UKRAINE:

ENERGY EFFICIENCY AND RENEWABLE ENERGY

SERGIY SAVCHUK
Head of the State Agency on Energy Efficiency and Energy Saving of Ukraine
National Renewable Energy Action Plan-2020

as of Oct.1, 2014, № 902-p

11%
of Renewables in final energy consumption

National Energy Efficiency Action Plan-2020

as of Nov. 25, 2015, № 1228-p

-9 % (6,5 million t.o.e.)
of energy saving comparing to the average final energy consumption in 2005-2009

Ukraine was the 20th country to ratify the Paris Agreement

New Energy Strategy – 2035 is being developed
KEY PRIORITY: SUBSTITUTION OF NATURAL GAS


- 7.2 billion m³ (or 30%)

New biomass heat generation facilities launched in 2014, 2015, 2016 **

Σ 1 670 MW

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

**According to regional state administrations.
<table>
<thead>
<tr>
<th>Residential buildings</th>
<th>Public entities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multi-Apartment</td>
<td>Private (Individual)</td>
</tr>
<tr>
<td>Number of Buildings</td>
<td>N/A</td>
</tr>
<tr>
<td>≈ 80 000</td>
<td>≈ 6.5 million</td>
</tr>
<tr>
<td>≈ 100 000</td>
<td></td>
</tr>
<tr>
<td>Necessary Investment</td>
<td>N/A</td>
</tr>
<tr>
<td>≈ from 50 to 85 billion USD*</td>
<td>≈ from 4 to 8 billion USD*</td>
</tr>
<tr>
<td>Annual Saving Potential (in gas equivalent)</td>
<td>N/A</td>
</tr>
<tr>
<td>8 billion cubic meters</td>
<td>800 million cubic meters</td>
</tr>
</tbody>
</table>

*depending on the thermal modernization level*
STATE SUPPORT PROGRAM FOR HOUSEHOLDS ("WARM LOANS PROGRAM")

Duration:
Active since Oct'2014

Mechanism:
Partial reimbursement of the loans obtained by participants (Individual Households & Home Owner Associations (multi-dwelling buildings))

Financial partners:
Oschadbank, Privatbank, Ukreximbank, Ukrgasbank

Support Share:
20% - for biomass boilers
35% - for energy efficiency measures for individual households
40% - for Home Owner Associations

Funding:
EUR 126 million has been distributed to 300 000 households
EUR 47,8 million - Government reimbursement

+ 286 regional programs
(from local budgets due to fiscal decentralization) for extra reimbursement of «warm» loans
ENERGY SAVING PERFORMANCE CONTRACTING FOR PUBLIC SECTOR

2016: first 20 EPCs were concluded in 5 regions of Ukraine
2017: more than 100 EPCs are under initiation

The following laws and regulations, developed with EBRD assistance, have been adapted:

• On public procurement and general issues
• On special ESCO’s budgetary commitments (amendments to the Budget Code of Ukraine) – extra guaranty for return of investment during EPC (up to 15 years)
• Model of energy performance contract
• Methodology of calculation of basic consumption level
• Other sub-Laws of Ministry of Finance
• New public procurement of ESCO’s service (e-procurement “PROZORRO”)
## RENEWABLES IN UKRAINE

### 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</td>
<td>839</td>
<td>938</td>
</tr>
<tr>
<td>Wind plants</td>
<td>371</td>
<td>497</td>
<td>514</td>
<td>525</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><strong>Total</strong></td>
<td>1218</td>
<td>1445</td>
<td>1492</td>
<td>1612</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>492</td>
</tr>
<tr>
<td>Wind plants</td>
<td>637</td>
<td>1124</td>
<td>1125</td>
<td>925</td>
</tr>
<tr>
<td>Small hydropower</td>
<td>286</td>
<td>251</td>
<td>172</td>
<td>189</td>
</tr>
<tr>
<td>Biomass</td>
<td>32</td>
<td>60</td>
<td>77</td>
<td>80</td>
</tr>
<tr>
<td>Biogas</td>
<td>5</td>
<td>40</td>
<td>64</td>
<td>89</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>1523</td>
<td>1960</td>
<td>1913</td>
<td>1775</td>
</tr>
</tbody>
</table>
## 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 plants</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>installed capacity</strong></td>
<td>4 625 MW</td>
<td>7 977 MW</td>
<td>10 900 MW</td>
</tr>
<tr>
<td><strong>Power generation</strong></td>
<td>11 471 GWh</td>
<td>18 726 GWh</td>
<td>26 000 GWh</td>
</tr>
<tr>
<td><strong>Heat and Cooling</strong></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><strong>Transport</strong></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>
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
Introduced feed-in tariff till 2030 for:

- on-ground solar power stations: 15,03 €ct/kWh;
- wind power turbines 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

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
LAW “ON ELECTRICITY MARKET OF UKRAINE”
08.06.2017, No. 2019-VIII

Targets of Law:
- creating a competitive electricity market
- providing reliable and uninterrupted power supply to customers

Key Provisions of the Law regarding Renewable Energy:

1. **Signature of long-term Power Purchase Agreement (PPA)** with Guaranteed Buyer within feed-in tariff up to 2030.

2. **Step-by-step introduction of payment for unbalanced power supply:**
   - 10% in 2021
   - 100% - in 2030

3. **Establishment of a "corridor of irreponsibility"** for an error in forecasting the volumes of electricity production from RES.
   - Allowable variation of declared amounts of power production:
     - for Wind Power Plants – 20%
     - for Solar Power Plants – 10%
     - for Small Hydro Power Plants – 5%

4. **Exemption from payment for unbalances** of RES facilities put into operation before the adoption of the Law.

Law stimulates:
- Improvement of the system for forecasting electricity production
- Expansion of the market of power storage systems
As of April 1, 2017 total capacity of renewable energy units which produce «green» energy is **1678,66 MW** (including 494,86 MW in the occupied Crimea).

Note: In 2016 there were introduced **120,6 MW** of new power facilities that generate «green» electricity and operate according to «green» tariff. **This is 4 times more than it was in 2015!**
The number of private houses eligible for solar panels installation is 6.5 million.
### EXAMPLES OF SUCCESSFUL RENEWABLE PROJECTS

<table>
<thead>
<tr>
<th>Boiler station on renewable fuels</th>
<th>Botievska wind power station</th>
<th>Wind power turbines production plant</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>The boiler station provides heat and hot water for 4 municipal medical institutions</strong></td>
<td><strong>Electricity output to the Integrated Power System of Ukraine – 634 mln. kWh</strong></td>
<td><strong>Under license of German company Fuhrlaender AG</strong></td>
</tr>
<tr>
<td>Installed capacity: <strong>10,5 MW</strong></td>
<td>Installed capacity: <strong>200 MW</strong></td>
<td>Installed capacity of turbines: <strong>2,5 MW, 3,2 MW</strong></td>
</tr>
<tr>
<td>Type of fuel: <strong>pellets</strong></td>
<td>Ratio of equipment availability: <strong>98,9%</strong></td>
<td>Mass of unit: <strong>285 tone</strong></td>
</tr>
<tr>
<td>Investments: <strong>47,3 mln UAH</strong></td>
<td>Ratio of capacity usage: <strong>36,2 %</strong></td>
<td>Height: <strong>100 m</strong></td>
</tr>
<tr>
<td>Put into operation: <strong>2015 year</strong></td>
<td>Total investment: <strong>340 mln. €</strong></td>
<td></td>
</tr>
<tr>
<td>Investor: <strong>APS Power Technology</strong></td>
<td>The level of &quot;green&quot; tariff: <strong>11,3 €ct/kWh</strong></td>
<td></td>
</tr>
</tbody>
</table>
**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: 10,000 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)
UAMAP – WEB PLATFORM OF INVESTMENT PROJECTS FOR ENERGY EFFICIENCY AND RENEWABLE ENERGY IN UKRAINE

www.uamap.org.ua
It’s time to INVEST in UKRAINE!