

# Dusting off Ukraine's energy sector

Why the country must address inefficiency and pollution at its ageing coal-fired power plants



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# Main findings

Ukraine's energy sector faces unprecedented challenges, from a reliance on expensive fossil-fuel imports to inefficient infrastructure and markets. But rather than viewing this as a vulnerability, Ukraine's energy sector is potentially a low-hanging fruit for reform. The current diplomatic crisis with Russia and the removal of politicians engaged in corrupting the sector may finally induce the political will to implement long-overdue reforms. Much of the country's electricity is wasted, with energy efficiency levels far below European standards. The amount of energy spent in Ukraine to produce one dollar of gross domestic product (GDP) is three times than the EU-average, while carbon dioxide emissions per unit of GDP are the highest in Europe<sup>1</sup>. Despite these losses, coal power plants are still able to sell electricity at very low prices due to the country's state aid regime.

This paper is based on a three-day field visit to Ukraine in July 2014 by CEE Bankwatch Network and the National Ecological Centre of Ukraine (NECU). Backed by desk research, the report finds that:

- **While Ukraine must reform its energy sector, change is not likely to happen fast.** Ukraine generates electricity from nuclear power plants (most of which now operate beyond their designed lifetime and represent a threat for the entire continent) and coal power plants (with limited pollution control, most if not all of which should have stopped operating as well), with a small share of hydropower. Ukraine faces a great challenge in phasing out these capacities.
- **Although a Contracting Party to the Energy Community Treaty, Ukraine counts on gaining a derogation from implementing the environmental *acquis*,** in spite of the social, health and economic impacts of operating these old and polluting coal power plants. In April 2014 Ukraine requested of the Energy Community Task Force on Environment that its already flexible 'opt-out'<sup>2</sup> derogation be extended to 40,000 hours until 2030, and for the Industrial Emissions Directive compliance date to be moved to 2033<sup>3</sup>.
- **Control of emissions from coal fired power plants is negligible.** Operators say that emissions are within national limits, but these levels exceed those in the EU by up to 50

1 UKEEP, 2009, <http://www.energyagency.at/fileadmin/dam/pdf/veranstaltungen/Reidlinger.pdf>

2 Under the Large Combustion Plant Directive (LCPD, 2001/80/EC), plants that 'opt out' of meeting the new standards can operate for a maximum of 20,000 hours after January 2008 and, at the latest, must be shut down by 2015. By virtue of article 16 (ii) of the Treaty Establishing the Energy Community, Contracting Parties have the obligation of implementing the Large Combustion Plans Directive.

3 On 24 Oct 2013, the Ministerial Council adopted two separate Decisions which contain rules for the design and operation of large combustion plants. An instrument that was adapted for the Energy Community needs is the "opt-out" (limited lifetime derogation) possibility. The Ministerial Council agreed that the opt-out would be applicable between 1 Jan 2018 and 31 Dec 2023, for a total number of 20 000 operational hours.

times. Reducing emissions at power plants is not cheap, and such investments do not make sense for power plants built in the seventies without first replacing major equipment (also not cheap), as the plants would not be able to operate long enough to pay back the money invested to reduce emissions. None of the coal-fired power plants in Ukraine have any SO<sub>x</sub> and NO<sub>x</sub> pollution control, while the current equipment that filters ash at these plants has already been used for decades.

- In western Ukraine, the coal power plants **Dobrotvir and Burshtyn** are connected to the European grid and export approximately 55 per cent of their electricity to Hungary, Romania, Slovakia and Poland. These power plants **would not be allowed to operate in the EU because of their emissions levels**, or they would face a strict deadline for closure.
- **People living around Dobrotvir and Burshtyn power plants are aware of the pollution risks but feel unable to change the situation.** DTEK, the company that operates both power plants, claims that locals do not complain about operations except when ash from the already-full ash dumps is blown by wind during dry periods.



# Power generation

The following table shows just how old is Ukraine's fleet of coal-fired power plants. Their total capacity is 27 980 MW, with Dneproenergo the largest owner at 8 400 megawatts (MW). While most of these companies are state-owned, DTEK, a private company, owns Shidenergo and controls Dneproenergo and Zahidenergo.

## Coal-fired power plants in Ukraine

Name	Owner	Years of unit commissioning	Units	Capacity (MW)
Slavyanskaya	Donbassenergo	1955–69	2	880
Starobeshevskaya	Donbassenergo	1961–67	10	2000
Pridneprovskaya	Dneproenergo	1959–66	8	1800
Krivorozhskaya	Dneproenergo	1965–73	10	3000
Zaporozhskaya	Dneproenergo	1972–77	7	3600
Zmiyevskaya	Centrenergo	1960–69	10	2400
Tripolskaya	Centrenergo	1969–70	6	1800
Uglegorskaya	Centrenergo	1972–75	7	3600
Dobrotvirska	Zahidenergo	1959–64	5	600
Ladyzhinskaya	Zahidenergo	1970–72	6	1800
Burshtynskaya	Zahidenergo	1965–73	12	2400
Luganskaya	Shidenergo	1956–69	8	1500
Kurakhovskaya	Shidenergo	1972–75	7	1400
Zuyevskaya	Shidenergo	1982–88	4	1200

Source: International Energy Agency, *Energy Policies Beyond IEA Countries, Ukraine 2012*, pg. 158

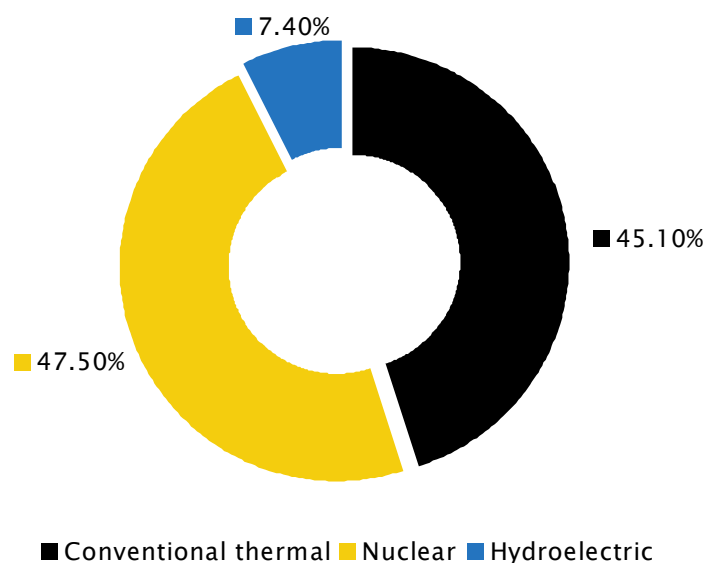
As much of the base load in Ukraine is provided by nuclear power, **most thermal power plants are used for load levelling**, for which a plant size of 200–300 MW is considered optimal, as they operate at a low utilisation factor. Large new power plants are not currently considered a necessity in Ukraine<sup>4</sup>. While the planned plants in Ukraine are to be of the supercritical or ultra-supercritical variety, using fluidised bed combustion, no new plants are planned in the near future, apart from some discussion about a new unit at Dobrotvir, with Japanese investment.

<sup>4</sup> IEA Clean Coal Centre, Prospects for coal and clean coal in Ukraine, No 11/5 June 2011, <http://www.iea-coal.org.uk/documents/82689/8096/Prospects-for-coal-and-clean-coal-in-Ukraine.-CCC/183>

# Electricity production

Ukraine's energy system is the sixth largest in Europe after Germany, France, Italy, Spain, and the UK. The installed capacity of Ukrainian power plants was 54.5 GW in 2013<sup>5</sup>.

Electricity generation in Ukraine, 2013



Source: World Energy Council, Sustainability index  
<http://www.worldenergy.org/data/sustainability-index/country/ukraine/2013>

Thermal power plants and co-generation plants produce 34.3 GW or 62.9 per cent of Ukraine's electricity. Nuclear power plants have a capacity of 13.8 GW or 25.4 per cent of the total energy mix. **Nuclear power plants have a larger share in the energy mix as they provide base load capacity.**

The thermal generation sector is made up of six major companies, which account for 95.0 per cent of electricity generation in the segment. The sector's private companies include DTEK Skhidenergo, DTEK Dniproenergo, DTEK Zakhidenergo, Kyivenergo, and Donbassenergo. The privatisation of Centrenergo, which was scheduled for 2013, was postponed for an indefinite period of time due to a fire at the Uhlehirska thermal power plant in March 2013<sup>6</sup>.

5 DTEK Annual Report 2013, <http://www.dtek.com/library/file/dtek-ar2013-en.pdf>

6 idem

# Coal – a pillar of Ukraine's energy sector

Coal is seen as a source for energy, economic and political independence in Ukraine. As the country's main indigenous fossil energy source, coal production totaled nearly 82 million tonnes (Mt) in 2011<sup>7</sup>.

Today the coal sector in Ukraine is characterised by a mix of public and private ownership. Public ownership is decreasing as privatisation progresses. DTEK<sup>8</sup>, a vertically integrated private holding company with a stake in coal production as well as power generation and distribution, represents around half of the coal production capacity in Ukraine. The government plans to advance the sector privatisation of the coal sector in the coming years.

## Resources

Ukraine has abundant coal reserves<sup>9</sup>, which account for more than 90 per cent of the country's fossil fuel reserves. Although the capacity of the coal and power sectors is well in excess of domestic demand, Ukraine is a net energy importer. The cost of gas imports from Russia has risen substantially in recent years. Gas accounts for almost 40 per cent of Ukraine's energy usage<sup>10</sup>.

Most of Ukraine's coal is located in the conflict stricken regions of Donetsk, Luhansk and Dnipropetrovsk in the Donetsk coal basin, which continues into Russia. There are two other basins, the Lviv-Volyn basin in western Ukraine, which continues into Poland, and the Dnieper coal basin, a lignite basin in central Ukraine. Ukrainian coal is high in ash and sulphur. This limits its export options, although the availability of washing and preparation facilities can help. Poor coal quality also constrains the efficiency of coal-fired power plant operations and increases emissions.

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7 International Energy Agency, Energy Policies Beyond IEA Countries, Ukraine 2012, pg. 153

8 <http://www.dtek.com/en/home>

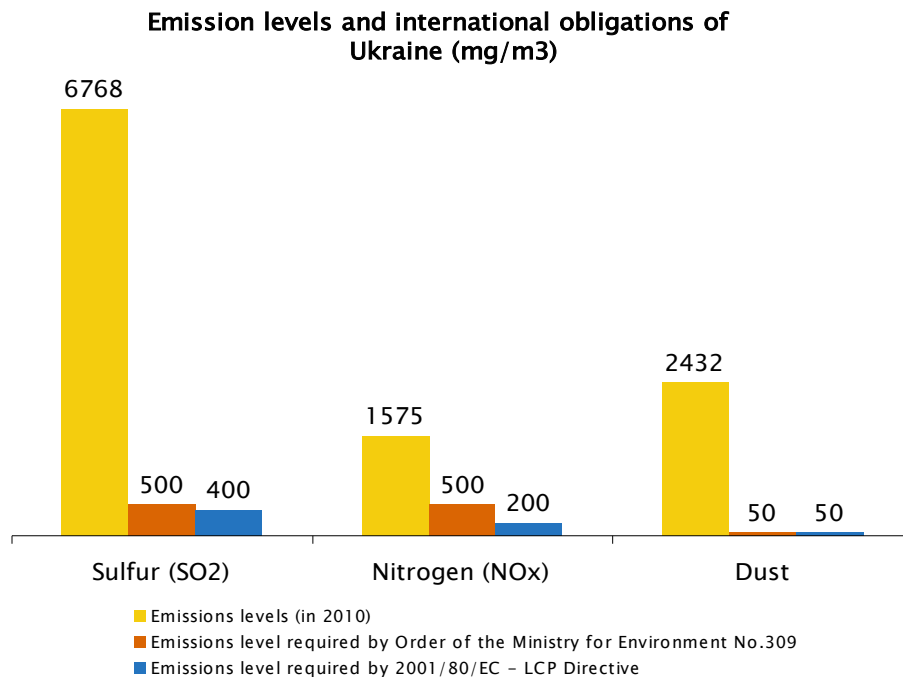
9 Euracoal country profiles – Ukraine, <http://www.euracoal.org/pages/layout1sp.php?idpage=269>

10 Economist Intelligence Unit, Energy Report Ukraine 2011



# Emissions from coal-fired power plants

Coal-fired power plants in Ukraine are generally old and inefficient. None of the coal-fired power plants in Ukraine have any SO<sub>x</sub> and NO<sub>x</sub> pollution control, while particulate matter emissions currently exceed limits set in the EU's Large Combustion Plants Directive (LCPD) by up to 45 times, on average (see graph)<sup>11</sup>. Some companies in Ukraine are making investments to improve efficiency as well as refurbishment. However, because electricity tariffs do not allow for a return on investment and price distortions on fuels do not promote efforts to increase efficiency, barriers to investment remain.



The government has committed to implement a number of EU directives<sup>12</sup>, including the LCPD, which must be implemented by 2018, and the Industrial Emissions Directive, with an implementation deadline for 2027, as per Ukraine's membership in the Energy Community

<sup>11</sup> PPT of the European Business Association – Thermal Power Generation Sector of Ukraine on the way to implement LCP Directive 2001/80/EC – <http://www.energy-community.org/pls/portal/docs/1216180.PDF>

<sup>12</sup> [http://www.energy-community.org/portal/page/portal/ENC\\_HOME/ENERGY\\_COMMUNITY/Legal/EU\\_Legislation#THEACQUISONENVIRONMNT](http://www.energy-community.org/portal/page/portal/ENC_HOME/ENERGY_COMMUNITY/Legal/EU_Legislation#THEACQUISONENVIRONMNT)

Treaty. The eventual fulfilment of these directives will have a positive impact on pollution reduction, as the directives impose dramatic emission reductions on Ukraine's coal-fired power plants.

However in April 2014, Ukraine requested that the aforementioned opt-out be extended to 40,000 hours until 2030 and the Industrial Emissions Directive compliance date be moved to 2033, as noted in the conclusions of the 33rd Permanent High Level Group of the Energy Community. In this way, Ukraine wants to continue business as usual in implementing the IED, without properly complying first with the LCPD.

The Permanent High Level Group<sup>13</sup> proposed that the Ministerial Council support an extended deadline for Ukraine, so that the Commission could present a proposal for a formal decision and to adopt this via written procedure.

While recognizing the difficult conditions in which Ukraine finds itself, creating a precedent whereby a regulatory framework sets different binding rules for its members is a slippery slope that would disturb the path towards a level playing field and result in electricity market distortion.

Moreover, the limited scope of the environmental *acquis* within the Energy Community Treaty is inadequate to protect the environment and public health from the impacts of the energy sector. EU commitments related to the environment need to be adopted, with equal weight given to all policy areas ie the environmental *acquis* must be seen as having equal importance as the energy *acquis*. Moreover, the implementation of the environmental *acquis* will help ensure a level playing field for the common energy market of the EU and Energy Community and avoid imports of electricity from environmentally-damaging sources. Yet not all Contracting Parties are willing to follow the agreed *acquis*. While some Contracting Parties are opposing stricter environmental regulations in the revised Treaty from 2016 onwards, and the deadline to implement the Industrial Emissions Directive – agreed under the current Treaty – has already been extended from 2018 to 2027, Ukraine is now even trying to extend this deadline further to 2033.

While electricity is relatively cheap in Ukraine, it comes at a great cost to the environment and people's health. Statistics from Dobrotvir and Burshtyn are quite worrying. In 2013, Ukraine exported some 4,300 GWh of electricity<sup>14</sup>, equivalent to a 500 MW net capacity power plant

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13 Composed of one representative of each Contracting Party and two representatives of the European Community, the PHLG meets normally four times a year and is in charge of the following: preparing the work of the Ministerial Council; giving assent to technical assistance requests made by international donor organizations, international financial institutions and bilateral donors; reporting to the Ministerial Council on progress made toward achievement of the objectives of this Treaty; taking Measures, if so empowered by the Ministerial Council; adopting Procedural Acts, not involving the conferral of tasks, powers or obligations on other institutions of the Energy Community; discussing the development of the *acquis communautaire* described in Title II on the basis of a report that the European Commission shall submit on a regular basis. [http://www.energy-community.org/portal/page/portal/ENC\\_HOME/ENERGY\\_COMMUNITY/Institutions/PHLG](http://www.energy-community.org/portal/page/portal/ENC_HOME/ENERGY_COMMUNITY/Institutions/PHLG)

14 <https://www.entsoe.eu/db-query/exchange/detailed-electricity-exchange>

exporting power 24 hours per day for an entire year. Assuming that this 500 MW power plant was new and would meet EU emission standards, it would result in 17 premature deaths (cases of serious respiratory, cardiovascular, and cerebrovascular disease associated to exposure to coal power plant emissions)<sup>15</sup>. However the number of deaths for a 40 year-old power plant in Ukraine with hardly any pollution control is difficult to estimate and likely to be much higher.

According to DTEK, the investments required for compliance with the LCPD are around UAH 100 billion (approximately USD 12 billion). DTEK also estimates that de-SOx and de-NOx equipment that is required to be installed before 2027 will cost around EUR 2.5 billion. While apparently there are no contractors in Ukraine who could design and build deSOx and deNOx equipment, DTEK has a pilot project with Vattenfall at the Krivoryzhska plant, where construction is expected to start in 2015. Clearly, this is a significant hurdle. If this level of investment were instead used for new, state-of-the-art plants, about the same quantity of electricity could be generated as today's installed coal-fired capacity. The current tariff scheme also does not allow sufficient return on investment, as DTEK's representatives have informed us during a meeting in their Lviv office. So it is difficult to conceive how this amount of money is going to be available in order to meet the 2018 deadline.

DTEK also believes that unavailability of equipment, an insufficiently-skilled workforce, and a lack of technical experience to design and operate environmental control technologies could hinder the implementation of the directive. In the case of some power plants, a lack of physical space for equipment may be a constraining factor. Nevertheless, the main barrier for compliance is economic.

## Waste from coal-fired power plants

Typically many countries will use the by-products of coal-fired plants productively. Fly ash is useful to cement production, bottom ash can be used for making roads and gypsum from desulphurization units can be used as a construction material. However, Ukraine has large resources of natural gypsum<sup>16</sup> that are sold at a low price, making it very difficult for thermal power plant operators to sell this by-product, if the de-SOx units were built.

Since the ash content of coal used in Ukraine is high<sup>17</sup>, power plants produce large amounts of sludge. DTEK representatives acknowledge that most of the ash dumps at their plants are full, and the three at Burshtyn are of particular concern because capacity is quickly being approached and new space is not readily available.

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15 <http://bankwatch.org/bwmail/56/croatian-coal-power-plant-predicted-be-killer-new-study>

16 Ukraine abounds in deposits of various materials required in construction - <http://ukraine-gateway.org.ua/country-guide/general-overview/natural-resources.html>

17 Strategy of coal industry development in Ukraine, G.G. PIVNYAK, P.I. PILOV, The National Mining University, Ukraine <https://www.min-pan.krakow.pl/Wydawnictwa/GSM2442/pivnyak-pilov.pdf>, page 30

Most of the land around the Burshtyn is agricultural, and according to the Land Code of Ukraine<sup>18</sup>, art. 23, agricultural land has a priority over other categories, industry included, and changes in the type of land use from agricultural purposes to other types is allowed only if the motivation for such a change is determined by a separate law.



*The ash dump of the Burshtyn coal-fired power plant*

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18 <http://zakon2.rada.gov.ua/laws/show/2768-14>

# Electricity trade

A portion of Ukraine's electricity system is synchronised with countries in eastern Europe. The Burshtynskaya thermal power plant supplies electricity to local consumers and to neighbouring Slovakia, Hungary and Romania at a total connection capacity of about 500 MW, but the plant is not connected to the rest of Ukraine. Power stations at Dobrotvorskaya and Burshtynskaya – the only ones that can export electricity to the European grid – belong to Zahidenergo, in which DTEK has a majority stake. Access to export power lines is distributed via auctions, all of which DTEK won, becoming the only exporter of electricity. The company has also received a waiver from paying the cross-subsidy (*dotatsionny sertifikat*) on electricity bought for export.

As part of the Energy Community framework, a plan is in place for the whole of Ukraine to synchronise with the European Network of Transmission System Operators for Electricity (ENTSO-E) within the next seven years<sup>19</sup>. This is a positive development, since enlarging markets improves security of supply and can open up more business opportunities for Ukraine given its extra capacity.

Exporting electricity is an area in which revenues are significant. DTEK Power Trade has framework electricity supply contracts with European energy trading units EDF in France and CEZ in the Czech Republic, regulating the supplies of Ukrainian power to Hungary, Poland, Slovakia and Romania<sup>20</sup>.

## Structure of exports of Ukrainian electricity, bln kWh<sup>21</sup>

	2012	2013	Change in %
<b>Belarus</b>	4.05	3.1	-23.5
<b>Hungary</b>	3.6	4.3	19.4
<b>Poland</b>	1.01	1	-1
<b>Moldova</b>	0.85	1.4	64.7
<b>Romania</b>	0.16	0.03	-81.3
<b>Slovakia</b>	0.1	0.04	-60
<b>TOTAL</b>	9.77	9.87	1.2

19 Energy Strategy of the Energy Community, <http://www.energy-community.org/pls/portal/docs/1810178.PDF>

20 [http://www.dtek.com/en/media-centre/press-releases/details/dtek-power-trade-signs-contracts-with-edf-and-cez-for-electricity-supplies-to-europe#.U\\_70EPkbVKB](http://www.dtek.com/en/media-centre/press-releases/details/dtek-power-trade-signs-contracts-with-edf-and-cez-for-electricity-supplies-to-europe#.U_70EPkbVKB)

21 Source: DTEK Annual Report 2013, pg. 57 (In the report, the total figure for 2012 is 9.75. We assumed this is a round-off error and therefore replaced it with the correct sum of the individual country figures.)

# Policy avenues

## Adoption of the Energy Strategy of Ukraine to 2030

After lengthy public debates and approval by industry experts, the Energy Strategy to 2030 was approved by the Cabinet of Ministers of Ukraine in July 2013. The Energy Strategy is designed to achieve the following results:

- fully cover growing electricity demand by retrofitting thermal power plants; increasing the life cycle of existing nuclear power plants<sup>22</sup>;
- investing in upgrades and the expansion of the electricity grid; and after 2018 by commissioning new generation facilities and reducing specific fuel costs;
- increasing annual gas production to 40–45 billion cubic meters per year and covering 90 per cent of gas demand with domestic gas;
- fully covering coal demand by increasing cost effective thermal coal production to 75 million tons per year and coking coal production to 40 million tons per year;
- significantly reducing public spending by terminating subsidies and increasing the efficiency of electricity sector companies;
- implementing comprehensive energy efficiency programmes to reduce specific energy consumption by 30–35 per cent by 2030;
- attracting necessary investments (about USD 200 billion) into the energy sector; this will require developing an industry reform program, creating competitive markets, increasing electricity prices in order to create a favorable investment climate for private investors, strengthening control over monopolies, and improving and stabilizing the regulatory framework. Investment needs in order to get to the 2030 forecast run upwards of EUR 46 billion in the thermal power sector alone (where capacity remains on the current level).

## Ukraine in the Energy Community

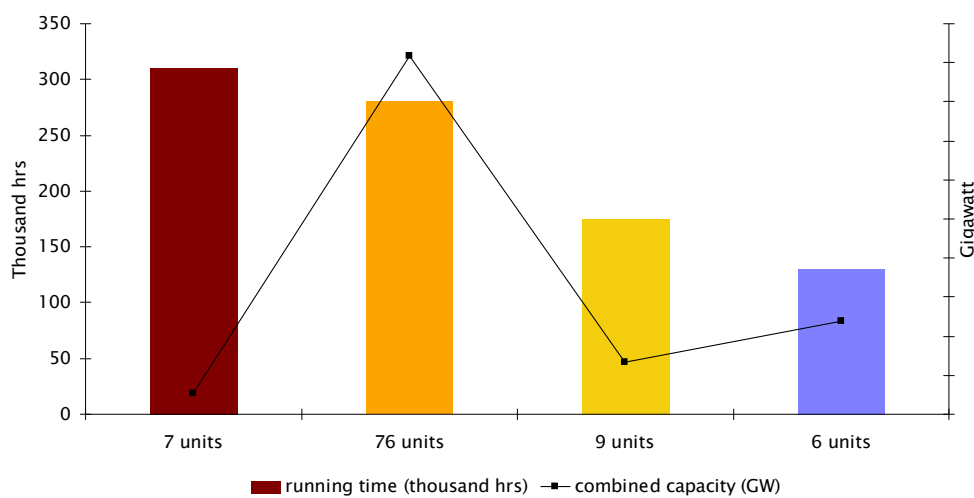
In September 2010 Ukraine acceded to the Treaty Establishing the Energy Community and undertook a number of commitments to reform its energy sector. This included pledges to align its energy sector with the EU internal energy market and the *acquis communautaire* related to energy. The adoption and full implementation of provisions within the Energy Community Treaty could provide Ukraine with a competitive, transparent and predictable market framework that would help attract investment and underpin efficiency improvements in the energy sector. While

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<sup>22</sup> Costs challenges aside, this measure is particularly difficult to put into practice in order to meet 2030 targets because according to the national energy company 'Ukrenergo', who is in charge of the long-term planning and regulation of the country's electrical networks, only five power plants are allowed to be taken offline every year in order to keep capacity levels manageable in the energy system.

a number of steps are already underway, further room for improvement and reform remains. Ukraine’s electricity infrastructure is ageing and deteriorating: many power plants operate well beyond their technical lifetimes (see chart below)<sup>23</sup> and at low efficiency levels. Furthermore, limiting emissions from air pollutants at large combustion plants as required under the Energy Community Treaty will require investments of nearly USD 10–12 billion. Conforming to these requirements provides an opportunity to reduce harmful air pollution and improve plant efficiency.

**Elapsed running time of groups of TPP units in Ukraine (estimate numbers)**



Under the original Energy Community Treaty provisions, Ukraine had to upgrade its plants by 2018 to comply with the LCPD or face closure. However in October 2013 a decision<sup>24</sup> was taken to extend the deadline but tighten the requirements, so they will have to be in line with the IED by 2027. An Energy Community study shows that investments aimed at compliance with the IED will not cost much more than complying with the LCPD, thus Contracting Parties have every incentive to strive for IED compliance. This Ministerial Council deadline extension has not been transferred into Ukrainian legislation yet, so the Order of the Ministry of Environment nr. 309, which regulates emissions from large combustion plants at the national level, still pinpoints 2018 as the deadline for implementation and thus a more ambitious target than the Energy Community ones.

23 Reproduced based on a presentation by the European Business Association: Thermal Power Generation Sector of Ukraine on the way to implement LCP Directive 2001/80/EC – <http://www.energy-community.org/pls/portal/docs/1216180.PDF>. The 300 000 hours running time represents an important threshold defined as the age limit for the metal according to current technological normative documents.

24 [http://www.energy-community.org/portal/page/portal/ENC\\_HOME/AREAS\\_OF\\_WORK/Environment/LCP](http://www.energy-community.org/portal/page/portal/ENC_HOME/AREAS_OF_WORK/Environment/LCP)

As part of the October 2013 decision mentioned above on compliance of existing plants with the IED by 2027, countries can develop National Emissions Reduction Plans (NERPs), a tool to allow thermal power plants to operate provided that every plant is in compliance with the IED. NERP allow countries a longer deadline than the original LCPD provisions in the Treaty, but the emissions limit values are stricter. NERP mean that instead of each plant following a certain trajectory of declining emissions, the average emissions from plants across the country must decline according to a pre-decided trajectory. Countries which do not want all of their plants to comply can average their emissions and decide which plant is easier and cheaper to retrofit, while the big polluters can delay action to limit their emissions.

Another tool is the opt-out, by which plants not included in a NERP are allowed to run for a maximum of 20 000 hours after 2018. They can then either run full time for just under three years or be kept in cold reserve for longer, with a maximum deadline of 2023.

The only country to have drafted a NERP so far is Ukraine, which is asking to extend the deadline for compliance with the IED from 2027 to 2033, 40 000 hours for the opt-out instead of 20 000 and 2030 instead of 2023 for the deadline for opt-out plants to close completely.

The ageing coal-fired power plants have had insufficient maintenance and limited investment for many years. This hampers efficiency which is further challenged by the high ash content of Ukrainian coal. Although some 30 units are reported as supercritical units, efficiency is far from state-of-the-art. While some investments and upgrades in recent years have improved plant performance, much more is needed and efficiency improvements should be a priority.

As Ukraine has one of the most energy-intensive economies in the industrialised world, energy efficiency represents the single best opportunity to improve energy security. Although the Energy Community sets a very low target for energy efficiency (9 per cent by 2020) improved efficiency is essential for Ukraine's growth and development and for protecting its environment. Ukraine can improve its energy efficiency considerably through targeted policies.



# Zooming in on Dobrotvir

## The Dobrotvir power plant

The Dobrotvirська power plant<sup>25</sup> is owned by DTEK Zakhidenergo and located in the western part of Ukraine, approximately 70 kilometres from Lviv. It employs around 950 people.<sup>26</sup>

Four of eight units are in operation, with an installed capacity of 500 MW. Dobrotvirська began commercial operation in 1959. Unit 8 is currently being tested after the installation of an electrostatic precipitator, so that dust emissions are in compliance with the LCPD. Unit 7 is scheduled for reconstruction in 2015.

In 2007 plant efficiency was reported at 32.49 per cent, while DTEK now reports it somewhere between 28 and 30 per cent. Used to cover peak load, Dobrotvirська needs to by-pass the electrostatic precipitator often. Cold starts, as well as ramping up or down trigger high fuel consumption.

Coal is transported to Dobrotvirська from DTEK mines in both Donbass and Cernonograd, located 15 kilometres from the plant. Dobrotvir's coal consists of 40 per cent volatile matter and 25 per cent ash, which is quite high, requiring more water use. Even some lignite has a lower ash content.

The construction of Units 9, 10 and 11 at 225 MW each began in 1988 but stopped due to the collapse of the Soviet Union in 1991. A Japanese delegation comprised of representatives from the ITOCHU Corporation and Tokyo Electric Power Services Co., Ltd. visited the plant in 2010 and 2013. Japanese ultra-supercritical technology promoters and development banks including NEXI



*The Dobrotvir thermal power plant*

<sup>25</sup> All photos in this section are under copyright by Oleg Savistky and Slavka Kutsay, National Ecological Centre of Ukraine

<sup>26</sup> Feasibility Study on Dobrotvirська Coal-Fired Power Extension Project in Dobrotvirська, Ukraine, Prepared by: ITOCHU Corporation Tokyo Electric Power Services Co., Ltd., pg. 3

and JBIC are proposing to alter the initial construction plan (225MW×3 units) into a single ultra-supercritical 600 MW unit at a cost of USD 870 million *“for the purpose of efficiency improvements and reducing emission of SO, NO and dust”*<sup>27</sup>. DTEK asked investors to consider making the best use of old constructions. The reasons why Dobrotvir was chosen and not others in the area are that it uses combusted bituminous coal to which USC technology can be applied, and the plant is near the Polish border and a transmission line that could export the generated electricity.

The feasibility study places such a high emphasis on electricity exports to Poland because existing power plants of 6,000 MW installed capacity are forced to shut down by 2017 in order to comply with the IED. The study suggests that this may cause power supply shortages in 2016–2017, with shortages in the winter season of 2017 estimated at 1,100 MW. Therefore, it is possible to contribute to the power supply stabilisation of Poland with this project.

However construction is only scheduled to begin in 2018 with commercial operation slated for 2021<sup>28</sup>. Also the feasibility study refers to an EIA that was prepared for the initial project in 1988<sup>29</sup>, and now the team that prepared the study is investigating whether the EIA permit is still valid, suggesting, thus, a way of bypassing current legislation on access to information and public consultations that had not been in place in 1988.



*DTEK workers at the Dobrotvir thermal power plant*

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27 Idem., pg. 73

28 Idem, table on pg. 27

29 Idem, pg. 109

## Residents of Dobrotvir

Dobrotvir is a town of 6,500 people, founded in 1951 with the construction of the existing power plant to accommodate workers at the plant. The initial population was about 1,500.

The town is not a signatory of the Covenant of Mayors and therefore does not have access to EU financial facilities that support signatories in the development and implementation of sustainable energy plans. The Mayor of Dobrotvir is quite keen to develop community-based renewable energy projects, building retrofits and pastime facilities for the locals and is seeking funding in this respect.



*The mayor of Dobrotvir*

During the visit, **Roman Nikolayev, Head of the Administration in Dobrotvir** said: *“We want the environmental tax to be used to solve our problems. Ash falls down on our heads, thus it is our right to decide where money should go. Period. We must get rid of this monopoly when our money goes somewhere we don’t know where, in the pocket of oligarchs.”*

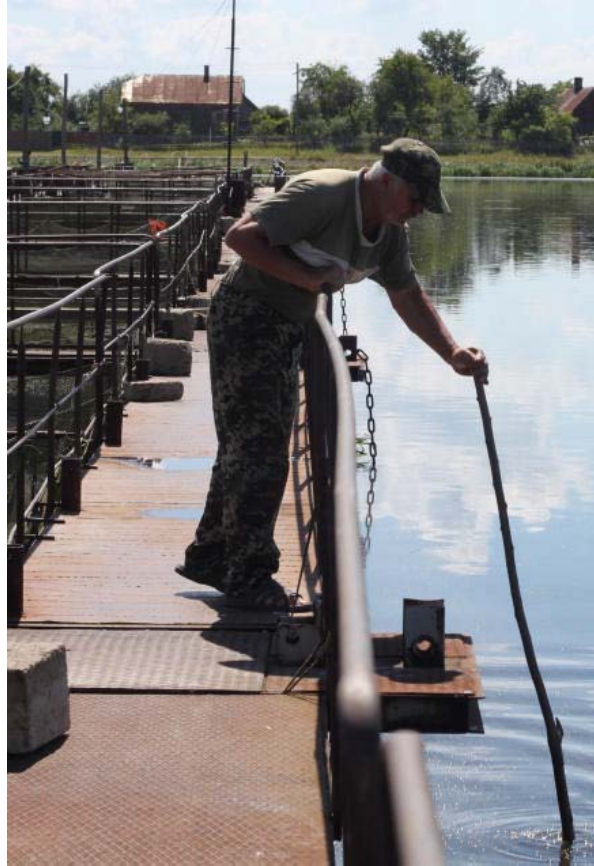
Residents in Dobrotvir acknowledge that even though the power plant is harmful to theirs and their children’s health, there is no way to get rid of the pollution immediately. They believe that thermal power plants are “less evil” than nuclear plants and more likely to be retrofitted with new technologies than replaced. But the community does not feel that their compensation is sufficient to accept living so close to a thermal power plant.

Another problem that the local administration faces is a lack of adequate information about air and water pollution. The town has no expertise and no accessible results from monitoring, so they can only guess by “watching the grey snow every winter and unceasingly washing their dusted cars”.

## Local business in Dobrotvir – a big challenge

Roman Ivanovich Depa started his fish farming business 15 years ago in the village of Ruda five kilometres from Dobrotvir. The farm is located right after the outfall of the water discharge channel from the Dobrotvir power plant. The plant, as in Burshtyn, does not have a cooling tower and instead uses a seven kilometer discharge channel that is diverted from the Zakhidnyi Buh River.

On 25 May 2014 hot water was discharged into the channel, and temperature at the fish farm site measured 41 to 42 degrees Celsius, killing all the fish in the channel. The water discharged at the power plant was presumably much hotter than that. After the accident, dead fish from the channel were collected by fishermen and DTEK employees. DTEK provided trucks to carry the fish to a waste deposit facility. The fish farm lost all of its brood stock fish and most of the young fish, weighing more than six tonnes in total.



*Above and below:  
Roman Ivanovich Depa at his fishfarm*



Since his business started, in 1999, Roman has taken Dobrotvir Power Plant to court 18 times. He says there have been multiple accidents, involving water pollution and hot water discharge. He is a licensed public environmental inspector and the deputy head of the public council for the department of fishery protection in the Lviv region. The accident in May was well documented, and official complaints were sent to all relevant institutions. The official estimate of state losses due to environmental damage is UAH 18 million, a bit more than EUR 1 million, and the losses to the fish farm itself were estimated at nearly EUR 100,000.

Water levels in the lake and the rate of water discharge through the dam are set by the power plant operator without notifying the fish farm or local communities.

The power plant operator, as concessionaire of the lake, is responsible for dredging the lake, but it has not done so in the last 15 years. The costs of this operation are estimated at about EUR 150,000.



*The power plant is visible behind the fishfarm*

# Conclusions

Ukraine's energy sector is at crossroads and in need of large and continued investments to ensure its modernisation, sustainability, security, self-sufficiency and competitiveness. The sector also needs coherent policies to ensure that environmental and social protection is given due consideration, and that in the drive for electricity exports aimed at attracting foreign investments to the country, people are not unduly exposed to health-threatening sources of energy.

Ukraine's membership in the Energy Community was jeopardised in 2013. A number of politicians, including ousted president Viktor Yanukovich<sup>30</sup>, expressed reservations about the Community even as Ukraine began implementing its commitments. Uncertainties regarding energy sector reform held the country back.

Currently President of the Energy Community's Ministerial Council, Ukraine, pushed by industry, has one foot in the doorway while attempting to lower ambitions for the implementation of the environmental *acquis*, specifically directives aimed at reducing emissions. This would be an extremely worrying precedent if a regulatory framework were to set different binding rules for its members. The situation is a 'double-edged sword' that might disturb the path towards a level playing field within the Community and result in electricity market distortion.

EU environmental commitments need to be adopted in Ukraine and guided by a long-term vision to protect people's health and contribute to import independence. The government should give equal weight to all policy areas, meaning that the environmental *acquis* must be seen as having equal importance as the energy *acquis*. Only after the implementation of the environmental *acquis* can a level playing field ensure a common energy market for the EU and Energy Community and avoid electricity exchanges from environmentally-damaging sources.

While electricity is relatively cheap in Ukraine, it comes at a great environmental and health cost. None of the coal-fired power plants in Ukraine have any SO<sub>x</sub> and NO<sub>x</sub> pollution control, while particulate matter emissions currently exceed those of the EU's Large Combustion Plants Directive by up to 45 times, on average<sup>31</sup>. The power plants in western Ukraine export electricity to EU member countries including Hungary, Slovakia and Romania that would not be allowed to host the plants.

If one were to put a price tag on the health impacts of operating Ukraine's obsolete power plants it is difficult to imagine that anyone would like to communicate this cost to the population. In the absence of a health impact analysis of energy production, one must make comparative

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30 Yanukovich Mulls Ukraine's Exit from Energy Community, Ekonomichna Pravda, 27.11.2013. – <http://www.epravda.com.ua/news/2013/11/27/405519/>

31 <http://www.energy-community.org/pls/portal/docs/1216180.PDF>

scenarios and reference relevant literature. A recent report published by Health and Environment Alliance states<sup>32</sup> that the external costs to health for electricity produced from lignite and coal are higher than for any other energy source in Europe. One terawatt hour (TWh) of electricity produced from hard coal implies on average 24.5 air pollution-related deaths. In addition, 225 cases of serious respiratory, cardiovascular and cerebrovascular disease were part of the estimated health burden of electricity generation from hard coal, as well as 17,676 cases of minor illnesses. A large coal power plant<sup>33</sup> operating at full load throughout the year usually produces several terawatt hours of electricity and thus a multiple of these health impacts.



*Burshtyn*

32 [http://www.env-health.org/IMG/pdf/health\\_report\\_the\\_unpaid\\_health\\_bill\\_how\\_coal\\_power\\_plants\\_make\\_us\\_sick\\_final.pdf](http://www.env-health.org/IMG/pdf/health_report_the_unpaid_health_bill_how_coal_power_plants_make_us_sick_final.pdf), pg. 23

33 Assuming an electric power of 1000 Megawatt (1 Gigawatt) and 7500 full load hours of 8760 potential hours during one year the plant will feed 7.5 Terawatt hours into the grid.

**“Ukraine’s energy sector faces unprecedented challenges, from a reliance on expensive fossil-fuel imports to inefficient infrastructure and markets. But rather than viewing these as vulnerabilities, Ukraine’s energy sector is potentially a low-hanging fruit for reform.”**



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