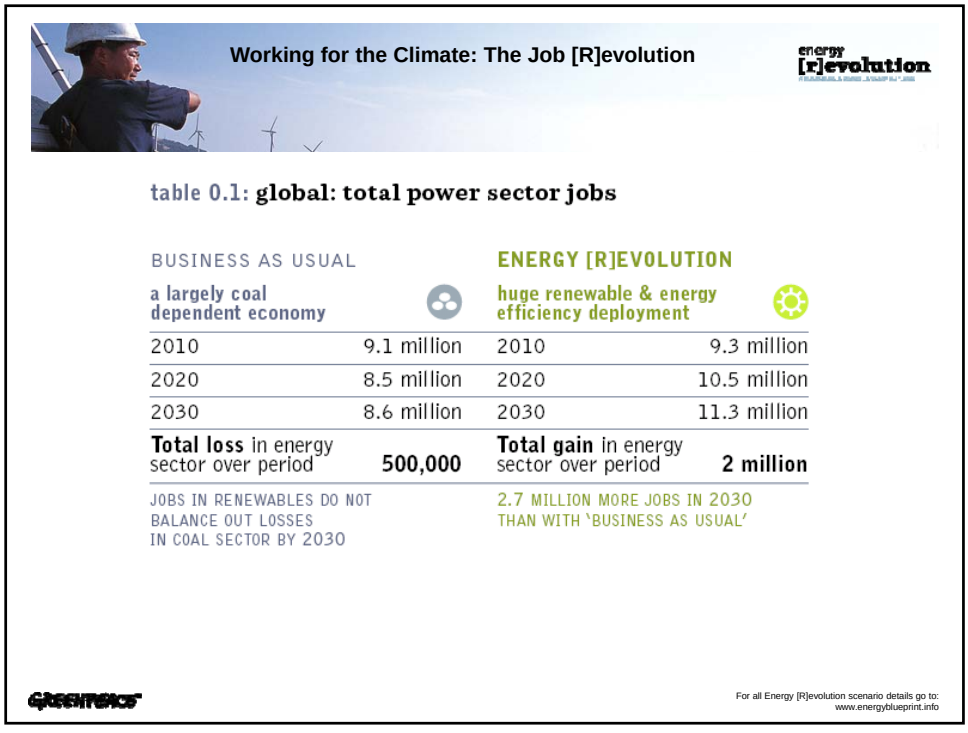
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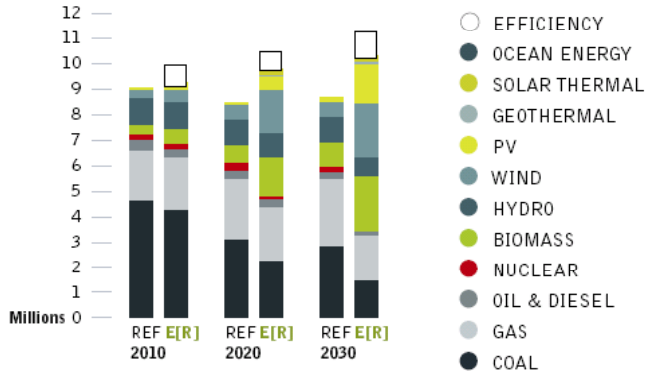
energy [r]evolution
table 0.1: global: total power sector jobs
BUSINESS AS USUAL
a largely coal dependent economy
ENERGY [R]EVOLUTION
huge renewable & energy efficiency deployment
2010 9.1 million
2020 8.5 million
2030 8.6 million
Total loss in energy sector over period 500,000
2010 9.3 million
2020 10.5 million
2030 11.3 million
Total gain in energy sector over period 2 million
JOBS IN RENEWABLES DO NOT BALANCE OUT LOSSES IN COAL SECTOR BY 2030
2.7 MILLION MORE JOBS IN 2030 THAN WITH 'BUSINESS AS USUAL'
For all Energy [R]evolution scenario details go to:
www.energyblueprint.info

Working for the Climate: The Job [R]evolution

energy [r]evolution

global: jobs by technology in 2010, 2020, and 2030



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energy [r]evolution

table 3.1: **global: summary of results**

	REFERENCE SCENARIO			[R]EVOLUTION SCENARIO		
	2010	2020	2030	2010	2020	2030
Jobs (millions)						
Coal	4.65 m	3.16 m	2.86 m	4.26 m	2.28 m	1.39 m
Gas	1.95 m	2.36 m	2.55 m	2.08 m	2.12 m	1.80 m
Nuclear, oil and diesel	0.61 m	0.58 m	0.50 m	0.56 m	0.31 m	0.13 m
Renewable	1.88 m	2.41 m	2.71 m	2.38 m	5.03 m	6.90 m
Energy supply jobs	**9.1**	**8.5**	**8.6**	**9.3**	**9.7**	**10.2**
Energy efficiency jobs	-	-	-	0.06	0.72	1.13
Total Jobs	**9.1**	**8.5**	**8.6**	**9.3**	**10.5**	**11.3**
Electricity generation (TWh)						
Coal	9,283	12,546	16,030	8,751	8,953	7,784
Gas	4,447	6,256	7,974	4,704	6,126	6,335
Nuclear, oil & diesel	4,004	4,133	4,079	3,814	2,309	1,003
Renewable	4,047	5,871	7,286	4,254	8,355	14,002
TOTAL electricity generation (TWh)	**21,780**	**28,807**	**35,369**	**21,523**	**25,743**	**29,124**

Note: *This underestimates energy efficiency jobs because it only includes jobs additional to the Reference scenario.*

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table 4.5: **capacity, investment, and direct jobs – wind**

		REFERENCE SCENARIO			[R]EVOLUTION SCENARIO		
Energy parameters	UNIT	2010	2020	2030	2010	2020	2030
Installed capacity	GW	114	293	295	154	802	1,405
Generated electricity	TWh	274	887	1,260	362	2,255	4,209
Share of total supply	%	1%	3%	4%	2%	9%	15%
Direct jobs							
Construction and manufacturing	Jobs	0.29 m	0.36 m	0.41 m	0.43 m	1.26 m	1.38 m
Operations and maintenance	Jobs	0.07 m	0.15 m	0.18 m	0.09 m	0.43 m	0.65 m
Total jobs		**0.36 m**	**0.51 m**	**0.59 m**	**0.52 m**	**1.68 m**	**2.03 m**

„For each job lost in the coal industry, 3 jobs will be created in the renewable industry."

Renewables are more labour intensive, but they don´t need fuel!

table 4.9: **capacity, investment, and direct jobs – coal**

		REFERENCE SCENARIO			[R]EVOLUTION SCENARIO		
Energy parameters	UNIT	2010	2020	2030	2010	2020	2030
Installed capacity	GW	1,477	2,054	2,665	1,400	1,460	1,263
Generated electricity	TWh	8,575	11,771	15,217	8,110	8,313	7,067
Share of total supply	%	40%	46%	52%	38%	32%	24%
Direct jobs		2.01 m	1.11 m	0.94 m	1.76 m	0.50 m	0.05 m
Construction and manufacturing	Jobs	0.26 m	0.27 m	0.29 m	0.25 m	0.20 m	0.14 m
Operations and maintenance	Jobs	1.93 m	1.49 m	1.38 m	1.90 m	1.25 m	0.88 m
Total jobs		**4.20 m**	**2.87 m**	**2.60 m**	**3.91 m**	**1.94 m**	**1.07 m**

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Working for the Climate: The Job [R]evolution

energy [r]evolution

Key Results of The Job [R]evolution in a nutshell:

by 2030:

- Under the Energy [R]evolution, the whole power sector would be employing about 2 million more than now (2.7 million more people than the 'business as usual' scenario). Without the Energy [R]evolution, the coal sector would be providing most of the power, but not as much employment.
- Under business as usual, there will be about 500,000 jobs lost in the power sector, because the 2 million reduction in coal power jobs is not compensated for by the rise in renewable and efficiency jobs.
- Coal, gas, oil and diesel sectors would provide around 2.5 million fewer jobs under an Energy [R]evolution scenario.
- The renewable sector would support 6.9 million jobs — about 5.3 million jobs more — under the Energy [R]evolution scenario.

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Working for the Climate: The Job [R]evolution

energy [r]evolution

Policy Recommendations

to kick start the Energy + Job [R]evolution

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we must take action now!!

energy [r]evolution

Governments around the world must show that they are serious about climate change by acting now to bring about an Energy [R]evolution.

• Standby power is wasted power. Globally, we have 50 dirty power plants running just for our wasted standby power.

We need our global leaders to:

1. Phase out all subsidies for fossil fuels and nuclear energy
2. Internalise the external (social and environmental) costs of energy production through “cap and trade” emissions trading
3. Mandate strict efficiency standards for all energy-consuming appliances, buildings and vehicles
4. Establish legally binding targets for renewable energy and combined heat and power generation
5. Reform the electricity markets by guaranteeing priority access to the grid for renewable power generators
6. Provide defined and stable returns for investors, for example by feed-in tariff programmes
7. Increase research and development budgets for renewable energy and energy efficiency.

• For a full copy of the report and to join the Energy [R]evolution, go to: http://www.greenpeace.org/energyrevolution

Greenpeace

For all Energy [R]evolution scenario details go to:
www.energyblueprint.info

Financing the energy [r]evolution in developing countries

table 2.2: **ftsm program**

KEY RESULTS	YEAR	TOTAL RENEWABLE ELECTRICITY GENERATION UNDER FTSM PROGRAM (TWh)	AVERAGE ANNUAL CO^2 EMISSION CREDITS (MILLION T CO_2)	TOTAL CO_2 CERTIFICATES PER PERIOD (MILLION T CO_2)	AVERAGE CO_2 COST PER TON ($/$TCO_2$)	TOTAL ANNUAL COSTS (BILLION $)	TOTAL COSTS PER PERIOD (BILLION $)
Period 1	2010-2019	556	34.9	349	31.1	1.1	10.8
Period 2	2020-2030	610	34.8	383	34.1	1.2	13.0
Period 1+2	2010-2030	1,166	34.8	731	32.6	1.1	24

EREC

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