

## Investment projects

UAH 19.9 bln was invested in production development across DTEK Group. The amount of capital investment almost doubled year-on-year, laying the foundations for improved performance statistics across all activity areas in the future. This will contribute to achieving Ukraine's strategic goal of energy independence.

Investments volume, UAH mln (IFRS, ex VAT)\*

Business segment	2017	2018	Change, (+/-)	Change, (%)
<b>DTEK Energy</b>	8,416	7,587	-829	-10
Coal production and processing	4,552	4,061	-491	-11
Electricity generation	1,526	1,408	-118	-8
Kyivenergo	1,199	103	-1,096	-91
Others	147	465	+318	+216
<b>DTEK Grids</b>	992	1,932**	+940	+95
<b>DTEK Renewables</b>	370	9,556	+9,186	+2,483
<b>DTEK Oil&amp;Gas</b>	1,143	1,685	+542	+47
<b>DTEK Group</b>	10,388	19,878	+9,490	+91

\* Excluding the cost of intangible assets.

\*\* The total amount of investments includes UAH 1,550 mln until the moment when DTEK Grids was separated from DTEK Energy

UAH **19.9** bln  
was invested in production development  
of DTEK Group

## DTEK Energy

### Coal mining and processing

Ukraine has sufficient reserves of G-grade coal to become energy independent. The company invests in the industrial development of enterprises and the new-generation of equipment for the maximum conversion of thermal generation to domestic coal.

#### Key projects in 2018

##### Ensuring stable ventilation of mines

- The Yuvileina mine is building a ventilation well. This long-term project provides for ventilation of the mine workings and transport connections to the work site to ensure access to new reserves and extraction of 19 mln tonnes of coal. In 2018, preparation for the well operation in the "load" mode was in progress — construction, installation work on the garage-charging facility was completed, and the side-tilting facility was constructed. The lift system for staff transportation has been working since 2016, the airing mode since 2013.
- The Dniprovs'ka mine is carrying out replacement of its main ventilation fan to provide enhanced airflow, which is important for maintaining coal production volumes. The project is to be carried out in three stages. During the first stage, the mechanical part of the main fan installation was commissioned, a vestibule-gateway was erected, and the channel door was replaced. In the second and third stages, which are scheduled to begin in 2020, the electrical part of the fan and charge feeders will be replaced.

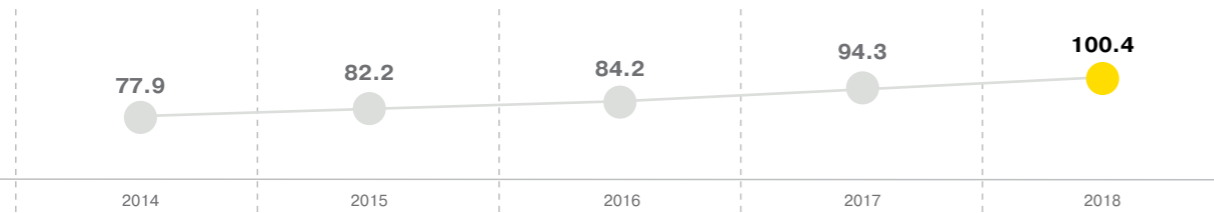
##### Modernization of processing facilities

- The first supplies of equipment were made to the DTEK Oktyabrs'ka CEP as part of a project to modernize outdated facilities, which envisages

enrichment of 1–13 mm run-of-mine coal in heavy-medium hydrocyclones.

- Two new centrifuges have been installed at the DTEK CCM Pavlohrads'ka CEP, one of the company's most powerful processing plants. This project will have a positive impact on the region's ecology, because the installation of centrifuges will reduce the consumption of chemicals during the enrichment of coal, while reducing the load on the water-slurry system of the enterprise. According to the results of 2018, the use of reagents was reduced from 11.4% to 10.4%, and the throughput load of the plant was increased from 925 to 1,013 tonnes per hour. It is planned to continue the implementation of the project and install two more centrifuges.
- The DTEK Dobropil's'ka CEP and DTEK Oktyabrs'ka CEP are building waste dumps using innovative "green dump" technology. A clay bank-up is carried out for each tier of the dump by building an internal drainage system and a fire-prevention protective layer. These projects reduce the environmental impact by eliminating the formation of combustion sources and the contact of waste coal with the environment, while water will be discharged into the pond and reused in production. In 2018, construction and installation work at DTEK Oktyabrs'ka CEP was completed, which ensures the disposal of waste coal for 10 years. The completion of the DTEK Dobropil's'ka CEP project is expected in 2019.

DTEK Energy's performance in coal production increased by one-third due to the development of production facilities, tonnes/person per month\*



\*The data are given for mining of D, DG-grade coal.

**Upgrading and developing new equipment**

On the request of the company, engineering plants are developing new-generation equipment aimed at increasing production levels of G-grade coal over a shorter time to minimize the use of anthracite by thermal generation. At the same time, coal deposits in Ukraine are characterized by location at great depths — from 500 to 1,000 meters, and thin productive reservoirs of 0.8–1 meters.

**2013—2016**

Development of fundamentally new equipment for carrying out rectangular airways in thin coal seams, in which equipment for coal extraction is then installed. Several of the company's mines carried out testing for a cutting frontal complex (CFC), in order to adapt it to work in various mining and geological conditions. Performance of the CFC allows an increase in the pace of mining, including through hard rock. The first samples were delivered to the Stashkov mine.

**2017—2018**

A CLS 450 cleaning combine has been developed and has passed industrial tests. It is intended for mining thin and medium coal seams in difficult mining and geological conditions. The CLS 450 will increase the output at the workface to over 2 tns tonnes of coal per day. The combine's completely conforms to the international standard of labor protection OHSAS 18001: 2007.

The first samples were delivered to Dobropil's'ka and Bilozers'ka mines.

**2018—2019**

Development of a new type of heavy-medium tunnel boring machine with installation for anchorage. The project aims to increase the rate of development of extraction from 5 to 10 meters per day. Testing of the new equipment, RH-160, is scheduled in 2019 at the Stepna mine.

To improve safety and efficiency of operations, the company is upgrading its mining equipment. In addition, new equipment has improved performance, which reduces operating costs. In 2018, DTEK's Pavlohrad coal mines were supplied with 12 tunneling and 8 cleaning combines, as well as 35 electric locomotives were modernized. DTEK Dobropolyeugol was supplied with 3 tunneling and 2 clearing combines.

**Cooperation with research institutions**

Development of coal deposits is a knowledge-intensive process, since in Ukraine the mining and geological conditions are among the most complex in the world. The company, together with research institutions, is developing solutions for the efficient development of deposits. Cooperation is in the following directions:

**Polyakov Institute of Geotechnical Mechanics under the National Academy of Sciences of Ukraine**

- developing recommendations for the ventilation and the degassing of the mine network
- examining aerogas control projects and fire protection projects at the mines
- developing measures for the opening and degassing of reservoirs
- studying the ability of coal seams to oxidation and spontaneous combustion
- determining the physico-mechanical indicators of rocks and coals

**NTU "Dnipro Polytechnic"**

- developing recommendations for rock-pressure control
- fixing a working face with a difficult-to-control roof
- rational parameters of mining operations

**Pisarenko Institute for Problems of Strength under the National Academy of Sciences of Ukraine**

- research and modeling of the condition of surface objects

**Ukrainian State Geological Research Institute**

- geological examination and estimation of the initial value of coal reserves

**SE "UkrNDIvuhlezbahachennya"**

- certification of coal for branding
- coal quality analysis

**SE "Shulgin State Road Research Institute"**

- studying the composition and properties of the rock
- developing recommendations for design and construction of highway embankments using byproduct rock of enterprises

**Electricity generation**

Reduction of the share of imported energy resources in the country's fuel balance and integration with the European energy system ENTSO-E remain the key tasks of the energy sector. The company actively supports these processes to strengthen the energy security of Ukraine. In 2018, DTEK Energy continued converting its TPPs to run on domestic coal and preparing for work according to ENTSO-E standards.

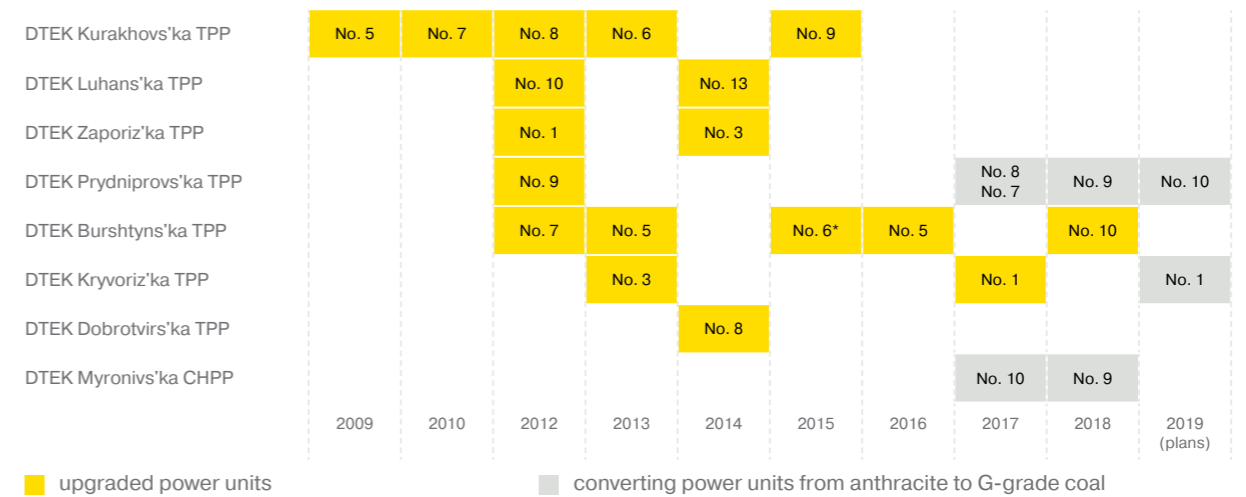
**Key projects in 2018**

- DTEK Prydniprov's'ka TPP: power unit No.9 was switched from anthracite to G-grade coal. To re-equip the power unit, more than 200 tonnes of heat and mechanical equipment was installed (gas, air, dust pipelines); three new fans were installed in the gas-air-drying scheme, 16 old burners were replaced with new ones, with low nitrogen oxide emissions. Similar work on re-equipment of the power unit No.10 has been completed in 2019. A new electrical filter was built as part of the project. Starting in 2012, when upgrading and reconstructing power units, the company has been reconstructing electrical filters to achieve dust emissions in accordance with Directive 2001/80/EC.
- DTEK Myroniv's'ka CHPP has completely transferred from anthracite to using G-grade coal. In the reporting period, the re-equipment of boiler No.9 was completed, similar work on boiler No. 10 was completed in 2017.
- DTEK Burshtyn's'ka TPP has reconstructed power unit No.10. As part of the project, a new boiler was built and the boiler drum, turbine, auxiliary transformer, turbine generator excitation system, dust preparation system and other equipment were replaced. Also, a new automatic control system was installed, which has

advanced functions for predicting the operating modes of equipment. The project has significantly improved production capabilities — the installed capacity of the power unit has been increased by 15 MW to 210 MW and the service life of the equipment has been extended by 15 years.

- DTEK Ladyzhyn's'ka TPP built a solar power plant at a dam with installed capacity of 0.5 MW. Ladyzhyn's'ka SPP has supplied electricity to the United Energy Systems of Ukraine since July 1, and produced 265.5 tns kWh during the past year.
- DTEK Zaporiz'ka TPP completed a pilot project to develop a standard plan for monitoring, reporting and verifying greenhouse gas emissions by thermal generation enterprises. This is a preparatory stage for the implementation of a national scheme for trading emissions of greenhouse gases. The project was implemented jointly with the World Bank under the Partnership For Market Readiness program, which was initiated to combat climate change.
- 11 power units of DTEK Energy TPPs completed the reconstruction of automatic frequency and power control systems, which will ensure the maintenance of the current frequency in accordance with ENTSO-E standards.

**4 GW of installed capacities were restored by DTEK Energy, due to the modernization of its TPPs and CHPP**



■ upgraded power units

■ converting power units from anthracite to G-grade coal

\* Overhaul with an increase in installed capacity.

## DTEK Renewables

### Renewable power generation

According to the Energy Strategy of Ukraine, annual generation by wind and solar power plants should reach 25 bln kWh by 2035. To help achieve this goal, the company plans to increase its portfolio of completed projects to 1,000 MW by 2020.

#### Key projects in 2018

- **Prymors'k wind park (installed capacity of 200 MW):** a contract was signed with GE Renewable Energy on acquisition, installation and further maintenance of 52 wind turbines. As at other plants of the company, new-generation wind turbines will be installed, which adapt to the direction and strength of the wind, with a capacity of 3.8 MW each. In addition, GE will supply high-voltage equipment for a central distribution point of 150 kV, two 150/35/10 kV substations and one 150/35/10 kV distribution substation. This will be the first case in Ukraine when digital technologies for controlling high-voltage equipment and substations will be introduced.

Construction of the wind farm consists of two stages. In 2018, during the first stage, the infrastructure construction and installation work was completed, all sets of towers and blades were delivered, commissioning works were carried out at the central distribution and transformer substations. The first seven turbines have been commissioned in March 2019.

Driveways and pile fields were prepared for the construction of foundations for wind turbines planned for the second stage of the project. The completion of the project is expected in 2019.

- **Orlivi's'ka wind park (installed capacity of 100 MW):** a contract for the construction of a wind park was concluded with the Danish company Vestas, which will supply 26 wind turbines with a capacity of 3.8 MW each. Vestas equipment has proved effective in Ukraine both in terms of wind-dynamic characteristics and electrical power output to the grid. In 2018, preparatory work was carried out at the construction site, and in second quarter 2019 will start delivery of the main equipment.

- **Nikopol solar plant (installed inverter capacity of 200 MW):** the project partner is China Machinery Engineering Corporation (CMEC), with whom a contract for design and construction of the plant has been concluded. Lands unsuitable for agriculture in the territory of an abandoned quarry are reserved for construction. Seraphim Solar and Trina Solar were selected as suppliers of solar panels, KSTAR will supply inverter substations, Xian Electric Engineering will supply transformers (all of them are Chinese companies). In 2018, solar panels and inverters were installed as part of the project, and infrastructure construction was completed.

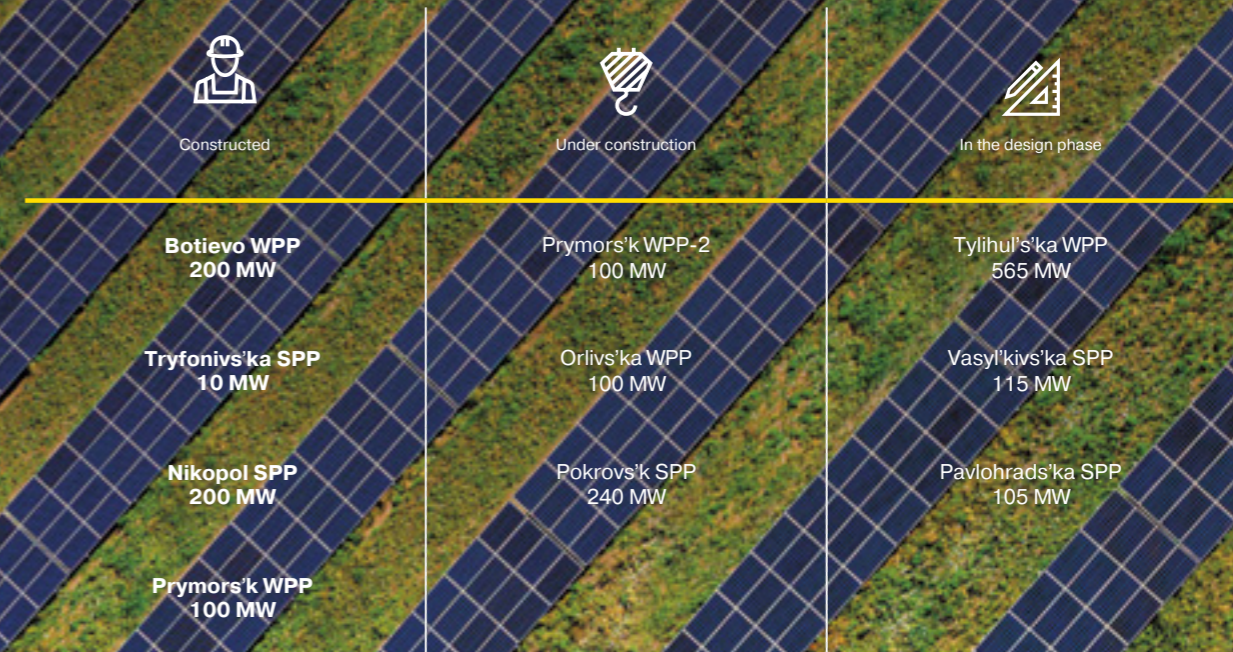
The plant generates green electricity as of 1 March 2019. Nikopol SPP is among the top 3 largest solar power plants in Europe (at the time of construction).

- **Development of new projects:** 1,000 MW of installed capacity in renewable energy should be achieved by 2020 in accordance with the development strategy of the company. A new project will be the construction of Pokrovs'k solar plant, the start of green power generation are planned in 2019 (installed inverter capacity of 240 MW).

- **In addition, the company is developing projects which implementation is planned for 2020.** Tylihul's'ka WPP and Tylihul's'ka WPP-2 with total installed capacity of 565 MW are projects in the wind energy sector. The new plants will produce around 2 bln kWh annually. This will allow CO<sub>2</sub> emissions to be cut by almost 3 mln tonnes annually. Among the solar projects, Vasyl'kivs'ka and Pavlohrads'ka SPPs (installed inverter capacity of 115 MW and 105 MW respectively) are under design.

1 GW of installed capacity of DTEK Renewables will reduce 2,600 ths tonnes of CO<sub>2</sub> emissions' equivalent per year

Data as of May 30, 2019



Production of electricity from fossil fuels involves the downside of atmospheric emissions of greenhouse gases. To estimate these emissions, the CO<sub>2</sub> equivalent is used, which allows all greenhouse emissions to be brought to a common denominator. To calculate the contribution of renewable energy to the reduction of emissions, we use conversion factors for specific CO<sub>2</sub> emissions per 1 kWh from the average calculation for thermal power plants. In 2010, the National Environmental Investment Agency of Ukraine approved the value of this indicator in the amount of 1,063 kg of CO<sub>2</sub> per 1 kWh.



# DTEK Oil&Gas

## Gas production

The company is the largest private gas producer in Ukraine. As a leader we feel responsibility to introduce new solutions and technologies, and share the accumulated experience in order to contribute to the development of the industry. Technological progress expedites achieving the goals of the Energy Strategy of Ukraine – to fully meet the country's need for natural gas from its own production.

### Key projects in 2018

- Wells No.25 and 61 were drilled at the Semyrenkivs'ke field. Production well No.25 was designed and drilled in compliance with the requirements and standards of the American Petroleum Institute (API) and the International Association of Drilling Contractors (IADC). Exploration well No.61 was drilled to study the marginal part of the field.
- Since 2017, the company has been using a pit-free drilling method using the technology of sludge decantation and recycling, which meets international environmental standards.
- Overhauls of wells No.8, 23, 68 and 70 — with a high content of gas condensate — at the Semyrenkivs'ke field were completed. When repairing some wells, the company used the technology of snubbing, which allows to carry out work without killing of well, continuing mining operations.

- Drilling of production well No.43 was started at the Semyrenkivs'ke field.
- A fully automated propane-refrigeration unit at the Semyrenkivs'ke field was commissioned to stabilize natural gas production. The project has become unique for the industry in terms of the equipment and technological solutions used.
- Compressors have been put into operation at gas utilization plants, which will improve the environmental friendliness of the enterprise by returning to the condensate stabilization gas treatment system.
- An automated dispatch control system (ADCS), developed by the company, was patented. The ADCS collects data from wells, from hydrocarbon metering stations, gas treatment installations, gas pollution systems, early detection and warning of emergencies. The system automatically analyzes technological parameters and sends information to users' computers and/or mobile devices.

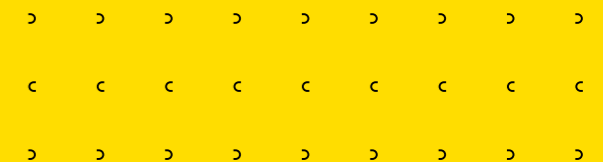
DTEK Oil&Gas is among the best expertise in the industry



16 wells built in five years  
The company now operates 24 in total



a depth of over  
**5 500**  
meters each



# DTEK Grids

## Electricity distribution and grid operation

The company intends to develop the concept of a Smart Grid, which will require a system upgrade of the electricity networks for the integration of modern technologies. This will allow cities to meet demand for automated management of their power grids to increase the comfort level for residents.

DTEK Grids began the implementation of automated power management system ADMS (SCADA), which accumulates and processes data from all parts of the networks. Implementation of this level of software is an important step in building a Smart Grid. For example, as soon as the system receives a signal of power outage somewhere, the ADMS identifies the incident site, analyzes what caused the failure, calculates options for optimal line switching and minimizes inconvenience for customers. Thus, the company's specialists will receive a tool for swift resolution of abnormal situations, and call-center employees will immediately inform customers of the cause of the failure, as well as the timescale for fixing the problem. Such a system is expected to be fully operational in Kyiv in three years, and in the Dnipropetrovs'k region in five years.

One more criteria by which evaluation of the company's effectiveness can be measured is connection to the electric grid. Simple and understandable conditions of this process are an important indicator in assessing the country's investment attractiveness in the Doing Business rating. The rules on data disclosure contained in the Law "On the Electricity Market" and their implementation by The Distribution System Code provide the basis for building such conditions. According to the requirements, as of 1 January 2019, distribution system operators have been obliged to make their geo-information data publicly available.

DTEK Grids is one of the first in Ukraine to fulfill this requirement. In 2018, DTEK Kyiv Grids, DTEK Dnipro Grids, DTEK Donetsk Grids and DTEK Power Grid opened their

maps of electricity networks online. Using the geographic information system, each user can obtain information about the location, voltage level; find the addresses and name of transformer substations, and distribution points. Development of the maps will be continued — the next steps will be an introduction of data, indicated available capacity, as well as creation of an online resource for customers to connect to networks.

In addition, departments for technological connections created in 2018 at DTEK Dnipro Grids and DTEK Donetsk Grids (the same department has been operating in Kyiv since 2017) will contribute to the increase in access availability to electricity grids. The task of the department's specialist staff is to prepare technical documentation, conduct all contractual and accompanying work with the client, as well as monitor the progress of work at each stage. Thus, customers should just submit an application through the Customer Service Centres or the company's website, which is immediately sent to this department's specialist representative. This approach helps to minimize the time for connecting and increase the number of completed applications. In 2018, DTEK Dnipro Grids almost doubled the number of established connections to more than 6,000. Perhaps, this is the secret of leadership of Dnipropetrovs'k region in the number of home solar power plants. Practically 6 mln kWh were sold in May-September 2018 by the regional prosumers — households that independently generate electricity for their own needs and sell the surplus to the network.

### DTEK Grids made more than 11 ths connections in 2018

Enterprise	Standard connection						Non-standard connection
	I degree (up to 16 kW inclusive), pcs.		II degree (from 16 to 50 kW inclusive), pcs.		III degree (from 50 to 160 kW inclusive), pcs.		
	city	village	city	village	city	village	
<b>DTEK Donetsk Grids</b>	830	563	355	120	23	2	26
<b>DTEK Kyiv Grids</b>	166	—	555	—	32	—	312
<b>DTEK Dnipro Grids</b>	3,540	1,314	2,201	955	52	8	76
<b>DTEK Power Grid</b>	—	—	—	—	—	—	1
<b>Total</b>	<b>4,536</b>	<b>1,877</b>	<b>3,111</b>	<b>1,075</b>	<b>107</b>	<b>10</b>	<b>415</b>

DTEK Grids provided a wide range of communication channels to household consumers

	Enterprise	Customer reach	Number of customer service centers	Number of contact centers	User account	PayHub	Facebook
<b>DTEK Dnipro Grids</b>		1,469 999	57	1	✓	✓	✓
<b>DTEK Donetsk Grids</b>		873 711	22	1	✓	✓	✓
<b>DTEK Kyiv Grids</b>		1,155 000	7	1	✓	✓	✓

#### Contact centers

- 24/7 support
- Free call
- Basic issues of power supply (transfer of meter readings, consultation on the account and current tariffs)
- Consultation on individual issues both by phone and on Facebook
- Contact in event of an accident
- Schedule of planned works

#### Customer service centers

- Principle of "one-stop shop"
- All electricity services, including connection to grids

#### Personal account and PayHub

- International security standards of payment systems
- No fee
- Online services for personal and mobile devices, based on Android and iOS
- All information and transactions on personal accounts (reception of meter readings, calculation of the cost of consumed electricity, payment, receipt of email)

#### Websites for customers

- Information about the company's work
- Online services for signing a contract with the company and joining the power grids
- Detailed information on current tariffs for households and legal entities
- Informing about the schedule of planned works

## Key projects in 2018

Within the reporting period, DTEK Grids' enterprises built 147.1 km of high-voltage lines, reconstructed 38.1 km of power lines, and repaired 2,985.4 km of lines, of which 821.4 km were replacement cables. In addition, 10 points were built, 27 substations and distribution points were modernized, 4,932 facilities were repaired. All these projects are designed to improve the quality of life for end-users through uninterrupted power supply to consumers. Also, modernization of power grids provides for the elimination of power shortages, which arise during the development of cities, and to reduce the frequency of outages in electricity transmission.

### DTEK Dnipro Grids:

- construction of the 150/10/6 kV Naddniprovskaya substation, an important infrastructure facility, was completed in Dnipro. From 2019, this substation will provide electricity to new metro stations and reliable power supply to two districts of the city;
- for the first time in Dnipropetrovsk region, aerial facilities (helicopters and drones) were used to survey power lines. Due to the data obtained, specialists will be able to carry out preventative repairs to suspect areas;
- in Dnipro and Pavlohrad, two updated customer service centers have been opened, which provide the entire package of basic services.

### DTEK Kyiv Grids:

- technical update of the 35/10 kV Garnizonna substation has been completed, which supplies Kyiv airport. A modern automated control system has been installed at the substation. This allows for the online collection, storage and transmission of information on both the state of the equipment and the parameters of electrical connections. In addition, the substation's relay protection, electric and control systems were converted to modern microprocessor devices which allow for free programming;
- reconstruction of the 110/10 kV Center substation, which is responsible for the quality and stability of the power supply of the central districts of the capital, has been completed. The project has created a reserve capacity of 40 MVA;
- for the first time in Kyiv, unmanned aerial vehicles (drones) equipped with scanners, video cameras and thermal imagers were used to check the condition of power lines;
- reconstruction of the Poznyaky substation, aimed at improving the reliability of the power supply along the left-bank part of the city, continues. An 110 kV

integrated distribution gas-insulated installation has already been commissioned; two cable lines have been built and are power-connected;

- construction of a 110 kV high-voltage cable transmission line was started as part of a long-term program for the modernization of the capital's power grids.

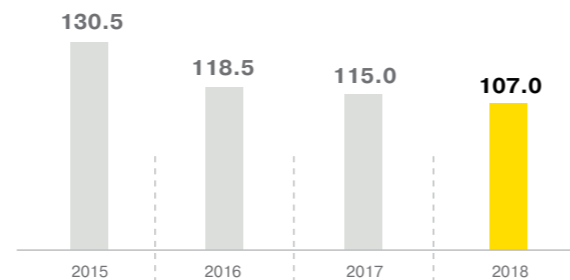
### DTEK Donetsk Grids:

- the energy sector provides reliable power supply to settlements in the front-line zone. Since the outbreak of hostilities, energy supply has been restored in 1,037 settlements;
- the first stage of reconstruction of the 35 kV Selydove substation was completed, which will significantly increase the reliability of the power supply to the city of Selydove and the surrounding settlements;
- in Pokrovs'k, an updated one-stop shop customer service center was opened. For the residents of Pokrovs'k, Myrnograd and Rodyn's'ke, the center provides all services: from verification of meter readings to carrying out contracts;
- the project on the organization of a new Central Dispatch Center is on-going; it will improve the management of the region's energy infrastructure.

### DTEK Power Grid:

- a comprehensive reconstruction of the 110 kV Vuhledar substation has begun to ensure a stable and reliable power supply to the city of Vuhledar.

## CAIDI, average power cut index of DTEK Grids' consumers, min.



CAIDI is the ratio of the sum of all customer power cuts durations to the total number of customer power cuts. The index is measured in minutes. The index does not include force majeure situations and outages in line with emergency shutdown schedules. This data is given for all operators of the distribution system of DTEK Grids.

## Characteristics of distribution system operators of DTEK Grids as of January 1, 2019

Enterprise	Total length of power lines, km	Total number of substations, pcs.	Total power of substations, MVA	Number of clients
DTEK Dnipro Grids	50,258.6	12,663	11,521.2	1,534,388
DTEK Donetsk Grids	32,691.8	6,921	5,105.9	886,808
DTEK Kyiv Grids	11,772.0	3,832	7,278.3	1,194,400
DTEK Power Grid	1,888.2	38	887.8	552
DTEK Energougol ENE	105.1	24	47.2	7,069
<b>Total</b>	<b>96,715.7</b>	<b>23,478</b>	<b>24,840.4</b>	<b>3,623,217</b>

## New areas

### Innovation and efficient use of resources

Further development of the Ukrainian energy sector is impossible without the integrated introduction of innovation. This is the only way to become part of the modern economy and global trends. DTEK Group integrates new approaches into the business ecosystem in order to find solutions and technologies for the transformation of industrial enterprises and the development of customer service.

### Innovation DTEK: integration of innovative solutions

To select and implement advanced technologies and solutions, DTEK has created the Innovation management

function, in 2018. The function is designed to focus on global trends and accelerate business transformation in order for DTEK Group enterprises to become part of modern energy and successfully work in the new electricity market.

### Three key objectives of Innovation DTEK

- 1** Creation of an open innovation culture through cooperation with both external and internal environment. Building a unified center for managing ideas of the DTEK Group.
- 2** Creation of efficient technological communities to attract external expertise in advanced areas, as well as ensuring rapid progression of solutions from concept to end product, adapted to the needs of enterprises.
- 3** Scouting of start-up teams on local and international sites according to the business needs for innovation and creating a base of priority ideas for testing.

In 2018, the Energy Accelerator project was launched with the support of the Radar Tech technology cluster, which is aimed at finding innovative solutions for business needs. 182 start-ups applied for participation in the project, of which nine reached the final round and went through an accelerator program with DTEK mentors.

Three projects were selected for commercial implementation:

- **eVRscan.** 3D laser scanning systems, which, using a scanning lidar and drone, allow for determining the amount of coal reserves currently in warehouses and obtaining digitized data. The technology makes it possible to repeatedly increase measurement accuracy compared to traditional methods, which will improve the quality of fuel supply planning. The startup was the first of the accelerator winners to go through to commercial launch — DTEK Energy's electricity generation directorate took measurements at six stations and plans to use eVRscan in the future.
- **QRSmarty.** The startup's solution enables increased control over accounting and movement of inventory items. Laser markings are applied to consumables, goods, and materials, and software that allows you to see data on storage and movement can be integrated into the general enterprise accounting system. A commercial launch of the solution is expected in enterprises in the first quarter of 2019.
- **Railtex.** A platform that helps to find the most advantageous offer for both car owners and shippers. The platform developers, the Railtex team, plan to create a Ukrainian wagon exchange. Thus, the product will facilitate liberalization of this market, which can change the working conditions of the whole sector of the economy — industrial freights. The Directorate of Logistics of DTEK Energy assists in finalizing the product and bringing it to the market, attracting major industrial carriers and transport fleet holders.

### STRUM: a network of fast-charging stations

Ukraine has been in the top 10 countries in the Global EV Revolution for two years in a row, according to InsideEV's. The high increase in the number of electric vehicles — 200% in 2017 and 93% in 2018 — is maintained at the state level by abolishing excise and VAT on the importation of electric vehicles. At the same time, the charging infrastructure for electric vehicles is still in its infancy: of 1,500 charging stations, only about 30 are fast chargers that can provide high-speed charging with power supply up to 50 kW.

In many countries, the driving forces behind charging infrastructure development are energy companies, for example, ENGIE, Enel, E.ON, EDF, Fortum, Vattenfall and others. Following this global trend and the demand in the Ukrainian market, the company launched the STRUM network of high-speed chargers in June. At the first stage, a convenient high-speed charging network was created in Kyiv. 10 pilot stations are located at a distance of 6–7 km from each other, which provides convenient logistics for drivers of electric cars. At the second stage of STRUM development, it is planned to cover the main long-distance routes of Ukraine: Kyiv — Odesa, Kyiv — Lviv and Kyiv — Dnipro. This will make travel by electric cars in terms of speed and comfort comparable to a trip by conventional cars.

STRUM provided charge for customer vehicles at 211 MWh in 2018.

This is equivalent to using 94 thousand liters of petroleum products, which could lead to 217 tonnes of CO<sub>2</sub> equivalent emissions. In future, the environmental impact will be enhanced by the organic growth of using electricity as fuel and the development of the network.

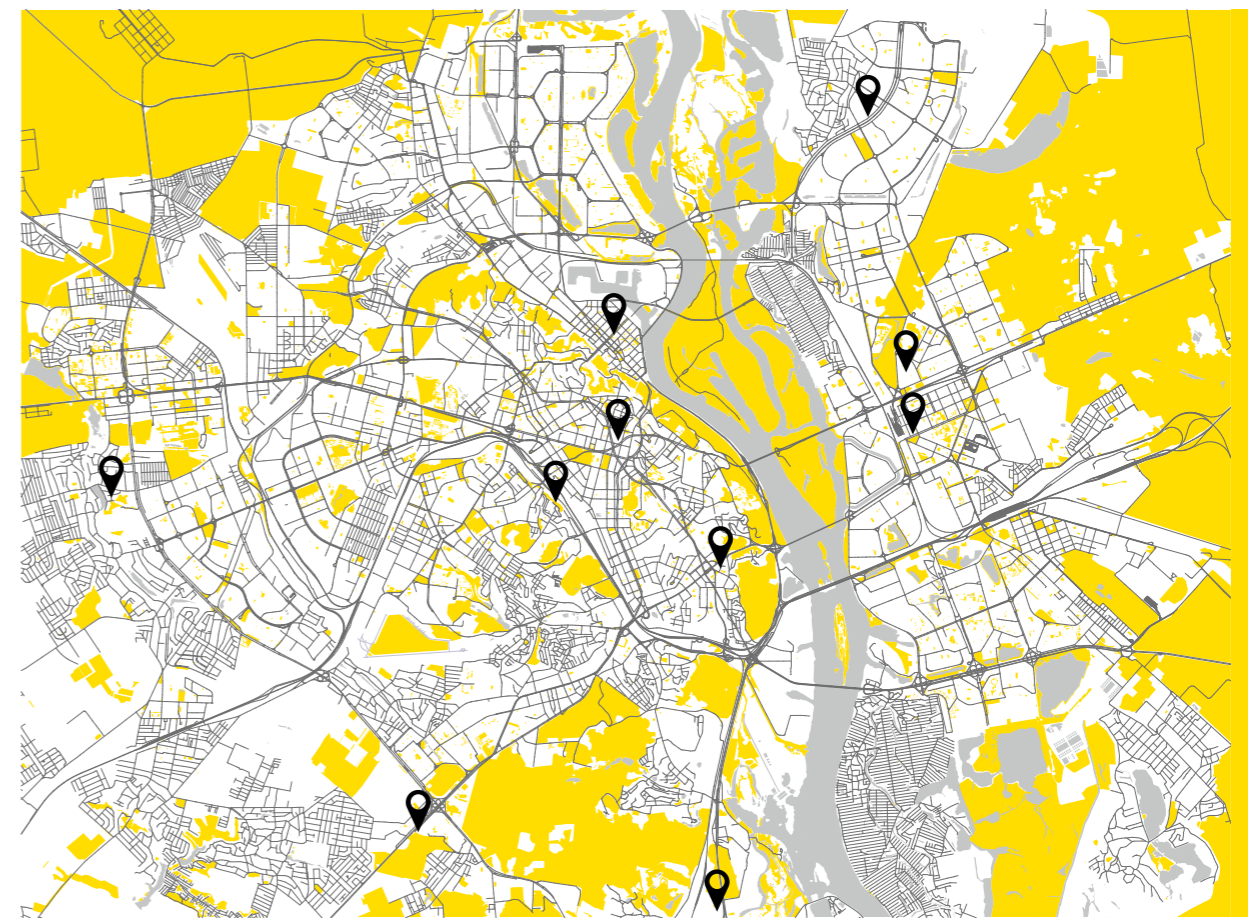


ABB equipment is installed in the STRUM fast charging network. Depending on the technical characteristics of the battery electric vehicle charging takes 15-50 minutes. The STRUM Charging mobile application is available for users, who can download it on PlayMarket and App Store.

Through the application, you can find a station and build a route, start and stop the process of charging an electric vehicle, and replenish the account. A similar application is used in 15 European countries for 10,000 electrical charges.

## DTEK ESCO: energy eaving and energy efficiency

DTEK ESCO specializes in comprehensive energy efficiency and energy saving services. It is important to tell consumers what effect can be achieved, and teach them to select tools. This will help create a culture of energy consumption Ukraine.

At the end of 2018, the total amount of energy service contracts of DTEK ESCO exceeded UAH 712 mln. The company's portfolio includes 37 completed projects, for which annual savings are estimated at 40.2 mln kWh and 1.6 mln cubic meters of natural gas. This is equivalent to reducing CO<sub>2</sub> emissions by 38.4 ths tonnes.

DTEK ESCO specialists have implemented 14 projects for industrial enterprises, another five are in the final stage. The completed projects allow for increasing the reliability of the equipment and the level of industrial safety, as well as improving the working conditions of employees.

For example, at the Central Mining and Processing Plant, due to the installation and re-equipment of pumping units, pump energy savings of up to 50% were achieved, which will amount to about 1.8 mln kWh per year — while increasing the reliability of the ore enrichment process. Ilyich Iron and Steel Works installed three sets of automatics and modernized 24 gas burners in the sintering plant's firing machines, which reduced natural gas consumption by 35%. And the metal sheet-rolling workshop of the Ilyich Iron and Steel Works the modernized lighting system — 2,200 LED luminaires — will reduce electricity consumption for lighting by 60%, an estimated 7 mln kWh per year, and increase industrial safety.

DTEK Energy continues to implement projects to reduce energy consumption by thermal power plants. In 2018, lighting systems were upgraded in the turbine department of DTEK Ladyzhyns'ka TPP and DTEK Zaporiz'ka TPP, in the machine room of DTEK Prydniprov'ska TPP, open switchgear of DTEK Kryvoriz'ka TPP (the expected total savings is 2.7 mln kWh per year). Switching to LED lamps ensures an optimally comfortable level of illumination of 200 lux for power engineers, which corresponds to recommended requirements for an industrial facility. In coal preparation, lighting systems at conveyor galleries of DTEK Dobropil's'ka CEP and the main building of DTEK Pavlohrads'ka CEP have been modernized.

The projects, in addition to saving energy, are aimed at improving working conditions and industrial safety.

In the public sector, the company completed nine energy-efficient projects for kindergartens and schools in Kyiv, Skvyra (Kyiv region), Pokrovs'k and Bakhmut (Donets'k region) in 2018. DTEK ESCO was selected on the results of tenders at the ProZorro platform, which is part of the Unified e-public procurement system in Ukraine.

As part of projects for the modernization of heating systems, the engineering utilities were insulated, the heating system was balanced, automatic weather control systems for coolant supply, and temperature sensors were installed. Energy saving windows were also installed at some sites. A comfortable temperature in the premises was achieved in all projects for children, and a reduction in the consumption of thermal energy from 20 to 45% was ensured for institutions.

**Since 2016, Ukraine has introduced an energy service mechanism in the public sector. The customer makes payment solely by saving energy, guaranteed and achieved as a result of the introduction of energy-efficient measures. The ESCO investor, upon completion of the contract, transfers to the customer all the equipment and all further savings.**

DTEK was the first among Ukrainian companies to develop a set of energy-efficient products under the brand Rozumnyi WATT (Smart WATT) for retail consumers. The sets include dual-zone electricity metering devices, LED-lamps, sockets with timers, instructions with tips on saving electricity and heat.

In 2018, the company opened up new opportunities for customers by offering to make a set independently, and expanded the choice of products for each position. In addition, an energy efficiency calculator is available at <https://dtek-esco.com/calc>, which is designed to help customers calculate current power consumption and show opportunities for rational consumption. This calculation makes it possible to determine the economic feasibility of acquiring a set, since it calculates how much the power consumption will change in a month, one year, five years, and 10 years.

At the end of the year, 18 ths sets of Rozumnyi WATT energy-efficient household goods were sold (2,379 sold in 2017).

