An Energy Efficiency Obligation Scheme For Russian Industry - An Ex Ante Evaluation Of Options

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Abstract

This paper presents findings from a study evaluating the potential use of market mechanisms for saving energy in Russian industry. The overall objective of the work was to support the UNIDO Market Transformation Programme (MTP), which aims to transform the Russian market for industrial energy efficiency in GHG-intensive industries. This study seeks to answer the question of whether energy efficiency obligations (EEOs), possibly including the trade of white certificates (WCs), can help achieve national energy efficiency objectives and improve energy efficiency of Russian industry. It identifies options for designing such a scheme by drawing on lessons learned through international experience with EEOs. The analysis concludes an EEO can be an effective policy instrument to drive industrial energy efficiency in Russia. It further recommends placing an energy efficiency obligation on electricity, heat, and gas suppliers, and targeting savings for all industrial end-uses and fuels. In addition, an EEO scheme in the Russian context could be combined with an energy audit scheme, as in the Danish scheme until end 2013, to reduce the cost involved for identifying promising energy savings potential. To simplify monitoring and verification, eligible measures under the scheme would best be limited to a predefined list of cross-cutting energy efficiency technologies that may be deployed in a range of subsectors. Savings would be estimated ex ante to facilitate monitoring, reporting, and verification, with random checks to confirm that savings have been achieved. Finally, while open trade of white certificates might provide an incentive to other parties to actively search for and realize energy saving opportunities, it is not recommended in the first iteration of an EEO as it may also increase the complexity of the scheme.

Introduction

This paper reflects findings from a study supporting the GEF/UNIDO Market Transformation Programme (MTP), which aims to transform the Russian market for industrial energy efficiency. The study will support MTP's aim to strengthen Russian policy-making and implementation relating to sustainable industrial energy efficiency. This paper contains the most important messages and the rational from the paper.

The paper seeks to answer the question of whether an energy savings obligation scheme (also known as a "white certificate" scheme), can be a sustainable and effective instrument to address Russia's high energy intensity, with a particular focus on the industrial sector. This includes large-sized, energy intensive companies (fuel & energy complex, ferrous and non-ferrous metallurgy, chemistry and petro chemistry, pulp and paper, cement production) as well as small- and medium-sized industries. The paper considers international experience with EEOs to assess the potential for an EEO in Russia, and to identify the most appropriate design elements for Russia's economic and regulatory context. It also examines whether opening the EEO to open generation and trading of the white certificates would benefit Russia.

The need to improve energy efficiency in Russia

The energy efficiency improvement potential in Russian industry is substantial (Bashmakov, 2013). It adds up to roughly 114 million tons of coal equivalent (Mtce), or 43% of industrial energy consumption. This is the sum of potentials in fuel processing and end-use, including energy savings from gas flaring reduction, and accounting for overlapping effects. It is more than the total energy consumption of Poland, the Netherlands, or Turkey.

Improvements to energy efficiency should bring considerable benefits to Russia. This includes economic benefits, as well as environmental and public health benefits arising from decreased emissions. Increasing energy efficiency will help Russia benefit from higher levels of oil and natural gas exports, which account for a significant portion of the economy. The Russian oil and gas sectors provide 65% of export revenue, over 45% of federal budget revenue, and account for 24% of total GDP.

Improving energy efficiency would also contribute to Russia's economic development. End-use energy costs more than quadrupled between 2000 and 2010 and reached 4.9 trillion rubles (around 100 billion euros). And while the ratio of energy costs to GDP declined from 14.5% to 10.8% in this period following energy efficiency improvements, significant potential to improve efficiency remains.

Energy efficiency policy in Russia

Russia's energy efficiency challenges are complex and require, for the most part, long-term structural solutions. Main barriers include low energy tariffs (compared with the EU and parts of the US), the unavailability of external and internal capital, lack of competition, and lack of information on energy saving opportunities and technologies. Strong policy mechanisms are required to overcome these and other barriers, and to drive investment in energy efficiency.

Energy efficiency policy in Russia has only recently resurfaced as a priority. From 1997 energy efficiency activities at the federal level in the Russian Federation started to increase compared to previous years. However, after the 1998 economic crisis, energy efficiency management was no longer a priority, and eventually federal energy efficiency policies in Russia became quite fragmentary. In 2008, of all executive bodies, only the Statutes of the RF Ministry of Economic Development mentioned energy efficiency activities. Energy pricing policy was practically the only federal instrument to promote energy efficiency.

Since 2008, Russia has renewed its focus on energy efficiency. Today, there are two high-level national goals for energy intensity: to reduce the energy intensity of Russia's GDP by 40% 2020 (compared with 2007),[1] and by at least 56% in 2030 (compared to 2005).[2] Federal Law No. 261 "On energy conservation and energy efficiency" ("Federal Law") and the 2010 state program on "Energy Saving and Energy Efficiency Improvement until 2020" put in place steps to help achieve these goals. Yet much remains to be done. The International Energy Agency estimates that Russia will not reach its 2020 target before 2028, and indeed very ambitious policies would need to be implemented and complied with in the coming years to meet the target.

Today, dozens of federal regulations on energy conservation and energy efficiency have been adopted, while a number of existing regulations have been amended and supplemented. Most of these regulations are focused on energy efficiency of buildings and relate to e.g. energy and water metering, or energy passports. Energy efficiency policies focused on industry are more limited. The Federal Law includes energy audits and energy efficiency state standards for industrial consumers. Large consumers must undertake mandatory energy audits. The law also introduces incentives and

[1] Presidential Decree No. 889, Concerning some measures for improving the energy and ecological efficiency of the Russian economy, June 4, 208.

[2] Russian Energy Strategy to 2030, Decree 1715r, November 13, 2009.

tax benefits for energy-intensive industry to replace inefficient equipment by energy-efficient machinery. So far, however, these initiatives have had limited success.

International experience

EEOs have a proven track record around the world of effectively delivering energy savings, and are gaining more attention in Russia as a way to stimulate energy efficiency, possibly with the inclusion of tradable (white) certificates (Tulikov, 2013).

An EEO is referred to as an "obligation" as it is designed around an obligation on energy companies to deliver energy savings among end-users. While the design details may vary, EEOs have a number of shared features:

1. A binding (sometimes a voluntary) obligation is placed on energy distributors or suppliers to save energy among end-users, possibly accompanied by the possibility to be exempted from the obligation (buyout), and/or a financial penalty in case of non-compliance.
2. Energy savings are realized by implementing eligible energy efficiency measures with consumers in targeted end-use sectors. The energy saving measures are usually undertaken or organised by the obligated energy companies, but depending on the rules of the energy efficiency obligation, they can be carried out directly by accredited organisations who are specialists in energy efficiency.
3. For all delivery routes, the energy savings must be accredited as genuine, additional energy savings by an independent authority. A balance has to be struck between accuracy, cost, and administrative efficacy in the measurement and verification of savings. These energy savings are declared on (white) certificates. Subsequent trading of these certificates may be allowed, either among obligated parties only, or among obligated and any accredited third parties.

Around the world, energy efficiency obligation schemes have been very successful. In fact they often deliver greater savings – sometimes at lower cost – than originally expected. They advance the introduction of standardised energy efficiency measures, often targeting smaller energy users (residential sector), lowering transaction costs and contributing to market transformation (Bertoldi et al. 2010). EEOs are in place in number of EU Member States, US States, China, and in 4 Australian States.

In the European Union, Member States with EEOs consider them as an important policy to meet national energy efficiency and climate objectives, and interest is growing (Lees, 2012). Currently, energy efficiency obligation schemes exist in 10 of the Member States with a further 7 planning to introduce them as part of their plans to meet their national energy saving targets as required by the 2012 EU Energy Efficiency Directive (2012/27/EU). Several other European countries, such as Germany and Switzerland, have considered options for introducing them as well (see e.g. Becker et al 2012, Becker and Thomas 2013, Ecofys 2014, Schlomann et al 2012).

The longest running schemes in Europe are in Denmark, France, Flanders, Italy and the UK. The end-use sectors targeted by EEOs in Europe differ by country; however, even where the industrial sector is covered by the scheme, most savings have come from the residential sector. (Most schemes allow obligated entities to meet their obligation through energy savings in any eligible end-use sector.) The exception is Denmark where the industrial sector is the biggest single source of end-use energy savings. The Danish scheme as designed through the end of 2013 was an interesting example, as it was combined with mandatory energy audits of industrial installations. These audits provided a good understanding of cost-effective energy savings potentials and reduced the cost for obligated parties to identify cost effective saving opportunities among end-users.

Another relevant European example for Russia to consider is Italy, which is the only country with significant experience in white certificate trading. Italy's experience serves as a cautionary note on trading, as it has had great problems in creating a fluid market of white certificates. Initially, the Italian scheme allowed for cheap and shallow energy efficiency measures. Once this potential was harvested, obligated parties lacked an understanding of cost-effective saving potential among their end-users, and the supply of certificates to the market fell short. The approach to continuous improvement since 2012 has allowed policy makers to overcome these issues and presently the Italian scheme is based mainly on industrial monitoring plan projects.

Within the United States, 25 states have an energy efficiency obligation that requires regulated utilities to meet specific energy efficiency goals. US programs differ from one another in their design, level of funding, and degree of success. Here, a greater portion of funds from energy efficiency obligations are invested in the commercial and industrial sectors. Several programs stand out as particularly effective in driving industrial savings. These include programs in California, Colorado, Massachusetts, Minnesota, New York, and Wisconsin.

Design characteristics of an EEO scheme for Russian industry

An authorized body will need to administer the EEO/WC scheme, and take on the corresponding responsibilities once the policy objectives and scope of the scheme have been politically agreed, and the scheme has been adopted. The Russian Energy Agency would seem an obvious candidate for fulfilling this role. The remainder of this section explores design options for an EEO in Russia.

Obligated parties

Most of the energy efficiency obligation schemes in the world place obligations on providers of energy: energy retailers, distributors or integrated companies, though the obligation can also fall to generators or even industrial customers. The natural monopoly of grids may lead some to suggest that there is an advantage to have the grid operators run the scheme.

In Russia, it would be possible to place an obligation on suppliers, distributors, or industrial end-users. Our recommendation is for Russia to place the obligation on suppliers of electricity, heat, and natural gas, for the reasons given below.

While an obligation on energy distributors is possible (as in Denmark), there is a major barrier in that distributor's income is very tightly connected to sales. A drop in sales will have a significant impact on distributors in a liberalized market, where distributors' income is directly linked to the volume of sales. If an obligation were to be placed on distributors, it would require decoupling of income from the amount of energy distributed, as is the case on several US jurisdictions. This may be done by introducing fixed charges for distribution.

Obligating industrial end-users, as in India or Finland, is also a possibility, though currently interest from industrial end-users is likely to be limited. One possibility would be to include industrial end-users on a voluntary basis, but it may not make a lot of practical sense to include them in a scheme that primarily obligates energy suppliers. Chances of success may be larger if a dedicated voluntary agreement with this group of stakeholders is concluded.

An obligation on energy suppliers is beneficial as they have direct links with industrial end-users. An obligation should cover suppliers of heat, electricity and natural gas. Inclusion of gas suppliers may be politically challenging with the present oligopoly in the Russian domestic gas market. However, considering the large share of gas suppliers in the Russian domestic energy market it is worthwhile obligating these parties in a scheme.

Heat –While around 60% industrial heat is self-generated by large and medium sized industries, and another 5% by SMEs, a third of heat supply for industry is provided by public heat supply retailers. In principle, they could be given an obligation for saving energy.

Electricity – As for electricity, fossil based power generators could be given an obligation for saving energy, and possibly also wholesale retailers of nuclear and hydropower. The electricity sector was restructured in the last decade and split into a state controlled transmission grid on the one hand, and wholesale companies on the other. The government has been trying to attract private investment into the wholesale and regional electric generating companies. As part of the market reform, most of Russia's fossil-fuelled power generation was privatized, while nuclear and hydropower remained under state control.

Natural gas – Upstream gas supply in Russia is still dominated by Gazprom, which produces three quarters of Russia's natural gas, and is in control of most of Russia's gas reserves. It controls more than 65% of proven reserves directly and additional reserves in joint ventures with other companies. While independent gas producers have gained importance (e.g. Novatek, LUKoil), upstream opportunities remain fairly limited for independent producers and other companies, including Russian oil majors. Gazprom's position is further cemented by its legal monopoly on Russian gas exports, although its monopoly on gas exports may be ending soon. Russia's government has announced that it intends to liberalize liquefied natural gas (LNG) exports starting in January 2014, breaking Gazprom's absolute export monopoly.

Nature of target

Three design details are particularly important when setting an energy savings target: how savings are measured (annually or as lifetime savings); the types of eligible savings (savings among end-users or including energy production and transmission/distribution); and measuring savings as primary or delivered energy.

Setting targets in terms of lifetime savings is preferred over annual savings. Annual savings incentivize measures with quick payback, while lifetime savings value more complex savings measures with benefits that extend over a longer timeframe.

Similarly, energy savings should only be included if they are attained in the end-user premises or properties. Energy savings from improved distribution or transmission or generation/production should not be eligible. EEOs are particularly well-suited to drive end-user savings, while there are plenty of commercial initiatives or regulatory incentives that can achieve such energy savings in the energy supply chain.

The choice of delivered or primary energy savings as the target will depend on the key policy objectives of Russian Government. The simplicity of the delivered energy saving is that it clearly reflects the real improvement in energy efficiency in the end-use application. On the other hand, using primary energy reflects the wider energy saving benefits, particularly in terms of the associated savings that will occur within the whole supply chain of that energy.

Energy carriers and targeted end-users

EEO schemes around the world differ also with regard to the end users targeted with the scheme. In Europe, Danish, French and Italian schemes have adopted a broad approach targeting most end use sectors apart from EU ETS (Denmark, France) or transport sectors (Denmark). The British scheme targets residential use only, while schemes in the United States typically are characterized by wide sectorial coverage.

To evaluate pros and cons of targeting different groups of industrial end-users, we modelled the effect of allocating a percentage of energy suppliers' revenues to energy efficiency measures. We included several variations: large industrial enterprises, SMEs, all industrial enterprises, either with or without energy-intensive industry. It was assumed that obligated entities would allocate 1% of their revenues to energy efficiency measures starting from 2016, and that this rate would increase linearly to 2% by 2020.

The analysis showed that if all industrial consumers are targeted under a scheme covering natural gas, electricity, and district heat, the potential annual customer-funded spending by obligated parties on EEO schemes would be highest, reaching 19-27 billion rubles by 2020 (in 2013 prices). Therefore, an EEO scheme that targets a wide group of industrial end-users is recommended as the most effective option. This will allow gas, power, and heat utilities to maximise financial resources raised through the scheme to invest in more energy efficient technologies. Assuming that all industrial enterprises are targeted, tariff increases would not need to exceed 2% for heat and 1% for electricity. For gas a 1% increase in tariff will allow partially cover the capital costs for more energy efficient technologies.

It is important to note that international experiences demonstrate the benefit of allowing obligated entities to save energy among all end-users of all fuels, not just their customers. For example, under the Danish EEO, electricity distributors actually save less than 50% of their own electricity, and make significant improvements in gas and oil efficiency. Similarly, it is common in Europe to allow energy companies to meet their obligation with savings among end-users who are not their customers. This approach is beneficial, as it allows suppliers to meet their obligation in the most economically efficient way possible. Therefore, obligated Russian energy suppliers could be permitted to save any end-use fuel to meet their target.

We conclude that a wide coverage of a scheme would be good, both in terms of targeted end-users and eligible measures. Large industrial enterprises and SMEs, including the energy-intensive industry would need to be charged higher energy tariffs to ensure that revenue increase is sufficient for funding the full potential of energy saving measures. If this is not allowed legally, the relevant legislation could be amended.

Eligible measures

In practice, in most of the currently existing EEO/WC schemes, eligible measures are defined in a list of standardised measures. Under many schemes, obligated parties (or, when having a role in the scheme, also third parties) may often suggest further measures to be added to the list over time. This should also be an option for Russia. After being examined and approved by the administrators of the scheme, these measures may be implemented as well, following the same concept of ex ante calculation of savings.

In existing schemes, lists of eligible measures often comprise more than 200 measures, as for instance in France. They vary regarding level of detail and options to combine complementary measures. This can e.g. be incentivised by granting a bonus (extra certificates) when a smart combination of measures is implemented. However, the experience is that a few key measures constitute the majority of the energy savings e.g. in France for the first obligation period over 73% of the savings came from the top ten measures; likewise for the UK period 2008-12, over 95% of the energy savings came from the top ten measures.

A key advantage of starting by focussing on widely used industrial energy efficiency measures, such as electric motors and drives, is that it will spread the benefits more widely amongst end users than an EEO which focusses on process energy with the requirement to perform detailed monitoring of the energy savings.

In Russia, energy saving potentials of cross-cutting energy saving measures are estimated to be 3.1 million tons of coal equivalent (Mtce) by 2020 and 7.0 Mtce by 2030 (Bashmakov, 2013). This includes savings from reduced steam consumption, elimination of excess (motor) capacity, efficient motors, variable speed drives, compressed air technology, and lighting systems. It excludes savings of process technologies. These are quite capital intensive and more difficult to finance via EEO/WC schemes. The scale of investments required for process technologies is estimated an order of magnitude higher than the potential customer funded spending through EEO schemes.

The role of auditing

A major cost to obligated parties under an EEO scheme relates to the identification of interesting and cost-effective energy saving potential. This may be referred to as the "search cost." Search costs may be reduced by the state or administrative bodies by making industrial end-users are already aware of the opportunities they have to save energy in their facilities. In Denmark, the EEO scheme for industry, until the end 2013, was successfully combined with a mandatory audit scheme. The audit scheme led to a good understanding of potential energy saving measures, which made it easy for obligated parties to harvest the available potential at limited cost. This would be a good option to consider for the Russian context as well.

Basically, an EEO/WC scheme may be combined with either a mandatory or a subsidised audit scheme. To make sure that any public funding of audits would be well spent, subsidies would be paid after some of the energy efficiency measures recommended in the audit had been implemented. This would help to reduce the risk of fraud. Thus, the enterprise under audit would need to finance the audit upfront, and would receive the subsidy only after the some of the measures were implemented. To avoid only cheap measures being implemented, the audit cost could be refunded only if energy efficiency investments have been made considerably in excess of the cost of the audit. This will help address the concern that many audit reports are subsidised without substantial investment in EE measures being made.

Mandatory audits have been introduced in Russia for large industrial energy users, public utilities, public buildings and state-owned facilities. However, compliance with this mandate is not straightforward, as monitoring of compliance is limited. Participation in an audit scheme might be enhanced considerably if the audit scheme could be either better enforced. Audits on industrial energy management could be incentivised through a combination of a mandate and subsidies.

Note that the audit scheme would be most effective in terms of harvesting the available energy savings potential if identified energy saving potential could be made public. This would allow all obligated parties, but also independent energy service companies to identify the most cost-effective energy efficiency measures with industrial end-users. However, it would also imply disclosing information that industrial end-users subject to the audits may prefer to keep confidential. This may turn out an important hurdle to transparency on available energy savings potentials.

Monitoring and verification

An essential element of an EEO/WC scheme is monitoring, reporting and verification of the savings achieved. Under the aspect of cost efficiency, individual, ex post verification is in most cases far too costly to work for all measures implemented under a scheme. Therefore, approaches for ex ante calculations of savings – so called 'deemed savings' - have been developed and have been delivering good results in combination with standard lists of eligible measures. The scheme administrator usually publishes a list of eligible energy efficiency measures along with any relevant technical standards and sampling procedures required for M&V. This approach would be a suitable approach for the Russian context.

Deemed savings are based on a default methodology, calculating the average savings that can be achieved, and applying weighting factors for different life times, percentages of degradation of devices, technological innovation, etc. The methodology is adjusted to each standard measure, a data sheet is provided containing formulas to calculate the amount of certificates that can be generated per standard measure. These ex ante estimates may be complemented with scaled engineering estimates in case equipment with deviating dimensions or capacities are installed.

Reported savings will need to be verified by independent third parties that have no connection to the obligated energy party. It is important to verify that the installation has taken place (prevention of fraud) and that it has been correctly installed (technical justification of awarding deemed energy savings). Verifying parties must be independent professionals and for the technical verification must have a background in energy efficiency engineering. For absolute certainty, verification would be performed on all reported savings, but budget may pose constraints as this would increase the costs to end consumers. Globally for the ex-ante energy saving approaches, verification is performed on a representative sample of all the reports delivered by obligated parties with the cost of verification ultimately passed on to the end use customers. Once verified, energy savings are registered in a database operated by the scheme administrator. Obligated parties receive a certificate for each energy saving measure implemented with the amount of energy savings on it.

Funding of savings measures and administrative cost of the scheme

Cumulative investments for improved energy efficiency in selected technologies up to 2030 add up to 900 million euros by 2020 and over 2 billion euros by 2030 (Bashmakov, 2013). A fundamental question is exactly how these investments in energy efficiency measures will be funded through an EEO/WC scheme. It is important to find a way to facilitate obligated entities to meet their obligation, as one of the benefits of EEOs is that, by funding measures through a tariff increase (regulated or otherwise) rather than through national budgets, they create a stable funding stream that is more protected from political shifts over time that often affect government budgetary support.

In France, the combination of a tax rebate with an EEO scheme turned out quite effective. However, this success was primarily because the tax break was not well known to households, which were targeted through the scheme. The EEO scheme increased awareness of the tax break among this group. One could assume that industries in Russia are well aware of any advantageous fiscal measures, and that the introduction of an EEO would not add much to awareness of such measures.

Nevertheless, a fiscal measure could be introduced to reduce the costs to obligated parties without raising energy tariffs significantly. In Russia, an investment tax credit was introduced in 2013 to advance investments in energy efficient technologies or facilities. The measure allows reducing tax payments to a degree for some time, with subsequent gradual repayment of the principal amount and accrued interest. It could be considered if this fiscal measure could be combined fruitfully with an EEO/WC scheme to fund energy efficient technologies implemented under the scheme.

Higher energy tariffs will be accepted by customers as long as they have a benefit from savings that outweighs higher energy cost (Lazar 2013). A tariff increase may be a viable option for Russia, as short payback periods characterize much of the energy saving potential in Russian industry. It is important however to consider the present legal framework and any limitation therein to further increase energy prices and tariffs.

Role of trade

Trade of energy saving certificates (white certificates) under an EEO is another characteristic to consider. The main reason for including the option of trade is to enlarge the number of opportunities for energy savings, and to enable a larger number of parties to identify these and to harvest the energy saving potential. In the theoretical discussion on energy efficiency obligations, open trade often plays a key role. Such trade can take place on a regulated spot market, administered by either the scheme administrator or another party. Obligated and accredited third parties may assemble energy saving certificates and engage in trading, as in Italy. This is based on the assumption of a fully functioning market on which the main behavioural driver is to generate savings

certificates at least cost and sell them for the best offer. Indeed, some schemes (e.g. Italy) provide an official trading platform run by the electricity market operator.

In practice, the extent of open trading varies considerably. It is common for trading to be permitted between obligated parties, and much less common for non-obligated parties to generate white certificates. Most schemes (including those with open trading) have adopted bilateral contracting between an obligated party and an energy efficiency expert. In France, third parties were allowed to engage in trading. However, it turned out that legal entities who are not under obligations do not massively participate (Zahm 2013). Also in the earlier UK schemes, trade between obligated parties remained limited.

A critical issue for the success of open trading is ample supply of certificates to create a fluid market for certificates. Both the Italian and Polish examples have demonstrated the difficulties in creating such a fluid market. The system in Poland includes a tendering procedure where energy saving projects are rewarded with white certificates. However, as the price of the certificates was unknown, activity was limited and very few projects were approved. It follows that clarity on a white certificate price is required before obliged parties will consider this in their investment decisions. In Italy, distributors initially had a disincentive to trade certificates as costs of energy savings measures initially were much lower (shallow measures allowed) than the allowance in the distribution price control; publicising this was clearly not in the obligated parties' interest. Obligated parties in Italy did not take much effort in identifying complex savings potentials, but understandably went for the most obvious and cheapest ones. The scheme thus stimulated a run on a few types of standard measures (e.g. compact fluorescent lighting, low flow shower heads) which could be reproduced in large numbers (Brogi 2013). Obligated parties tried to overachieve their savings target by early realisation of large scale cheap saving measures. As banking of the energy savings towards the next phase was possible, little use of trade was be made. Once cheap potentials had been harvested, it became challenging to identify new savings opportunities at such low costs. It turns out that even after eight years of operation two thirds of the transactions in Italy are still bilateral i.e. not generated by third parties and sold on the market place.

In the light of these international experiences it is recommended to start with a scheme in which only obligated parties are able to directly submit certificates to the scheme administrator. The expectation is that most of these energy savings will arise through bilateral contacts between the obligated energy suppliers and energy efficiency experienced companies. Furthermore, trading of the verified white certificates should be allowed between the obligated parties from the onset of the EEO. An registration database (preferably online) is necessary to keep track of trading transactions between obligated parties. Such a registry will be restricted to the obligated parties and as international experience shows fairly limited trading, the registry could be operated by the scheme administrator. If bilateral trade is evaluated favourable, the trade of white certificates may be opened to third parties (ESCOs or end-users). This might be more complex to manage, but could create also more leverage to implement projects.

Existing schemes follow different paths regarding banking and borrowing. In most schemes, banking is allowed to a certain extent. Experience shows that having no banking option limits flexibility for obligated parties (e.g. risk that flow of certificate generation does not match with target in period of obligation) and can have "stop-go" impacts for energy efficiency industries if obligated parties meet their targets early. Excessive banking and borrowing can lead to speculative behaviour (realising savings only under certain market conditions). In addition, borrowing could imply a conflict with a penalty for failing to meet the energy saving target. Therefore, best practice is to allow banking within a certain range considered big enough to provide flexibility, but limiting speculative effects.

Role of ESCOs, contractors and agents in identifying savings potentials

In theory, a key role in EEOs is often attributed to Energy Service Companies (ESCOs).

There are several ways to define ESCOs, the most important ones being a broad definition, comprising all businesses and crafts dealing in any way with energy saving, and a narrow definition, focussing on specialised companies offering energy performance contracting. Here we adopt the narrow definition.

In most of the existing EEOs, obligated parties do not get engaged in energy savings projects themselves, but make use of contractors and agents to identify attractive savings potentials and to implement them at least cost. These market players delivering energy services may be of strategic importance, as their commercial success depends on identifying sufficient cost efficient potential. However, ESCOs as in the narrow definition tend to play a limited role.

International experience is that the ESCO main market lies in the public, commercial and large condominium sectors, and it is debatable whether ESCO development would be any different in Russia. EEOs in Russia focussed on the end use sector of industry will therefore not necessarily contribute to the development of ESCOs. This does not preclude ESCO development in the Russian industrial sector, but it is likely to require significant financial help.

Industrial installations tend to be less uniform in the setup of their operations, and thus more time is needed to define where and how energy may be saved, and to design tailor-made energy saving solutions. This implies a higher search cost which may, depending on the mode of financing, either drive up the overall cost of the scheme, or make business for contractors and agents unattractive, resulting in a scarcity of viable savings projects. In order to avoid such dilemma, the combination of an EEO with an audit scheme is recommended.

Buyout fees and penalties

It is essential to any system design to define clearly the rules of participation for the stakeholders, which is a role for the scheme administrator. After making a choice on who belongs to the group of obligated parties, it has to be decided whether a buy-out or exemption option should be allowed, and under which conditions. For parties below a certain size, transaction cost might be too high to be competitive. These parties are often given the option to buy-out from the scheme at a relatively low price, e.g. 20% above the expected cost of energy certificates, or to be completely exempt for very small companies.

On penalties, international best practice is to implement clear financial sanctions for obligated parties not complying with their targets. By the end of the obligation period, the scheme administrator checks to what degree obligated parties have complied with their individual targets. Non-compliant parties could be penalised to encourage participants in the scheme to comply with their targets.

A financial penalty may consist of a fixed fee – i.e. a fixed amount for every unit of energy not saved) – or a variable fee – e.g. related to the degree of non-compliance and the turnover of the non- compliant party. While charging a variable fee would allow for collecting greater sums in particular when larger obligated parties are penalised, a fixed amount is more predictable, more transparent, and less prone to possible erroneous financial statements of obligated parties. The penalty should be significantly higher, e.g. several times higher than the average certificate price. For example, in the French scheme the penalty was initially set at twice the expected cost of a WC, but in practice turned out to be 5 times higher than the average certificate price. Alternatively the penalty can be to undertake increased energy efficiency as in the UK i.e. the obligated party missing its target has to make up the energy saving shortfall in the next phase and carry out additional energy efficiency measures dependent on the extent the target was missed.

Revenues generated from penalties and buy-out fees could be used to finance the general administration cost of the system and/or a partial subsidy of energy efficiency measures or a complementary auditing scheme. While buy-out fees can be calculated and planned, revenues from penalties are subject to fluctuation and become available only several years later, therefore they do not contribute to a steady refunding of a scheme.

Table 1: Overview of design options for an EEO in Russia's liberalized energy market

Obligated parties	
Suppliers	(+) Close connection to end-user
Distributors	(-) Income tightly connected to sales, which is a disincentive to save energy
Industrial end-users	(-) Interest among Russian end-users likely to be limited
Recommendation	*Obligate heat, electricity, and gas suppliers, and allow them to save all fuels*
Nature of target	
Lifetime savings	(+) Values more complex savings with benefits over longer timeframe
Annual savings	(-) Incentivizes measures with quick payback
Final energy savings	(+) Clear reflection of efficiency improvements in application
Primary energy savings	(+) Wider energy saving benefits including the whole supply chain
Include distribution or transmission?	(+) Wider potential (-) Difficult to exploit
Recommendation	*Adopt a target based on lifetime savings and exclude distribution and transmission. The choice of final or primary energy savings depends on policy objectives of the Russian Government*
Targeted end-users	
Large industrial enterprises	(+) Limited group, easier to connect to
Industrial SMEs	(+) Target a broader group to stimulate innovation across society
All industrial enterprises	(+) Largest potential customer-funded spending
Recommendation	*A wide coverage of a scheme is recommended*
Eligible measures	
List default measures	(+) Spread benefits widely among large groups of end users
Process technologies	(-) Capital-intensive, more difficult to finance via EEO/WCs
Recommendation	*Adopt a list of standardized eligible measures*
The role of auditing	
No audit scheme	(-) No reduction of 'search cost'
Mandatory	(+) Mandatory audits are already included in Russian legal framework
Subsidized	(+) Greater compliance
Recommendation	*Consider providing a subsidy for the mandatory audits to enhance compliance*
Monitoring and verification	
Ex post verification	(-) Too costly
Deemed savings	(+) Cheap
Scaled engineering estimates	(+) Relatively cheap verification for deviating equipment
Recommendation	*Combined deemed savings and scaled engineering estimates*
Funding of saving measures	
Raise energy tariffs	(+) Stable funding stream (-) Potential limitations in existing legal framework in Russian Federation
Use fiscal measure	(-) Success uncertain, as investment tax rebates exist already
Role of trade	
Open trade (including non-obligated parties)	(+) Exploit largest possible energy saving potential (-) Difficult to create fluid market
Bilateral trade (obligated parties only)	(+) Enlarge the energy saving potential that may be realized without the need to create a fluid markets
Allow banking	(+) Increases flexibility for obligated parties to comply
Allow borrowing	(-) Advances speculation
Recommendation	*Initially allow for bilateral trade only (including banking, not borrowing)*
Role of ESCOs	
Energy performance contracts	(-) Difficult to a business from the start, in absence of fluid WC market
Identifying saving potentials	(+) Easier to establish a viable business
Recommendation	*Ensure ESCOs may identify cost-effective saving potentials*
Buyout fees and penalties	
Buyout	(+) Allow small parties to avoid relatively high transaction costs
Penalty	(+) Encourage obligated parties to comply with targets
Recommendation	*Establish a buy out at a low price (e.g. 20% above cost of energy). Include a penalty of several times cost of savings*

Conclusions and recommendations

The aim of this study was to assess whether an energy efficiency obligation scheme can be an effective instrument to improve energy efficiency in Russian industry. Our general conclusion is that they can very well serve the purpose, provided that certain design criteria are taken into account (see **Table *1***). In general, may of the international lessons may be of direct use for Russia, where energy markets have been restructured and liberalized in recent years. A Russian EEO/WC scheme could potentially benefit from a combination with the mandatory audit schemes already in place.

One critical ambiguity relates to the way the scheme would be funded. Additional funding could be generated (partly) through an increase of energy tariffs, provided that the Russian legislative framework would allow this, or by combining the EEO with a fiscal measure, such as the recently introduced investment tax credit. Our recommendations are based on our understanding of the Russian regulatory framework, our knowledge of international experiences of such schemes, and our assessment of economic impacts of such schemes, notably with regard to the parties obligated under the scheme. Our recommendations will need to be considered by relevant stakeholders in Russia. Their scrutiny of these findings will lead to an updated and final version of our recommendations.

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