



Advanced technologies in the field of Energy Efficiency and Renewable Energy

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Advanced technologies in the field of Energy Efficiency and Renewable Energy

Overview of energy efficiency policies (affecting the development and adoption of clean energy technologies)

Production of Electricity

- The EU Directive 2010/75/EU, the European Union;
- The federal position on the pollution of air (CSAPR), United States, 2011;
- 12th Five-Year Plan (2011 - 2015), China.





Advanced technologies in the field of Energy Efficiency and Renewable Energy

Overview of energy efficiency policies (affecting the development and adoption of clean energy technologies), Energy efficiency end-user.

Industrial Processes

- The EU Directive 2012/27/EU on the energy efficiency;
- The EU Directive on Environmental Design;
- Japan's Law on Rational Use of Energy (amended April 2010);
- China's industrial energy conservation plan. The "Top 10,000 energy-intensive industries";
- The ENERGY STAR program for the industrial sector of the U.S.





Advanced technologies in the field of Energy Efficiency and Renewable Energy

Overview of energy efficiency policies (affecting the development and adoption of clean energy technologies), Energy efficiency end-user.

The rules and regulations of Energy efficiency of buildings

- The EU Directive on the Energy Performance of Buildings (published EPBD 2010 2010/31/EU);
- Mandatory standards and regulations energy efficiency of buildings, China;
- Implementation of the program rules and regulations energy efficiency of buildings (BECP), U.S.





Advanced technologies in the field of Energy Efficiency and Renewable Energy

Overview of energy efficiency policies (affecting the development and adoption of clean energy technologies), Energy efficiency end-user.

Energy-using Products

- The EU eco-design directive;
- The EU Directive 2010/30/EU on energy labelling;
- Standards Programme "Leader race» (Top Runner), Japan;
- 12th Five-Year Plan, China;
- The program of the Department of Energy to implement standards for appliances and commercial equipment; program «ENERGY STAR».





Advanced technologies in the field of Energy Efficiency and Renewable Energy

Examples of stimulus policies in the field of renewable energy

Regulatory and Planning	Economic instruments	Solidarity and voluntary instruments	Instrument to promote market
Feed-in tariffs	Capital subsidies, grants	Voluntary agreements	Campaigns - to ensure public awareness
Commitment utilities use renewable energy sources (renewable portfolio standard)	Tax reduction and tax credits	Public-Private Partnership	Informing the public
The system of pure dimension	Government procurement tenders	Public-State partnership	Public Opinion Monitoring
Commitments/mandate	State investment		
Overstep certificates confirming the generation of electricity using Renewable Energy Sources	Price differentiation		
The Targets (primary energy, final energy or energy source)	Trading System		





Advanced technologies in the field of Energy Efficiency and Renewable Energy

Overview of energy efficiency policies and renewable energy sources (impact on the development and adoption of clean energy technologies)

Policy in the field of renewable energy sources

- Directive 2009/28/EC Renewable Energy Sources;
- U.S. energy policy; Campaign "California goes to solar power!" (Go Solar California!);
- The energy policy of Japan; reduced rate;
- 12th Five-Year Plan (2011-2015)., China; preferential tariffs, tax credits, preferential policies for land use and the surcharge on energy from renewable energy sources.





Advanced technologies in the field of Energy Efficiency and Renewable Energy

Review of existing energy efficiency technologies and renewable energy, applicable in Central Asia

Energy efficiency in energy production

The use of fossil fuels for electricity and heat will continue for the long term

- The main directions of improving energy efficiency in new construction related to: the use of new technologies of burning fossil fuels, the use of high-efficiency steam and gas turbines, utilization of associated petroleum gas for power generation;
- Increase efficiency in the modernization of existing power plants with the use of advanced energy-efficient equipment, instruments, materials, automatic control systems, denial of direct combustion of fuel in the boilers through the introduction of a combined cycle, the optimization of demand management to ensure a uniform and carrying capacity of the power system;
- Reduce transmission losses will upgrade and replacement of obsolete power and switching equipment in substations, the use of modern supervisory systems, relay protection and automation devices of compensation and reactive power control.





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Review of existing energy efficiency technologies and renewable energy, applicable in Central Asia

Technologies in the field of wind energy

- The fastest growing energy source in the world production of electricity, 280 GWh in 2012;
- The countries with the largest installed capacity of wind power generation in 2012: China (75,564 MW), USA (60,007 MW), Germany (31,332 MW) and Spain (22,790 MW);
- Many wind turbine manufacturers in the world, mainly in Europe, Asia and America;
- Capital costs of a typical project is 75% -80% for ground installations, and 30% -50% for offshore installations;
- Connecting wind farms to the network can be a challenge.





Advanced technologies in the field of Energy Efficiency and Renewable Energy

Review of existing energy efficiency technologies and renewable energy, applicable in Central Asia

Solar power technologies

- Solar thermal collectors;
- The solar photovoltaic (PV) system as well as;
- Concentrated Solar Power (CSP);
- Currently, the installed capacity of PV systems is 104 GW. The leading countries in terms of installed capacity in 2011 were: Italy (9304 MW), Germany (7,500 MW), China (2,500 MW) and the U.S. (1867 MW).





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Review of existing energy efficiency technologies and renewable energy, applicable in Central Asia

Hydro Power Station

Two categories:

- Larger plants (usually used with large dam reservoirs);
- Small facilities (tanks have limited capacity or stations are channel type).

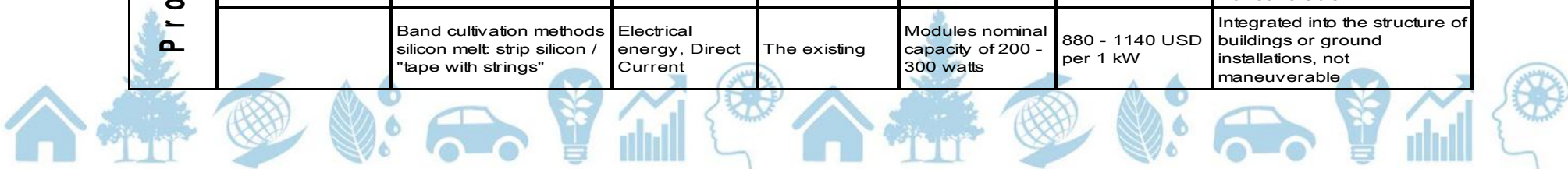
Hydro Power Station

- Is one of the most studied technologies;
- Well distributed throughout the world, and the current total installed capacity of small installations is 186 GWh.



Advanced technologies in the field of Energy Efficiency and Renewable Energy

The database of commercial and emerging technologies using renewable energy								
	RES	Technology	Product / Application	Condition	Power per unit	Average cost (*)	The technical potential	
Production of electric energy	Wind Energy							
		large centralized	Electrical energy	The existing	2 MW - 8 MW	2,000 USD / kW	Onshore and offshore	
		Small decentralized (with the vertical and horizontal axis of rotation)	Electrical energy, Direct Current	The existing	200 W - 15 kW		Integrated into a building or self-contained	
	Concentrated Solar Power							
		Parabolic trough concentrator	Electrical energy	The existing	Stations by 50 MW - 250 MW	3100 - 9300 USD per 1 kW	Investments from scratch in unused areas	
		Installation of tower type	Electrical energy	The existing	Stations by 1.5 MW - 400 MW	6400 - 10700 USD per 1 kW	Investments from scratch in unused areas	
		Linear Fresnel lens	Electrical energy	Workings / The existing	Stations by 50 MW - 250 MW	3100 - 9300 USD per 1 kW	Investments from scratch in unused areas	
	Solar photovoltaics							
		Crystalline silicon (C-Si)	A single-crystal silicon	Electrical energy, Direct Current	The existing	Modules nominal capacity of 200 - 300 watts	880 - 1140 USD per 1 kW	Integrated into the structure of buildings or ground installations, not maneuverable
			Polycrystalline silicon	Electrical energy, Direct Current	The existing	Modules nominal capacity of 200 - 300 watts	880 - 1140 USD per 1 kW	Integrated into the structure of buildings or ground installations, not maneuverable
		Band cultivation methods silicon melt strip silicon / "tape with strings"	Electrical energy, Direct Current	The existing	Modules nominal capacity of 200 - 300 watts	880 - 1140 USD per 1 kW	Integrated into the structure of buildings or ground installations, not maneuverable	



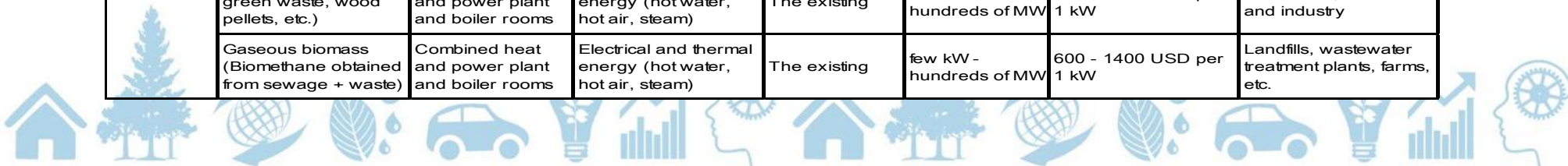
Advanced technologies in the field of Energy Efficiency and Renewable Energy

The database of commercial and emerging technologies using renewable energy							
	RES	Technology	Product / Application	Condition	Power per unit	Average cost (*)	The technical potential
Production of electric energy	Thin-film technology	Cadmium telluride (CdT)	Electrical energy, Direct Current	The existing	Modules rated power ~ 80 W	770 - 1000 USD per 1 kW	Integrated into the structure of buildings or ground installations, not maneuverable
		Amorphous silicon (a-Si)	Electrical energy, Direct Current	The existing	Any power (flexible structure)	650 - 750 USD per 1 kW	Integrated into the structure of buildings or ground installations; agile and maneuverable
		Indium gallium diselenide, copper / disulfide (CIS, CIGS)	Electrical energy, Direct Current	The existing	Any power (flexible structure) ~ 145 watts nominal power (rigid structure)	770 - 1000 USD per 1 kW	Integrated into the structure of buildings or ground installations; agile and maneuverable
	Concentrated solar PV	Items with concentrating lenses	Electricity, Alternating current / Direct Current	The existing	~ 20 kW - 60 kW ~ with one solar panel	3100 - 4400 USD per 1 kW	Ground installations
	Organic solar cells	The oligomeric photocells	Electrical energy, Direct Current	Workings / Demonstration	Any power	Not yet available	Wide range of applications (e-oligomers)
		Polymer solar cells	Electrical energy, Direct Current	Workings / Demonstration	Any power	Not yet available	Wide range of applications (electronic polymers)
		Elements of dye-sensitized photo	Electrical energy, Direct Current	Workings / Demonstration	Any power	Not yet available	Wide range of applications (electronic ink)



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	RES	Technology	Product / Application	Condition	Power per unit	Average cost (*)	The technical potential	
Production of electric energy	The inverters	Central, linear or micro	Electricity, Alternating current	The existing	not applicable	0.25 USD per 1 watt peak	Photovoltaic parks	
	Support Systems	Cables, wires, external devices	Supporting peripherals	The existing	not applicable	820 - 1660 USD per 1 kW	Photovoltaic installation	
	Tracking Devices	Uniaxial and biaxial	Tracking the observed movement of the sun in order to increase productivity	The existing	not applicable	20% of the investment cost of solar	Photovoltaic parks	
	The energy of water							
		Channel		Electrical energy	The existing	less than 100 kW - 10 MW	500 - 3500 USD per 1 kW	Small rivers, ecologically sensitive areas
		Dike		Electrical energy	The existing	several MW - 900 MW	1000 - 3500 USD per 1 kW	Any of the river in an environmentally non-sensitive areas
		The increase in power		Electrical energy	The existing	Depends on the object	Depends on location	Existing hydropower
	The energy of geothermal sources							
		High temperature		Electrical energy	The existing	300 kW - 100 MW	1500 - 5500 USD per 1 kW	Available high-temperature sources
	Biomass							
		Solid biomass (wood, green waste, wood pellets, etc.)	Combined heat and power plant and boiler rooms	Electrical and thermal energy (hot water, hot air, steam)	The existing	few kW - hundreds of MW	600 - 1400 USD per 1 kW	Household, services and industry
	Gaseous biomass (Biometane obtained from sewage + waste)	Combined heat and power plant and boiler rooms	Electrical and thermal energy (hot water, hot air, steam)	The existing	few kW - hundreds of MW	600 - 1400 USD per 1 kW	Landfills, wastewater treatment plants, farms, etc.	



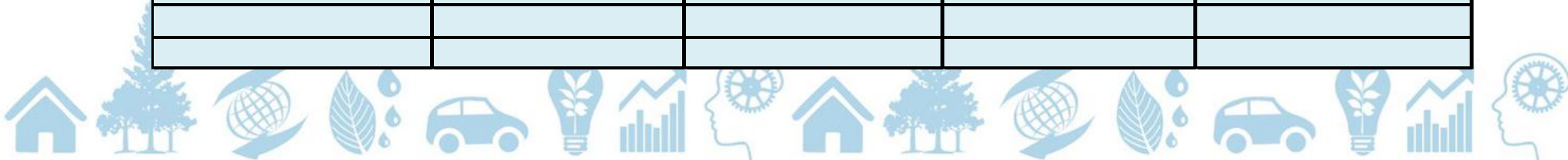
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	RES	Technology	Product / Application	Condition	Power per unit	Average cost (*)	The technical potential	
Production of electric energy	Solar thermal collectors							
		Flat solar collectors	Hot water for domestic use, appliances, space heating	The existing	Available to any power	500 USD for 1 sq.m.	On the roof of buildings, land, home, industrial, to service sectors	
		Vacuum solar collectors	Hot water for domestic use, appliances, space heating	The existing	Available to any power	500 USD for 1 sq.m.	On the roof of buildings, land, home, industrial, to service sectors	
	Geothermal heating and cooling							
		Geothermal heat pumps	Heating and Cooling	The existing	Available to any power	2000 - 5000 USD per 1 kW	Household and service sector	
	Biomass							
		Solid biomass (wood, green waste, wood pellets, etc.)	Wood-burning stoves, water heaters, high-efficiency appliances for furnaces, etc.	Space heating	The existing	Available to any power	400 - 700 USD per 1 kW	Household, services and industry
		Liquid biomass (biodiesel, bioethanol)	Combustion Engines (automotive and stationary)	Fuel (without or in combination with petroleum products)	The existing	Not applicable	Not applicable	Transport and stationary combustion engines



Advanced technologies in the field of Energy Efficiency and Renewable Energy

The database of commercial and emerging technologies in the field of renewable energy. The list of manufacturers and developers				
Wind Energy		Concentrated Solar Power		
The large	Small decentralized	Parabolic	Tower type	Linear Fresnel lens
www.enercon.de	www.urbangreenenergy.com	www.flagsol.com	www.abengoasolar.com	www.aveva.com
www.vestas.com	www.helixwind.com	www.abengoasolar.com	www.saint-gobain-solarpower.com	www.novatecsolar.com
www.suzlon.com	www.windspireenergy.com	www.solarmillennium.de	www.wilsonsolarpower.com	
www.sinovel.com	www.evancewind.com	www.saint-gobainsolarpower.com	www.brightsourceenergy.com	
www.goldwindglobal.com			www.solarreserve.com	
www.gamesacorp.com				
www.ge-energy.com				
www.energy.siemens.com				



Advanced technologies in the field of Energy Efficiency and Renewable Energy

The database of commercial and emerging technologies in the field of renewable energy.

The list of manufacturers and developers

Solar photovoltaics				The energy of water
Crystalline silicon (C-Si)	Thin-film technology	Concentrating photovoltaic systems	Organic solar cells	
www.upsolar.com	Cadmium telluride (CdT)	www.amonix.com	www.plextronics.com	www.alstom.com
www.yinglisolar.com	www.firstsolar.com	www.arimaeco.com	www.heliatek.com	www.voith.com
www.trinasolar.com	www.antec-solar.de	www.soitec.com	www.polyera.com	www.andritz.com
www.schueco.com	www.ge-energy.com	www.cyriumtechnologies.com	www.solarmer.com	www.newmillsengineering.com
www.rcssolar.com	Amorphous silicon (a-Si)	www.isofoton.com		www.gugler.com
www.ldksolar.com	www.unisolar.com	www.opelsolarinc.com		www.hydrolink.cz
www.jinkosolar.com	www.anwell.com	www.pyronsolar.com		www3.toshiba.co.jp
www.isofoton.com	www.kaneka-solar.com	www.semprius.com		www.canyonhydro.com
www.goldigreen.in	www.moserbaer.com	www.soitec.com		
www.everenergy.com.tw	Copper Iridium / gallium diselenide / disulfide (CISCI GS)	www.solfocus.com		
www.conergy.com	www.nanosolar.com	www.solergyinc.com		
www.s-energy.com	www.solarion.net	www.spectrolab.com		
www.sharp-solar.com	www.solyndra.com			
www.q-cells.com	www.xsunx.com			
global.kyocera.com	www.ascentsolar.com			
www.suntech-power.com	www.heliovolta.net			
panasonic.net/energy/solar/	www.miasole.com			
www.mitsubishielectric.com	www.solarion.net			
www.motechsolar.com	www.solteature.com			
www.schott.com	www.wuerth-solar.com			
nl.sunpowercorp.be				
www.shenzhensolarpanel.com				



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The database of commercial and emerging technologies in the field of renewable energy.
The list of manufacturers and developers

Energy of geothermal sources	Biomass	Solar thermal collectors		Geothermal heat pumps
		Flat solar collectors	Vacuum solar collectors	
www.ormat.com	Boilers for solid biomass	www.solarhart.com	www.rittersolar.de	www.bosch.com
www.hotrockltd.com	www.baxi.co.uk	www.sun-master.com	www.apricus.com	www.climatemaster.com
www.chevron.com	www.ashwellbiomass.com	www.shueco.com	www.australiasunenergy.com	www.gogogeo.com
www.rockenergy.no	www.windhager.co.uk	www.bosch.com		www.geothermalgenius.org
	www.andritz.com			www.nibe.eu
	www.energy.siemens.com			www.china-heatpump.com
	Boilers for biogas			www.waterfurnace.com
	www.viessmann.com			
	www.dws.be			
	www.dalkia.com			
	www.dresser-rand.com			
	www.schmitt-enertec.com			
	www.cat.com			
	www.cumminspower.com			
	www.ge-energy.com			
	cogeneration.tedom.com			
	www.wartsila.com			





Advanced technologies in the field of Energy Efficiency and Renewable Energy

Main sources of funding

The current economic and financial barriers to realizing the potential of energy efficiency and renewable energy:

- Price subsidies for electricity and gas to the end user;
- High initial investment costs;
- Duration of simple payback period of some investments;
- lack of practice internalize the cost of carbon emissions.





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Main sources of funding

The role of governments:

- Creation of regulatory instruments;
- Establishment of planning tools;
- Simplification of the market;
- Public relations;
- Use approaches that imply the joint participation;
- A decisive influence on the economic and financial instruments.





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Main sources of funding

The role of governments - national funding:

- Subsidies in the form of grants, soft loans;
- Direct public investment;
- Tax credits and benefits;
- Reduced rates;
- Economic instruments - reducing interest rates, guarantees or credit lines.





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Main sources of funding

Energy Service Companies

The main obstacles to successful work:

- The uncertainty in the legislative framework, including the procurement rules;
- Low and subsidized energy prices - reducing the economic potential of energy efficiency;
- The lack of reliable data on energy consumption - it difficult to establish baseline levels and, therefore, to ensure the reliability of data on actual savings.





Thank you for your attention!

