

KeepWarm

*Energy efficiency
investment in
District Heating in
Ukrainian Cities*



This project is funded by the EU's Horizon 2020 research and innovation programme under grant agreement N°784966, and lasts from April 2018 – September 2020.

This project receives co-funding from the German Federal Ministry of Economic Cooperation and Development.



Ukrainian DH context

40% of Ukrainian citizens are served by DH, particularly in densely populated **urban** areas. DHSs are typically **owned by municipalities** and operated by municipal enterprises.

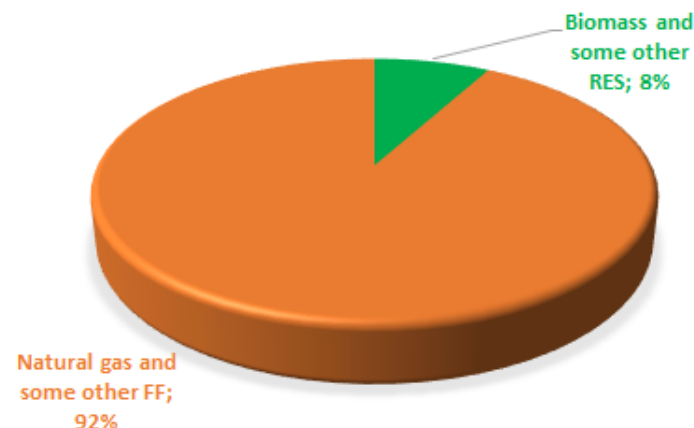
Challenges

- **Smart modernisation** of DHS is needed to increase efficiency
- Heat energy **demand decreasing**
- Significant **debt** levels and lack of **financial resources**
- **Third-party access** to DH networks
- Human resources **deficit**



Source: [Pixabay](#)

DH ENERGY MIX - UKRAINE



District Heating in Ukraine

Trends

- The use of **biomass** for heating is growing
- **Energy efficiency** investment is increasing but needs to be accelerated

Policy stance

- Goal of **40% share of RES** share in DH by 2030
- Measures to **minimise natural gas** usage **and increase efficiency** in DH and buildings
- **Reducing GHGs emissions** according to NDC

Investment subsidies covering:

New DHS /expansions of DHS	-
DHS retrofits for EE / RES	++
Consumers / connections	++
Soft loans and other financing	+
Tax incentives	-

Recommended actions

- Approve a sector strategy on efficient DH and decarbonization goals
- Develop a debt management plan
- Increase public investment in DH modernization
- Support new business models

For more information:

<http://www.keepwarmeurope.eu/country-pages/ukraine/>

DHS Bila Tserkva

(Municipal enterprise Bilotserkivteplomerezha)

- Location: **Bila Tserkva, Ukraine**
- Ownership: **municipal**
- Grid: **163 km** (owned by the municipality)
- Customers: **1,370 buildings**
- Connected load: **327 MW**
- Boiler output: **419 MW** (407 boilers)
- Type of DHS: **hot water**
- Current fuel: **natural gas**
- Potential renewables nearby: **biomass**



Source: DHS Bila Tserkva web-site, bctm.com.ua

Investment plans (2020-2025):
Installation of new efficient natural gas boilers and 1 MW biomass boiler, replacement of pipelines, including 800 mm pipeline connecting DHS with the nearby CHP plant

For more information:

DHS Zhytomyr

(Municipal enterprise «Zhytomyrteplokomunenergo» of Zhytomyr city council)

- Location: **Zhytomyr, Ukraine**
- Ownership: **municipal**
- Grid: **207 km** (owned by the municipality)
- Customers: **1,952 buildings**
- Production: **563,299 MWh** (2017)
- Boiler output: **789 MW** (204 boilers)
- Type of DHS: **hot water**
- Current fuel: **natural gas**
- Potential renewables nearby: **biomass**



Source: DHS Zhytomyr web-site, tke.org.ua

Investment plans (2020-2025): **Biomass CHP unit with ORC technology, complex modernization of network subsection**, installation of new natural gas boilers, replacement of pipelines, and installation of individual heating units.

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DHS Ternopil



(Municipal utility district heating company
“Ternopilmiskteplokomunenergo” of Ternopil City Council)

- Location: **Ternopil, Ukraine**
- Ownership: **municipal**
- Grid: **152 km** (owned by the municipality)
- Customers: **over 42,000**
- Production: **471,597 MWh** (2018)
- Boiler output: **709 MW** (137 boilers)
- Type of DHS: **hot water**
- Current fuel: **natural gas**
- Potential renewables nearby: **biomass**



Source: DHS Ternopil web-site, teplo.te.ua

Investment plans (2020-2025):
10 MW and 4 MW biomass boilers, modernization of boiler houses, replacement of pipelines, and installation of individual heating units.

For more information:

<http://www.keepwarmeurope.eu/country-pages/ukraine/>

- Location: **Khmelnytskyi, Ukraine**
- Ownership: **municipal**
- Grid: **138 km** (owned by the municipality)
- Customers: **about 20,000**
- Connected load: **96.75 MW**
- Boiler output: **293.8 MW** (43 boilers)
- Type of DHS: **hot water**
- Current fuel: **natural gas**
- Potential renewables nearby: **biomass**



Source: DHS Khmelnytskyi web-site, pivzakteplo.com

Investment plans (2020-2025): **Construction of 5 MW biomass boiler, modernization of boiler houses with new burners installation**, replacement of pipelines and installation of individual heating units.

For more information:

Natural Gas Prices

- Natural gas is the dominant fuel for the district heating sector;
- The price of natural gas is subject to political impact and market fluctuations, which result in high uncertainties on future cost;
- Different levels of natural gas prices have been applied in estimating economic feasibility of investment projects:
 - EUR 270 per 1000 m³ - “subsidized price”;
 - EUR 371 per 1000 m³ - “baseline level”;
 - EUR 480 per 1000 m³ - “market level”;
- All assumed prices are significantly higher than the current level of natural gas prices in Ukraine.

- The main types of energy efficiency improvements for DHSs in Ukraine include:
 - Replacement of steel pipes with pre-insulated pipelines;
 - Replacement of burners in existing natural gas fired boilers;
 - Installation of new natural gas fired boilers with the efficiency of at least 92%;
 - Centralization of DH grid sections with decommissioning of smaller inefficient boiler houses;
 - Replacement of grid pumping equipment;
 - Installation of frequency converters.

Feasibility of Energy Efficiency Measures

Assumed natural gas price, EUR per 1000 m ³	270	371	480
Modernization scenarios	IRR value under different NG prices		
DemoUkraine project – centralization of heat supply, new boilers, substations, pipeline replacement	10.6		
Modernization of heat generation facilities – installation of new natural gas fired boilers with the efficiency of 92%	10.0	14.1	18.3
Replacement of main pipeline between DHS and CHP	5.2	8.4	11.5
Replacement of pipelines – sections with heat energy losses significantly exceeding the average heat losses	3.1	5.8	8.5
Boilers replacement at 7 First Vilskyi lane boiler house	16.2	25.3	31.1
Boilers replacement Karetnyi lane boiler house	11.9	17.1	22.4
Modernization of the district heating sub-network connected to RK-6 boiler house	6.9	9.2	11.6
Pipelines replacement - pipelines connected to three boiler houses (Molodizhna 2, Ternopilska 14/3, and Pivnichna 2)	<0	0.4	2.2
Replacement of burners	15.7	21.6	27.7
Optimization of district heating system in Grechany district	1.3	3.1	9.1

For more information:

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Conclusions

- Feasibility of energy efficiency investment in DH significantly depends on natural gas prices and reduction of fossil fuel subsidies is important for promoting EE improvements;
- Replacement of inefficient boilers and modernization of burners demonstrate high economic feasibility;
- Feasibility of complex project including boilers and grid modernization is case-specific and opportunities for centralization, optimization of generation capacity and network design should be reviewed to improve financial attractiveness;
- Pipelines replacement demonstrate low or medium (for most inefficient sections) feasibility and would required significant public support
- Energy security impact should be considered along with economic feasibility during the selection of priority projects

Thank you!

For more information,
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[@KeepWarm_EU](https://twitter.com/KeepWarm_EU)



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