

## ACHIEVING EU TARGETS ON RENEWABLE ENERGY: STRATEGY FOR UKRAINE

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**November 17, 2010  
Cork, Ireland**

### Ukraine and The Energy Community

September 24, 2010 Ukraine has signed the Energy Community accession protocol. For the final entry into force this Protocol requires its ratification by the Ukrainian Parliament.

The condition of admission to Energy Community was performance of a package of measures to improve nuclear safety at Ukrainian nuclear power plants according to the IAEA recommendations, and also harmonization of Ukrainian legislation in the power and gas sectors to the norms of the relevant EU directives.

According to Article 20 of the Energy Community Treaty, within one year from the date of admission member-states shall provide the European Commission the plan of implementation of the Directives 2001/77/EC and 2003/30/EC of the European Parliament and of the Council respectively on the promotion of electricity produced from renewable energy sources and of the use of biofuels or other renewable fuels for transport. The European Commission is to submit a plan of each contracting party to the Council for approval.

## The Ukrainian Energy Strategy till 2030

The Ukrainian Energy Strategy of 2006 projects that wind power will substitute consumption of 700,000 TOE/year in 2030. According to “Energy Strategy of Ukraine till 2030”, total share of renewable energy sources and non-conventional sources of energy will increase by 19% in 2030.

Source (million TOE)	Years			
	2005	2010	2020	2030
<b>Renewable Energy Source (Total)</b>	<b>1.66</b>	<b>3.84</b>	<b>12.05</b>	<b>35.53</b>
Bio Energy	1.3	2.7	6.3	9.2
Solar Energy	0.003	0.032	0.284	1.1
Small Hydropower industry	0.12	0.52	0.85	1.13
Geothermal Energy	0.02	0.08	0.19	0.7
Wind Energy	0.018	0.21	0.53	0.7
Ambient Energy	0.2	0.3	3.9	22.7

Though “Energy Strategy of Ukraine till 2030” indicates RE development in the country, the document has been strictly criticized by energy experts, NGOs and renewable energy advocates for its “nuclear orientation”.

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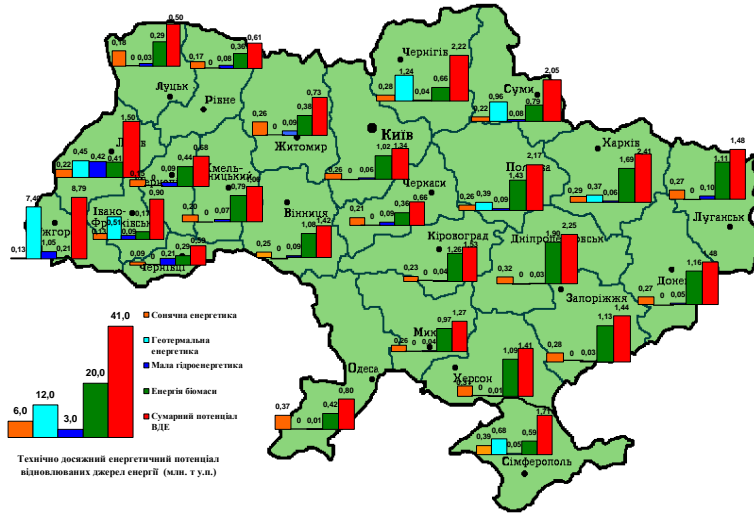
## Renewable Potential of Ukraine\*, PJ (1)

Solar energy	Geothermal energy	Small hydro	Bio-energy	TOTAL
175	350	90	585	1200
Substitution of fossil fuel by “big” hydro				205
Substitution of fossil fuel by wind energy				440
Technically achievable potential of non-conventional sources of energy				290
<b>TOTAL</b>				<b>2135</b>

\* According to the National Agency of Ukraine on Ensuring of Efficient Use of Energy Resources

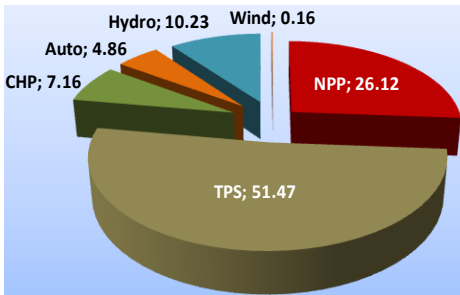
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**Renewable Potential of Ukraine\* (2)**



\* According to the National Agency of Ukraine on Ensuring of Efficient Use of Energy Resources

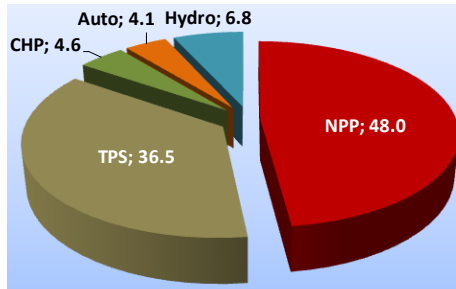
**Structure of installed capacities & electricity producing in 2009, %**



Installed capacities, %

Total installed capacity of power plants 2009 was 52.96 TW in late, and according to that indicator Ukraine took the second place in Central and Eastern Europe (after Russia) and could be equated to energy sector of Italy.

Amount of electricity production after protracted decline stabilized in 2000, and currently achieves about 190 bln kW\*h, being 61% of electricity produced in 1990.



Electricity production, %

As shown, there is a discrepancy between installed capacity and the share of power production, especially for coal and gas.

## Green (feed-in) tariff of Ukraine

Law On power generation sector, introduces a concept of green (feed-in) tariff as a special tariff to purchase electricity, produced by the objects of electric energy using renewables (in case of hydroenergy - produced by small hydroenergy objects).

Implementation of feed-in tariff is the very **first step** toward increased use of renewables for electricity production in country's national energy balance.

Wholesale electricity market in Ukraine is obliged to purchase with green tariff all electricity produced by power facilities using renewables that was not sold directly to consumers or electricity distributing companies, in other words grid access is guaranteed by law, which is major advantage of current legislation. Its significant disadvantage is the one that there are several national policy papers defining general use of energy from renewables, but there is no vision/target on a national level of how much electricity from renewables has to be consumed.

Electricity produced from renewables can be sold with green tariff either based on direct contracts to consumers or to wholesale electricity market. In fact, green electricity turns to be expensive, so there is no economic point for consumers to purchase it, so the only real purchaser of green electricity is the wholesale electricity market. Size of green tariff is fixed for each entity that produces electricity from renewables, each type of alternative energy and power for each object.

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## Coefficients of feed-in tariffs in Ukraine

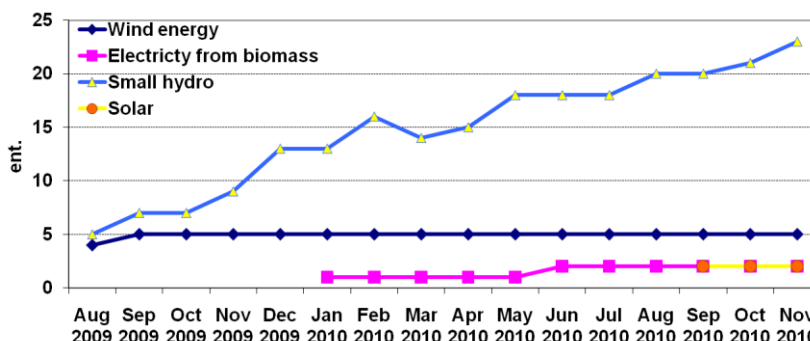
Coefficient	Source of electricity
4.8	Solar energy from ground-installed objects
4.6	Solar energy from roof-installed objects, whose capacity does not exceed 100 kW
4.4	Solar energy from roof-installed objects, whose capacity does not exceed 100 kW and for other solar objects installed on building facades with any capacity possible
2.3	Biomass (excluding biogas)
2.1	Wind energy from facilities with capacity more than 600 kW
1.4	Wind energy from facilities with capacity between 600 kW and 2000 kW
1.2	Wind energy from facilities with capacity less than 600 kW
0.8	Small hydro

*Source:* Law on the Power Sector #575-97/VR, adopted on 16 Oct 1997, and amended on 17 Nov 2009

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## Number of electricity producers who have obtained feed-in tariff permit

An issue of licensing of green electricity requires further improvement, mainly regarding registration of green electricity producing companies. Nonetheless, adoption of feed-in tariff in Ukraine has already resulted in several plans announced to build 6 new onshore wind farms in Ukraine with total capacity of 2676.25 MW by 2013. The number of entities allowed to use feed-in tariff is growing real fast, especially bearing in mind that it takes significant amount of time to start production of green electricity (except for existing small hydro objects). One of the reasons for this is that feed-in tariff has triggered interest of large business.



Source: National Electricity Regulatory Commission of Ukraine, <http://www.nerc.gov.ua> 9

## TIMES-Ukraine model

The work on TIMES-Ukraine model started at IEF in 2006 in the framework of special research projects of Ukrainian National Academy of Sciences.

In 2009 after joining SYNENERGY project and with contribution from IRG and CRES experts the initial TIMES-Ukraine model was finished, however, the model update is performed quarterly.

The energy system of Ukraine is represented as the single region. Although the base year is 2005, in order to reflect the impact of the world economic crisis the model has also been additionally calibrated with data for 2006 and 2009.

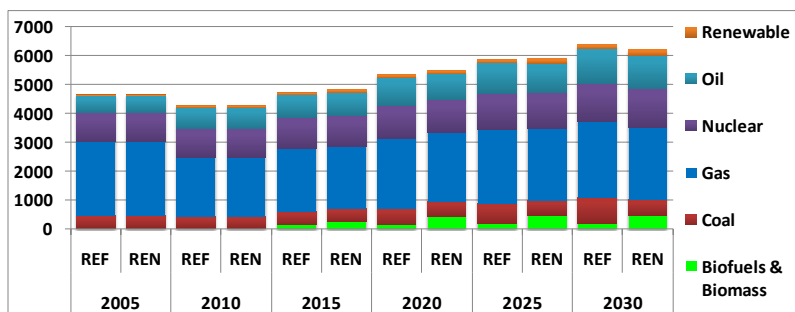
The structure of the model was designed considering existing statistical classifiers (NACE and CPA) and based on the primary statistical forms of the National Statistic Committee with the disaggregation on the data from the Ministries, state committees and big energy companies.

### Approbation of the modeling approach

- SYNENERGY: Strategic planning project leaded by IRG (USAID) / CRES (Hellenic Aid)
- Coal sector policy support program (funded by EU and implemented by Human Dynamics Consortium)
- Projection of demand for the main energy recourses in the Fifth National Communication on Climate Change
- Various short and mid term projections by request of Ukrainian Ministries
- Research cooperation with the biggest private energy and industrial companies, association of producers and consulting companies under non-profit partnership agreements
- According to the Government Decree №472 on 14.06.2010 and Decree of the Presidium of UNAS №399 on 06.07.2010 IEF was assigned to create information-analytic system for strategic planning of energy sector and projection of the energy balance, where TIMES-Ukraine model was supposed to be taken for the basis

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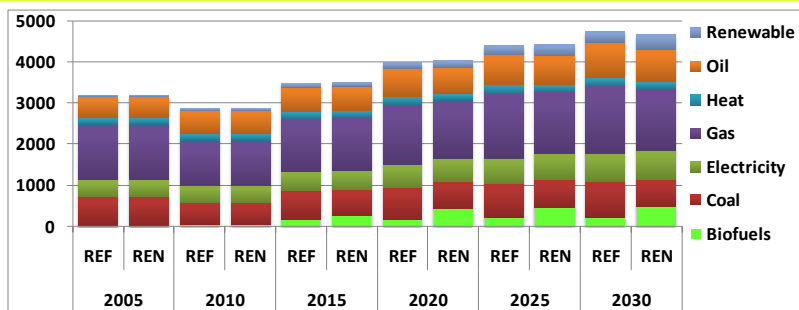
### Total primary supply, PJ



	2020		2030	
	REF	REN	REF	REN
Biofuels & Biomass	3.2%	8.4%	3.4%	8.2%
Coal	10.3%	9.2%	14.1%	9.1%
Gas	46.2%	44.5%	42.0%	41.5%
Nuclear	22.0%	21.5%	21.4%	22.3%
Oil	18.3%	16.4%	19.2%	18.9%
Renewable	1.7%	2.3%	1.9%	3.5%

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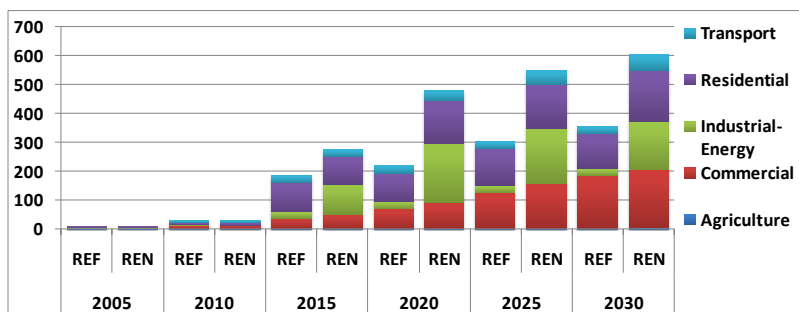
### Gross final consumption of energy, PJ



	2020		2030	
	REF	REN	REF	REN
Biofuels	4.2%	10.9%	4.3%	10.3%
Coal	19.8%	16.6%	19.1%	15.2%
Electricity	14.7%	15.1%	15.0%	16.3%
Gas	37.5%	36.0%	36.0%	33.7%
Heat	5.2%	4.3%	4.3%	3.6%
Oil	17.2%	15.7%	17.9%	17.6%
Renewable	3.7%	4.4%	5.9%	8.0%

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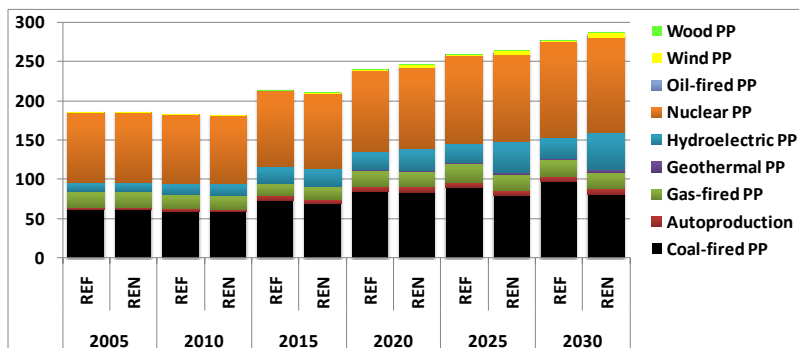
### Renewable energy consumption by sectors, PJ



Sectors	2020		2030	
	REF	REN	REF	REN
Agriculture	1.4%	0.7%	1.1%	0.8%
Commercial	31.0%	18.7%	50.9%	33.4%
Industrial-Energy	10.9%	42.3%	6.7%	27.1%
Residential	45.4%	31.3%	34.2%	29.6%
Transport	11.2%	6.9%	7.0%	9.1%

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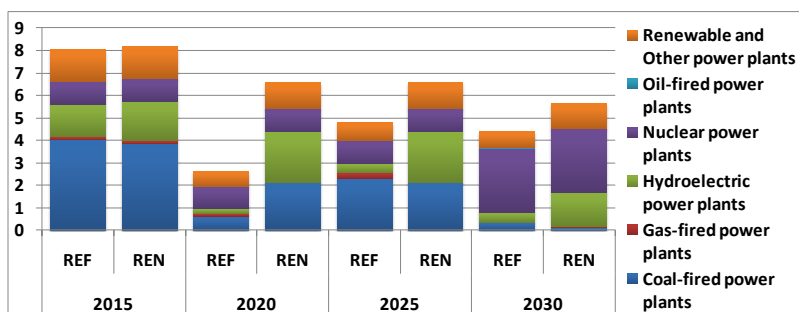
### Electricity Generation, TWh



	2020		2030	
	REF	REN	REF	REN
Coal-fired power plants	35.6%	34.0%	34.9%	28.2%
Gas-fired power plants	8.6%	8.0%	7.6%	7.1%
Nuclear power plants	43.0%	41.8%	43.6%	42.2%
Other power plants	2.5%	2.7%	2.6%	2.6%
Renewable power plants	10.2%	13.5%	11.2%	19.9%

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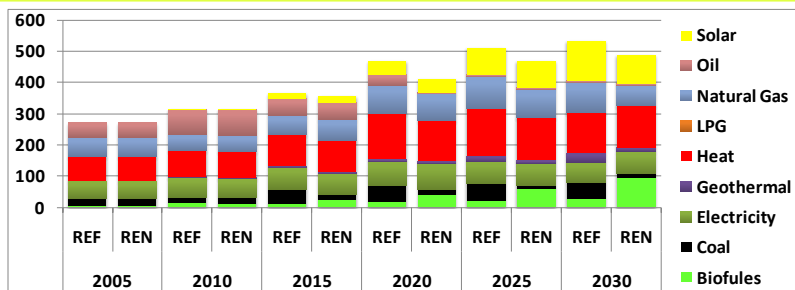
### New power plants building by fuel type, GW



	2020		2030	
	REF	REN	REF	REN
Coal-fired power plants	5	6	7	8
Gas-fired power plants	0	0	1	0
Hydro power plants	2	4	2	8
Nuclear power plants	2	2	6	6
Renewable and Other power plants	2	3	4	5

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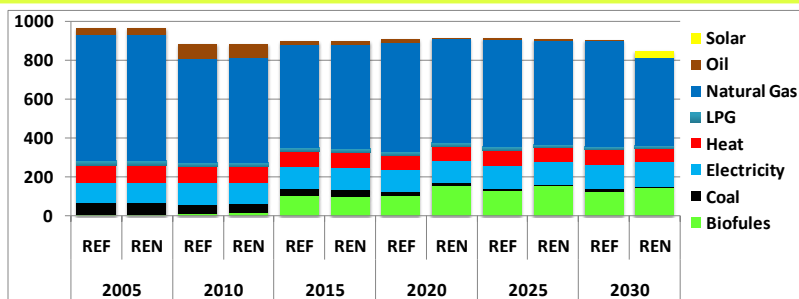
### Final Energy Consumption in Commercial Sector, PJ



	2020		2030	
	REF	REN	REF	REN
Biofuels	3.1%	9.4%	4.9%	19.0%
Coal	12.1%	4.3%	9.9%	2.9%
Electricity	16.0%	20.2%	12.4%	14.3%
Geothermal	1.8%	1.4%	4.9%	2.8%
Heat	30.7%	32.1%	25.0%	27.2%
Natural Gas	19.1%	20.6%	17.9%	13.4%
Oil	7.5%	1.1%	0.9%	0.9%
Solar	9.6%	10.9%	24.2%	19.3%

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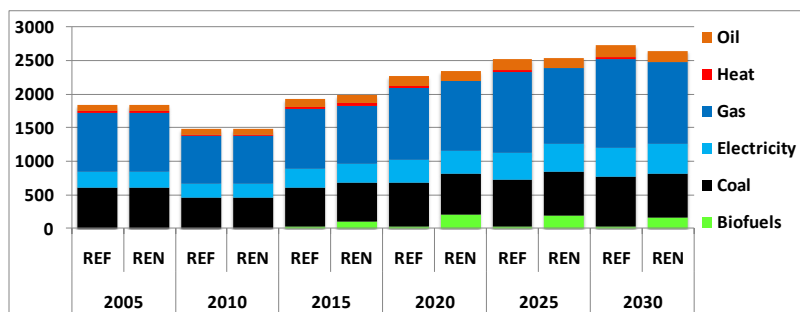
### Final Energy Consumption in Residential Sector, PJ



	2020		2030	
	REF	REN	REF	REN
Biofuels	10.9%	16.4%	13.5%	17.0%
Coal	2.5%	1.8%	1.9%	0.3%
Electricity	12.2%	12.3%	13.4%	15.5%
Heat	8.7%	8.5%	8.9%	7.9%
LPG	2.2%	2.2%	1.8%	2.0%
Natural Gas	61.2%	58.2%	60.0%	53.1%
Oil	2.3%	0.6%	0.5%	0.2%
Solar	0.0%	0.0%	0.0%	4.1%

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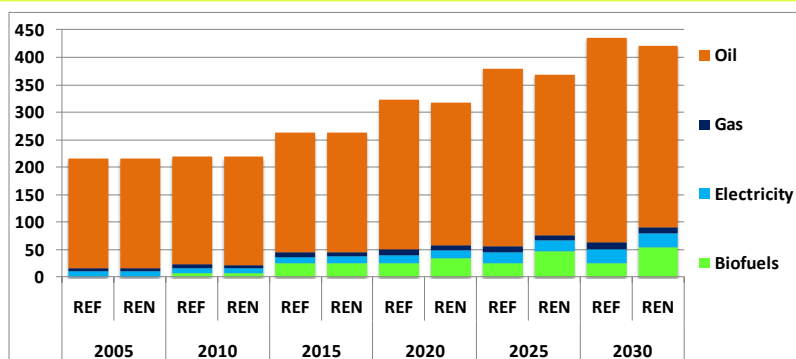
### Final Energy Consumption in Industry, PJ



	2020		2030	
	REF	REN	REF	REN
Biofuels	1.1%	8.7%	0.9%	6.2%
Coal	29.1%	25.9%	27.4%	24.4%
Electricity	15.0%	15.0%	16.1%	17.2%
Gas	47.0%	44.3%	48.1%	45.8%
Heat	1.5%	0.0%	1.3%	0.0%
Oil	6.3%	6.1%	6.3%	6.4%

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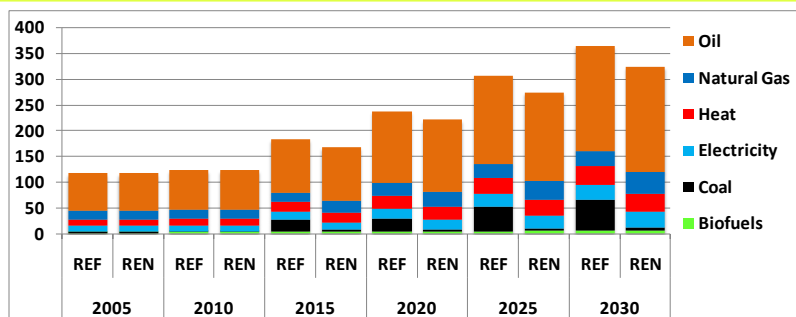
### Final Energy Consumption in Transport Sector, PJ



	2020		2030	
	REF	REN	REF	REN
Biofuels	7.6%	10.4%	5.7%	13.1%
Electricity	4.9%	5.0%	5.8%	6.1%
Gas	2.9%	2.5%	3.0%	2.5%
Oil	84.6%	82.1%	85.4%	78.4%

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## Final Energy Consumption in Agriculture, PJ



	2020		2030	
	REF	REN	REF	REN
Biofuels	1.3%	1.5%	1.1%	1.5%
Coal	10.4%	1.3%	16.4%	2.0%
Electricity	8.4%	9.0%	8.0%	9.0%
Heat	10.6%	11.4%	10.1%	11.3%
Natural Gas	10.5%	13.4%	8.4%	13.1%
Oil	58.9%	63.4%	56.0%	63.1%

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## Conclusions

- Feed-in tariff for electricity producers introduced in 2009 turned out to be indeed effective instrument for attracting private investment in renewable energy
- The number of applications to build the new power capacities and the progress rate of new installations just during the last year give us ground to say that Ukraine could be confident enough to achieve the targets of EU Directives
- However, to have enough of manoeuvrable capacities there will be a need for modernization or installing of new power plants on traditional fossil fuels
- The most prospective seems to be the use of renewable energy for heating and water heating in the commercial and residential sectors and for cogeneration auto-production in industry
- In the transport sector biodiesel promises to be the dominating type of biofuel

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### Next Steps

- Advanced research of renewable energy potential for preparing the National Renewable Energy Action Plan
- Disaggregation of TIMES-Ukraine model for the more detailed study of the GHG reduction strategies
- Explore the potential and internal effects of the increasing of electricity exports to EU countries after obtaining the full membership in Energy Community and integration of the Ukrainian and European transmission lines

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