ENERGY EFFICIENCY IN THE STEEL SECTOR:

WHY IT WORKS WELL, BUT NOT ALWAYS

FOREWORD

OECD Steel Committee delegates discussed an earlier version of this report at the Steel Committee meeting in May 2015. The report was revised after that meeting to include survey responses from more steel companies. Delegates agreed to declassify the report in September 2015 through the written procedure. The report will be made available on the Steel Committee website: www.oecd.org/sti/steel.

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ACKNOWLEDGEMENTS

This document was prepared by Mr. Hannes Mac Nulty, an expert on energy efficiency developments in the industrial sector who kindly assisted the OECD's Steel Unit on work in the broad subject area of steel and the environment during 2013-15. The Secretariat would like to thank Mr. Mac Nulty as well as a number of steel companies and steel associations that collaborated in the energy efficiency survey discussed in this report. The Secretariat assumes full responsibility for any errors or omissions in this paper.

EXECUTIVE SUMMARY

The benefits of energy efficiency are commonly accepted in the steel sector. Beyond cost-saving, the increased productivity and competitiveness associated with improving energy management merit the investment in many cases. Despite this, research continually shows that steel manufacturers are not always choosing to implement energy efficiency measures to the extent that would bring them the most benefit.

The OECD has undertaken a project to investigate why some companies in the steel sector are not implementing energy efficiency measures, and the circumstances surrounding their decisions. One of the main objectives of this project is to understand whether there are specific barriers that offset the potential cost savings that can be obtained through energy efficiency projects, and/or if previous negative experiences with energy efficiency projects play a role in disproportionately dissuading further investment.

To obtain this information, an energy efficiency survey was developed and distributed to steel companies around the world, in collaboration with a number of major international and national steel associations. This survey was carried out from April to June 2015. An interim report, discussed in May 2015 at the 78th session of the OECD Steel Committee, presented the survey results based on company responses received until 28 April. The survey was open for responses several weeks following the May 2015 Steel Committee meeting. The complete and final results of the survey are presented in this revised document.

In total, there were thirty responses to the over 200 surveys distributed, which equates to a response rate of 15%. The respondents are relatively evenly represented across North, South and Central America, as well as in Asia and Europe. While most of the organisations surveyed have revenues of over USD 5 billion, smaller company sizes are also well represented (with revenues ranging from USD 100 million to USD 5 billion). The majority of the organisations that responded are integrated steel mills, but electric-arc furnace producers are also well represented, accounting for 7 of the 30 responses. While considerable effort was made to include as wide a variety of companies as possible, it should be noted that there is possibly some bias, with more "active" (i.e. energy efficiency aware) firms more likely to make up the larger number of responses than those that haven't undertaken as much investment in energy efficiency measures.

Overall, the survey results show that the steel sector is progressively implementing energy efficiency projects, and this is largely being done at individual companies' own initiative because of the potential cost savings. These findings differ from the results of previous surveys undertaken on wider industry and manufacturing, which have found that firms in many other sectors are lagging behind the steel sector in terms of energy efficiency implementation. Examples of these surveys are provided in the section on the importance of energy efficiency to the steel sector.

This survey found that restrictive internal investment criteria remain an issue for companies in the steel sector and may reduce the implementation of energy efficiency measures that, if assessed more comprehensively, could be commercially viable. Long payback periods were consistently identified as issues facing companies that are otherwise interested in investing in energy efficiency projects. To glean more information, three additional questions were put forth to respondents about the additional benefits, other than energy savings, associated with energy efficiency projects. With 22 of the 30 respondents

replying to these additional questions, the results indicate that the organisations involved in the survey had a very good awareness of additional benefits, other than energy savings, that could be applied to payback period calculations. However, the evidence obtained also demonstrated that no substantial methodology existed to be able to include the true value of all the relevant benefits in payback period calculations for energy efficiency projects.

While the respondents to the survey indicated that they were progressively implementing energy efficiency projects, and largely at their own initiative, it also revealed that regulatory policies do not have a particularly strong impact on the sector's energy efficiency activity. However, the survey results suggest that financial mechanisms that support shared investment schemes (rather than subsidies) could help stimulate more investment in energy efficiency projects by helping firms overcome the commonly cited barrier of a lack of available capital. In addition, policies that support innovation and the development of new tools (e.g. as demonstrated by the success of a standardised energy management system) will likely remain of considerable importance to advancing energy efficiency more rapidly within the sector than it would occur in a purely commercial environment.

Key findings from the Survey

- All companies who responded to the survey are, to some degree, actively implementing energy efficiency measures, and the vast majority can be considered very active; 93% of respondents said that their organisation had an energy efficiency goal and, of these, 79% integrate these goals into their core business strategies.
- All respondents said that energy efficiency was important to their organisation, while 93% are involved in some form of benchmarking process, and this was primarily based on an external reference.
- Cost control and better productivity are the main drivers for companies to implement energy efficiency, while corporate reputation and government regulations remain low on the list of influencing factors.
- The vast majority of organisations surveyed (90%) are using some form of energy management system to track and optimise energy use. Of these, over 70% have implemented a formal energy management system that is either certified or related to an energy management standard.
- 53% of respondents reported that their organisation had not had any negative experiences with the implementation of energy efficiency projects. However, those who reported negative experiences largely associated them with payback periods that were longer than expected. By a considerable margin, long payback periods also topped the list of barriers that organisations face when considering energy efficiency projects.
- Only 10% of respondents stated that energy efficiency projects were perceived as more risky than core business projects.
- Energy efficiency goals, which were in place in almost all surveyed organisations, are driven by government requirements in only 17% of the cases. While all surveyed organisations have implemented energy efficiency measures, only 13% of these were implemented in order to comply with regulations.
- Cost control is over five times more likely to be a driver of energy efficiency initiatives than compliance with government regulations, according to the organisations surveyed.
- 76% of respondents considered other benefits (besides energy savings) to be achieved through energy efficiency projects.

Project background

Energy efficiency has the technical potential to reduce energy consumption within the steel sector by 20%, according to estimates by the International Energy Agency (IEA, 2014a). Papers discussed recently by the OECD Steel Committee show how government policies can promote the implementation of energy efficiency measures as well as the introduction of energy management systems (EnMS) that are cost-efficient, structured and effective.[1]

Further, widely-available information clearly emphasises how the steel sector itself can significantly benefit from energy efficiency. Beyond cost savings, energy efficiency can increase companies' productivity and competitiveness. Nevertheless, research shows that the steel sector, in a similar fashion to all other industry sectors, does not always choose to implement energy efficiency measures, or at least not to the extent that would bring them the greatest benefits (EIU, 2011; Reinaud and Goldberg, 2011; Worrel, 2011). This indicates that various policy, market or organisational failures could be creating barriers to energy efficiency implementation. Better understanding the failures can, in turn, shed light on whether or not there is role for policy, and what it should be.

The OECD undertook a project to look closely at the barriers to the implementation of energy efficiency measures in the steel sector. The project examines whether previous negative experiences with implementing energy efficiency projects are dissuading further investment, and considers the typical advantages and disadvantages of implementing energy efficiency measures, from the perspective of steel manufacturers.

To obtain this information, the Secretariat collaborated with the external expert and author of this report and developed an energy efficiency-specific survey intended for steel manufacturing firms. The survey was distributed to steel companies around the world in early April 2015, with the help of a number of major international and national steel associations. All survey results were collected by June 2015.

To complement the results of this survey, and to provide more specific context for the overall project, a portfolio of case studies on the common positive and negative experiences that steel companies have had with energy efficiency implementation is also being developed. These case studies will be developed during the course of 2015 and will be provided for the Steel Committee's review at future meetings. The survey results and case studies are intended to provide the OECD Steel Committee with information on:

- The importance of energy efficiency for steel-producing companies, and their executives' attitude towards this topic;
- Why some companies consider energy efficiency measures but do not proceed with them; and
- The main barriers to energy efficiency implementation in the steel sector and any associated negative experiences.

This project aims to provide delegates of the Steel Committee with the tools to better understand policies that can encourage the adoption of cost-effective energy efficient investments in the steel sector. In addition, it is expected that the aggregated results of the survey will also provide the steel industry with valuable information on how some companies are implementing energy efficiency improvements.

[1] See OECD (2013) and OECD (2014).

The survey

The global online survey was carried out from April to June 2015 and sought responses from member companies of a wide range of collaborating national and international steel associations. In total, 30 organisations from the steel sector responded to the survey. With approximately 200 surveys distributed, the response rate was 15%. While there is a relatively good representation of organisations across North, Central and South America, and all of Asia and Europe, responses from Asian-based organisations make up a small majority.

The survey was targeted at firms and not plants. Firms are referred to as "organisations" throughout this report. Organisations of all sizes are represented in these final survey results, with 13.4% of them having annual revenues of USD 100 million to USD 1 billion, 26.7% with revenues of USD 1 billion to USD 5 billion, and 60% having revenues of over USD 5 billion. Figures 1 and 2 summarise the type of steel producers that responded and their location.

Figure 1. Survey responses, by the organisation's primary steel production type

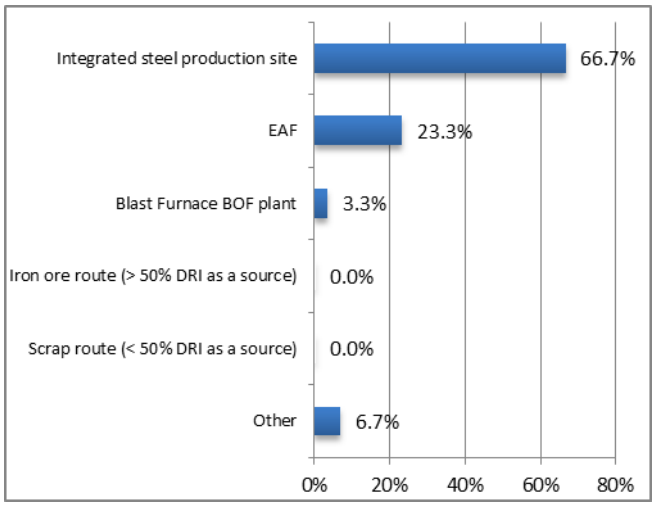
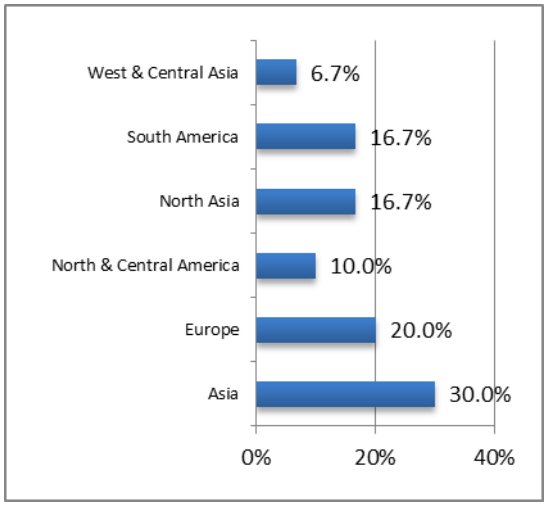


Figure 2. Survey responses, by organisation location



Note: Integrated steel production sites are defined as having all the functions for primary steel production, from iron making to rough and/or product rolling.

Following a presentation of the survey's interim results at a Steel Committee meeting in May 2015, it was decided to approach all the online survey respondents by email with three additional questions in order to gain more insight into energy efficiency project payback periods. Twenty-two of the 30 survey respondents provided answers to these additional questions. Their responses are detailed in the appendix of this paper along with the other survey questions.

1. How important is energy efficiency to the steel sector?

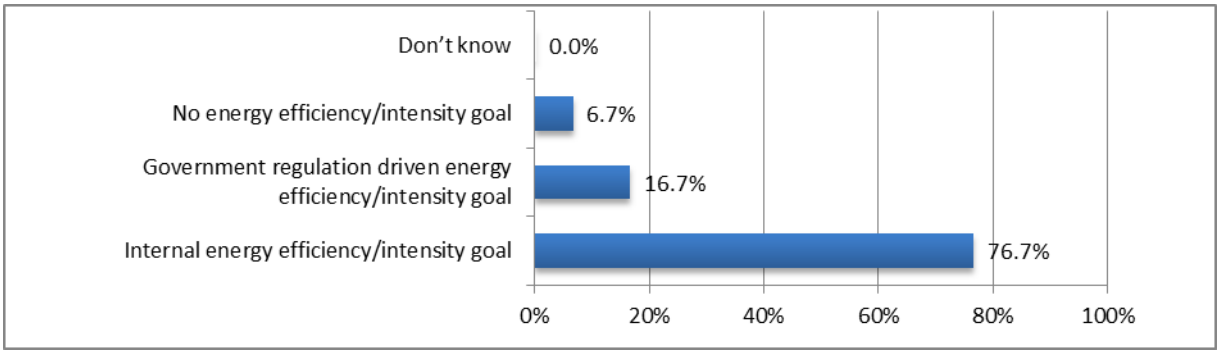
Previous global energy efficiency surveys that have focused on industry or the manufacturing sector have found that, while many companies see energy efficiency as critical to their businesses, only a minority actually take action to improve efficiency, and even then they often only do it to comply with legislation. The same studies also showed that the main barrier to action is a lack of information (ABB, 2011 and EIU, 2011). Adding to this, McKinsey's 2011 industry survey on sustainability showed that just

36% of executives say their organisations have a strategic approach to energy efficiency and a defined set of initiatives.

In contrast to these findings, the results of this steel sector-specific survey showed that steel-producing companies are, in fact, highly engaged in energy efficiency projects. All organisations surveyed to date have implemented energy efficiency measures during the last three years and the vast majority (93%) have established formal energy efficiency goals (see Figure 3), with 79% of these companies having integrated their energy efficiency goals into their overall business strategies. Furthermore, the establishment of such energy efficiency goals was, in the large majority of cases, not driven by government regulation but rather by a deliberate, internal strategy.

Even though efforts were made to reach out to all types of organisations, those that completed the survey may be more likely to already be actively engaged in energy efficiency projects, representing in turn "the upper levels" of energy efficiency activity. It is important to bear in mind this potential response bias.

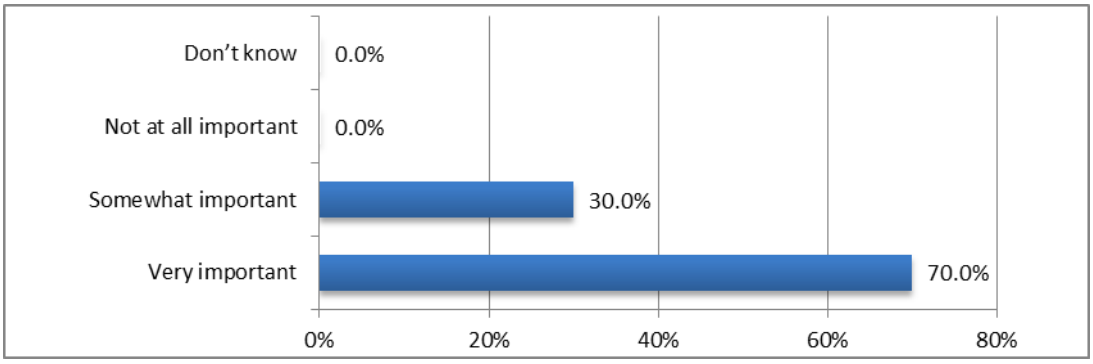
Figure 3. Survey question 24: Has your organisation established an overall global energy efficiency/intensity goal?



The steel industry is the second-largest industrial energy consumer. As a result, reducing energy intensity is of particular importance to steel-producing companies (IEA, 2014a). Approximately 57% of the organisations surveyed had energy costs of 10-20% of total revenue, which demonstrates the substantial potential benefits of using energy efficiency to drive down their energy consumption, outside of regulatory pressure from government. This figure is in line with the World Steel Association's data on energy use, which details energy as accounting for 15-20% of the total cost of steel production, depending on the region (World Steel Association, 2014).

The role that energy efficiency plays in the overall business strategy of surveyed organisations was said to be "very important" by 69% of respondents, with the remainder stating that it is "somewhat important" (see Figure 4). 77% of respondents also stated that, five years from now, energy efficiency would be more important to their organisation's business strategy. This result – coupled with the fact that energy efficiency initiatives within the surveyed organisations are led equally by CEO/presidents and corporate energy managers (30% in each case) – demonstrates how the steel sector bucks the trend shown by broader industry, which has had difficulty in implementing effective energy efficiency measures (ABB, 2011 and Economist, 2011).

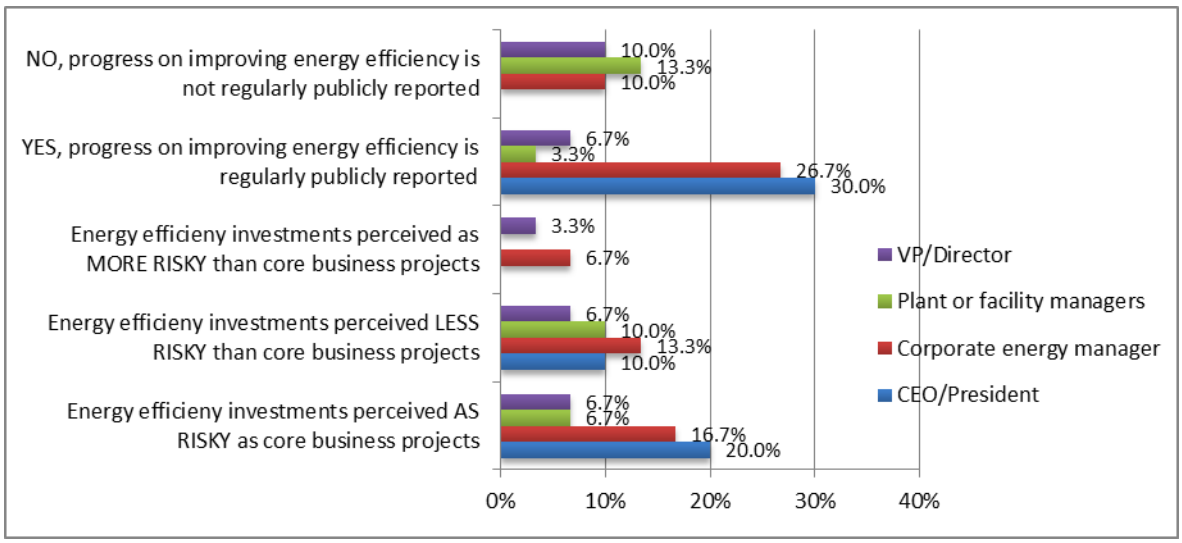
Figure 4. Survey question 32: How important are energy efficiency initiatives to your organisation's overall business strategy today?



These results support the widely-accepted fact that both the initial implementation and ongoing success of energy efficiency projects are highly dependent on senior management support and leadership (Reinaud and Goldberg, 2011). The lack of a defined energy efficiency goal, and a disconnect between energy efficiency investment projects and the overall business strategy, have been shown to be very common occurrences in the general industry sector, which in turn emphasises the point that energy efficiency is too often an untapped cost-saving measure (EIU, 2011 and Johnson Controls, 2013).

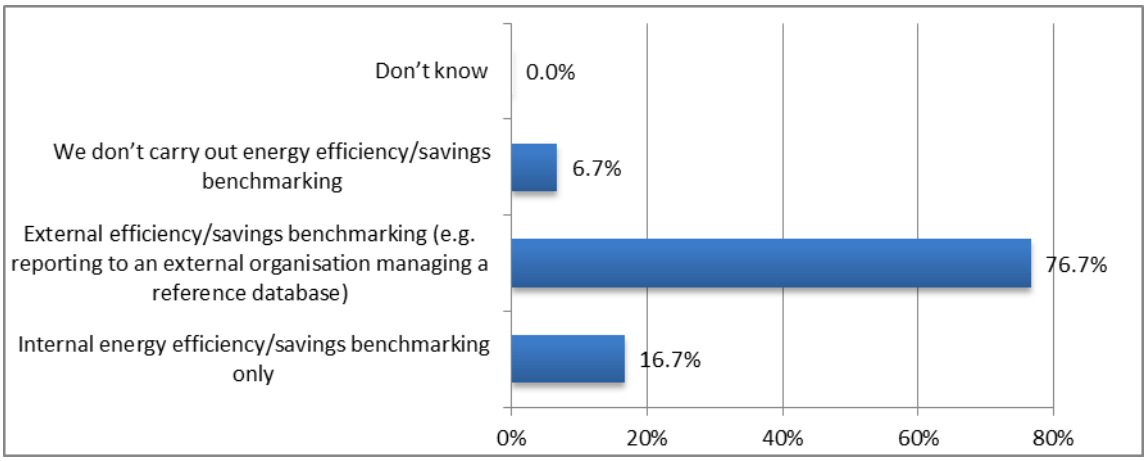
The survey results also showed that, even when there is a broad level of senior management support for energy efficiency within the steel sector, having the top management (CEO/President level) ultimately responsible for energy efficiency will still ensure the best result. Organisations with corporate energy managers leading energy efficiency projects demonstrated similar effectiveness to those with CEO/presidents as lead, except that the latter were more likely to report publically on their energy efficiency progress and no organisation with a CEO/President as lead perceived energy efficiency investments as more risky than core business projects (see Figure 5).

Figure 5. How the person globally responsible for energy efficiency affects an organisation's perception of risk and public reporting



Overall, 67% of respondents said their organisation regularly publicly reported its progress on energy efficiency, for example, as part of its annual report. This figure demonstrates that steel-producing companies – and particularly those where responsibility for energy efficiency is led by the CEO/President or a specifically-assigned corporate energy manager – are taking a proactive approach to including energy efficiency within their overall business strategies. This attitude is backed up by the results obtained on benchmarking. Only 7% of respondents said that their organisation did not carry out energy efficiency benchmarking exercises, while 77% were involved in an external benchmarking practice (see Figure 6).

Figure 6. Survey question 29: Does your organisation carry out energy efficiency/savings benchmarking across the steel industry to compare their performance?



2. Catalysts for energy efficiency

Research by the World Steel Association found that the energy intensity of steel production has decreased by 50% over the past 40 years (World Steel Association, 2014). Energy is, indeed, a significant cost factor, accounting for 15-20% of total steel production costs (World Steel Association, 2014).[2] This supports our findings on the heightened level of awareness and action in the steel sector compared to broader industry, and is likely a reflection of the fact that firms in the sector have been implementing energy efficiency measures for some time.

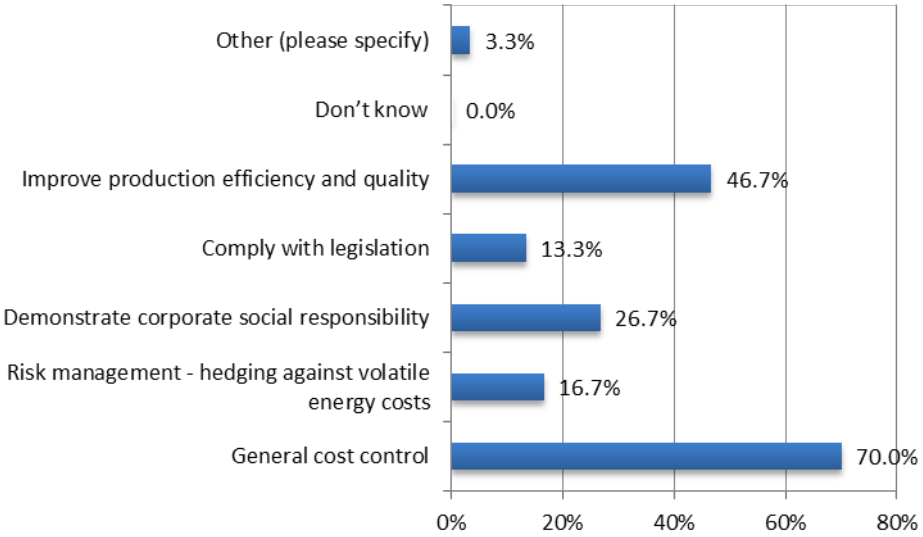
Of all the benefits organisations identified in their responses to the survey, the main drivers for pursuing energy efficiency measures were cost savings and improved productivity (see Figure 7). Cost control, prioritised by 70% of respondents, was cited by well over twice as many respondents as corporate social responsibility, while compliance with legislation was cited by only 13% of respondents, the second-lowest. Interestingly, only 17% of companies also indicated that the risk of volatile energy prices was a driver for energy efficiency projects. Constantly changing energy prices can be of more concern to companies than just a high but steady price level because they make investment returns difficult to calculate. Reducing energy costs lowers the effects of energy-price volatility.

The McKinsey 2011 Business of Sustainability survey, which covers all industry sectors, reported that 33% of respondents implemented sustainability measures to improve operational efficiency and lower costs, while 32% did so because of corporate reputation. McKinsey also found that the number of

[2] According to the World Steel Association's factsheet on energy use in the steel industry. See www.worldsteel.org/publications/fact-sheets/content/02/text_files/file0/document/fact_energy_2014.pdf.

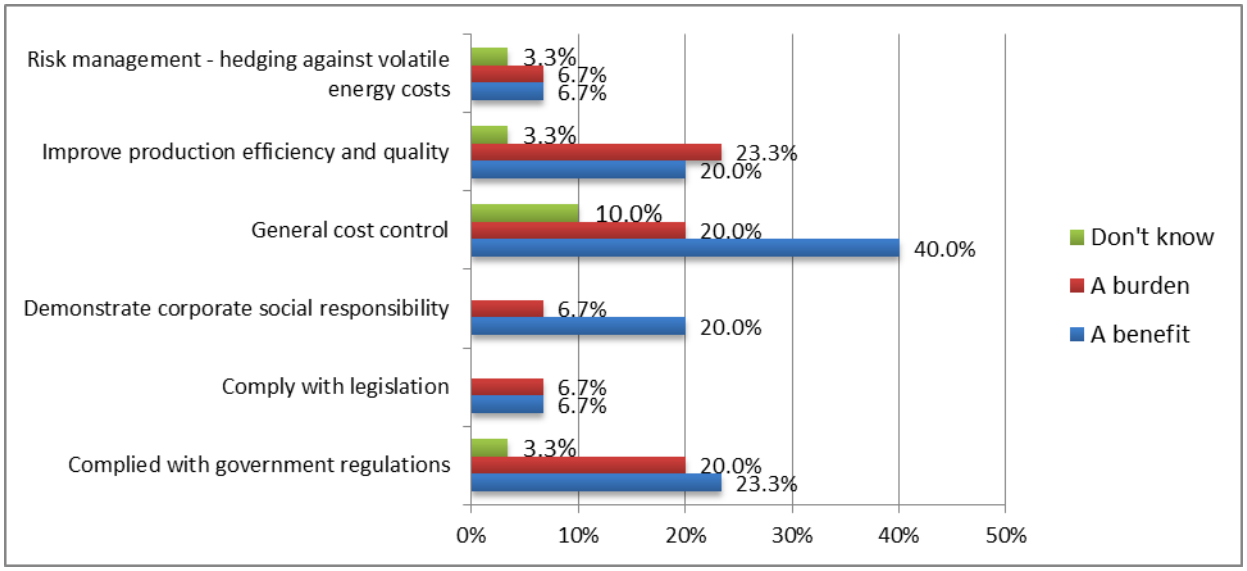
companies implementing energy efficiency measures to improve operational efficiency and lower costs had increased by 14 percentage points year-on-year since their 2010 survey, indicating the relatively low priority that energy efficiency has historically had in business strategies. By contrast, this OECD survey found that the steel sector is actively engaged in energy efficiency primarily for commercial reasons and has been for some time.

Figure 7. Survey question 40: What are the main business benefits to your organisation from implemented energy efficiency measures?



As part of considering the main business benefits of energy efficiency measures to the respondents' organisations, an attempt was made to determine how they might be affected by energy efficiency legislation. Figure 8 looks at whether energy efficiency legislation is seen as a burden or benefit to the steel industry. The most noticeable impact of energy efficiency legislation being perceived as a benefit is in the area of cost control and corporate social responsibility. This could demonstrate that organisations that are most active in energy efficiency, whether for legislation compliance reasons or otherwise, tend to look at energy efficiency as more than just production efficiency (a traditional driver of energy efficiency in the steel sector).

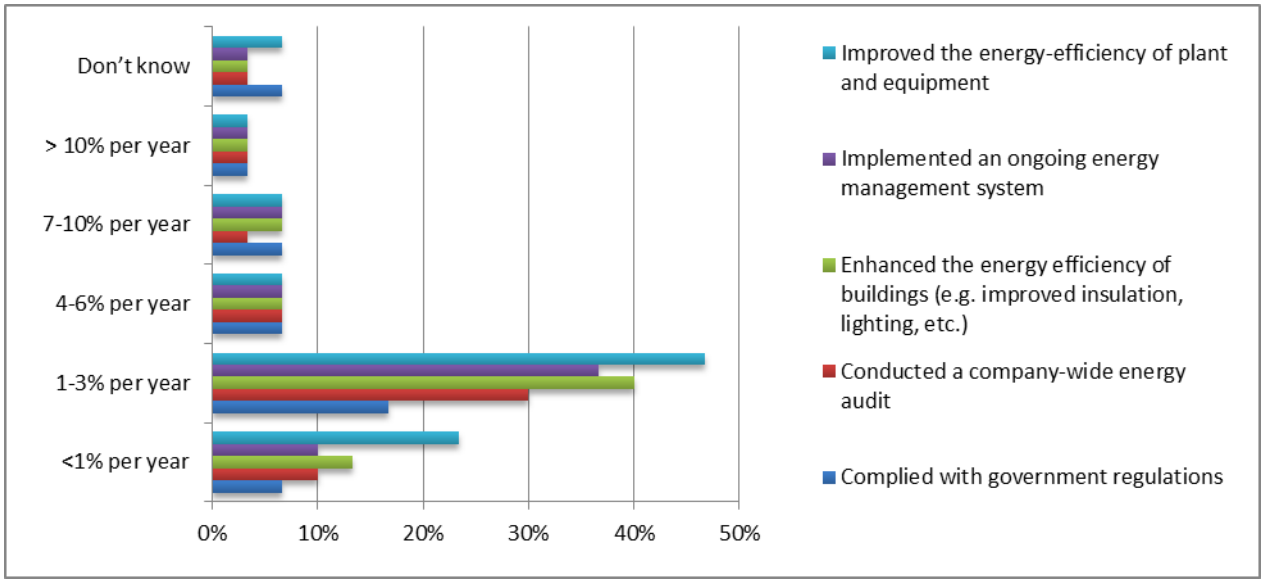
Figure 8. The effect of energy efficiency legislation (benefit, burden or don't know) on the business benefits of energy efficiency in the country where an organisation is headquartered.



An overwhelming majority of organisations surveyed (83%) said that energy efficiency initiatives helped improve their bottom-line over the past three years. 50% of respondents reported relatively low annual energy savings of between 1-3% , while 13% of respondents experienced 4-10% annual savings, and 3% reported annual savings of greater than 10%.

In Figure 9, the various implemented measures are compared to the cost savings achieved in order to determine the effect of a company's technical development stage on the level of annual savings achieved. While the accuracy of the results would be improved with a larger sample, it can be seen that, in general, companies with lower savings levels are those least driven by regulation. This point, and the fact that these companies are still actively implementing energy efficiency measures, would tend to imply that energy efficiency is an established practice. This would support the concept that low levels of energy savings may simply be attributed to the fact that steel-producing companies have been investing heavily in energy efficiency for several decades (World Steel Association, 2014). Therefore, the larger energy savings would have been typically achieved as a result of the initial "low-hanging fruit" projects. However, based on the data gathered through this survey, it is important to note that, regardless of the fact that many steel companies have been engaged in long-term energy efficiency initiatives, they are still achieving ongoing energy savings, albeit of a lower magnitude.

Figure 9. Comparison of cost savings achieved by the respondents' organisations with the type of energy efficiency measures implemented by the specific organisation.



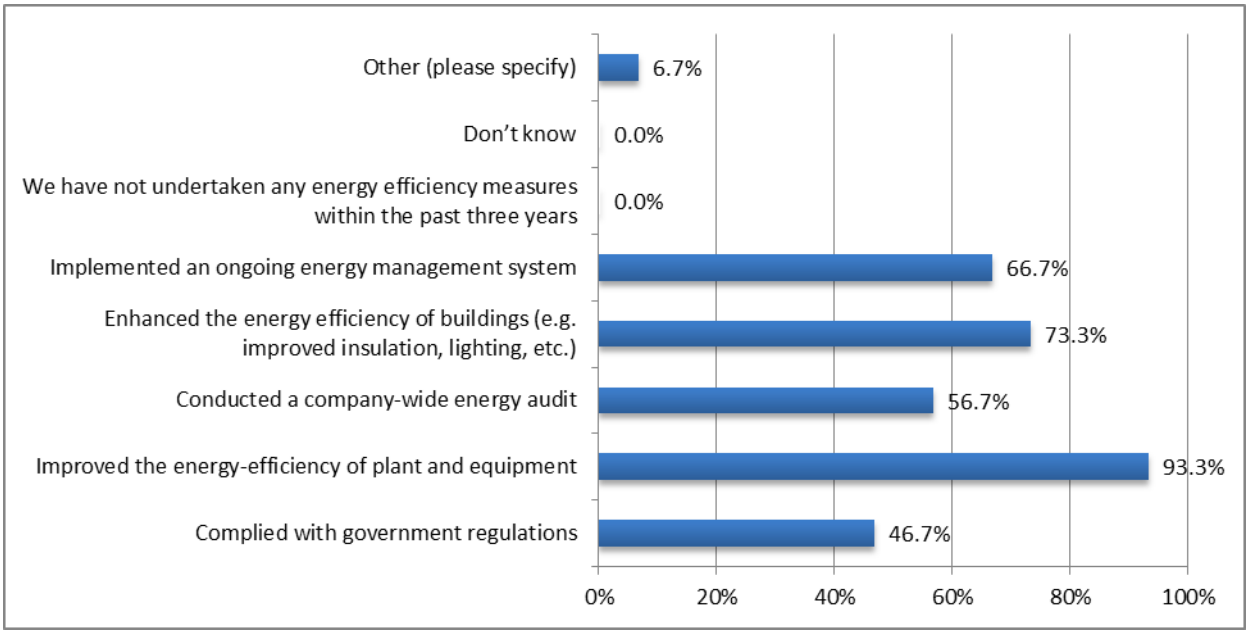
3. How energy efficiency measures are implemented

Energy management systems are helping steel companies to systematically save energy through both operational and technology changes (OECD, 2014). The response from organisations involved in this survey indicates that nearly all of them (90%) are using some form of energy management system to track and optimise energy use. Of these, 70% have implemented a formal energy management system that is either certified or related to a standard. This is much higher compared to the manufacturing industry as a whole. The Economist Intelligence Unit and Enerdata, on behalf of ABB, carried out an energy efficiency survey in 2011 that found that only 50% of general manufacturing companies had an energy management system in place.

When looking at the types of energy efficiency measures that organisations have implemented within the past three years (see Figure 10), an important observation that can be made is that the least implemented measures are those which are associated with government regulation compliance only. Understanding and managing energy are high priorities, with energy management systems and energy audits a common measure in this context. Whilst the energy-saving potential available from building-related measures (e.g. insulation and lighting) is often overlooked by energy-intensive companies, it is clearly not the case with the steel companies responding to this survey, of which 73% had implemented similar measures.

The top of the list of implemented measures are, however, energy efficiency improvements to plants and equipment, which 93% of organisations had implemented, again underlining that improved cost control and productivity are primary drivers for energy efficiency projects. Comparing again to the ABB 2011 survey, it is interesting to note that there is a reversal in the type of measures recorded for the general manufacturing industry, with considerably more building-related measures being implemented than improvements to plants and equipment.

Figure 10. Survey question 38: Which, if any, energy efficiency measures have your organisation undertaken within the past three years? Please select all that apply.



Of the organisations surveyed, 90% said that energy efficiency decisions (investment and/or strategy) are made by the same people who make core business decisions. This finding may demonstrate how the steel sector differs from the general manufacturing sector: energy efficiency projects are being consistently implemented to improve core manufacturing processes as well as other unrelated areas, such as building-based improvements.

4. The barriers to making energy savings viable

One of the main objectives of this project is to determine why organisations might not implement energy efficiency measures when there is such potential to reduce costs by doing so. This project has also endeavoured to try to determine whether energy efficiency measures are not being pursued because of other reasons that reduce or outweigh the savings potential, and/or because of previous negative experiences with energy efficiency projects.

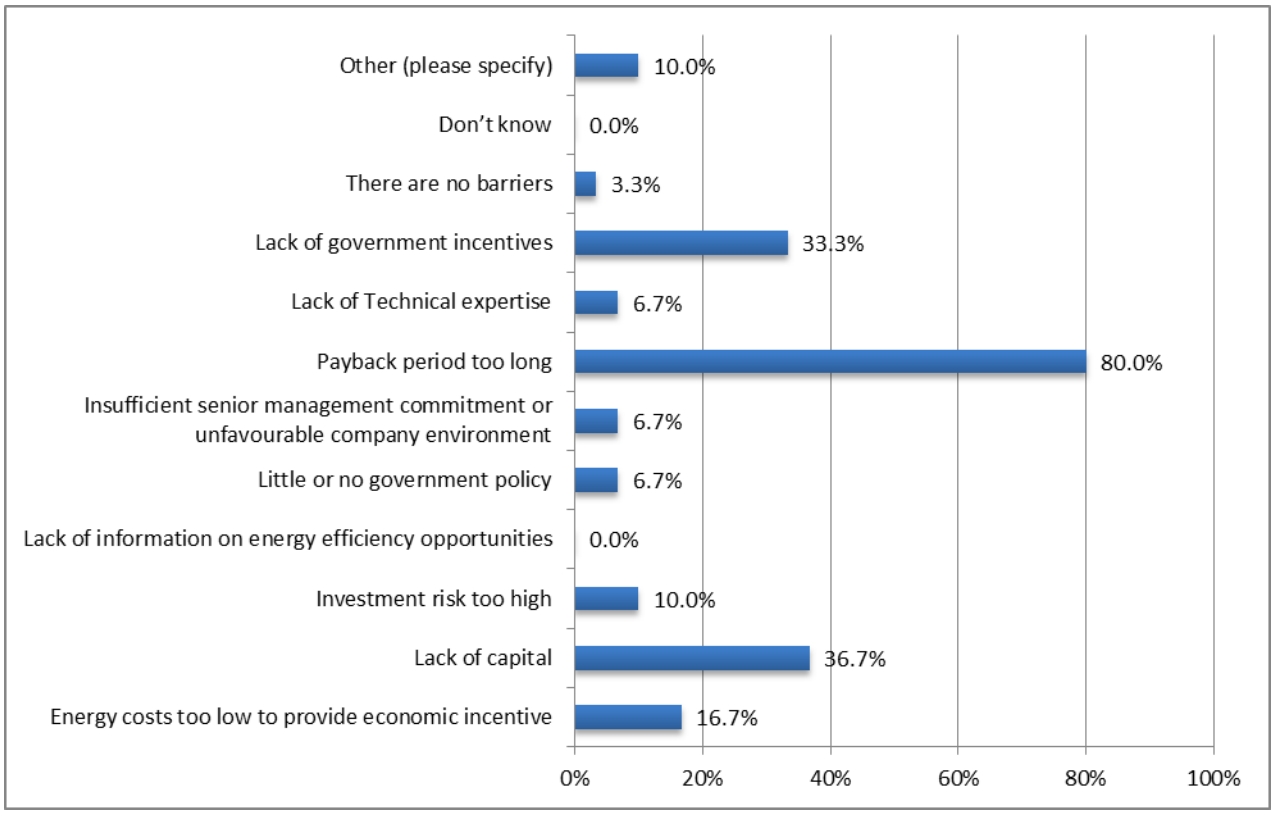
Given that cost control was said to be the most important energy efficiency driver, it was not surprising that the organisations responding to this survey said that a viable payback period (investment cost divided by discounted annual savings) on any investment was the primary hurdle they faced when planning energy efficiency projects (see Figure 11). While an overly lengthy payback period was the greatest barrier to investment, it was followed by other project financing-related barriers, such as lack of government incentives and lack of capital. All other barriers rated much lower in terms of their impact on energy efficiency projects.

The results also show that, in the steel sector, no company identified a lack of information as a barrier to energy efficiency, and notably only 7% identified a lack of senior management commitment or technical expertise as issues.

When respondents were asked what the perceived risk of energy efficiency projects was compared to core business projects within their organisation, 50% responded that it was "as risky", 40% said "less

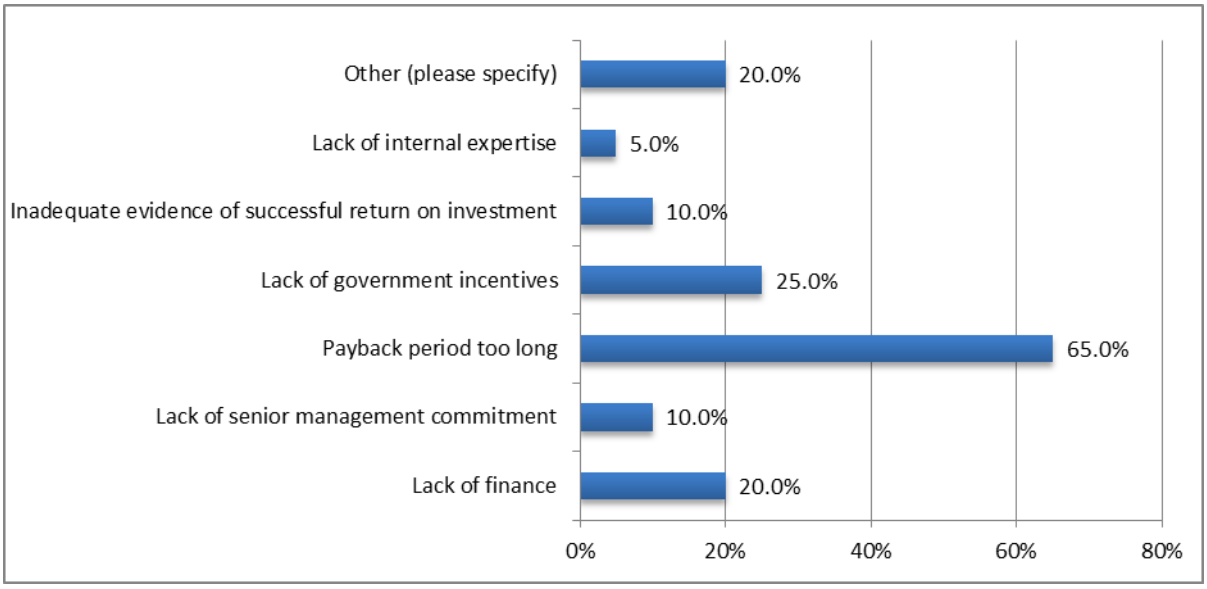
risky" and only 10% of respondents viewed energy efficiency projects as being "more risky". Such a result would further substantiate perceptions that energy efficiency is generally well established as a cost-cutting process within the steel sector, but that it is also subject to the standard investment criteria applied to all other core business projects. Therefore, energy efficiency would not be given priority for reasons other than those that are commercially related.

Figure 11. Survey question 27: What, if any, are the main barriers that your organisation faces when considering investment in industrial energy efficiency? Select up to three.



The issue of lengthy payback periods for energy efficiency projects was highlighted again in the responses from companies when asked if their organisation had previously considered implementing energy efficiency measures but not gone ahead with them for a particular reason. 67% of respondents replied in the affirmative to this question and, of those, 65% pointed to the length of the payback period being the reason, indicating that this factor is much more important than other possible reasons (see Figure 12).

Figure 12. Survey question 37: What was the reason that your organisation did not implement the considered energy efficiency measures?

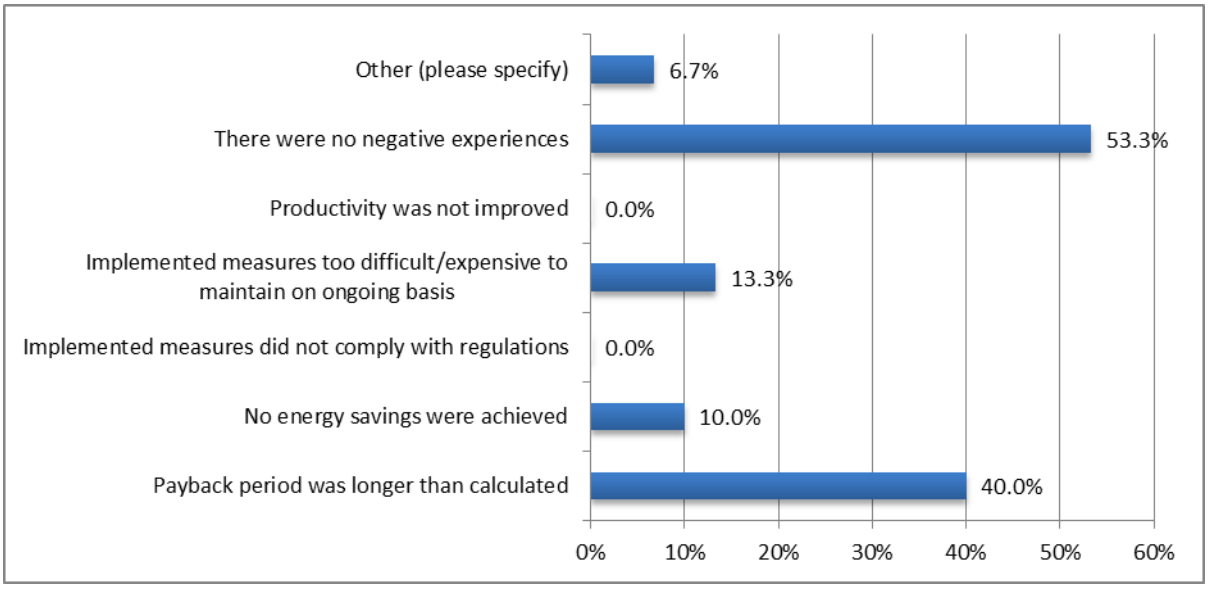


By and large, organisations have had a positive experience with their energy efficiency projects, with 53% of respondents stating that they had had no negative experience. In the cases where negative experiences were noted, the payback period was again an issue, with 40% of respondents saying that it had been longer than calculated (see Figure 13). Other negative experiences were not commonly cited, with only 10% and 13% of respondents, respectively, mentioning a lack of energy savings and ongoing difficulty with implemented measures as issues.

The survey also revealed that energy prices play a smaller role than what might be expected for such an energy-intensive sector – in terms of both driving and restricting energy efficiency projects (see Figures 7 and 11). This could be explained by the fact that organisations funding investments in new technologies with internal financial resources alone can typically do so only in times of expanding production or when equipment requires replacement. Under such funding conditions, energy prices tend to be a rather weak driver for investments in new technologies, which are instead more commonly incentivised by the potential to improve process and production.

Volatile energy prices can, however, affect the final payback periods of implemented energy efficiency measures. For example, a reduction in energy prices can negatively affect the original calculation applied to the payback period as the annual savings are automatically reduced by the lower energy price. Such an experience can lead to future uncertainty and thus, in turn, reduce further potential investment. This issue is in addition to the typical difficulty in aligning equipment suppliers' theoretical projections to the savings actually achieved onsite; and the impact of market changes.

Figure 13. Survey question 39: What, if any, were the negative experiences following your organisation's implementation of energy efficiency measures? Please select up to two experiences.



In regard to the last point, increased productivity during times of market expansion will typically lead to higher energy efficiency purely on the basis of increased capacity efficiencies (capacity utilisation rates, and more output for a given capacity that typically remains in operation over the entire business cycle means greater energy efficiency). However, when market conditions weaken, the subsequent lower level of production capacity will similarly lead to reduced energy efficiency, regardless of the type of implemented energy efficiency measure. Considering that such common factors are at play in the ongoing operation of a steel company, it is perhaps easier to understand why the only real negative experience that companies have with implemented energy efficiency projects is related to an inconsistent payback period.

5. Investment criteria for energy efficiency projects

The survey results, as outlined in the previous sections, show that, energy efficiency projects tend to be treated in a similar fashion to core business projects and that energy efficiency is clearly an established method for controlling costs within the steel sector. While this is a very good portrayal of the steel sector compared to the general manufacturing industry – which does not value energy efficiency projects in the same way (McKinsey 2011) – it does point to the disadvantage of applying a standard set of investment criteria to energy efficiency projects, as other benefits outside of energy savings could be excluded.

In addition to responding to the required set of survey questions, respondents were also invited to provide general comments on their experiences with energy efficiency. While most of those who provided additional information reiterated the important role that payback periods played in investment decisions for energy efficiency and core business projects, a number also mentioned that there is considerable opportunity to look at other savings potential outside of the normal energy efficiency project parameters. This feedback is in line with the ever-growing evidence that energy efficiency investments should be considered with a wider set of criteria than commonly applied in order to be able to evaluate all benefits – not just energy savings – arising out of energy efficiency measures (e.g. reduced maintenance costs, resource efficiencies and improvements in safety and quality).

The International Energy Agency (IEA) recently engaged in a comprehensive project that investigates the benefits (known as multiple benefits) outside energy savings, and their relative value, that should be

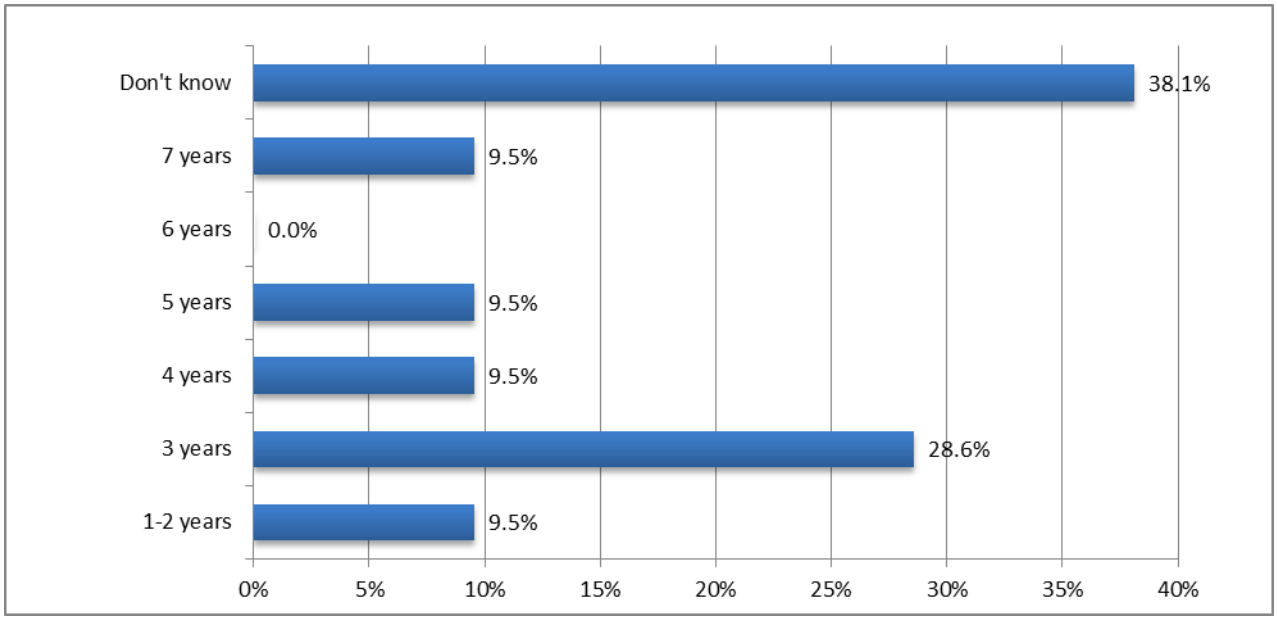
considered for energy efficiency projects. While the research to date has shown that the value of the productivity and the operational benefits derived from strategic energy efficiency measures can be up to 2.5 times the value of the direct energy savings, inclusion of these benefits within the investment criteria of an energy efficiency project is still not widely accepted or applied (IEA, 2014b). However, the relatively recent implementation of more innovative energy-savings strategies – such as standardised energy management systems – has seen energy efficiency projects progress outside the usual scope of activity through the identification of new ways to save energy. This has also provided a means by which other savings can be more easily established.

These points lead to the conclusion that the steel industry, while advanced in terms of applying energy efficiency within its core business strategies, could be applying an excessively restricted set of investment criteria for energy efficiency projects, specifically in relation to payback period calculations which might be more weighted towards energy savings than other potential, but indirect, financial savings.

Following the conclusion of the online survey, and based on the review of the interim survey results, a decision was made to gather additional information on how steel companies calculated payback periods for energy efficiency projects. With payback periods having been repeatedly identified as a key barrier to energy efficiency investments, three additional questions were sent to respondents. These questions were designed to glean information on the maximum payback periods of energy efficiency projects, whether the payback periods were based on energy savings only or also on other financial benefits resulting from energy efficiency projects, and, in the case of other financial benefits, what impact these had on the payback period calculations (see Appendix Q41–Q43 for full details).

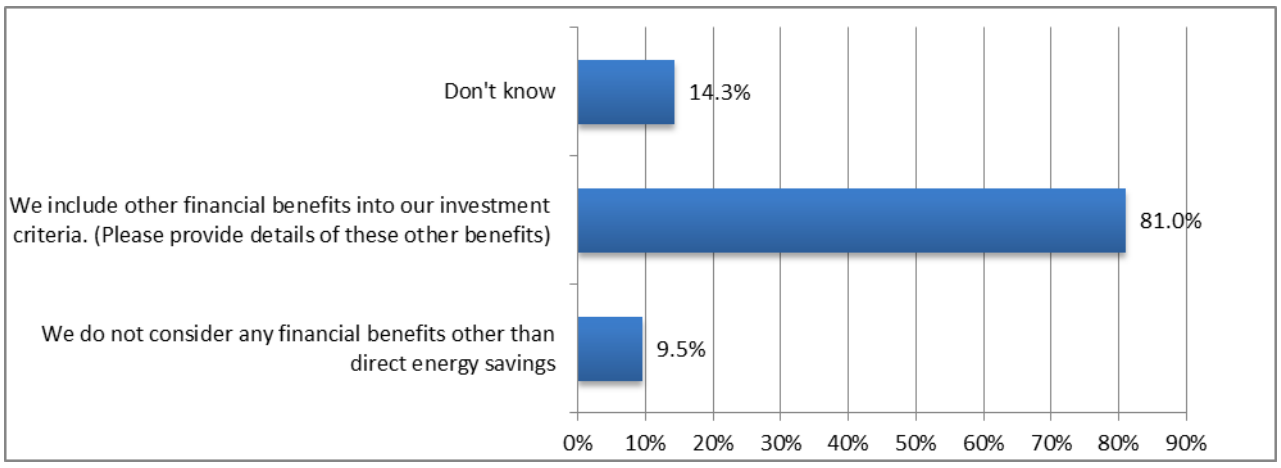
Twenty-two of the 30 respondents answered these additional questions, providing a relatively good perspective of how payback periods might be typically applied to energy efficiency projects. The majority of respondents said that the maximum payback period applied to its investment criteria for energy efficiency projects was three years (see Figure 14). However, some respondents also gave periods of between four and seven years, well above what one might expect. In addition, a number of respondents said that, for some projects, the payback period could be up to ten years. However, the latter would apply only in the case where investments were required anyway, such as, for example, in the case of the refurbishment of a reheating furnace where burners are replaced with more efficient units.

Figure 14. Survey question 41: What is the maximum payback period (in years) that your organisation allows for in its investment criteria for energy efficiency projects?



In an effort to determine to what extent companies incorporated other benefits into their investment criteria, the survey respondents were asked to elaborate on how their organisation evaluated their energy efficiency projects. Figure 15 shows that the large majority of respondents (81%) did in fact consider other financial benefits outside energy savings. When asked to detail examples of these other benefits, about a third said that the widest possible range of savings was considered. Other respondents cited quality, maintenance and productivity savings but, in a few cases, access to tax breaks and other government incentives were also noted.

Figure 15. Survey question 42: When applying investment criteria to proposed energy efficiency projects, does your organisation consider any other financial benefits beyond energy savings when calculating the return of investment (examples of other financial benefits are quality and safety improvements, reduced maintenance costs, better resource management, etc.)?



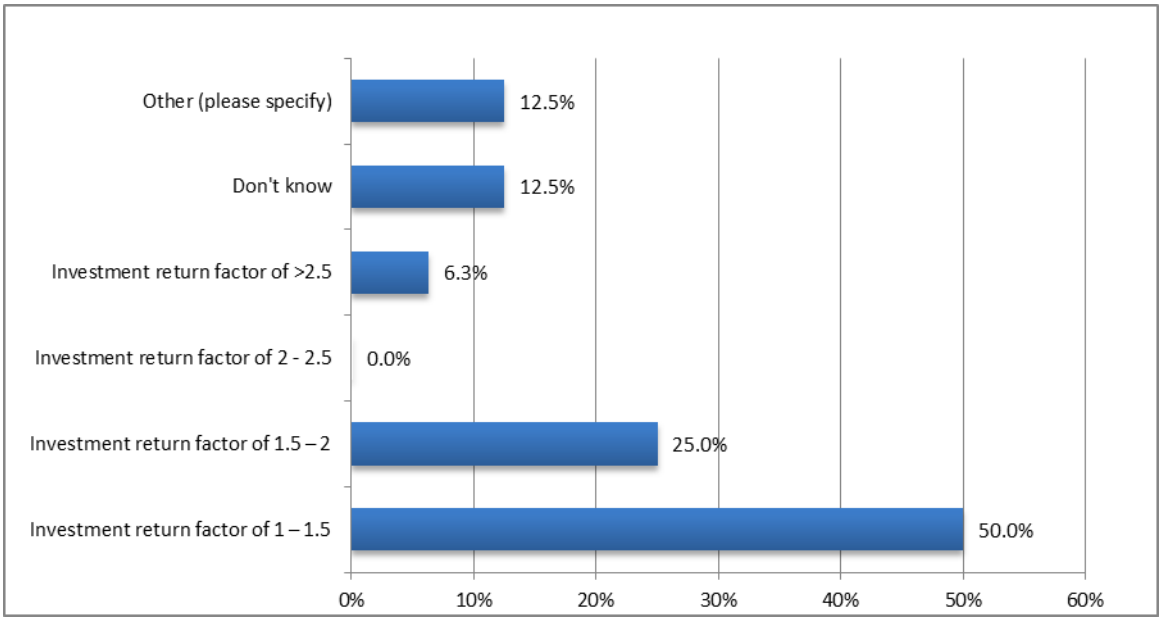
Respondents that said their organisation included other financial benefits outside of energy savings in their investment criteria were asked if they could assign a value to these benefits compared to identified energy savings (See Figure 16). The majority of respondents said that the value of these additional benefits was up to half as much as the value of the direct energy savings. A large number of respondents also stated that the value of the additional benefits could be sufficiently high as to match the value of the energy savings.

At first glance, these answers seemed to dispel the common assumption that only energy savings are evaluated for the payback period calculation. However, follow up many of the respondents revealed that they caveated their response to this question with a statement about how the additional benefits were very hard to value and that, due to the variance in project types, there was never a straightforward way to assess them. In summary, it could be determined that, while awareness of additional benefits was widespread, and even if as a result energy efficiency projects were often given added credence, ultimately it was generally unlikely that payback period calculations were more highly valued than standard energy savings.

Importantly though, these additional questions did demonstrate that the organisations involved in this survey were very aware of the potential of energy efficiency project benefits outside of energy savings and were open to considering their value wherever possible.

Figure 16. Survey question 43: If your organisation includes other financial benefits than energy savings when calculating the return on investment for energy efficiency projects, can you please give the additional factor of return that is calculated for these benefits?

For example, a factor of 1 is for when only energy savings are used to calculate the return of investment; a factor of 1.5 is for when other benefits make up an additional 50% of the savings that energy savings only would bring; a factor of 2 is for when other benefits make up an additional 100% of the savings that energy savings only would bring; and so on.



6. The influence of energy efficiency regulation

The responses received about the government regulation of energy efficiency were similar to the results of other industry surveys.[3] In general, the majority of respondents across all reviewed surveys and this OECD survey indicated that government regulation rated lower than cost control in being a driver for energy efficiency implementation, and even lower than corporate reputation. The low importance attached to the role of regulation may, of course, reflect a degree of strategic bias in the responses.

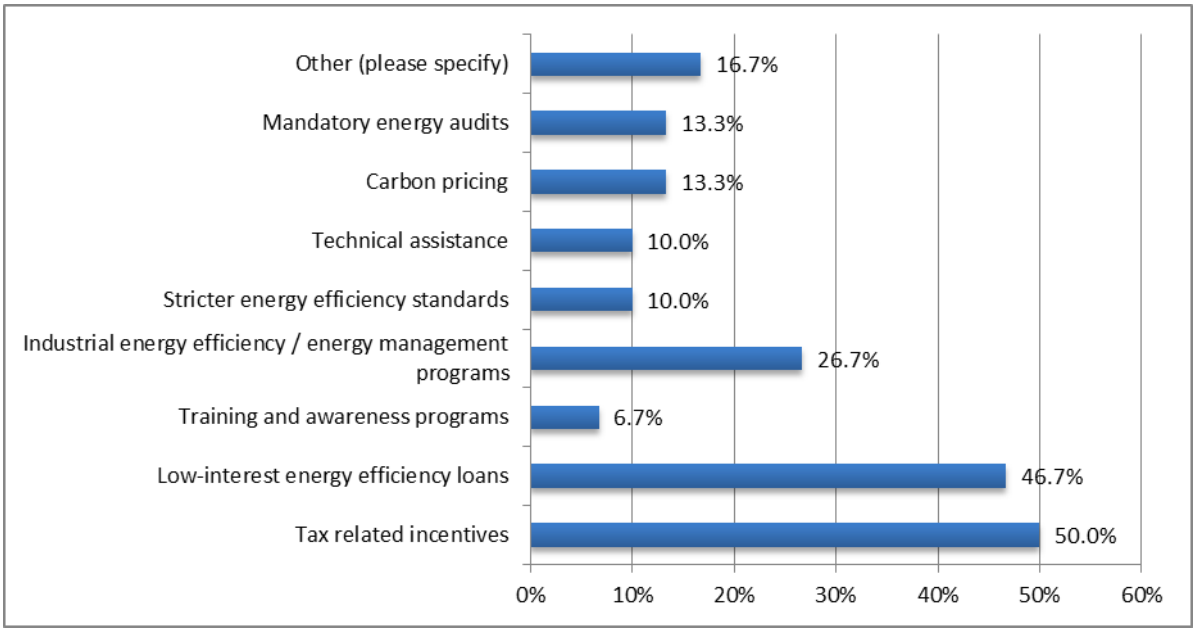
Even though 80% of respondents said that existing regulatory policies governing energy efficiency within the steel sector were either "stringent" or "somewhat stringent", the survey highlighted the relatively low influence of government regulation:

- Energy efficiency goals, which practically all surveyed organisations have in place, were only driven by government requirements in 17% of cases;
- All surveyed organisations have implemented energy efficiency measures but only 47% of these were implemented in order to comply with regulations; and
- Cost control is over five times more likely to be a driver of energy efficiency initiatives than government regulation compliance.

However, it must be also pointed out that this level of influence was dependent on the type of government policy in question. When organisations were asked which type of policy would have the greatest impact on improving energy efficiency for them, finance-related incentives clearly came out on top (see Figure 17). Anecdotal information obtained during the survey, as well as the respondents' additional comments on the online survey form, point to a common difficulty in accessing sufficient capital for specific projects. Therefore, when looking at the respondents' interest in finance-related incentives, it should also be noted it is likely to lie with financing mechanisms rather than direct subsidies. An example provided by one respondent was that the ideal scenario for government support would be in the form of shared investment. This would negate the need for a subsidy-based scheme but still require government input to provide access to required capital for projects that had a longer term return. Nonetheless, readers should note that a strategic bias also potentially exists with respect to the effects of different measures, with positive incentives ranked high and negative regulatory/mandatory constraints ranked low.

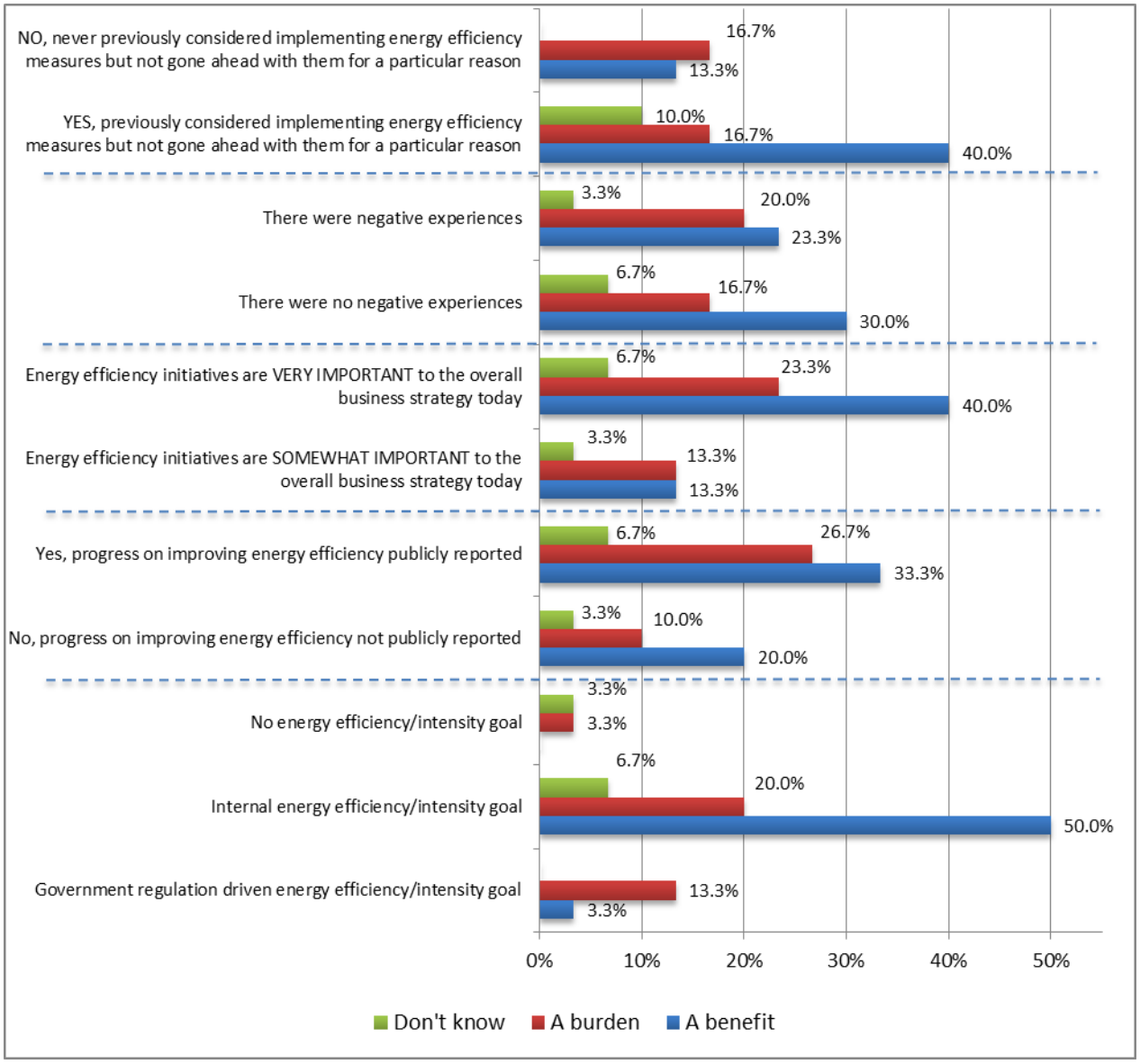
[3] McKinsey, 2011; Prindle and de Fontaine, 2009; ABB, 2011; EIU, 2011; Johnson Controls, 2013.

Figure 17. Survey question 19: Which of the following energy policies would have the greatest impact on improving energy efficiency for your organisation? Please select the top two.



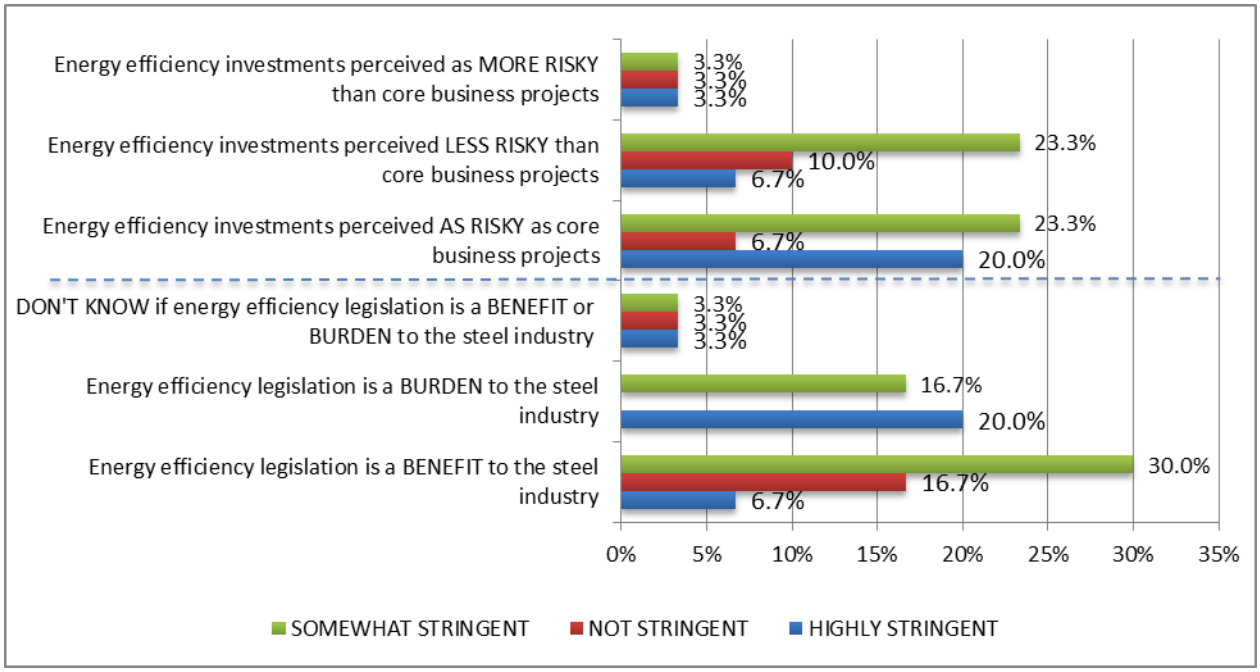
When asked if energy efficiency legislation was more of a burden or a benefit to the steel industry, 53% of organisations indicated that it was a benefit, and 37% noted that it was a burden. These results were compared to responses on experiences with energy efficiency projects and how energy efficiency was strategically approached by an organisation (see Figure 18). Overall, the outcome of this comparison correlates with the results from the previous sections – that is, organisations that perceive energy efficiency legislation as a benefit have typically had better experiences with energy efficiency projects and are more proactive in their strategic evaluation of energy efficiency.

Figure 18. Comparison of an organisation's opinion of energy efficiency legislation (benefit/burden) with their energy efficiency experiences and strategic approach to energy efficiency.



To investigate the impact of existing statutory and regulatory policies in the country where an organisation was headquartered, we compared these results with those relating to the risk perception of energy efficiency projects, and looked at whether energy efficiency legislation was considered a benefit or a burden to the steel sector (see Figure 19). In the case where statutory and regulatory policies where considered to be highly stringent, the outcome tended to be more negative, with respondents more likely to say that energy efficiency was perceived to be as risky or more risky than core business projects. In addition, for organisations headquartered in a country where they felt the policies were highly stringent, the general perception was that energy legislation was more of a burden than a benefit. The opposite was observed for those organisations based in countries where policies were not perceived as stringent.

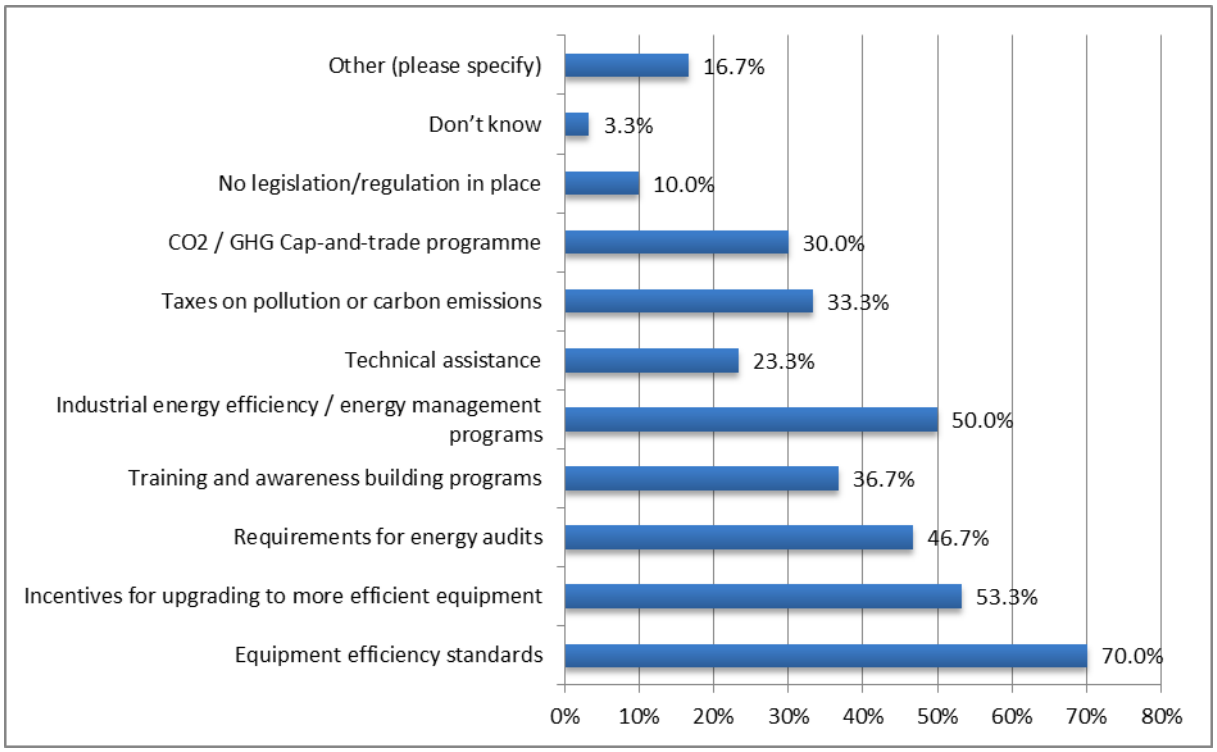
Figure 19. The effect of highly stringent, somewhat stringent or not stringent statutory and regulatory energy efficiency policies on the steel sector



In 2013, a study was carried out on 831 foundries in Europe to identify the barriers that that industry faced (Trianni, A. et al., 2013). The results obtained from 125 foundries indicated that the main barriers were a general lack of resources (i.e. time and capital) and the need to guarantee the continuity of business. These results are similar to those obtained by this survey and help explain how the issue of lack of capital can affect investment decisions for energy efficiency projects that could be considered worthwhile if the payback period were not too long. Reduced capital availability could mean projects with a longer term of return are side-lined simply due to a company's uncertainty about their long-term financial sustainability.

The OECD survey included a question on the type of statutes and regulations governments used to promote energy efficiency within the steel sector (see Figure 20). While the results indicate that policies that offer government technical and financial support are more or less on par with regulatory-based policies, the type of financial support commonly available to companies is not typically sufficient to address large-scale projects with long payback periods (OECD, 2013).

Figure 20. Survey question 18: In the country in which your organisation is headquartered, what types of statutes and regulations does the government use to promote energy efficiency within the steel sector? Select as many as required.



The results of the survey demonstrate that the steel sector is very proactive in energy efficiency implementation (see Sections 1 and 2), and that the reason energy efficiency projects are not always implemented is primarily related to the perceived lack of economic viability of the particular investment. Looking at these results in conjunction with the low level of influence that government regulation appears to have in driving investment in energy efficiency measures, it could be understood that government energy efficiency policies have limited relevance to the steel sector – unless they are financial incentives.

However, it is important not to be too simplistic in the analysis of these survey results. Government policies have played a significant role in the development of new and more innovative methods to achieve energy efficiency outside the normal scope of the steel sector's proactive energy efficiency activity. For example, systematic energy audits and standardised energy management systems – both of which are widely implemented by the steel sector (see Figure 10) – owe a lot of their successful application to government programs that have supported their standardised development and subsequent uptake by industry (IEA/IIP, 2012).

In addition, the complexity of energy efficiency projects – whether in terms of their technical differentiation from industry's core business activities or the need to apply a more detailed set of investment criteria – can make it harder for companies to obtain external funding from financial institutions. Government policies therefore remain important in terms of supporting the development of a more widespread understanding of energy efficiency measures amongst all the market players, such as financial institutions, and enabling easier access to external funding by way of financial mechanisms (IIP, 2012).

The results of this survey (statistical and anecdotal) show that the financial support that companies look for from governments is not typically in the form of subsidies, but rather a new way to access capital – whether through shared investment schemes or other similar non-subsidy-based mechanisms. An effective policy structure for the steel sector, in the form of both regulatory and financial policies, should therefore ideally be grounded in a comprehensive understanding of the industry's needs within each country, as well as the wider trends affecting a company's decision-making process for energy efficiency project investments. For example, many common policy measures can help improve payback periods for energy efficiency investments – from carbon pricing to tax credits for capital investment – but it is also important to emphasise the commercial viability of energy efficiency through policies that help companies improve their awareness of energy efficiency benefits outside just energy savings, and provide industry-standard tools to help measure them.

7. Conclusions

Overall, the respondents to the survey indicated that they were generally very engaged in energy efficiency practices – more so than would be typical for the average industry sector, including the manufacturing sector overall. While this might be partly a reflection of the sample of respondents, this can also be explained by the energy-intensive nature of the steel industry, where energy costs can be up to 20% of total revenue. The survey also shows that senior management in the steel sector is driving energy efficiency projects and that energy efficiency goals are embedded in overall business strategies.

Cost control was shown to be the primary driver of energy efficiency projects, with government regulation having a much lower impact in pushing the sector towards energy efficiency. With practically all respondents reporting an improvement to their bottom-line as a result of energy efficiency measures, there is also strong evidence that companies in the steel sector are proactive in finding new ways to continuously improve their energy savings, as evident by the energy management systems implemented in nearly all surveyed companies.

The majority of companies surveyed indicated that they had had no negative experiences with implementing energy efficiency measures. Those that had had a negative experience mostly stated that it related to a payback period that was longer than expected. It is the length of the payback period that dominates the list of barriers facing the sector.

While respondents in general demonstrated a good awareness of benefits beyond solely energy savings, there was not strong evidence that there was a systemic application of the true value of the other benefits in the calculation of payback periods. There is strong potential to investigate the potential to more comprehensively include the true value of various energy efficiency benefits in payback period calculations as this could also provide a means by which longer payback periods for energy efficiency projects could be accepted by companies.

As a whole, the steel sector appears to be implementing energy efficiency projects progressively and largely at their own initiative. In terms of policies that could have the most impact on the sector, it is suggested that financial mechanisms that support shared investment schemes (rather than subsidies) could help in the implementation of energy efficiency projects with long payback periods. In addition, policies that support innovation and the development of new tools (e.g. as demonstrated by the success of a standardised energy management system) will likely remain of considerable importance to advancing energy efficiency more progressively within the sector than would be typical in a purely commercial environment.

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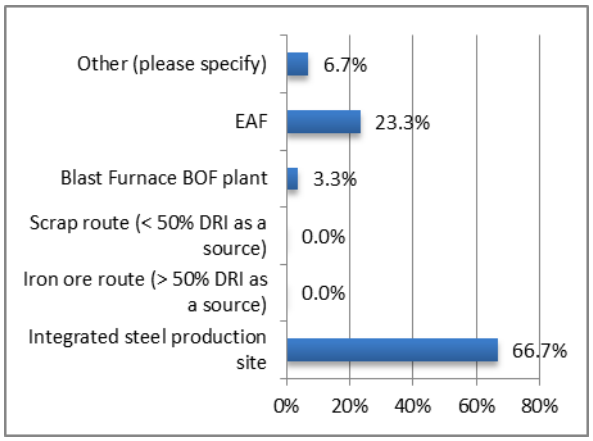
APPENDIX – LIST OF SURVEY QUESTIONS AND RESULTS

Survey part 1 - Basic details

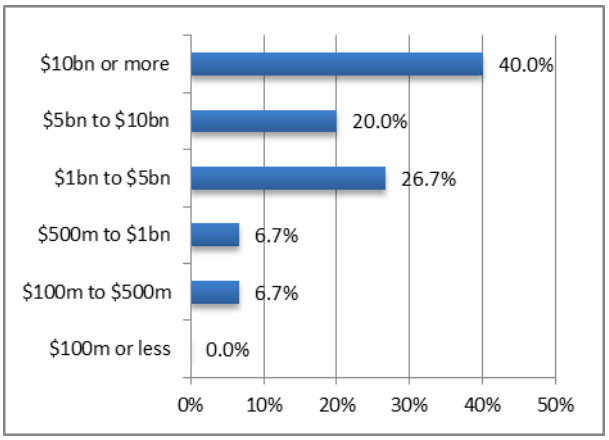
1. Organisation name:
2. Survey respondent name:
3. Survey respondent salutation:
4. Survey respondent title:
5. Survey respondent phone number:
6. Survey respondent email:
7. Survey respondent location:

Survey Part 2 – Background Information

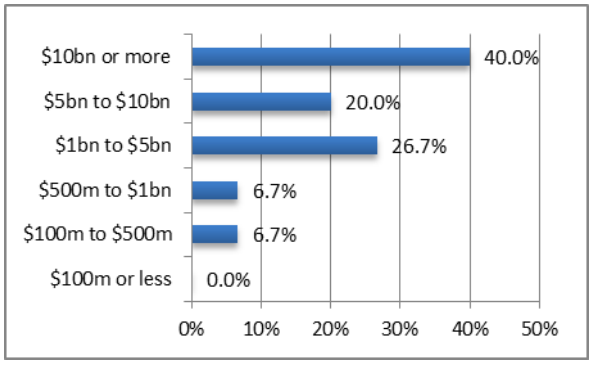
8. What is your organisation's primary steel production type?



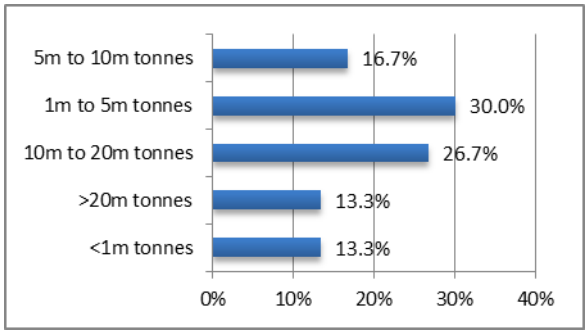
9. What is your organisation's global annual revenue in US dollars?



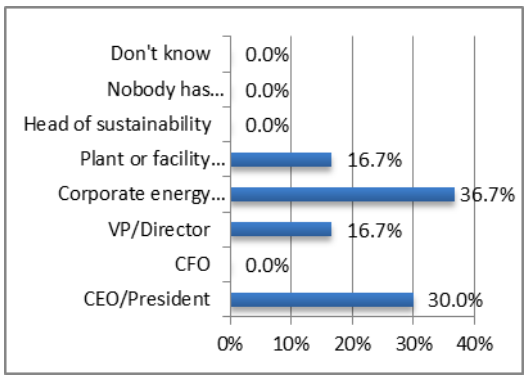
10. What is your organisation's total global annual production level (metric tons)?



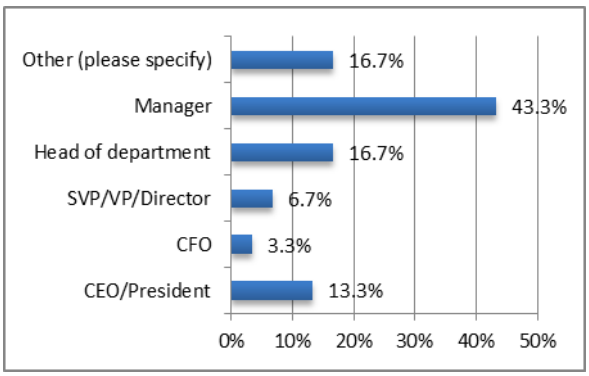
11. How many employees does your organisation have globally?



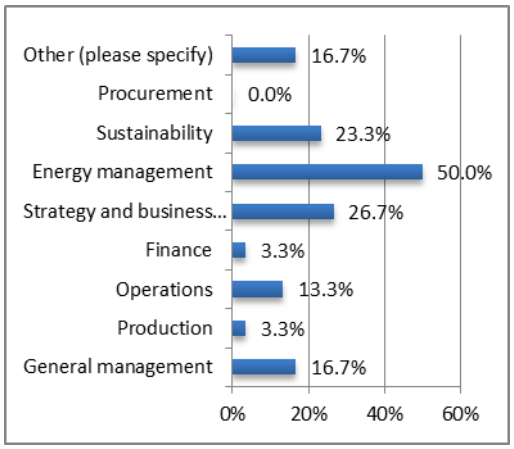
12. In your organisation, who is the lead person responsible for energy efficiency globally?



13. Which of the following best describes your job title?

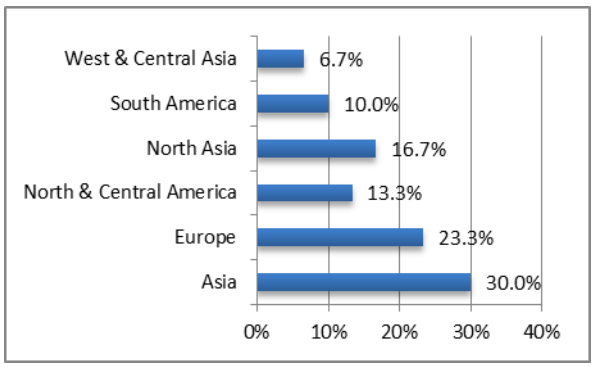


14. What are your main functional roles? Please select up to two

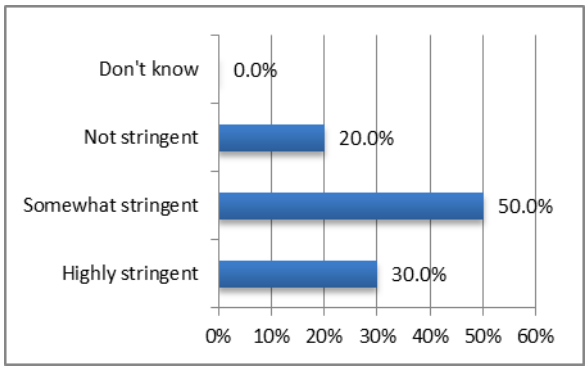


Survey Part 3 – Energy efficiency within your organisation's country

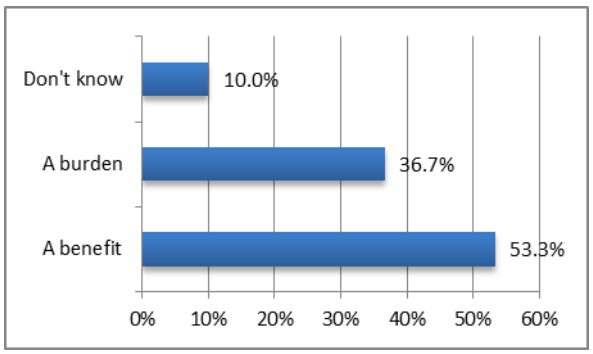
15. Where is your organisation's headquarters located?



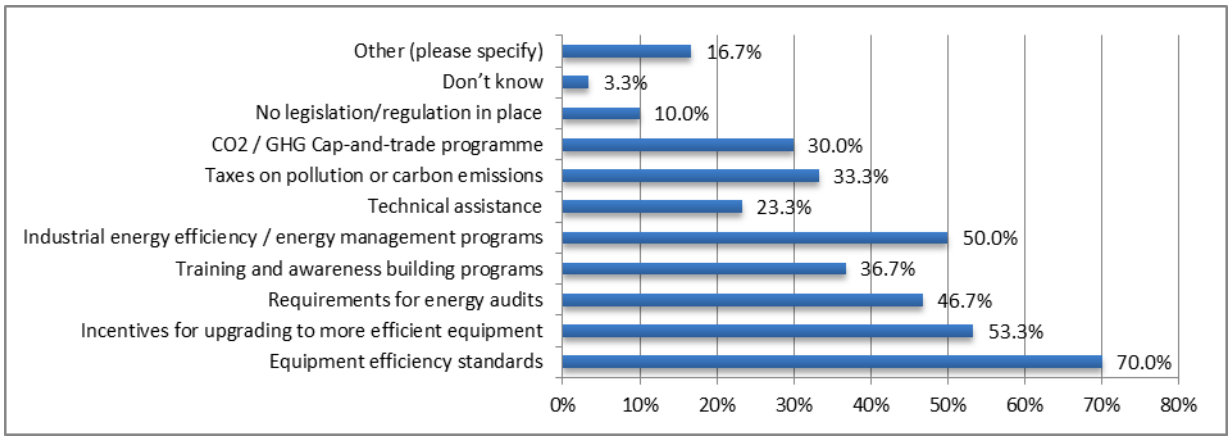
16. For the country in which your organisation is headquartered, please describe the level of existing statutory and regulatory policies governing energy efficiency within the steel sector?



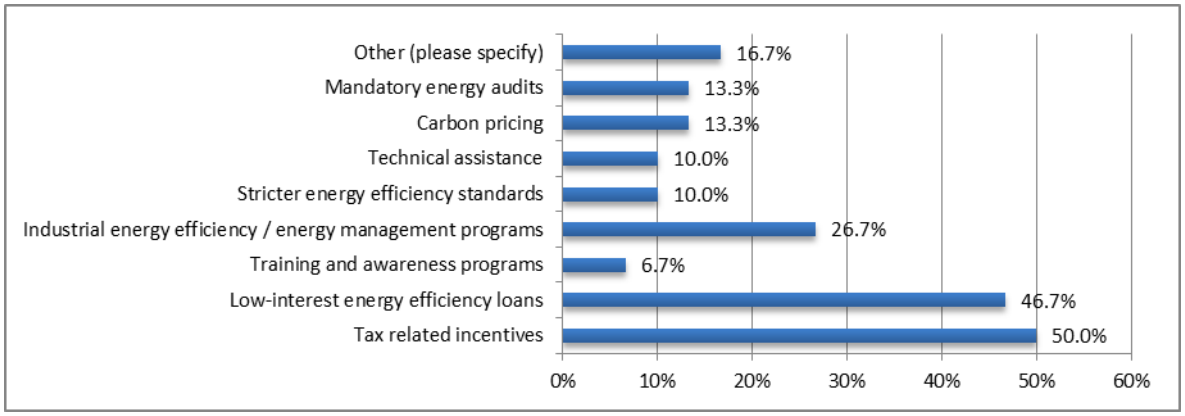
17. In your opinion, is energy efficiency legislation in the country in which your organisation is headquartered currently more of a benefit or a burden to the steel industry?



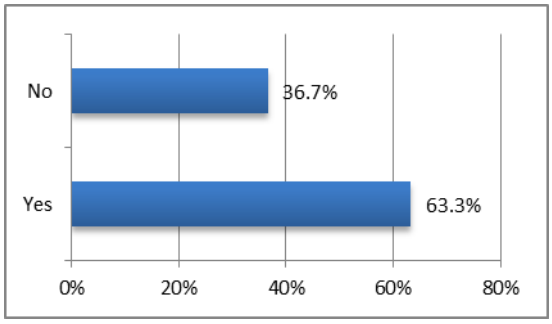
18. In the country in which your organisation is headquartered, what types of statutes and regulation does the government use to promote energy efficiency within the steel sector? Select as many as required.



19. Which of the following energy policies would have the greatest impact on improving energy efficiency for your organisation? Please select the top two.



20. Does your organisation have sites in countries other than where its headquarters is located? *(If yes, include Q21)*

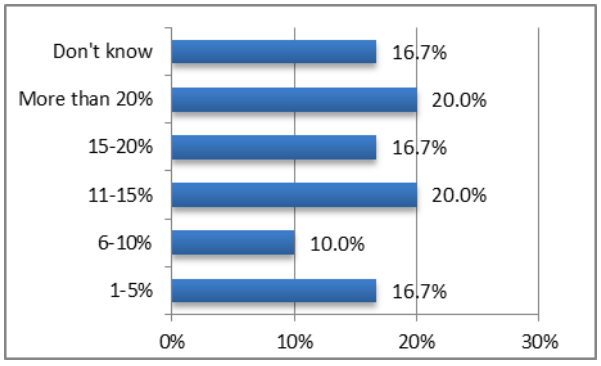


21. Please list the countries where your organisation has sites located:

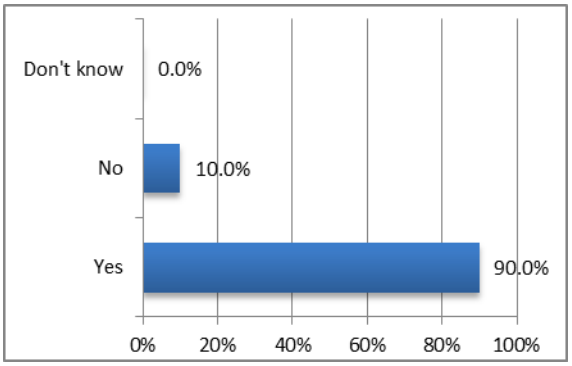
No Graph

Survey Part 4 – Energy efficiency within your organisation

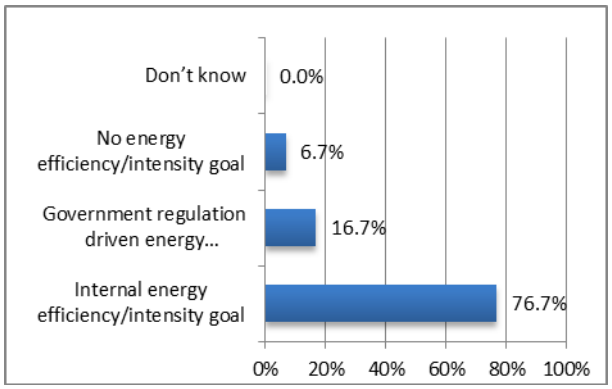
22. On average, what percentage of global annual revenue would your organisations global annual energy bill be:



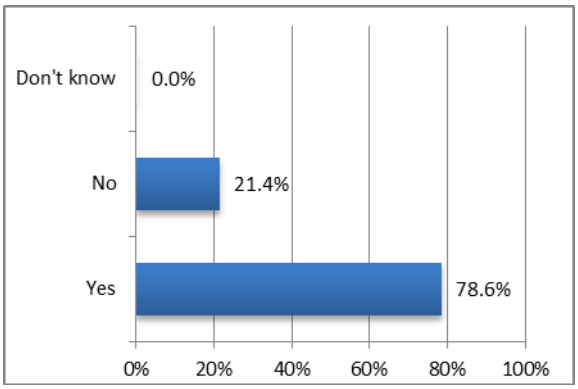
23. Are energy efficiency decisions (investment and/or strategy) made by the same people as core business decisions?



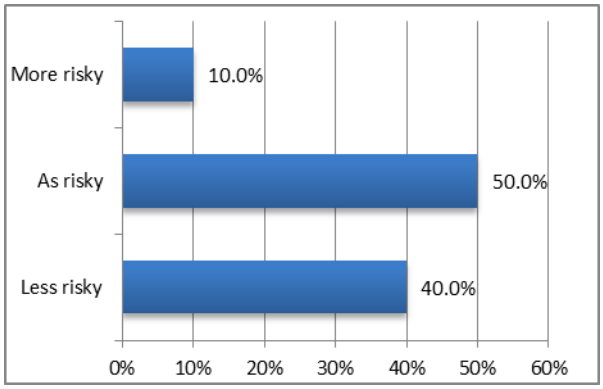
24. Has your organisation established an overall global energy efficiency/intensity goal? (If yes, include Q25)



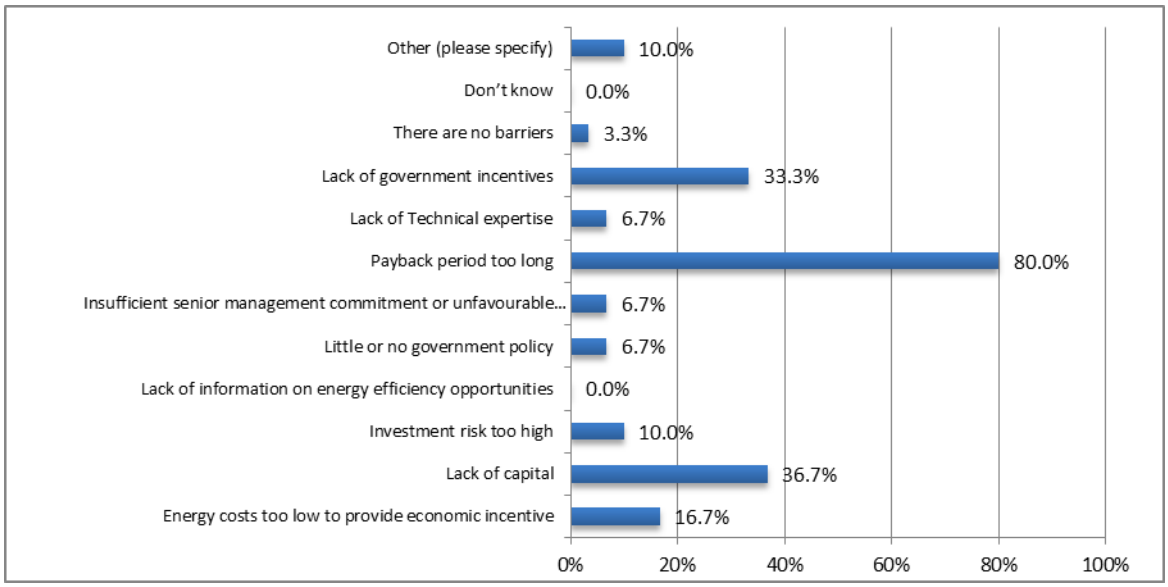
25. Are the goals for improving energy efficiency/intensity linked to annual business targets for the organisation?



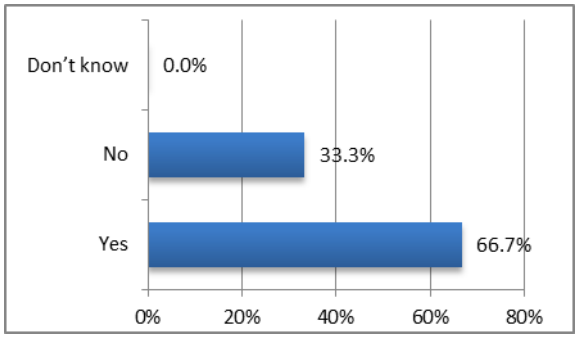
26. In your opinion, what is the perceived risk of energy efficiency projects compared to core business projects within your organisation?



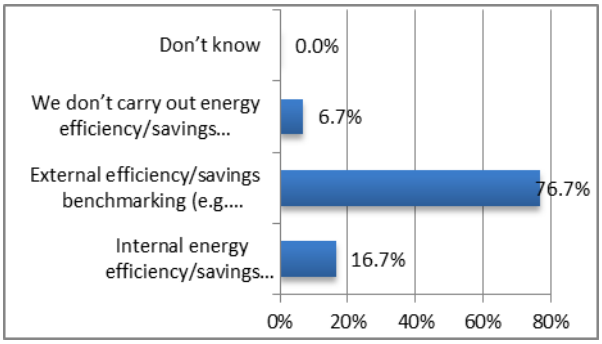
27. What, if any, are the main barriers that your organisation faces when considering investment in industrial energy efficiency? Select up to three.



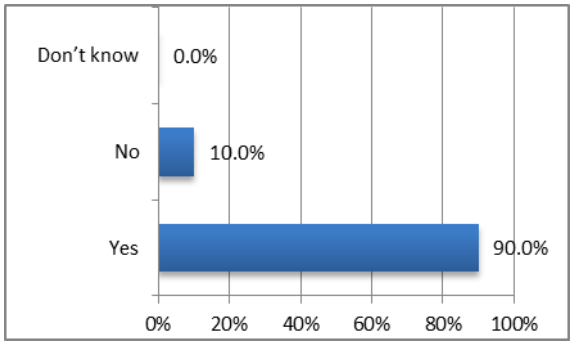
28. Does your organisation regularly publicly report its progress on improving energy efficiency, for example as part of its annual report?



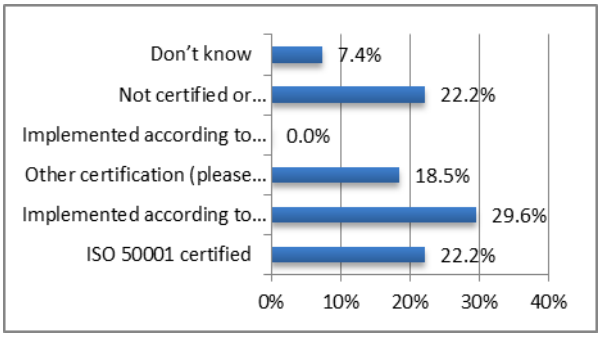
29. Does your organisation carry out energy efficiency/savings benchmarking across the steel industry to compare their performance?



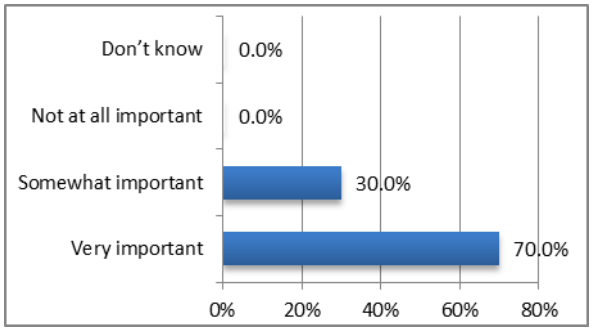
30. Does your organisation use energy management systems to track and optimize energy use? (If yes, include Q31)



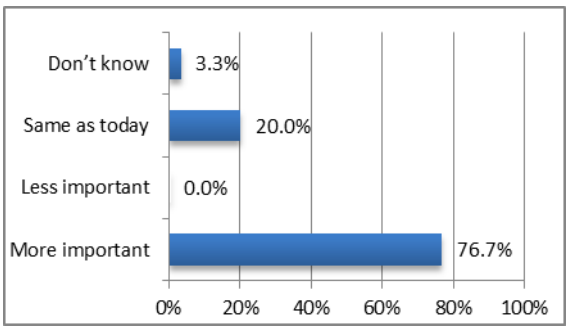
31. Is your energy management system certified or implemented according to a specific standard?



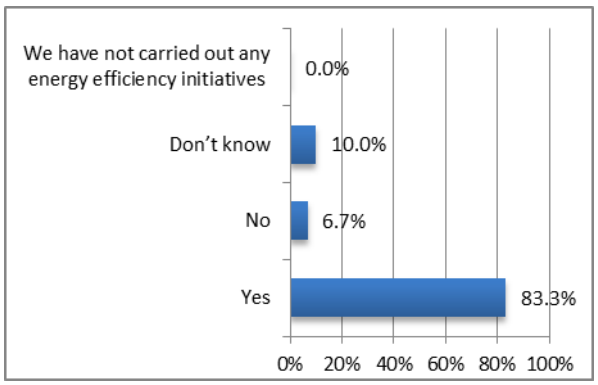
32. How important are energy efficiency initiatives to your organisation's overall business strategy today?



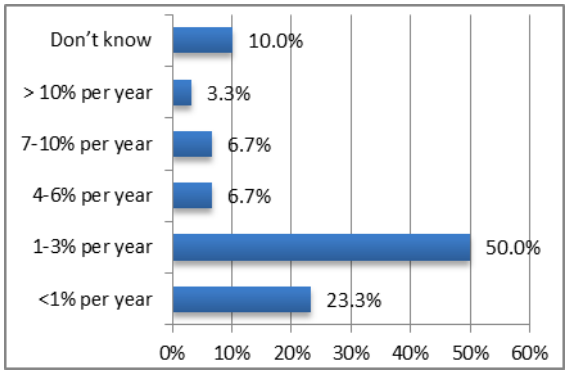
33. Five years from now, will energy efficiency initiatives be more or less important to your organisation's business strategy?



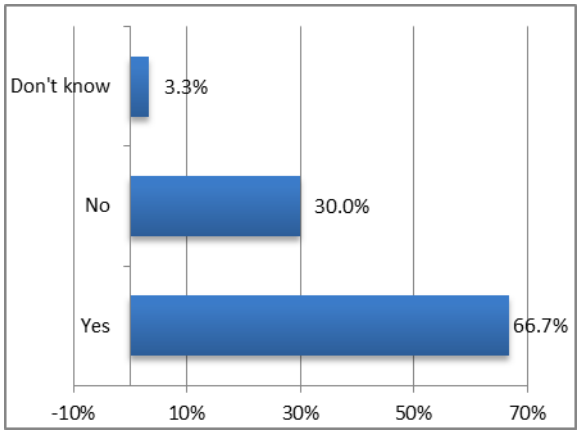
34. Have your organisation's energy efficiency initiatives helped improve the bottom line at your organisation in the past three years?



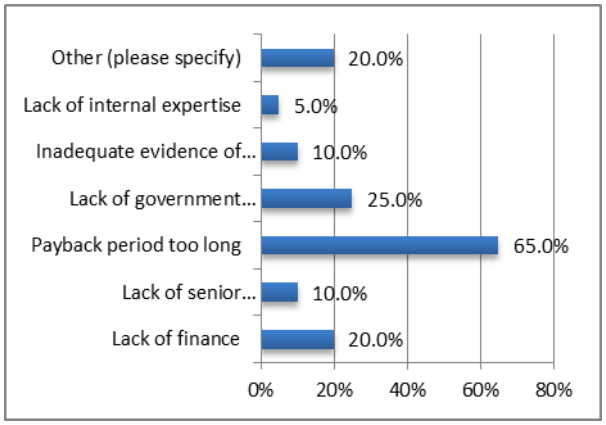
35. On average, how much of your organisation's annual energy bill would you estimate has been saved by energy efficiency measures on average over the past three years?



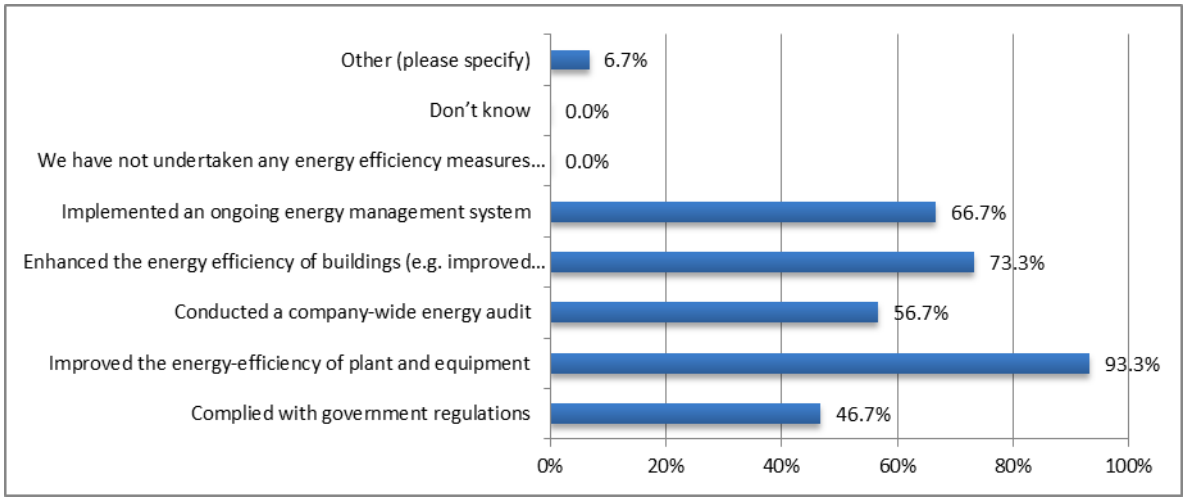
36. Has your organisation previously considered implementing energy efficiency measures but not gone ahead with them for a particular reason? (If yes, include Q37)



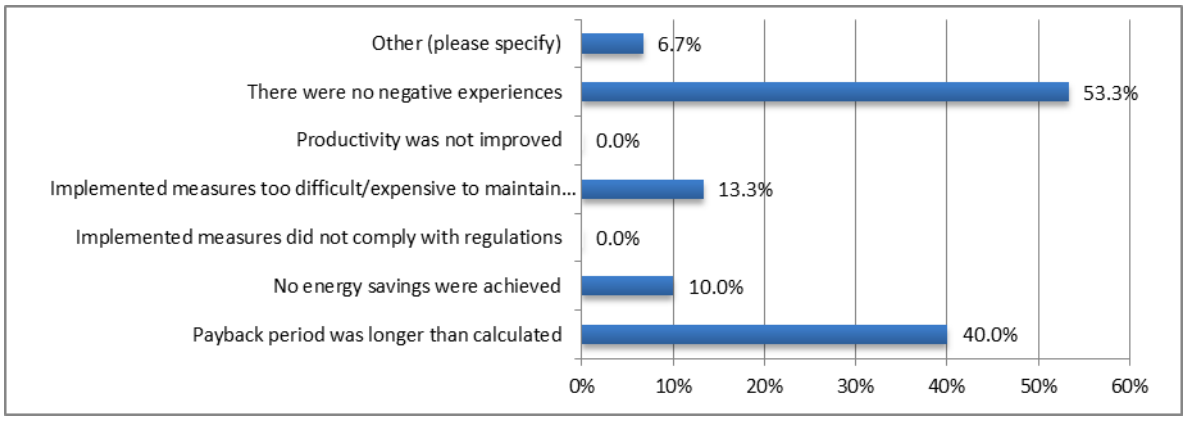
37. What was the reason that your organisation did not implement the considered energy efficiency measures?



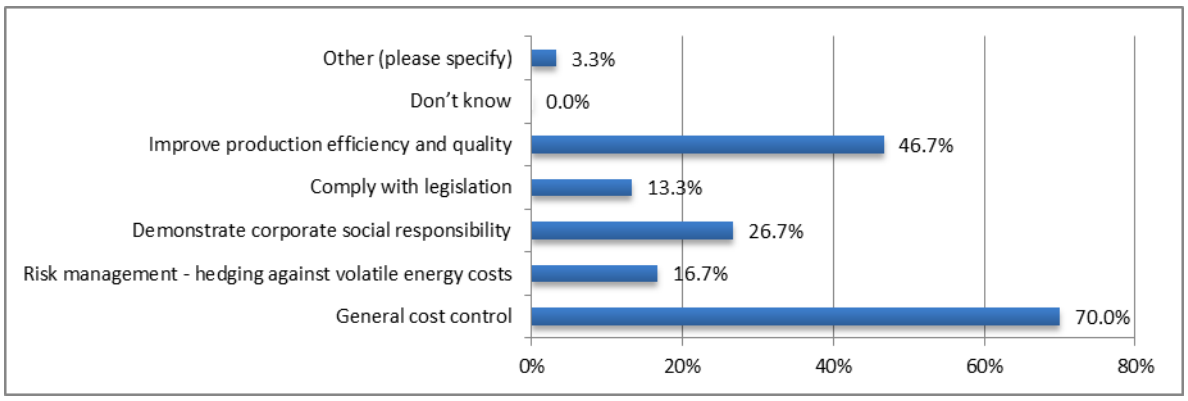
38. Which, if any, energy efficiency measures has your organisation undertaken within the past three years? Please select all that apply.



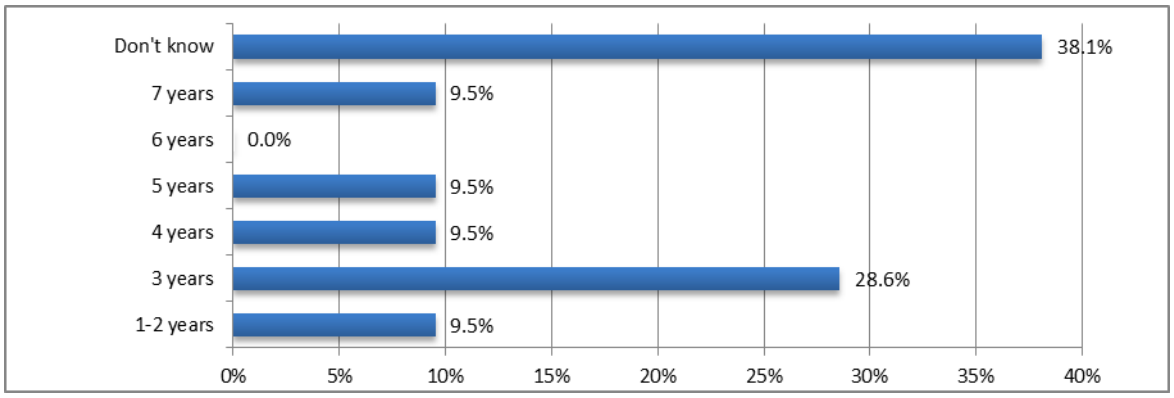
39. What, if any, were the negative experiences following your organisations implementation of energy efficiency measures? Please select up to two experiences.



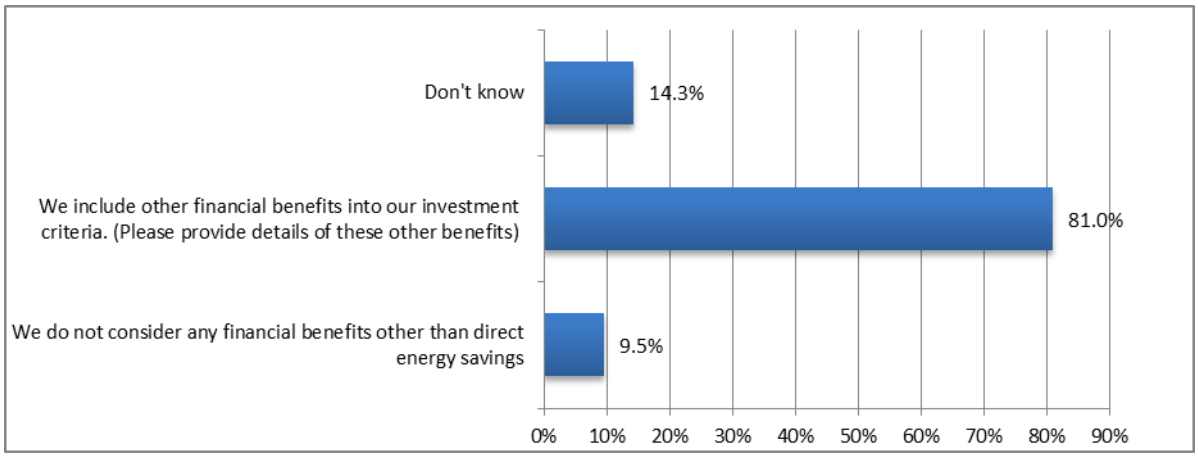
40. What are the main business benefits to your organisation from implemented energy efficiency measures? Please select the top two.



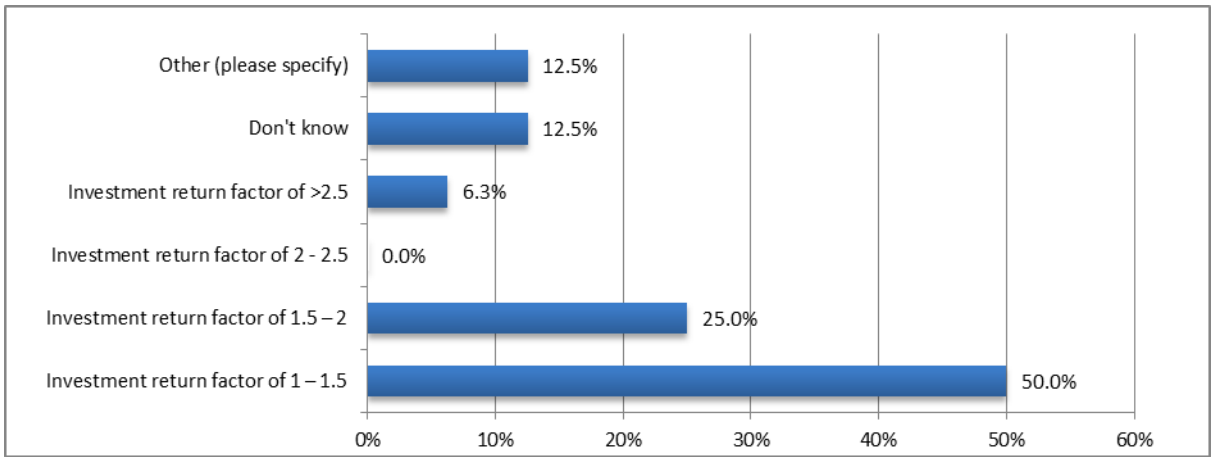
41. What is the maximum payback period (in years) that your organisation allows for in its investment criteria for energy efficiency projects?



42. When applying investment criteria to proposed energy efficiency projects, does your organisation consider any other financial benefits beyond energy savings when calculating the return of investment (examples of other financial benefits are quality and safety improvements, reduced maintenance costs, better resource management, etc.).



43. When your organisation includes other financial benefits than energy savings when calculating the return on investment for energy efficiency projects, can you please give the additional factor of return that is calculated for these benefits.
For example, a factor of 1 is for when only energy savings are used to calculate the return of investment, a factor of 1.5 is for when other benefits make up an additional 50% of the savings that energy savings only would bring, a factor of 2 is for when other benefits make up an additional 100% of the savings that energy savings only would bring, and so on.



Optional free-text questions:

44. What were the biggest successes your organisation observed in its energy efficiency initiatives?
45. What were the most significant setbacks or negative experiences your organisation observed in its energy efficiency initiatives? What didn't work and why?
46. What were the most important lessons learned since your company implemented or considered energy efficiency initiatives?
47. What are the largest ongoing challenges keeping your organisation from realising its energy efficiency goals?
48. In your opinion, which are the main steel production innovations that have the best potential for energy efficiency?