November 2020



The market takes shape: he Ukrainian gas sector to 2030

Ukraine's gas sector is changing. Gas consumption is around 30 bcm/year, half the level of ten years ago, and energy efficiency gains could reduce it further. In the same decade, direct imports from Russia fell from a range of 35-40 bcm/year to zero in 2016, and have remained there. Import capacity on Ukraine's western border, including virtual reverse flow, is more than adequate, and expanding. Domestic prices move in line with European market prices, and price regulation has been removed from all sectors except district heating. Regulation is converging with European Union rules. Exchange trading has begun. Transportation has been unbundled from the state-owned national holding company, Naftogaz Ukrainy, and the transit business was stabilised by the deal signed with Gazprom at the New Year.

Not only has the market changed, but so have the factors shaping it. The disputes with Russia over import prices have ended, and those over transit arrangements have been pushed to the background. Of greater consequence are the speed and manner in which Ukraine integrates into the European market, and how long-overdue reforms of gas distribution, and supply to households and the district heating sector are managed. In the decade to 2030, energy policy discussions – as yet largely inconclusive, but more focused than any since independence – will influence demand. As elsewhere, the place of gas, if any, in decarbonisation strategy has to be defined. These same discussions will influence whether and when Ukrainian gas production, which has been set back by military conflict and economic recession, might attract substantial investment.

This paper offers a view on how political and economic factors will influence the market in the near term, and over the next decade. There are sections on (1) Energy policy and market prospects; (2) Gas market development; (3) Gas for electricity and heat; (4) Gas production; and (5) Imports, transit and storage.

1. Energy policy and market prospects

The year 2014 marked a turning point in Ukrainian government policy, energy policy included. The government of President Yanukovych was removed by popular action; Crimea was annexed by Russia; and a military conflict ensued, in which 13,000 people have died and more than 1.6 million have been displaced. The conflict, together with the turbulent external environment, intensified Ukraine's economic difficulties. Ukraine recorded sharp falls in GDP in 2014 (-6.5%) and 2015 (-9.7%). In 2016 the economy stabilised; growth has since then been in the range of 2-4%.¹ In 2014, one of the first acts of the new government was to sign the Association Agreement with the European Union that Yanukovych had rejected. This strengthened Ukraine's commitment, made in 2011 when it became a contracting party to the Energy Community Treaty, to align energy sector regulation with the EU's. Further international

¹ World Bank data, Ukraine GDP (annual). Casualty figure from Office of the UN High Commissioner for Human Rights, report on Ukraine, February 2020



commitments followed: in 2015, Ukraine committed to policy targets linked to the UN Sustainable Development Goals, and in 2016 ratified the Paris Agreement on climate change. In June 2019, the EU-Ukraine Association Agreement was updated to ensure alignment with provisions of the EU third energy package.²

Energy policy debates

The commitments implicit in Ukraine's Energy Community membership, and made explicit in these international agreements, were reflected in the Energy Strategy of Ukraine to 2035 (ESU 2035), drafted in 2015 and approved by the Cabinet of Ministers in 2017.³ The ESU 2035 envisages further progress towards regulatory convergence with the EU, and includes measures that could potentially enhance decarbonisation. But it is vague on key issues, including how decarbonisation targets may be reached, the pace at which coal production and use may be phased out, and the role of gas in the energy transition. These issues – which Ukraine faces in common with many other countries – have been aired in subsequent policy documents. The most important of these are a Green Energy Transition concept, published by the energy ministry in January 2020;⁴ a National Energy and Climate Plan, a re-draft of which is now (October 2020) under discussion;⁵ and a Low Emission Development Strategy produced in July 2018, pursuant to Ukraine's Nationally Determined Contribution (NDC) to the Paris agreement.⁶

The extent to which Ukrainian policy prioritises decarbonisation will influence the pace of the coal phase-out. Strategic decisions on energy efficiency, regulation of electricity and heat, and energy provision to homes, will influence gas demand. Whichever direction is taken by energy policy, Ukraine's energy balance will change significantly over the next decade. Table 1 presents a summary for 2018, the latest year available. The three big primary energy inputs are coal (30% of the total), gas (27.5%) and nuclear (23.5%), followed by imported oil products (10.5%). Electricity generation is primarily from nuclear (56%), coal-fired thermal generation (22%), and combined heat and power plants (CHPs), mostly run from gas (11%).⁷ Gas is also the main fuel for Ukraine's inefficient heat sector and for household heating and cooking.

In the policy discussions, these five areas are among the most important:

1. Ukraine's nationally determined contribution (NDC) to reducing greenhouse gas emissions under the 2015 Paris agreement. Ukraine's first NDC, submitted in 2016, was to limit greenhouse gas emissions in 2030 to no more than 60% of the 1990 level. The 1990 start date gave Ukraine, in common with other post-Soviet states, the opportunity to adopt a target for "reducing" greenhouse gas emissions that allows a considerable increase: Ukraine's emissions were 945.8 million tonnes of CO₂ equivalent (Mt CO₂eq) in 1990, and plummetted to 430 Mt CO₂eq in 2000, due to the 1990s economic slump. They hit a nadir of 322.3 Mt CO₂eq in 2015, and were 341.5 Mt CO₂eq in 2018. The 2030 target under the first NDC is 567.5 Mt CO₂eq, a fraction under 140% of the 2018 level.⁸

² Annex 27 of the Association Agreement was updated in June 2019. See: Association Agreement between the European Union and its Member States, of the one part, and Ukraine, of the other part. Document 02014A0529(01)-20200201 <a href="https:/

³ Energetichna Strategiya Ukrainy na period do 2035 roku "Bezpeka, energoefektivnyst', konkurentospromozhnist'" (Kyiv: Cabinet of Ministers, 2017), approved by resolution 605-r of 18 September 2017

⁴ *Kontseptsiya 'zelenogo' energetichnogo perekhodu Ukrainy do 2050 roku* (Kyiv: Ministerstvo energetiki ta zakhizstu dovkyllya, 2020), and English-language version (Ukraine 2050 Green Energy Transition Concept) (Kyiv, 2020)

⁵ The draft plan had not been made public at the time of writing

⁶ Ukraine 2020 Low Emission Development Strategy (Kyiv, 2017)

⁷ In the first quarter of 2020, sales to the wholesale electricity market were 55.9% from nuclear stations; 22.1% from (almost all coal-fired) electricity plants; 11.1% from (almost all gas-fired) CHPs, 4.3% from hydro power and 5.4% from renewables. *Zvit z monitoringu funktsyonuvannya optovogo rinku elektrichnoy energyy u I kvartaly 2020 roku* (Kyiv: NKREKP, 2020), p. 7
⁸ These numbers are for total GHG emissions (excluding land use, land use change and forestry (LULUCF)). Ukraine's first NDC committed it to decide on its approach to LULUCF by 2020, and this is one of the issues under discussion. While the 1990 total GHG emissions (including LULUCF) was 6.2% lower than the total (excluding LULUCF), the difference is now negligible (less than 1%). *Intended Nationally-Determined Contribution of Ukraine to a New Global Climate Agreement* (unfccc.int, 2016); *Ministry of Energy and Environmental Protection of Ukraine, Ukraine's Greenhouse Gas Inventory 1990-2018* (draft) (Kyiv, 2020)



Table 1. Summary of Ukraine 2018 Energy Balance, 000 tonnes of oil equivalent

	Coal	Crude	Oil pro-	Natural	Nuclear	Hydro,	Bio-	Electri-	Heat	Total
		oil	ducts	gas		wind	fuels	city		
						and	and			
						solar	waste			
Production	14556	2341		16487	22145	1094	3726		534	60883
Imports	13806	1333	10208	8459			37	3		33847
Exports, & intn'l aviation bunkers (1)	-60	-41	-597				-542	-524		-300
Stock changes	-247	1	78	707			-14			526
Total Energy Supply	28055	3635	9690	25653	22145	1094	3208	-522	534	93492
Electricity plants	-12384		-132	-212	-21991	-1094	-3	12295	-130	-23650
Combined heat & power plants	-2363		-156	-3624	-155		-146	1314	3238	-1892
Heat plants	-681		-37	-4912			-776		6054	-352
Oil refineries, coal transfm'n & other	-5492	-3875	2389				-336			-7313
Energy industry own use, losses,	-723	249	-1333	-1961				-2884	-2172	-8825
transfers & statistical differences										
Total final consumption	6411	9	10421	14943			1948	10203	7523	51458
Industry	5101		445	2927			28	4448	3542	16491
Transport	5		7394	1455			36	598		9488
Residential	727		76	8689			1814	3091	2271	16668
Commercial and public services	40		114	866			33	1731	1491	4275
Agriculture, forestry and fishing	7		1171	122			37	335	219	1890
Non-energy use (2)	531	9	1221	884						2645
Notes										

1. 300 ktoe of oil products went to international aviation bunkers. All other volumes are exports

2. These volumes are mostly inputs for chemical manufacture, including fertiliser

Source: IEA web site, summary by author

	ino 1 – business as usual. Scenaric		ence. st	enano	J – ciiiia	- neuti	arecom	omy
Sumn	nary of emissions and fuel use in	2015	2030			2050		
government's Scenarios 1, 2 and 3		Actual	S1	S2	S3	S1	S2	S3
GHG e	emissions, Mt CO2e	310.5	408.5	252.7	241.1	523.7	267.3	56.5
Share	of 1990 GHG emissions level, %	35	46	29	27	60	30	6
Total	primary energy supply, mtoe	89.5	124.7	98.6	99.8	162.3	117.3	106.7
	Coal, % of TPES	30.2	38.5	23.5	23.1	36.2	24.7	2
	Gas, % of TPES	29	28.5	27.8	27.3	25.7	18.6	13.8
	Renewables, % of TPES	3.6	5	16.1	16.5	6.5	24	41.1
	Nuclear, % of TPES	25.5	16.8	24.7	25.4	19.4	26.9	39.5
Electr	icity production, TWh	157	210	198	207	280	299	385
	Coal, % of elec. output	33	43	18	16	40	14	0
	Gas, % of elec. Output	5	4	7	5	2	0	1.3
	Renewables, % of elec. output	5.9	14.1	29.7	34.1	16.5	46.3	57.7
	Nuclear, % of elec. output	56	38	46	46	42	41	40
Impli	ed gas balance, bcm	31 14	42 64	32.89	32 70	50.05	26.18	17.66

Source: Support to the government of Ukraine on Updating its NDC. Report 3 / modeling report (London: EBRD, 2020), p. 9

The Paris agreement requires nations to submit new NDCs in a five-year cycle, with the second NDC due for submission in 2020. The EU, in particular, is urging the government to aim for more ambitious targets. The Low Emission Development Strategy, adopted in July 2018, projected 2030 emissions in a range of 29-41% of the 1990 level, and 2050 emissions in a range of 31-53% of the 1990 level. Three scenarios, modelled for the government by a team at the Institute for Economics and Forecasting at the



National Academy of Sciences of Ukraine, are summarised in Table 2. Scenario 1 assumes that current legislation remains in place, but that problems with implementation continue; Scenario 2 assumes that legislation is implemented; Scenario 3 assumes that additional measures are adopted.

The EU's call for more ambitious targets in the second NDC has been taken up in public discussion. Low Carbon Ukraine, a research group supported by the German environment ministry, has argued that policies aligned with Scenario 1 (business as usual) would allow emissions to rise by 30% by 2030, and risk being rejected by the Energy Community. Other civil society groups have urged a focus on Scenario 3, which would require substantial investment in renewable technologies during the 2020s, aimed at cutting emissions to 6% of the 1990 level by 2050 – and could be associated with a more ambitious NDC. The energy ministry has also commissioned a fourth "combined" scenario, that would achieve emissions reductions similar to those in Scenario 3, but without investing in new nuclear capacity as the government currently plans to do.⁹

2. The phase-out of coal-fired power stations. In 2017, a National Emissions Reduction Plan (NERP) was adopted, providing for the closure or upgrading of 147 coal-fired electricity generation plants, under Ukraine's obligations to the Energy Community to implement the EU Large Combustion Plants Directive (LCPD, 2001/80/EC). Nineteen plants have opted-out under the directive, meaning that they can run for 20,000 hours before closure; a further 61 opted-out plants are entitled to run for 40,000 hours under an ECS decision to reflect Ukraine's situation;¹⁰ and 67 plants, covered by the NERP, are required to implement the EU Industrial Emissions Directive, meeting emissions limits by deadlines in 2028 or 2033.¹¹ Ukraine faces political pressure to tackle more rigorously non-compliance with air pollution standards set in the NERP, and to improve monitoring.¹²

Following the election as president of Volodymyr Zelensky in 2019, the prospect of a complete cessation of coal-fired electricity generation has been discussed for the first time. The Green Energy Transition concept published by the energy ministry in January set out an approach to strategic planning that prioritises greenhouse gas emissions reduction. It envisages renewable sources supplying 70% of electricity by 2050, and coal-fired generation being completely substituted by renewables and flexible gas plants.¹³

The timing of, and funding of, the coal phase-out will be politically contested. The fate of coal-fired power plants is linked to that of the coal mines; their closures have had and will have major social and economic consequences. DTEK, Ukraine's largest energy holding company, and largest owner of coal-fired generation capacity, has said it welcomes the NERP. But the new government appointed in March, with Denis Shmyhal as prime minister and Olha Buslavets as acting energy minister, has declined to approve or develop the Green Energy Transition concept. Ministers have stated that the already-lengthened closure timescales in the NERP are too short.¹⁴

3. *Heat sector reform*. The ESU 2035 refers to the need to optimise the heat sector – a major consumer of gas – but the government has no detailed approach either to decarbonising heat or to reducing

⁹ Low Carbon Ukraine, Setting sensible climate targets for Ukraine's NECP (Berlin, July 2020); Drugii NVV Ukrainy: rezul'taty modeliovannya (presentation, Kyiv, 11 June 2020). On the compatibility of ESU2035 and other policies with EU standards, see Energy Community Secretariat, Annual Implementation Report, pp. 171-186 (Brussels: ECS, November 2019)

¹⁰ See Energy Community Secretariat, *Annual Implementation Report*, 2019, pp. 182-183; Energy Community Secretariat decision 2015/07/MC-EnC. The arrangements for the 19 opted-out plants expire on 31 December 2023, and for the 61 plants covered by decision 2015/07/MC-EnC, on 31 December 2033. The LCPD was superseded on 1 January 2016 by the Industrial Emissions Directive

¹¹ The NERP was amended in July 2019 to update the emissions reduction measures and reflect changes in electricity market regulation (see ECS, *Annual Implementation Report*, p. 182). Plants covered by NERP have to comply with IES sulphur dioxide and dust/fly ash emissions limits by 1 January 2028, and with nitrogen oxides limits by 1 January 2033. If they do not do so they are required to close

¹² See CEE Bankwatch Network, The impacts of Ukraine's energy sector on air quality (November 2020)

¹³ Kontseptsiya 'zelenogo' energetichnogo perekhodu Ukrainy do 2050 roku, pp. 1-2, 4 and 6

¹⁴ See facebook post by Maksim Nemchinov, deputy energy minister, 9 October 2020



losses. In the absence of a strategy, there has been a spontaneous trend towards households shifting to autonomous heating.¹⁵

4. Energy efficiency measures. Ukraine's GDP per unit of energy use is one of Europe's lowest – a third of Romania's and less than half of Poland's¹⁶ – and an energy efficiency action plan due for publication this year is not available. The importance of the issue can be seen in the range of prognoses in the Low Emission Development Strategy: emissions in 2050, as a proportion of the 1990 level – which would be directly reflected in the energy balance – are estimated at 70% in a business-as-usual scenario, 53% in an "energy efficiency" scenario" and 31% in an "energy efficiency, renewable energy, modernisation and innovation" scenario.¹⁷

5. Integration and implementation of policies. The ESU2035 has been criticised by international organisations and others on the grounds that general aims expressed are not translated into specific policy measures. It does not include detailed energy balance forecasts or estimates of the effect of policy choices on GDP. A monitoring report by the OECD concluded that ESU2035 suffers from "structural weaknesses", i.e. a "lack of clear allocation of responsibilities for monitoring and implementation", and an absence of formal mechanisms. It noted that the strategy is "only partially consistent with the EU-Ukraine Association Agreement": although the ESU 2035 outlined measures to reduce greenhouse gas emissions and restructure the coal sector, the EU-Ukraine Association Agreement mandates a set of legal acts to "(a) reform energy markets and (b) align energy efficiency standards according to EU rules", and these are lacking. Moreover, Ukraine has yet to devise an approach towards reducing its portfolio of energy subsidies (estimated at \$17 bn/year in 2018). Ukraine has one of the lowest emissions taxes in the world (10 UAH per tonne of carbon, about 2.5 times lower than Poland's), which the OECD has warned could lead to the imposition of EU carbon border taxes in future.¹⁸ The hope is that these issues will be addressed in the National Energy and Climate Plan.

Implications for the energy balance

The projections for energy supply included in the ESU 2035 are shown in Table 3. The two right-hand columns show, for comparison, projections reflecting Scenarios 2 and 3 modelled for Ukraine's second NDC under the Paris agreement, extrapolated from Table 2 above. The estimates in ESU 2035 differ from these Scenarios in two important respects.

- 1. The ESU 2035 assumes that Ukraine's total energy supply will not rise significantly by 2030 and will be about 10% (9 mtoe) lower than Scenarios 2 and 3.
- 2. The ESU 2035 assumes that all this saving will be made at the expense of coal: it estimates energy supply from coal will fall from 27.3 mtoe in 2015, and 28 mtoe in 2018 (see Table 1) to 18 mtoe in 2020 and 13 mtoe in 2030. Such a reduction is not expected in 2020, and without a sharp turn in government policy is surely not achievable by 2030.

¹⁵ OECD Monitoring of the Energy Strategy of Ukraine Until 2035 (Paris: OECD, February 2020), p. 29 and p. 41

¹⁶ World Bank data web site <https://data.worldbank.org/>. GDP per unit of energy use (2017 PPP \$ per kg of oil equivalent) is 11.2 (2015) for Poland, 14.4 (2014) for Romania and 5.0 (2014) for Ukraine

¹⁷ Ukraine 2050 Low Emission Development Strategy (Kyiv, Nov 2017), pp. 8-11; Low Carbon Ukraine, Quarterly Monitoring Report on the Implementation of Ukraine's Energy Action Plan, June 2020

¹⁸ OECD Monitoring of the Energy Strategy of Ukraine Until 2035 (Paris: OECD, February 2020), p. 9; CMS Law, Ukrainian Energy Strategy up to 2035: Safety? Energy efficiency? Competitiveness? (Kyiv, May 2018); Ecoaction and others, Roadmap: Climate Goals for Ukraine 2030 (Kyiv, 2020), p. 6



Total primary en	ergy supp	oly, millio	ons of to	e			
	Actual	Projecti	on	S2*	S3*		
	2015	2020	2025	2030	2035	2030	2030
Coal	27.3	18	14	13	12	23	23
Gas	26.1	24.3	27	28	29	27	27
Oil products	10.5	9.5	8	7.5	7	9	9
Nuclear	23	24	28	27	24	24	25
Renewables**	2.7	6.5	10	15.5	24	16	16
Total	90.1	82.63	87	91	96	99	100
* Calculated from	n Table 2,	and rou	nded, b	y the au	thor		
** including hyd	ro, bioma	ss, wind	, solar ai	nd geotl	nermal		

Nevertheless, the ESU 2035 reflects aspirations that are likely to guide government policy in the next few years, and are likely to be encouraged by the European bodies that are influencing policy: to reduce significantly the role of coal in electricity generation; to promote energy conservation that would help to constrain a rise in total energy supply; and to align Ukrainian market regulation with the EU's.

The gas sector will mostly be affected by the policy discussions in three ways:

First, although substantial progress on the coal phase-out is unlikely in the next few years, it is likely to gather pace over the longer term. Policy discussions will then influence the proportions in which nuclear, renewables and gas substitute for coal. Current policy provides for an expansion of nuclear capacity (construction of a third unit at the Khmelnitsky power station), but the EC and international institutions, as well as Ukrainian environmentalist organisations, oppose this on cost and other grounds. While it is generally accepted that some thermal generation will provide flexibility to support renewables, there is as yet no government commitment to building new gas-fired generating capacity, which some researchers believe to be already competitive at current gas and electricity prices.¹⁹

Second, effective energy conservation policies and market reform in the district heat and residential sectors, which account for about half of Ukraine's gas consumption, would be to gas's advantage. While such actions would probably reduce consumption still further, they would also reduce or eliminate the non-payment problems that have stymied market development.

Third, continued alignment with European regulation will make possible the development of a fully traded gas market. Again, this is unlikely to mean increased volume, but should mean new opportunities for inward investment, including in the upstream.

2. Gas market developments

In 2019, gas consumption in Ukraine fell below 30 bcm/year for the first time. In 2020 so far it is fractionally up year-on-year – 18.73 bcm in January-July, compared to 18.56 bcm in the same period of 2019, i.e. just under 1% higher²⁰ – likely due to the predominance of sources of demand not significantly affected by the coronavirus pandemic, such as household consumption and heat. The gas balance for 2018-19, as reported by Naftogaz Ukrainy, is shown in Table 4.

¹⁹ The OECD recommends postponing any decision on Khmelnitsky until after 2035. See OECD Monitoring of the Energy Strategy of Ukraine, p. 29. On gas-fired plants, see Low Carbon Ukraine, *Estimating the profitability of gas power plants in Ukraine* (Berlin/Kyiv, 2020)

²⁰ State Statistics Service of Ukraine <ukrstat.gov.ua>, fuel consumption pages



Table 4. Ukraine	e gas balance, 2018-2019		
bcm		2018	2019
Industrial +	Industrial	9.4	8.1
public sector	Public sector / religious	0.5	0.4
Gas companies	Ukrtransgaz	1.9	1.9
own use	Gas distribution companies	0.1	0.2
	Gas dis co's: unauthorised withdrawals**	0.9	0.7
	Ukrgazvydobuvannya	1.4	1.3
	Ukrnafta	0.3	0.4
	Other	0.1	0
Regulated	Heat for households	4.8	4.6
sector*	Heat for industrial/ public sector	1.7	2.3
	Heat: unauthorised withdrawals**	0.6	0.5
	Households: direct use	10.6	9.5
Total		32.3	29.9
* Regulation of ho sector is due to er	ousehold prices ended in July 2020; regulation of nd in May 2021	prices for	heat
** Estimates by N	aftogaz of the level of unauthorised withdrawals		
Source: Naftogaz l	Jkrainy Annual Reports		

The level of gas consumption in Ukraine has fallen significantly throughout the post-Soviet period. Figure 1 shows the changes since 2006, when consumption was between twice and three times its current level. Three factors have been at work: economic recession (especially, the impact of the 2008-09 crisis); political and military crisis (especially, in 2014, when Ukraine lost about 7% of its territory and suffered further economic dislocation); and market reform and energy-savings measures.²¹

There are no compelling reasons to expect any significant increase in demand in the next few years. Industrial recovery, e.g. in the chemicals sector (specifically, the manufacture of fertilisers) may result in some increased demand – but this could easily be cancelled out by economic problems and energy efficiency measures elsewhere. Longer-term, companies in Ukraine, like other European countries, are considering potential new sources of demand such as hydrogen production and the use of LNG and CNG for transport. Although Naftogaz has agreed with Energoatom, Ukraine's nuclear power company, to work out a hydrogen strategy, it is likely to be several years before this makes an impact on demand.²²

The sources of supply, and market dynamics, have also changed. Until 2014, most supplies were imported. Ukraine's own production has long been in the range of 18-21 bcm/year, and until 2012, all the remaining gas came from Russia and central Asia. Reverse flow imports across Ukraine's western border started in 2013 and ramped up sharply after 2014. By November 2015, with demand having fallen again and Ukraine and Russia in a state near to war, direct Russian imports ceased. Currently, supply is 20-21 bcm/year of domestic production and 10-12 bcm/year of imports, all reverse flow – either physical or virtual – via Slovakia, Hungary and Poland.

Over the past five years, Naftogaz has ceased to be the near-monopoly supplier to the domestic market. Its share of imports has fallen to about half: it imported 7 bcm of the total 10.6 bcm imported in 2018, and 7.2 bcm of 14.3 bcm imported in 2019. The remainder was imported by a range of wholesale traders (65 companies in 2018 and 76 in 2019). The share of gas produced in Ukraine by non-Naftogaz companies has also grown, to 4.7 bcm in 2019.

²¹ See: S. Pirani, Adversity and reform: Ukraine Gas Market Prospects (Oxford Energy Insight no. 7), March 2017

²² "Ukraine gas demand may rise as fertilisers ramp up output", ICIS, 20 May 2020; Naftogaz Ukrainy press release, "Naftogaz i Energoatom dogovorilis'", 24 September 2020





Source: Naftogaz, ministry of energy, author's estimates

In the wholesale market, industrial customers are supplied at unregulated prices; prior to 2014 these were essentially netted back from import prices, but since then they have been set in the market. Naftogaz sales to this unregulated segment of the market fell from 9 bcm in 2014 to 4.5 bcm (45% of this market segment) in 2016 and to a mere 0.6 bcm (5%) in 2017. In 2019, Naftogaz's share of the unregulated market remained very low: it reported intra-group sales of 2.4 bcm for Ukrtransgaz's operational needs and just 0.7 bcm (6%) to other commercial customers.²³

The market for industrial customers is now dominated by non-Naftogaz trading companies. In the retail market for household customers, Naftogaz has begun competing with other suppliers, following the long-awaited cancellation of the Public Service Obligation (PSO) on 1 August 2020. For district heating companies, Naftogaz will continue to supply gas under the PSO until May 2021. In both the household and district heating sectors, Naftogaz and its single owner, the Ukrainian state, have historically born losses of two kinds. First, until April 2019, regulated prices under the PSO were significantly lower than market prices, which were close to import parity. Naftogaz's upstream subsidiaries were obliged by law to supply gas to the holding company at a regulated price. Second and more seriously, a large stock of debt (reported as 106.7 UAH (\$3.7 billion) in September 2020) accumulated mostly from district heating companies that failed to pay for gas, and from gas distribution companies that failed either to pay for gas off-taken for their operational needs, or to pass on payments from related supply companies (see below).²⁴ Market reform should reduce the build-up of such debts in future.

Trading and the wholesale market

The traded gas market in Ukraine principally serves customers not covered by the PSO – industry, trade, and the energy sector's own use – who accounted for 14.6 bcm of consumption in 2018 and 13.0 bcm in 2019 (see Table 4 above). The largest category, industry, is dominated by metallurgy, and the chemical and petrochemical industries. (For statistical information on the sub-sectors, see Appendix.)

²³ Naftogaz Ukrainy, *Annual Report 2017*, p. 77; Naftogaz Ukrainy, *Annual Report 2018*, p. 26; Naftogaz Group, *Annual Report 2019*, p. 61; Naftogaz Ukrainy press releases, 7 February 2020

²⁴ Naftogaz Ukrainy, Annual Report 2018, p. 27; Naftogaz Group, Annual Report 2019, p. 31 and p. 72



A market in physical gas has been growing steadily; prices have since the mid-2000s been close to import netback levels. Sales are mostly bilateral, by suppliers or traders to industrial customers, but in the last three years steps have been taken towards a liquid market with an active exchange.

In 2017, Ukrtransgaz, then the transportation division of Naftogaz, began – in preparation for unbundling – to conduct tenders to purchase gas for its own use (4.7 bcm in 2017). Although most of the purchases were by Naftogaz, this trade sent out price signals. These tenders have been continued by Gas Transmission System Operator of Ukraine (GTSOU), the new TSO unbundled from Naftogaz on 1 January 2020. In 2019, regulation was put in place for month-ahead and day-ahead sales; daily balancing was introduced; and Argus began to publish Ukrainian current month and month-ahead prices. There were difficulties. For example, provision for prices to be fixed against the previous month was an invitation to practice speculation. Penalties for traders being out of balance were initially set at very low levels, making further room to game the market.²⁵ Nevertheless, Ukrainian prices began more closely to follow the formula [European prices + transport costs from the border]. This is evident in Figure 2, which compares Ukrainian prices to TTF prices.



Data from Argus Direct. Data sets: natural gas TTF month 1, London close, €/MWh; natural gas Ukraine advance payment (excl. VAT), London close, €/MWh

The volumes of bilateral trade on the Ukrainian Energy Exchange (UEEX) are now growing. UEEX volumes rose from negligible levels to 0.15 bcm in 2018 and 0.39 bcm in 2019. In July 2019 Naftogaz Trading began to place volumes on the exchange. In the first half of 2020, 0.735 bcm of gas was sold on the UEEX, which reported activity by Naftogaz; traders including PPC, Smart Energy, Kraft Energy and IEK M2; and distribution network operators.²⁶ Within-day and next-day trading has been introduced, and some counterparties are now using standardised contracts.

UEEX is working with the National Energy and Utilities Regulatory Commission (NEURC), GTSOU and other market participants to improve the balancing regime. Imbalances had ballooned during 2020, to 0.5 bcm in July alone. From 1 September, NEURC reduced tolerance levels for imbalances, to 3% (from 10%) for suppliers, and to 7.5% (from 15%) for gas distribution companies. Penalties for positive

²⁵ Naftogaz Ukrainy, Annual Report 2017, p. 107; author's notes

²⁶ Ukrainian Energy Exchange, *Work results for the first half of 2020* (slide presentation); Naftogaz Group, *Annual Report 2019*, p. 74



or negative imbalances were raised. In September, UEEX launched anonymous, cleared settlement of within-day imbalances, with transactions settled through escrow accounts to manage non-payment risk. For the longer term, UEEX is studying the best legal clearing model for spot and physical futures. UEEX hopes to introduce a one-way auction for GTSOU to buy or sell gas; for this, legislation that requires GTSOU to purchase gas exclusively through the state ProZorro tender platform will have to be amended. UEEX is also in discussion with regulators to resolve other obstructions to market development, including uncertainties over the registration of VAT on traded volumes.²⁷

Sales to households / opening-up of retail market

The provision of gas to households – about 9-10 bcm/year in recent years – formally became a market on 1 August 2020, with the cancellation of the PSO that required Naftogaz to supply households. Regulation has been amended and households should for the first time be able to switch supplier. The measure has been prepared over several years by the monetisation of subsidies paid by the state to lower-income households.²⁸

The low gas prices of 2019-20 have made the transition easier. During 2019 import prices fell rapidly and went below the regulated level of household prices. Naftogaz, which has until now bought gas for household consumption from its production subsidiaries, and sold it on to gas supply companies (gazzbuty), began to experiment with marketing measures, e.g. offers to retail customers of gas at summer prices for delivery during the winter heating season.²⁹ In January 2020, the government issued a decree to the effect that household prices should not exceed the level of [TTF price + transport to Ukraine border + Ukraine transmission costs]. In March 2020, Naftogaz correlated the price with that paid at GTSOU's auctions, resulting in a further reduction.³⁰

Although opening up the household sector is expected to reduce the level of market concentration, at present it is dominated by two players: Naftogaz, and the RGC group, which is controlled by the group of companies headed by Dmitry Firtash, the exiled businessman.³¹ There are about 12.5 million households supplied with gas; supply companies owned by RGC serve about 8 million of them. Naftogaz currently supplies only 2% of household customers, but says it aims to serve 2.5 million households. It is offering an annual tariff plan linked to NCG prices, and quarterly and monthly plans linked to the UEEX.³²

Market reform will surely lead towards some resolution of the problem of debts accumulated under the PSO. The largest debt burden is of gas supply companies to Naftogaz (23.6 billion UAH) and regional distribution companies to GTSOU and Ukrtransgaz, for unsanctioned offtake of gas (35 billion UAH). The debt owed by district heating companies to Naftogaz is even larger (see next section). The intracompany debts are much greater than the aggregate debt of households to gas supply companies and heat companies. In September, Naftogaz identified RGC as responsible for 13 billion UAH of debts and

²⁷ Penalties are now: for suppliers, 10% of the daily balancing price for imbalances of 3-5%, and 20% of the price for imbalances of more than 5%; for distribution companies, 10% of the daily balancing price for imbalances of 7.5-15%, and 20% of the price for imbalances of more than 15%. "Ukraine regular lowers tolerance levels", ICIS, 27 August 2020; "Ukraine exchange introduces within-day gas trading", *Argus European Natural Gas*, 24 September 2020; "Ukrainian gas bourse prepares for large-scale transformation", ICIS, 13 July 2020

²⁸ After the cancellation of the PSO, a "supplier of last resort" system is in place to ensure that households are not left without gas. Gazpostachalna, a Naftogaz subsidiary, has been selected for this role by an energy ministry tender; as of mid-September, Naftogaz stated that the function had not been required. See "Ukraine selects Naftogaz", Argus FSU Energy, 16 July; Naftogaz Ukrainy facebook post 16 September. On monetisation of subsidies, see European Commission, *Macro-financial Assistance to Ukraine: disbursement of the second instalment. Information Note to the European Parliament and to the Council (May 2020)*, p. 17

²⁹ Naftogaz Ukrainy press release, 23 August 2019

³⁰ Naftogaz Group, Annual Report 2019, p. 31

³¹ Firtash, who has played a major role in the Ukrainian gas sector throughout post-Soviet times, is based in Vienna and subject to a US extradition warrant

³² OECD Monitoring of the Energy Strategy of Ukraine, p. 42; Group DF web site, "Oleg Nikonorov: 'We want to provide the best service'", 27 November 2019; Naftogaz press releases, 27 August and 8 September 2020; Naftogaz Group, Annual Report 2019, p. 57



said that RGC-affiliated companies stopped debt repayments as soon as the PSO was cancelled. Naftogaz also denounced political lobbyists who have drafted a law cancelling the accumulated debt.³³ Table 6 summarises debts as reported in September.

Table 6. Reported debts in the gas sector, 15 September 2020							
Debtor(s)	Creditor	Amount (bn UAH)	Notes				
Regional gas distribution companies (oblgazy)	GTSOU and Ukrtransgaz	35	Unsanctioned offtake of gas				
Gas supply companies (gazzbyty)	Naftogaz	23.6					
District heating companies and combined heat and power plants	Naftogaz	44.5	For production of heat (36.6 bn) and electricity (7.9 bn)				
Industrial enterprises	Naftogaz	3.6					
Total 106.7 \$3.77 bn at current exchange							
Note. The aggregate debt by house	eholds for supp	oly and distri	bution of gas, heat and hot water,				
Was 38.9 bn UAH on 31 August, acc	ording to the st	ate statistic	s agency				
Sources: Naftogaz Ukrainy, state statist	tics agency, news	reports					

3. Gas for heat and electricity

Gas is the main fuel for heat production. Its role in electricity generation is minor, but could grow. In the short term, heat sector reform could potentially make gas sales there profitable. In the longer term, much depends on energy policy. If Ukraine opts to electrify residential heating, in line with the decarbonisation strategy prevalent in Europe, gas will be displaced. However, the role of gas in electricity generation could expand.

Heat produced by boilers

Gas for heat production, supplied by Naftogaz under the PSO, was 7.1 bcm in 2018 and 7.4 bcm in 2019.³⁴ Most of this gas is supplied to municipal district heating companies who own networks of boilers; a smaller proportion, probably around 40%, goes to CHPs that supply heat to those heating companies and electricity to the grid.³⁵ (See below.) In April the government decided that, whereas the PSO for gas supplied to households was cancelled from 1 August 2020, the PSO for gas supplied to heat producers would remain in place until 1 May 2021.³⁶

Naftogaz has stated that the heat producers are "the most problematic group of customers", responsible for a "substantial part" of the debt burden that has been accumulated by them since 2015. As Table 6 above shows, district heating companies and CHPs accounted for 44.5 billion UAH of the debts owed to Naftogaz in September 2020. Naftogaz has proposed rescheduling debts by district heating companies, and asked the government to use reduction of subventions to local governments (which in many regions own these companies) as a lever; in September it published a list of offenders; negotiations are ongoing.³⁷

³³ Ekonomichna Pravda, "Naftogaz sobiraetsia suditsia s gazsbytami", 7 September 2020; Naftogaz press release, 16 September 2020; Aliona Osmolovska, "Zabuti vse: iak zakonoproekt pro 'spisannya borgyv' mozhe zirvati pidgotovku do zimi", Interfax-Ukrainy, 16 September 2020

³⁴ See Table 4 above. These figures are the totals of the rows ("heat for households", "heat for industrial/ public sector" and "heat: unauthorised withdrawals")

³⁵ See Table 1. In 2018, the IEA counted 4.9 million toe of natural gas used in heat plants (i.e. boilers), compared to 3.6 mtoe in CHPs

³⁶ Ukrainian government resolution no. 303, 24 April 2020 <https://www.kmu.gov.ua/npas/pro-vnesennya-zmin-do-postanovi-k-a303>

³⁷ Naftogaz Group, *Annual Report 2019*, pp. 73-74; Naftogaz Ukrainy press release, "Svoevremennyi start otopitel'nogo sezona", 17 September 2020



The cancellation of the PSO for heat producers will require the owners of these firms, mostly local governments, to review their strategy. This in turn, may open the way for energy efficiency savings, the potential of which is well known. The European Bank for Reconstruction and Development (EBRD) and Naftogaz-Energoservis, a Naftogaz subsidiary, have participated in schemes to finance efficiency measures at household level – but, so far, these schemes are mostly limited to e.g. insulating buildings and giving households more control over their own gas supply by providing individual supply and meters.³⁸ The overhaul of heating systems, mostly installed in the 1960s-80s, and their possible electrification, remains in the realm of political discussion.

Combined heat and power plants

Ukraine's fleet of about 40 CHPs is a significant consumer of gas (probably around 3.0-4.5 bcm/year), coal and oil products. The CHPs account for about 40% of the total heat generated, including 18.5% from gas-fired CHPs; the remaining 60% of heat is from overwhelmingly gas-fired heat plants (i.e. boilers).³⁹ The CHPs also account for 11.6% of installed electricity generation capacity, and in 2019 for 7.1% of electricity output, more than the contribution of hydro or of renewables. More than half of the CHP-generated electricity is from gas.⁴⁰ The shares of electricity generation capacity and output are shown in Table 7.

Some CHPs are owned by private corporations, including the Firtash group, some by entities linked to local government, and some by the state property fund. In the last three years, Naftogaz has become the largest single manager of CHPs, while DTEK has relinquished some CHPs.

DTEK had controlled two of the largest CHPs, Kyiv TETs-5 and Kyiv TETs-6, through a subsidiary, Kyivenergo. In 2018 these two plants were bought by Kyivtoplenergo, a local-government-affiliated company. Kyivenergo has since been wound up, while DTEK has taken over the capital city's electricity networks.⁴¹

Table 7. Ukraine electricity generation: capacity and output								
	Installed	capacity	Electric	Electricity output				
	2019,	2019,	2018,	2019,	2019, %			
	MW	%	bn kWh	bn kWh				
Nuclear	13835	26.2	84.4	1 83	54			
Thermal power plants	21842	41.4	47.8	3 44.9	29.2			
Combined heat & power plants	6091	11.6	11	l 10.9	7.1			
Hydro + hydro pumped storage	6297	11.9	12	2 7.8	5.1			
Wind, solar and biomass	4723	8.9	2.6	5 5.4	3.5			
Producers on territory of DSOs			1.5	5 1.8	1.1			
Total	52788	100	159.3	3 153.8	100			
Source: Ukrenerao Sustainability Report	2019.pp.62	-64						

³⁸ In most of Ukraine's apartment blocks, which have Soviet-era systems, individual households can not control the flow of gas or heat. Naftogaz Group, Annual Report 2019, pp. 111-112; EBRD press release, 21 Sep 2018, "30,000 Ukrainian households benefit"

³⁹ For 2018, the IEA energy balances (Table 1) show 4.35 bcm (3.62 million toe) of gas consumed by CHPs. The gas balance published by Naftogaz (Table 4) shows 7.1 bcm total supplied to the heat sector in total, implying 3 bcm for CHPs. In 2017, the IEA registered 404787 TJ of heat generated, of which 161,393 TJ was from CHPs, including 74,753 gas-fired CHPs. IEA *World Energy Balances* (2019 edition), p. II.367

⁴⁰ Of 12,048 GW generated by CHPs in 2017, 6,892 GW (57%) was from gas-fired plants. IEA *World Energy Balances* (2019 edition), p. II.367

⁴¹ DTEK Annual Report 2017, p. 75; Interfax-Ukraine, "Naftogaz, Kyivenergo, Kyivteploenergo sign amicable agreement", 9 October 2018; Biz.liga.net, "Byvshaya Kievergo Akhmetova – ofitsial'nyi bankrupt", 25 September 2020; Finance.ua, "Sud priznal 'Kievenergo' Akhmetova bankrotom", 27 September 2020



Naftogaz's first takeover of CHPs was of the Novoyavorivsk TETs and Novyi Rozdil TETs in the Lviv region. Both had been managed by Garant Energo M, but in 2019, after debts built up and maintenance was neglected, the government appointed Naftogaz as manager. In August 2020 Naftogaz took ownership of the Severodonetskaya TETs, and was appointed manager of a further five plants owned by the state property fund – at Odessa, Krivoi Rog, Kherson, Nikolayev and Dneprovsk. These are comparatively large plants that serve heavily-populated urban areas and sell electricity to the grid. Naftogaz has pointed to the potential for energy efficiency savings. Progress will surely also be made on reducing the debt burden. The company may gain advantages from vertical integration: it will burn its own gas to produce electricity and heat for increasingly competitive markets.⁴²

Electricity market and prospects for new gas-fired power generation

In round numbers, six tenths of Ukraine's electricity is generated from state-owned nuclear and hydro plants; three tenths from privately-owned and state-owned coal-fired plants; about 7% from CHPs; and 3-4% from wind and solar. (See Table 7 above.) The wholesale electricity market was liberalised in July 2019, but many elements of state regulation remain: cross-subsidies for households have been preserved in a PSO mechanism; losses by the state-owned companies persist, and Energorynok, the energy market company, remains saddled with debt; thermal generation is dominated by DTEK, a near-monopoly supplier; and while steps are being taken towards integrating regulation with that in Europe, the electricity export market is also a near-monopoly, of the Burshtyn Energy Island trading zone, where DTEK owns 90% of capacity.⁴³

There has been significant growth of wind and solar capacity. Installed capacity of new renewables rose from 2 GW at the end of 2018 to 6.2 GW at the end of 2019; the leading investors are DTEK in wind and CNBM of China in solar. A long-standing dispute between government and renewables companies, over a proposal retroactively to reduce feed-in-tariffs, under a scheme that has now been phased out, was resolved by agreement in June. Ukraine, in keeping with international trends, is now moving to auctioning forward contracts.⁴⁴

The future of electricity generation, though, is highly dependent on the policy discussions referred to in section 1. Ukraine has excess electricity generating capacity; with a slower coal phase-out, that will persist. Wind and solar capacity is likely to continue to expand, albeit much more slowly after the switch away from FiTs. Over the longer term, the possible expansion of nuclear capacity – whether by the long-postponed new units at the Khmelnitsky plant, or in some other form – could be a factor.

Two contrasting arguments on gas have been presented, in government hearings and public discussion: on one hand that, in keeping with the Green Energy Transition strategy, investment should prioritise further expansion of renewables, demand management and storage; on the other, that gas is the best source of flexibility for a growing share of renewables, and that the economic logic of new CCGT plants, in particular, is compelling. The latter argument implies an expansion of gas-fired capacity.⁴⁵

⁴² Naftogaz Group, *Annual Report 2019*, p. 109; "Gazovyi DTEK'. Naftogaz nachal zakhvatyvat rynok teploenergetiki", UBR.UA, 31 August https://ubr.ua/finances/zhilishhno-kommunalnoe-hozjajstvo/hazovyj-dtek-naftohaz-nachal-zakhvatyvat-rynok-teploenerhetiki-3895556>

⁴³ Low Carbon Ukraine, Quarterly Monitoring Report on the Implementation of Ukraine's Energy Action Plan, June 2020; Yuri Kubrushko, "Dlia preodoleniia krizisa v energetike nuzhny chetkie tseli", Kozatka.media, 15 May 2020; OECD Monitoring of the Energy Strategy of Ukraine Until 2035, p. 39; Energy Community Secretariat, Annual Implementation Report, 1 November 2019, p. 172

⁴⁴ DTEK, *Annual report 2017*, pp. 49-50; Interfax-Ukraine, "Share of foreign RES investors", 7 May 2020; Tetiana Mylenka, "All details of Ukraine's new feed-in tariffs for PV", *PV Magazine*, 6 August 2020; https://euea-energyagency.org/en/news/market-news/neurc-approved-reduced-feed-in-tariffs/

⁴⁵ Naftogaz Group, Annual Report 2019, p. 58; https://iportal.rada.gov.ua/ru/preview/preview/anonsy_sobytij/189817.html; https://energytransition.org/2020/04/a-turning-point-for-ukraine-full-scale-energy-transition-or-re-established-gas-dependency/>



4. Gas production

Ukraine's gas production was 20.7 bcm in 2019, down slightly from 21.0 bcm in 2018. Ukraine has substantial hydrocarbons resources, and the aspiration to become self-sufficient in gas is expressed regularly by politicians and industry managers. This could mean raising production to around 30 bcm/year – a target that is clearly out of reach in the next few years. While regulatory reform and successful licence auctions raised hopes in 2019, low prices and the coronavirus pandemic have put paid to ambitions for developing new fields. In the near term, Ukraine will be focusing on maintaining output at the level of the last two decades, i.e. in the range of 19-21 bcm/year.

Ukraine suffered setbacks upstream in 2014-15, as a result of the outbreak of military conflict and the fall in international oil prices. The Russian annexation of Crimea deprived Ukraine of Chornomorneftegaz, the Crimea-based production company, and its output of around 1.5 bcm/year. Then Shell, which had in 2013 signed Ukraine's first production sharing agreement (PSA) with an international major, for the Yuzivska field, declared force majeure due to military activity nearby. Advanced talks on other PSAs with a consortium led by ExxonMobil, and Chevron, were halted.

Over the next three years or so, efforts were made to improve the legal framework for inward investment. Royalties were fixed at 12% for hydrocarbons produced less than 5 km below the surface and 6% for those below 5 km, with a five-year stabilisation clause. A transparent set of rules was adopted for licence auctions. Nevertheless international investors largely stayed away from two rounds of auctions in 2019. In the first, only three of ten blocks were sold, and in the second, Ukrgazvydobuvannya, Naftogaz's production subsidiary, took six or the seven blocks offered. In 2020, three small blocks were awarded to foreign-owned ventures: Hrunivska (Suny and Poltava region) to York Energy, a subsidiary of Alpha Energy of the USA; and Ichyanska (Chernihiv) and Okhtyrska (Sumy, Poltava and Kharkiv) to EP Ukraine of the Netherlands.⁴⁶ Exploration schedules will inevitably be pushed back in the current low price environment: for example, exploration by PGNiG of Poland, in partnership with ERU of Ukraine, due to start in the third quarter of 2020, has been delayed until 2021.⁴⁷

Ukraine's own production companies are concentrating mainly on more effective exploitation of existing fields. Ukrgazvydobuvannya, which accounted for 14.9 bcm of the national total output of 20.7 bcm in 2019, is seeking to address a high level of field depletion with workovers and hydro fracking operations. Ukrgazvydobuvannya has also signed a 15-year production enhancement contract with Expert Petroleum of France, which has committed to invest 1 billion UAH over the next five years in maximising output from mature assets.⁴⁸

5. Imports, transit and storage

Over the past year, Ukraine has taken big steps towards integrating its gas transmission infrastructure with the networks in Poland, Slovakia, Hungary, Romania and Moldova. Arrangements have been put in place for virtual reverse flow (backhaul) across Ukraine's western borders. From 2013 until the end of 2019, some Russian gas was transported to European countries, sold to traders there, and then turned around and returned to Ukraine (physical reverse flow); this has now been largely superceded by virtual reverse flow, under which the Ukrainian TSO nets off volumes imported eastwards against volumes of Russian gas flowing westwards. Of the 12.5 bcm imported by Ukraine in January-August 2020, 4.7 bcm (38%) came via virtual reverse flow. (See Table 8.)

The transformation of cross-border arrangements has also facilitated the integration of Ukraine's large storage facilities into the European market, with a large proportion of the imported volumes going to be stored under the "customs warehouse" (duty free) arrangement set up earlier this year. Over the summer, with European gas storage almost full to capacity, Ukrtransgaz, which operates Ukraine's

⁴⁶ Pirani, Adversity and reform: Ukrainian gas market prospects (OIES, 2017), p. 7; Association of Gas Producers, Digest, 1st Quarter 2020; CMS Law, Progress in the Ukrainian gas sector, 24 January 2020; energy ministry press release, 30 April https://mepr.gov.ua/news/35226.html>

⁴⁷ "Polish-based PGNIG postpones start of gas exploration", Interfax-Ukraine, 12 October 2020

⁴⁸ Naftogaz Group, Annual Report 2019, p. 26 and pp. 63-66



storage, was able to provide substantial storage services to traders in central and eastern Europe. (An OIES Energy Comment, published in June, dealt with this in detail.⁴⁹) Discounted transmission services, and specifically GTSOU's "short haul" product, helped to attract these flows.

Table 8. Gas in	nports to	Ukraine,	Jan	-Aug 202	0	
bcm	Total	Via virtual		To "customs warehouse"		
		reverse		Via "short-	Other	
Via Slovakia	8	1.6		haul"		
Via Poland	3.2	0.8		facility		
Via Hungary	1.3	2.3				
Total	12.5	4.7		4.9	3.3	
Source: GTSOU						

Imports and integration with western markets

With both *Hungary* and *Poland*, interconnection agreements between the transmission system operators (TSOs) allow for virtual reverse flow, constrained only by the volume of forward (east to west) flow. An agreement signed in April 2020 between GTSOU and the Hungarian TSO, FGSZ, provided for two physical interconnection points (IPs), Beregovo (east to west) and Beregdaroc (west to east), to be unified into one virtual interconnection point (VIP), Bereg. From Ukraine to Hungary there is 45.5 mmcm/d of firm capacity and 40.5 mmcm/d of interruptible capacity; from Hungary to Ukraine the total capacity is the same, but it is all interruptible. Market participants believe that, if and when some of this can be made firm, Ukrainian traders could access e.g. LNG imports via the Croatia terminal.⁵⁰ A similar agreement with the Polish TSO, Gaz-System, took effect on 1 July, and unified two IPs, Drozdovichi (with reported capacity of about 14 mmcm/d Ukraine-Poland) and Hermanowice (with previously reported interruptible capacity Ukraine-Poland of 4.3-6.4 mmcm/d).⁵¹

On the border of Ukraine and *Slovakia*, through which most of the Russian gas that transits Ukraine to European destinations passes, progress on virtual reverse flow has been slower. Until March, Ukrainian imports of up to 10 bcm/year all flowed eastwards through the Budince IP (capacity 42 mmcm/d); flows through the much larger Velke Kapusany IP (capacity of more than 200 mmcm/d) were all Ukraine-Slovakia. Eustream, the Slovakian TSO, began in March to offer 10 mmcm/d of virtual reverse flow capacity via Velke Kapusany, and in June a further 7 mmcm/d was added. However Eustream did not share GTSOU's enthusiasm for expanding virtual reverse flow, and a bad-tempered dispute followed.⁵²

On 23 June GTSOU announced that Budince would be closed for repairs from 11 August until 1 October. Eustream complained publicly that the closure – announced just as west-to-east flows were swelling, as European market players sought to take advantage of Ukraine's storage arrangements – was "unfortunate"; "we were only informed of Ukrainian intentions about two weeks ago"; and the disruption was of a kind "we have not witnessed in the past 50 years". GTSOU responded that a "mutually feasible solution" would be to expand virtual reverse flow via Velke Kapusany. Eustream conceded, and announced that 60 mmcm/d exit capacity would be available from 1 July to 1 October. In the month that followed, around 43 mmcm/d went to Ukraine on that route, in addition to flows through Budince running close to capacity of 42 mmcm/d. With the repair completed at the end of September,

⁴⁹ S. Pirani and J. Sharples, *European Gas Storage: backhaul helps open the Ukrainian safety valve* (Oxford Energy Comment), May 2020

 ⁵⁰ GTSOU press release, 29 April 2020; ICIS, "Ukraine gas market should focus on three goals", 29 September 2020
 ⁵¹ Joint press release by GTSOU and Gaz-System, 5 June 2020; Naftogaz Group, *Annual Report 2019*, p. 85; Pirani and Sharples, *European gas storage*, p. 7

⁵² Eustream press releases, 28 February 2020, 6 June 2020



and the Ukrainian storage facilities set to move into withdrawal mode in October, the virtual reverse flow experiment ended. The experience suggests that, although Eustream prefers to use physical reverse flow, the Velke Kapusany route could become, over time, virtual reverse flow capacity of last resort.⁵³

The Trans-Balkan pipeline that runs from Ukraine through *Moldova and Romania* south-westwards is also being opened up for reverse flows, including virtual. With the commissioning of the Turkstream pipeline last year, east-west flows through the Trans-Balkan line slowed to a trickle, in line with Gazprom's policy of shifting transit away from Ukraine. In June, Moldovagaz, which operates the Moldovan section of the Trans-Balkan line through a subsidiary, Moldovatransgaz, announced that capacity would be available for booking under standard contracts in line with EU regulation. In October, Moldovagaz announced that it had itself booked Ukrainian import capacity, and is planning to store about 100 mmcm (about one tenth of Moldova's total 1 bcm of consumption) in Ukraine for withdrawal in December and January.⁵⁴ In August, ERU Trading, a Ukrainian gas trader, announced that it had imported a delivery from Greece and brought it to Ukraine on the Trans Balkan line with reverse flow agreements. ERU Trading managers urged Transgaz, the Romanian TSO, and GTSOU to sign an interconnection agreement covering the Mediesu Aurit/ Tekovo IP, to facilitate reverse flow directly, rather than through Moldova.⁵⁵

The storage and transit businesses

Ukraine's storage business, which is run by Ukrtransgaz, a Naftogaz subsidiary, has this year been transformed by a combination of circumstances. The pressure on European storage capacity, caused by low prices and market oversupply, was aggravated by the coronavirus pandemic, and stimulated an unprecedented level of demand for Ukrainian storage. Both Ukrtransgaz and GTSOU reacted rapidly and made a commercial success of meeting this demand. By 1 September 25.6 bcm was in storage, 13.3 bcm of which was injected in 2020 – a substantially higher level than other recent years (see Figure 3). This included 7.9 bcm owned by non-resident companies, 6.8 bcm of which was injected this year.⁵⁶ It may be assumed that most of these volumes owned by non-residents will eventually be returned to non-Ukrainian markets, as and when demand requires.

It is as yet unclear to what extent the exceptional circumstances of 2020 will change things over the longer term. It has long been assumed, including by managers working in the Ukrainian gas sector, that although the storage capacity is substantial, transport costs would always leave it struggling to compete with storage providers in central and eastern Europe. As and when European gas demand returns, and storage capacity becomes available in other markets, some of this year's demand for Ukrainian storage is sure to disappear. The Ukrainian companies involved may, however, be able to stimulate further demand by combining storage services with expanded virtual reverse flow. The ultimate aim for those companies would surely be to convince European purchasers of Russian gas to offtake volumes in Ukraine rather than further downstream. The conditions for such a shift must be more favourable than ever.

⁵³ GTSOU press releases, 23 June and 25 June 2020; Eustream press releases, 24 June 2020, 29 June 2020; ICIS, "Ukraine breaks gas import records", 4 August 2020

⁵⁴ ICIS, "Moldova offers transit gas capacity", 18 June 2020; Moldovagaz press release, 2 October 2020; ICIS, "Moldova exports gas to Ukraine", 1 October 2020

⁵⁵ Platts *European Gas Daily*, "Ukraine gets first gas shipment from Greece via Romania", 27 August 2020; GTSOU press release, 2 September 2020; ICIS, "Ukraine gas market should focus on three goals", 29 September 2020

⁵⁶ Ukrtransgaz press release, 2 September 2020





Note: the table shows volumes stored at end of month. Source: GIE/Ukrtransgaz⁵⁷

The success of Ukraine's storage business must be balanced with the continuing decline of its transit business. In the first nine months of 2020, GTSOU transported 39.5 bcm of Russian gas to Europe, 40% down year-on-year.⁵⁸ The overall causes of the decline are (1) the slump in European demand and (2) that Gazprom operates on the principle of using Ukraine as the transit route of last resort. The agreement signed at the New Year, which is in place until 2024, works on a ship-or-pay basis: Gazprom is committed to pay a fixed transit fee. At current volumes, transit under this contract is almost twice as expensive, calculated per unit of gas, as via Nord Stream 1.⁵⁹

There is every reason to believe that Russian transit volumes will fall further in 2021-22. Up to 15.75 bcm could be diverted via the second string of Turkstream, which is completed but for which on-shore infrastructure to carry gas into south eastern Europe is still under construction. The largest unknown, of course, is whether and when Nord Stream 2 will be commissioned, and although this is unlikely in 2021, it represents an even greater threat to Ukraine's transit business. It remains likely that – as the author and his colleagues have argued before⁶⁰ – after the expiry of the current contract at the end of 2024, flows of Russian gas through Ukraine will be under 20 bcm/year and could be as low as zero.

⁵⁷ In September, Ukrtransgaz changed its accounting procedures, and started to exclude from the statistics submitted to GIE 4.665 bcm of "long term gas" (cushion gas), plus 0.4 bcm stored at the Vergunske facility that is in an area of eastern Ukraine outside of government control. I have adjusted the end of September figure to include these volumes, in order that it remains comparable with the other points on the chart. See Ukrtransgaz press release, 18 September 2020

⁵⁸ GTSOU press release, 2 October 2020. Naftogaz announced that Gazprom had booked some additional capacity in October 2020, but this is assumed to have been small volumes booked due to seasonal factors, and does not change the overall picture. Naftogaz Ukrainy press release, 21 September 2020; TASS, "Eksperty sviazali zakaz [...] s sezonnym faktorom", 22 September 2020

⁵⁹ Vitaly Yermakov, Russian Gas: the year of living dangerously (OIES, September 2020), pp. 16-17

⁶⁰ See: S. Pirani and J. Sharples, *The Russia-Ukraine gas transit deal: opening a new chapter* (Oxford Energy Insight), February 2020



Conclusions

Market reform has now produced significant change in the Ukrainian gas sector, and will continue to do so in the next few years. The wholesale market will progress; volumes and the range of products on the UEEX will expand; a liquid market, with prices correlated with those at the European hubs, is in prospect.

The removal of the PSO on sales to households in August 2020, and the forthcoming removal of the PSO on sales to the heat sector in May 2021, are significant. These two sectors account for about half of Ukraine's gas consumption and will increasingly be supplied on a market basis. Energy efficiency measures requiring strong government action, such as buildings insulation and electrification of household heat, may not be implemented in the next several years – but when they are, they will reduce gas demand in these sectors.

Policy discussions on decarbonisation, Ukraine's Nationally Determined Contribution under the Paris agreement, and coal phase-out, will not alter things in the next few years. But in the longer term, radical change in the electricity sector is likely. Coal-fired power generation will be phased out, albeit at a much slower pace than European and international institutions recommend. Policy decisions will influence the respective roles of nuclear, renewables and gas in replacing coal.

As market prices extend to the heat sector, investment in Ukraine's CHPs may be expected. The future of the heat boilers will depend on political action. In the longer term, and depending on policy decisions on decarbonisation, we may see investment in new gas-fired electricity generation capacity.

The aim of self-sufficiency in gas will not be achieved in the next few years. Investment in the upstream will take some time to recover from low gas and oil prices and the international conditions created by the coronavirus epidemic. The improvements in the regulatory regime may help to keep upstream activity, and gas output at or close to the current level. But substantial investment will be required to expand production, and this is not in short-term prospect.

Market reform has made great progress in Ukraine's transportation and storage businesses. The implementation this year of virtual reverse flow arrangements on the western border is an important step towards integration with the European market, even though progress on interconnection agreements is incomplete, particularly with Slovakia and Romania.

An unexpected opportunity for Ukraine's storage business arose this year from the oversupply in Europe; Ukrtransgaz and GTSOU rose to the challenge and took advantage of it. It remains to be seen whether demand for Ukrainian storage can be maintained as and when the European market gets back into balance, but there can be no doubts about the Ukrainian companies' ability to meet such demand. One issue to watch is whether these changes will lead to European purchasers of Russian gas deciding – which they have been reluctant to do in the past – to shift delivery points for some volumes to Ukraine.

In contrast to the storage business, Ukraine's gas transit business will continue to decline. The completion of the pipelines carrying Turkstream 2 gas into south-eastern and central Europe will lead to further transit volumes being shifted from the Ukrainian route. This will be followed, albeit with further delays, by the completion of Nord Stream 2. Transit of Russian gas via Ukraine will thus be reduced to a very low level (between zero and 20 bcm/year) after the expiry of the current contract at the end of 2024. The signs are that this will be a much less serious problem for Ukraine than has often been assumed, and that more attention will be focused on market development, integration with the European market and determining the place of gas in Ukraine's energy transition.



Appendix. Gas consumption by industry

The state statistical service records gas consumption by sub-sector in industry, transport and the energy sector. This breakdown for 2018 is shown in Table 9. There is a discrepancy between these figures, that add up to 9.6 bcm, and consumption by non-PSO customers of 14.6 bcm, as reported by Naftogaz. Naftogaz's number is likely to be accurate. The volumes recorded by the state statistical service for metallurgy, chemical & petrochemical and pipeline transport appear to be too low.

Table 9. G sector, 20	ias consumed in industry, transport and the en 18 (bcm)	ergy
Industry	Metallurgy	1.91
	Chemical & petrochemical, incl. as feedstock	1.32
	Cement & other mineral products	0.52
	Machine-building	0.20
	Mining	0.36
	Other industry and construction	0.05
	Trade and services	1.04
	Agriculture, & food & tobacco	0.36
Transport	Automobile transport	0.03
Energy	Energy sector own consumption	1.14
sector	Power plants	0.25
own use	Pipeline transport	1.72
	Losses in transport & distribution	0.71
Total		9.60
Source Ene Inventory, 1 converted t	rgy Balance of Ukraine in 2018. (<i>Ukraine's Greenhouse</i> <i>990-2018, Annex 4: Fuel Balances,</i> p. 465.) Abbreviated to bcm by author	<i>Gas</i> and

I thank my colleagues Jack Sharples and Patrick Heather, and people in companies, international institutions, and research and civil society organisations in Ukraine who have taken the time to discuss issues with me. All opinions expressed, and mistakes made, are mine alone.