Energy Behaviour of SMEs in New Zealand

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Executive Summary

This project is part of the wider Energy Cultures 2 MBIE funded research programme examining energy in households, transport, and business.

The research aim of this project was to examine the highest impact opportunities for energy savings in SMEs in New Zealand. In order to do this a survey was completed to give some insight into current energy practices, material culture, and norms and attitudes. Therefore, the results are focused on the organisational level – to understand at the business level what energy means to businesses, how enterprises use energy, and what actions they are taking to reduce energy consumption. While only a small number of responses were generated from the many attempts to gain participants, the data was rich enough to provide some insights into energy and SMEs.

Q1. What is the current energy use in SMEs in New Zealand?

In terms of SME energy use participants in this survey indicated that:

- Most of their energy spend was on electricity and petrol.
- The main use for energy in their work place was for heating and cooling spaces which largely used electricity through heat pumps and plug-in heaters.
- Almost three quarters of participants had company vehicles (the median number of cars is 2) the majority of which are small trucks or medium and large cars.

Q2. What are the (perceptions of) attitudes towards energy usage in SMEs?

A series of questions asked respondents attitudinal questions regarding energy and overall results showed that they do not feel strongly either way about the posed questions. Around half of participants think they know what to do and have made changes to save energy. Other key points include:

- Most think that their energy and electricity bills are significant expenses.
- Three quarters of participants think that our society needs to reduce energy consumption, but only around half of participants think that they and people they work with need to conserve energy.
- This is probably explained by 50% of participants already having taken action to save energy.
- But also 83% are interested in new opportunities to save or profit from energy.
- The majority of participants (69%) indicated that their supply chain (customers and clients) were not concerned about their environmental commitment – however 31% of participants did think they were concerned.
Finally, and perhaps most telling was that nearly half of participants responding thought that they cannot control how much electricity they use and 50% responded that they would not consider changing the time of energy use in order to save money. These results indicate that respondents feel they do not have flexibility to change their operations for energy reasons. Overall, it would seem that respondents are finding energy as a significant expense; they are trying to do things to save energy and are interested in finding new opportunities to save energy, but do not feel pressure externally (other than cost) to change and are not feeling in control of how much energy they use nor how and when it is used.

**Q3. What are the main energy efficiency initiatives or energy savings currently being undertaken by SMEs?**

Overall, a variety of changes have been made by participating enterprises to save energy. Generally, the initiatives focus on reducing energy consumption through more efficient behaviours without any costs associated. This could be conceptualised as the first stage in energy efficiency and what is often termed ‘the low hanging fruit’. Although the comments from respondents also indicated a general ‘frugality’, that is that using excess energy was just not part of what is happening in these businesses – they are very careful about what they do and how they do it. Some enterprises however, had invested in technologies to improve efficiency. Others were embedding sustainability and energy efficient practices into their business processes, but these enterprises could be thought of as ‘niche’ in relation to the wider sample.

**Q3a. What changes are possible for SMEs to become more energy efficient?**

Scenarios regarding vehicle technology were provided to participants for responses to judge attitudes towards changing. The overall reaction to the purchasing of biofuels or EVs was even between those who would not consider and those likely although those very likely to consider outnumbered those very unlikely. In summary, from the responses to changing to EV or biofuels in company vehicles it would seem that change is not resisted but would be embraced if costs were the same or less. However, technologies have to be proven and have support before it would be seen to be ‘safe’ to make the change. At present there is considerable infrastructure around fossil fuels that make them ‘safe’ for organisations to adopt (this is often a taken-for-granted adoption) that is not seen to be present around ‘other’ technologies. Shifting norms and common sense adoption of technology can take time or be part of a normative disruption. There is an interesting space developing here and it will be interesting to see how change might occur.

**Q4. What are the key barriers to change for energy efficiency, and what would enable those barriers to become enablers?**

As expected from many of the comments throughout these results the largest barrier to developing energy savings programmes in these businesses that it is not seen as a priority. This is consistent with the apathy that was seen in the perceptions of energy
responses. However, it does not fit with the perception that the energy and electricity bills are seen by many as significant. That is, if it is something that is costing your business a significant amount of money then it should be a priority to take action. There are two caveats to this statement. First, many respondents feel a lack of control over the way in which energy is used in the business operations - therefore energy management programmes are not seen as a priority. Second, many respondents indicate being frugal in their business operations so maybe do not see the need for a management programme. These are speculations from the data and more research is needed to investigate these findings further.

The results of the survey provide a descriptive overview of the responses from a small number of SMEs in New Zealand. While the sample size was not large or representative it has however provided a slice of SMEs energy behaviour. The data has been further developed through a qualitative analysis to provide a conceptual map of the responses. This creates another perspective to understand the data. Four different perspectives on energy and the relationship with the business emerged and are described:

- Frugal
  - Not interested in energy but don't overuse
  - Switching off to save costs
  - Don't see relationship between energy and core business

- Do more with less
  - Not interested in energy but don't overuse
  - Developing ways to use energy more productively
  - Don't see relationship between energy and core business

- Integrate
  - Interested in energy consumption
  - Developing and investing ways to use energy more productively
  - Do see relationship between energy and core business

- Market it
  - Business built on being energy efficient
  - Investing in ways to use energy more productively
  - Actively build a relationship between energy efficiency and core business

Finally, there are many ways in which high impact savings can be made by SMEs. It is recommended that starting with an energy audit and management system would be essential. However, getting to the point of doing that is not as simple as it would seem as many businesses have more pressing issues to be dealing with. Therefore the report concludes by suggesting further research into triggers to encourage businesses to think about energy and the effect not being efficient may have on the productivity and profitability of the business operations.
Report structure

The report has been split into five sections:

- Section one provides the context for the report. It gives the background on SMEs in New Zealand and current literature.
- Section two outlines the research method for this project.
- Section three describes the results from the initial pilot case studies that helped provide information for the survey.
- Section four discusses the results of the survey in relation to the research questions. It provides the raw data but discusses them in relation to the questions.
- Section five concludes the report.
Section 1. Introduction: Setting the Scene

As background to the research this section briefly describes some of the key indicators of SMEs in New Zealand. It covers key statistics and research in the New Zealand SME area to provide the context for this study that is largely focused on energy and SMEs.

The SME in New Zealand

In New Zealand, there is no official definition of a small and medium enterprise (hereafter SME), though the general rule of thumb is that an SME is an enterprise employing less than 20 employees. Outside of New Zealand, there is also confusion, with varying definitions and units of measurement between regions. However, to be consistent with the unit of measurement employed by the OECD (i.e. the total numbers of employees) globally a SME is thought to be businesses employing 10-50 employees.

There are a number of key statistics and definitions used to describe the vast number of SMEs in New Zealand. These include: (Factsheets, MBIE, 2013)

- In February 2012 there were 469,120 enterprises in New Zealand & 1.93 million paid employees.
- Non-employing enterprises dominate, making up 68% of all enterprises.

Figure 1 shows the breakup of enterprises in New Zealand by employee number. Key, are the number of non-employing enterprises, and also those that employ 1-5 employees. By international standards, these enterprises are micro-sized.

This report largely focuses on SMEs in the New Zealand definition but does include
many organisations that fit within the global numbers. The analysis of the case studies goes beyond that to consider what any sized business in New Zealand is doing to become energy efficient. This is a product of a general lack of data concerning just SMEs and energy in New Zealand.

**Key facts about SMEs in New Zealand**

Figure 2 provides an overview of the key industries SMEs operate within. Note the large number of non-employing businesses in the service sector (see Figure 2). If employee numbers are considered up to 20 (our working definition of SMEs for New Zealand) then this covers all industries in a dominant fashion. Two industries stand out as not being being significantly above 90% SME and they are ‘public administration and safety’ and ‘education and training’. Despite the large number of SMEs, when the employee pay and GDP contribution are considered, the smaller number of larger enterprises start to show their domination as Figures 3 and 4 show – have a larger income per employee and contribute more toward GDP per employee.
Figure 3 - Average Total Income per Employee

Chart 16: Average Total Income per Employee (RME)

Figure 4 - Contribution to GDP by Number of Employees

Chart 5: Contribution to GDP by Number of Employees (March 2010 year)

Data source: Statistics New Zealand National Accounts 2010
Finally, smaller enterprises do not seem to survive as long as larger enterprises. On average, SMEs are younger than larger organisations too. Figure 5 illustrates the survival rates.

New Zealand SMEs occur across all industry sectors, and the resulting heterogeneity of these organisations is one of the key difficulties when researching and working in this sector. SMEs in New Zealand really are small enterprises - micro-sized by international definitions. They do not have the incomes of large employers and nor do they pay employees similar rates (in 2011 the average large enterprise paid on average NZ$55,000 whereas the SME paid an average of around NZ$40,000). These figures indicate the resource-constrained nature of the typical SME, which is an important point to consider when considering efficiency investments. In addition, the SME is also on average younger and does not survive as long - meaning that investing long term is going to be a more difficult decision. Hence, the two characteristics that need to be remembered are:

- Resource poor (people and money)
- Short term

Both of these are not conducive to thinking about aspects of the business that are not pressing or not a significant financial drain.

**Research on SME behaviour in New Zealand**

There is a relatively small level of research into the behaviour of SMEs. Despite the fact that New Zealand is dominated by small enterprises, they are not frequently singled out as a specific unit of study. As an explanation of why this is, Lewis, Massey and Harris (2007) identify a number of complexities from their research experiences in studying SMEs in New Zealand that include:

- Access to SMEs
- Attitudes of SME owner-managers to research
- Attitudes of the “purchasers of the research”
- Lack of an SME paradigm - meaning that there is an “absence of a widely accepted overarching or integrating framework” (Lewis et al, 2007: 154).

The practical complexity of being unable to easily access the central unit of analysis is
an issue - and has been for this research too. Their resource constraints and small employee numbers means that they are often unwilling to engage with any activity – including engaging with research – that might seem superfluous. However, SMEs are clearly an important area of study for New Zealand (Steenkamp & Kashyap, 2010) and as such it is important to continue to develop methods of studying them to understand more about these enterprises in New Zealand.

In the analysis of current literature, four key themes emerged about SMEs in New Zealand that are important for developing and understanding energy cultures in SMEs.

1. Tensions of the SME

One of the key themes from the literature on SMEs in New Zealand is the tensions involved with these enterprises. The key tension is that while SMEs struggle with finance and resources due to size limitations they can, through being smaller, also be more flexible, adaptable and responsive to environmental changes (Davenport & Bibby, 2010). Thus, there are advantages and disadvantages to the small size of the SME.

2. The entrepreneur or owner/operator

Unlike large organisations where the management can be diffused and organisation can be governed by an external board, the SME often simply has an owner/manager or entrepreneur making the key decisions and pushing the organisation (or not). For example, research into innovation and SMEs shows that the adoption of innovations & the level of entrepreneurial innovativeness and personality play an important role in SMEs (Radas & Bozic, 2009). Therefore often the focus is on the individual owner/founder as the key agent in terms of decision-making and innovation.

3. Innovation and SMEs

Furthermore when considering business innovation, SMEs “are considered to be the engine of economic growth and employment” (Radas & Bozic, 2009: 438) and are thought to do so through innovation. Innovation can be thought of as:

- Creating a new product or service
- Significantly improving a current product or service
- Designing a new or improved process in the enterprise.

Due to the cumulative number of SMEs in New Zealand, it is deemed important for them to be involved with the development of innovative products, services and processes.

4. Life-style businesses and comfort growth

To somewhat contrast the above research, studies into growth and the New Zealand SME show that the founder and owner may not always be interested in constant growth. Indeed, a generic model of growth for SMEs would not account for the
differing types of SME growth (Lewis, Massey & Harris, 2007). In their study of growth and SMEs in New Zealand Massey, Lewis, Warriner, Harris, Tweed, Cheyne & Cameron (2006) find that the growth model chosen is closely linked to the owner’s objectives. Therefore, if an owner is largely interested in lifestyle due to their personal circumstances, then that will largely dictate the way the business will grow and may lead to (intentionally) capped growth.

The above themes are important to consider when researching and working with SMEs. In particular, that frequently the owner/manager is running the SME, often by themselves, and they act as the crucial indicator as to how that business will operate, innovate and grow. This is important when considering energy use, investments in energy efficiency, and the embedded energy in goods and services - all measures that require resources, motivation and, crucially, time, to address.

Research on SMEs and energy/greening

Research in the area of SMEs and energy globally is scant. There is some work in the area of greening and SMEs (Brammer, Hoejmose & Marchant, 2012; Argon-Correa, Hurtado-Torres, Sharma & Garcia-Morales, 2008), but most focuses on reasons why SMEs currently do not green their organisation (Hillary, 2004; Jenkins, 2004; Gadenne, Kennedy & McKeiver, 2009) or what would drive SMEs to undertake greening activities (Williamson, Lynch-Wood & Ramsay, 2006; Studer, Tsang, Welford & Hills, 2008). One useful framework of the activities, carried out by organisations that engage in greening, is a result of research conducted by Banerjee (2001). The framework splits the level of organisational engagement into four levels of focus:

- Employee
- Manufacturing
- Corporate
- Marketing

Each involves relevant aspects of sustainability concerning the particular focus - eg employee looks at recycling, manufacturing at waste, corporate at the strategy and marketing at product stewardship (Banerjee, 2001: 38). The integration and adoption of the levels of focus largely depend on the context of the organisation and the resources available (Banerjee, 2001). Similarly, Argon-Correa et al (2008: 88) found that SMEs undertake a variety of strategies that bring together three key organisational capabilities: "shared vision, stakeholder management and strategic proactivity." While there is considerable heterogeneity within the SME sector and the greening activities that they carry out (Brammer et al, 2012) these framings are useful to think about how ventures may operate in a green way, where energy efficiency is one aspect of that greening.
New Zealand Energy Use

Every three years, a Statistics New Zealand survey is completed to understand energy use. The last survey was in 2012 and provides general data on energy consumption. Trends in energy use can be seen in Figure 6.

In 2013 energy use in New Zealand was dominated by both the industrial and transport sectors, with the transport sector rising to be the overall largest user of energy. While industrial energy use has dropped slightly commercial has risen over the past ten years on this graph. However, commercial energy use remains quite low in comparison to industrial use and it would be in this sector that many of the SMEs would fit.

Figure 7 depicts the key energy-related contributions to GHG emissions in New Zealand for the year 2011. As Figure 6 indicates though, it is the industrial businesses that are probably contributing to that the most. Understanding the actual impact of SMEs is difficult given the lack of breakdown, but if we do understand that there are a large number of SMEs in New Zealand, then the cumulative impact of them in New Zealand will be contributing reasonably significantly.
Current Work with SMEs and Energy in New Zealand

In New Zealand at present there are several agencies researching or working with SMEs or business and energy.

• One particularly useful study for this project has been the Building Energy End-Use Study BEES carried out by The Building Research Association NZ (BRANZ). This particular programme was interested in examining energy and water consumption in non-residential buildings to identify opportunities for increased efficiencies in these areas. The results that are currently being released are useful for this research programme.

• Other research is being carried out with larger enterprises (not SMEs) - e.g. Waikato University. In addition, every four years researchers from the Management school at Waikato have carried out a nationwide survey on sustainability in NZ enterprises. This was last carried out in 2010.

• EECA has been building up a number of case studies and energy efficiency ideas for business, plus has funding to help bring about energy change in business.

• Pure Advantage is also building up case studies of enterprises that have been active concerning energy and business operations.

• Sustainable Business Council (SBC) has long worked in the area of energy efficiency and business and has produced documentation to help their members reduce their energy usage. SBC tend to work with the larger sized companies in New Zealand.

• Sustainable Business Network (SBN) also has longstanding programmes in the energy area to help businesses conserve energy. SBN often work with SMEs and the fee structure is tailored to help smaller businesses to become members.
Some Local Government Authorities have been active in the energy area and developing case studies - for example Venture Southland and Christchurch City Council.

There are other groups that have been examining SMEs or business and energy use and these are included in the case study research in this report. However, to the best of my knowledge, there does not seem to be any other agency in New Zealand carrying out research investigating energy use in SMEs and understanding that in terms of ‘cultures.’ However, the list above indicates that this is an active area with a number of groups working successfully with enterprises to help them save energy.
Section 2. Method

To examine energy use, attitudes, and changes in SMEs and business in New Zealand, the research was multi-stage and involved mixed methods. Figure 8 shows the stages of the project.

**Figure 7 - Stages of the Project**

1. Pilot case studies
   2. Survey

Understanding energy use in business

The Pilot Case Studies

The first phase was a number of pilot case studies involving SMEs in Dunedin. Interviews were carried out with SMEs from different industries identified through firstly the type of industry and then if they were an SME, using the OECD definition of SME. The interviews were carried out by Sara Walton and Cle-Anne Gabriel, a Materials Flow expert. The industry categories were:

- Accommodation and food services
- Retail
- Tourism
- Manufacturing/assembly
- Food processing.

The actual businesses were chosen from lists of Dunedin businesses and were emailed with a follow up phone call. Many of the identified businesses did not want to participate. In total five SME businesses were involved in the study and the person responsible for the energy or the enterprise owner was interviewed. The interviews lasted about 20 minutes and then the energy consumption at the business premises was analysed in order to provide a preliminary overview of the energy consumption patterns of the company. The aim was to identify any aspects of the company’s energy consumption infrastructure that could be improved. This was achieved by
conducting a brief walk-around on the premises, taking note of the numbers and types of certain energy consuming equipment, machines and appliances and estimating their (1) energy consumption based on typical wattage and hours of operation as well as (2) estimated cost based on per kWh electricity rates. Participants were provided with a short report on their energy consumption and some ideas for reducing energy consumption.

The Survey

The second phase of the study involved a survey to identify energy use in SMEs throughout New Zealand. The questionnaire consisted of 42 questions (see Appendix 1), developed from conclusions from the pilot case studies, from collaborators’ work and literature in the field. The survey was completed online and used the programme “Qualtrics” to compile and administer the questionnaire.

The survey was designed in four parts, covering questions on: (1) energy use, (2) transport use, (3) energy efficiency initiatives, and (4) demographics. The first part of the survey asked key questions designed to give an insight into the main types of energy use in the enterprise, and in particular the technologies and fuel sources used for heating and cooling the premises. The second part explored transport in the enterprise, with questions about vehicle ownership, changes to the fleet, actions taken to reduce costs, fuel monitoring, and the possibilities of participants considering electric vehicles or using biofuels. The third part contained questions about energy efficiency in the premises, operations, and products and services. Finally, the fourth part consisted of questions designed to obtain information about the company status and total energy spend.

Survey participants were sourced in a number of ways. Organisations holding databases of SME details were contacted to see if they were willing to send a survey invite to their database. Councils and Economic Development Units were also contacted and asked if they had databases that they were able to use and if they were interested in knowing about energy consumption of businesses in their jurisdiction. Positive responses were gained from Southland, Auckland, and Dunedin Councils, but Wellington and Christchurch\(^1\) were non-responsive. In addition to these councils, Z Energy offered to send a survey invite to their database of businesses, and the “Sustainability Matters” fortnightly journal, sent to accountants and businesses, offered to include the link in their publication.

Survey participants were then recruited in a number of ways. Auckland and

\(^1\) Christchurch was also considered but due to earthquake disruption it was deemed to be difficult to survey the SMEs located there.
Southland Councils, Z Energy and Sustainability Matters included the survey link in a newsletter. The e-newsletter was in the text of an email but required participants to read the newsletter and click the link. Dunedin Council sent an email to their database, which included the link. As an incentive participants were offered the chance to go in the draw for an iPad mini and a draw was held at the conclusion of the survey. In total 180 usable questionnaires were returned.

One of the key difficulties in this way of using databases is a lack of control from the researcher’s perspective. This made it hard to manage the process and to send reminders (this was done in Dunedin and Auckland), personalise the letter, and know how many people had received the invitation. However, acknowledgment must go to the various groups who helped out and included the survey in various emails to their databases. Small business research has been noted as having particularly poor response rates (Curran & Blackburn, 2001).

**Summary of Method**

This study has involved the following empirical research in a study of energy use and patterns of energy change in SMEs/business in New Zealand.

- Pilot study of five organisations including energy audits
- Completed surveys from 180 businesses on their energy use.
Section 3. Results 1: Pilot Case Study Interviews

The five pilot cases were selected to span a broad range of industries (retail, accommodation, tourism, manufacturing, and food production) and size (3-43 employees). Whilst there was some variation in the source of their main energy use (the tourism operator used large amounts of energy on transport fuel, and manufacturer identified machinery as a key energy use), three of the industries (retail, accommodation provider, and food production) identified that their major energy use was in heating and cooling. Figure 9 explores the key findings in more detail.

![Figure 8 - Pilot Case Study Results](image)

<table>
<thead>
<tr>
<th>Org</th>
<th>Industry</th>
<th>No. employees</th>
<th>Energy use as total spend</th>
<th>Key energy use</th>
<th>EE measures</th>
<th>Future plans</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>Retail</td>
<td>3</td>
<td>Heating and cooling</td>
<td>None - new business and lease premise</td>
<td>Change lighting</td>
<td></td>
</tr>
<tr>
<td>b</td>
<td>Accommodation provider</td>
<td>4 PT</td>
<td>5% Heating</td>
<td>None - was in the process of selling. But cost as a barrier to do anything in the past.</td>
<td>Selling business</td>
<td></td>
</tr>
</tbody>
</table>
| c   | Tourism operator        | 9 in winter & 40 in summer | Fuel (92% of energy spend) then freezer | -Purchase of fuel efficient vehicles  
- Lighting  
- Everything examined for environmental impact. | Own property so changes constant. |
| d   | Manufacturer            | 43            | 1% Machinery               | - Full insulation  
- Installed heat pumps | Leased building and newly built so not much more. |
| e   | Food production         | 12            | Heating and cooling in production | None to date | Newly leased building and had changed energy as a result so not many planned changes. Also cited size of the company as a hindrance. |

It appears that despite some of the businesses being fairly large (40 and 43 employees; using the OECD definition of SME – up to 100 employees), they all considered their operations to be too small to accommodate major efficiency alterations. Additionally, while it is conceivable that all businesses may derive some
benefit (economic, procedural, or marketing) from the implementation of energy efficiency improvements, the cases studied suggest that the decision to implement such improvements depends largely on the direct benefit to their product or brand. Although the reality of the businesses was such that they tended to be lean operations in terms of energy usage – for example, two of the businesses, despite employee complaints, did not heat the manufacturing floor. One even joked that they would prefer to supply ‘merino underwear’ for their employees instead. Furthermore, after completing the energy audit we found that often what the managers had told us regarding energy use did not match the energy that was consumed. Usually it was more than they thought. Therefore this set of pilot interviews provided some useful learning for the survey development.

Conclusions and Learning for the Next Stage

There were a number of key points from this stage which assisted with the development of the survey:

1. **That SMEs are not particularly interested in examining energy use.**
   - It is going to be hard/impossible to get a high response rate

2. **That SMEs are probably already running the operations of the enterprise in an energy ’lean’ style.**
   - There is a need to find out if this is more widespread across SMEs

3. **That how the owner/managers see the energy consumption is not necessarily accurate.**
   - The survey may not be an accurate representation of energy use in the enterprise.
Section 4. Current SME energy use and attitudes: survey results

The survey was conducted to try and generate information on energy use in SMEs. The research questions are:

- What is the current energy use in SMEs in New Zealand?
- What are the (perceptions of) attitudes towards energy usage in SMEs?
- What are the main energy efficiency initiatives or energy savings undertaken by SMEs?
- What are the key barriers to change for energy efficiency and what would enable those barriers become enablers?

The survey was administered and achieved a very poor response rate (total 180 completed). This was disappointing but expected, for the reasons discussed in the section previous. However, the qualitative data generated from the few responses is consistent and plentiful, and is able to be analysed meaningfully to provide information on energy consumption of SMEs in New Zealand.

Respondents

In total there were 180 returned questionnaires that were able to be used (see Figure 10). The number from Dunedin was higher than the other locations and that was due to the survey method of direct mail. This data has a Dunedin bias and that needs to be noted especially with the qualitative data.

![Figure 9 - Participants by Location](image)

<table>
<thead>
<tr>
<th>Location</th>
<th>Number of responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auckland</td>
<td>39</td>
</tr>
<tr>
<td>Dunedin</td>
<td>132</td>
</tr>
<tr>
<td>Southland</td>
<td>5</td>
</tr>
<tr>
<td>Random</td>
<td>4</td>
</tr>
<tr>
<td>TOTAL</td>
<td>180</td>
</tr>
</tbody>
</table>

Industry

129 organisations identified which industry/industries they belong to (see Figure 11). The numbers total more than 129 as the business could belong to more than one industry. The four most common industries were:

- Manufacturing
- Professional, scientific, and technical activities
- Accommodation and food service activities
- Information and communication
Business life-cycle

Of the 125 organisations that specified where they were in the business life cycle, nearly half described themselves as ‘established’ (see Figure 12). When you combine the ‘mature’ category on 20%, two thirds of the respondents fit into either of these 2 categories. The number of start-up or seed companies was low, with only 7% of the respondents falling into either of these categories.

Turnover

Judging by the responses illustrated in Figure 13, the turnover bands offered may have been too low, as there were few responses in the lower bands, but the highest frequency of responses was in the $1,000,000 and above category.
**Geographical scale of the business**

Of the 124 organisations that provided their geographical spread (see Figure 14), 57 were regional only, with the rest of the companies evenly split between national and international at 35 each.

*Figure 13 - Participants by Geographical Spread of Business*

*Figure 12 - Participants by Turnover*

**Research Questions**

This section presents the results from the survey in relation to the research questions for the survey.

"Regional", "National", "International" labels on the bar chart show the distribution of respondents according to the geographical spread of their business.
1. What is the current energy use in SMEs in New Zealand?

Questions were included in the survey that asked participants about the energy use in general in their workplace. These questions asked participants about their energy related expenditure, their main energy consuming activities, and their heating and cooling technologies and sources. Figure 15 shows how much the surveyed SMEs spend on various forms of energy.

![Figure 14 - Energy Spend of Enterprises Per Annum](image)

Figure 15 also shows the number of businesses that spend a certain amount on energy; these are indicated by the y-axis. The majority of money is singularly spent on electricity, followed by transport fuel – diesel and petrol. In both of these, the majority spend under $7500 per annum. However, electricity has another spike in the largest bracket too, between $30-50,000. One participant noted spending $100,000 on electricity, $60,000 on gas and $80,000 on transport fuel. This was the largest energy spend of the participants.

Participants were asked what uses the most energy in their workplace. There is quite an even split between machinery and appliances but with space heating/cooling being the largest use of energy (see Figure 16).
Questions were included to understand the key aspects of space heating and cooling as frequently these involve significant energy usage. Figure 17 indicates that electricity is the dominant source of energy for space heating and cooling, as the following figure illustrates. ‘Other’ includes wood pellets and wood and note the minimal use of coal.

Figure 15 - Key Energy Uses

Figure 16 - Key Energy Source in the Organisation
In terms of the technology used to heat/cool spaces, heat pumps are the single dominant technology (see Figure 18). Other sources listed by participants included: wood pellets burners, wood burners, fan, oil, radiant or portable heaters and passive solar. The majority of responses in the other category were some form of electric plug-in heater.

**Transport**

Of the 163 respondents who answered the question about having company vehicles, 114 (71%) answered that they did have them. The average number of company owned vehicles is 5.3, but this is skewed due to a few respondents indicating that they have a large number of company vehicles. A more useful indication may be the median, which is 2 cars. Figure 19 indicates that there are a variety of different types of vehicles in use.
Summary

In terms of SME energy use participants in this survey indicated that:

- Most of their energy spend was on electricity and petrol.
- The main use for energy in their work place was for heating and cooling spaces which largely used electricity through heat pumps and plug-in heaters.
- Almost three quarters of participants had company vehicles (the median number of cars is 2) the majority of which are small trucks or medium and large cars.

2. What are the (perceptions of) attitudes towards energy use in SMEs?

To capture perceptions of energy and energy use a number of questions were asked using a Likert scale to try and understand attitudes towards energy use. The results of this part of the survey are depicted in Figure 20; all figures are percentages across the respondents.

![Figure 19 - Attitudes towards Energy Use](image-url)
Of note:

- 54% think that the organisation has done a lot to reduce energy consumption.
- 52% agree or strongly agree that they know what to do.
- 83% agree or strongly agree that they are interested in new opportunities to save money or profit from electricity.
- 59% of participants agree or strongly agree that the energy bill is significant expense - but still over one quarter of participants disagree, but there is no discernible pattern to those who agreed or disagreed with this statement.

Furthermore, 77% agree and strongly agree that they are interested in changing the way they use electricity if it reduces the bill. The data contains indications that national and international companies, companies with higher turnovers and companies whose energy bills are a higher percentage costs of operational costs are slightly more interested, but the sample is too small to state this with certainty.

In terms of the changing the time of use of energy, greater numbers of participants disagree and strongly disagree. Therefore there does not seem to be an appetite from these respondents to change the time they use energy. This is probably not surprising for dominant business hours dictate the times of use and often cannot be easily changed.

Finally, there are in the responses to most questions large numbers in the middle of the scale - i.e. that neither agree nor disagree. This can be read in two ways. First, that this group of respondents are undecided about the question and have maybe not given energy much thought or do not understand the question. Second, maybe this group of respondents do not care much about energy - it is just not a concern for them. As such, they could be ambivalent about the questions and just marked the mid-point. In considering the responses throughout the survey there is evidence of the latter reading - that perhaps participants are just not interested in energy issues.

**Summary**

These questions have provided some useful data from SMEs. First, there are a large number of responses (on average just under one quarter – 24.33%) in the middle of the table/scale indicating that there is a reasonable amount of apathy for the concept of energy amongst respondents - they do not feel strongly either way about the questions. Around half of the participants think they know what to do and have made changes to save energy. Other key points include:

- Most think that their energy and electricity bills are significant expenses.
- Three quarters of participants think that our society needs to reduce energy consumption but only around half of participants thought of themselves and the people they work with as needing to conserve energy.
• This is probably explained by 50% of participants already having taken action to save energy.
• But also 83% are interested in new opportunities to save or profit from energy.
• The majority of participants also indicated that their supply chain (customers and clients) were not concerned about their environmental commitment – however 31% of participants did think there were concerned.

Finally, and perhaps most telling was that nearly half of participants responded that they cannot control how much electricity they use and 50% again responded that they would not consider changing the time of use in order to save money. These results indicate that respondents feel they do not have flexibility to change their operations for energy reasons. Overall, it would seem that respondents are finding energy as a significant expense, they are trying to do things to save energy and are interested in finding out new opportunities but do not feel pressure externally (other than cost) to change and are not feeling in control of how much energy they use nor when it is used.

3. What are the main energy efficiency initiatives or energy savings currently being undertaken by SMEs?

Participants were asked what energy actions they had taken. The question was scaled for participants to respond with options of either full, partial or none to the various actions, plus a freetext ‘other’ section. The results in Figure 21 depict responses to both partial and full combined. It indicates both the action taken and the number of participants undertaking that action.

*Figure 20 - Energy Efficiency Actions Currently Undertaken*
It would seem that insulation is clearly the energy efficiency action that has been most undertaken by this group of respondents. However, also interesting in these responses is the large number of businesses changing to LED lighting. The initial financial outlay for LED lights is expensive but the return on that investment is usually not a long period of time. Nearly one third of the participants have made this change.

Participants were also asked to describe physical and behavioural changes they have undertaken in the past five years to embed energy efficiency in their products and services. Responses to these questions in free text were wide ranging, however dominant themes emerged from the data. These are grouped according to the question asked:

- Physical changes
- Behavioural changes
- Production process changes
- Changes to the product

**Physical changes to save energy**

In total 117 participants responded to a question on the physical changes they had made and described these changes. The most popular responses have been grouped into two key areas (see Figure 22).

<table>
<thead>
<tr>
<th>1. Replacing technologies</th>
<th>Replacing technologies was a popular response with heat pumps replacing other forms of heating/cooling and LED lights being the most frequent technology to be installed.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Adding insulation</td>
<td>This theme from participant comments encompassed all the actions that were taken to insulate premises in any way - either floor, wall or ceiling and double glazing the widows. One participant mentioned having triple glazing; another had installed a moisture barrier.</td>
</tr>
</tbody>
</table>

While there are two themes listed in Figure 22, the most common change mentioned in this section was ‘switching off,’ however we would see this as more a behavioural change than physical change. Therefore, as it was also mentioned frequently in behavioural changes it is included as a theme there.

SMEs occupying rental properties had particular difficulties in making any physical changes to the premises. For example, comments from those who were renting indicated: “no changes as it is an old concrete building and the Landlord will not do anything” and “we rent an office in a listed building - so old and cold”. Such issues with renting are consistent with residential renters too and also with results from the earlier mentioned BRANZ funded study that found those leasing or renting premises found it hard to encourage the building owner to make any energy efficient changes.
The upfront cost of taking action was raised by some participants either directly or indirectly. One participant stated that “when considering investment we are presently only investing in items that increase productivity as we don’t have the financial flexibility to do both”. Another similar comment was “they all cost too much to install”. Perhaps the most quirky comment came from a Dunedin participant - “wear more clothes in winter”.

Other changes included power factor correction (4 enterprises), reducing server hardware, installing heat recovery and installing gas water califonts. Overall, there were a variety of physical changes that had been made, but from reading through the comments, the most commonly cited change was LED lighting. It was striking that the physical changes are not more substantial.

**Behavioural changes to save energy**

A total of 124 comments were made to the question on behavioural changes. They were varied but have again been grouped into three key areas as seen in Figure 23.

![Figure 22 - Behavioural Changes to Save Energy](image)

<table>
<thead>
<tr>
<th>1. Switching off</th>
<th>While many statements were made about switching off appliances in the physical changes they were also made in the behavioural changes as well.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Travel and communication</td>
<td>Three things that people were discussing in this theme were - minimising travel, planning travel to be efficient and using Skype or similar technologies to avoid unnecessary travel.</td>
</tr>
<tr>
<td>3. Organisational/ cultural changes</td>
<td>This was a smaller theme from the comments, but suggested that some enterprises are working toward cultural changes in attitudes in the organisation through staff education.</td>
</tr>
</tbody>
</table>

The behavioural changes mentioned were largely around switching off as well - which is a behavioural as much as a physical energy saving change. Other behavioural aspects covered changing norms in terms of the ways in which things are done in the organisation – for example travel and general educational aspects.

The most common phrase from respondents in this section was “switching off” for example: “switching off electrical gear, including computers off at the end of the day”. Other switching off responses included turning off appliances or machinery when it was not in use, lights and anything that used energy unnecessarily.

Travel was also mentioned in relation to reducing travel as much as possible. Practices included using technology such as teleconferencing, the use of skype but also elements of prudence such as considering what is essential to attend. For example, “we limit travel where possible” and “travel as little as I can”. Further to this travel planning was also mentioned by a small number of participants – “more
inclusive trips rather than several trips back and forth use suppliers in close proximity to our workplace”. These types of statements were not overwhelming in the data but the notion of being careful and non-extravagance was pervading. Indeed one statement summed it up – “we already run a tight ship can’t think of anything more we can do that will cost nothing”.

In addition, one further and lesser theme was apparent in the responses and that was about staff and organisational culture, with comments such as:

“Selection of staff. Combining strategic interests with practice. Trying to walk the talk”

“We are in the process of rolling out company strategy and values around sustainability”

“Staff education in turning things off after use”

These comments show that energy efficient practices are starting to be embedded in these businesses. There is movement from an owner/manager being conscious to making it part of the company culture.

Changes to the production process to save energy

In total, 100 comments were made regarding changes to the production process with a number of participants (one third of those) responded with ‘not applicable’ or ‘none’ (see Figure 24).

<table>
<thead>
<tr>
<th>Changes to Production Process</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Packaging changes</td>
<td>Such as minimising packaging or changing the materials used in packaging, e.g. “use recycled plastic for wrapping”</td>
</tr>
<tr>
<td>2. Sourcing local</td>
<td>e.g. “we try to source more and more product locally”</td>
</tr>
<tr>
<td>3, Changing what is offered/ product service mix</td>
<td>e.g. “Our services are now almost entirely deliverable via digital technology, with very little use of paper...and very little need to travel in the course of production or delivery”</td>
</tr>
</tbody>
</table>

Understandably, given earlier comments about feeling a lack of control over the operations this section had fewer responses than the previous two. A handful of participants mentioned the notion of lean manufacturing processes or similar, for example “we run a super lean operation”. One participant commented “Nothing was extravagant before and is still that way” indicating, again as was noted earlier, that many of the respondents were frugal as a matter of business necessity. A couple of responses noted achievements around energy efficiency such as “our product uses
half the energy of other competing products to manufacture”, indicating that this is seen as a competitive advantage to their business to have such energy savings.

Changes to the product/service for the end user to save energy

The final set of questions asked participants about changes they have made to products and services to create energy savings for the end user. While some participants passionately discussed changes, there was a large number of responses (51 out of the 96 - 53% in total that responded) stated ‘none.’ There were two groups of responses for this section (see Figure 25).

Figure 24 - Energy Saving Changes to Production Process

| 1. Offering professional services for others to improve clients energy efficiency | For example: “this is what we do...we design, fabricate and install water and waste water treatment systems for municipal and industrial use. All of our projects optimise energy use, and often create new energy sources, such as captured heat, biogas etc”. |
| 2. Improving their own products efficiency through design | For example: “improved our fires efficiencies by upwards of 10-15% by changing to power fluid direct vent tech knowledge with improved heat exchanger”. |

The first were professional services that embed energy efficiency and other green initiatives into other business operations. The second type of response was those that concentrated on the product and service and not necessarily the operations of the enterprise. It was the latter that were more frequent in the responses and consisted of about

Two comments were made in this section about the clients’ role in the decision making process - which interestingly was not always positive to including energy efficiency in the product or service. For example: “we design heavy vehicles - so there is a balance in designing a vehicle that is lighter (which uses less energy) but also needs to comply with legal requirements (e.g. Safety etc). This is an ongoing conversation as at times it depends on our clients time/cash”.

In general, the comments by respondents in this section were scant compared with the earlier sections on physical and behavioural changes. To start to embed energy saving technologies into production processes and the products or services offered by the enterprise requires a commitment of resources and given the comments made by these respondents on being frugal, this result is not surprising.
Transport and saving energy in the workplace

A total of 31.5% of participants had made changes to the transport fleet to be more energy efficient, with Figure 26 indicating what the popular changes were.

From the number of responses it is clear that maintaining tyre inflation is the most popular action with regard to making changes to reduce transport fuel costs. In addition using digital media and having a travel plan, mentioned in the previous sections also featured frequently in responses. The other actions included; purchasing fuel efficient vehicles, using public transport, bio diesel conversion, cycling and having office bicycles, using diesel rather than petrol, walking, buying an EV (one participant), having hybrids (2 participants) and reducing use where possible.

A further question asked whether participants had short, medium or long term plans to change their current transport systems in the enterprise. As Figure 27 shows, a large majority do not have plans to change.

Those that do have plans to change included changes to using more efficient modes and transport technologies, using EVs, increasing e-commerce, transport sharing, and one participant from Auckland discussed lobbying for rail services.
Summary

Participants were further asked about what results they had seen from the savings from a list of possibilities with Figure 28 illustrating the outcome.

Consistent with other responses throughout the survey, reducing costs was seen as a key outcome of energy savings. Furthermore, participants were asked to estimate their savings in terms of the percentage reduction in energy costs. Figures ranged from 1-70% with the mode being 20% savings. Other benefits (the purple bar in Figure 28) that participants had found included; having a better conscience, being responsible, improved connectivity, and having more competitive client solutions.

Overall, a variety of changes have been made by participating enterprises to save energy. Generally, the initiatives focus on reducing energy consumption through more efficient behaviours without any costs associated. This could be conceptualised as the first stage in energy efficiency and what is often termed ‘the low hanging fruit’. Although the comments from respondents also indicated a general ‘frugalness’, that is that using excess energy was just not part of what is happening in these businesses; they are very careful about what they do and how they do it. Some enterprises however, had invested in technologies to improve efficiency. Others were embedding sustainability and energy efficient practices into their business processes, but these enterprises could be thought of as ‘niche’ in relation to the wider sample.

3a. What changes are possible for SMEs to become more energy efficient?

Further to question 3 was an interest in whether respondents would make changes to the company transport fleet. These questions were designed to find out what were the key decision making criteria that respondents might use before making a change. Transportation was used as it is one of the key spending areas, is more similar across different firms, and is rising overall in the energy use in New Zealand graphs.

Changes to the transport fleet

To gain some insight into what might bring about change in energy efficient transport, two questions were included that asked about whether participants would consider changing to biofuels or electric vehicles (EV) if the costs were the same or lower. The questions were designed to be hypothetical to provide insight into the
decision making criteria for companies to consider a different technology or fuel.

**Biofuels**

First, participants were asked how likely they were to consider using biofuels as a replacement for petrol or diesel, assuming that the price is the same or less as current fuel. Even though the cost factor was included in the question (as being the same or less) costs were still raised by many participants as a factor to consider in the decision making (see Figure 29).

This is a very evenly spread graph. There are slightly more on the likely and very likely (n=67) than on the unlikely and very unlikely (n=45). However there are a number (n=32) that are undecided. Participants were then asked to give reasons for their answers, giving the opportunity to find out the reasons behind these results. The following three themes emerged.

1. **Supply**

Participants were concerned about the security of supply - ensuring that supply would be continuous. An example of the comments made in response to this question is: “Access to supply would be the main factor”. Knowing that biofuel will be available when it is needed was a very common concern. That is that it would be ‘easy’ for respondents to be able to purchase.

2. **Sourcing**

Another set of comments were about where the biofuels were sourced. These statements were ethically based, for example “depends how biofuels are sourced and from what they are derived”. Some participants elaborated on this stating that “they need not come at the cost of food production”. These statements were less common than supply and security but nonetheless were cited by a number of participants.

3. **Suitability**

A final set of comments related to the suitability of biofuels as an energy source for transport fleets. For example, one participant noted that they are “not yet sure of the suitability for present day piston engines”. SMEs may lack knowledge about the suitability of biofuels with current technology (the internal combustion engine) - meaning that there is a perception that biofuels as a new technology is not proven alongside the traditional engine technology as an appropriate fuel. The costs of conversion were also raised as an issue to consider - that is how much it would cost
to convert current cars to biodiesel.

Other things mentioned included costs of sunk assets in terms of the vehicles already owned and if that car was already fuel efficient then participants felt no need to change. One participant mentioned that biofuels would only be an interim measure as biofuel was still polluting.

Overall, there was a relatively positive response to the use of biofuels, particularly in the comments, as many participants noted that biofuels are “reducing the use of fossil fuels” and “clean and environmentally friendly”. There were a few conditions noted - the supply, sourcing, and suitability of the fuel and costs (although the question tried to rule out costs). However, these conditions are not unlike factors that could be asked of current fuel - how continuous is the supply, how ethical is the sourcing, and is it suitable as a fuel for transportation? In general, the results point to a lack of knowledge of biofuels in a New Zealand context by a number of the participants and some who openly admit this in their response, for example one participant states: “don’t know enough to make an informed decision”. Furthermore, there seems to be a perception that there are issues to change fuels that cannot be overcome. It would seem that there are a number of perceptions existing that will need to be addressed by biofuel retailers before the market may respond favourably. The point being that any ‘new’ fuel needs to be able to demonstrate to consumers that there is supply security, it is sourced ethically and that it is suitable to use as a fuel for vehicle fleets if it is going to be adopted.

Electric vehicles

Next, participants were asked how likely they were to consider using EVs assuming that the price is the same or less than a similar petrol model vehicle. The overall responses to the question are indicated in Figure 30.

Figure 30 is more uneven at the first glance than Figure 29 with the responses from the biofuels. For example there are a large number of unlikely responses to consider having an EV. However, overall the responses were even - in total those very unlikely and unlikely came to 56 and those likely and very likely came to 58 with 27 participants in the middle. Like the biofuel questions, participants were then asked to give reasons for their answers. The following four themes emerged from the responses.
1. **Cost**

There were many comments regarding the costs of the cars and that they would have to be comparable with prices of current vehicles for participants to consider EVs. For example: “the capital cost of the vehicle would need to be comparable”. Some participants mentioned ‘full costs’ - which are assumed to mean the whole-of-life cost including battery replacements.

2. **Current technology**

There was another set of comments concerned the technology involved with EVs and these focused on the battery. Positive comments included ones such as the following: “the technology is fast improving, the economics and availability looking increasingly attractive”. However, as many comments were concerned about the battery capacity and the inability for the current technology to work for their business needs. For example: “it will be many years until the technology required is available to do this on rural backroads” and “I would want a car that can go the same speed”. These comments indicate that some participants are unsure about the EV technology for their current work practices.

3. **Charge**

Related to point 2 above, many participants specifically mentioned the charge time and whether it would be compatible with the way their enterprises operate. In many cases, where large amounts of travel were necessary, participants stated that the charge time would not be compatible. For example: “unsure about the range that you can get from an electric vehicle given the distances that we travel” and “some of our vehicles travel long distances so until there is a method of quick recharging of the distance that can be travelled on a single charge increases it wouldn’t be practical”.

In addition to the length of charging, the place of charging was also mentioned. For example, one participant asked - “Where would I plug it in? Can’t at work because I work in an office and not plugging it in at home”. This highlights a tension with EVs at present because the place of charging that is most physically convenient may be at the employer/ees home, which may in turn not be the most financially convenient. Other comments indicated that the availability of charging stations was an issue. This points to the lack of current infrastructure around EVs and this was recognised in a number of comments suggesting that current systems had a “culture” around them to support the use of that technology.

4. **Clean**

A few comments emerged about the EV technology being ‘clean’ and a renewable energy which was seen as a positive aspect of owning and using an EV as a business vehicle. Overall these comments were small in number but worthy of mentioning an attitude toward the idea of the clean car fitting with the organisational values. For example: “cleaner alternative would be good but would depend on electricity source i.e. how clean is the electricity being produced”.

40
Taken as a whole, the above themes capture the majority of the comments that were made by participants. There are a few other comments that are worth mentioning. Firstly one participant suggested reducing the excise tax so that the cars would be cheaper to purchase. Another stated that there are “hidden costs of recharging” but yet didn’t elaborate into what the hidden costs might be, and finally another participant stated that a reason for not likely buying EVs would be that “electricity is highly priced in New Zealand”. Therefore, for some (not the majority) the EV, even at the same price, is not an attractive option. Many participants still mentioned costs as being a key factor in the purchasing of cars and a handful of participants mentioned that they only purchase second hand vehicles anyway. Overall, the purchasing decision of EVs by businesses is a complex decision notwithstanding the incumbent socio-technological dominance of fossil fuels. It would seem that some participants find it hard to imagine an alternative to the combustion engine when currently the infrastructure is continually supporting that choice.

Summary

The responses provided by participants to the scenarios regarding vehicle technology show some interesting results. The overall reaction to the purchasing of biofuels or EVs was even between those who would not consider and those likely although those very likely to consider outnumbered those very unlikely.

These results indicate the following:

- Some enterprises are open to technological changes but the changes have to be cost effective for the enterprise (SME).
- Any change has to fit within the current operations - yet operations are flexible in some regards - particularly for obvious cost savings i.e. using Skype.
- Price was still mentioned by the large majority even though the question assumed the same or less price.

For change:

- Lack of knowledge about the different technologies and what the capabilities are.
- Need for infrastructure to support newer technologies (as it is easier to stay with ICE and petrol/diesel).

In summary, from the responses here it would seem that change is not resisted but would be embraced if costs were the same or less. However, technologies have to be proven and have support before it would be seen to be ‘safe’ to make the change. At present there is considerable infrastructure around fossil fuels that make them ‘safe’ for organisations to adopt (this is often a taken-for-granted adoption) that is not seen to be present around ‘other’ technologies. Shifting norms and common sense adoption of technology can take time or be part of a normative disruption. There is an interesting space developing here and it will be interesting to see how change
might occur.

4. What are the key barriers to change for energy efficiency and what would enable those barriers to become enablers?

First, to understand the context of encouraging energy efficiency in the workplace participants were asked whether they have an energy management programme currently, and if not, why not. It is clear to see that the majority of the participants do not have a programme in place, as Figure 31 illustrates.

The key reasons for not having an energy management programme are that:

- It is not seen as a priority - 68%
- There is not time to develop one - 18%
- No money for one - 10%
- No regulation to push for one - 4%

In addition, participants were asked what would encourage them to develop an energy management system and Figure 32 shows that reducing costs and therefore saving money would be the significant driver.

It is also interesting to note here that about 25 participants think that moving premise would encourage the development of energy efficiency actions in their business. But perhaps more pertinent in these responses is that the clear dominant factor of saving money would perhaps be an outcome of the other actions. Thus, if the actions were taken then saving money may
well result.

Summary

As expected from many of the comments throughout these results the largest barrier to developing energy savings programmes in these businesses that it is not seen as a priority. This is consistent with the apathy that was seen in the perceptions of energy responses. However, it is not consistent with the perception that the energy and electricity bills are seen by many as significant. That is – if it is something that is costing your business a significant amount of money then it should be a priority to take action. There are two caveats to this statement. First, many respondents feel a lack of control over the way in which energy is used in the business operations, therefore energy management programmes are not seen as a priority. Second, many respondents indicate being frugal in their business operations anyway so maybe do not see the need for a management programme. Furthermore it would seem that respondents do not see that they need professional help to reduce energy costs. These are speculations from the data and more research is needed to investigate these findings further.

Conceptual Map of Responses

There were a vast number of qualitative statements generated in the survey process from participants. While many have been incorporated in the results section to explain the different themes and responses received, this section takes a disaggregated approach to the data to group respondents based on the patterns in their responses.

The following conceptual map of the data is generated from an overall qualitative disaggregated perspective of the survey data. It was developed after analysing the more descriptive statistics and through a close reading of the comments and responses from each participant. The notion of a close reading means that “the act of interpretation of texts [happens in] three stages: explication, explanation and exploration” (Czarniawska, 2014: p 13 based on Hernadi, 1987). As there were not many statistically interesting patterns in the quantitative data it was useful to see patterns emerge from the qualitative responses. The easiest way to show the different responses is using a thematic perspective and mapping the various positions.
The overall results indicated that participants generally seemed quite ambivalent towards energy consumption – that is that many respondents were not actively seeking to use less energy. But many participants were already watching their energy spend and minimising it through careful consumption, for example one participant stated regarding the question on any energy changes “nothing beyond the usual awareness of making a room warm in the cheapest possible way using whatever I have to work with at the time”. The key groups that emerged from the qualitative responses are indicated in Figure 33.

The first quadrant is the ‘frugal’ SME. These responses depicted a position whereby the participant was keen to switch off energy using devices when not in use, but was not interested in engaging with energy as a way for the organisation to be more efficient, they just did not aim to use any energy than what was minimally needed. For example “switching EVERYTHING [sic] off at the end of the day” and “I have always switched off the computers and screen and all lights at the end of the day”. The final example illustrates this quadrant and many of the SMEs involved in the research succinctly “we already run a tight ship can’t think of anything more we can do that costs nothing”. It depicts the frugal quality or not overusing energy but not seeing as something that there is any point in examining further.

In contrast, the ‘do more with less’ position was interested in developing ways for the business to use energy more productively but still was not making a connection between energy use / efficiency and the core business. For example, one participant states “Always switch off laptops and screens, at least to full stand-by mode, during all breaks and nights. Travel as little as I can. Using less water for doing bits and
pieces. Using recycled paper for notes” and “have always been energy conscious-cost minimisation”. Key in this quadrant was the shift in thinking around wanting to develop ways of operating that are more energy efficient but still partly frugal, and not changing business processes for energy but changing energy in the business processes – a subtle yet significant difference.

However, the two other positions in the quadrant were more interested in the energy consumed as part of the business operations. For example, the ‘integrate’ position saw a relationship between energy use and the core business – whether that was in the products or goods that they sold or the way in which they could run a more lean operation. This was important to them strategically to use energy more productively. For example, responses that evoked this position were more like the following example – “more than 10 years ago we moved to a primary reliance on digital communication in place of paper based processes, physical meetings and travel. We have also changed our service mix. Our services are now almost entirely deliverable via digital technology, with very little use of paper (where previously it was heavily paper based), and very little need to travel in the course of production or delivery”. Participants in this quadrant had moved from just changing some basic aspects of their energy consumption to save money to, as this example shows, the service delivery or the business model to incorporate energy efficient practices. That is they changed the way they deliver value to the customer and therefore their business model.

The ‘market it’ position held similar beliefs but actively built a strategic relationship through the core business and energy efficiency and most often this was through the services they provided to their customers, for example architectural firms building more sustainable designs. One participant gave a list of what they have been doing to develop their accommodation business outside of Auckland – “We rebuilt the 1875 xxxx Hotel from the inside out to retain its classical heritage while giving it longevity with modern energy-saving technologies including using the exhaust from the cool store to pre-heat the water system, LED lighting, movement activated auto-lighting, hush glass, increased natural lighting, heat pumps, energy saving power-off to guest rooms, automatic doors, insulation between walls and into ceilings and underfloor. Winning Hospitality NZ’s Award for Excellence for the best new/redeveloped accommodation hotel”. With such an extensive list of changes and investment into energy saving technologies it seems that the owners are embedding energy efficiency into their business operations with a view to it being a strategic advantage – one that can potentially be used as a marketing factor for the business. This business was the best example of the behaviour and thinking in this quadrant.

This conceptual map is neither exhaustive nor representative but instead offers a way to understand the ways in which norms and thinking around energy was seen across the participants. It is also not necessarily static, meaning that participants do have the ability to move. While there were only 180 survey respondents there were enough glimpses of difference between the responses to distinguish these differing positions. Indeed, it seemed that participants who responded seemed to not care about energy or really care, and then there were a few groups in between, with more in the former.
Section 5: Conclusion

The research aim of this project was to examine the highest impact opportunities for energy savings in SMEs in New Zealand. In order to do this a survey was completed to give some insight into current energy practices, material culture and norms, and attitudes. Therefore, the results are focused on the organisational level: to understand at the business level what energy means to businesses, how enterprises use energy, and what actions they are taking to reduce energy consumption. While only a small number of responses were generated from the many attempts to gain participants the data was rich enough to provide insights into energy and SMEs.

It would seem that one of the initial steps for SMEs in this area would be to develop an energy management plan through an energy audit. The majority of participants had neither an audit nor plan. Measuring energy is an important first step for managing energy. Currently audits are offered through EECA and it would seem that the uptake is not high – but many businesses that do find ways to save money through being efficient with energy (see case studies at http://www.eecabusiness.govt.nz/case-studies). As such there is a step before getting the audit and that is perhaps the key step in the process of developing energy savings in SMEs – getting the business owners (often owner/operators) to stop and think about energy! While the majority of participants are keen to understand new ways to save energy and costs, the interview data tells us that in addition to that most of the business managers have bigger costs to examine and as such energy is not seen as important to spend time managing.

The key question then becomes – how can SME business managers be encouraged to consider energy as a flexible cost that can be changed for the benefit of business productivity and profitability? To this question there is no easy answer.

For business, it seems to be about costs and managing risk to the organisation. As energy efficiency becomes more about energy savings and less about fixed costs (so more about managing waste and adding to the bottom line of the enterprise), monitoring and managing energy use will be more commonplace. Once this occurs then investing (with a reasonable payback period) in energy saving technology and embedding energy savings into goods and services can be realised. Only at this stage can systems type thinking come into fruition and a movement toward energy efficiency address the energy wastage that is all too accepted currently.

Further research is needed to understand the initial steps or triggers that will encourage the process described above. A number of factors might come to play in the decision to save energy. For example, customer pressure, demand response systems, policy, rising costs, and/or resource scarcity. Participants in this study reported that costs and saving money would drive them to implement an energy management system – however a large number did not have one at present. There may be a tipping point whereby the energy costs reach such a point that they need to be examined as part of the business processes. Understanding what triggers that point is an important next step in this wider research project.
References


Appendix 1

The following survey questions were administered as a web-based survey. As such, they are not presented in the same format as they appeared on the webpage.

SME Questionnaire - EC2 - 2013

SECTION 1 - THE ORGANISATION
1. What is the name of your organisation?
2. Describe your primary business activity.
3. Which of these categories does your organization fit within (Select any that apply)
   A  AGRICULTURE, FORESTRY AND FISHING
   01 Crop and animal production, hunting and related service activities
   02 Forestry and logging
   03 Fishing and aquaculture
   B  MINING AND QUARRYING
   05 Mining of coal and lignite
   06 Extraction of crude petroleum and natural gas
   07 Mining of metal ores
   08 Other mining and quarrying
   09 Mining support service activities
   C  MANUFACTURING
   10 Manufacture of food products
   11 Manufacture of beverages
   12 Manufacture of tobacco products
   13 Manufacture of textiles
   14 Manufacture of wearing apparel
   15 Manufacture of leather and related products
   16 Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials
   17 Manufacture of paper and paper products
   18 Printing and reproduction of recorded media
   19 Manufacture of coke and refined petroleum products
   20 Manufacture of chemicals and chemical products
   21 Manufacture of basic pharmaceutical products and pharmaceutical preparations
   22 Manufacture of rubber and plastic products
   23 Manufacture of other non-metallic mineral products
   24 Manufacture of basic metals
   25 Manufacture of fabricated metal products, except machinery and equipment
   26 Manufacture of computer, electronic and optical products
   27 Manufacture of electrical equipment
   28 Manufacture of machinery and equipment n.e.c.
   29 Manufacture of motor vehicles, trailers and semi-trailers
   30 Manufacture of other transport equipment
   31 Manufacture of furniture
   32 Other manufacturing
   33 Repair and installation of machinery and equipment
D ELECTRICITY, GAS, STEAM AND AIR CONDITIONING SUPPLY
35 Electricity, gas, steam and air conditioning supply
E WATER SUPPLY; SEWERAGE, WASTE MANAGEMENT AND REMEDIATION ACTIVITIES
36 Water collection, treatment and supply
37 Sewerage
38 Waste collection, treatment and disposal activities; materials recovery
39 Remediation activities and other waste management services.
F CONSTRUCTION
41 Construction of buildings
42 Civil engineering
43 Specialised construction activities
G WHOLESALE AND RETAIL TRADE; REPAIR OF MOTOR VEHICLES AND MOTORCYCLES
45 Wholesale and retail trade and repair of motor vehicles and motorcycles
46 Wholesale trade, except of motor vehicles and motorcycles
47 Retail trade, except of motor vehicles and motorcycles
H TRANSPORTATION AND STORAGE
49 Land transport and transport via pipelines
50 Water transport
51 Air transport
52 Warehousing and support activities for transportation
53 Postal and courier activities
I ACCOMMODATION AND FOOD SERVICE ACTIVITIES
55 Accommodation
56 Food and beverage service activities
J INFORMATION AND COMMUNICATION
58 Publishing activities
59 Motion picture, video and television programme production, sound recording and music publishing activities
60 Programming and broadcasting activities
61 Telecommunications
62 Computer programming, consultancy and related activities
63 Information service activities
K FINANCIAL AND INSURANCE ACTIVITIES
64 Financial service activities, except insurance and pension funding
65 Insurance, reinsurance and pension funding, except compulsory social security
66 Activities auxiliary to financial services and insurance activities
L REAL ESTATE ACTIVITIES
68 Real estate activities
M PROFESSIONAL, SCIENTIFIC AND TECHNICAL ACTIVITIES
69 Legal and accounting activities
70 Activities of head offices; management consultancy activities
71 Architectural and engineering activities; technical testing and analysis
72 Scientific research and development
73 Advertising and market research
74 Other professional, scientific and technical activities
Veterinary activities

ADMINISTRATIVE AND SUPPORT SERVICE ACTIVITIES

Rental and leasing activities

Employment activities

Travel agency, tour operator and other reservation service and related activities

Security and investigation activities

Services to buildings and landscape activities

Office administrative, office support and other business support activities

PUBLIC ADMINISTRATION AND DEFENCE; COMPULSORY SOCIAL SECURITY

Public administration and defence; compulsory social security

EDUCATION

Education

HUMAN HEALTH AND SOCIAL WORK ACTIVITIES

Human health activities

Residential care activities

Social work activities without accommodation

ARTS, ENTERTAINMENT AND RECREATION

Creative, arts and entertainment activities

Libraries, archives, museums and other cultural activities

Gambling and betting activities

Sports activities and amusement and recreation activities

OTHER SERVICE ACTIVITIES

Activities of membership organisations

Repair of computers and personal and household goods

Other personal service activities

3. What is your role within the organisation?

4. Is your organisation split across several sites or part of a larger group or chain of organisations?
   No, we have just one location;
   Yes, we are one of several locations of a larger group

5. Is this the head-office responding Yes/ No

6. What is the ownership structure of your organisation? Please tick all that are appropriate
   family owned,
   partnership,
   publically funded,
   overseas owned,
   NZ owned

7. How many years has the company been in operation: □ years
8. In terms of the business life cycle, where would you place your organisation?
   - Seed
   - Start-up
   - Growth
   - Established
   - Expansion
   - Maturation
   - Decline/Exit

9. Turnover approximately, (please circle):
   - 10-20,000
   - 21,000-40,000
   - 41,000-60,000
   - 61,000-80,000
   - 81,000-100,000
   - 101,000-150,000
   - 151,000-250,000
   - 251,000-500,000
   - 501,000-1m
   - 1m+

10. What is the geographical scale of your business?
   - Regional
   - National
   - International

11. How much does your organisation spend on purchasing energy annually?

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<th>$500-749</th>
<th>$750-999</th>
<th>$1000-1499</th>
<th>$1500-1999</th>
<th>$2000-4999</th>
<th>$5000-7499</th>
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<td>Other (specify)</td>
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</tbody>
</table>

^Woody biomass = firewood, wood pellets, wood chips
* For stationary engines and/or heating

12. What is your **total** energy (including transport fuel) spend as percentage of cost of operation? __________% (approximate value)
SECTION 2 - PREMISES

13. How many employees does your organisation have at its site?
   Full-time employees __, Part-time employees ______

14. Do customers/clients come to your location? Yes, No

15. What are the days and hours of occupation/operation for your location?
   Sunday __, Monday__, Tuesday__, Wednesday__, Thursday__, Friday__, Saturday
   ______

16. Does your organisation own or rent the premises in which you are based? Tick the appropriate box.
   Own outright
   Own with a mortgage or loan
   Part own and part rent (shared ownership)
   Rent from Council (local authority)
   Rent from private landlord or letting agency
   Don't know
   Other (specify) ______

17. Was the building in which you are based purpose-built for your organisation? Yes/No?

18. In what year was the building in which your organisation is based built?
   ____(Year),
   I don't know

19. How long has your organisation been based in its current premises?
   ____(years, months)

20. Has your organisation undergone an energy audit or a review of its energy efficiency?
   Yes,
   No
   Don't know

SECTION 3- ENERGY SUPPLY
21. Do you contract directly with an electricity supplier (such as Mercury Energy or Contact) or do you buy electricity /fuel from a third party intermediary, e.g. via an energy broker

We contract directly with an electricity supplier - name ______________________

We contract for electricity via ______, I don't know.

22. Has your organisation ever had such an arrangement for differential pricing based on the time of use of electricity in the past 5 years?

Yes, 
No, 
I don't know

23. Does your organisation operate any of the following energy supply technologies on the premises?

- Wind turbine [number] Yes / No How many do you have? If yes, how many MegaWatts do they produce?

- Photovoltaic cells/solar panels Yes/No If yes, how many MegaWatts do they produce?

- Gas micro combined heat and power system (CHP) Yes / No If yes, how many MegaWatts do they produce?

24. Do you have any short / medium / long term plans to change your energy supply? Please circle all that apply.

25. What would encourage you to change your form of supply? - ______________________

26. What barriers do you see for changing energy supply technologies? For example, cost, time, relevance

SECTION 4 – ENERGY USE AT YOUR PREMISES

27. What is your premises' main source of heating energy?

- Gas
- Electricity
- Oil
- Coal
- Other (Specify)_______ Don't know

28. What is your premises main heating/cooling technology

- heatpump
- air/ ground source
central heating
air conditioning

29. Does your premises have programmable thermostats? Yes, No, Don't know
   If yes, what temperature are they set to?___
   If this changes seasonally, please state the different settings at different seasons:
   summer____ autumn ______ winter ______ spring ___________

30. Do you have plug in electric heaters in your premises? Yes, No

30a. Are these controlled by employees? Yes, No

30b. What months are they usually used? (tick all that apply)
   summer____ autumn ______ winter ______ spring ___________

31. What uses the most energy within your organisation, to the best of your knowledge (apart from transport, covered in next section)? Please tick the appropriate box and elaborate on the particular item.
   Machinery (specify) ___________
   Appliances (specify) ___________
   Space heating and/or cooling (specify)_____________
   People’s behaviours (specify)_____________

SECTION 5 – TRANSPORT ENERGY USE
32. Do you have company owned vehicles? No, Yes - how many _______

33. What type of vehicles are in the fleet? Tick all that apply or Ask how many of each?
   LIST VEHICLES HERE

34. Have you made any changes to the fleet to reduce fuel consumption? Yes/no? If so, what changes?

35. Have you taken other actions to reduce transport fuel costs
   Training for yourself or employees
   Developing a travel plan for your organization
   Encouraging greater use of skype and other digital media for meetings
   Changing tyres
   GPS systems

36. Would you consider using biofuels as a replacement for petrol or diesel in your vehicles (assuming same or less price as current fuel)?
   never / maybe / likely / very likely / already do
   Give reasons for your answer
37. Would you consider using electric vehicles - either hybrids and/or plug-in electric-vehicles (assuming the same or less price as a similar petrol model car)?
   never / maybe / likely / very likely / already do
   Give reasons for your answer...
   Which of your current vehicles might they replace?

38. Does your organisation have short medium or long term plans to change transport systems?
   yes no
   what would the new transport system be?

SECTION 6- ENERGY EFFICIENCY MEASURES
39. Do you have any of the following energy efficiency measures within the premises of your organisation:
   Solid wall insulation Yes / Partial/ No
   Cavity wall insulation Yes / Partial/ No
   Ceiling insulation Yes / Partial/ No
   Under floor insulation Yes / Partial/ No
   Double glazing Yes / Partial/ No

40. Describe any other physical changes you have made at your premises over the past 5 years to try to use energy more efficiently or to save energy;
   ................

41. Describe any behavioural changes you have made in your organization over the past 5 years to try to use energy more efficiently or save energy

42. Describe any changes, over the past 5 years, that you've made to your products or services to save energy in the production processes or service operations:
   ___________________________________________________________

43. Describe any changes over the past 5 years that you have made to your products or services to save energy for the end user:
   ___________________________________________________________

44. Do you have energy monitoring equipment Yes  no. If yes, specify ....

45. If yes to any of the above, have you experienced any of the following as a result of these actions
   - more comfortable working environment
   - reduced business costs from greater energy efficiency
   - energy savings? (estimate % reduction in energy costs)
   Other .....

46. Do you have an energy management programme or policy? Yes / No / Don't know

47. If no, why not?
not a priority / no time / no $ / no regulation

48. What would encourage you to develop a programme?
- saving money
- having an energy audit
- moving premises
- changing heating systems
- employee feedback

Section 5 - Energy perceptions
This next set of questions will be agree-disagree questions and the options are agree strongly, agree, disagree, and disagree strongly.

48. The electricity bill is a significant expense for my organisation
Agree strongly  Agree  Disagree  Disagree strongly

49. Added together, our energy bills are a significant expense for my organisation.
Agree strongly  Agree  Disagree  Disagree strongly

50. My organisation is interested in changing the way we use electricity if it reduces the electricity bill
Agree strongly  Agree  Disagree  Disagree strongly

51. My organisation is interested in changing the way we use electricity if it helps the environment
Agree strongly  Agree  Disagree  Disagree strongly

52. By changing the way the people I work with and I use electricity, we can reduce the organisation’s energy bill
Agree strongly  Agree  Disagree  Disagree strongly

53. My organisation would consider changing the time it uses electricity to shift away from peak times (15:30-20:00) to save money
Agree strongly  Agree  Disagree  Disagree strongly

54. My organisation would consider not using electricity at particular times in the year in order to save money
Agree strongly  Agree  Disagree  Disagree strongly

55. My organisations' customers/client groups are concerned about our environmental commitment
Agree strongly  Agree  Disagree  Disagree strongly

56. Our society needs to reduce the amount of energy we use
Agree strongly  Agree  Disagree  Disagree strongly

57. The people I work with and I need to reduce the amount of energy we use
<table>
<thead>
<tr>
<th>Agree strongly</th>
<th>Agree</th>
<th>Disagree</th>
<th>Disagree strongly</th>
</tr>
</thead>
<tbody>
<tr>
<td>58. My organisation has already done a lot to reduce the amount of electricity it uses</td>
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</tr>
<tr>
<td>Agree strongly</td>
<td>Agree</td>
<td>Disagree</td>
<td>Disagree strongly</td>
</tr>
<tr>
<td>59. My organisation has already made changes to the way we work in order to reduce the amount of energy it uses</td>
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<tr>
<td>Agree strongly</td>
<td>Agree</td>
<td>Disagree</td>
<td>Disagree strongly</td>
</tr>
<tr>
<td>60. My organisation knows what it needs to do in order to reduce electricity usage</td>
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<tr>
<td>Agree strongly</td>
<td>Agree</td>
<td>Disagree</td>
<td>Disagree strongly</td>
</tr>
<tr>
<td>61. My organisation cannot control how much electricity it uses</td>
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<td></td>
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<tr>
<td>Agree strongly</td>
<td>Agree</td>
<td>Disagree</td>
<td>Disagree strongly</td>
</tr>
<tr>
<td>62. My organisation would be interested in new opportunities to save money or profit from electricity</td>
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<tr>
<td>Agree strongly</td>
<td>Agree</td>
<td>Disagree</td>
<td>Disagree strongly</td>
</tr>
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</table>