

Renewable Energy in the CIS Countries

Dr. Stepan Kudrya,
Institute of Renewable Energy, Kyiv, Ukraine

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CIS countries cover great geographic territories located in different climatic zones, the last having various geomorphic structure



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Conventional Energy Sources

Country	Territory, thousand km ²	Population, million people	Total energy consumption, Million tce	Energy production, Billion tce	Own energy supply, %f total consumption
Azerbaijan	86,6	8,2	21	19	90
Armenia	29,8	3,2	2		3
Belarus	207,6	9,9	36	3	8.3
Georgia	69,7	5,1	4	1	25
Kazakhstan	2724,9	14,2	88	107	121.5
Kirghizia	200	5,01	3	1	33,33
Moldova	33,7	3,6	5		
Russia	17075,4	143,3	1025	1382	134.8
Tajikistan	143,1	6,4	5	2	40
Turkmenistan	488,1	5,3	18	42	233
Uzbekistan	447,4	24, 9	65	70	107
Ukraine	603,7	47,9	234	119	50.85

Among CIS states only Azerbaijan, Kazakhstan, Russia and Turkmenistan have got sufficient export potential and fuel-energy resources to meet their own energy needs

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Conventional Primary Energy Resources, %.

Country	Nuclear MW/%	Thermal MW/%	Hydro MW/%
Azerbaijan	-	3880 / 83.1	790 / 16.9
Armenia	440 / 17.6	1756 / 70.5	296 / 11,9
Belarus	-	7401 / 99.9	7 / 0.1
Georgia	-	1692 / 38.6	2690 / 61.4
Kazakhstan	150 / 0.9	13694 / 86.2	2053 / 12.9
Kirghizia	-	831 / 22	2949 / 78
Moldova	-	996 / 94.3	60 / 5.7
Russia	22242 / 10	146800 / 68	45000 / 22
Tajikistan	-	No info available	92,7%
Turkmenistan	-	No info available	1,2 / 0,1
Uzbekistan	-	7295 / 84.1	1379 / 15.9
Ukraine	11818 / 22.4	36345 / 68.7	4706 / 8.9

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Hydro Power

Large hydro energy makes up considerable part of generating capacities structure in CIS countries:

- Azerbaijan – 16,9 %
- Armenia – 11,9 %
- Georgia – 53,5 %
- Kazakhstan – 12,9 %
- Kirgizia – 78 %
- Russia – 22 %
- Tajikistan – 92,7 %
- Uzbekistan – 15,9 %
- Ukraine – 8,2%

CIS countries with moderate hydro energy potential:

- Belarus (7 MW, 0,1 %)
- Moldova (60 MW, 5,7 %)
- Turkmenistan (1,2 MW, 0,1 %)

Level of Nuclear Power Use in CIS Countries.



The majority of nuclear power plants have to exhaust their service life up to the year 2006-2010

Nowadays in nuclear power engineering of CIS countries there have been in operation 42 nuclear units with total capacity 34500 MW, including:

Russia - 28 units, total capacity 22242 MW;
Ukraine – 13 units, total capacity 11818 MW;
Armenia – 1 unit, capacity 440 MW;
Kazakhstan – 1 unit, capacity 150 MW

Renewable Energy in the CIS Countries

During last 20-30 years CIS countries have shown great interest towards renewable energy use.

Actually in almost all CIS countries theoretical potential of renewable energy sources and their complex use exceed current energy consumption.

Technically achievable economic potential of renewable energy varies among CIS states, the highest being stated in Russia and Ukraine.

Economical potential of renewable sources in Russia ("large hydro power" and peat are not included) nowadays can provide conventional fossil fuel savings of about 0,3 billion t.c.e. That is almost 1/3 of total country's annual consumption of natural gas, oil and coal

Technically achievable potential of renewable energy in Ukraine amounts to 63 t.o.e. Provided favorable conditions for renewable energy use it can cover 30% of total country's energy demand

Renewable energy potential in CIS countries:

Economic – about 20-30%

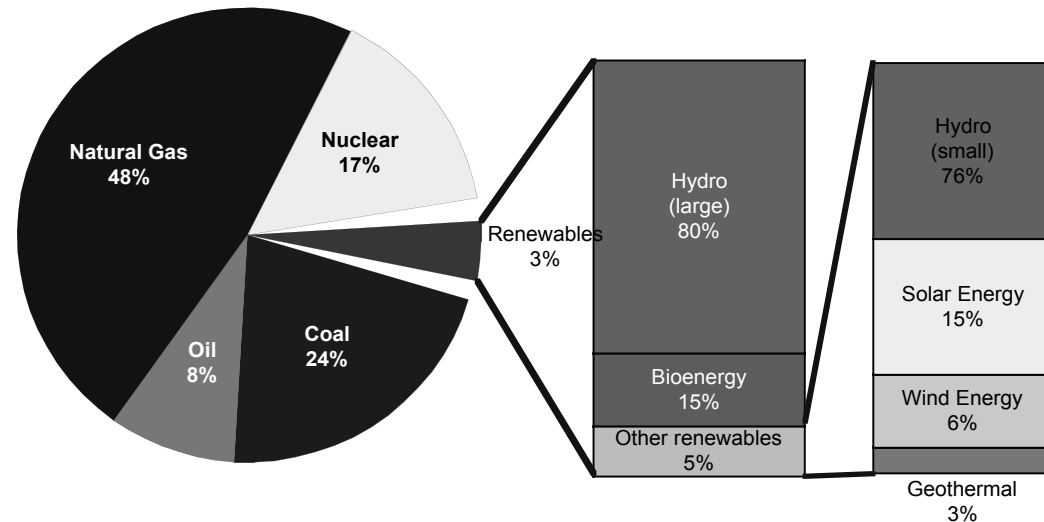
Technical – about 50%

Perspective – over 100%

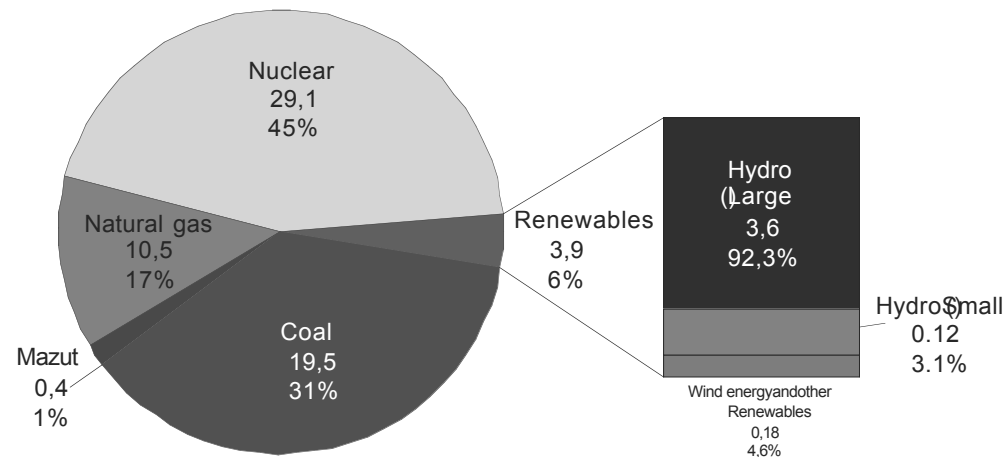
Renewable Energy in the CIS Countries

Ukraine is one of the countries that experiences energy shortage. It can meet own energy needs in primary fuel sources due to own fossil fuel of a little larger than 1/3 (nuclear power is excluded).

One of the most significant state measures devoted to development of non-traditional and renewable energy in Ukraine was creating the Program of state support for non-traditional and renewable energy sources development as well as small hydro and thermal power. This Program was developed as a component part of National Energy Program of Ukraine.



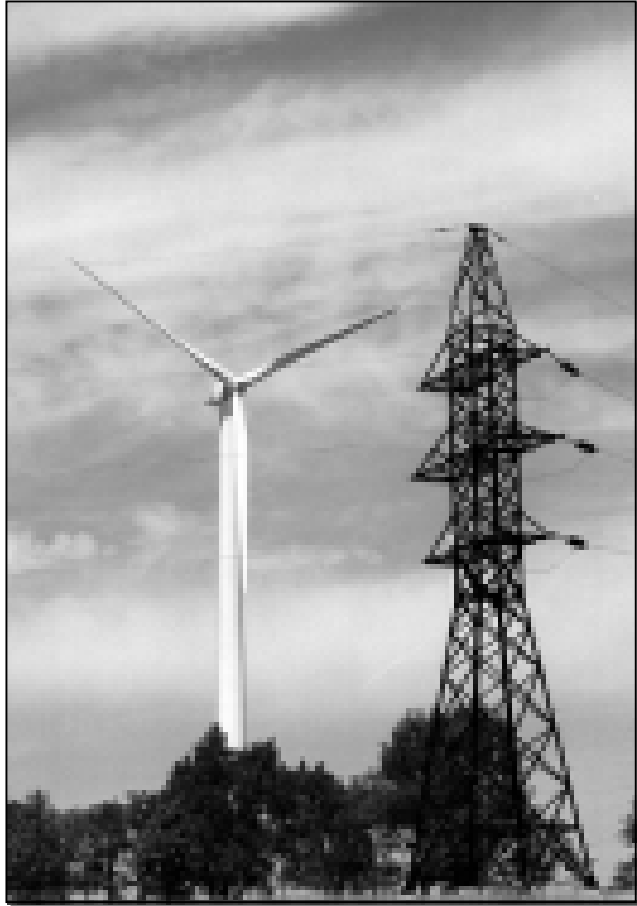
Share of different types of fuel use in Ukraine, year 2003



Electricity production in Ukraine in 2003 (million t.c.e./%).

Renewable Energy in the CIS Countries

Windpower in Ukraine



Turbowinds T600-48



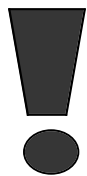
USW 56-100

In the nearest future the production of 2-2,5 MW wind turbines is expected

Renewable Energy in the CIS Countries

Perspectives for Renewable Energy Sources Development by 2030

– – –	Renewable energy sector	Technical potential, million t o.e./year	RES capacities replacing fuel energy, years, thousand t o.e./year						
			2001	2005	2010	2015	2020	2025	2030
1	Wind energy	15	14,4	158	591	2751	4289	6378	8901
2	Solar energy	6	2,44	14,6	50,5	145,1	328,0	590,96	927,6
3	Hydropower	10	3857	3817	4065	4128	4565	4911	5143
4	Bio energy	20	988	1267	2662	4474	6318	7880	9215
5	Geothermal power	12	7,5	110	262	1983	3733	5459	7000
Total replacing capacities of conventional fuel sources		63	4869,34	5366,6	7630,5	13481,1	19233,0	25219,0	31186,6
Share in total energy consumption (200 million t o.e.)		31,5%	2,4%	2,7%	3,8%	6,7%	9,6%	12,6%	15,6%



Thus, in the year 2030 due to favorable conditions it will be possible to achieve 50% use of total annual technically achievable renewable energy potential (63 million t o.e.), which is about 15% of total country's energy consumption

Renewable Energy in the CIS Countries

One of the main stages of Ukrainian science and industry development in the field of renewable energy was creating specialized Institute of Renewable Energy in the framework of National Academy of Sciences

The following relative public organizations operate in Ukraine:

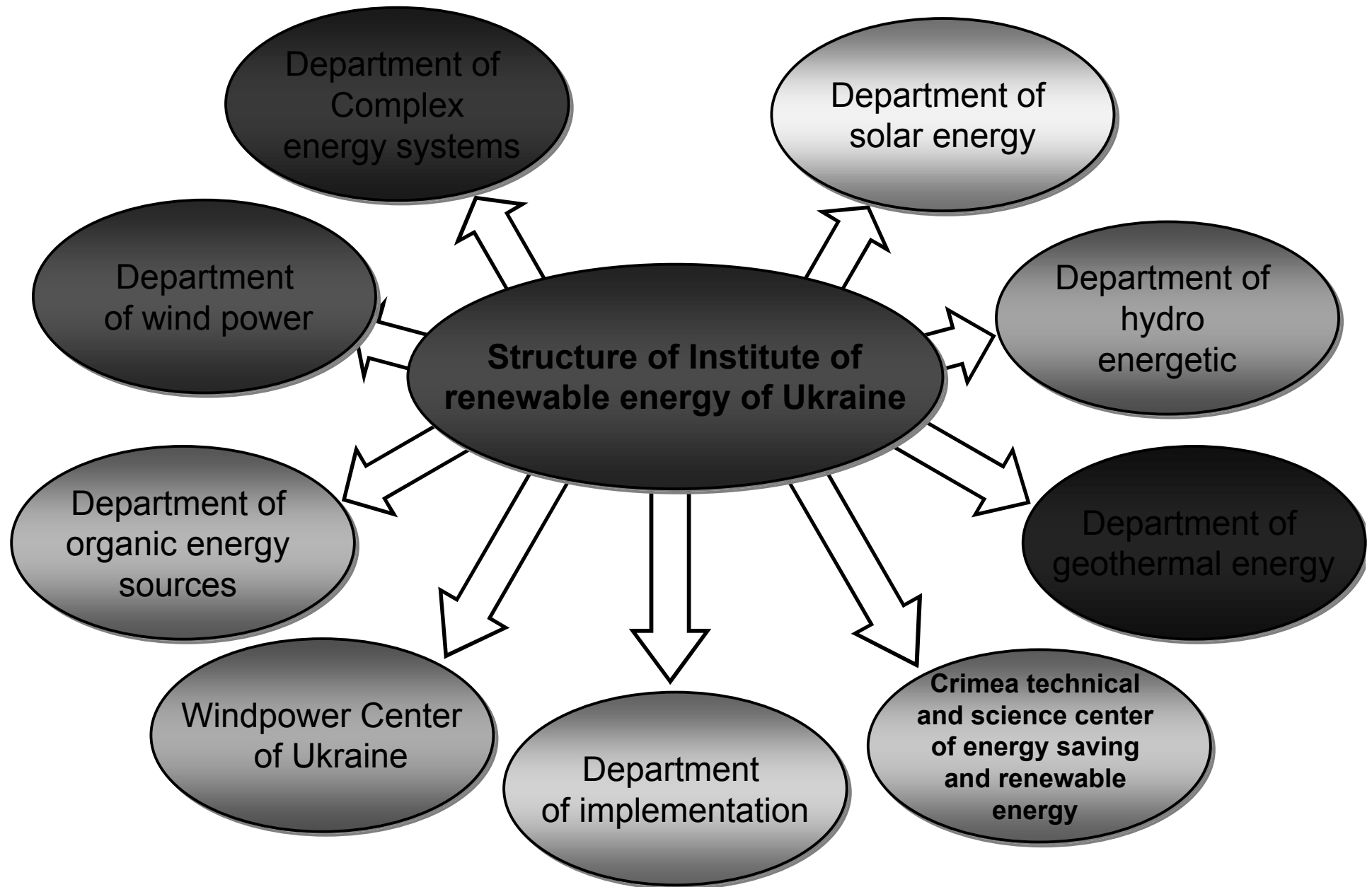
- Bio Energy Association;
- Geothermal Power Association;
- Youth organization “Green Energy for the Future”;
- Public organization “Renewable Energy Agency ”

The following international scientific and technical conferences are held annually:

- Renewable Energy of the XXI Century;
- Bio Energy;
- Wind Power

Currently there are 10 higher educational institutions in Ukraine training competent experts in various fields of renewable energy. The leading one is the department of renewable energy at National Technical University of Ukraine

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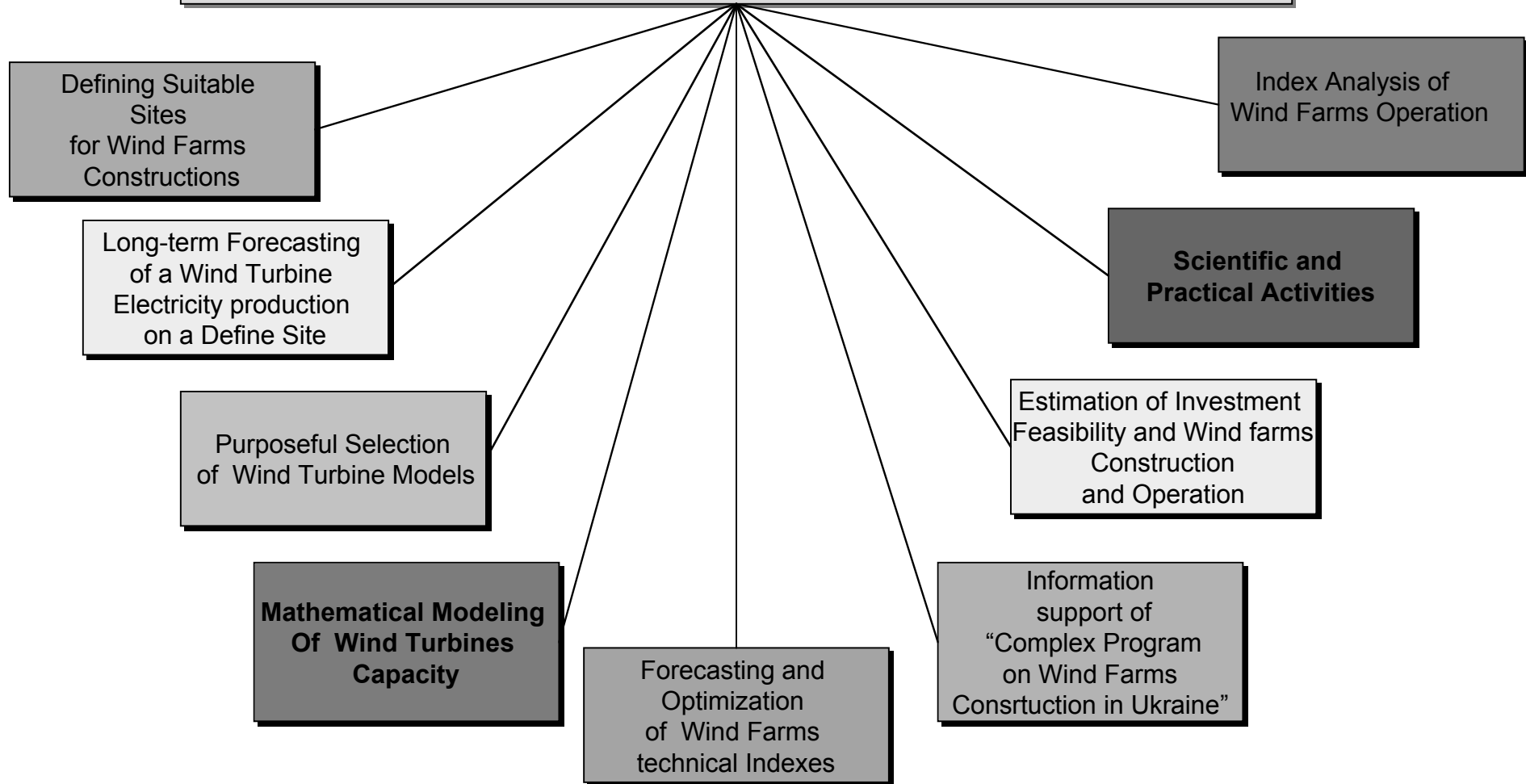


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Inter-Branch Scientific and Technological Center for Wind Power Engineering

IBSTC for Wind Power performs the following activities:



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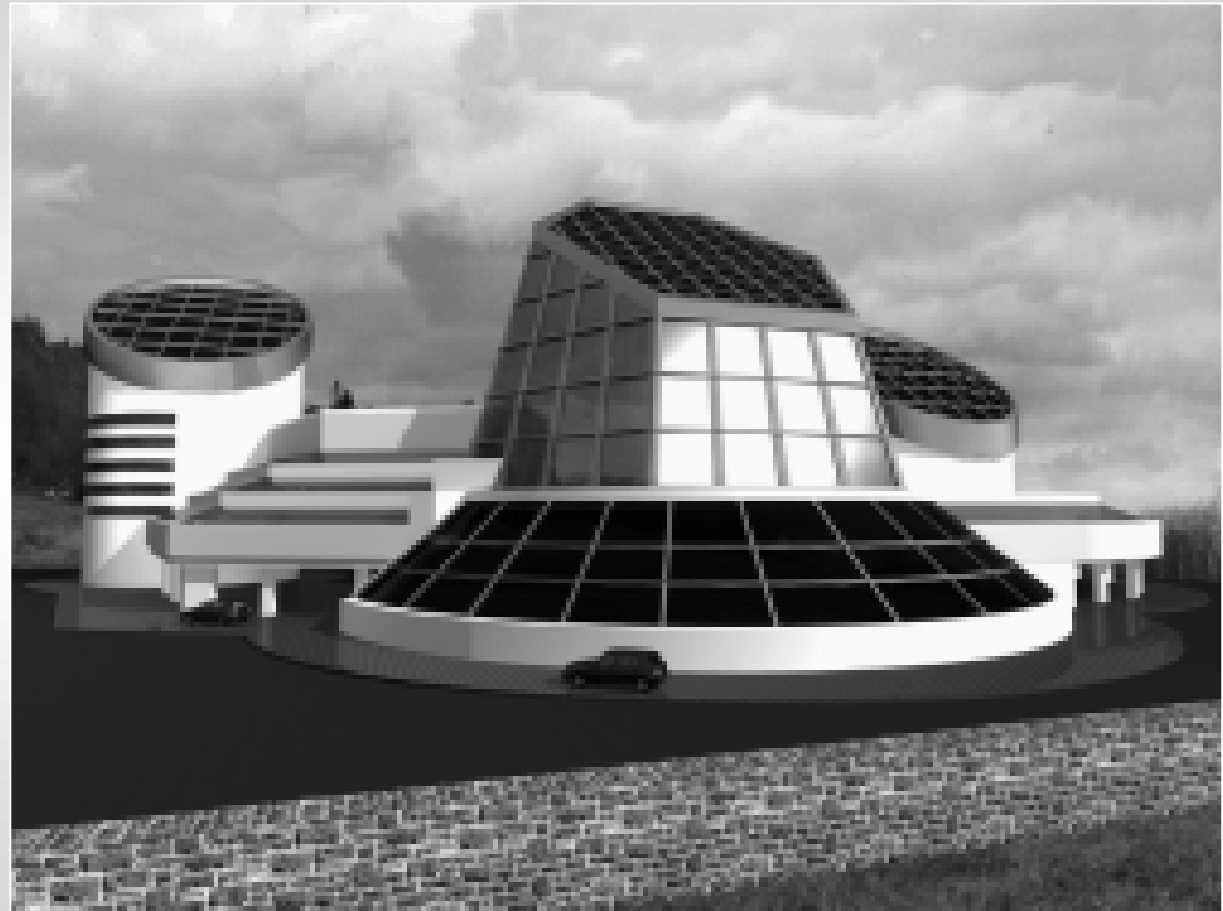
Renewable Energy in the CIS Countries

Currently the project activity is being carried out on constructing new building of the Institute of Renewable Energy. The building will serve both as demonstration and exhibition object of one complex energy system. It will fully utilize the energy of renewable sources, thus heat and electricity in the building by 100% will be supplied for the account of renewables.

The building will function as a closed loop.

The tender on installing in the building wind turbines, solar and PV units, bio energy plants, heat and electricity accumulators is in the process at time being.

Everyone is welcomed in project participation.



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At present in the field of renewable energy of Ukraine there have been:

- adopted 3 Laws,
- approved 42 State Standards,
- are being carried out 7 State Programs in further sectors, namely, *wind power, geothermal power, small hydro energy, bio energy, complex energy systems based on RES use. The last includes Adaptation Program for state programs regulations on coping RES with EC demands*

The analysis of renewable energy state of the art in CIS countries shows that in order to achieve commercial use of RES it is necessary to:

- Establish educational system;
- Develop positive image and public awareness;
- Develop national energy policy:
 - *Establishing legislative and reference basis;*
 - *Establishing incentive systems – tariffs, incentive rates, etc.;*
 - *Financing state programs;*
 - *Establishing and support for public organizations activities;*
 - *Integration towards EC*