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Modernizing residential heating in Russia: End-use practices, legal developments and future prospects

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ABSTRACT

This article explores the significance of modernization policies concerning Russia's technically obsolete but socially important residential heating sector, focusing on the 2009 energy efficiency framework law and its prospects for implementation. Ownership and control structures are in flux throughout the heating sector chain. Inefficiencies, causing low service quality and rising prices, have already started eroding the market share of district heating, despite its potential benefits. End-use management practices – such as lack of metering, communal billing and low prices that do not cover production costs – reduce consumer incentives to cut consumption. The diversity of end-users adds to the complexity of focused measures like energy-saving contracts. However, end-use sector reforms such as mandatory meter installation and increasing prices –even if socially acceptable and fully implemented – cannot alone provide the massive investments required. More appropriate is sector-wide reform with the government's financial participation – especially if consumer efforts can yield better service quality.

Keywords: Heating sector, Russia, modernization

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1. Introduction

The necessity of modernizing the Russian economy has been obvious for a long time. Raw material export as a major source of GDP is a strategically risky choice, and cutting this dependence on international commodity markets by increasing the share of manufactured goods would be more sustainable in the longer term (Pynnöniemi, 2010). In order to boost the competitiveness of the economy, as well as the standard of living of the population, tapping into the vast energy efficiency potential of the country was made the flagship of President Medvedev's modernization campaign in the late 2000s. In 2008, he established the official target of cutting energy intensity by 40% from 2007 to 2020 (N889); also the Russian Energy Strategy until 2030 foresees a 56% reduction in energy intensity in GDP for 2005–2030 (Russian Government, 2009). Diversifying the economy into 'future' sectors such as renewable energy, pharmaceuticals, IT as well as supporting innovation and research in general, is also perceived as an important source of future growth in the context of the modernization initiative. However, the practical problems with policy implementation in Russia have led to doubts about the success of Medvedev's goals; modernization in one format or another has been in the Russian / Soviet policy agenda across times.

This article focuses on attempts to improve the end-use energy efficiency of district heating in the residential sector, which has not received sufficient attention by social and political scientists previously, given its social and environmental importance. Internationally, district heating typically provides an efficient form of heating, most commonly in Northern Europe and Central and Eastern Europe. Russia's district heating system, the largest in the world, serves 73% of the population i.e. some 104 million people, covering 92% of urban and 20% of rural areas, and is thus socially a vital sector. The sector is important also as regards environmental issues, since it accounts for 32% of national fossil fuel consumption (MUNEE, 2007: 11; UNECE, 2010: 236) and shows a significant efficiency improvement potential. However, the benefits of district heating are undermined by the Soviet-era technological and institutional systems still in use in Russia.

The Law on Energy Efficiency N 261 of November 2009 consists of awareness raising, regulatory and market-based measures, including a ban of fluorescent light bulbs, energy audits, fiscal incentives, energy saving targets for the public sector and regional programmes. Several policies and regulations are relevant to residential sector heating: the obligation to install heat meters, financial solutions for meter installation, revision of heating norms and long-term tariffs. This article examines the significance of these policies in the context of the entire heat-sector chain and its modernization needs. Also the prospects for successful implementation of the policies are discussed in light of the current debate in Russia.

2. Structure of the Russian heating sector

2.1. Stakeholders

District heating is based on a shared heat supply for a larger number of dwellings and industrial consumers, instead of site-specific heat generation. Such centralized generation systems can save fuel as a result of the combined heat and power (CHP) production process. The district heating chain consists of three stages: 1) generation (power plants and boiler houses); 2) distribution (pipeline network); and 3) consumption (residential sector: house or flat). In Russia about half of district heating is generated by large-scale CHP plants and the other half by heat-only boiler houses (HOBH). In 2007, the main fuel was gas, which accounted for some 66% of heat generation, as against 20% for coal (UNECE, 2010: 237).

The ownership and management structure of Russia's heating sector is in flux and local institutional solutions vary widely. *Private-sector producers* – territorial generation companies (TGKs)[2] – typically operate large-scale CHP. These companies were created during the power-sector reform in the 2000s, and have become an important group of actors in the heating sector (Solanko, 2011). *Local industrial enterprises* have traditionally provided communities with heat from their facilities, and such systems are still in use in many industrial towns even though the enterprises often make no profit from this activity (Haaparanta et al., 2003). *Municipal heat generators* have the specific task of generating and distributing heat for the population in areas not covered by TGKs or industrial facilities; they typically operate HOBHs or small CHP. Traditionally controlled by municipalities or local governments, their operations are now often privatized or leased to private-sector heat suppliers. The distribution networks which connect the heat supplier to residential sector consumer are typically controlled by municipalities and operated by a service company that leases the pipelines. With large-scale CHP, trunk pipelines tend to be controlled by the TGKs.

In addition to the involvement of sectoral ministries, the Russian Energy Agency (Rosenergo) was created to facilitate the implementation of the Federal law N261 and state activities in energy efficiency, innovations in energy sector and renewables. It has affiliates in more than 70 regions, and its responsibilities include distribution of information, expert support on methodological issues and financing, and the development and monitoring of energy efficiency programmes in the regions, municipalities and companies, which is the most relevant task of the organization on the heating sector.

The residential sector accounts for 45% of heat consumption, whereas the industrial sector consumes 38%, commercial and public sectors 15% and agriculture 2%. Total final consumption of heat fell by 47% during 1990–2007. Proportionally, industrial consumption showed the greatest decline, some 54%, during 1993–2007, whereas combined residential, commercial and public consumption fell by 33% (IEA, 2002; UNECE, 2010). Significant here is that the decline in heat consumption continued until 2007, while power consumption started recovering in the late 1990s and regained the pre-transition level in the late 2000s (US Energy Information Administration, 2011).

2.2. Problems and potentials

The declining demand for district heat can be explained at least partly by the restructuring of the industrial sector towards less energy-intensive production processes as well as the increasing share of services at the expense of industry in Russia's GDP. Also, actors in both sectors have been searching for more reliable decentralized supplies of heat as a result of the rising prices and the poor quality of service. As a result, large-scale CHP generators have been losing market shares (MUNEE, 2007: 23; Murray and Denysenko, 2007); since the 2000s, the share of boiler houses or heat pumps specific to individual buildings or groups of buildings that provide decentralized heating solutions has been growing. The Soviet-era approach of using very large central stations to heat large city districts or entire towns is slowly fading away (MUNEE, 2007: 20).

The low quality of the service follows from the post-Soviet financial problems and lack of investments. According to official estimates, 65–70% of district heating fixed assets require replacement (Ministry of Energy of the Russian Federation, 2010) and 15% of assets are close to breakdown (Aleksejev, 2011). This is largely due to the ageing of the infrastructure: 40% of the thermal power capacity is over 40 years old (McKinsey&Company, 2009: 48). Average efficiency

[2] In some cases also wholesale electricity generating companies, OGKs, which consist of power plants specialized in electricity generation. Their plants are located around the country to prevent the creation of local electricity monopolies. TGKs, by contrast, generate both electricity and heat, and their assets consist mainly of combined heat and power (CHP) plants. TGK assets are typically located in a small number of neighbouring regions.

levels for coal and gas-fired plants are low – 33% and 36%, as against 45% efficiency rate in modern coal-fired plants and 58% for combined cycle gas turbines (ibid: 48).

Also heat distribution pipelines tend to be obsolete, without insulation and prone to leakage. Moreover, their capacity is often over-dimensioned for the current local heat load, which in turn leads to unnecessarily high fuel consumption. Transmission losses are estimated at 20–25%, although losses as high as 50% have been recorded in some systems (IFC and World Bank, 2009: 68; McKinsey&Company, 2009: 48). In comparison, distribution losses in Western countries tend to lie at some 5–10% (IEA, 2004: 55). However, there are significant local differences in Russia – from more or less the Western standard, to as much as four times that level.

The overall energy saving potential of the heat generation and distribution part of the chain has been estimated at 31.2 Mtoe, and the final use in residential buildings 53.4 Mtoe of total TPES of 653.6 Mtoe in 2005 (IFC and World Bank, 2009: 35). Experts advocate varying measures as the most attractive. The IEA has emphasized the generation and distribution potentials as more cost-efficient than end-use (Murray and Denysenko, 2007) while the McKinsey estimate (2009: 24) stresses the insulation of buildings, increasing the share of CHP, retrofitting heating, ventilation and air conditioning systems and their controls, and installing flat-level heat meters and thermostats. According to the Russian Ministry of Regional Development, the cheapest options include boiler combustion process improvement and optimizations, optimization of water preparation, cleaning pipes and boilers, and system adjustment of heating grids, while replacing the average housing stock with new is estimated to cut heat consumption by two thirds (Aleksejev, 2011).[3] Why then are these significant saving potentials not being tapped in practice?

3. Governance of district heating in the residential sector

3.1. Metering

It is common that neither generation nor consumption of heat is metered in Russia. In September 2010, according to the Ministry of Regional Development, 40% of public buildings and 25% of private houses/flats had heat meters;[4] however, a few years earlier CENEf had estimated that this was the case only in 10% of residential buildings. Introducing meters is challenging due to the technical features of the building stock (MUNEE, 2007: 25–27). Building-level heat metering is the most practical metering option for existing residential buildings since the typical vertical-stand pipe circuit does not allow flat-specific meter installation based on one meter only. Thus, meters are normally installed at the 'border' of the network and the end-user side, building or private house.

Meter installation is challenging also because of the social diversity among the occupants of one and the same building. In the Soviet Union, the housing stock was mostly divided into municipal and 'departmental' housing managed by enterprises for their workers. There was also a less significant number of buildings owned by social organizations such as unions, cooperatives and private owners. At the beginning of the economic transition, the housing stock was privatized, resulting in a fundamental change of ownership. By 2006, private owners accounted for some 80% of the stock. Privatization also created low-income bracket 'poor home-owners' unable to afford to maintain and upgrade their properties. Further, home-owners vary in the level of interest in participating in communal decision-making (Vihavainen, 2009: 76). Some flats also remain rental

[3] Half of Russia's multi-storey buildings were constructed before 1971, 43% in 1971–1995 and only 7% after 1995. Average heat intensity in multi-storey buildings is 229 kWth /m² per annum, but in the new buildings it is 77 kWth/m² per annum. Aleksejev (2011).

[4] Status provided by the Ministry of Energy RF at the Joint Russian–Japanese workshop on Energy Efficiency, September 2010.

municipal properties, while privately owned flats can co-exist in the same building: this can add to the challenges of communal decision-making.

3.2. Billing

Residential consumers are charged for communal services such as heat, water, sewage and waste disposal in one bill. Heat is the dominant item, with regional variations of 47 to 65% of the total. In the *absence of metering*, the charge is calculated by multiplying the size of the flat (m²) by heating norm and heating tariff. This *norm-based billing* has been criticized for lacking specificity (MUNEE, 2007: 27). *When heat is metered* at the entrance point to the building, the costs are allocated to individual apartments based on the floor area and the consumption data from the previous year.[5] This allocation method blurs market signals on the individual level to save heat.

Home-owners can choose from three methods of managing their building: 1) direct administration by each owner; 2) communal decision-making and cooperation through homeowners' association or a cooperative; and 3) hiring a management company. The first option implies separate billing of each flat for services, making individual heat meters the most convenient solution. The second option makes the owners collectively responsible for the service charges of the building, and can lead to problems with free-riding non-paying neighbours. Management companies are expensive (20–30% of service changes); however, they take responsibility for collecting the payments from the residents (Vihavainen, 2009). The latter two options require building-level metering only, although norm-based billing can be used as well.

The Russian heat sector has been claimed to lack direct contact between the heat supplier and the residential customer as well as consumer choice (MUNEE, 2007). However, many of these practices are not unique to Russia. Similar practices are used also for instance in Finland; building-level heat consumption is billed on the basis of the previous year's metered consumption and checked against the actual metered consumption once or twice a year. The housing cooperative[6] tends to be heat supplier's customer rather than each end-user, and heating charges are included in the service charge bill of the cooperative and divided among tenants on the basis of floor space. Thus the reasons for the problems in Russia are more likely to lie in the chronic shortcomings of the heating infrastructure or pricing, especially in the case of norm-based solutions, rather than in the billing practices *per se*.

3.3. Price dynamics

A typical explanatory factor of inefficiency would be the low price of energy, which fails to provide incentives for energy saving. Despite the cuts during the first years of economic transition, heating prices have been increasing since the mid-1990s (Graph 1) – in the 2000s even significantly faster than the consumer price index, as shown in Table 1. The price increases in Moscow and Chelyabinsk are illustrated in Appendix 1. From January to October 2010, communal tariffs grew on average by 12.3%, significantly contributing to the inflation rate of 6.8% over the same period (*Meter* 2010a). In 2010, tariff increases varied between 4% and 45%, and even an increase of 80% was recorded. The debate on reasonable tariff growth has involved Prime Minister Putin himself, who recently mentioned a 15% increase as the limit of 'reasonability' (*RBK* 2011a).

But is heating expensive in Russia? In 2005, the average Russian spent 9.4% of his final consumption on housing utilities (with heating representing 47–65% of the total bill). In an international perspective, 9.4% is relatively low: comparative figures are Latvia 17.9%, Italy 17.3%, Hungary 15%, the UK 15.3%, Sweden 19.2% and the USA 16% (UNDP Russia, 2010).

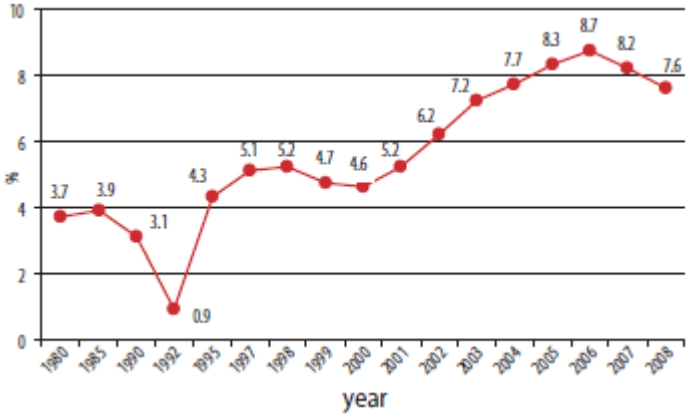
[5] Resolution of the Russian government N 307, 'Rules for Communal Services Provision'.
[6] generally arranged in the format of a limited company

Table 1. Heating price increase compared with consumer price index

	2002	2003	2004	2005	2006	2007	2008	2009
Average price of heating m² – 2009 RUR	1.75	2.68	3.85	6.13	8.26	10.75	14.73	18.24
Annual real change of average heating price, %	83.3	53.6	43.5	59.1	34.7	30.3	37.0	23.8
Consumer price index, %	15.8	13.7	10.9	12.7	9.7	9.0	14.1	11.7

Sources: IMF, 2010 Table A7; Rostat, 2010 Table 24.10; Trading Economics website.

Graph 1. Housing utilities, in overall consumer spending of Russian households, %



Source: UNDP Russia, 2010: 62.

However, the uneven income distribution adds a dimension to heat pricing in Russia. In 2008, the highest-earning 20% of the population had some 49% of income, while the poorest 20% were left with 6% of the total. This is shown in the Gini index[7] which gives Russia a reading of 42.3 (World Bank, 2011: 70). In practice, this means that housing utility expenditures can loom far larger than the average share of budget in poor households. Some 27.5% (39 mln) of the population are pensioners (average pension was ca. RUB 5,190 per month) and 13.2% (18.5 mln) are living below the minimum survival income of RUB 5,153 in 2009. Price increases were one of the main concerns of Russian consumers (Levada Centre, 2011).

Some social support schemes are at place to make utility bills more affordable; in 2007 households covered 2/3 of the real total cost of utility services. However, the majority of allocated subsidies addressed all households regardless of income level, and thus mostly benefited the wealthier consumers. The subsidies allocated to specific vulnerable groups (as discounts on bills) have been increasing, but only some of them are means-tested. The current threshold is defined as household bills exceeding 22% of aggregate household income, although lowering this to 15% has been discussed (UNDP Russia, 2010: 64–66). The threshold of 22% share of income as a test for social support scheme illustrates the wide differences in utility costs across Russia; this would be deemed expensive also in an international comparison. The other major indication of the sustainability of energy prices is related to whether they cover the costs of production, transport and system maintenance.

[7] The Gini index measures the extent to which the distribution of income among individuals or households within an economy deviates from a perfectly equal distribution: 0 represents absolute equality, whereas 100 implies absolute inequality.

3.4. Tariff setting and subsidies

Historically, it was irrelevant whether Soviet-era heating tariffs covered production and transport costs, since the budget would even out any losses. In practice, industrial consumers subsidized residential consumer prices. The social aspect of utility prices has dominated tariff-setting policies since the economic transition begun; the government wanted to ensure the affordability of heating and other utilities when the liberalization of most consumer prices led to general price increases in the early 1990s. This tradition has been difficult to alter; the tariffs paid by consumers even today typically do not cover full costs.

The tariff-setting system is complicated and includes elements of arbitrariness. The Federal Energy Commission establishes separate minimum and maximum heat-tariff thresholds for final consumers as well as for supply companies that buy heat from generators. Local-level tariffs are established within these thresholds by the Federal Tariff Service through its regional branches. The tariff rates approved are based on the 'cost-plus' formula, which is meant to consist of the annual operation cost as calculated and summed up with the regulated profit rate. This has been criticized for not stimulating savings because it establishes no genuine incentive for the provider to cut heat losses it gets paid for, and for the lack of transparency of the cost elements. Legitimate operating costs are negotiated on the regional level rather than based on the actual operating costs and investment needs, which leaves room for corruption and fraud; tariffs have been criticized for providing populist instruments to the upper echelons of local administrations seeking to pursue political objectives (IEA, 1993:19; IUE, 2003: 21).

The difference between supplier and consumer tariffs is covered from the municipal or regional budgets. Any differences between the supplier tariff and the actual generation costs are either cross-subsidized from the profits the heat generator makes from its other business (TGKs, industrial heat) or from the municipal or regional budgets (HOBHs, perhaps in some cases also local industrial side-producers of heat). The differences between the generation tariffs and generation costs shown in Table 2, as well as the average residential consumer tariff of 23–25 USD/Gcal in the mid-2000s (MUNEE, 2007: 32) and the generator tariffs, illustrate cross-subsidies. Tariffs differ significantly among regions, depending on the condition of the infrastructure, type of fuel, local institutional arrangements, tariff-related negotiations as well as the heating load balance in the local network.

Table 2. Comparison of supplier tariffs and actual generation costs

USD / Gcal in 2006	**Low**	**High**
Municipal generator tariff	9	57
Private sector generator tariff	4	100
Actual generation cost	N/A	300*

* Excluding distribution losses

Source: MUNEE, 2007: 30.

Cross-subsidies have created a vicious circle, causing disadvantages to the sector. Heat generators have not been able to transfer the rising fuel costs to their customers. This has cut the financial resources available for the maintenance and replacement of generation and distribution capacity. From this follows increasing inefficiency, which has significantly added to the heat generation costs over time. Currently the costs of inefficiencies are transferred to the consumer through increasing tariffs as well as decreasing quality of services, like cuts in the heating season and heat-supply temperature.

Even though Russian system often lacks heat metering, billing practices do not differ fundamentally from those of more efficient countries. The problems of the heat-sector chain seem related more to energy pricing and subsidies, as well as the investment gap since the beginning of the economic

transition which has left the infrastructure in need of updates on an unforeseen scale. It could be argued that the modernization needs of the sector are now beyond the reach of the current pricing system regardless of price increases, and that a more far-ranging reform is needed.

4. Energy efficiency legislation and the residential heating sector

Additional regulation and incentives to spur modernization of the heating sector are urgently needed to enable the benefits that district heating can offer, as well as to facilitate the continuity of district heating, which is losing importance in the residential sector. Recent developments in the legal framework on energy efficiency have introduced several elements relevant to the residential heating sector. But how significantly do these measures – heat metering, changes in heating norms and longer-term pricing – address the sector-wide reform needs? And how likely are they to be implemented successfully?

Already the 1996 energy efficiency legislation (28-FZ, Article 11) introduced an *obligation to meter heat*, both produced and consumed, from the year 2000 onwards. However, this law was never seriously enforced. The framework law N 261 restates this obligation to measure all heat consumption on the level of the individual building. The requirement to install heat meters in new buildings, and in old ones in the case of renovation, may seem more practical than building-level meter installation across the entire building stock.

Russian experts have argued against 'blind meter introduction'– i.e. a general rule to install heat meters in every building, without assessing how they fit the heat-billing infrastructure and practices of local institutional control structures. They argue that more specific heating norms, for instance on the basis of building types, could offer significant improvements to billing practices while providing a low-cost alternative to meter installations. Experts warn of a 'metering trap' where the cost of meter installation exceeds the value of the heat savings to be gained from metering during the remaining lifetime of a building (MUNEE, 2007: 27, 45–46). Further, the old building stock also often indicates that the potentials for improving efficiency may be limited, for structural and managerial reasons (see for instance Opitz et al., 1997).

If current billing practices and price levels remain unchanged, it seems unlikely that metering alone can contribute significantly to heat savings – as also recognized by Russian experts, especially in the case of building-level metering (*Meter* 2010b). Further, heating prices would remain low from the perspective of better-off consumers, while the poorest 20% would be less likely to afford investments in energy-saving measures, even in privatized flats. Thus, although a positive development in the longer run, heat metering in its current form is unlikely to deliver energy savings on its own. Installing heat meters together with thermostats[8] to regulate individual room temperature could be more successful in facilitating energy savings.

Energy-saving contracts between consumer and supplier/distributer are established by the framework law to facilitate *financing the installation of heat meters,* to be borne by the owner(s) of the property. In practice the difference between the traditional heating bill, calculated on the basis of norm consumption per m², and the bill based on actual metered consumption, is used as a financial mechanism. In return for meter installation, the consumer agrees to continue to pay the higher norm-based heating bills until the debt is settled. A template contract has been developed for such a meter-installation arrangement (Ministry of Energy of the Russian Federation 2010); some regional legislation also provides templates (Government of Archangelsk Region 2010). Such innovative solutions to financing heat meter installations are welcome in order to push for the

[8] estimated to cost RUB 15,000

implementation of the regulation. However, this can work only for meter installations which lead to lower heating bills.

Box 1.Measures directly relevant to residential heating introduced in N261.

Law on Energy Efficiency N 261, November 2009

- Homeowners and owners of apartments are to install energy meters on the flat level, except heat meters, which can be installed the building level, by 1 January 2012
- Heat suppliers should arrange the installation process from 1 July 2010
- All new buildings are to meet energy efficiency requirements during construction and maintenance
- Renovated buildings must be equipped with heat meters to the extent technologically possible
- Energy service contracts between consumers and heat suppliers to install meters; the latter to cover the cost of meter purchase and installation, with the cost reimbursed by charging the former the currently used higher norm-based bill until the difference of the heat saved has returned the investment (maximum over 5 years)

The idea of an *energy-saving contract* was introduced in the framework law also for more general purposes in order to support refurbishment of residential-sector infrastructure. Russian practitioners and experts have reported various problems that obstruct the implementation of such contracts. In general, the lack of accurate contract law and practices of contract compliance, the lack of metering data, and the unpreparedness of the banking sector have been noted (Ivanov, 2011). Contracting flat-owners on the building level can also lead to problems with communal decision-making. Contracting measures with budget organizations – like many multi-storey buildings in Moscow – are hampered by a number of rules. Budget funds are difficult to contract over the period of a budget year and in practice lead to annual renegotiation; this would only allow projects with a very short payback period. *Long-term 'frozen' tariffs* have been introduced by the framework law in order to provide certainty in the payback period for such contracts. However, energy service businesses have questioned the reliability of tariff agreements over a 3–5 year period (Petrovits 2011). These issues give rise to concerns as to whether energy-saving contracts can facilitate heating-meter installations in practice, or at least at the planned pace, and energy efficiency in the budget sector more generally.

Box 2. Measures relevant to residential heating sector introduced in N1830-9

Governmental Order N 1830-9: Action plan for Federal Law N 261, December 2009

- Development of documents regulating the relationships between the supplier and building/flat owners on meters installation by 1 March 2010
- Meters installation in blocks and municipal flats in regions (funded from regional budgets) step by step by 1 January 2012
- Changes of heat consumption standards to stimulate conversion to metering process by 1 May 2010

The Action Plan for implementing the framework law provides some practical stimuli for installing meters. In August 2010, the Ministry of Regional development drafted and submitted regulations to the government on doubling the tariffs for non-metered communal services from 2011 and quadrupling them from 2012 in buildings still without meters. These regulations are under discussion at the time of writing and have yet to be approved; some opposition has been voiced in the public debate, arguing that it is illegal to use the absence of meters as a criterion for higher tariffs (*Meter* 2010b). This kind of economic 'stick' may provide incentives for consumers to install meters, at least in cases when meter installation has been avoided due to fears of higher heating bills

as a result. On the other hand, this initiative may still be rejected, or the scale of price increases may water down the anticipated incentives.

The regions have been allocated an important role in implementing energy-efficiency policies, including heat metering, as many of the above regulations are to be defined by the regional programmes. By June 2011, over 70 of the 83 regions had approved a programme, and the rest were discussing or developing their drafts (Gasho & Repetskaya 2011). In addition to introducing specific indicators, the main tasks of regional administrations concern the installation of energy meters in the residential sector, energy audits, energy-saving contracts and long-term tariffs.[9] Regional programmes have been criticized for a slow start and lack of ambition as regards short-term target setting and lack of details such as indicators of energy efficiency and improvement potential (Gasho & Repetskaya 2011); also the lack of awareness and expertise prevailing on the municipal level has provoked concern.[10] The potential and willingness of regions to finance energy-saving measures can also been questioned: utility tariffs are ultimately regulated on the federal level, but financing for energy efficiency has not been stipulated in many regional budgets. According to Gasho and Repetskaya, the regions require assistance of some 2.3 Trillion RUB whereas the total announced allocation for this purpose under the framework law is 59.1 Bln RUB (N261). The federal budget had registered 18 Bln RUB for this purpose in June 2011 (Gasho & Repetskaya) and additional 5.3 Bln RUB in October 2011 (Russian government 2011a).

The framework law on energy efficiency does not address the main problems of residential-sector district heating. Further, Russia's wider systemic problems as regards bureaucracy, the rule of law, low energy prices and the administrative division of tasks can hinder the implementation of the above-mentioned incentives. In addition to the framework law, there have also been broader attempts to address the reform needs of the heating sector – but are they likely to deliver significant changes?

4.1 Regulatory developments beyond the framework law

After lengthy discussions throughout the 2000s, *a heating law* was approved in 2010.[11] It covers issues around the responsibilities of actors, tariff setting and heat-supply security. The law requires a significant number of sub-laws in order to be implemented (Semonova 2010); at the time of this writing, many of which are still under preparation, often by regional governments. Minister of Energy Sergey Shmatko has stated that the goal of the legislation is to achieve a full-price market in the heating sector – especially with reference to the non-payment problem, which led to TGKs not receiving 60 Bln RUB over the winter period 2009–2010; this has limited the modernization investments TGKs have been able to carry out (Kommersant, 2010). These plans have been criticized for contradicting the basic idea of a market. Russian law provides no efficient tools for enforcing payments: disconnecting non-paying customers is forbidden during the winter season. Also the involvement of civil servants and their close circles in the heating sector has been questioned as a disturbance to a true market (Ponomarev, 2010).

As part of the heating law, it is also worth mentioning the Regulatory Asset Base (RAB) method which is meant to allow generators and distributors to opt for a long-term tariff setting from January 2012 (initially a three-year trial period, further terms are likely to be longer) in order to facilitate infrastructure investments (Federal Tariff Service 2008). RAB is intended to guarantee that investment yields will be paid back through regulated depreciation of assets over their lifetime, so

[9] Status provided by the Ministry of Energy RF at the Joint Russian–Japanese workshop on Energy Efficiency, September 2010.
[10] Discussions in the 'Energy Saving and Energy Efficiency Improvement until 2020: implementation and financing' conference in Moscow 19 April 2011.
[11] Federalnyi zakon 190-F3, O teplosnabzenii, 27 June 2010.

investors will receive a fixed return on their investment in addition to depreciation allowances. This would be an improvement over to the current annually set tariffs, which provide no certainty as to the payback period of investments. RAB has been tested for the heating sector since the beginning of 2011 in pilot regions. The experiences of attracting funds for moderenization have been positive in Orlovsk region, however, the general pressure of tariff increases have raised discussion on the impact of RAB into heat prices which is expected to be some 20-25% per annum. In May 2011, the government postponed the beginning of RAB until January 2013 (*RBK* 2011b). It is admittedly difficult to estimate the significance of the heating law, but RAB, if successful, could be a step towards facilitating desperately-needed modernization investments in the sector. However, fitting RAB together with tariff regulation is likely to prove problematic.

5. Discussion

Unmetered heat consumption is commonplace in Russia. Metering is typically conducted on the level of the building, which reduces economic incentives to cut individual heat consumption while the old building stock limits the measures that can be taken to improve heat efficiency. Similar building-level billing solutions are in use in Finland, where inefficiency is not a problem. Metering alone would probably make little difference in Russia either. Those consumers who can readily afford to pay their heating bills would be unlikely to make investments in cutting a small expenditure item, whereas poor home-owners who struggle to pay their bills and who rely on subsidies could not afford savings measures, even with a genuine incentive.

The obligation of consumers to cover the costs of meter installations also tests the willingness to pay for heating. Attempts to create incentive structures based on tariffs (steeply increasing tariffs for unmetered heat after the deadline for meter installation) have faced public opposition that indicates low willingness to pay. Any dramatic increase in tariffs would be deemed unreasonable in an energy-rich country like Russia. In an international perspective, Russians appear to pay significantly less for utilities than customers in many other countries, even when compared to countries with similar per capita income levels. However, the uneven income distribution makes *heating expensive for a significant part of the population* even in comparative terms. Further, it is understandable that residential customers are *not willing to pay more for district heating, given the low quality of service*. These are the key challenges any successful policy would have to address.

It may be helpful to differentiate policies based on the income levels of consumer groups. Energy-saving contracts with expert organizations could serve as a useful financial vehicle to assist higher-income consumers, instead of sector-wide subsidies. However, an unreasonably long payback period of meter installation can be a valid argument against the obligation. The legislation follows similar logic: five years is defined as the longest possible payback period for investment through energy-saving contracts. However, the obligation to install meters still applies regardless of this.

In the case of payback periods longer than five years, as well as of lower-income home-owners, an ‘amnesty’ based on means-tested government grants for installations that would cause significant financial disadvantage might assuage public opinion. However, such an arrangement would require either a simple method of defining which households qualify for a grant (based on the existing threshold of utility expenses or building-type indicators, etc.), or an arrangement with companies which specialize in identifying energy-saving potentials. The latter may be too complicated under the prevailing conditions.

The quality of service constitutes a chicken-and-egg problem: service is so bad that consumers are unwilling to pay more, but it cannot be improved to correspond with the tariffs paid without charging more so that the costs of modernization can be covered. The whole chain from generation

to end-use suffers from this inefficiency through high costs and low quality of service. This is shown by end-users opting for decentralized heating solutions instead. In order to secure the future of district heating, which could provide many environmental benefits and contribute to the overall energy security of the country, more financial resources beyond tariffs must be identified, to enable significant infrastructure reforms.

Russia's heating sector involves a complex chain of actors and interests as well as technical challenges, and thus, it is important to take a wider perspective on its future development. The heating law took a long time to materialize, and has been unable to deliver the comprehensive reform that the sector desperately needs. Piecemeal reforms like meter installation can deliver only very limited benefits, and at the risk of even stronger public opposition if customers fail to see any improvements regardless of the required efforts. Combining the RAB method and regulated tariffs can also be problematic, given the low existing tariffs for consumers and the major investments needed in generation and distribution as well as the public debate concerning the increase of heat price that the introduction of the RAB method would be likely to generate.

Rather than figuring out how to force householders to install meters, it is important to even out the burden of increasing tariffs to lower-income customers and to establish safeguards so that the tariffs will be acceptable to the public. The low quality of the related infrastructure is a result of the Soviet system and the years of economic transition. It would be difficult to make any particular part of today's heating-sector chain pay for its modernization. To facilitate cooperation across the chain, it could be helpful to build broad domestic consensus on 'a heating sector reform project'.

First, the task of financing the infrastructure updates could be linked to raising the quality of district heating services more publicly, and setting up a time-scale when the public can expect to see improvements in service. Second, it is unrealistic to expect revenues from higher end-user tariffs and large-scale generators' power-sale revenues to finance the update of the entire sector; it is impossible for generators to finance large-scale replacement of obsolete assets since the investment costs cannot be transferred to the end-user due to tariff regulation. Government participation in achieving this common goal could pave way for greater acceptability of tariff increases. For instance, budget grants to top up tariff-regulated revenues for infrastructure updates and preparations for the growing need for means-tested support to poor residential end-users who cannot cope with the increasing tariffs could be constructive ways of doing this. Also public–private partnership arrangements between heating suppliers and the government could be an option, and probably more transparent than the current system of budget subsidies through negotiated tariff setting. Third, if the regional/municipal level budgets are chosen as the source of grants or other financial support, it is important to ensure that they will have the required funds available, and that the process is monitored in order to avoid sharp regional differences in implementation due to budgetary and institutional differences as well as corruption. The government attempts to enforce the implementation of the regional energy efficiency programmes by setting rules for receiving federal budget support with Resolution 746 (Russian Government 2011b), however, the indicator-based approach to rank the regions chosen may add to the bureaucracy and fail to capture all details relevant to decision-making.

6. Conclusions

The elements covered by Russian energy-efficiency legislation on residential-sector heating – metering, longer-term tariffs and financial measures for the costs of meter installation – are all important and should be seen as positive developments. However, they do not address the main problems of the heating sector: tariffs that fail to cover the costs of production, distribution and the massive need for modernization, as well as the low quality of service. Due to social and institutional

reasons, this can be achieved only through a comprehensive reform of the heating chain, from generation to end-use.

Piecemeal end-use solutions, like installing meters, are likely to provide very limited benefits. The main dilemma of forced meter installation is that the people are unlikely to be financially better off with meters. To make the situation worse, Russian residential-sector consumers seem unwilling to pay for meter installation, let alone accept tariff increases, which have been suggested as 'a stick' to achieve compliance. In order to constructively facilitate the acceptability of charging end-users higher tariffs in order to modernize the sector, this article suggests to deepen the division of consumers into income groups, and to address the modernization need as a wider 'heating reform project' by allocating more public co-financing for achieving results that make a difference to the end-users. The former suggestion could be approached by increasing means-tested financial support. The latter suggestion would link increasing tariffs to improving quality of service, increase government participation in this common task and ensure the genuine abilities of the regions to fulfill the tasks allocated to them regardless of budgetary balancing, local politics and corruption.

In June 2011, the government postponed the deadline for heat-meter installation by six months (Russian government 2011c). This may even be more credible in terms of implementation; punishing those who have not installed meters by requiring higher heating tariffs may seem more palatable if the consumers are granted more time to comply. Moreover, the whole idea of setting higher tariffs for unmetered heat consumption has not appeared in the debate during autumn 2011, which may be a sign of it being abandoned as a result of public opposition. The government should ensure that whichever policy option it finally chooses, implementation will be enforced; this is especially important in the Russian context, since the previous energy efficiency law was left largely unimplemented.

The sector is in a dire need of reform. The low quality of heating services has already started to erode the customer base, as consumers are investing in alternative decentralized heat solutions. These are likely to be the better-off customers who can afford alternative solutions. Such a shift towards decentralized heating solutions may therefore lead to growing inequalities among customers; in the end only the poorer customers could be left as the end-users of the expensive but low-quality centralized heating systems, and even less able to cover the costs of heating-sector reform than today's clientele. This makes it all the more important to facilitate a sector-wide reform, as soon as possible.

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APPENDIX A

Table A1: Moscow, average norm-based heating costs

	2007	2008	2009	2010
Heating tariff (RUR/Gcal)	709.4	845.6	945.4	1090.0
Average living area per person in Moscow (m²)	19.9	20.1	20.3	20.3[1]
Average norm of heating Gcal/m²	0.016	0.016	0.016	0.016
Average monetary income in Moscow	35,490	34,207	41,891	43,189[2]
Heating bill, average Moscow share of income, after income tax (%)	0.7	0.9	0.8	0.9
Monthly heating bill per person in Moscow (RUR per month)	225.9	271.9	307.1	354.0

[1] 2009 data

[2] Based on Jan–Sept 2010 data.

Sources: Rosstat 2010, tables 6.48, 6.7. Average heating norm: http://www.moskv.ru/articles/fulltext/show/id/8602/.

Table A2: Chelyabinsk, average norm-based heating costs

	2009	2010
Heating tariff (RUR/Gcal)	490.44	637.38
Average living area per person in Chelyabinsk region (m²)	22.6	22.6[1]
Average norm of heating Gcal/ m²	0.016	0.016
Average monetary income in Chelyabinsk region	15,044	16,346[2]
Heating bill, average share of Chelyabinsk income, after income tax (%)	1.4	1.6
Monthly heating bill per person in Chelyabinsk (RUR per month)	177.3	230.5

[1] 2009 data

[2] Based on Jan–Sept 2010 data.

Sources: Rosstat 2010, tables 6.48, 6.7. www.fortum.ru. Average heating norm for Moscow applied due to similarity of climatic conditions: http://www.moskv.ru/articles/fulltext/show/id/8602/.

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