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WHITE PAPER ON TRANSFORMING DISTRICT HEATING IN UKRAINE: ASSESSMENT AND RECOMMENDATIONS

ENERGY SECURITY PROJECT (ESP)

Update August 07, 2020

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operated by
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UNITED STATES DEPARTMENT OF ENERGY
under Contract DE-AC05-76RL01830

Printed in the United States of America

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This document has been prepared
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CONTENTS

ACRONYMS

bcm	Billion cubic meters
CMU	Cabinet of Ministers of Ukraine
CHP	Combined heat and power
DH	District heating
EBRD	European Bank for Reconstruction and Development
EIB	European Investment Bank
EU	European Union
ESP	USAID Energy Security Project
Gcal	Gigacalorie
HOA	Homeowners' association (condominium)
IEA	International Energy Agency
IFI	International Financial Institution
IHS	Individual heat substation
IMF	International Monetary Fund
MinEnergy	Ministry of Energy and Environment Protection of Ukraine
MinRegion	Ministry of Territories and Communities Development of Ukraine
Naftogaz	NAK Naftogaz of Ukraine, PJSC
NEURC	National Energy and Utilities Regulatory Commission
OECD	Organization for Economic Cooperation and Development
PSO	Public Service Obligation
RE	Renewable Energy
Tcm	Thousand cubic meters
Toe	Ton of oil equivalent
TPA	Third-party access
UAH	Ukrainian Hryvnia
USAID	United States Agency for International Development
VAT	Value added tax
USD	United States Dollar

EXECUTIVE SUMMARY

District heating (DH) is transforming the European energy landscape, bringing in efficient, local and renewable energy where it had never been possible. Ukraine has a tremendous asset with its existing DH demand and networks. However, underinvestment and poor management have made Ukraine's DH systems inefficient and unreflective of customer needs. The experience of the European Union Member States in Central Europe demonstrates that deep and consistent reforms can address the current challenges in the sector. Based on this experience, the benefits Ukraine can expect from reform of its DH sector include improved energy efficiency and economic competitiveness, enhanced environmental sustainability, and strengthened energy security.

DH policy in Ukraine has not yet undergone the structural reform that other sectors of the economy have seen already: service quality has, if anything, declined in the last 25 years; subsidies have risen; and many local leaders wonder if they should continue to support DH. As a result, Ukraine's DH sector is in a vicious circle, where financial, operational and technical problems reinforce each other. Comprehensive and well-planned efforts are necessary to pave the way out of this vicious circle for a stronger and more sustainable DH sector. Such structural reforms are essential to attract the investments needed to improve quality, efficiency and the long-term potential of the sector.

The purpose of this White Paper is to provide evidence-based guidance on reform approaches that are feasible in Ukraine and well-tested internationally. Based on experience in Europe, consistent, well-planned reforms can lead to significant improvements in DH services, transparency and financial stability. The White Paper describes key challenges faced by the Ukraine's DH sector and provides recommendations on developing and implementing a comprehensive 10-year strategy that can lead to the following three major transformative outcomes:

1. Loyal and satisfied customers (through ensuring access to affordable and high-quality DH services and fostering customer-oriented suppliers);
2. A sustainable and self-sufficient DH sector (with improved market relations along the heat supply chain and heat subsidies limited to vulnerable households only); and
3. An efficient and environmentally friendly heat supply market (through promoting energy-efficient buildings, optimized and upgraded heating systems, and utilization of renewable energy and waste heat potential).

In 2020-21, Ukraine is expected to take crucial steps to complete its natural gas market transformation (in line with the EU Third Energy Package). This includes unbundling of the gas supply system, easing the public service obligation (PSO) to residential and DH consumers, and creating conditions for retail gas competition. In Ukraine, the natural gas and DH sectors are closely interconnected, as natural gas is by far the most important fuel source for heat generation, making up a significant portion of overall natural gas consumption. However, DH regulations are not well aligned with the upcoming natural gas market liberalization. To avoid financial, social, and political shortcomings, DH regulations should be adjusted and/or redesigned before the beginning of the 2020-21 heating season. This should include updating rules regarding operating and investment costs to ensure that these costs can be included in the tariff. In addition, this will include phasing out natural gas PSO requirements by May of 2021, per Ukraine's obligations to the IMF, which puts strong pressure on the need for DH regulatory reform.

The recommendations presented in this White Paper were developed to address and mitigate the risk of higher heating prices for residential consumers, which is key to ensuring that DH reform is feasible. This can be achieved by launching large-scale building renovations prior to making large investments in DH companies. A comprehensive program to renovate buildings not only leads to energy savings and lower heating bills, it also provides economic stimuli and creates new jobs, thus improving Ukrainian citizens' quality of life.

1. INTRODUCTION

1.1. OBJECTIVES OF THIS WHITE PAPER

District heating (DH) can bring tremendous benefits to Ukraine, and most European countries are actively expanding their DH systems. Today, most DH systems in Ukraine suffer from underinvestment and inefficiency, among other challenges. In short, Ukraine's DH sector needs deep transformation to achieve the benefits the sector brings to other European economies. Because of the complexity of the sector and the number of stakeholders involved, a comprehensive strategy is essential to make significant progress in reforming the sector.

This objective of this White Paper is to describe the key challenges facing Ukraine's DH sector, and the strategic actions that can lead to bold transformation. This White Paper considers the need to sequence reforms and address the underlying barriers, recognizing that numerous Ukrainian institutions at various levels would need to be engaged in fleshing out the reform agenda and implementation plan. In other words, this paper is designed to build consensus on the critical elements of reform. As a first step in that process, USAID intends to use this White Paper to align goals and consolidate recommendations within the donor community. It will help to provide clear and consistent messages to Ukrainian stakeholders. With a common voice, the donor community can elevate the importance of these reforms for Ukraine's future while at the same time providing assurances that international partners are willing to provide Ukraine with the needed technical and financial support for its DH sector reforms and modernization.

This White Paper builds on several other analytical studies of Ukraine's DH sector. Examples of previous studies on selected DH issues include an analysis of consumption-based billing (World Bank, 2012), heat supply schemes and investments (MinRegion, 2016), importance of buildings (MinRegion, 2016), and attracting investments from international donors and financial institutions (World Bank, 2019). These studies provide important background information and offer detailed analysis of various aspects of the DH sector in Ukraine, which are extremely helpful. the goal of the current study is to provide a comprehensive picture on how to make the DH system viable, including improving energy efficiency in buildings, making the companies more customer-focused, and building conditions for attracting large-scale private investment in the DH sector.

1.2. BENEFITS OF DISTRICT HEATING: THE EUROPEAN CONTEXT

DH is a critical energy source in many European countries, including Ukraine. Compared with individual, building-level heating systems, it also offers tremendous potential in terms of energy efficiency, economic competitiveness, environmental sustainability, and energy security.

1.2.1. Energy efficiency

Because most European DH systems are based primarily on combined heat and power (CHP), waste heat and renewable energy, their environmental impact is low. Effectively, they use heat from sources that would be wasted (including power generation) to meet demand. This repurposing of waste heat makes DH very efficient and cost-effective as well. On the other hand, Ukraine has a very low share of CHP, waste heat and renewable energy in its heat generation compared to other European countries, that is one of the reasons its systems are so inefficient. Specifically, in 2017, CHP's share in heat generation for DH in Ukraine was 40% , while this share was 72% in European Organization for Economic Co-operation and Development (OECD) countries. At the same time, the share of CHP in heat production in Ukraine has grown essentially since 1990. Economically justified development of CHPs in Ukraine should account for the implementation of the Third Energy Package in electricity and state support of CHPs' competitiveness on the electricity market

Other European countries have worked hard to improve overall system efficiency. For example, heat pipes typically have low loss rates because of insulation, corrosion protection and consistent repairs.

Individual heat substations (HIS) with controls and automatic weather regulation are also the norm in Europe, allowing for system integration to improve efficiency and service quality.

1.2.2. Economic competitiveness

Because DH in Europe is typically highly efficient, it is usually the most competitive option for European customers in urban areas. Also, since DH has been increasingly using local and waste products for heat supply, prices are typically more stable than for alternatives like natural gas-fired individual boilers. Price stability in general promotes economic growth and competitiveness. Not surprisingly, in Europe, DH is seen as an important contribution to economic development.

1.2.3. Environmental sustainability

Many European cities with robust climate goals are pushing hard to increase DH coverage. DH creates opportunities for environmentally sustainable heating, including biomass and waste heat. Building-level boilers that use natural gas cannot easily switch to other fuels. In fact, when cities look forward to carbon neutral futures in coming decades, residual fossil fuel use for heating in buildings is one of their greatest policy challenges.

At the same time, it is difficult to move to DH after neighborhoods and buildings are constructed. Ukraine has a tremendous asset in that it has a connected heat load already available, something that most European countries are working very hard to achieve. However, if Ukraine's DH systems are not maintained and transformed, this connected load will wither, along with the potential for a smooth transition to more efficient and well-run DH.

1.2.4. Energy security

Integrating efficient, local fuels and heat sources is not just environmentally sustainable, it also increases energy security. Waste heat is local, as is much of the biomass sold for DH. As these reliable local sources of energy have become more prevalent in DH, energy imports have gone down. This would be much harder to do with individual systems. Likewise, the efficiency of well-operated DH also reduces potential energy imports and security risks.

2. UKRAINE'S DISTRICT HEATING SECTOR: CURRENT SITUATION AND CHALLENGES

2.1. VICIOUS CIRCLE OF DISTRICT HEATING IN UKRAINE

DH can make a substantial contribution to a sustainable energy future. In most urban and dense suburban areas, modern DH solutions are the most cost-effective, environmentally friendly option for heating buildings. DH can save energy and boost energy security, but only if it is properly regulated, wisely managed, and there is adequate investment.

In Ukraine, there are over 1,600 DH companies providing centralized heat and hot-water supply services and employing over 65,000 workers. Centralized DH supply services are provided to 37% of Ukrainian families, and accounts for a significant share (over 20%, as estimated) of their housing and utility expenses in urban areas.

Ukraine remains highly dependent on fossil fuels with gas and coal together accounting for around 90% of the total energy mix in the DH sector. In 2019, DH companies consumed 7.4 bcm of natural gas, accounting for 25% of overall natural gas consumption in Ukraine. Much of it is wasted, which creates adverse economic, social, and environmental effects.

For almost 30 years, while other sectors of the economy have reformed and seen commensurate growth, state policy on DH has remained more or less as it was in the Soviet era, with significant subsidies and inefficiencies fueling the growing problems in providing high-quality services to customers. Under current policies, the sector is stuck in a "vicious" circle, where financial, operational and technical problems exacerbate each other (Figure 1).

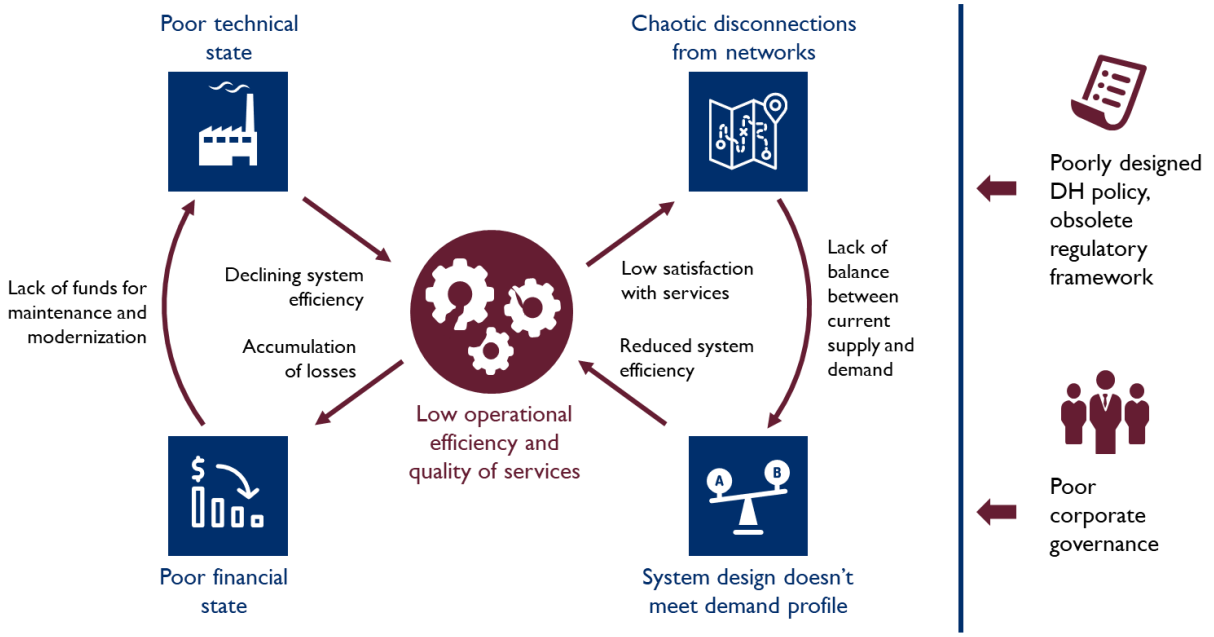

Figure 1. Vicious circle of district heating

Source: IEA, 2004. Coming in from the Cold: Improving District Heating Policy in Transition Economies, World Bank, 2019. Setting the agenda for further district heating reform in Ukraine, expert analysis.

DH systems in Ukraine were designed with excess generation capacity compared to systems in Western Europe, and excess capacity has further grown as customers have left the network. Disconnections from DH networks, linked to poor service quality and improving energy efficiency in buildings, were major reasons for the drop in DH demand. This excess capacity leads to significant inefficiency and higher costs. These high operating costs and the declining customer base make it difficult to finance renovations. As a result, the production assets have been deteriorating. Over 60% of heat boilers exceed their typical engineering life, and over 60% of heating networks require insulation or replacement. These outdated assets provide poor quality services, which further increase costs and encourage more customers to leave the system.

Some small and mid-sized cities have largely switched from DH to individual and decentralized solutions. Households in some multi-story buildings switched to individual gas boilers in each apartment, while many commercial and public building owners installed biomass or electric boilers. In the cities where these changes have occurred, the DH systems are severely deteriorated, and it would be very difficult and costly to rebuild them.

From 1995 to 2018, the share of urban households served by DH decreased from 89% to 55%, which has reduced economic competitiveness and increased pollution. It also has placed a burden on other infrastructure, including electricity and gas supply. The shift to individual boilers also creates health and safety risks because of poor quality equipment, buildings not designed for boiler ventilation from individual apartments, and negligent maintenance. Lack of clear heat planning and inconsistent communications with local governments and customers have also created confusion about whether DH systems should be preserved.

Tariffs that do not reflect costs have made it difficult if not impossible for DH companies to invest in modernization, which means that over time, the quality and efficiency of the services they provide has declined. This inefficiency also raises the cost of the service. Because of inadequate funding and poor governance, most DH companies have yet to reorient their businesses to focus on customer needs. They often have a poor understanding of customer concerns and priorities. Combined, these factors further incentivize disconnections.

Another critical issue for the DH sector is payment discipline. Late payments and lack of ability to enforce collections further drive DH companies into debt, debt for which they pay penalties, but that is not factored into tariffs.

Due to these inefficiencies and the desire to keep DH tariffs for the residential sector artificially low for affordability, the true cost of DH in 2018 was UAH 40 billion higher than what consumers actually paid. This figure includes the direct and indirect state subsidies, which as costly as they are, still do not close the cash flow gap of DH companies. (The gap appears to have declined in 2019, but data are not yet available to make a clear assessment. In 2020 and beyond, the gap could increase again, for instance, if the market gas price goes up).

In short, DH companies in Ukraine have large operating losses and significant unpaid debt. As of January 1, 2020, debt of DH companies to NAK Naftogaz of Ukraine (Naftogaz) amounted to UAH 34 billion. This in turn is also one of the reasons the companies fail to invest at adequate levels to maintain reliability and increase efficiency. According to an assessment by the Ministry of Territories and Communities Development (MinRegion), the DH sector requires at least USD 6 billion in investments to modernize the networks and heat generation assets. (This estimate only accounts for replacing a small share of heat networks; it does not consider costs of new connections or more comprehensive renovations, so the total cost may be higher) . Comprehensive and well-planned efforts are necessary to pave the way out of this vicious circle and to create a stronger, more sustainable DH sector. These efforts need to include reforms that will attract the necessary investments. Such reforms and investments in turn can fully realize the benefits of DH and support economic growth.

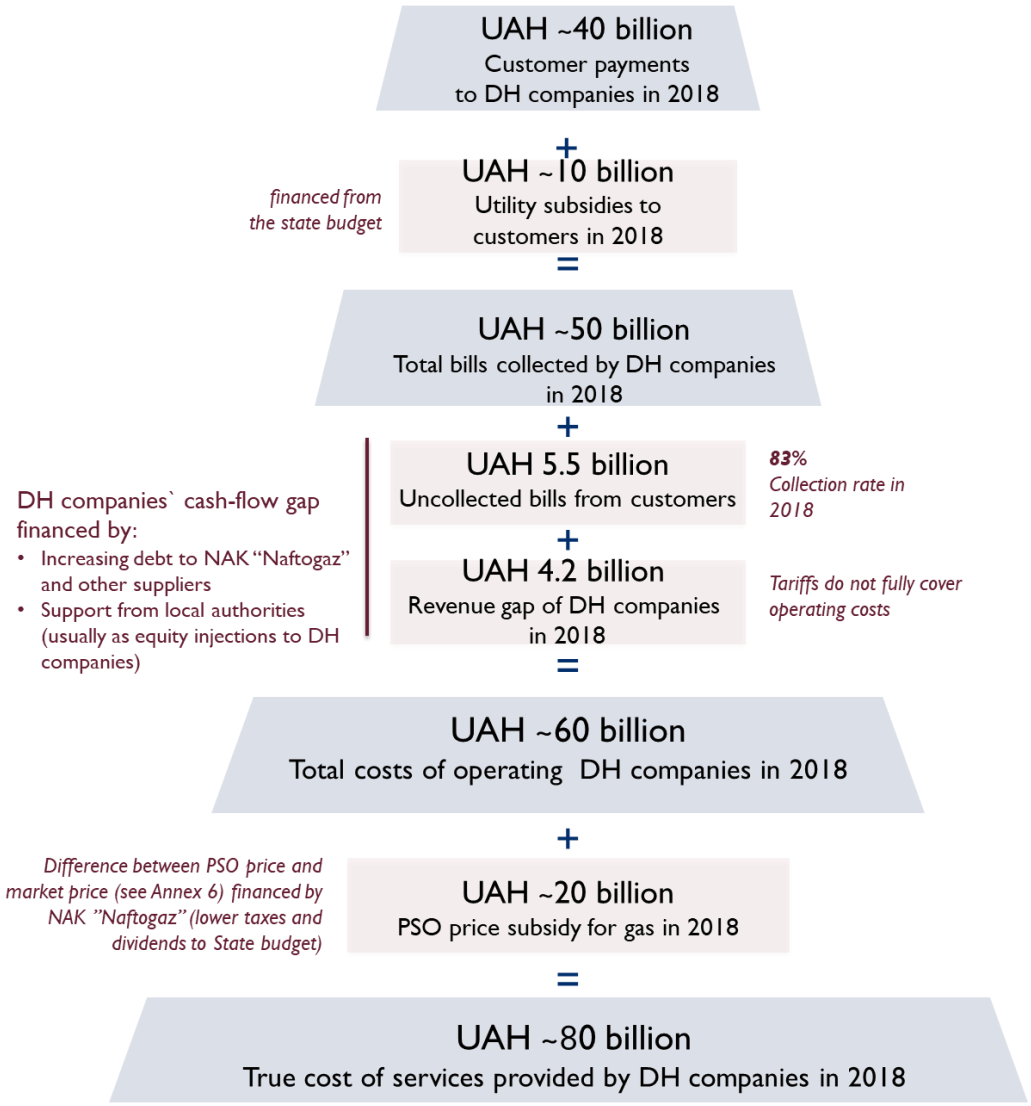

Figure. 2 Estimating the "true cost" of DH and hot water supply services in 2018

Source: Ukrstat, MinRegion, expert analysis.

Most local governments provide financial support to DH companies, but these are typically directed at financing operational gaps and emergency maintenance or repairs. Private investments in district heating are rare in Ukraine, and in many cases are used to help buildings disconnect from DH. The key source of investment for DH companies to date has been loans from international financial institutions (IFIs), usually mixed with grants and technical assistance from other donors. The total financing committed by IFIs for DH modernization is close to USD 600 million. However, the implementation and disbursement rates for these projects remain low, both due to intrinsic problems in DH companies and complex regulations.

The global COVID-19 pandemic poses additional challenges to the district heating sector. The pandemic itself and quarantine measures have severely affected economic activity and incomes. This has left households less able to pay for heating services, imposed additional costs on DH companies, and constrained budgets of municipalities that provide financial support to DH companies. With central and local governments focused on immediate actions to mitigate the crisis, there is likely to be less attention paid to medium-term issues. At the same time, the pandemic has contributed to historically low gas prices, which provides an opportunity to implement tariff reform. The implications of these effects and their interactions are explored in more detail in detailed power point presentations on district heating reform and the COVID-19 pandemic, which includes specific recommendations on adapting and responding to the crisis.

2.2. TARIFFS, PAYMENT DISCIPLINE, AND GOVERNANCE

2.2.1. Oversight and Regulation of the DH sector

The government plays an important role in regulating the DH sector. This includes multiple government entities at both the central and local level. This complexity means that coordination is essential to developing a cohesive strategy for the sector.

Within the central government, there are several ministries and agencies involved in different aspects of district heating. For example, MinRegion sets most national policies for the DH and buildings (public and residential) sector. It has developed tariff methodologies for locally regulated DH companies. NEURC, on the other hand, establishes its own tariff methodologies and regulates most of the largest DH companies.[1] The Ministry of Energy and Environmental Protection (MinEnergy) sets policies regarding CHPs, as well as for the major DH fuels, natural gas, and coal. The State Agency on Energy Efficiency and Energy Saving (SAEE) under MinEnergy sets many policies related to renewable energy, including in the DH sector, and plays a large role in promoting energy efficiency in buildings. The Ministry of Social Protection and Labor (MinSoc), together with the Ministry of Finance (MinFin), set social support and other subsidy policies.

In many cities, there are likewise multiple agencies responsible for DH governance and policy. This can include offices in the city administration, as well as committees in the city council. In practice, this often means that while the cities own the DH assets, they do not have a consistent approach to governing those assets for public benefit and long-term sustainability. City capacity to set tariffs also varies widely, regardless of whether that is their responsibility or not.

This plethora of institutions makes developing robust, consistent policies very challenging, and today, there is no overarching coordination mechanism specifically for DH. The rest of this section looks at five important issues regarding oversight of the DH sector: tariff setting, payment discipline, debt restructuring, gas liberalization and tariff implications, and broader governance of DH assets.

2.2.2. Tariffs

Tariff and regulatory reforms are essential to the economic sustainability of DH. The health of the DH sector depends on the extent to which tariffs cover costs. In a healthy system, tariffs should also incentivize reasonable investment, efficiency, and reliability. The good news is that many of these elements already exist in the Ukrainian legislation, but implementation has been a challenge. Regardless of who is the regulator, a large share of the cost of DH is not covered by the tariffs in most cities, which ultimately leads to system inefficiency and, ironically, higher costs. Though the tariffs are based on the cost-plus methodology, in reality, they do not fully cover the operating and capital expenditures of DH companies. This is one of the major causes of the companies' financial distress. The Heat Supply Law states that tariffs should cover reasonable costs, but in regulations and practice, there are many ways that costs are rejected. A few examples include:

- When fuel costs change, it can take months or longer for the DH tariffs to catch up. This delay can create significant losses for DH companies.
- Allowable labor costs are kept at levels so low that DH companies experience difficulties attracting competent staff.
- Information technology costs are minimized, which makes it difficult to track bills, repairs and other essential business functions.
- Systematically denying medium and long-term investment costs in DH has made systems unreliable and expensive to operate. In most systems, investments make up less than 2% of costs, which means even basic maintenance investments may often be skipped.

[1] NEURC regulates DH companies with heat production capacity over 170,000 Gcal and where over 90% of customers have building-level heat meters. The regulator sets heat tariffs for 26 licensees.

Another large area of losses is the way that tariffs are calculated based on normative demand, rather than actual sales. In setting the tariff, the costs are divided by the anticipated sales; when these are based on inflated norms, rather than actual sales, the revenue that comes in is substantially less than the expected revenue in the tariff calculations. In one large DH company,[2] this practice resulted in almost a 19% difference in revenue compared to actual costs in 2018. Moreover, this practice allows DH companies to underestimate network losses and instead effectively attribute them to generation, which makes it harder to assess investment needs and options. (These normative consumption levels would also lead to overinvestment in capacity). A large share of the energy put into the system is simply lost to inefficiency: in some large systems, for example, heat distribution systems can lose up to 26% of the heat they transport, a level virtually unheard of internationally.

Addressing these cost gaps is truly urgent, and when cities address them in a piecemeal way by providing direct subsidies when the financial situation becomes dire, the result can be poor strategic choices and growing costs.

In addition, as mentioned, Ukraine has two completely different sets of regulatory rules affecting DH. These vary depending on who regulates heat tariffs. This approach adds a level of complexity that can lead to confusion on which regulations to follow (Annex 4.2). For example, in case when DH companies use the heat from CHP plants, they may have different regulators for the same product from different plants. Likewise, the rules differ in what is considered a reasonable cost. Certain maintenance investments are allowed under the NEURC rules, but not under the MinRegion rules. Some cities have complained that the MinRegion rules can be hard to implement because they are written by policy makers, not regulators with experience in implementing rules. The situation is further complicated by the fact that the number of NEURC heat licensees has varied quite a bit in recent years, and the companies involved must switch between two different sets of rules when these changes happen. This creates problems for operational planning and for maintaining high technical capacity on the regulations. In short, the existence of two parallel sets of regulatory requirements appears to be a barrier to high quality regulation.

A transparent, rules-based DH regulatory system is important to stabilizing the sector. During this transition, it is also essential to build capacity at the national and local level for transparent, rules-based regulation. One option to help in building such capacity is to create a center of regulatory expertise at NEURC; such a center could also support local governments. One important principal based on the experience of the EU Member States in Central Europe is not to change the regulator without thorough consideration and capacity building. Thus, the priority in the near-term should be on building robust regulatory expertise and streamlining regulations so that there is one common and consistent set of regulations across the country. Likewise, in cases where municipalities regulate heat tariffs, checks and balances are important. In most European countries, there is a national regulator that ensures that municipalities set tariffs according to the rules; the national regulator also serves as an appeals organ.

2.2.3. Residential customer payment discipline and outstanding debts

Ensuring a high level of collections is critical for the financial well-being of any utility. In recent years, there have been significant shortfalls in the collection rate from residential DH customers. The debt of residential customers to DH companies was UAH 19.4 billion as of December 2019. This in turn impacts DH companies' ability to pay their own debts.

Poor customer payment discipline is not necessarily a result of low affordability or dissatisfaction with service quality. For example, some high-income consumers systematically do not pay because they are not penalized for such behavior. At the same time, monetization of subsidies has improved payment discipline since low-income customers know that they will lose their subsidies if they do not pay.

[2] This situation is common among many systems. Because of political and business sensitivities, we believe it is better not to name individual systems, although the data are based on real cases.

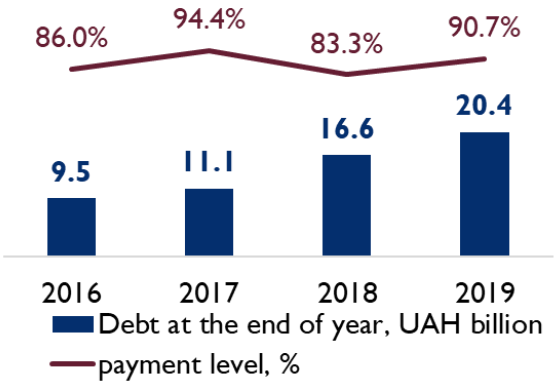

Figure 3. Household payments for DH and hot water supply

Source: Ukrstat

Generally, it is not technically possible to disconnect individual consumers and the current tariff methodology does not factor in collection risk. Therefore, DH companies have limited tools to enforce payment collection and handle it financially. For example, fines which DH companies are allowed to impose on households are capped at 3.6% per annum (0.01% daily), which is lower than the inflation rate. Thus, from a purely economic perspective, it is a rational decision for households to not pay for DH services before legal enforcement procedures are initiated. In addition, law enforcement procedures are quite time-consuming and costly. Thus, DH companies have little financial incentive to initiate enforcement before significant debt is accumulated. In order to improve customer payment discipline, DH companies should be allowed to impose fines high enough to motivate people to pay, and legal enforcement procedures should be simplified.

In Central Europe, HOAs were a key factor in improving payment discipline because HOAs can effectively put pressure on individual families to ensure that the building is not disconnected. Contracts between the HOA and DH company (e.g. when there are no direct contracts with individual households) mean that disconnections of buildings are technically possible. Clear ability to enforce collections is also important in addressing non-payments and past debt.

2.2.4. Addressing ongoing district heating company debt

The lack of cost-reflective heat tariffs, residential customer nonpayment, and a range of other factors have resulted in significant debt in the district heating sector. The total debt of DH companies to Naftogaz reached UAH 37 billion in April 2020. The Ukrainian government has proposed a bill on restructuring this debt, which would cancel fines on debt accumulated by DH companies between 2016 and May 2020 and impose a moratorium on fines related to debt accumulated after May 2020. Similar types of debt restructuring laws have been passed numerous times since Ukraine's independence. However, these measures do not address the underlying problems, so debts of DH companies to Naftogaz and other companies have continued to grow. Instead, debt restructuring should be addressed comprehensively. A first step is developing a full list of reasons behind the growing debt, then working to address these directly; this includes tariff reform, improving customer payment collection, and dealing with other holes in district heating company budgets. Once the underlying conditions are addressed, restructuring of DH company debt can be done in a more sustainable way.

2.2.5. Liberalization of the gas market

Ukraine is liberalizing its gas market in line with the EU 3rd Energy Package. This will likely transform the gas market in 2021. As a result of these reforms, market-driven natural gas suppliers will not be required to supply fuel at discounted prices to certain customer groups, including DH companies.

In other words, natural gas subsidies for DH companies may go away.[3] In Ukraine, the gas and DH sectors are closely linked as gas is the most important fuel for DH, and DH represents a large share of overall gas consumption (25 % in 2019, 7.4 bcm of 29.8 bcm totally consumed). However, DH regulations are out of sync with the upcoming changes. To avoid such cost gaps, which could lead to significant financial, social and political consequences, these regulations should be adjusted and/or redesigned before the beginning of the 2020-21 heating season. This may include retaining certain public service obligation (PSO) regulations for gas supplies to DH companies in the short-term.

In addition to the changing subsidies, another, related challenge that needs to be resolved is the mismatch between floating gas prices that launched in May 2019, and the delays that typically occur in incorporating these changes to DH tariffs. If this timing issue is not addressed, this mismatch could result in a huge financial gap in the 2020-21 heating season.

2.2.6. Governance of Municipal Assets

Good governance is critical to improving DH service quality and financial performance. This includes both improved transparency as well as a greater focus on customers as a managing principle. Today, DH companies in Ukraine rarely consider the needs of customers as their primary focus. Rather they see their primary focus as supplying heat to "consumers", in other words, production output. This mentality is reminiscent of the one that existed in Soviet times, and in the end, it does not serve customers or society well. It leads to inefficiency and poor quality of the services. The resulting lack of transparency also leads to corruption, which further damages public trust.

Since most DH companies in Ukraine are owned by municipalities, modernizing the governance model for these assets will be an essential part of improving DH. This includes several elements such as:

- Establishing independent supervisory boards to ensure that DH assets are managed in the public interest;
- Designing governance so that customers are the central focus. This includes outreach to key customer groups regarding operations, concerns and planning;
- Enhancing the transparency of this oversight by making public all key data and documents related to these municipal companies, including board meeting summaries, company financial and service data, and investment plans; and
- Developing long-term strategies for DH companies that will transform their operations and attract the needed investments. Given the scale of investment needed in Ukraine, it is important to consider how best to leverage private capital, recognizing that today, these companies by and large are public assets.

Regulators can also help improve governance by ensuring transparency and fairness in all regulatory decisions. This includes mandating the release of key information used in decisions, and clearly describing the legal basis for tariff decisions.

These changes in governance can have the added benefit of improving customer satisfaction, which can reduce the number of disconnections. For example, two of the most common complaints about DH companies include the poor quality of hot water service, particularly in the summer, and the byzantine system of redressing billing complaints. Today, few of the leading stakeholders are seeking to address these issues through tariffs, municipal oversight, or DHC decisions.

[3] In Ukraine, the term "subsidies" in the context of district heating typically refers to the payments the government makes to low-income households to ensure that they can pay their monthly utility costs. In reality, Ukraine provides many types of subsidies for DH. These include the discounted PSO prices for natural gas, periodic DH debt forgiveness, and municipal payments for DH operations and investments.

Moving from a system based on social entitlement to an efficient, market-oriented approach can help ensure the long-term viability of the sector by reducing waste and inefficiency, and by improving customer satisfaction. This in turn can reduce the rate of disconnections, which so often destroy DH systems.

Many smaller systems have already closed due to such disconnections, including Truskavets, Nikopol, Marganets, and Pokrov. Without stronger governance, there are open questions about the viability of DH on a larger scale. Leadership in improving governance is therefore a critical factor in transforming DH in Ukraine into a modern, European-style energy source.

2.3. BUILDINGS

2.3.1. Energy Efficiency in Buildings

Most of the buildings in Ukraine were constructed during the Soviet era without great consideration for their energy efficiency. Moreover, these buildings were not properly maintained in most cases, so their condition deteriorated, lowering energy efficiency even further. This results in excessive energy consumption and exorbitant heating bills, undermines the quality of utility services, and leads to poor levels of comfort, health and safety.

International experience shows that public support and well-crafted policies can help catalyze large-scale, energy-efficiency renovations of residential housing. These energy efficiency improvement in turn help unlock the potential of other key measures in heating reform. Large-scale renovations of residential buildings would help lower heating costs, which can make tariff reform more feasible. Also, improving energy efficiency in buildings reduces the costs of modernizing district heating by reducing the capacity requirements. This will reduce future tariff costs for investment.

Currently, there are two active programs for renovations at the national level. The first, "Warm Loans", is financed directly from the state budget. It has been operating since 2015 and due to its simplicity, it is most helpful for single-family houses. The second, "EnergoDim", is operated by the Energy Efficiency Fund. It was launched in September 2019 and focuses on multifamily buildings.

Another important category is public buildings, which, according to European legislation and experience, can play an exemplary role in energy efficiency. Public authorities and organizations at both national and local level must significantly increase their efforts to renovate their own buildings that would have an added benefit of reducing energy bills.

Performing comprehensive building renovations is expensive. Preliminary estimates indicate that comprehensive renovation of all multifamily buildings in Ukraine may cost around USD 20 billion. With multifamily buildings, it is important to approach them in a comprehensive manner. In particular, the insulation and efficient windows only work if they seal the entire building envelope. Also integrated retrofits can ensure that systems are designed to work efficiently together. At the same time, given the scale of the retrofits needed, it is possible that, to reduce energy use quickly, some retrofits may prioritize the largest energy saving measures, like modernization of internal engineering systems (networks) within the buildings, installing heat substations with thermostatic controls etc.

Eventually, all multifamily buildings should be fully insulated with a more comprehensive package of energy conservation measures. Although the initial financial investment will be high, modernizing buildings will pay for themselves because of the reduced energy cost. The reduction in heat demand will also reduce the need for heat subsidies. These demand reductions are one of the key reasons why it is important to modernize buildings early in the reforms. DH system modernization plans should consider likely changes in future demand due to efficiency in order to maximize financial value for the companies, customers and government.

2.3.2. Building Management and Homeowners' Associations

Ukrainian legislation provides apartment owners within multifamily buildings the right to manage their common property. This includes making decisions on maintenance of the building, implementing energy efficiency measures, investing into upgrading the internal engineering systems (networks), etc. However, it does not give them the responsibility of actually creating a building management structure such as a homeowners' association (HOA). As a result, the process of creating HOAs has been moving slowly. Under Ukrainian legislation, a majority of apartment owners in a building must opt in to create an HOA. Both inertia and concern about added expenses mean that it can be difficult to obtain the necessary majorities to create a HOA or to make any significant decision about improving the building. There are about 33,000 registered HOAs in Ukraine, while the total number of multifamily buildings is about 180,000. Equally importantly, many of the HOAs that do exist in Ukraine have limited responsibilities; for example, it is rare today that HOAs hold contracts for heat supply.

In Poland and other countries in Central Europe, progress was much faster in this area, in part because of regulations that required a single entity in each building to sign contracts for heat and building services, combined with programs that built capacity for HOAs and supported them with renovation costs. These requirements effectively obligated buildings to establish HOAs.

Effective structures to manage buildings (such as HOAs) are important in DH reform for two reasons. First, HOAs will be better able to ensure timely payments, since buildings that do not pay can be disconnected, while individual apartments, technically speaking, cannot be. Second, HOAs can sign contracts for energy efficiency investments in the building, which can dramatically speed up the rate of renovations.

2.4. DISTRICT HEATING SYSTEM DEVELOPMENT

2.4.1. Heat system development planning

Ukraine urgently needs to develop and invest in its DH networks, but it is also important to ensure that these investments are well-planned to meet the needs of the future. The basic framework that many EU countries use involves three elements: network development plans, least-cost investment plans, and tariffs that then support those investments. Least-cost investment plans in Europe are common; they involve levelized cost analyses that consider different supply and demand-side options for meeting future heat demand. Ukraine has begun to pursue such an approach. MinRegion has developed a draft new heat network development methodology which represents an improvement, although strong support for implementation is needed. The network development plans describe who is zoned for connection to DH, based on cost-effectiveness; they also describe heat demand and future heat supply volumes, as well as network needs. One major challenge is assessing what future demand may be. Currently, most Ukrainian DH systems are significantly over capacity, which reduces efficiency and increases costs. As Ukrainian buildings become more efficient, heat demand will likely drop based on the experience in other transition economies. It is interesting to note that while Ukraine emphasizes heat supply in its planning, in Denmark and other Western European countries, the emphasis is on holistic planning, looking at both supply and demand in an integrated way. Thus, network development needs to take a system-wide approach to ensure that revitalization is efficient, effective and useful.

Despite the benefits described earlier, DH is not always the most appropriate heating type in all localities. The key factor is the density of the heat demand: if it is low, decentralized heating may be the most cost-effective option. In 1995, DH served 89% of urban households. But since that time, the number of buildings connected to DH has declined significantly (a key factor was the poor service quality). As of 2018, DH serves only 55% of urban citizens and in most cases, DH systems are oversized compared to the current demand, which undermines their efficiency.

Heat development plans determine where it is cost-effective for buildings to have DH and where it is not. In other words, they define DH zones. Establishing DH zones ensures that investments are made in areas where it makes economic sense. Developing capacity at the local level to use or understand the output of network planning software will help facilitate this transition.

Sequencing of investments is also extremely important in network development. First, sequencing limits the risk of investing in oversized capacity and creating stranded assets. Investing first in investments closer to buildings, like the individual heat substations (IHSs) that can efficiently connect buildings to the network, can allow planners to better understand future demand before making comprehensive investments in new supply. Likewise, investments in the distribution network reduce losses that impact the supply capacity needed. The second reason that sequencing is important is that investments need to be carefully planned to avoid increasing tariffs rapidly before service improvements appear. Sequencing can also target the most important cost and energy-saving opportunities in the system, which can help bring down costs, making it easier to finance future investments. Policy reforms should take advantage of the benefits of sequencing.

2.4.2. Heat substations

Installing efficient heat substations with thermostatic controls and automated weather regulation can significantly improve DH efficiency and lower costs. A modern individual, or building-level, heat substation (IHS) is made up of a heat exchanger and controls. These systems are low cost compared to other energy saving measures, but they can reduce energy use in the buildings they connect to by around 20-25%, so they pay for themselves rapidly. IHSs also make it possible for homeowners to regulate their heat consumption, which then allows other retrofit measures to result in actual energy and cost savings.

Because such investments can reduce total demand, it is important to prioritize these investments to more accurately size investments in generation, transmission, and distribution capacity. Cities in Central Europe installed IHSs primarily in the 1990s and early 2000s, in other words, soon after they began large-scale transformation of their systems. Some cities relied extensively on donor investments to catalyze change, but then moved to private financing for scale-up, and typically they were able to install IHSs in a majority of buildings within a few years, given how cost effective they were. In Ukraine, only a small portion of buildings are equipped with IHSs. For example, in Kyiv, only 10% of residential buildings have them.

There are two primary reasons for the delays in Ukraine compared to Central Europe. First, is the delay in creating HOAs and programs to support energy efficiency. Second is the fact that utilities in Ukraine currently do not have the clear legal authority to jump start the process or an ability to be repaid for installation and maintenance costs through the tariff, as they do in countries like Poland and Latvia. Giving utilities clear legal permission to install and own IHSs could speed these investments; likewise, rapidly expanding the number of HOAs would ensure that there is a single building entity to turn over to IHSs in the initial years after installation. It will also be important to explore the feasibility of a range of options for rapidly deploying IHSs in Ukraine. In most EU countries, there are multiple, well-functioning models for installing IHSs, including financing them through the tariff so that DH companies can install and maintain them, and having HOAs finance their installation and maintenance directly. European experience also demonstrates that HOAs should be allowed to determine the heat settings, so that comfort improves, and buildings are operated efficiently.

2.4.3. Development of CHP, Renewable Energy and Waste Heat for DH

CHP is essential to making DH cost-effective and efficient. In most of Europe, CHP and renewable energy (RE) dominate in DH supply. In Ukraine, on the other hand, heat-only boilers generate 60% of the heat while CHP plants provide 40%. A very small, but growing share of heat production in Ukraine is from RE. Ukraine has also seen growth in the share of CHP, but at a much slower pace than in most of Europe. In most of Europe, the challenge is creating the heat demand to grow the role of CHP in the power sector. In Ukraine, the share of CHP in the power sector is on par with Europe, but from the perspective of the heat sector, there is a major problem (or opportunity) with the low level of CHP deployment.

Over the last decade, Ukrainian tariff and incentive policies have done little to promote CHP and other types of efficient heat supply. This is both because tariffs rarely allow for investment components, and they do not prioritize investments that lead to efficiency. This is a major challenge that must be addressed to transform DH. Many EU countries provide incentives for CHP-produced power and for RE and waste heat, typically through incentive mechanisms like obligations on utilities to meet certain targets.[4] Ukraine should also explore policy options that will help introduce efficient, cost-effective CHP, as well as RE and waste heat, into the local DH markets. Incentive-based tariffs and benchmarking can also encourage investments in efficiency, including CHP. Many countries limit CHP incentives for coal-fired power; this can be important to help to offset local pollution caused by coal-fired installations within city limits.

At the same time, incentives for CHP also present a near-term urgent challenge regarding CHP supply in the DH sector. With the new electricity market, CHP plants must be competitive to sell power. Electricity sales often account for a large share of CHP revenue and are crucial for financial stability, even if DH-focused CHP plants are operated primarily based on heat demand. Thus, while the heat tariff may not adequately cover the costs of the heating share of CHP production, there are new pressures to reduce the price being charged for power sold in order to compete. This is putting extreme financial pressure on CHP plants just at a time when many need to make investments in order to qualify for new incentives for high-efficiency electricity from CHPs. An additional, but non-trivial challenge, is the lack of consistent regulations on allocating costs at CHPs between power and heat. Such consistent rules are essential when one product is regulated and the other is set by the market.

In the long run, based on international experience, the CHP sector in Ukraine can become a substantial contributor towards achieving national energy efficiency and environmental goals. However, this requires setting a coordinated, national CHP development policy and strategy (possibly, as part of a wider energy sector strategy), as well as adopting a comprehensive action plan. The preparation of these documents should be based on a comprehensive assessment of the current CHP market and potential for new high-efficiency cogeneration development. The same is true for other types of highly efficient and environmental heat sources like RE and waste heat.

2.4.4. Third-Party Access

Promoting third-party access (TPA) is often considered in the context of gas and electricity markets, but DH networks are different from gas and electric networks in many ways. One of the key aims of the EU Third Energy Package is to establish integrated gas and electricity markets with cross-border competition, for which unbundling of network and energy production activities is a necessary precondition. Clearly, establishing such a market for DH is impossible to achieve, even within a single country, as it is a product produced and consumed locally (transmission of the heating energy over long distances is not economically justified).

Moreover, establishing competition among generation facilities requires a circular DH network design, which is rare in Ukraine. A circular design means that multiple facilities are connected to a unified, or circular, transmission system as opposed to a radial system where the transmission pipes travel from individual production facilities to neighborhoods without significant interconnections. Rebuilding the networks from a radial to circular design would require substantial investments. Considering the many other fundamental problems in the Ukrainian DH sector discussed in this paper, it is hard to recommend large- scale promotion of TPA in the short or even mid-term (before these fundamental problems are properly resolved). However, a TPA approach might be tested in a certain DH networks, if the necessary conditions are in place, including the existence of a circular network in satisfactory condition.

[4] In the EU, energy efficiency obligations are requirements on energy suppliers to invest in (or purchase) energy savings equal to a certain percentage of their energy supply. The countries with the largest district heating networks extend such obligations to district heating companies as well.

2.4.5. Accelerating IFI Investment

IFIs can provide catalytic financing that can facilitate the transformation of companies and policies in the DH sector. IFI investment needs to go hand-in-hand with other changes in the sector to maximize impact. Legal and regulatory changes should be implemented to provide a stable operating environment. Increasing the transparency in DH companies' operations and the use of modern business practices is also necessary to attract outside investment. Streamlining procurement and construction regulations and aligning them with international practices can reduce the time taken to put investments to use, allowing investments to be utilized more effectively. Once DH companies become attractive options for investment through tariff reform and governance improvements, investments can be scaled up by attracting private financing.

2.5. AFFORDABILITY AND SOCIAL SUPPORT

2.5.1. Affordability of District Heating in the Residential Sector

Natural gas is the primary source of energy for heating needs. Since 2015, Ukraine has taken major steps to reform its natural gas sector, in particular, by establishing cost-reflective pricing. Energy prices were increased more than four-fold, triggering a proportional increase in DH tariffs. Housing and utility subsidies helped offset the impact of these increases on the neediest, and at its peak in 2016-17, these subsidies supported more than 40% of Ukrainian households. This share declined to 24% by January 2019. The subsidy system is very generous in Ukraine. In the 2018-2019 heating season, utility subsidy payments made up 9.8% of household income for the families receiving support. Over 40% of families with subsidies paid 7% or less of their income for utilities.

Affordability of utility services, in which heating accounts for the largest share, has long been considered one of the most socially and politically sensitive issues in the country.

In Western and Central Europe, where heat prices are significantly higher than in Ukraine, families in general are much more satisfied with their DH. Countries that were the most successful with DH reforms sequenced their reforms, so their DH systems were able to show improved efficiency and service quality over time, and the neediest families received welfare support to ensure that their basic household needs were met, even as tariffs rose. It is important to emphasize that improvements in energy efficiency played a critical role in these changes, as they made DH more affordable.

3. RECOMMENDATIONS FOR UKRAINIAN AUTHORITIES

3.1. VISION AND GOALS FOR DISTRICT HEATING REFORM

Ukraine has chosen the path towards EU integration and made commitments under the EU Association Agreement. However, there is currently a gap between Ukraine's DH policy and the best practices seen in EU Member States. It is important to carefully design Ukraine's DH strategy so that it incorporates these best practices, but also considers Ukrainian conditions, such as the need to dramatically improve energy efficiency.

Due to inefficiencies and subsidies aimed at affordability, the true cost of DH in 2018 was UAH 40 billion higher than what customers actually paid. This estimate considers direct and indirect state subsidies and the cash flow gap of DH companies. Estimates for 2019 are not yet available, but the gap is expected to be significantly lower as a result of lower market gas prices. In 2020 and beyond, the gap could increase again (for instance, if the market gas price goes up). In other words, now is an ideal time to launch deep reform of the DH sector, taking advantage of low natural gas prices to catalyze change.

Ukrainian authorities should leverage EU experience to ensure that the DH strategy is sustainable and tested for success in the real world. This strategy could focus on three main goals:

1. Maintaining loyal and satisfied customers (through offering affordable bills for consumed heat, stimulating high-quality heat supply services, and fostering customer-oriented suppliers);
2. Creating a sustainable and self-sufficient DH sector (through focusing on improvement of market relations along the heat supply chain, promoting tariffs to cover all reasonable costs, and limiting heating subsidies to vulnerable households only); and
3. Developing an efficient and environmentally friendly heat supply market (through promoting energy-efficient buildings, optimized and upgraded heating systems, and utilization of renewable energy and waste heat potential).

Figure 4. Strategic goals of DH reform

The strategic goals could have the following specific objectives (expressed as desired outcomes):

- Significant energy savings and environmental benefits due to improved energy efficiency in buildings, modernization of existing assets, and development of modern DH solutions;
- Affordable customer bills for DH services (higher tariffs are compensated by reduced consumption);
- Reliable and uninterrupted heat supply (for example, by providing hot water supply services with standard technical parameters year round);
- Increased customer payment discipline as a result of improved enforcement mechanisms;
- Customer-oriented suppliers who are also able to finance investment programs without direct or indirect subsidies from local or central governments;
- Tariffs that reflect all reasonable investment and production costs and incentivize efficient, high-quality services; DH sector regulations that align with new rules for gas, electricity and housing markets; and,
- Improved corporate governance and transparency.

Transforming Ukraine's DH sector requires working across multiple dimensions including regulation, financial instruments, governance of DH companies, and communication. It is important that these measures address not only the "symptoms" but also the root causes of the DH market's current state (see Annex 4.5).

Figure 5. Categories of measures

3.2. SEQUENCING OF REFORMS

Transforming district heating requires a strategic approach that carefully considers the sequencing of reforms. Restoring the financial stability of DH companies by implementing cost-reflective tariffs, regulatory reform, and payment enforcement instruments should be a top priority, as this will help create the foundation of change for large-scale reforms. Such changes are essential to put DH companies in a position where they can attract the types of financing needed for large-scale DH modernization and energy efficiency improvements within the DH systems and the buildings they serve.

It is also important to improve focus on customers early in the reform process. Investment in energy efficiency, including in buildings, is important to lower costs, which creates space for tariff reform to cover investment without harming customers. Improved service quality is also a major customer priority. In Ukraine, lack of hot water in the summer and inefficient billing and service requests are top concerns, but so is system reliability. In addition, international experience with tariff reform tells us that reforms are more socially and politically durable when customers have clear information on the purpose of the changes and when the social safety net reforms can support the neediest, so that people are not left out in the cold, figuratively speaking. This is particularly important now, during the COVID-19 crisis.

3.2.1. Recommendations by Policy Area

3.2.1.1. Tariffs, Payment Discipline, and Governance

A pressing issue to address before the heating season of 2020-21 is to prevent some of the most potentially significant DH failures that may arise as a result of the current poor financial state of DH companies in Ukraine. Tariffs currently do not cover all operating costs, contributing to ongoing financial losses. With the introduction of the new natural gas market (causing significant fluctuations of the gas prices for DH companies), this situation could worsen. Today, changes in fuel costs may take months to incorporate into DH tariffs (Odesa, for example, went for years without updating its DH tariff to reflect increases in gas prices). Thus, the tariff methodologies should be urgently changed to allow all operating costs to be covered, and to ensure that the tariffs can adjust very rapidly when prices for major inputs change. This is particularly important because natural gas prices are at historically low levels today. Inclusion of investment costs in the tariff should be addressed at the same time. The IMF provided a structural benchmark that heating tariffs be reviewed to include both gas and non-gas costs, including capital expenses, by the end of August 2020 (IMF 2020).

Current PSO rules oblige Naftogaz to supply gas to DH companies even if the companies do not fully pay for such supplies. If these obligations are lifted (as reflected in MEFP with IMF), many DH companies will not be able to secure gas supplies without external interventions. Therefore, some interim regulation system may be needed, possibly with the involvement of local governments. This interim system would allow DH companies to continue purchasing gas at a discounted price in the short term while details are worked out on comprehensive reforms. At the same time, it is also essential to modify tariff methodologies to cover all reasonable operating costs and investment needs, utilizing this opportunity to fix systemic gaps in the tariff system.

Tariff and governance reforms that should be prioritized to set the framework for further system modernization include:

- Restoring the financial stability of DH companies through the implementation of cost-reflective tariffs;
- Comprehensively addressing ongoing DH company debt through tariff reform, payment enforcement, and other measures;
- Streamlining DH regulations to allow for one set of regulations and adopting modern tariff-setting methodologies;
- Improving sector-relevant legal and regulatory changes to facilitate investment (primarily with support from IFIs and donors, but perhaps also with the attraction of private investment);
- Enforcing the installation of building-level commercial meters for all consumers of DH companies (e.g., for residential, industrial and public buildings);
- Setting favorable regulatory conditions for CHP, renewable energy and waste heat sources in DH; and
- Improving corporate governance and the transparency of DH companies' operation and promoting customer-oriented approaches.

3.2.1.2. Buildings

Large-scale energy efficiency renovations of buildings can and should happen in parallel with reforms to the tariff structure and governance. Focusing on reforms that lead to efficiency first is important for the sequencing of reforms. Energy efficiency improvements lower the cost of district heat and provide jobs during the renovations. Lowering heat consumption in buildings through efficiency means that households will be better positioned to pay for tariffs that temporarily rise in order to finance needed investments into DH systems. Focusing first on efficiency investments can also reduce total investment costs by ensuring that future DH capacity is designed to meet today's needs. At the same time, while building efficiency should not be delayed, it may be challenging to implement large-scale efficiency investments before there are policies in place to scale up IHS installation and facilitate HOA formation. The following actions can set the framework for further energy efficiency investments in buildings:

- Further developing and improving national programs and financial instruments for supporting building renovation projects that are tailored to different building types (single-family homes, multi-family buildings, and public buildings). This also requires large-scale efforts to expand HOAs, including new legislation and support policies. For example, in Poland, buildings are required to have an HOA to sign DH supply contracts. HOAs also make it easier to attract investment in large residential buildings. In order to achieve the maximum result for invested capital, in the first years, more focus should be on modernizing the internal engineering systems in buildings (including installation of IHSs with thermostatic controls). In many European countries, an established model to finance IHSs is to allow DH companies to own, invest into and profit from heat substations for the initial years after the installation, allowing rapid deployment of that energy saving technology. Also, state programs should consider alternative sources of financing, such as funds from building owners, local budgets, donors, and commercial financing; and

- Improving the regulatory environment, which would facilitate building renovation projects, while ensuring minimal energy efficiency standards and enforcing safety requirements.

3.2.1.3. DH System Modernization

Large-scale investments in modernization of DH companies should be a priority over the longer term. The framework for investment should first be set through tariff reform and governance improvements. Actions for DH system development include:

- Implementing mechanisms that allow DH companies to benefit from large-scale implementation of efficient, building-level heat substations;
- Developing heat supply schemes to define DH zones and determine where investments will be cost-effective;
- Adopting best practice technical standards and construction project cycle management practices, to improve corporate governance and make companies more attractive for outside investment;
- Sequencing investments, focusing first on installations closer to buildings, to more accurately size future demand and avoid investing in oversized capacity; and
- Developing pilot projects to modernize neighborhoods of multifamily buildings, switching to renovated and highly efficient boiler houses and CHP systems, and scaling-up the projects with the support of development banks.

The national DH modernization program should use targeted state and local funds, as well as IFI financing, to leverage large-scale commercial financing. Investment may come in tranches, where initial tranches can help reform company systems and governance.

3.2.1.4. Affordability and Social Support

As tariffs are reformed to improve the financial stability of DH companies and subsidies to DH companies are phased out, special attention needs to be paid to social support systems to ensure that low-income families are able to meet their basic needs. Meeting people's basic needs is also essential for ensuring public support for the reforms. Focusing on efficiency throughout the system can help with this by improving affordability, as does improving governance of the systems to minimize financial waste. However, with reform, the tariffs will change to reflect investments DH companies make, so it is very important to systematically consider how this affects affordability of heating services. Subsidy programs may need to be revised to allow for faster processing of new claims in the near-term. In the future, policy makers should consider replacing utility financial support with more comprehensive welfare reform, along with programs that help low-income families participate in energy efficiency retrofits. A World Bank report (World Bank, 2020) found that Ukraine's large budget for social assistance provides an opportunity to redirect resources and rationalize the system in a way that reduces poverty. A central part of this issue is the unbalanced nature of the system; housing and utility subsidies account for 48% of the overall social safety net budget, and improved targeting of this assistance could have a large impact.

Social support systems in OECD countries are different from the system in Ukraine. Typically, OECD social support systems that impact energy payments include welfare support based on comprehensive family needs (without tying those needs to energy use directly); emergency utility bill assistance that can help ensure bills are paid when unexpected circumstances arise in the short-term; and assistance with energy efficiency retrofits for low-income households. In Ukraine, there is targeted energy assistance for households that pay a large share of their income for utilities, and there are programs like the Energy Efficiency Fund for general residential retrofits. However, these programs do not help mitigate the impact of family emergencies on bill payments, nor do they address the challenges of retrofitting buildings when low-income families in the building cannot afford their share of a building's retrofit cost. The Government of Ukraine can consider reviewing its social support system to better align with OECD countries, including adding emergency utility bill assistance and targeted low-income retrofit assistance.

3.2.1.5. Communication and Coordination

Throughout the sequence of reforms, it is also important to provide customers with transparent and consistent information on the changes in the district heating sector, which can build trust and customer satisfaction as the reforms are being implemented. This should include producing communication and public awareness campaigns, capacity building for homeowners, and bringing in market stakeholders (energy auditors, engineers, construction companies, etc.). It is also important to enhance coordination between government entities because DH policy touches on so many areas including energy, housing, state budgeting, and social support. The government should consider creating a high-level coordination group. Likewise, donors are seeking to enhance among themselves and with government and other stakeholders to ensure that financial and technical support align with planned reform actions.

3.3. SUMMARY OF RECOMMENDED ACTIONS

Tariffs, Payment Discipline, and Governance
Change regulations and regulatory practices to allow timely and full coverage of all reasonable operational and and investment costs into the heat tariffs.
Redesign the DH regulations to avoid failures due to gas market liberalization.
Adopt tariff regulations that create incentives for efficiency and high-quality service.
Build capacity for transparent and rules-based regulation, including creating a national regulatory training center of excellence.
Improve corporate governance and transparency of DH companies to promote customer-oriented approaches, including through independent supervisory boards.
Consolidate NEURC and MinRegion regulations so that there is a single fair and consistent set of rules. Clearly define regulatory rights and responsibilities of central and local authorities in DH regulation.
Establish favorable regulatory conditions for utilization of combined heat and power (CHP) plants, renewable energy, and waste heat sources.
Provide DH companies with tools for timely legal enforcement of collections, including streamlined legal procedures and ability to impose meaningful fines on late payment.
Comprehensively address ongoing DH company debt through policy reform in combination with debt restructuring.
Buildings
Start large-scale energy efficiency retrofits of multifamily buildings using monies from the Energy Efficiency Fund and develop new policies and mechanisms for building renovations.
Promote the establishment of homeowner associations (HOAs) and competitive markets for professional building management services.
District Heating System Development
Promote large-scale installation of individual heat substations (IHSs), including through new legal mechanisms that would allow DH companies to make these investments.
Adopt network and investment planning regulations along with robust capacity building in cities and DH companies.
Collect data and indicators on DH system performance and use this data to inform future policy developments.
Accelerate and scale up IFI investments in the DH sector.
Affordability and Social Support

Develop mechanisms to support for emergency utility bill assistance for low-income households.
Ensure that low-income households have access to free or reduced cost retrofits in their buildings to facilitate comprehensive building retrofits.
Communications and Coordination
Develop a public information campaign to provide clear information on the benefits and plans regarding DH, targeting leading stakeholder groups. Build stronger coordination between relevant government entities as well as key stakeholders to ensure that DH reform proceeds smoothly and efficiently

3.3.1. Linkages between National Policies and Local Activities

Municipalities play an important role in implementing district heating reform, and policies should be consistent between the national and local level. Municipalities should be active participants in policy design as well as implementation. Two-way communication is essential to facilitate this. Municipalities need to be part of the conversation because without them, policy reform is not likely to succeed. Municipalities own most of the DH systems in Ukraine; they are important players in tariff regulation, and they currently dedicate a significant share of municipal budgets to subsidize DH operations and investments.

This section outlines recommendations for municipalities, grouped by policy area.

Municipalities should introduce cost-recovery tariffs and update them regularly to reflect changes in fuel prices. Cities can also help solidify the financial situation of DH companies by improving payment discipline of customers. This could include adopting clear collection policies, improving collection systems and enforcement, and streamlining payment and billing practices, such as by offering online payment and billing options. Municipalities should be leaders in improving governance and transparency of DH companies by adopting regulation to create independent supervisory boards and publishing all reports online and improving communications with customers.

To facilitate energy efficiency improvements in the building sector, a recommendation for cities is to develop local energy efficiency programs in coordination with the central EE fund to promote retrofits of residential buildings. They can also promote HOA formation or selection of building managers by co-owners. Cities can also target public buildings with high heat consumption as candidates for retrofits.

Municipalities can help drive DH system development by developing heat supply schemes. They should support the transition to renewables and cogeneration in DH systems. In addition, municipalities should assist in facilitating IFI investments in the DH sector. Finally, cities play an important role in ensuring affordability and social support, and should coordinate to ensure family needs are met while payments to DH companies are reduced. Clear communication with customers at the local level is essential for ensuring that the reforms are successful.

Summary of recommended actions for municipalities

Policy Theme	Activities in Cities
Tariffs, Payment Discipline, and Governance	Introduce cost-recovery tariffs with regular updates Ensure good payment discipline through communication and enforcement Create independent, professional supervisory boards and increase transparency/public info
Buildings	Develop local energy efficiency programs in coordination with EE Fund Promote homeowner associations/professional management
DH System Development	Develop heat supply schemes Support transition to renewables, cogeneration and third-party access
Affordability, Social Support, Communications	Reducing payments to DH companies requires coordination to ensure family needs met Clear communication essential for reform success

3.3.2. Major Implementation Risks and Mitigation Options

The key implementation risks include: (I) concern about lack of popular support for reforms such as cost-recovery tariffs and stricter payment discipline; and, (II) insufficient institutional capacity and/or lack of coordination between different central and local government bodies (including NEURC and municipalities).

The most likely ways to mitigate these risks include:

- Transparent public and stakeholder communication on the benefits of DH and the reform plans, including strong coordination among key stakeholder groups;
- Planning for robust capacity building to ensure that the reforms are well implemented; and
- Sequencing of reforms to ensure that energy efficiency improvements lower bills and tariff reforms are linked with improved service quality.

Another risk to consider is that this strategy envisages large-scale implementation of building renovations and DH modernization projects. Due to lack of implementation capacity, limited financial resources and/or regulatory bottlenecks, the uptake may be slower than expected.

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4. ANNEXES

4.1. DH PRODUCTION SNAPSHOT IN THE EU AND UKRAINE: THE ROLE OF CHP AND RENEWABLES

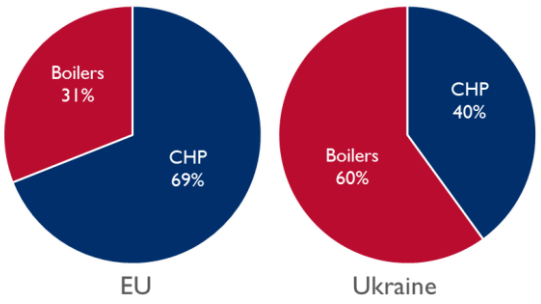


Figure A-1.1. *Share of CHP in heat generation in the EU and Ukraine in 2017 Source: International Energy Agency statistics*

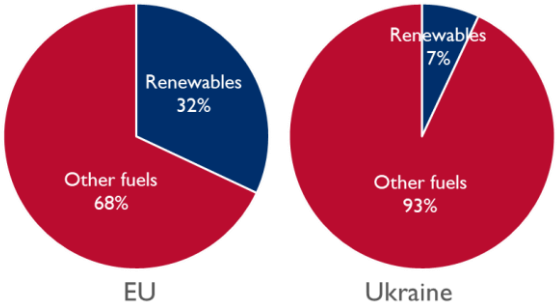
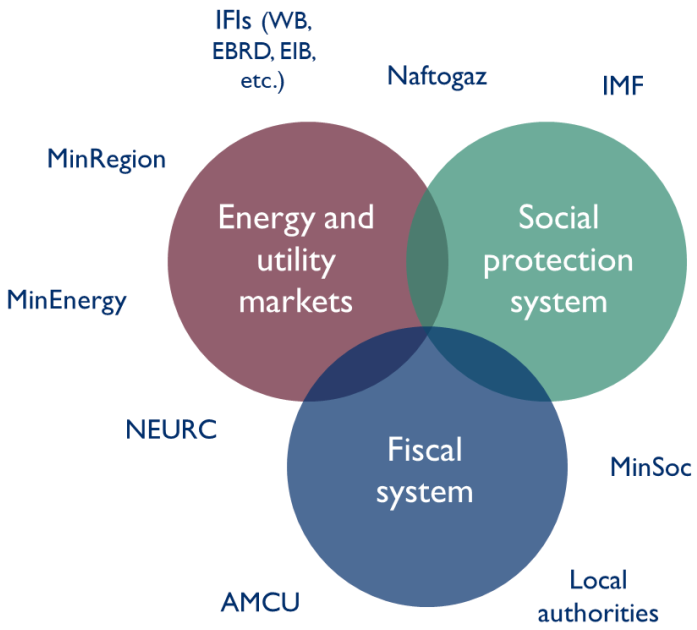


Figure A-1.2. *Share of renewables in heat generation in the EU and Ukraine in 2017 Source: International Energy Agency statistics*

4.2. COMPLEX AND INTERCONNECTED REGULATIONS



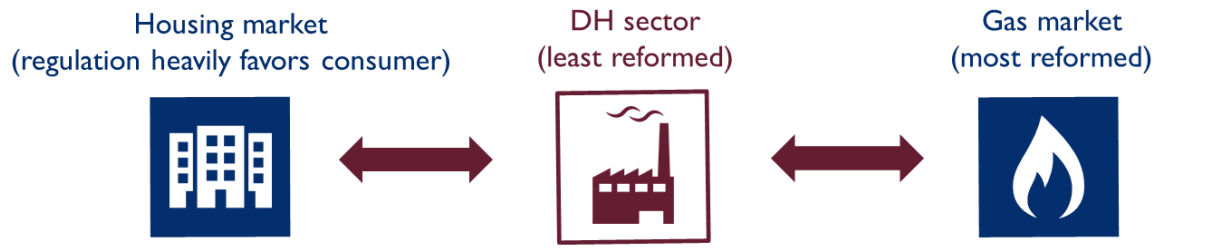
Any changes in regulations (such as floating PSO gas price) without proper adjustment of other parts of the system (heating tariffs, subsidies) may lead to failures

It is challenging but feasible to achieve both social and economic goals (tariffs must cover the real cost and the most vulnerable households can receive subsidies).

Figure A-2. *Complex and Interconnected Regulations*

(Abbreviations: AMCU - Antimonopoly Committee of Ukraine; EBRD - European Bank for Reconstruction and Development; EIB - European Investment Bank; IFI - International Financial Institution; IMF - International Monetary Fund; MinEnergy - Ministry of Energy and Environment Protection; MinFin - Ministry of Finance of Ukraine; MinRegion - Ministry of Territories and Communities Development; MinSoc - Ministry of Social Policy of Ukraine; NEURC - National Energy and Utilities Regulatory Commission; WB - The World Bank)

4.3. GAPS BETWEEN HOUSING, UTILITIES AND ENERGY MARKET REGULATIONS



- Housing reform stopped between "soviet" and EU models – most active homeowners organized and took responsibility, but the majority still rely on a paternalistic approach from the state
- The professional housing management market is still at the early stage of development
- Residents of multistory buildings are overwhelmed with the number of options and shared responsibilities to maintain those buildings
- Customer payment discipline is low

- Issues in regulation, tariffs (methodologies and setting mechanisms)
- Poor technical and financial state of DH companies
- Poor governance of DH companies
- Poorly constructed instruments to enforce customer payments
- CHPs may lose their electricity market shares and are not able to modernize assets within the current electricity market model and regulation

- National regulation is mostly in line with 3rd EU Energy Package (promotion of market competition)
- PSO in place, but is expected to cease in 2020
- Strong control over the payment discipline of DH companies to Naftogaz
- Strong financial influence on the national budget
- Strong market power of Naftogaz

Figure A-3. *Gaps Between Housing, Utilities and Energy Market Regulations*

4.4. FACTORS TO IMPROVE CORPORATE GOVERNANCE OF DH COMPANIES

Corporate governance of DH companies should follow OECD principles

Figure A-4. *Factors to Improve Corporate Governance of DH Companies*

4.5. CURRENT STATE, "SYMPTOMS" AND FUNDAMENTAL CAUSES

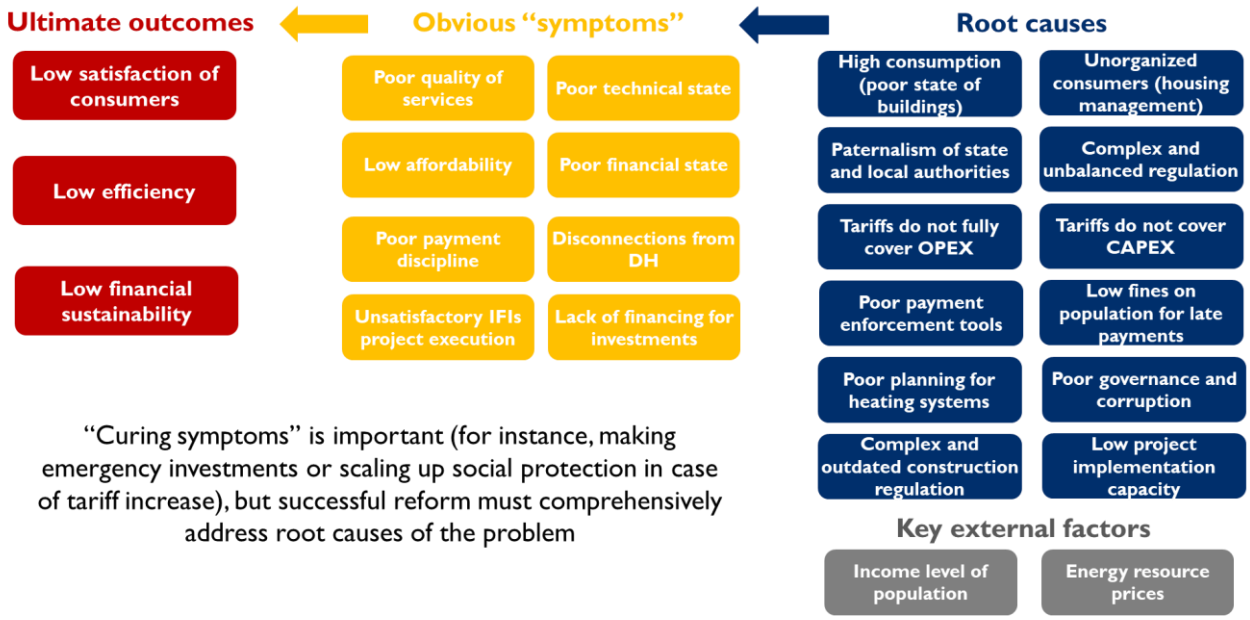


Figure A-5. *Current State, "Symptoms" and Fundamental Causes*

4.6. GAS PRICES: PUBLIC SERVICE OBLIGATION VS. COMMERCIAL CONSUMERS

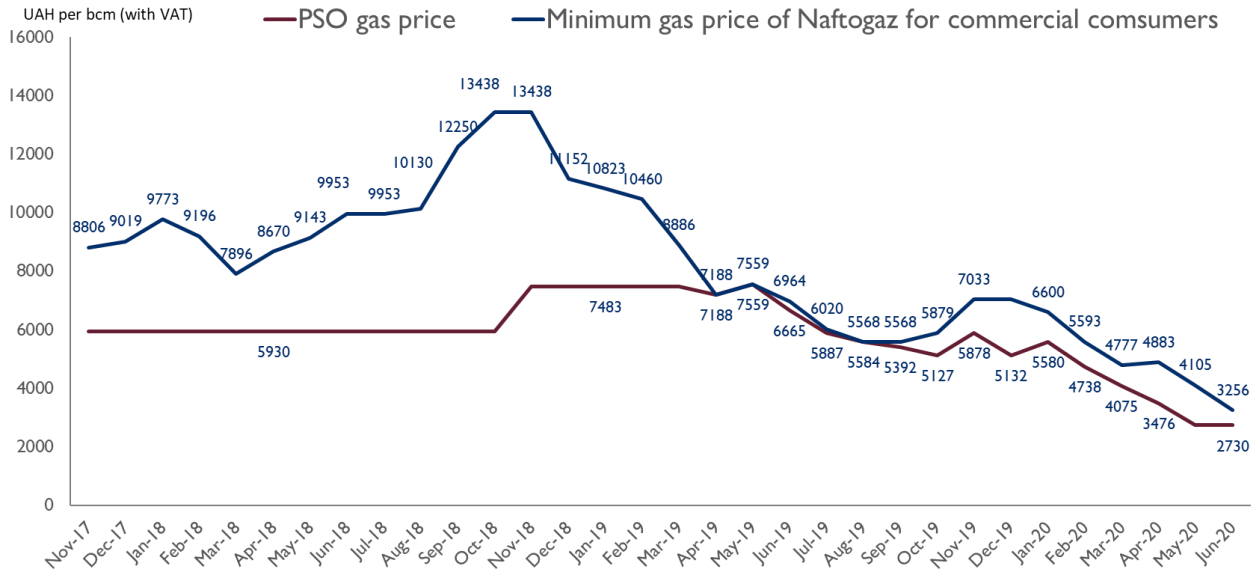


Figure A-6. *Gas Prices: Public Service Obligation vs. Commercial Consumers*

Source: NAK Naftogaz of Ukraine

4.7. DH AND ENERGY SUPPLY CHAIN ACCUMULATED DEBT

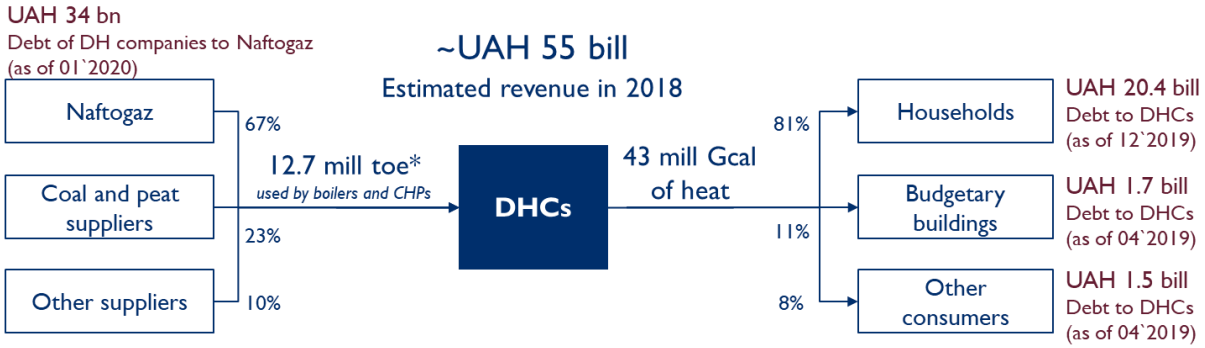


Figure A-7. *DH and energy-supply chain accumulated debt*
Source: Ukrstat, MinRegion, NAK Naftogaz of Ukraine, expert analysis.
** Some of the fuel is used for electricity production in CHP systems.*