# Can Ukraine abandon nuclear energy? Yes we can

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Ukraine's potential to improve energy efficiency and develop renewable energy sources (RES) is significant enough to allow Ukraine to gradually reduce its dependency on nuclear energy. The energy intensity of Ukraine's economy is among the highest in the world, two and a half times higher than the OECD country average,[1] meaning that vast opportunities for improvements can lead to a significant decrease in its demand for energy, including electricity demand. Focusing on the efficiency of energy use and on the development of local, low-carbon energy sources would bring Ukraine a number of benefits in the longer term, including: decreased nuclear risks and spent nuclear fuel costs, increased energy security, economic benefits, improved quality of the environment and living standards.

This paper both outlines the possible structure of Ukraine's generating capacities in 2030 without extending the operations of nuclear power plants (NPP) and with no new coal-fired thermal power plants and argues that this would be sufficient to cover the country's demand if the potential for energy efficiency increases is effectively utilised.

## Official electricity demand figures are exaggerated, much less would be needed

According to the revised Energy Strategy of Ukraine until 2030, total electricity demand in 2030 is expected to be 282 TWh (basic scenario). However, these estimates are based on exaggerated assumptions of economic growth (five per cent annually), a very low rate of energy efficiency increase (only 1.2 per cent annually), and a low target for decreasing the economy's electricity intensity (only by 40 per cent by 2030).

Total electricity demand in 2030 is likely to be much lower. With more emphasis given to the increased efficiency of energy use, rather than providing more generating capacities, electricity demand can remain close to current levels at approximately 210 TWh annually.

- In 2012 the EBRD decreased its economic growth outlook for Ukraine from 5.5 per cent to 2.5 per cent annually, and in part to decreased demand for Ukraine's key export goods, further slow-down in economic growth is expected.
- Currently Ukraine's electricity intensity per capita GDP is twice as much as the OECD country average (0.31 versus 0.64) offering vast opportunities to decrease this intensity and at the same time lower electricity demand.[2]
- Two per cent growth in annual electricity demand is unreasonably high. For example, during a ten year period in Poland (2000-2010), electricity consumption grew by just six per cent at 0.6 per cent annually, while GDP more than doubled. Given that electricity consumption in the last decade has varied in Ukraine by a maximum of ten per cent (from 173 to 193 TWh/year), we believe that a 0.5 per cent increase in electricity consumption in the coming decades would be a more appropriate rate, leading to about ten per cent[3] growth by 2030.

## There is enough RES potential to cover up to 27 per cent of electricity demand in 2030

Using the existing RES potential in Ukraine would supply approximately 58 TWh/year of electricity, covering the total electricity demand without extending the lifetime of expired nuclear reactors and without increasing GHG emissions from the energy sector. This would require about 18 GW installed capacities of RES (covering 27 per cent of electricity demand in 2030) with a breakdown shown in the table below. Such a target would be in line with those of EU countries and still less ambitious than for example Germany which has a target of 38 per cent by 2030.

The data is taken mostly from the EBRD's Ukraine Sustainable Energy Lending Facility (USELF) - Renewable Energy Scenarios. We aim to use data that takes into consideration not only the technically achievable potential but also data that reflect the possibility for the potential to be utilised in the short and medium-terms, although there are more optimistic assessments of RES potentials in Ukraine e.g. provided by state official agencies such as the National Agency of Ukraine on ensuring the efficient use of energy resources.[4]

Table - Structure of generating capacities in Ukraine in 2030 - revised

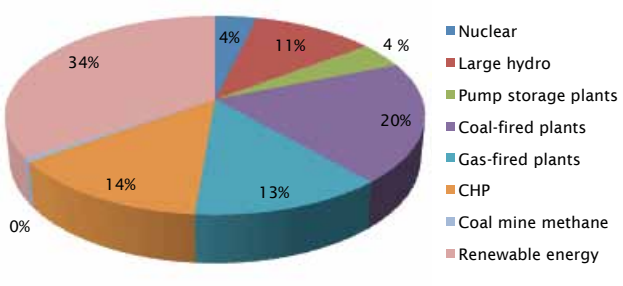


Figure - Structure of generating capacities in Ukraine in 2030 - scenario proposed by Bankwatch/NECU

Small hydro is an important source of energy to be further developed, with significant potential in the Carpathian region and in the Dnieper tributaries. However in view of the negative ecological and social effects from construction in such sensitive areas like river basins, not all this potential is feasible. For this scenario we account for only 1 GW, half the potential proposed by NAER.[5]

## Conventional energy use will decrease, with no new coal and nuclear capacities

We assume that 2000 MW of nuclear capacities providing 16 TWh will still be operational in 2030, as Khmelnitsky NPP unit 2 and Rivne NPP unit 4 will not reach the end of their designed lifetime. Large hydro will increase energy production from the current level of 12.4 TWh

| | Installed capacity, GW - revised Energy Strategy, basic scenario | Installed capacity, GW, BWN scenario | Production, TWh, BWN scenario |
|---|---|---|---|
| Nuclear | 18.8 | 2 | 16 |
| Large hydro | 5.8 | 5.8 | 14 |
| Pump storage plants | 4.7 | 2.2 | 3.3 |
| Coal-fired plants | 19.7 | 10.4 | 51. |
| Gas-fired plans | 3.8 | 6.8 | 41.7 |
| CHP | 6.3 | 7,3 | 23 |
| Coal mine methane | N/A | 0,32 | 2.7 |
| Wind | 3.5** | 13.3* | 38.4 |
| Solar (PV) | 2** | 2.6* | 3.9 |
| Small hydro (up to 10 MW) | 0,6** | 1 | 6.6 |
| Bioenergy | 1.2** | 1.1* | 7.2 |
| Biogas (for electricity) | N/A | 0.2* | 1.5 |
| Sum of renewable energy | 7.3*** | 18.2 | 57.6 |
| **TOTAL** | **66.4** | **53.0** | **209.6** |
| **Share of RES, per cent from total** | **11** | **34** | **27** |



*- data from USELF SEA Report, Annex 1 – Renewable energy scenarios in Ukraine;
** - figures from Revised Energy Strategy (version for public consultation (7.06.2012), section 3B, p. 45; Mean values were considered to correspond to basic scenario.
*** - The total RES installed capacity sums up to 7,3 GW (as opposed to 6 GW as indicated in table "Installed capacities and production structure for scenarios" on page 31 of the Revised Energy Strategy).

to 14 TWh, as per the revised official Energy Strategy of Ukraine.

In 2030 thermal power generation would still be responsible for a significant share of electricity production, totaling 46 per cent. Our scenario suggests the same amount electricity in 2030 as the official Energy strategy of Ukraine (116 TWh); however, we believe it can be produced with a lower installed capacity through a higher capacity factor, which is currently very low e.g. no use of gas-fired plants in 2010. About seven GW of gas-fired thermal power plants (including four GW of new gas-fired capacities to replace old coal-fired units, instead of four GW of new coal-fired units proposed by the authors of the revised energy strategy) could provide roughly 42 TWh of electricity. The price of imported natural gas should be compared to the cost of subsidising the coal sector, the investments needed for the planned switch to newer coal-firing technologies and the external social costs.

Additionally, there are a number of effective leverages for the improvement of gas use efficiency. Increasing the use of co-generation technology, implementing widespread energy efficiency programmes in the residential sector to reduce heat loss, promoting state support for heating in rural areas based on RES instead of gasification are the key measures that can help Ukraine decrease its dependence on imported gas without increasing its dependence on coal.

## Renewable energy prices go down, coal and nuclear prices go up

Prices for nuclear and coal electricity in Ukraine are slowly increasing yet still do not fully reflect production costs. NPPs and thermal power plants now require significant investments for modernisation, and this will have to be reflected in tariffs that will inevitably increase, as well as retail electricity tariffs. Conversely, the 'green tariff' is predicted to continually decrease over the coming years and, according to NAER, the average retail tariff will be higher already next year than the tariff for small hydro already next year, the tariff for wind in 2017 and for solar in 2030.[6]

A similar trend exists with regards to the economic feasibility of different options for new capacities. RES technologies are progressively becoming cheaper,[7] but construction costs for nuclear plants are growing constantly for the few new units being constructed in Europe.[8] Extending the lifetime of nuclear units merely postpones decommissioning tasks (and costs), allowing the current government to keep playing the game of "cheap nuclear electricity" for several more decades while ignoring the growing and dangerous risks. Decommissioning the existing units is inevitable, and it is becoming more costly with each additional year of operation e.g. the extra spent nuclear fuel and waste to treat, and thus is not a strategic option.

## Conclusions and recommendations

Ukraine has enough potential to satisfy its electricity needs without extending the lifetime of expired NPPs or constructing new ones, and without the increased use of coal in thermal power plants. The government should prioritise decreasing the economy's energy intensity, which will automatically lower demand for generating capacities and combusted fossil fuels and at the same time contribute to the system's sustainability and economic benefits in the long-run.

The task is not easy, as a shift in thinking is required away from "capacity extensions" and short-term solutions towards rational use and sustainability in the long-run. Many European countries have started this process, and Ukraine will require additional help due in part to its Soviet legacy both in the energy sector's structure and mentality.

The European Commission and EBRD have an exceptionally important role in helping Ukraine along its way. All technical and financial support for the Ukrainian energy sector provided by Europe should therefore focus on promoting energy efficiency, reducing losses and developing RES – areas that Ukraine desperately needs to develop if it wants to stay in line with European trends. There are no grounds for European institutions to support the further development of Ukraine's coal or nuclear sectors, which are already subsidised heavily. Such practices have stagnated these sectors in the last two decades and have contributed to effectively placing Ukraine's energy sector on life support, as the country with the world's second highest energy-intensive economy.

This is why we believe that the Ukraine NPP Safety Upgrade Programme – which supports the continued operation of nuclear plants beyond their designed lifetimes ¬ is not crucial

for the development of Ukraine's energy sector and should not receive public money. We recommend that both the Commission and EBRD halt any plans to support either the nuclear or coal sectors in Ukraine if this support is not connected directly with the closure and decommissioning of old NPPs and TPPs, or the environmental rehabilitation of exhausted coal mines.

Notes

1. TRES/GDP (PPP) 0,40 in Ukraine in 2011 compared to 0,16 in OECD countries
2. Calculated based on IEA Key World Energy Statistics 2011 data: Electricity consumption/ GDP(PPP)
3. Reference year throughout the paper is 2011
4. 2009 National Report about implementation of the Energy Efficiency State Policy, by National agency of Ukraine on ensuring of efficient use of energy resources management, Kyiv 2010.
5. State Agency on Energy Efficiency and Energy Saving of Ukraine
6. http://ua-energy.org/post/22380
7. http://go.bloomberg.com/multimedia/the-great-renewable-energy-race/
8. The cost of the Flamanville 3 reactor in France has grown from EUR 3.3bn to EUR 6bn and the Olkiluoto 3 reactor in Finland faces EUR 2 bn in cost overruns.