

Carbon Strategy for Renewable Energy Sector in Pakistan

Key Data

- **Factor established in 1999**
 - one of the early movers in the carbon business
 - headquarters in Zurich, Switzerland
- **3C established in 2003**
 - independent spin-off Dresdner Bank / Allianz Group
 - headquarters in Frankfurt am Main / Germany
- **Structured as a holding organization and backed by strategic investors**
- **First Climate employs more than 200 specialists** (incl. JV partners)
 - engineers, traders, analysts, fund advisors, lawyers, marketing & sales experts
- **Assets under Management 2008:** EUR 200 Mio
- **Turnover 2007:** EUR 10 Mio

FACTOR

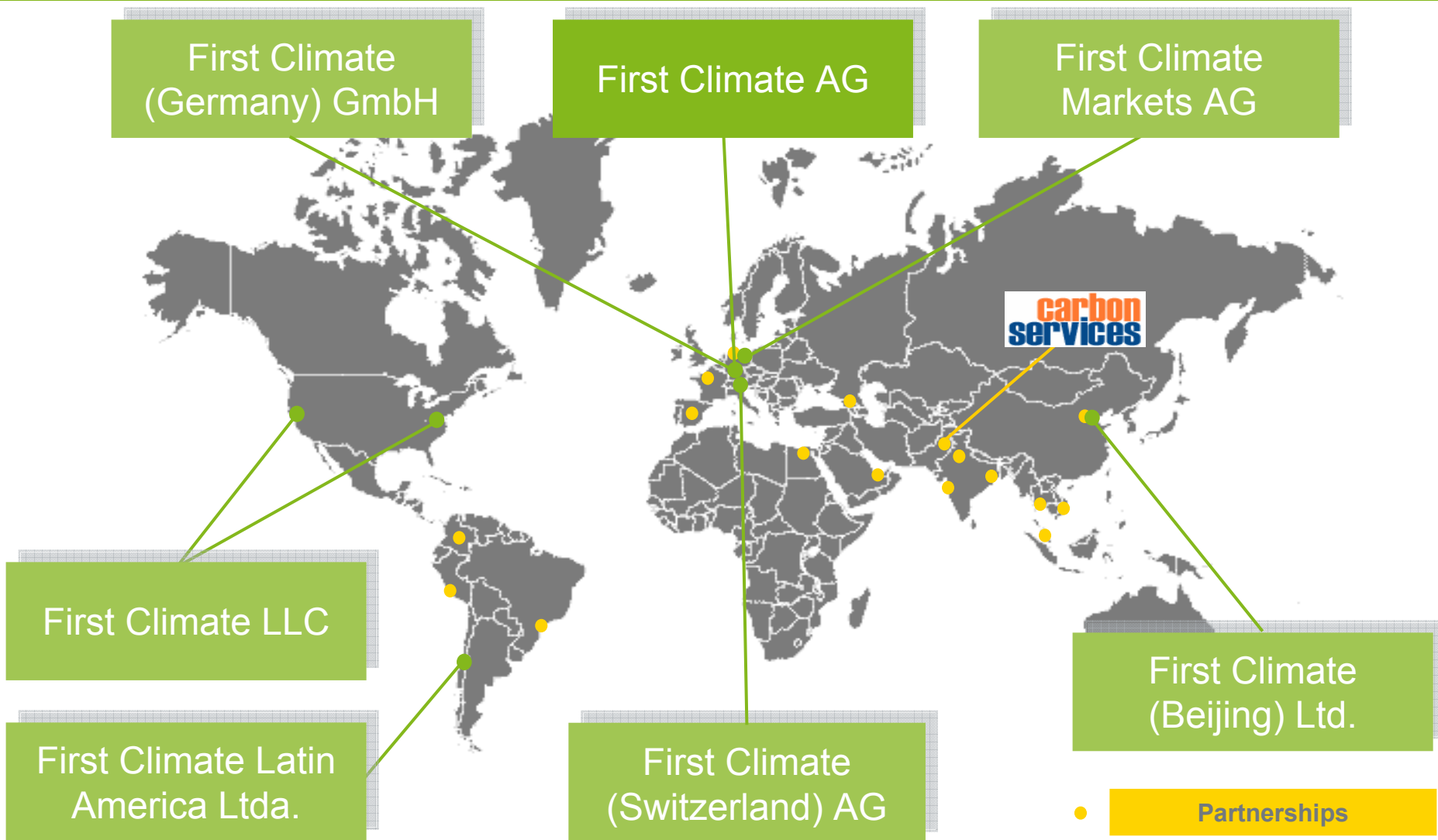


Core Business Areas



Project Development + Carbon Credit Commercialization =
Integrated Carbon Asset Management

First Climate Operations Worldwide



Contents

- **Renewable Energy Technologies**
- **Renewable Energy CDM Projects**
- **CDM Methodologies for Renewable Energy**
- **Carbon Strategies for the Renewable Energy Sector of Pakistan**

Renewable Energy Technologies

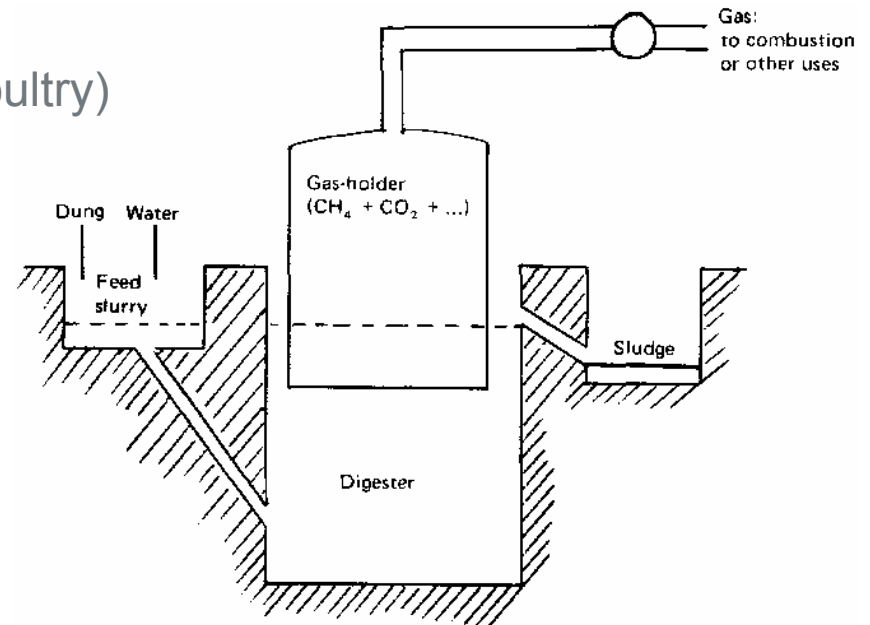
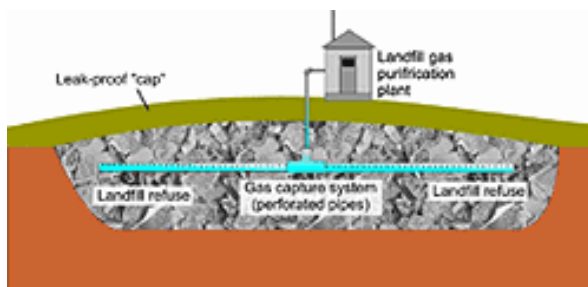
▪ Biogas

- ▶ Energy from organic materials
- ▶ Disposability: high
- ▶ Gas produced by anaerobic (without oxygen) decomposition of organic materials from plants and animals
- ▶ Consists mostly of methane (60% - 80%) and carbon dioxide (20% - 40%)
- ▶ Replaces natural gas for electricity production, heating and cooking

Renewable Energy Technologies

▪ Biogas

- ▶ Sources of biogas:
 - ▶ Wetlands (e.g. swamps and marshes);
 - ▶ Sewage sludge
 - ▶ Animal Waste Treatment (Cows, Poultry)
 - ▶ Landfill gas capture







Renewable Energy Technologies

▪ Biomass

- ▶ Energy from plant material and animal waste
- ▶ Disposability: high

- ▶ Types of biomass :
 - ▶ Growing plants specifically for energy use (wood, grass, etc.)
 - ▶ Residues from plants and agriculture (Sugar trash, cotton stalk, rice husk, etc), forestry wastes, solid waste of community, etc.)
 - ▶ Animal Waste Incineration (Poultry)
 - ▶ Municipal Solid Waste (RDF Fuel for Power, Cement Kilns, etc)

Types of Biomass	
	Wood fuel
	Rubbish
	Alcohol fuels
	Crops

Renewable Energy Technologies

■ Biomass

▶ Use of biomass:

- ▶ combustion methods (heating, cooking, industrial processes, electricity production)



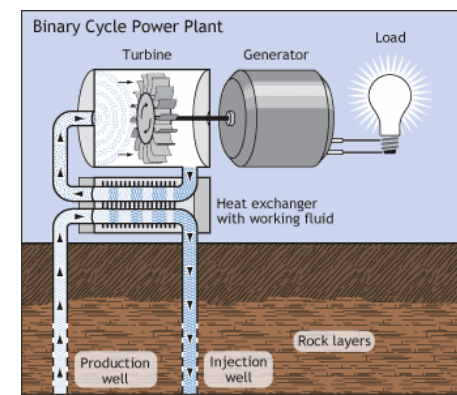
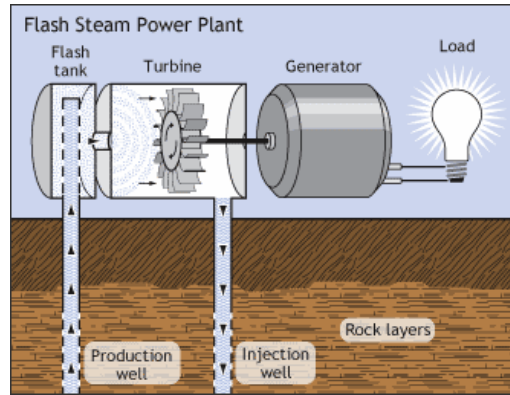
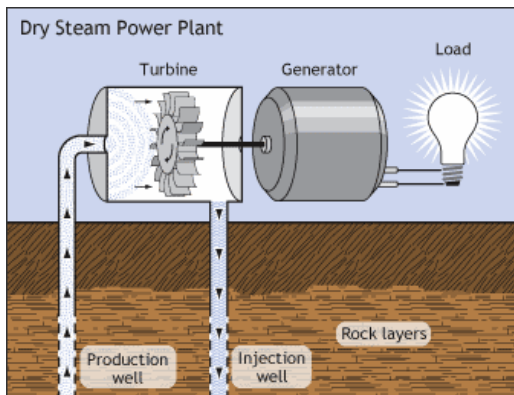
- ▶ non-combustion methods (convert raw biomass into a variety of gaseous, liquid, or solid fuels => biodiesel)



Renewable Energy Technologies

■ Geothermal

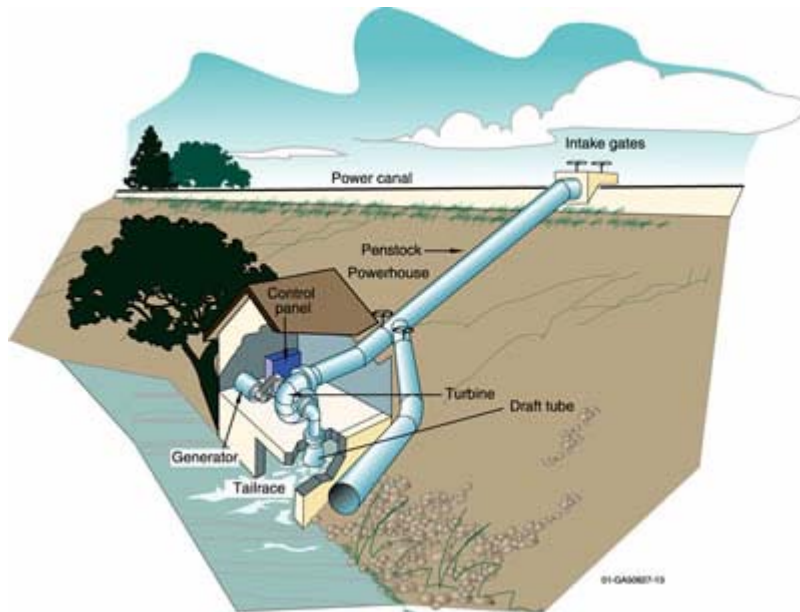
- ▶ Energy from earth-heat
- ▶ Disposability: moderate (can be found almost everywhere, but can be exploited only if heat comes to surface by itself)
- ▶ Inject cool water into earth,
- ▶ Water is heated up by heat of earth and then rises to the surface
- ▶ Capture the steam and use it to drive electric generators for electricity production



Renewable Energy Technologies

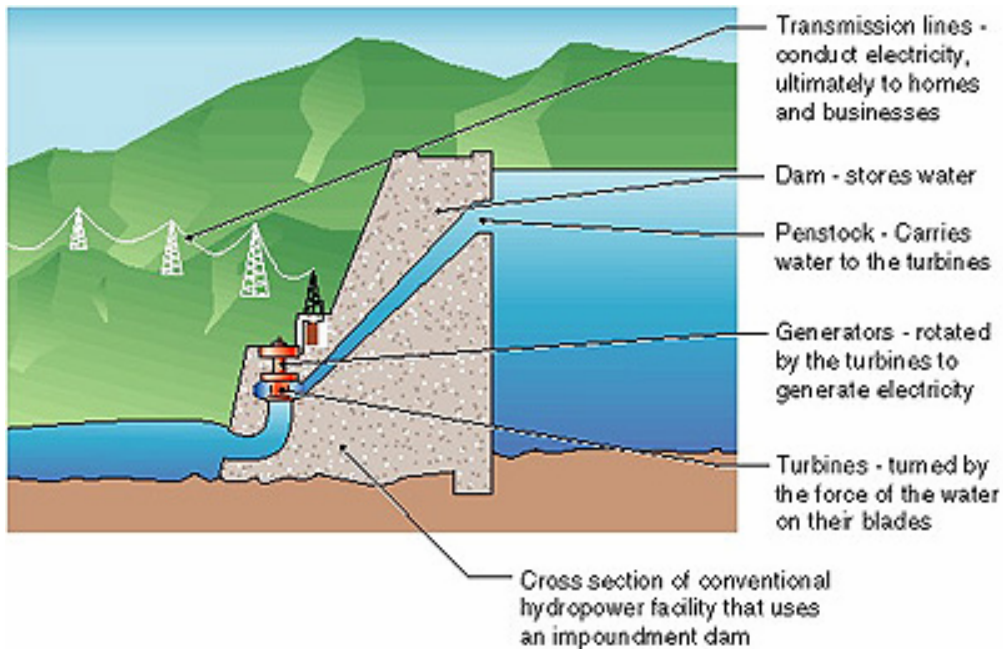
▪ Hydropower

- ▶ Energy from falling water
- ▶ Disposability: water sources
- ▶ Kinetic energy of falling water is converted by turbines and generators into electricity
- ▶ Use by private unity or export to the regional or national grid



Renewable Energy Technologies

▪ Hydropower

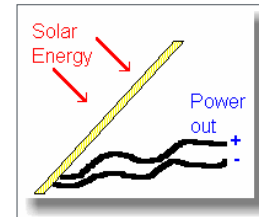


Renewable Energy Technologies

▪ Solar

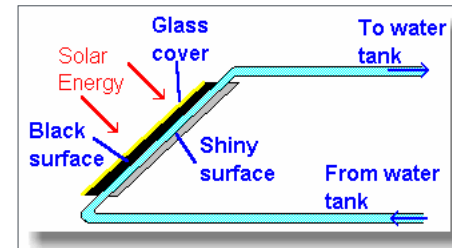
- ▶ Energy from the sun
- ▶ Disposability: high, but intermittent and unpredictable.

- ▶ Transformation of radiant energy
- ▶ Main use of solar energy:
 - ▶ **Photovoltaic** or “solar cells”
 - direct energy production
 - direct conversion into electricity



- ▶ **Solar Power Plants**

- indirect energy production
- heat from solar thermal collectors
- heat fluid => steam production => power generation



Renewable Energy Technologies

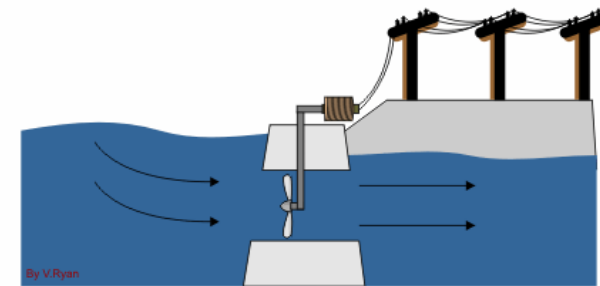
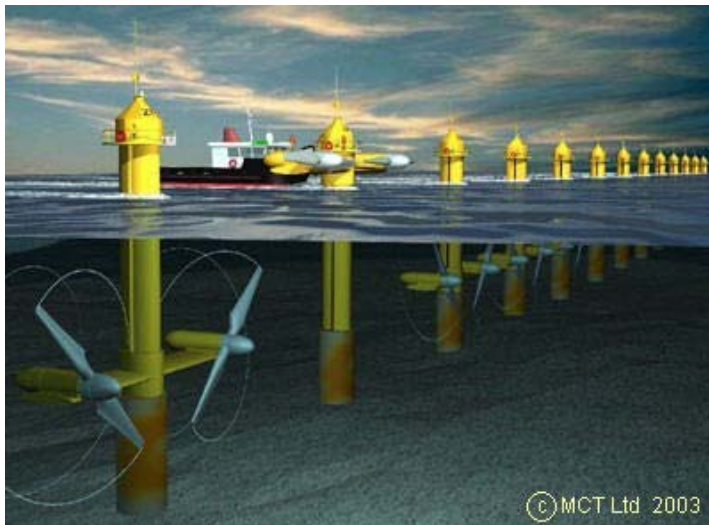
- ▶ **Solar Furnaces or Solar Thermal Concentrating Systems**
 - use of mirrors to concentrate the rays of sun
 - produce very high temperatures
 - used in industrial applications or electricity production
- ▶ **Domestic Solar Water Heating Systems**



Renewable Energy Technologies

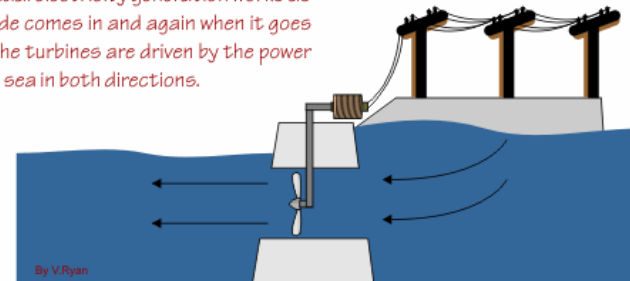
▪ Wave and tidal power

- ▶ Energy from waves and tides
- ▶ Disposability: moderate (oceans and rivers with tides)
- ▶ Uses tides or waves to generate electricity through tidal stream generators



TIDE COMING IN

This tidal electricity generation works as the tide comes in and again when it goes out. The turbines are driven by the power of the sea in both directions.



TIDE GOING OUT

Renewable Energy Technologies

▪ Wind

- ▶ Energy from the wind
- ▶ Disposability: moderate, but intermittent and unpredictable.
- ▶ Conversion of kinetic energy of the wind into mechanical energy or electricity
- ▶ The power and energy output increases as the wind speed increases (until certain safety limit where turbines can be damaged)



Contents

Renewable Energy Technologies

Renewable Energy CDM Projects

CDM Methodologies for Renewable Energy

Carbon Strategies for the Renewable Energy Sector of Pakistan

Renewable Energy CDM Projects

- **CDM Projects in Renewable Energy Sector**

- Type and Status in absolute numbers
- CDM pipeline as per 19th of August 2009

Type	At Validation	Registered	Rejected	TOTAL
Hydro	780	462	118	1360
Wind	473	267	52	792
Biomass energy	396	261	126	783
Landfill gas	63	58	10	131
Solar	24	11	4	39
Methane avoidance	23	3	0	26
Geothermal	8	7	0	15
Tidal	0	1	0	1
TOTAL	1767	1070	310	3147

Renewable Energy CDM Projects

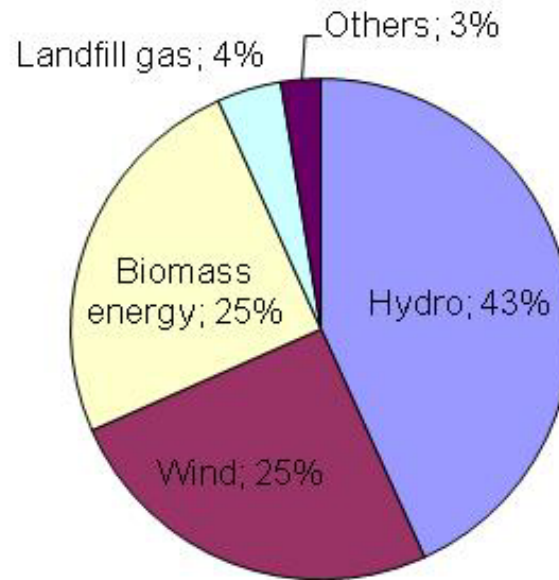
- **CDM Projects in Renewable Energy Sector**

- Type and Status in percentage
- CDM pipeline as per 19th of August 2009

Type	At Validation	Registered	Rejected	TOTAL
Hydro	25%	15%	4%	43%
Wind	15%	8%	2%	25%
Biomass energy	13%	8%	4%	25%
Landfill gas	2%	2%	0%	4%
Solar	1%	0%	0%	1%
Methane avoidance	1%	0%	0%	1%
Geothermal	0%	0%	0%	0%
Tidal	0%	0%	0%	0%
TOTAL	56%	34%	10%	100%

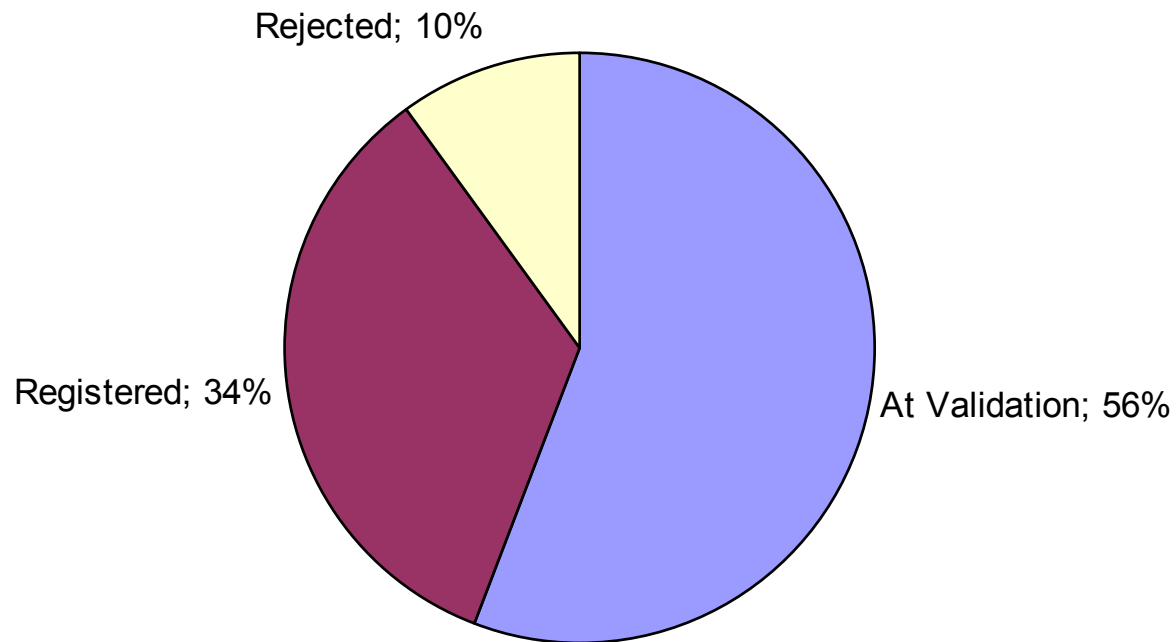
Renewable Energy CDM Projects

RE CDM Projects per Project Type



Renewable Energy CDM Projects

RE CDM Projects by Project Status



Renewable Energy CDM Projects

▪ Status of CDM Projects in Renewable Energy Sector

- ▶ Type per Host country
- ▶ CDM pipeline as per 19th of August 2009

Host country	Biomass energy	Geothermal	Hydro	Landfill gas	Solar	Tidal	Wind	Methane avoidance	TOTAL
China	78		884	38	5		379	4	1388
India	369		141	8	7		336	1	862
Brazil	131		84	10			11	3	239
South Korea	3	1	10	10	20	1	14		59
Malaysia	44		3	5				1	53
Pakistan	1		2						3
Others	155	14	212	60	7	0	52	17	517
TOTAL	781	15	1336	131	39	1	792	26	3121

- ▶ Pakistan has:
 - ▶ 1 registered project (Hydro)
 - ▶ 2 projects at validation (Hydro, Biomass Energy)

Contents

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CDM Methodologies for Renewable Energy

▪ Large Scale Methodologies

- Large Scale projects (output capacity > 15MW)
- Methodology per type of renewable energy:

Methodology	Biomass energy	Geothermal	Hydro	Landfill gas	Solar	Tidal	Wind	Methane avoidance	TOTAL
ACM2	6	13	629		3	1	529		1181
ACM6	284		1				2		287
ACM1				107					107
ACM3	21								21
ACM14								16	16
AM36	16								16
ACM10								10	10
AM25	3			7					10
ACM12	2			1					3
AM47	3								3
AM42	2								2
AM52			2						2
AM39	1								1
AM57	1								1
AM69	1								1

CDM Methodologies for Renewable Energy

- **Most used consolidated methodologies for renewable energy**
 - ▶ ACM0002 / Version 10
 - “Consolidated baseline methodology for grid-connected electricity generation from renewable sources”
 - ▶ **Applicability :**
 - hydro, wind, geothermal, solar, wave or tidal power plant/unit
 - grid connected electricity generation from landfill gas : combined with ACM0001 "Consolidated baseline methodology for landfill gas project activities“
 - ▶ **No applicability for :**
 - biomass fired power plants
 - switching from fossil fuels to renewable energy sources
 - Hydro power plants that result in new reservoirs or in the increase in existing reservoirs where the power density of the power plant is less than 4 W/m²

CDM Methodologies for Renewable Energy

- **Most used consolidated methodologies for renewable energy**
 - ▶ ACM0006 / Version 9
 - “Consolidated methodology electricity generation from biomass residues”
 - ▶ **Applicability :**
 - biomass residue fired electricity generation project activities, including cogeneration plants
 - ▶ **Applicability conditions :**
 - No other biomass types than *biomass residues* are used in the project plant and
 - these biomass residues are the predominant fuel used
 - projects that use biomass residues from a production process, the implementation of the project shall not result in an increase of the processing capacity of raw input (e.g. sugar, rice, logs, etc.) or in other substantial changes (e.g. product change) in this process
 - The biomass residues used by the project facility should not be stored for more than one year
 - No significant energy quantities are required to prepare the biomass residues for fuel combustion

CDM Methodologies for Renewable Energy

- **Other consolidated methodologies for renewable energy**

- ▶ ACM0001 / Version 11

“Consolidated baseline and monitoring methodology for landfill gas project activities”

- ▶ **Applicability :**

- landfill gas capture project activities (baseline scenario is partial or total atmospheric release of the gas)

- captured gas is flared and/or used to produce energy and/or supply consumers through natural gas distribution network

CDM Methodologies for Renewable Energy

▪ Other consolidated methodologies for renewable energy

▶ ACM0003 / Version 07.2

“Emissions reduction through partial substitution of fossil fuels with alternative fuels or less carbon intensive fuels in cement manufacture”

▶ Applicability :

- cement industry where fossil fuel(s) used are partially replaced by one or more carbon intensive fossil fuel(s) and/or alternative fuels

▶ Applicability conditions :

- significant investment is required

- during the last three years prior to the start of the project activity, no alternative fuels have been used in the project plant

- CO₂ emissions reduction relates to CO₂ emissions generated from fuel combustion only and is unrelated to the CO₂ emissions from decarbonisation of raw materials

- applicable only for installed capacity

CDM Methodologies for Renewable Energy

- **Other consolidated methodologies for renewable energy**

- ▶ ACM0014 / Version 3.1

“Mitigation of greenhouse gas emissions from treatment of industrial wastewater”

- ▶ **Applicability :**

- project activities that aim at reducing methane emissions from industrial wastewater treatment

- ▶ **Applicability conditions :**

- average depth of the open lagoons or sludge pits in the baseline scenario is at least 1m²

- heat and electricity requirements per unit input of the water treatment facility remain largely unchanged in the baseline scenario and the project activity;

- data requirements as laid out in this methodology are fulfilled

CDM Methodologies for Renewable Energy

- **Approved large scale methodologies for renewable energy**

- ▶ AM0036 / Version 2.2

“Fuel switch from fossil fuels to biomass residues in boilers for heat generation”

- ▶ **Applicability :**

- project activities that switch from use of fossil fuels to biomass residues for heat generation

- ▶ **Applicability conditions :**

- heat generated in the boiler(s) is not used for power generation or if power is generated, it is not increased as a result of the project activity

- use of biomass residues or increasing the use of biomass residues beyond historical levels is technically not possible at the project site without a significant capital investment

- Existing boilers at the project site have used no biomass or have used only biomass residues (but no other type of biomass) for heat generation during the most recent three years prior to the implementation of the project activity

- No biomass types other than *biomass residues*, as defined above, are used in the boilers

- no increase of the processing capacity of raw input (e.g. sugar, rice, logs, etc.) or in other substantial changes (e.g. product change) in the production process

- biomass residues used at the project site, site where the project activity is implemented, should not be stored for more than one year

- No significant energy quantities are required to prepare the biomass residues for fuel combustion, i.e. projects that process the biomass residues prior to combustion (e.g. esterification of waste oils) are not eligible under this methodology

CDM Methodologies for Renewable Energy

- **Other consolidated methodologies for renewable energy**

- ▶ ACM0010 / Version 5

“Consolidated baseline methodology for GHG emission reductions from manure management systems”

- ▶ **Applicability :**

- manure management projects on livestock farms

- ▶ **Applicability conditions :**

- Farms where livestock populations, comprising of cattle, buffalo, swine, sheep, goats, and/or poultry, is managed under confined conditions

- Farms where manure is not discharged into natural water resources (e.g. rivers or estuaries)

- in case of anaerobic lagoons treatments systems, the depth of the lagoons used for manure management under the baseline scenario should be at least 1m²

CDM Methodologies for Renewable Energy

- **Approved large scale methodologies for renewable energy**

- ▶ AM0025 / Version 11

“Avoided emissions from organic waste through alternative waste treatment processes”

- ▶ **Applicability :**

- waste treatment projects of fresh waste that would have otherwise been disposed of in a landfill:

- composting process

- gasification to produce syngas

- anaerobic digestion with biogas collection and flaring

- mechanical/thermal treatment process to produce refuse-derived fuel

- incineration of fresh waste for energy generation, electricity and/or heat

- ▶ **No applicability for :**

- project activities that involve capture and flaring of methane from existing waste in the landfill

CDM Methodologies for Renewable Energy

- **Approved small scale methodologies (AMS-xx.x)**

- ▶ Small Scale projects (output capacity < 15MW or emission reductions of less than or equal to 60 kt CO2 equivalent annually)
- ▶ Methodology per type of project:
 - ▶ Type I : Renewable Energy Projects
 - ▶ Type II : Energy Efficiency Improvement Projects
 - ▶ Type III : Other Project Activities

Methodology	Biomass energy	Geothermal	Hydro	Landfill gas	Solar	Tidal	Wind	Methane avoidance	TOTAL
AMS-I.D.	175	1	716	8	19		260		1179
AMS-I.C.	190	1		3	12				206
AMS-III.E.	53			2					55
AMS-I.A.	5		5		5		1		16
AMS-I.B.	3								3
AMS-III.G.				3					3
AMS-III.D.	1								1
AMS-III.H.	1								1

- ▶ Renewable Biomass Projects
 - ▶ General guidance on leakage in biomass project activities (Version 2)

CDM Methodologies for Renewable Energy

▪ Type I : Renewable Energy Projects

▶ AMS-I.D. / Version 14

“Grid connected renewable electricity generation”

▶ Applicability :

- category comprises renewable energy generation units :

photovoltaics,

hydro,

tidal/wave,

wind,

geothermal,

renewable biomass.

▶ No applicability for :

- combined heat and power (co-generation) systems are not eligible under this category

CDM Methodologies for Renewable Energy

▪ Type I : Renewable Energy Projects

▶ AMS-I.C. / Version 15

“Thermal energy for the user with or without electricity”

▶ Applicability :

- renewable energy technologies that supply individual households or users with thermal energy that displaces fossil fuels

- technologies : solar thermal water, heaters and dryers, solar cookers, energy derived from renewable biomass and other technologies that provide thermal energy

- biomass-based co-generating systems that produce heat and electricity are included in this category

CDM Methodologies for Renewable Energy

- **Other small scale methodologies for renewable energy (Type III)**

- ▶ AMS III.E. / Version 16

“Avoidance of methane production from decay of biomass through controlled combustion, gasification or mechanical/thermal treatment”

- ▶ **Applicability :**

- measures that avoid the production of methane from biomass or other organic matter that would have otherwise been or is already disposed in a solid waste disposal site without methane recovery

CDM Methodologies for Renewable Energy

▪ Type I : Renewable Energy Projects

▶ AMS-I.A. / Version 13

“Electricity generation by the user”

▶ Applicability :

- limited to households and users that do not have a grid connection (except isolated mini-grid capacity not exceed 15 MW)

- technologies : solar power, hydropower, wind power, and other technologies (solar home systems, wind battery chargers)

▶ No applicability for :

- combined heat and power (co-generation) systems

Contents

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High Potential Sectors for RE

- **Wind Power**
- **Hydro**
- **Sugar**
 - Bagasse Cogeneration
 - Biogas Power Generation
- **Domestic Solar Water Heating**
- **Agricultural Waste**
 - Bagasse Cogeneration
 - Cotton Stalk
 - Rice Husk
 - Wheat Trash
 - Sugarcane Trash
- **Municipal Solid Waste**
 - Landfill Gas Capture and Power
 - Refuse Derived Fuel

Additionality Issues with Guaranteed ROE

- **Projects > 50MW seek a Guaranteed ROE from the PP**
- **Guarantees reduce the element of risk**
- **Other projects in Pakistan being setup at 15% ROE (Thermal)**
- **Power Purchaser ALONE can also not get CDM Registration**
 - **NOT THE INVESTOR**

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