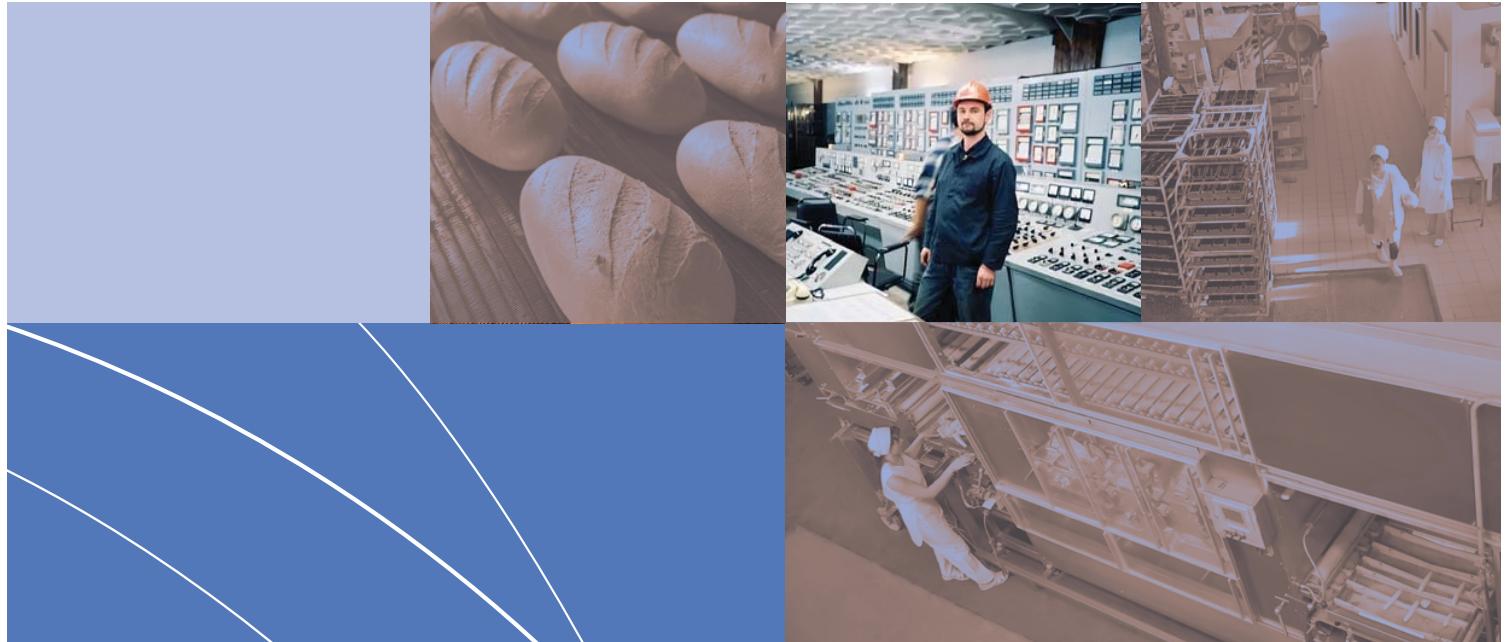


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IFC Advisory Services in Europe and Central Asia
Energy Efficiency Survey Project

Energy Efficiency: A New Resource for Sustainable Growth

RESEARCHING ENERGY EFFICIENCY PRACTICES AMONG COMPANIES
IN ARMENIA, AZERBAIJAN, BELARUS, GEORGIA, RUSSIA, AND UKRAINE



In partnership with



Free State of Saxony



**International
Finance Corporation**
World Bank Group

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Energy Efficiency: A New Resource for Sustainable Growth

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IN ARMENIA, AZERBAIJAN, BELARUS, GEORGIA, RUSSIA, AND UKRAINE

2010

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Foreword

Energy efficiency is an important development priority for IFC due to the rapidly increasing demand for energy, growing supply constraints, and related concerns over the environmental and health effects of pollution.

We have the potential to reduce global energy demand growth by at least half - the equivalent of 64 million barrels of oil a day¹ - by significantly increasing investments to improve worldwide energy efficiency: estimates suggest \$170 billion annually through to 2020. Increasing energy efficiency is also critical to reducing greenhouse gas emissions, which in turn is critical to stopping and mitigating the effects of climate change.

IFC, as part of its mandate to promote sustainable development in the private sectors of developing economies, promotes the efficient use of energy in industrial enterprises.

The long-term competitiveness of small, medium and large enterprises is crucial if the private sector is to continue to grow. Businesses that implement energy efficiency (EE) measures can reduce the share of energy costs in their operations and make all the difference in determining their long-term success and viability.

This report contains the findings from a survey carried out among industrial enterprises in Armenia, Azerbaijan, Belarus, Georgia and Ukraine during the summer of 2008, and in Russia in 2006. The survey, conducted through a detailed questionnaire and face-to-face interviews with the management of the enterprises sought to obtain a picture of how industrial enterprises in these countries manage and finance energy efficiency improvements.

This report presents and analyzes survey results on managers' attitudes toward, and knowledge of, energy efficiency measures (Chapter 2); companies' historical and planned use of energy efficiency measures (Chapter 3); the ways in which energy savings are incentivized, planned, and evaluated in the survey countries (Chapter 4); and the ways in which companies pay for investments in energy efficiency (Chapter 5). Chapter 6 draws conclusions from Chapters 1-5 and recommends areas for further work by industry, government and financies to increase energy efficiency.

¹ McKinsey Global Institute, February 2008

Executive Summary

This report summarizes and analyzes the results of energy efficiency surveys undertaken by IFC in the industrial sectors of six countries: Armenia, Azerbaijan, Belarus, Georgia, Russia, and Ukraine (the “survey countries”).

The survey assessed how industrial enterprises in each of the survey countries prioritize, understand, plan, finance, and implement energy efficiency investments. The resulting analysis is intended to help governments, financial institutions, companies, donors, and private investors identify opportunities to provide goods and services that improve energy efficiency.

The industrial sectors surveyed were the food, chemical, building materials, metal processing, and machine building industries.¹

The survey countries are some of the most energy-intensive economies in Europe and Central Asia. Of 35 countries in Europe and Central Asia, two of the survey countries (Ukraine and Russia) rank within the top five in terms of energy intensity. Four of the survey countries (Ukraine, Russia, Belarus and Azerbaijan) rank within the top 10.

Energy intensity in these countries has decreased over the past decade, primarily because of Gross Domestic Product (GDP) growth. Prior to the global financial crisis, growth in the survey countries ranged from seven to 17 percent annually, from 2000 to 2007. GDP per capita roughly doubled in each country over the same time period.

The following table summarizes the key energy efficiency indicators for the surveyed companies in each country.

	Armenia	Azerbaijan	Belarus	Georgia	Russia	Ukraine
Prioritization of EE	Low	Low	Medium	High	Medium	Medium
Actual awareness of EE potential and measures	Low	Medium	High	Low	Medium	Medium
Historical EE investment	Medium	Low	High	Medium	Medium	Medium
Planned EE investment relative to historic	High	High	Low	High	Low	Low
Average value of investments planned	Low	Medium	High	Medium	Low	Low
Integration of EE into Business Planning	Low	Low	High	Low	Medium	Medium
Perceived Effectiveness of EE Laws and Regulations	Medium	Medium	High	Medium	Low*	Medium

*The survey in Russia was conducted in 2006. The situation has changed significantly with the enactment of the Law on Energy Saving and Improving Energy Efficiency in 2009.

Nearly half of respondents in every survey country stated that improving energy efficiency is one of the main priorities for their business. Armenian companies were least likely to consider energy efficiency a priority, and Georgian companies the most likely. Sectors that had higher energy costs as a proportion of total costs were more likely to assign a higher priority to improving energy efficiency. This was the case in Ukraine, Belarus, and Armenia, and was true for most sectors in Azerbaijan and Georgia.

Most survey respondents felt that company management had a good understanding of

This report summarizes the results of surveys in six countries

The survey countries are some of the most energy-intensive in the region

Managers in the survey countries say energy efficiency is a priority ...

¹ Different industries were surveyed in Russia. These were: light industry, wood processing, meat and dairy processing, bakery and confectionary, and metal working and machine building.

... and feel they understand its importance ...

...but underestimate potential energy savings

Many companies have implemented energy efficiency measures ...

... but prefer no-cost or low-cost measures

Planned investment in energy efficiency is substantial ...

... but the average value of planned investments is small ...

energy costs, and more than 90 percent thought management had at least an approximate understanding. Most respondents also believed management in their companies to be generally informed or well informed about opportunities for improving energy efficiency.

Respondents almost always underestimated the potential benefits of energy investments to their companies. Managers in Azerbaijan, Belarus, Georgia, and Russia, which gave the highest estimates of potential energy savings, underestimated potential benefits by an average of 40 percent. In Armenia and Ukraine the underestimations were greater, with most managers underestimating energy savings potential by more than 65 percent.

Metering is important for monitoring and evaluating the implementation of energy efficiency measures. Fewer than 20 percent of the companies surveyed had metering in place at the division level or at the level of individual equipment. Many respondents indicated they were investing in metering upgrades, but these companies were in countries (Belarus, Russia, and Ukraine) in which the metering stock was already highest and at the finest level of granularity (at the division and equipment levels).

Like metering, energy audits are important for identifying where energy can be saved. However, few respondents (fewer than half in all countries except Azerbaijan) conduct energy audits.

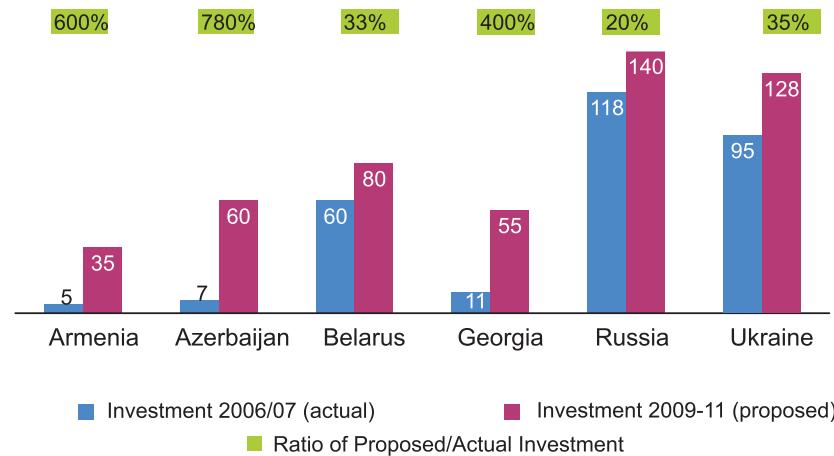
More than two thirds of the companies surveyed in each country had implemented one or more energy efficiency measures in recent years. Roughly half of the companies surveyed had implemented three or more measures.

Most of the energy efficiency measures adopted in recent years have been low-cost or no-cost measures (administrative or organizational measures). Energy-efficient lighting was the most common or second most common energy efficiency measure that companies implemented during 2006–07. Of the no-cost measures, the most common was the appointment of a specific employee responsible for energy efficiency. No- and low-cost measures are attractive because they have short payback periods and do not require significant budgetary allocations.

Most companies in the survey countries have plans to increase their investments in energy efficiency substantially. Figure below compares companies' planned investments to their historical investments, by country.²

HISTORICAL AND PLANNED INVESTMENT IN ENERGY EFFICIENCY

(In USD, millions)



Investment plans reflect the same preference for low-cost energy efficiency investments as seen in the past. Most survey respondents were planning to invest relatively small amounts (less than \$50,000) in energy efficiency. Only a small proportion of respondents plan to spend more than \$500,000 over the period: 13 percent in Armenia and Russia, 15 percent in Ukraine, and 24 percent in both Azerbaijan and Georgia.

² This is based on investment plans put forward by companies prior to the impacts of the global financial crisis of 2008–2009. The current appetite for energy efficiency investments may have changed.

Formal planning for energy efficiency - and incorporating this into business strategy - is uncommon in most of the survey countries. Only 29 percent of the companies surveyed in Armenia, and 24 percent of the companies surveyed in Azerbaijan and Georgia had developed and executed an energy efficiency plan. In contrast, in Belarus roughly 80 percent of the companies surveyed had developed an energy efficiency plan.

All of the countries in the survey, except Georgia, have passed national legislation related to energy efficiency. Most also have a national policy outlining the plan or strategy for achieving the country's energy efficiency potential. In Belarus, in particular, a comprehensive energy efficiency law appears to be one of the most important reasons for the substantial gains in energy efficiency in recent years.

However, many respondents felt that existing legal frameworks did not promote energy efficiency in their country. In the six survey countries, between 19 percent (in Russia) and 50 percent (in Belarus) of respondents indicated that the existing framework successfully promoted energy efficiency.

Most respondents said their companies were not investing in energy efficiency because of financial barriers. More than half of survey respondents said that a lack of internal funds prevented them from making investments in energy efficiency. Roughly 20 percent of respondents said that they had difficulty attracting external financing for projects. Twenty percent of respondents indicated that other barriers (organizational or technical) prevented them from investing in energy efficiency³.

Only 15 to 35 percent of respondents actually sought outside financing for their projects. Respondents who sought financing for their energy efficiency investments were generally quite successful in finding it. In Belarus, Georgia, Russia and Ukraine, more than 80 percent of respondents who sought outside financing for energy efficiency projects received the financing they sought.

The expected payback periods for planned investments are longer than the payback periods on investments in the recent past, suggesting that companies are making more substantial energy efficiency investments (with higher capital costs). The surveys also suggest that loan tenors are generally keeping pace with the payback periods of planned investments.

The surveys show some promising findings for energy-efficient goods and services, but also substantial challenges.

The following findings are promising:

- **Managers say they view energy efficiency as a priority.** As noted above, most of the managers surveyed view energy efficiency as one of their business's top three priorities.
- **Planned investment in energy efficiency is substantially higher than historical levels.** As shown above, respondents in all of the survey countries plan to invest more in energy efficiency than they have in recent years. Three of the survey countries plan to invest many multiples more than they have in recent years.
- **Payback periods are increasing.** Longer payback periods suggest that there is a movement from no-cost and low-cost measures toward more substantive, capital-intensive measures with greater overall savings potential.
- **Lenders have more knowledge of, and are more comfortable with, energy efficiency investments.** As described above, most respondents who had applied for financing for energy efficiency investments received it. Moreover, loan durations are keeping pace with payback periods, suggesting that lenders are not only willing to meet the need for financing in general, but are also increasingly willing to extend longer-term loans for larger, more substantial projects.
- **Better incentives, monitoring, auditing, and planning means a higher likelihood of obtaining finance.** A higher percentage of respondents in Belarus

**... and not integrated
into broader business
strategies**

**Energy efficiency
policy is developing...**

**... but many
government measures
are ineffective**

**Managers cited a lack
of internal funds, or
external financing, as a
barrier ...**

**... but the minority
of respondents
who sought outside
financing found it ...**

**and loan tenors are
keeping step with
longer payback
periods ...**

**Conclusion: a mix
of promise and
challenges**

Some promising trends

³ Organizational or technical barriers include: problems evaluating projects; lack of experience in developing projects; and the necessity of obtaining a permit or consents from the government.

said their companies applied for and received external funding for energy efficiency, in comparison with respondents in other countries. Companies in Belarus are also better equipped in terms of metering, are more likely to conduct energy audits, and are more likely to integrate energy efficiency into their other business plans. Together, these factors suggest that better monitoring and planning can help facilitate access to financing.

- **Government incentives for energy efficiency can help.** The survey shows that companies in Belarus are some of the most active in planning, implementing, and financing energy efficiency investments. Respondents in Belarus were also more positive about the effectiveness of government energy efficiency measures than respondents in other countries. Although Belarus is one of the most energy intensive economies in the region, it still can serve as an example for other countries to follow when trying to promote energy efficiency through effective government policy.
- The challenges revealed by the survey mirror the usual list of “barriers” to energy efficiency, namely: informational, financial, and legal/regulatory.
- Company managers and financiers do not have enough, or do not have the correct knowledge of, energy efficiency investments and potential.
- Company managers are limited (or, at least, perceive they are limited) to using their own funds for investment instead of outside financing. This limits the size and scope of energy efficiency investments.
- Laws, regulations, and incentives for energy efficiency are generally ineffective, and may even discourage energy savings⁴.

The usual challenges

Recommendations

Industry can ...

Government can ...

Financiers can ...

- **Increase awareness:** increase the awareness of company managers and staff of the benefits of energy efficiency.
- **Provide incentives:** provide incentives for staff to reduce energy consumption.
- **Integrate planning:** ensure that the company has an energy efficiency action plan, and that this plan is integrated with other company plans and procedures.
- **Improve information:** upgrade metering equipment and use energy audits.
- **Finance:** apply for loans that allow the company to save more energy, sooner than would be possible with internal funds.
- **Implement the legal framework:** governments must ensure that the legal framework for energy efficiency is effective—in other words, that the necessary measures are designed, funded, and appropriately enforced to achieve the objectives
- **Remove other obstacles:** the survey shows that there is a substantial lack of information on energy efficiency practices and benchmarking, energy consumption metering and database as well as coordinated effort between policy makers and consumer groups, hindering the efforts to invest in energy efficiency.
- **Educate:** improve company managers’ understanding of the impact of energy efficiency measures on a company’s financial standing, and the benefits of utilizing external financing.
- **Develop products:** foster the creation of relevant financial products and services.
- **Help with applications:** create clarity around application requirements, and streamline processes.
- **Support projects:** assist companies with the design and evaluation of energy efficiency projects.

⁴ For example, in several countries (Belarus and Azerbaijan, in particular), cumbersome and time-consuming procedures to obtain permits and licenses were seen by a significant proportion of respondents as a barrier to implementing energy efficiency projects.

1 Energy Consumption and Energy Efficiency in the Survey Countries

This report summarizes and analyzes the results of energy efficiency surveys undertaken by IFC during 2008 in Armenia, Azerbaijan, Belarus, Georgia and Ukraine, and in Russia in 2006⁵. The purpose of the surveys was to analyze how industrial enterprises in each of the survey countries prioritize, understand, plan, finance, and implement energy efficiency investments. The analysis is intended to help governments, donors, and private investors identify opportunities to provide goods and services that improve energy efficiency in the industrial sectors.

This first chapter sets the stage for the analysis in subsequent chapters. It provides a brief overview of:

- aggregate energy intensity in the survey countries;
- recent economic growth in the survey countries;
- the industries surveyed; and
- energy consumption by the industries surveyed.

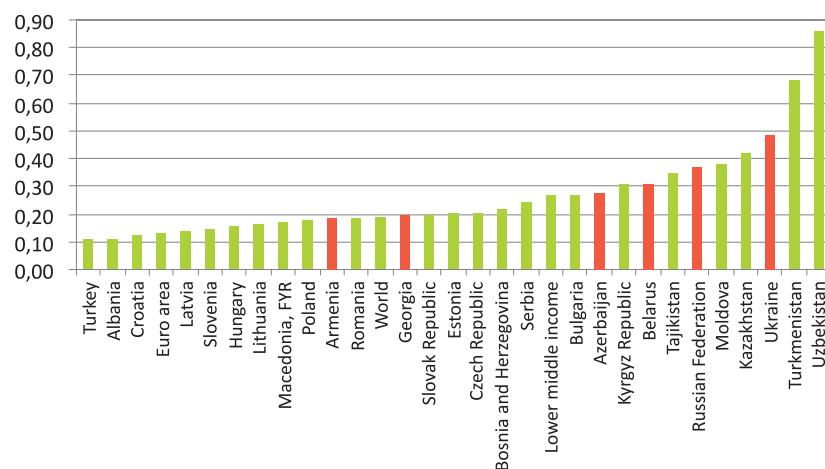
The subsequent chapters summarize and analyze survey results on managers' attitudes toward, and knowledge of, energy efficiency measures (Chapter 2); companies' historical and planned use of energy efficiency measures (Chapter 3); the ways in which energy savings are incentivized, planned, and evaluated in the survey countries (Chapter 4); and the ways in which companies pay for investments in energy efficiency (Chapter 5). Chapter 6 draws conclusions from Chapters 1-5 and recommends areas for further work by industry, government and financiers to increase energy efficiency.

1.1 Energy Intensity in the Survey Countries

The countries surveyed in this study (the "survey countries") represent some of the most energy-intensive (and hence least energy-efficient) economies in Europe and Central Asia. Of 35 countries in Europe and Central Asia, two of the survey countries (Russia and Ukraine) rank within the top five in terms of energy intensity. Four of the survey countries (Azerbaijan, Belarus, Russia, and Ukraine), rank within the top 10. All but one of the survey countries (Armenia) rank within the top 18 energy intensive economies in the region. Figure 1.1 shows the energy intensities of the survey countries in comparison with selected European countries.

The countries surveyed are some of the most energy intensive in the region

Figure 1.1: COMPARISON OF ENERGY USE PER UNIT OF GDP
Energy use per unit of GDP, ECA, 2006 (kg of oil equivalent per constant 2005 PPP \$)



Source: World Bank Development Indicators Database.

⁵ Appendix A summarizes the methodology used for the survey.

GDP growth in the region has driven reductions in energy intensity

1.2 Economic Growth in the Survey Countries

Energy intensity in the survey countries has declined steadily in recent years but remains high relative to that of their regional peers. Improvements in energy intensity can generally be attributed to the increased use of existing productive capacity rather than improved efficiency of energy use.

Prior to the global financial crisis, all of the survey countries experienced consistently high levels of economic growth. Growth ranged from seven to 17 percent annually from 2000 to 2007. Gross Domestic Product (GDP) per capita roughly doubled in each country over the same time period. Economic growth was driven primarily by the following.

- **Exports.** Industrial exports contributed to economic growth in Armenia, Georgia, and Ukraine. Oil and gas exports contributed to growth in Azerbaijan and Belarus.
- **Expansion of certain large sectors.** Expansion of the oil and gas sectors in Azerbaijan, and the service and construction sectors in Armenia and Georgia, contributed to economic growth.

The global financial crisis hit many of the survey countries hard, and was felt by this region more than any region in the world. Box 1.1 summarizes the impact of the global financial crisis in the survey countries.

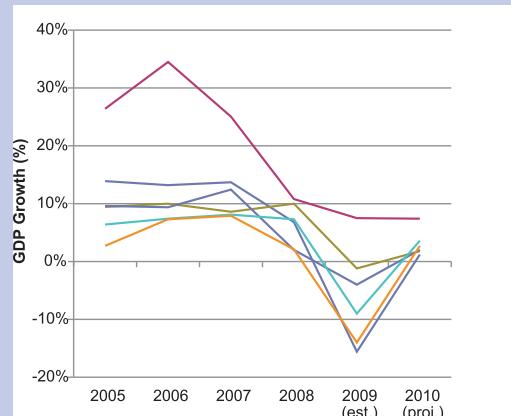
Box 1.1: Economic Impacts of the Global Financial Crisis

The global financial crisis hit countries in Europe and Central Asia harder than any other region. Azerbaijan is the exception, where GDP is expected to grow by 7.4 percent in 2010. Economic growth slowed or contracted in all of the survey countries in 2009. The figure below shows changes in GDP growth over the past decade in the six survey countries.

GDP Growth in the Survey Countries, 2005–2010 (projected)

The impact of the financial crisis varied from country to country and depended primarily on how the largest sectors of each country's economy were affected. Important impacts of the crisis in each country included the following.

- **Armenia.** Sectors hardest hit included: real estate, metallurgy, manufacturing, and construction. Unemployment rose to seven percent. Remittances, which account for roughly 20 percent of GDP, fell by nearly 30 percent by the end of May 2009. The local currency depreciated by roughly 30 percent.
- **Azerbaijan.** Sectors hardest hit included: oil and construction. The National Bank of Azerbaijan reduced refinancing rates to provide better access to liquidity for the under-developed banking system. The National Bank also guaranteed nearly all deposits.



Source: IMF World Economic Outlook, 2009. IFC Country Reports on Energy Efficiency, available at: <http://www.ifc.org/eesurveys>.

Figure: 2000–08 data: World Development Indicators. 2009–10 data: IMF World Economic Outlook, 2009.

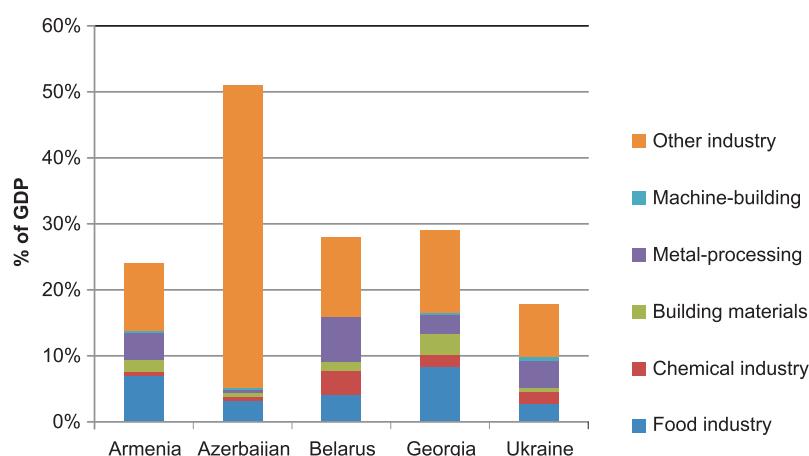
- **Belarus.** Many companies found access to credit and loan facilities restricted or unavailable as a result of the crisis. However, the economy experienced modest growth as a result of the large state presence (roughly 75 percent) in the economic structure.
- **Georgia.** Investments fell sharply. The banking sector experienced liquidity problems. Public revenues fell, and unemployment increased.
- **Russian Federation.** Heavy reliance on the price of a single commodity and a major decline in Russian financial markets contributed to a 7.9 percent drop in GDP in 2009. Heavy crude oil lost more than 70 percent of its value from July 2008 to November 2008. By September 2008, the RTS stock index had fallen almost 54 percent since the beginning of the year, amounting to a roughly 1 trillion loss in share values.
- **Ukraine.** Sectors hardest hit included: finance and steel. Industrial production lost roughly one third of output in the first nine months of 2009. The local currency depreciated by 51 percent.

Growth in the region is expected to recover moderately (by 1.2–2.7 percent) in 2010 and to improve further in subsequent years. The 2009 IMF World Economic Outlook forecast growth for most of the survey countries at 1.2–2.7 percent in 2010, with Azerbaijan the outlier, at 7 percent. The 2010 World Economic Outlook forecast average growth for the CIS at 3.8 percent in 2010 and 4 percent in 2011.

1.3 Overview of the Industries Surveyed

Five industrial sub-sectors (food processing, chemicals, building materials, metal processing, and machine building) make up 56 to 57 percent of the total industrial output in Armenia, Belarus, Georgia, and Ukraine. These sub-sectors contribute 18 to 29 percent of GDP in all of the survey countries except Azerbaijan. In Azerbaijan, the oil and gas sub-sector is the dominant contributor to GDP. Figure 1.2 illustrates the contribution of the five industrial sub-sectors to GDP.

Figure 1.2: INDUSTRIAL OUTPUT (% OF GDP), BROKEN DOWN BY INDUSTRIAL SUB-SECTOR



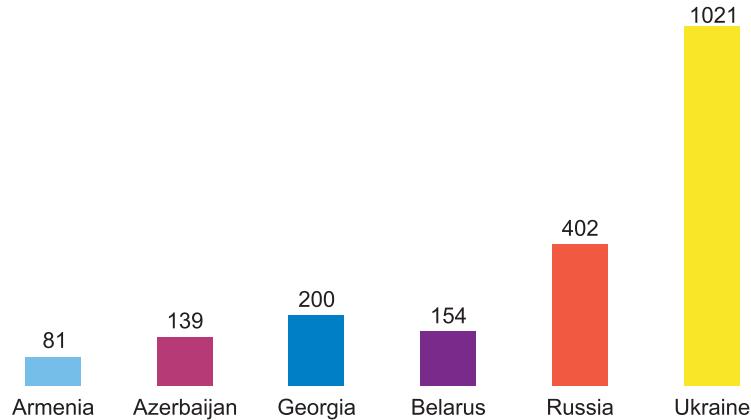
Source: National Statistical Agencies in each country

1.4. Energy Consumption by the Industries Surveyed

The cost of energy consumption varies considerably by industry and by country. Figure 1.3 shows, for each survey country, the average energy cost per company.

Figure 1.3: AVERAGE ENERGY CONSUMPTION PER COMPANY

(In USD, '000)



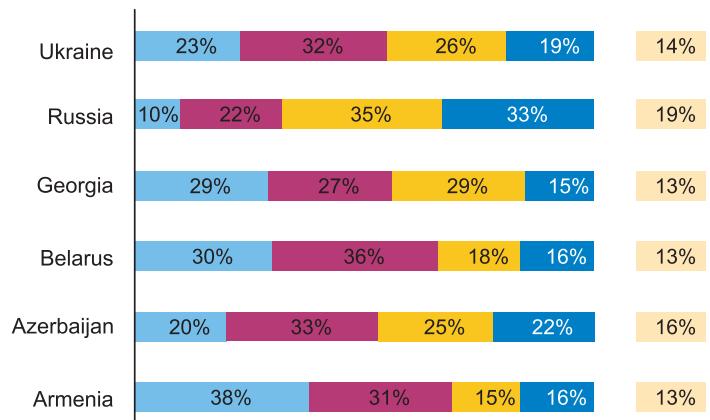
The costs of energy consumption are highest in Ukraine, and - as would be expected - generally highest for medium and large companies.

1.4.1 Specific Energy Costs as a Proportion of Total Costs

Specific energy costs - the ratio of energy costs to total operating costs - are the most important factor for companies in considering energy efficiency measures. As Figure 1.4 below illustrates, specific energy use differs by country and industry: Ukraine generally has the highest energy costs across all sectors, while Armenia and Belarus have the lowest.

Figure 1.4 shows the energy costs, as a proportion of total operating costs, faced by survey respondents.

Figure 1.4: ENERGY COSTS AS A PROPORTION OF TOTAL OPERATING COSTS IN SURVEY COUNTRIES



■ Up to 5% ■ From 6 to 10% ■ From 11 to 20% ■ More than 20%

■ Average share of energy costs as a proportion of total operating costs

The food processing and machine building sectors face the lowest energy costs as a percentage of total operating costs, and the chemical processing and building materials production sectors the highest.

1.4.2 Prices for Oil, Gas, and Electricity

Energy input prices are generally higher in those countries with lower energy costs as a percentage of total operating costs⁶. This is not surprising, as energy prices are important drivers of energy efficiency. Subsidized or otherwise, artificially low energy prices are a disincentive for energy efficiency measures. Energy prices are also important because, together with consumption, they drive energy cost, and subsequently have a significant impact on the competitiveness of businesses.

The survey countries enjoyed access to cheap fuels for many years. This has been achieved through fuel cost subsidies from the government (Armenia and Azerbaijan)⁷; a preferential trade regime which has included very cheap fuels (Belarus);⁸ and significant domestic energy resources (Azerbaijan and Russia).

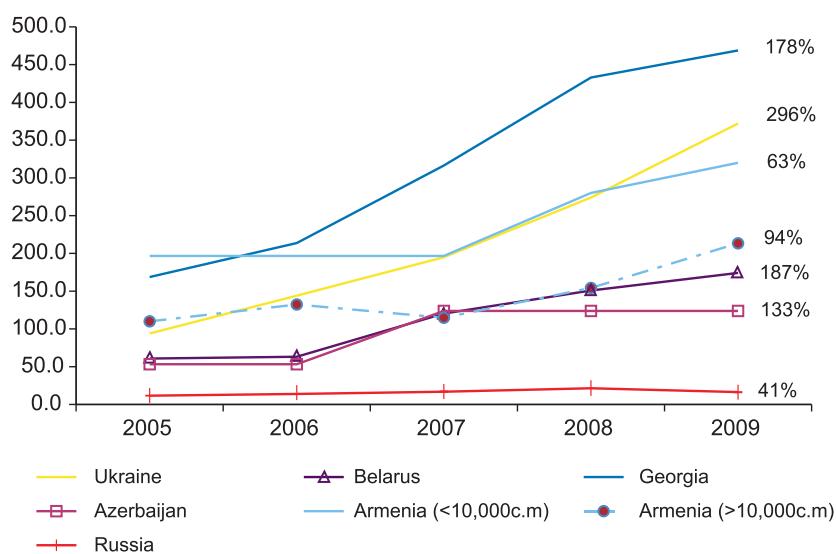
Over the past five years, many of the survey countries have raised electricity and gas tariffs two or three-fold.

Figure 1.5 and Figure 1.6 illustrate the change in gas and electricity tariffs faced by industrial consumers in each of these countries over the period

2005–09. The figures on the right-hand side show the increase in tariffs over this period.

Figure 1.5: INDUSTRIAL GAS TARIFFS

(USD, 1000m³)



Source: National Statistical Agencies, Ministries of Energy, World Bank publications.

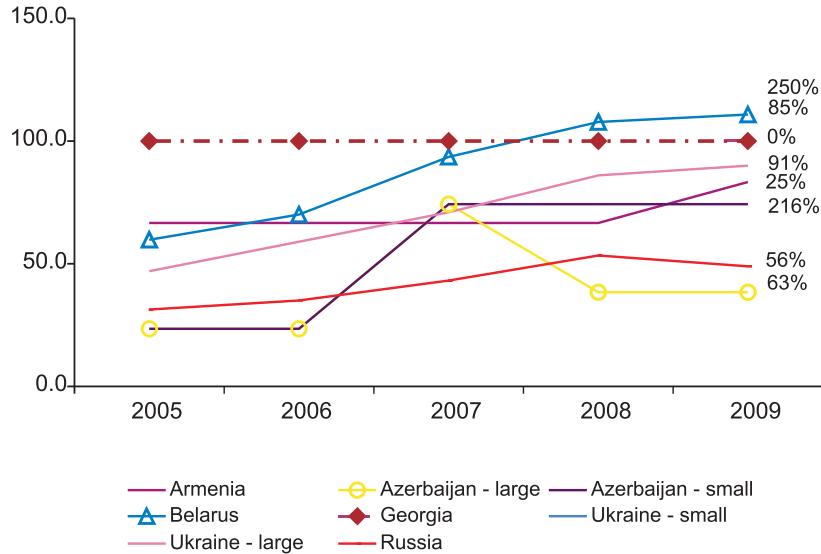
⁶ Ukraine is the exception, where, because of the predominance of heavy industry, energy tariffs are high and specific energy costs are higher than in the other survey countries.

⁷ Subsidies ceased in Armenia in 2008 but remain in Azerbaijan.

⁸ This regime ended in 2006, and a timetable was agreed such that Belarus will face international energy prices for energy imports by 2011.

Figure 1.6: INDUSTRIAL ELECTRICITY TARIFFS

(USD / MWH)



Source: National Statistical Agencies, Ministries of Energy, World Bank publications.

The figures show that Georgian industry faces the highest gas tariffs, and almost the highest tariffs for electricity. At the other end of the spectrum, both gas and electricity tariffs in Azerbaijan remain low (as a result of continuing subsidies), at only about one quarter to one third of the tariffs faced by Georgian businesses.

The data suggest that high tariffs are not an impediment to cost competitiveness. Companies in Georgia face among the highest electricity and gas prices, but do not have higher specific energy costs than companies in the other survey countries. In contrast, Azerbaijan has among the lowest electricity and gas tariffs, but its companies spend relatively more on energy than their peers in the other survey countries.

2 Prioritization and Understanding of Energy Efficiency Potential

This chapter uses the survey data to analyze how managers of industrial companies view energy efficiency, and whether the managers have a good understanding of energy consumption and energy efficiency potential.

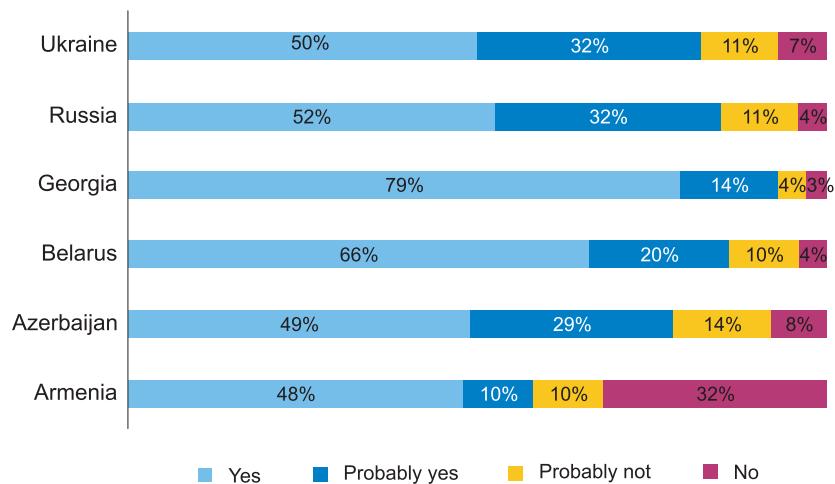
2.1 Prioritization of Energy Efficiency

Most survey respondents identified energy efficiency as one of the three main priorities for their business. They cited cost competitiveness and energy reliability as reasons for prioritizing energy efficiency.

Figure 2.1 shows that nearly half of respondents in every survey country indicated energy efficiency to be one of the three main priority issues for their business.

Energy efficiency measures are a priority for most companies surveyed ...

Figure 2.1: IS ENERGY EFFICIENCY IMPORTANT FOR YOUR BUSINESS?



As Figure 2.1 shows, companies in Armenia were least likely to consider energy efficiency as a priority for their business: 32 percent of Armenian respondents indicated that energy efficiency measures were not a priority, compared to only a few percent of respondents in other countries. Fewer than half of Armenian respondents said energy efficiency was a priority issue for their business⁹.

Companies in Georgia were most likely to consider energy efficiency a priority for their business, followed by companies in Belarus. In Georgia, high energy tariffs undoubtedly helped elevate the importance of energy efficiency. In Belarus, energy efficiency laws (including mandatory audits) were probably an important driver.

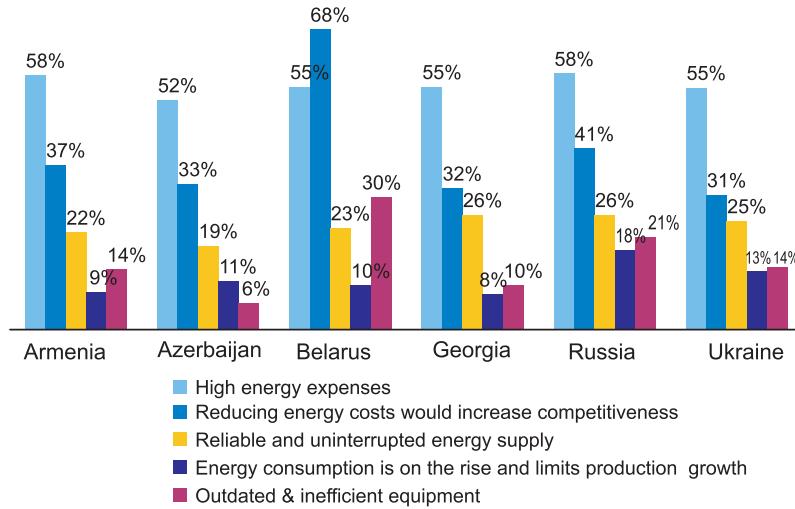
Companies in sub-sectors with higher specific energy costs were more likely to prioritize energy efficiency. This was the case in Armenia, Belarus, and Ukraine, and was true for most sub-sectors in Azerbaijan and Georgia. Accordingly, companies in the chemical and building materials sub-sectors saw energy efficiency as a priority. Companies in the machine building sector did not see energy efficiency as a priority.

⁹This survey preceded significant tariff hikes in Armenia in 2009.

Energy efficiency helps reduce costs and improve competitiveness

Respondents who said energy efficiency was a priority for their business were also asked why. As shown in Figure 2.2, the main reasons were energy cost and the impact of energy cost on the competitiveness of the business. Reliability of energy supply was also an important reason.

Figure 2.2: WHY IS ENERGY EFFICIENCY A PRIORITY FOR BUSINESS?



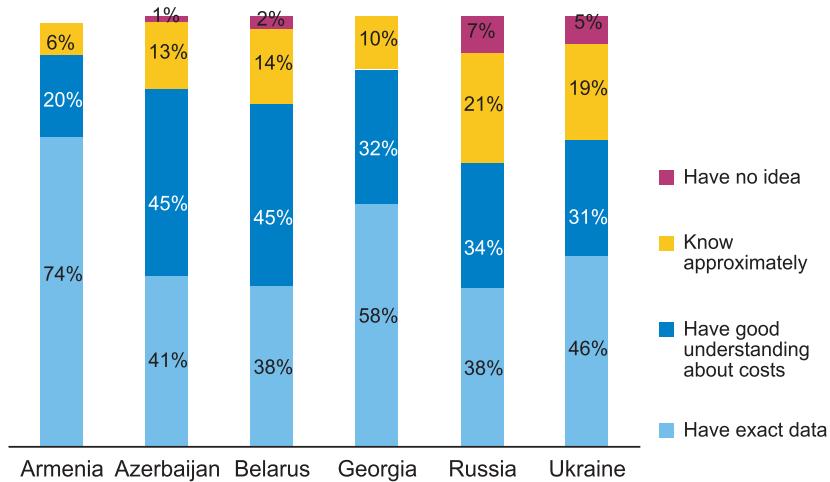
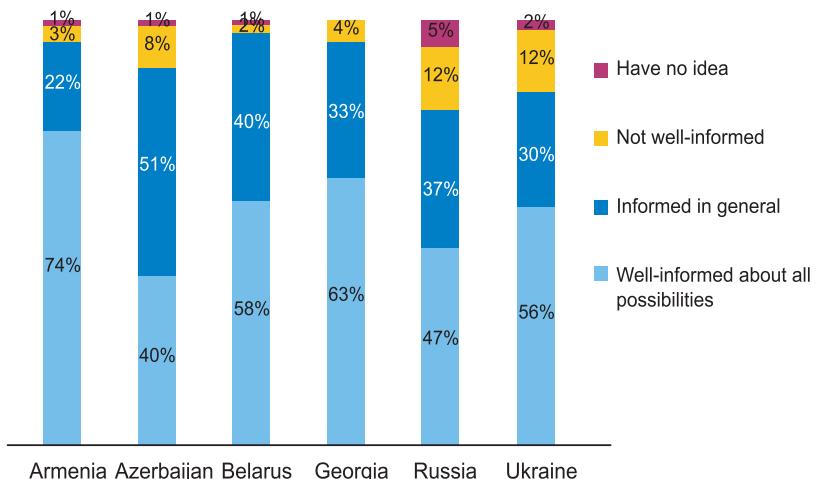
2.2 Managers' Awareness of Energy Efficiency

The survey showed that managers believed they had a good understanding of energy costs and energy efficiency potential. However, the survey also showed that managers typically underestimated potential energy savings by a wide margin. One reason for this is that managers do not have enough information—namely, detailed data on their companies' energy use, and knowledge of those measures that would allow them to improve energy efficiency.

Managers believe they understand energy costs and opportunities to improve energy efficiency

2.2.1 Management Understanding of Energy Consumption and Costs

Figure 2.3 and Figure 2.4 tabulate responses to two survey questions about managers' awareness of energy costs, and opportunities for improving energy efficiency. Management awareness of energy costs, and of opportunities to reduce those costs, is of course important to developing effective, targeted, energy efficiency programs.

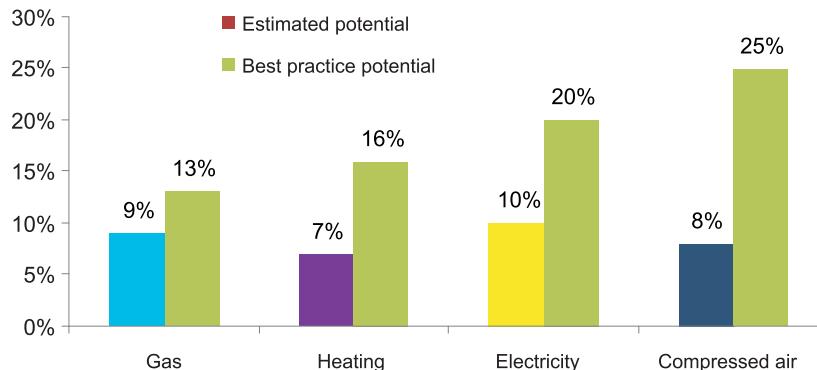
Figure 2.3: HOW WELL DOES MANAGEMENT UNDERSTAND ENERGY COSTS?**Figure 2.4: HOW WELL INFORMED ARE MANAGERS ABOUT OPPORTUNITIES TO IMPROVE ENERGY EFFICIENCY?**

As Figure 2.3 shows, most managers felt they had a good understanding of energy costs, and more than 90 percent felt they had at least an approximate understanding. Similarly, as Figure 2.4 shows, most respondents felt they were generally informed or well informed about opportunities for improving energy efficiency. However, as shown in sections 2.2.2 and 2.2.3, managers' perceptions may not be in line with reality.

2.2.2 Management Assessment of Benefits

Respondents almost always underestimated the potential benefits of energy investments in their companies. The survey asked respondents to indicate the percentage by which their company could reduce consumption of each type of energy while maintaining current production levels. Figure 2.5 compares the energy savings potential estimated by respondents to the energy savings potential if international best-practice technologies were used.

Figure 2.5: BY WHAT PERCENTAGE COULD YOUR COMPANY REDUCE ENERGY CONSUMPTION?



However, in reality, managers vastly underestimate energy savings potential

It is evident that managers do not have a good understanding of potential savings from implementing energy efficiency measures. Managers in Azerbaijan, Belarus, Georgia, and Russia, gave the highest estimates of potential savings (and therefore, in this case, the most accurate), but underestimated potential by an average of 40 percent. In Armenia and Ukraine, underestimates were greater, with most managers underestimating savings potential by more than 65 percent. It is worth noting that Armenian respondents were also those most likely to rate their company management as being well informed about energy efficiency opportunities.

Respondents in the survey countries are not alone in underestimating energy efficiency savings. The tendency to underestimate savings is common throughout emerging and developed economies. Company managers and their financiers often do not have sufficient experience with energy efficiency projects, or the companies in which they work may not have in place processes for assessing energy efficiency potential. More fundamentally, managers may simply not have the information they need to make decisions about energy costs and potential investment. Managers' access to information in the survey countries is described below.

1.2.3 Management Access to Information

Managers often do not have access to the data necessary to make good decisions about energy efficiency

Managers must have access to information if they are to understand energy use and opportunities for energy savings in their companies. Meters (electricity, gas, and sometimes heat) provide data on energy use. Energy audits typically provide information on opportunities for energy savings.

Roughly 40 percent of respondents claimed that management of their companies had exact energy cost data, and more than 70 percent had at least a good understanding of costs. However, a much smaller percentage of respondents reported having in place metering at various division levels within their company, or at the level of specific equipment. For example, 58 percent of Georgian respondents claimed to have exact data on energy costs, but less than 20 percent reported metering energy use at a division or equipment level.

A similar contradiction can be seen in survey responses on energy audits. Most respondents said company managers were well informed about energy efficiency potential, and more than 90 percent claimed to be "informed of general facts". However, a considerably smaller percentage had recently conducted energy audits (Figure 4.5, below). In Armenia, for example, 74 percent of respondents claimed to be well informed, but only 18 percent had carried out recent energy audits. In Azerbaijan, in contrast, only 40

percent of respondents claimed to be well informed, while more than 50 percent had recently carried out an energy audit.

The survey results on energy metering and audits are discussed in more detail in Chapter 4.

3 Recent and Planned Investments in Energy Efficiency

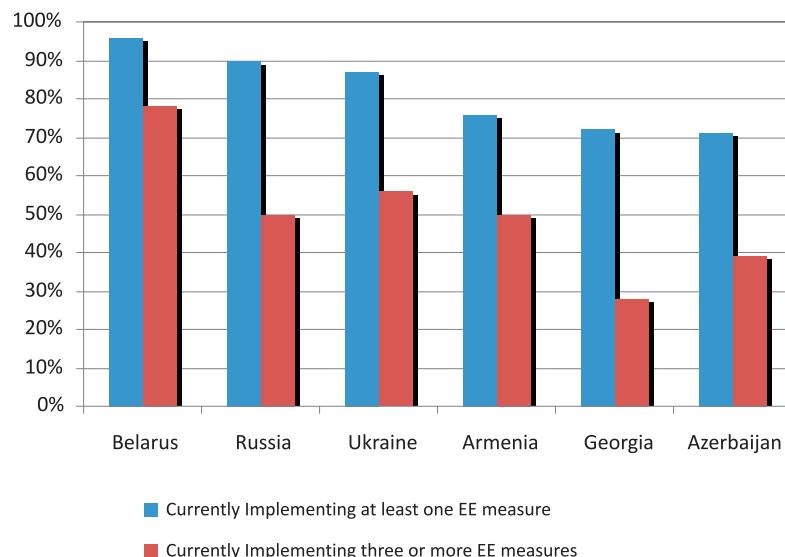
This chapter describes and analyzes survey respondents' energy efficiency investments (during 2006–07), and the investments they planned to make during 2009–11.

3.1 Recent Investments in Energy Efficiency

Most respondents have implemented at least one energy efficiency measure

Investment in energy efficiency varied widely between the survey countries. Figure 3.1 summarizes the survey results. In Belarus, 96 percent of companies implemented at least one measure, and 78 percent implemented three or more measures.

Figure 3.1: PROPORTION OF COMPANIES INVESTING IN ENERGY EFFICIENCY

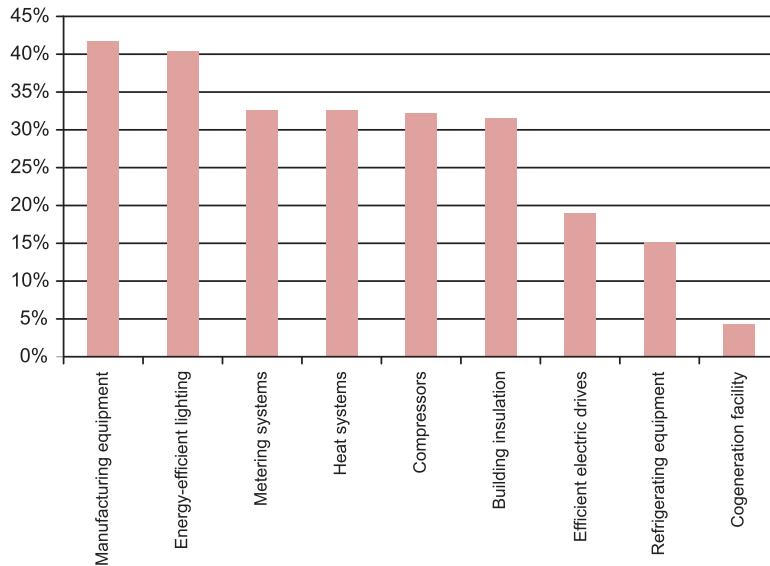


Investments in manufacturing upgrades were most common, followed by lighting

Investments in manufacturing upgrades were most common, followed by investments in energy-efficient lighting. Roughly 40 percent of respondents in each country reported that they had invested in manufacturing upgrades or lighting. Also relatively common were investments in energy metering systems, heat systems, compressors, and insulation. Roughly one third of the respondents in each country reported that they had invested in one of these measures. Roughly 18 percent of respondents in each country reported that they had not made any investments in energy efficiency. Figure 3.2 shows the average of survey responses in each country, for different investment measures.

Figure 3.2: MOST COMMON ENERGY EFFICIENCY INVESTMENTS

(AVERAGE PERCENTAGE IN EACH COUNTRY)



Companies with older capital stock were more likely to have made investments in energy efficiency than companies with newer capital stock.

Companies in Belarus and Russia had the highest proportion of outdated equipment, with 50 percent or more of respondents having refrigeration systems, boilers, heat exchangers, electric drives and motors, and ventilation systems more than 10 years old.

Companies in Belarus also had the largest proportion of manufacturing equipment that was more than 10 years old (approximately 70 percent). These companies accordingly were more likely to invest in upgrading manufacturing equipment (58 percent in Belarus and 45 percent in Russia).

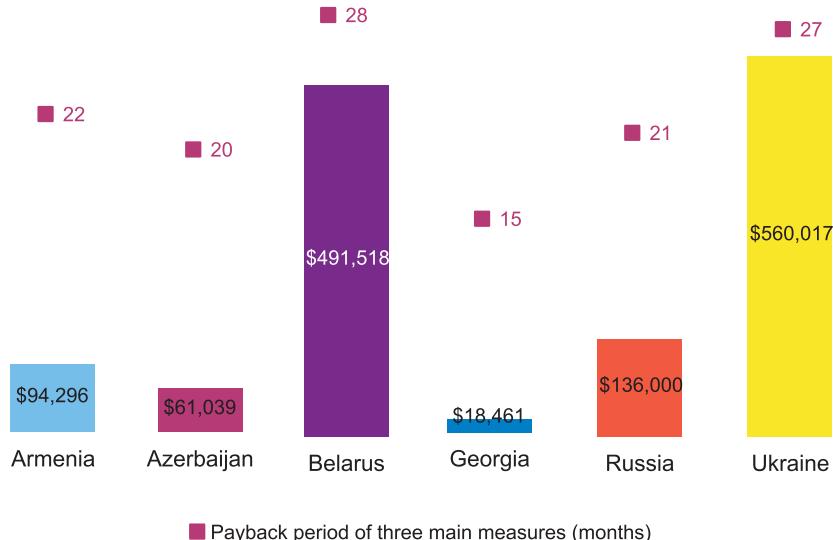
Companies in Belarus and Ukraine spent the most on energy efficiency investments. Investments in these countries also had longer payback periods than those in the other countries, reflecting expenditure in Belarus and Ukraine on more complex, higher-cost manufacturing and energy equipment upgrades. Companies in the other survey countries spent less on energy efficiency, and invested in quicker payback manufacturing, metering, and lighting projects. Companies in Georgia spent the least on energy efficiency, reflecting the low proportion of upgrades that had been undertaken (11 percent had invested in metering, 35 percent in lighting, and 49 percent in manufacturing equipment).

Figure 3.3 illustrates the survey results. The figure shows average expenditure by companies in each survey country on the three main measures implemented, and the average payback period for these investments.

Companies with older equipment were more likely to invest manufacturing upgrades

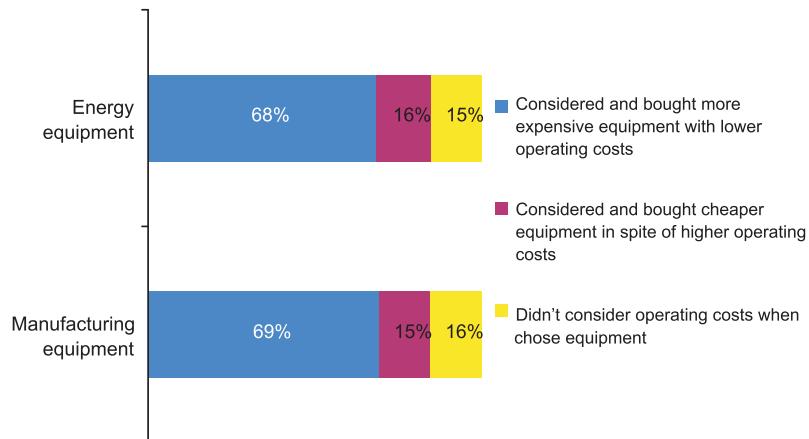
Companies in Georgia and Armenia invested less in metering and manufacturing upgrades

Companies in Belarus and Ukraine spent the most, and made higher-cost, longer-term investments

Figure 3.3: INVESTMENT AMOUNTS (PER COMPANY, AVERAGE) AND PAYBACK PERIODS

The trade-off between capital and operating costs matters

As criteria for making their investments, the majority of respondents (more than 79 percent in each survey country) said they considered purchasing manufacturing and energy equipment with higher capital costs but lower operating costs (of which energy costs are a component). The survey results are shown in Figure 3.4.

Figure 3.4: RESPONDENT DECISIONS ON HIGHER CAPITAL COST/LOWER OPERATING COST EQUIPMENT

Companies in Azerbaijan and Russia were the least likely to consider the trade-offs between capital expenditure and operating expenditure, and most likely to purchase low capital cost/high operating cost equipment. This trend may indicate a lack of understanding of the options, or a lack of funds to pay for more than the minimum cost of equipment.

3.2 Planned Investments in Energy Efficiency

Planned increases in energy efficiency investment are substantial

Figure 3.5 compares survey respondents' actual investment in energy efficiency investment planned for the period 2009–11. These figures are based on investment plans put forward by companies prior to the impacts of the global financial crisis of 2008–2009: the current appetite for energy efficiency investments may have changed.

Figure 3.5: HISTORICAL AND PLANNED INVESTMENT IN ENERGY EFFICIENCY¹⁰

(In USD, millions)

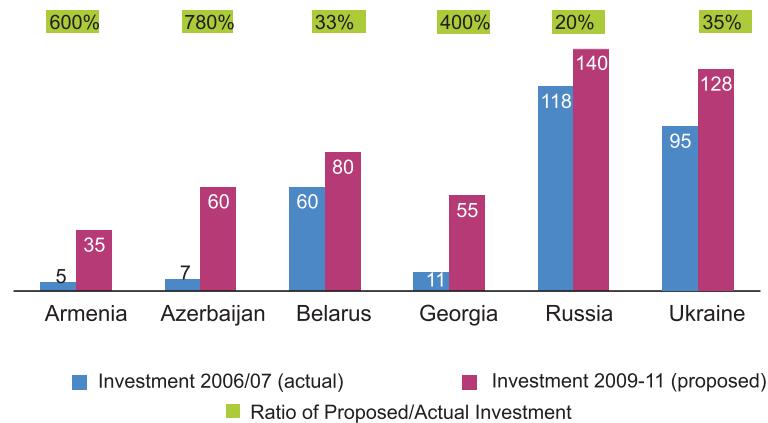
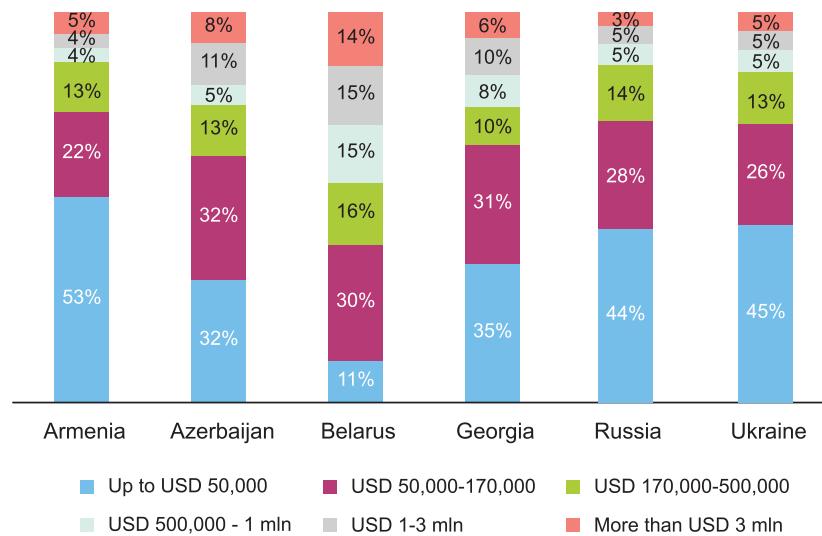


Figure 3.6 shows how much respondents planned to invest in energy efficiency during 2009–2011. Most survey respondents planned to invest relatively small amounts (less than \$50,000). Only a small proportion of respondents planned to spend more than \$500,000 over the period: 13 percent in Armenia and Russia, 15 percent in Ukraine, and 24 percent in both Azerbaijan and Georgia.

The average value of planned investments is small

Figure 3.6: HOW MUCH DO COMPANIES PLAN TO INVEST IN ENERGY EFFICIENCY ?

In Belarus, in contrast, 44 percent of respondents indicated that they planned to spend more than \$500,000. Roughly 30 percent of Belarusian companies plan to spend more than \$1 million and 89 percent plan to spend more than \$50,000.

The aggressive investment plans in Belarus are across all equipment types, with increases (relative to 2006–2007) ranging from five-fold (the food and chemical processing sectors) to 11-fold (the building materials sector).

¹⁰ This figure refers to total actual and planned expenditure by the companies surveyed. It should be noted that a larger number of companies in Russia and Ukraine were surveyed (625 and 325, respectively).

4 Incentivizing, Planning, and Evaluating Energy Efficiency Investments

This chapter describes how energy efficiency investments are incentivized, planned, and monitored. It describes and analyzes, more specifically:

- the measures that governments and company management use to try to improve energy efficiency in the survey countries;
- how companies plan for energy efficiency investments; and
- the use by companies of energy audits and energy metering to determine which energy efficiency investments to make.

4.1 Government Incentives and Requirements

All but one of the survey countries have passed laws related to energy efficiency

A range of instruments are available to policy makers wanting to improve energy efficiency in industry. These instruments are usually administrative or financial, and are set out in laws or decrees made by national, and sometimes regional and local, government agencies.

With the exception of Georgia, all of the countries in the survey have passed national legislation related to energy efficiency. Most also have a national policy outlining a plan or strategy for achieving the country's energy efficiency potential. Table 4.1 lists the names of these laws and policies for each survey country, and the year in which they entered into force.

Table 4.1: LEGAL AND POLICY FRAMEWORK FOR ENERGY EFFICIENCY IN THE SURVEY COUNTRIES

	Law	Year passed	Policy Document	Year Passed
Armenia	Law on Energy Savings and Renewable Energy	2004	National Program on Energy Savings and Renewable Energy	2007
Azerbaijan	Law on the Use of Energy Resources	1996	State Program on the Use of Alternative and New Energy Sources	2004
Belarus	Law on Energy Saving	1998	State Program of Energy Savings for the Period of 2006–10	2006
Georgia	No legal framework exists. Law was expected to pass in 2008, but was put on hold due to the conflict between Russia and Georgia.			
Russia	Law on Energy Saving and Improving Energy Efficiency	2009	No specific energy efficiency policy; energy efficiency covered in Energy Strategy of Russia through 2020	
Ukraine	Law on Energy Conservation	1994	Energy Efficiency National Action Plan	Under development

However, many respondents felt the existing legal frameworks failed to promote energy efficiency at the time of the survey. At the time of the survey in 2006, respondents in Russia showed the lowest level of support, with only 19 percent saying that current laws encourage energy efficiency (the current situation has improved significantly, with the enactment of the new Law on Energy Saving and Improving Energy Efficiency and high federal priority given to increasing the energy efficiency of the economy). In Belarus, in contrast, 50 percent of respondents said that current laws encourage energy efficiency.

In many of the survey countries, the regulations that implement the energy efficiency laws are often absent or ineffective. For example, the government of Armenia has passed voluntary energy efficiency standards, but the voluntary standards do little to incentivize energy efficiency. In Ukraine, caps on energy use in industry have proven ineffective because the fines for noncompliance are too low. In Azerbaijan, the government has yet to pass any secondary legislation or regulation necessary to implement energy efficiency measures. This may explain why roughly half of respondents in Azerbaijan indicated that they felt the legal framework promoted energy efficiency, but few could identify specific policy-level energy efficiency initiatives from which they could benefit.

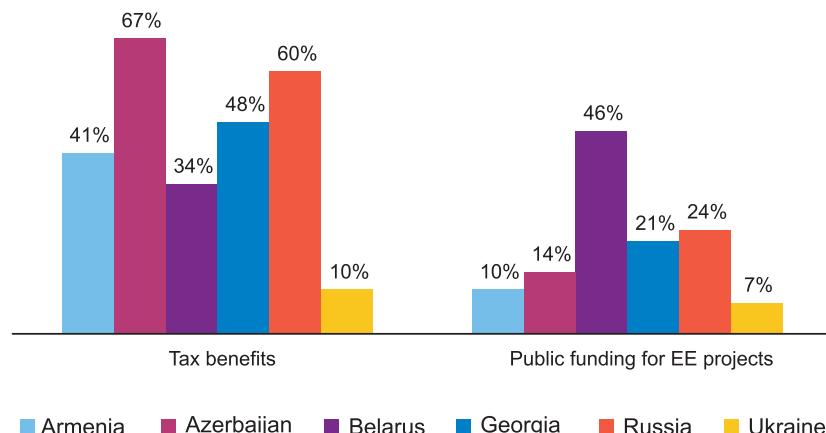
Respondents were also asked to rank the mechanisms that would most stimulate their company to improve its energy efficiency. Most respondents favored tax credits or other tax incentives, and direct public funding of energy efficiency projects. Figure 4.2 shows the survey results for the most preferred measures.

Public funding for energy efficiency projects was strongly preferred in Belarus, probably because of the large number of state-owned enterprises in that country. (Few respondents thought governments guarantees for loans were good for incentivizing energy efficiency). This is surprising given that many companies cite difficulties in obtaining external finance as a barrier to investing in energy efficiency (see Chapter 5).

But respondents feel that laws are ineffective

Respondents prefer tax incentives and direct government funding for energy efficiency

Figure 4.2: WHICH GOVERNMENT MECHANISMS COULD IMPROVE ENERGY EFFICIENCY IN THE SURVEY COUNTRIES (TOP TWO MEASURES)?



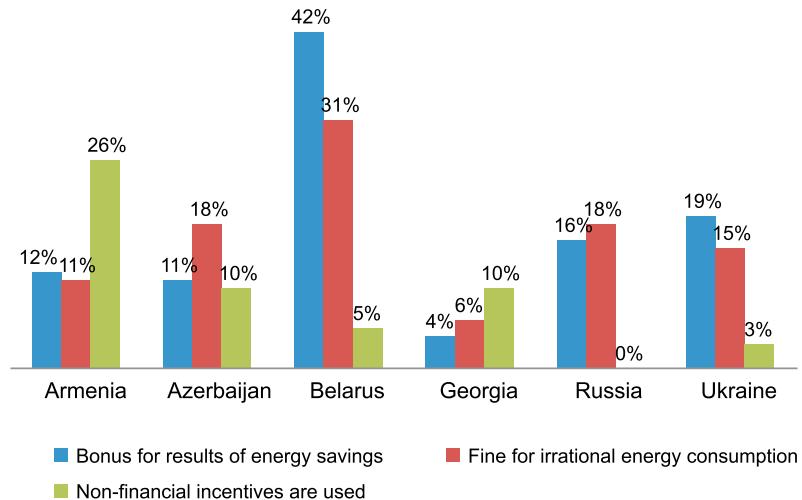
4.2 Management Incentives and Requirements

The survey found that some companies in all of the survey countries provided incentives for employees to save energy (or disincentives against wasting energy), but also found that the practice was not commonplace. Companies in Belarus stand out as the most active, more than one third of respondents provide incentives or disincentives to save energy.

Figure 4.3 summarizes the survey results. The most common measures included:

- rewarding staff financially for savings energy (or conversely, applying penalties for wasting energy);
- using non-financial measures, for example, informing employees about energy efficiency opportunities; and
- making an employee or unit of the company responsible for improving energy efficiency.

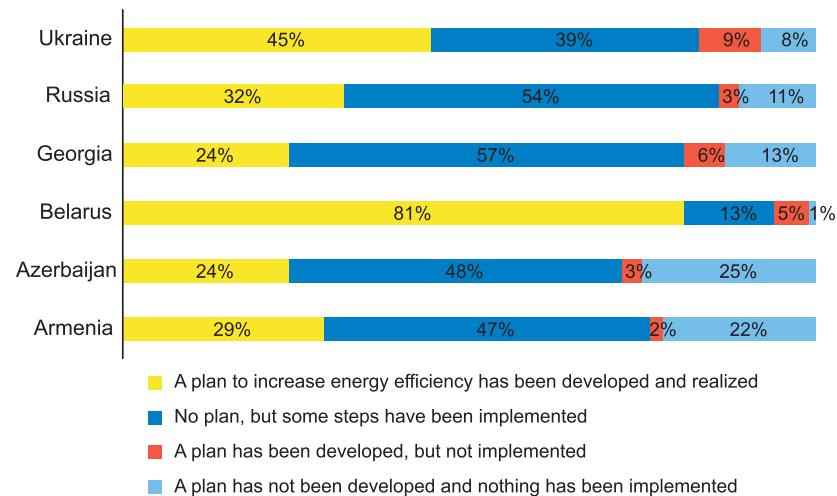
Figure 4.3: HOW DO YOU REWARD ENERGY SAVINGS?



4.3 Energy Efficiency Plans

The extent to which energy efficiency plans are aligned with business strategy and integrated into broader business planning varies considerably. Figure 4.4 shows the extent to which survey respondents have energy efficiency plans in place, and have implemented energy efficiency measures that they planned.

Figure 4.4: DO YOU HAVE PLANS AND HAVE YOU IMPLEMENTED ENERGY EFFICIENCY MEASURES?



Planning for energy efficiency has become widely accepted in Belarus

In Belarus, planning for energy efficiency is more widely accepted as an integral part of business strategy than in other survey countries. Approximately 80 percent of companies

in Belarus have developed and implemented energy efficiency plans. This is driven primarily by:

- the need to increase competitiveness, which has resulted in companies placing greater emphasis on managing costs such as energy costs; and
- the active role played by government in promoting industrial energy efficiency.

Far fewer companies in the other survey countries have integrated energy efficiency planning into their business strategies. Only 29 percent of companies in Armenia, and only 24 percent of companies in Azerbaijan and Georgia, reported having developed and executed an energy efficiency plan. This is not to say that companies in these countries are not carrying out energy efficiency measures. As shown in Chapter 3, companies in all survey countries are investing in energy efficiency, in spite of not having an energy plan.

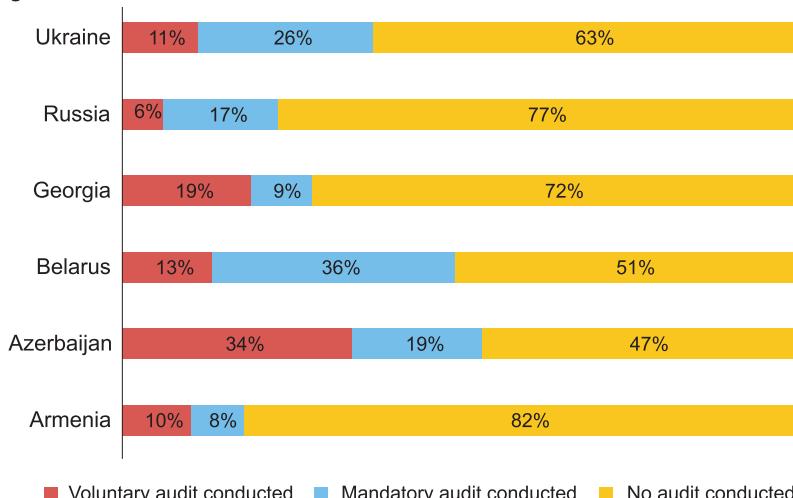
The survey found that larger companies were more likely than smaller companies to have developed and executed energy efficiency plans¹¹. However, in Belarus and Ukraine—where energy efficiency plans are most common—small companies were only slightly less likely than the largest companies to have a plan. In contrast, the difference was greater in the other countries; for example, in Georgia only six percent of small businesses had had an energy efficiency plan, in comparison with 43 percent of large businesses.

While smaller companies were less likely to have developed and implemented a formal energy efficiency plan, the survey showed that they were likely to use organizational measures to improve energy efficiency. The most common approaches included financial incentives (rewarding or penalizing staff for energy savings or wastage, respectively), informing employees about energy efficiency measures, and making a specific employee or unit responsible for energy efficiency.

4.4 Energy Audits

Energy audits are most common in Azerbaijan and Belarus. Both countries have mandatory audit requirements applicable to companies with energy consumption above a specified level¹². Other countries also have some level of mandatory requirement in place. Figure 4.5 shows the percentage of respondents who had implemented voluntary or mandatory audits in each survey country.

Figure 4.5: DID YOU CONDUCT ENERGY AUDITS?



There is less planning in other countries, but some implementation nevertheless

Larger companies are more likely to develop and execute plans ...

... but smaller companies often adopt organizational measures

Audits were most common in Azerbaijan and Belarus

¹¹The survey classified companies as large (defined as those with turnover in excess of \$25 million), medium-large (\$5–25 million), medium (\$1–5 million) and small (turnover of less than \$1 million).

¹²The Law on the Use of Energy Resources (Azerbaijan) requires enterprises whose annual energy consumption exceeds 8,140 MWh (the equivalent of 1,000 tons of coal) to conduct energy audits. The Belarusian Law on Energy Saving requires that companies with total energy consumption above 1,500 tons of coal equivalent (tce) per year (about 12,211 MWh) carry out an energy audit. The “tons of coal equivalent” is the energy unit widely used across the region of the former Soviet Union.

Companies that had carried out audits were more likely to invest in energy efficiency

Generally, companies were more likely to have carried out energy equipment upgrades, and invest in energy metering, if they had conducted an audit. However, companies were likely to invest in efficient lighting or building insulation whether they had an audit or not, possibly because the lower complexity and well-documented benefits of these measures meant the decision did not rely on audit findings. Similarly, investments in manufacturing upgrades depended more on production requirements than on the results of an energy audit.

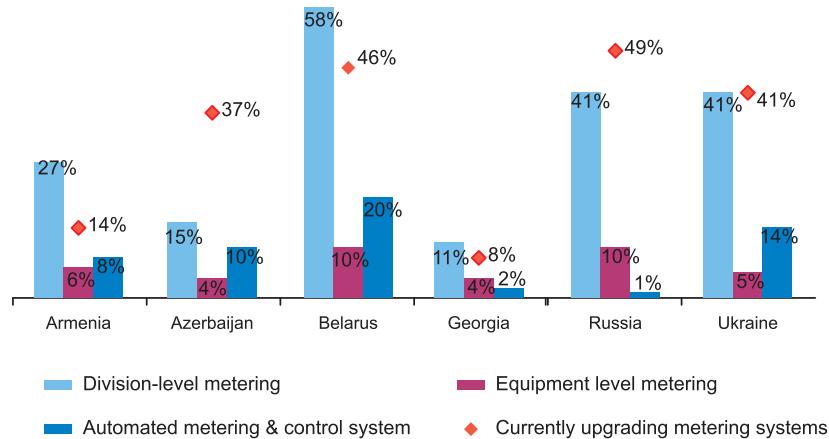
4.5 Energy Metering

Figure 4.6 shows how respondents measure energy consumption. All respondents had company-wide metering in place, but fewer than 20 percent had metering at the division or equipment level.

Figure 4.6: HOW DOES YOUR COMPANY TRACK ENERGY CONSUMPTION?

Figure 4.6 also shows the percentage of firms that had upgraded their metering systems during the period of 2006–07. While it might be expected that metering upgrades would be more prevalent in countries such as Armenia, Azerbaijan, and Georgia, where

Companies in Belarus and Ukraine were more likely to have metering at the division and equipment levels



the quality of metering stock is lowest, this is not the case. Metering upgrades were more common in countries that already have the “best” equipment (in other words, meters which provide information at the finest level of detail)—namely, Belarus, Russia, and Ukraine. This suggests that managers who already use more advanced metering understand its benefits in controlling energy costs.

Survey respondents in countries with the “best” metering systems, and those had made the most upgrades, were also more likely to have developed and executed energy plans. This finding suggests that the objective information provided by metering systems is useful in supporting the development of energy efficiency plans.

Higher turnover companies monitor energy consumption at a more detailed level

The sophistication of metering equipment also varied according to the size of the company. Companies with higher turnover generally had metering systems that monitored consumption at the most detailed levels.

A sizeable proportion of small- and medium-sized companies also monitor energy consumption at a detailed level. For example, in Ukraine nearly 40 percent of companies using automated metering systems were found to be small- or medium-sized companies. This shows that improved metering is not necessarily cost-prohibitive for smaller companies.

5 Project Financing of Energy Efficiency

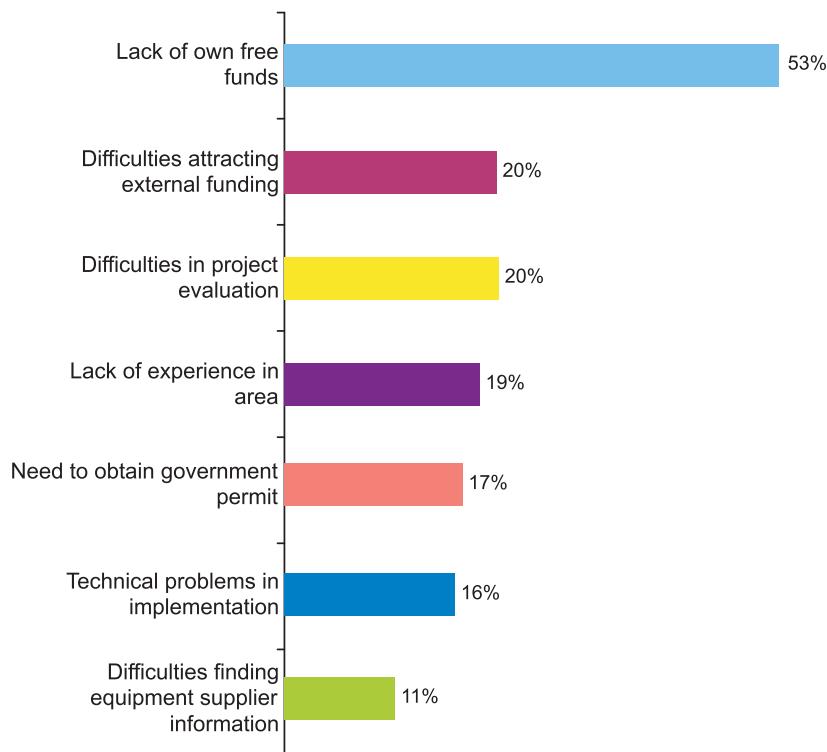
This chapter describes and analyzes survey data relating to how companies pay for energy efficiency investments. Section 5.1 assesses the importance of financial barriers in preventing companies from investing in energy efficiency. Section 5.2 describes how survey respondents financed their energy efficiency investments. Section 5.3 concludes by describing the survey results on loan tenors and payback periods.

5.1 Financial Barriers to Energy Efficiency

Asked what difficulties they had experienced in implementing energy efficiency projects, respondents primarily cited financial and organizational barriers. Figure 5.1 shows the barriers identified by respondents in each country. These barriers appear to be relatively common across the countries.

Financial barriers prevent investment in energy efficiency

Figure 5.1: WHAT BARRIERS PREVENT YOU FROM INVESTING IN ENERGY EFFICIENCY?



The most significant barrier cited in every country was financial. More than half of all respondents said that a lack of internal funds was a barrier to investment in energy efficiency. Roughly 20 percent of respondents indicated that they had difficulty attracting external funding for projects. However, only a small proportion of respondents had applied for external financing.

Companies say they lack sufficient internal funds or cannot secure outside financing

This finding suggests that, despite an improving availability of external financing, self-funding is preferred. The fact that external financing can release internal funds for more productive uses does not appear to be well understood.

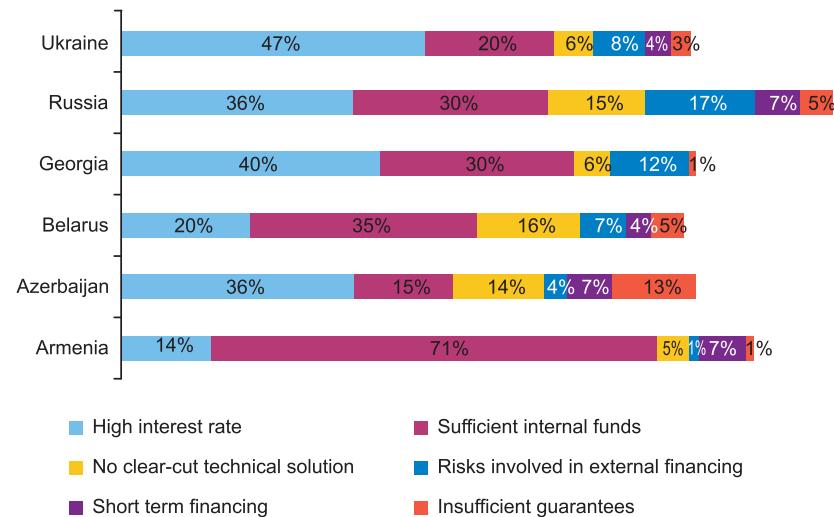
Survey respondents also cited organizational barriers. Organizational barriers included problems evaluating projects, lack of experience in developing projects, and the necessity to obtain a permit or consents from the government. Technical problems during implementation were also cited as barriers. Roughly 20 percent of respondents stated that organizational or technical barriers prevented them from investing in energy efficiency.

5.2 Financing of Energy Efficiency Measures

Few respondents sought external financing ...

Company managers were also asked why they had not applied for external financing for recent projects. Figure 5.2. shows the survey results. One of the two key reasons given was that companies had sufficient internal funds; yet more than 40 percent of respondents, on the question of project difficulties (Section 5.1) had cited “lack of own free funds”.

Figure 5.2: WHY DID YOU NOT APPLY FOR EXTERNAL FUNDING?

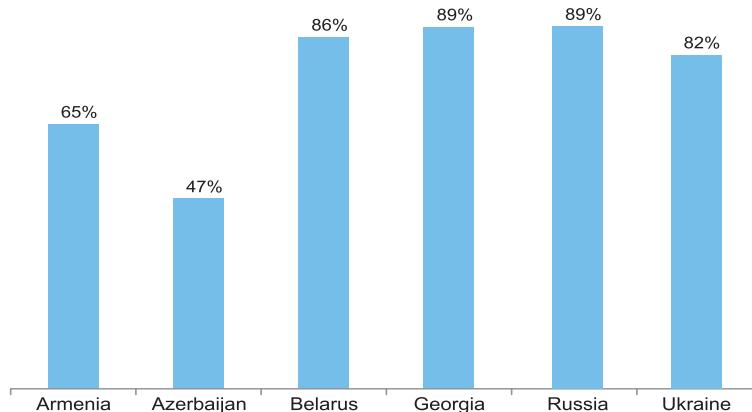


... but many who sought it, received it

Twenty percent of respondents indicated that they had difficulty attracting external financing for energy efficiency investments. However, the survey also found that respondents (in all of the survey countries) were generally reluctant to seek external financing for energy efficiency projects. Only 15–35 percent of respondents actually sought financing¹³.

Of the respondents who sought financing, many received it. Figure 5.3. summarizes the success rates for obtaining loans in each of the survey countries. Respondents in countries where a lack of external financing was the principal barrier (Belarus 38 percent, Georgia 22 percent, Russia 18 percent), were also more likely to have applied for financing (35 percent, 27 percent, and 24 percent, respectively), and more likely to have been successful in obtaining it (86 percent, 82 percent, and 89 percent, respectively).

¹³ Seventeen percent of companies in Armenia, 15 percent of companies in Azerbaijan, 27 percent companies in Georgia, 15 percent companies in Ukraine, and 35 percent companies in Belarus.

Figure 5.3: WERE YOU SUCCESSFUL IN OBTAINING EXTERNAL FINANCING?

The reasons for the contradiction cannot be determined from the survey data. However, it is possible that respondents who sought external financing had a greater appreciation of the difficulties of doing so, and had therefore become better at preparing successful applications.

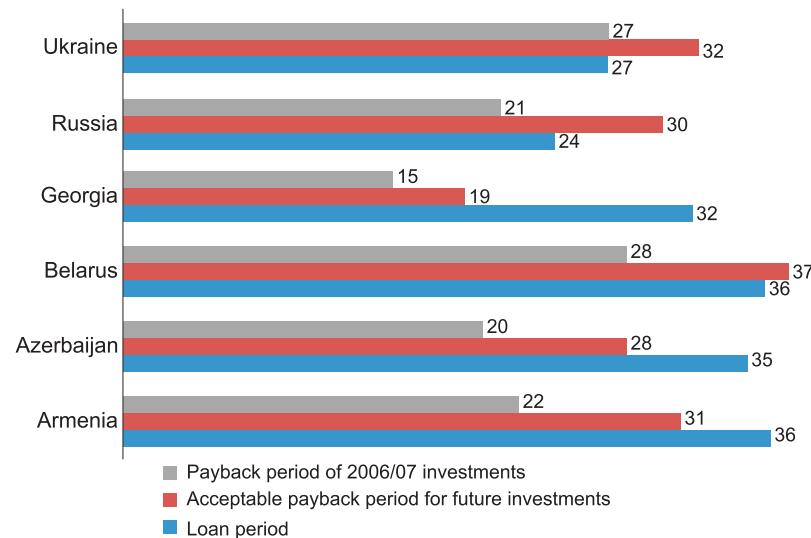
In terms of the unsuccessful applications, the most common reason given was “high interest rates”. Other reasons included administrative problems, such as incomplete loan documentation, applicants’ inability to provide loan guarantees, or short maturity periods¹⁴.

5.3 Payback Periods and Loan Tenors for Energy Efficiency Measures

The survey suggests that investors and banks are becoming more familiar with energy efficiency investments because of companies’ expected payback periods and the durations of loan facilities offered by banks, are increasing.

Figure 5.4 shows the tenor of recent loans taken out by the companies in the survey compared with the payback periods that companies considered to be acceptable (in months), by country. Payback periods for investments carried out over the 2006–07 period are also shown.

Payback periods and loan tenors are getting longer

Figure 5.4: PAYBACK PERIODS AND LOAN TENORS FOR ENERGY EFFICIENCY PROJECTS

¹⁴ These reasons were provided for unsuccessful applications in Armenia, Azerbaijan and Ukraine. No reasons were given in the cases of Belarus and Georgia.

Expected payback periods for future investments were longer than the expected payback periods in previous years. This finding suggests that companies are becoming more comfortable with undertaking longer-term investments in energy efficiency.

The survey asked whether companies had used analysis of payback periods to inform investment decisions. Analysis of payback periods is often, but not routinely, used in project evaluation. In most countries, fewer than 50 percent of companies said they always considered payback periods. The outliers were Belarus (where 69 percent reported always having considered payback periods), and Azerbaijan (where only 34 percent reported always having done so). A surprising proportion claimed to have never used this sort of analysis (nine percent in Belarus, up to 35 percent in Armenia, and up to 46 percent in Azerbaijan, respectively).

While projects with the shortest payback periods are not always implemented first, it is reasonable to assume that, as more and more investments are made, average payback periods will increase as it becomes harder to find projects with short payback periods.

The survey data support this hypothesis: as shown in Figure 5.4, payback periods for projects implemented in 2006-07 were shorter than payback periods for projects planned for 2009-11.

Available loan tenors and expected payback periods are consistent

Figure 5.4 also shows that loan tenors generally consistent with the payback periods of planned investments. Georgia is the exception, where loan tenors significantly exceed those required for the planned investments.

In Armenia, Azerbaijan and Belarus, companies can obtain three year or longer loans for energy efficiency projects.

Average payback periods in Belarus, both actual and forecast, were somewhat longer than those in the other countries. Companies were willing to invest in energy efficiency projects with payback periods as long as three years. However, while the tenors of existing bank loans and leasing contracts were found to be almost 44 months (for projects carried out by survey respondents), this is likely to be at the long end of what lenders are willing to risk.

6 Conclusions and Recommendations

The survey shows evidence of promising trends for improving energy efficiency in the survey countries, but also evidence of enduring challenges. This chapter first summarizes, in Section 6.1, the most important findings, and concludes in Section 6.2 with recommendations on how industry, governments, and financiers can use the survey information to improve energy efficiency.

6.1 Summary of Key Survey Findings

All of the survey countries have experienced steady economic growth, and this has produced reductions in energy intensity as a result of the increased use of existing production equipment and facilities. The other significant driver of reduced energy intensity has been energy efficiency investment, with the primary driver for this being government policy.

Energy intensity remains high in Azerbaijan, Belarus, Georgia, Russia, and Ukraine. Only Armenia has reduced energy intensity to a level that is even close to comparable with that of its European competitors, but this is primarily due to increased export activity, the expansion of the construction and service sectors, and the fact that Armenia has little heavy industry. Therefore, there is still substantial room for improving energy efficiency and, with it, the competitiveness of industry in external markets.

The survey shows broad acceptance of the idea that energy efficiency measures can provide substantial benefits in terms of competitiveness. However, the rate at which energy efficiency measures are being implemented varies significantly by country and industrial sub-sector.

6.1.1 The Importance of Government Action

The extent to which energy efficiency is prioritized by government is a key driver of energy efficiency gains. Governments have put varying levels of priority on energy efficiency: companies in countries (such as Belarus) whose governments place a strong emphasis on energy efficiency have made substantially greater investments in energy efficiency than companies in the other survey countries.

At one end of the spectrum, Georgia has no policy frameworks for energy efficiency. This lack of policy support was reflected in the survey, with 70 percent of respondents indicating that they considered current regulatory instruments to be ineffective. Significant support will be needed from government to achieve better energy efficiency outcomes.

The governments of Armenia, Azerbaijan, and Ukraine have instituted legal frameworks prioritizing energy efficiency, but the majority of company managers in these countries indicated that they did not think the laws promoted industrial energy efficiency. Supporting practical instruments to promote energy efficiency are needed.

In the case of Belarus, a major reason for the gains in energy efficiency in recent years has been the government's role in designing and enforcing a comprehensive policy on energy efficiency. Half of all respondents said the legal framework facilitate energy efficiency gains.

In some countries, existing laws discouraged, rather than encouraged energy efficiency. In Azerbaijan and Belarus, for example, cumbersome and time-consuming procedures to obtain permits and licenses were seen by many respondents as barriers to the implementation of energy efficiency projects.

6.1.2 Industry Understanding and Prioritization of Energy Efficiency

Until managers have a good understanding of energy costs, and a knowledge of energy efficiency measures and potential savings that might be achieved, planning for and implementation of energy efficiency measures will remain sub-optimal. Increasing the awareness and knowledge of company managers regarding available measures and technologies, and of the need to plan for energy efficiency, is therefore important.

Gathering Information

In Azerbaijan, Armenia, Georgia, and Russia, energy efficiency measures applied to date have primarily been low-cost, low-complexity, and self-funded—a focus on improving information and knowledge around the potential of more complex measures, and of the benefits of external financing, would be very useful in these instances.

In Armenia and Ukraine, in particular, managers vastly underestimated energy efficiency potential, suggesting that management awareness of best-practice technologies is inadequate. However, underestimation of potential was found to be common in all survey countries, particularly for more complex measures and within smaller companies. More widespread investment in metering upgrades and in conducting energy audits is needed to help managers understand the value of investments.

Currently, the metering stock in most of the survey countries is relatively poor. With the exception of Belarus and Ukraine, few companies have metering in place at a level of granularity finer than company-wide, although, in recent years, investment in metering upgrades has been very common in some countries: 40–50 percent of respondents in Belarus, Russia, and Ukraine have invested in recent metering years, but only eight percent and 11 percent in Armenia and Georgia, respectively.

Similarly, few companies use energy audits to inform energy efficiency plans. However, mandatory audit requirements for large companies in Azerbaijan and Belarus have resulted in a significantly greater proportion of companies conducting audits (about 50 percent, compared to 18–35 percent in the other survey countries). Because the survey also showed that those companies that carry out audits tend to invest in more complex energy efficiency measures (such as energy equipment upgrades) and more in energy efficiency in general, this is an important action area.

Business Planning for Energy Efficiency

Formalized planning for energy efficiency investment within the broader development planning of a company utilizes the information provided by audits and energy metering. While the extent to which formal energy plans had been prepared varied widely between countries, the study showed that larger companies were more likely than smaller companies to have a formal energy efficiency plan in place. It also showed that, across the board, companies with energy efficiency action plans have implemented more energy efficiency projects (and with larger investments) than those without such arrangements in place.

In addition to having a formal energy efficiency plan, the survey found that many companies do implement alternative, organizational measures to improve energy efficiency. Examples include: motivating staff through financial incentives for prudent energy use, having an individual or unit responsible for energy efficiency, and informing staff about the importance of energy efficiency and how it might be achieved. Belarusian and Ukrainian companies were found to be most likely to have such measures in place, and Armenian and Georgian companies the least likely. The most common measure, namely, making an individual responsible for energy efficiency, was found to have been implemented in 75 percent of Belarusian and 51 percent of Russian companies.

6.1.3 Investment

The key finding of this study related to investment in energy efficiency measures is that industrial enterprises across all countries operated a lot of energy-intensive equipment that has outlived its economic usefulness. This increases operating costs, because the equipment is less efficient, and because old equipment breaks down more often.

Investment in no-cost measures (for example, administrative initiatives) and low-cost measures (for example, efficient lighting) has been substantial in recent years. Investments in energy efficient lighting were the most common or second most common energy efficiency investment in every survey country (in terms of percentage of respondents), with at least one quarter of companies in the survey implementing such measures over the 2006–07 period.

Investment in the upgrading of metering has also been substantial in some countries. Interestingly, the greatest investment has occurred in those countries—Belarus and Ukraine—that already have the best metering “fleet” (in other words, metering facilities delivering the finest granularity).

However, the area in which the most substantial gains can be made is in the replacement of outdated manufacturing and energy equipment. The preponderance of outdated equipment is substantial across all countries, with the most outdated equipment being in use by companies in Belarus, Georgia and Russia. More than 20 percent of manufacturing equipment in the first two of these countries is more than 25 years old, and more than 40 percent is older than 10 years. In Russia, more than 50 percent of energy equipment is older than 10 years.

Across the board, the food processing sector is the least likely to have retained outdated energy and manufacturing equipment, reflecting the particularly competitive nature of that industry. Even in Belarus, only 23 percent of food processing businesses have equipment older than 15 years; in Georgia this figure is only six percent.

In terms of the level of investment that has occurred in recent years, more than one third of respondents, across all countries, have undertaken manufacturing upgrades over the 2006–07 period, and substantial numbers have invested in various energy equipment upgrades, particularly in upgrading heating systems, in compressors, and in building insulation. In most cases, a decision to select higher capital/lower operating cost options was made.

Planned expenditure over the next few years showed significant increases over 2006–07 levels: companies in Armenia, Azerbaijan, and Georgia plan, collectively, to increase expenditure on energy-efficient equipment by 400–600 percent over 2006–07 levels. Planned expenditure increases by companies in Belarus and Ukraine, of about one third (and by Russian companies, of 20 percent) appear modest in comparison. However, these countries have started from a substantially higher base, having spent \$60 and \$95 million, respectively, in 2006–07, compared to only \$5 million, \$6.8 million, and 10.9 million in Armenia, Azerbaijan, and Georgia, respectively. Russian companies spent about \$120 million¹⁵.

6.1.4 Financing Energy Efficiency

The approach to financing energy efficiency projects was found to be common across all of the countries in the study. The majority of surveyed companies displayed reluctance to seek external funding, and preferred instead to use their own funds to invest in energy efficiency. This reluctance to borrow means that many profitable energy-efficient measures are being postponed or abandoned even though, in the longer term, the savings they generate would outweigh the costs of borrowing.

While more than 40 percent of respondents claimed that lack of own free funds was a barrier to investing in energy efficiency, only a small percentage of companies (ranging

¹⁵ It is worth noting, however, that the survey included 325 companies in Ukraine and 625 in Russia.

from 15 percent in Azerbaijan to 35 percent in Belarus) had applied for external financing. In Belarus, Georgia, Russia, and Ukraine, success rates for those that had applied for funding exceeded 80 percent, and loan maturities were generally in line with payback periods for the proposed investments.

6.2 Recommendations to the Main Actors in Energy Efficiency in the Six Countries Involved

Implementation of energy efficiency measures will benefit the survey countries in the longer term, increasing their competitiveness and helping them to combat the current financial and economic crisis. This section looks at the actions that could usefully be taken by industry, financiers and government to achieve greater gains in energy efficiency.

6.2.1 Industry

Actions that need to be taken by industry can be split into three broad categories: awareness-raising and administrative measures; technical measures; and financial measures.

Awareness-raising and administrative measures include the following.

- Awareness: increase the awareness of company managers and staff concerning the benefits of energy efficiency in terms of energy and costs.
- Administrative measures: where this is not already done, apply tools such as bonuses to reward initiatives by staff to reduce energy consumption, and appoint a staff member or create a unit within the company to be responsible for monitoring energy efficiency.
- Planning: ensure that the company has an energy efficiency action plan that is aligned with company development plans.
- Obtaining quality information: use energy audits as a means to understand current energy consumption patterns; consider how to most cost-effectively invest in energy efficiency and optimize energy usage; prioritize investment; and provide useful information for energy efficiency planning and loan applications.
- Education: companies need to know how to set up energy cost centers, which can be achieved by monitoring the energy consumption of specific industrial processes and of the most energy-intensive equipment. Company staff also need to have skills in project evaluation, develop strong linkages between technical and financial staff for the purposes of planning and seeking external funding, and understand the benefits of external funding.

Technical measures include the following.

- Investing in quality information capability: where economically feasible, upgrade metering equipment to enable monitoring of energy consumption by production unit and energy-intensive equipment.
- Benchmarking: undertake assessments of technically feasible and cost-effective energy savings by benchmarking with companies from the same sector within the country, and with companies in other countries.

Financial measures include the following.

- Analysis of individual energy efficiency opportunities: apply rigorous analysis to potential projects—this will not only help integrate energy efficiency into company development strategies and investment decision-making processes, but will also provide rigorous analysis to support applications for external financing.
- Consider external funding: using a company's own capital as its only source for energy efficiency investments limits and delays potential savings.

6.2.2 Governmental Authorities

As seen in Belarus, government policies can be instrumental in improving the energy efficiency of national economies. There is a range of instruments available to policy makers seeking to reduce energy consumption, including administrative or financial measures.

With the exception of Georgia, the six countries in the survey have in place legislation related to energy efficiency. However, in several cases the secondary legislation required to implement such laws remains incomplete, reducing the gains that might be achieved through its adoption.

In the case of Georgia, specifically, the top priority for government authorities should be to develop and implement a legal framework for energy efficiency. As noted above, the survey found that 70 percent of Georgian respondents considered that the legislative framework did not promote energy efficiency. The survey also showed that Georgian companies lagged behind most of the other survey countries in terms of planning for energy efficiency, conducting energy audits, and investing in energy efficiency initiatives (including metering), and that Georgia had one of the oldest manufacturing equipment “fleets”. In addition, the Georgian economy’s energy intensity (in other words, the amount of energy consumed per unit of GDP) is higher than in comparable economies. This is despite the fact that Georgian companies face among the highest gas and electricity tariffs. When compared with the success seen in Belarus, in particular, there is a strong case for a legal framework that will help improve energy efficiency.

In the case of all of the survey countries, governments must ensure that the existing legal framework for energy efficiency is effective—in other words, that measures are designed, funded, and appropriately enforced to achieve the necessary objectives. Currently, mechanisms tend, in many cases, to rely on mandatory requirements—for example, inspections or energy audits. A number of more incentive-based mechanisms might be considered in addition to these, such as tax benefits for energy efficiency investments.

In several countries (Belarus and Azerbaijan, in particular), cumbersome and time-consuming procedures to obtain permits and licenses were seen by a significant proportion of respondents as constituting a barrier to the implementation of energy efficiency projects. Governments can assist in this area by working with the industrial sector in reducing these barriers.

6.2.3 Financiers

Energy efficiency financing can become a unique and attractive product offered by financial institutions. There is a growing need for external financing for energy efficiency in all of the survey countries, particularly given the significant increase in planned expenditure by firms over the next few years, and the full economic potential beyond that time.

Useful initiatives by lending institutions might include the following.

- Education: improving company managers’ understanding of the impact of energy efficiency measures on their company’s financial standing, and the benefits of utilizing external financing.
- Product development: fostering the creation of relevant financial products and services.
- Assistance with applications: creating clarity around application requirements, streamlining processes, and so on.
- Project support: lending institutions could appoint a designated expert in energy efficiency financing to assist companies with the design and evaluation of energy efficiency projects. This approach is potentially advantageous to financial institutions, as it can lead to increased lending for projects with known benefits, and reduced time spent on assessing and working with companies on unsuccessful applications.

Appendix A:

Survey Methodology

Data from two surveys contribute to this report. A survey was undertaken in Russia in 2006, with a second survey undertaken for the other five survey countries in 2008. The latter was based on, but was not identical to, the former survey.

The objective of both surveys was to show how industrial enterprises in each of the survey countries evaluate, plan, finance, and implement energy efficiency improvements. Survey characteristics are outlined below in respect of the five-country survey, with differences from the Russian survey noted.

Characteristics of the survey include the following:

Industry sectors covered. The companies surveyed represent five industrial sectors that are generally highly energy-intensive and have significant potential for energy savings. These sectors are:

- the food processing industry;
- the chemical and petrochemical industry;
- the building materials industry;
- the metal processing industry; and
- the machine building industry.

Survey respondents were intended to represent the predominant industrial sectors of the survey countries.

In the case of Russia, the industries surveyed were wood processing, light industry, metal processing, machine building, the meat and dairy industry, and the bread and confectionary industry.

Countries and regions covered. The survey was carried out among enterprises in Armenia, Azerbaijan, Belarus, Georgia, and Ukraine, during the summer of 2007. The Russian survey was carried out during the summer of 2006, and as such, the “current” investments and “future” investment plans relating to companies in this country differ from those of the other countries. Companies were selected from a number of regions across each country.

Sampling method and sample size. The survey was conducted using a detailed questionnaire, and through face-to-face interviews with the management of at least 100 companies in each of the survey countries. The sample of respondents was developed on the basis of the incidence and distribution of medium to medium-large manufacturing enterprises representative of the respective industry sectors throughout the country in question. The sample distribution (in terms of the number of companies) was as follows: Armenia—100, Azerbaijan—100, Belarus—125, Georgia—100, Ukraine—325, and Russia—625, giving a total sample of 1350 companies. Probability proportional to size sampling was carried out in all six survey countries so that the five industrial sectors of industry were proportionally represented in the actual industry composition.



