State Policy and Potential of Renewable Energy in Ukraine:
Reduction of gas consumption during heating period for the years 2013/2014, 2014/2015 and 2015/2016*

- 7.2 billion m³ (or 30%)

Dynamics of natural gas substitution during 2014/2015/2016 years **

\[ \sum 1,670 \text{ MW} \]

introduced during 3 years

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*According to "Naftogaz Ukraine" (Excluding ARC, Luhansk and Donetsk regions).

**According to regional state administrations.
# Targets of National Renewable Energy Action Plan till 2020

<table>
<thead>
<tr>
<th></th>
<th>2009</th>
<th>2016</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Power generation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power generation</td>
<td>4 625 MW</td>
<td>7 977 MW</td>
<td>10 900 MW</td>
</tr>
<tr>
<td>Heat and Cooling</td>
<td>11 471 GWh</td>
<td>18 726 GWh</td>
<td>26 000 GWh</td>
</tr>
<tr>
<td>Heat and Cooling</td>
<td>1 473 thou. t.o.e.</td>
<td>3 576 thou. t.o.e.</td>
<td>5 850 thou. t.o.e.</td>
</tr>
<tr>
<td>Transport</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transport</td>
<td>52 thou. t.o.e.</td>
<td>298 thou. t.o.e.</td>
<td>505 thou. t.o.e.</td>
</tr>
</tbody>
</table>
### Installed Capacity of RES Power Plants, MW

<table>
<thead>
<tr>
<th>Year</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solar PVs</td>
<td>748</td>
<td>819/411*</td>
<td>839/432*</td>
<td>891/484*</td>
</tr>
<tr>
<td>Wind plants</td>
<td>334</td>
<td>514/426*</td>
<td>514/426*</td>
<td>523/435*</td>
</tr>
<tr>
<td>Small hydropower</td>
<td>75</td>
<td>80</td>
<td>87</td>
<td>90</td>
</tr>
<tr>
<td>Biomass</td>
<td>17</td>
<td>35</td>
<td>35</td>
<td>39</td>
</tr>
<tr>
<td>Biogas</td>
<td>7</td>
<td>14</td>
<td>17</td>
<td>20</td>
</tr>
<tr>
<td>Total</td>
<td>1181</td>
<td>1462/966*</td>
<td>1492/997*</td>
<td>1563/1068*</td>
</tr>
</tbody>
</table>

### Electricity Production by Types of RES, mln kWh

<table>
<thead>
<tr>
<th>Year</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solar PVs</td>
<td>563</td>
<td>485</td>
<td>475</td>
<td>476</td>
</tr>
<tr>
<td>Wind plants</td>
<td>637</td>
<td>1172</td>
<td>974***</td>
<td>797***</td>
</tr>
<tr>
<td>Small hydropower</td>
<td>286</td>
<td>251</td>
<td>172</td>
<td>172</td>
</tr>
<tr>
<td>Biomass</td>
<td>32</td>
<td>60</td>
<td>77</td>
<td>72</td>
</tr>
<tr>
<td>Biogas</td>
<td>5</td>
<td>40</td>
<td>64</td>
<td>81</td>
</tr>
<tr>
<td>Total</td>
<td>1523</td>
<td>2008</td>
<td>1762</td>
<td>1598</td>
</tr>
</tbody>
</table>

* - without AR Crimea, where WPP – 87.768 MW, SPP – 407.09 MW.
** - as for 1st December 2016.
*** - 138 MW of WPP are situated on the territory of combat zone.
National Renewable Energy Action Plan till 2020 (NREAP)

Law of Ukraine «On Fostering Renewable Energy Development», 04.06.2015, No. 514-VIII

Introduced feed-in tariff till 2030 for:

- on-ground solar power stations: 15,03 €ct/kWh;
- wind power plants above 2 MW: 10,18 €ct/kWh;
- biomass power stations: 12,39 €ct/kWh;
- hydro-power stations up to 10 MW: 10,45 €ct/kWh;
- geothermal power installations: 15,03 €ct/kWh;
- private household PVs up to 30 kW: 18,09 €ct/kWh;
- private household wind turbines up to 30 kW: 11,63 €ct/kWh.

Premium for Ukrainian equipment usage is provided (5-10% to existing tariff)

GOAL:
11% of RES in Ukrainian gross final energy consumption by 2020

Average biomass feed-in tariff, €ct/kWh

- Poland: 3,80
- Germany: 10,00
- Ukraine: 12,39

*approved by Order of the Cabinet of Ministers of Ukraine №902-p dated October 1, 2014
**as for the year of 2016
Capacity of renewable power facilities, operating within “Feed-in” tariff

120 MW of new capacity was introduced in 2016 generating "green" electricity and operating within “Feed-in" tariff, which is 4 times more in comparison to 2015.
The number of private houses applicable for solar panels installation is 6.5 million
(No.1959 of 21.03.2017)

The main provisions:

- establishing tariffs for the heat produced from alternative sources at level 0.9 as of the current tariff for heat producers from natural gas or average tariff in region for public entities and population by local authorities;

- average tariff for heat produced for population and public authorities, is calculated by local authorities according to the Cabinet of Ministers Order.
Required Investments for National Renewable Energy Action Plan Implementation

Total amount of investments required – 12 billion EURO:
- 6,54 bln – for electric power production;
- 5,2 bln – for heating and cooling;
- 0.45 bln – for transport.

The Investment should be directed to the construction of:
- Solar and wind power stations
- Cogeneration plants on biomass and biogas
- Waste recycling plants
- Geothermal power stations
- Small hydro power stations
POTENTIAL of renewable energy sources in Ukraine
Examples of Successful Renewable Projects

Boiler station on renewable fuels

The boiler station provides heat and hot water for 4 municipal medical institutions

- Installed capacity: 10,5 MW
- Type of fuel: pellets
- Investments: 47,3 mln UAH
- Put into operation: 2015 year
- Investor: APS Power Technology

Botievska wind power station

Electricity output to the Integrated Power System of Ukraine – 634 mln. kWh

- Installed capacity: 200 MW
- Ratio of equipment availability: 98,9%
- Ratio of capacity usage: 36.2 %
- Total investment: 340 mln. €
- The level of "green" tariff: 11,3 €ct/kWh

Plant for wind power units assembly

Cooperation with the German company Fuhrlander Wind Technology LLC

- Installed capacity of unit: 2,5 MW
- Mass of unit: 285 tone
- Height: 100 m
Examples of Successful Renewable Projects

### Biogas plant 5.5 MW (PJSC “Orel-Lieder”)

- Recycling 100% of chicken manure
- Energy supply of poultry
- Reduced CO2 emissions: **270 000 tonnes**
- Produced Biogas: **35 million m³**
- Produced "Green" electricity: **70 million kWh**
- Produced "Green" heat: **10000 Gcal**
- Replaced of natural gas: **1.2 million m³**

### Energy willow (SALIX energy)

- Company: «SALIX energy»
- Plantations area: **1 700 ha**
- Crop capacity: **20 t/ha**
- Annual growth: **34 000 t/year**
- Crop capacity cycle: **25 years**
- Heat of combustion: **17,3-18,0 MJ/kg**
- Substitution of gas: **10 mln m³ gas/year**

### Boiler Plant on Alternative Fuel

- Provides heat and hot water for 52 multistorey buildings, 2 kindergartens, 1 school
- City: **Vinnitsa**
- Start of operation: **2016**
- Capacity: **23.2 MW** (5.2 MW on wood chips, 18 MW on gas)
- Type of fuel: **wood chips**
- Investments: **3,6 mln EUR**
- Producer: **VIESSMANN AG (Switzerland)**
Typical Construction Model of BioCHPP

| Capacity: | 5.3 MW – electricity  
13 MW – heat power |
| Efficiency: | 87% (chips 1970 Kcal/kg) |
| Fuel: | chips, pellets |
| Cost: | 0.09 EUR/kW*h  
23.8 EUR/Gcal |
| Rates: | 0.12 EUR/kW*h  
44 EUR/Gcal |

Necessary investments about 12 million EUR

The payback period is 3.5 years  
from the date of commissioning  
(construction time - 1 year)
UAMAP – web platform of investment projects for energy efficiency and renewable energy in Ukraine

www.uamap.org.ua
THANK YOU FOR ATTENTION!

www.saee.gov.ua