Title	Defining corporate energy policy and strategy to achieve carbon emissions reduction in non-energy intensive multi-site industrial organisations
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Publication Date	2017-07-05
Publication Information	Contreras, Sergio, Finnerty, Noel, Sterling, Raymond, Coakley, Daniel, & Keane, Marcus M. (2017). Defining corporate energy policy and strategy to achieve carbon emissions reduction in non-energy intensive multisite industrial organisations. Paper presented at the 10th International Conference on Sustainable Energy and Environmental Protection: Energy Management and Policies, Bled, Slovenia. DOI: 10.18690/978-961-286-051-6
Publisher	University of Maribor Press
Link to publisher's version	https://doi.org/10.18690/978-961-286-051-6
Item record	http://hdl.handle.net/10379/6826
DOI	http://dx.doi.org/10.18690/978-961-286-051-6

10TH INTERNATIONAL CONFERENCE ON SUSTAINABLE ENERGY AND ENVIRONMENTAL PROTECTION (JUNE 27TH – 30TH, 2017, BLED, SLOVENIA), ENERGY MANAGEMENT AND POLICIES
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Defining Corporate Energy Policy and Strategy to Achieve Carbon Emissions Reduction in Non-Energy Intensive Multi-Site Industrial Organisations

NOEL FINNERTY, SERGIO CONTRERAS, RAYMOND STERLING, DANIEL COAKLEY & MARCUS M. KEANE

Abstract Research on the components and characteristics of long-term energy policy and strategies in large organisations is limited. Non-energy intensive multinationals do not face the environmental regulations required by their energy intensive counterparts, further widening the "energy efficiency gap" due to missed opportunities. This work investigates the development of long-term energy policy and associated strategy for non-energy intensive multi-site organisations via a systematic literature review identifying essentials of energy policy, strategy and associated barriers/drivers to energy efficiency. Highlights include a review of energy policy guidelines and standards, an analysis of the parameters influencing decision-making practices, including the non-energy benefits of energy efficiency investments and a study of 6 top-ranked sustainable global companies to identify best-practices. Subsequently, this work proposes a methodology to formulate 'corporate energy policy and strategy' for non-energy intensive industries. A case study is presented with findings on initial deployment in a Fortune 500 multinational.

Keywords: • energy policy • energy strategy • ISO 50001 • non-energy intensive • multinational •

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https://doi.org/10.18690/978-961-286-051-6.1 ISBN 978-961-286-051-6

Available at: http://press.um.si.

1 Introduction

Industrial firms struggle to make positive investment decisions on energy efficiency projects even when they are financially viable, contribute to lessen their impact on the environment and even provide additional non-energy benefits. This sub-optimal level is referred to in literature as the "energy efficiency gap" [1]. It is a consequence of the interaction between energy efficiency barriers and drivers that affect a firm's decision making processes.

Empirical research shows that energy efficiency barriers affect small, medium and large manufacturing companies, and that the impact on non-energy intensive[1] firms is greater than on the energy intensive ones [2]. Since energy costs are a small fraction of production costs in non-energy intensive companies, energy efficiency is given less importance. Moreover, as energy efficiency may not be closely related to the core business activities, it could also be treated as non-strategic, leading to lack of top management involvement, competition for funding with other "more important" investments, limited resources and an unstructured decision making process [3].

Different drivers stimulate enterprises to find and execute investments in energy efficiency. These drivers can be internal or external to the firm and include, reduction of production costs, compliance with environmental regulations on energy efficiency and CO_2 emissions or an improved sustainability record. Non-energy intensive organizations are not required to meet the strict environmental regulations required by their energy intensive counterparts, however, due to their size and revenue volumes, they are subject to high public exposure through corporate sustainability rankings making them an interesting focus group in terms of energy policy and strategy formulation. However, drivers are ineffective to overcome barriers if companies do not practice energy management and lack long term energy strategies and appropriate energy management systems [1], [2].

This study identifies the essential components of a corporate energy policy and proposes an approach to formulate the supporting energy strategies to enable non-energy intensive firms meet energy and carbon reduction goals.

2 Literature Review

In large organisations, energy policy is typically associated with an internal energy strategy. Although, a long-term energy strategy is a fundamental driver for energy-related issues, research about essential components and characteristics of such a corporate strategy are rare. An study in Sweden, found that the majority of the studied firms did not have an energy strategy or had a short-term one (<3 years) [1]. Also in Sweden, it has been found that long-term energy strategies of more than three years are more frequent in large firms than in small ones [4]. It is expected that an energy strategy helps to create, maintain, or develop a firm's competitive advantage by increasing value, reducing costs and reducing risks associated with energy issues [3]. Finally, to the best of our knowledge, peer reviewed literature on corporate energy policy and supporting energy strategy is scarce, to date, no research has been conducted for non-energy intensive multinationals.

2.1 Main barriers to energy efficiency

Since 1998 empirical studies have provided evidence about the barriers that prevent cost-effective energy efficiency projects from being executed in manufacturing firms. Previous research revealed that barriers vary according to both the characteristics of the firm (e.g. size, energy intensity and sector) and the energy efficiency measure (e.g. production disruption, implementation and technical requirements).

Low capital availability is a recurring and relevant economic obstacle for energy efficiency investments, but, in large firms, it can be considered because of the low priority of energy efficiency. This low priority reveals companies strategic view on energy efficiency [5]. In fact, while access to external funding and lack of own capital are reported as causes for this barrier in SME's [6][7], opportunity costs and allocation of capital to other non-energy projects might be the reason in large enterprises [8].

Risk of production disruptions are regarded as a critical barrier in both non-energy intensive [9] [10] and energy intensive firms [11].

Lack of awareness, governmental initiatives, and time to implement energy efficiency are also identified barriers [10], [2], [6], [12].

2.2 Main drivers to energy efficiency

Reduction of energy costs is perceived as the most important driver for energy efficiency but it might not be enough motivation to adopt energy conservation measures if energy is given low-priority within the organisation [5], [13].

The existence of a long-term energy strategy and ambitious people within an organisation is one of the top drivers for adoption of energy efficiency measures [9], [11], [14].

Awareness of the non-energy benefits related to an energy efficiency investment, those that affect the production cost, and including them into the financial evaluation can also lead to more favourable assessments [15]. Energy efficiency projects can be successfully *sold* to management if rather than the usual financial approach a strategic approach is taken [5] by using non-energy benefits to emphasise its contribution to enhance a firm's competitive advantage.

However, industry "do not seem to have yet acknowledged how relevant non-energy benefits are to promote energy efficiency measures adoption" [2], and "lack of knowledge of how these [non-energy benefits] should be quantified and monetised" [16].

2.3 Decision-making practices in manufacturing firms

The investment decision process plays a definitive role in the selection and implementation of energy efficiency measures in manufacturing firms. The decision-making practices are influenced by diverse internal factors surrounding the evaluation process (e.g. criteria selection), the financial assessment (e.g. fiscal rules on payback period and methods used) and the investment parameters such as categorisation, size and complexity. In addition, external and cultural factors also shape decision-making processes. "Profitability plays an important but not decisive role in investment decision-making" [12], the rest of the decision is related to, for example, strategic character of investment, company culture and knowledge of non-energy benefits or lack of information about contracts with third party companies (e.g. ESCOs or fuel suppliers).

2.4 Non-energy benefits of energy efficiency investments

Non-energy benefits are mainly related to positive impacts on productivity such as lower maintenance costs and improved public image.

Benefits such as reduced labour and maintenance costs can be monetised to construct compelling business cases with higher savings and better financial metrics than those accounting for lower energy consumption alone [17]. The average payback period from a sample of projects was reduced from 4.2 to 1.9 years when the contribution of productivity related benefits was monetised [15].

Non-energy benefits are considered as essential components of the business case and profitability of energy efficiency investments. Two main reasons are identified. First, by connecting non-energy benefits and their contribution to improve a firm's competitive advantage imprints a strategic character to these investments. Second, the potential of non-energy benefits to increase the profitability of energy efficiency projects.

2.5 Energy policy guidelines from international standards

ISO-50001 [18], ENERGY STAR™ [19], and SEP™ [20] standards recognise that energy policy is fundamental to set the direction and drive energy performance improvement through the implementation of energy management systems. These standards converge in defining energy policy as top management's official commitment to improve energy performance in an organisation. However, none provides a step by step guide to policy formulation and associated supporting strategies.

2.6 Industry best practices on corporate energy policy

Companies voluntarily participate in sustainability ranking processes via surveys [21]–[23] aimed at recognition as leading performers in sustainability. The outcome of these rankings is followed by investors that direct resources towards top ranked enterprises [23]–[25]. Top ranked sustainable companies are a source of best practices in energy performance improvement. Since part of the ranking criteria relate to energy performance, their sustainability assessments cover energy related issues. Six non-energy intensive corporations were studied. They are recognised leaders in sustainability in their industry sector.

An analysis of the energy policy practices that are being applied by the six corporations, including information found in the Carbon Disclosure Project, is used to identify best practices on energy policy. Findings are:

- **Hierarchy within the organisation:** embedded into or dependent on the Corporate Sustainability Policy.
- **Justification:** Alignment to relevant climate change efforts (e.g. Paris Agreement [26]);
- **Carbon emission scope covered by energy policy:** Scopes 1, 2 or 3 of the Green House Gas Protocol [27];
- **Duration:** Two main deadlines identified: 100% RES electricity by 2020; 80%-100% emissions reduction by 2050;
- **Targets:** Separate energy from CO_2 targets:
  - Energy: Source all electricity from RES (medium term) and all energy from RES (long term);
  - Carbon: carbon positive or carbon neutral;
- **Target setting methods**: ‘Scientific based’.
- **Common strategies for targets achieving:** Promotion of energy efficient manufacturing; Use of renewable energy; Dedicated budget for energy and carbon reduction projects; Monetary reward for managers linked to targets' achievement; and Membership to industry advocacy initiatives.
- **Other strategies:** ISO-50001 implementation, favourable ROI requirement for energy/carbon reduction projects, operation in ‘green’ certified buildings, new facilities aligned to high energy efficiency standards.

None of the six top ranked corporations uses an internal price for carbon to drive investments in energy performance improvements that reduce carbon emissions. In addition, only one corporation uses carbon offsets to neutralise its global carbon emissions and another has set a goal to reach a carbon positive state.

3 Methodology

This section proposes a methodology for the definition of a corporate energy policy *(Why)* and the development of an associated corporate energy strategy *(How)* to deliver on the vision and goals set out (*What*) in the proposed policy.

3.1 Corporate energy policy

The corporate energy policy is part of the organisation's sustainability policy or plan to improve environmental performance.

An energy policy establishes top management's direction regarding energy issues in the long-term, emphasizes top management's support to energy management and contains goals such as reduction of energy usage and implementation of energy management systems [1].

The energy policy will document the justification for pursuing performance improvements and will ensure organisation's top-level commitment to achieve carbon emissions reduction targets. The policy should remove the barriers and build on the drivers identified in section 2.

Based on the identified best-practices, Figure 1 summarises the process for developing and implementing a corporate energy policy.

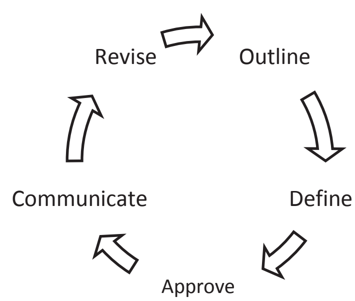

Figure 1. Energy Policy Process.

Outline: a single, easy to read yet comprehensive statement is needed to outline the corporate energy policy. This statement is the first commitment of the organisation towards improving its performance and is also a key communication piece for disseminating the policy. The statement must at least show a clear performance improvement goal and deadline for achievement (e.g. carbon neutrality by 2030).

Define: the next step is to define the constitutive elements of the corporate energy policy. The corporate energy policy must at a minimum:

- Be aligned with the organisation's nature and strategic direction of the corporate sustainability plan;
- Reflect the organisation's long term vision in energy performance and carbon emissions (e.g. Alignment with global climate change efforts such as the Paris Agreement);
- Clearly define what is within the scope of the performance targets set as defined by the Greenhouse Gas Protocol [28];
- Engage and commit top-management to the implementation of the vision;
- Commit to the development of a roadmap to achieve the long-term vision (energy strategy section 3.2);
- Establish performance improvement as a priority and align individual sites to it;
- Reflect the commitment to provide the necessary resources to achieve the vision;
- Be documented;
- Commit to internal and external communication of its goals and achievements;
- Enact a periodic review and update process.

Approve: since the energy policy presents a clear and sometimes aggressive commitment to achieving improved performances, it is paramount that it is approved and endorsed by top-management.

Communicate: the energy policy must articulate and disseminate, through a common language, its commitment to employees, shareholders, the community and (internal/external) stakeholders.

Revise: revise the energy policy document periodically to ensure its alignment with the corporate sustainability plan and updated global performance improvement efforts.

3.2 Corporate energy strategy

The corporate energy strategy should define the targets, roadmap and enablers required to meet the long-term targets that ultimately deliver the long-term vision committed to by policy.

Set 'SMART' Targets

While the policy defines the long-term vision and associated boundary conditions (GHG protocol), best practice indicates that a staged approach to reaching the vision through long term target setting is optimal. Definition of targets is suggested to follow the 'SMART' approach [29]: **S**cientific based, **M**easurable, **A**ttainable, **R**elevant and **T**ime bound. It is recommended to separate energy and carbon targets as follows:

- P% renewable electricity by 20YY (medium term);
- Q% renewable energy by 20ZZ (long term);
- R% CO_2 reduction by 20WW (medium term);
- Carbon neutral/positive by 20TT (long term).

Energy Strategy Roadmap

The proposed roadmap is referred to as C^3. It stands for **C**ut, **C**onvert and **C**ompensate. It is aligned to the long-term target performance requirements.

Cut energy use: continuous pursuit of increased energy efficiency at a site level through EEM's (Energy Efficiency Measures).

Convert to renewables: through a procurement strategy and its generation on site.

Compensate unavoidable CO_2 emissions: purchase off-setting certificates, through projects 'in country' where possible.

It is worth noting whilst all three strands of the roadmap can be developed in parallel it is envisaged that the implementation of 'Compensate' commences when the 'Cut' & 'Convert' initiatives are mature.

Energy Strategy Enablers

To advance the C^3 roadmap and meet the targets outlined ultimately requires investment. The literature review highlights the gaps that currently exist in the ad-hoc decision-making practices. To ensure optimal investment a 'Decision Support Framework' (DSF) is needed to allow top management unbiased visibility to all potential EEM's from any site [30].

The C^3 roadmap is underpinned by several enablers that provide critical inputs from management teams. The following paragraphs outline the key areas supported by enablers;

Decision making process: requires defining the project selection criteria to use (e.g. financial, sustainability and business continuity criteria) and the appropriate mechanism to quantify (monetise if possible) all associated non-energy related benefits. The strategic input is from top management and it is fed into the DSF. Assigning a value to 'non-energy related benefits' needs to include the impact to the sustainability targets set (e.g. using carbon pricing) as well as those related to improved business reliability and reduced maintenance. Such approach helps formulate a compelling business cases by effectively communicating the link between energy improvement projects and core business activities. This is a vital stage in the process of 'levelling the playing field' between energy and other company investments. Firstly, as defining the selection criteria enables energy projects compete independently from other business related projects. Secondly, if there is no dedicated energy budget it is imperative that all non-energy benefits are accounted for to optimise the business case.

Investment Strategy: top management and the finance department are key players. Ideally a dedicated budget is set-aside for C^3 implementation. Even if this is not always feasible, an investment roadmap is required to deliver the strategy and policy targets. Direction is needed on the preferred company funding mechanism (e.g. own company capital vs. power purchase agreements (P.P.A)) and on financial rules relating to payback parameters such as NPV, IRR, and RoI. The strategy needs to recognise the special features that typical energy projects exhibit (e.g. long payback times). It is recommended to fix future energy forecasting based on a set period of past performance for each site in the network. Agreement on the financial equivalent of a production disruption period (recommended one hour) is required to monetise the potential impact or improvement on business continuity associated with an EEM. Establishing accountability and links between management remuneration and energy performance targets is also recommended.

Energy management system support: initiatives driven by an energy management system are enabled by strategic energy management decisions. For example: energy audit frequency and intensity level, energy management maturity models and yearly progression targets, alignment to independent certification bodies (e.g. LEED and ISO-50001) to ensure best practices, alignment to industry advocacy initiatives (e.g. CDP and RE100) for recognition of progress and achievements and, communication strategies (internal and external).

Verify: Metrics and monitoring

Key performance indicators (KPI) are required to track performance at an individual site and organisation level to meet policy targets. The KPI are designed to capture both quantitative (e.g. energy usage) and qualitative (e.g. energy management maturity) metrics.

Promote and disseminate the strategy

Investment in EEM is improved by effectively communicating the link between EEM and core business activities. Alignment of policy and strategy reporting to the 'Global

Reporting Initiatives' [31] is recommended to facilitate benchmarking and sustainability mapping from organisation's sustainability reports.

4 Case study

GEMS (Global Energy Management System) [30] is a methodology designed between Boston Scientific Corporation (BSC) and the National University of Ireland, Galway (NUIG) aimed to guide multi-site organisations to meet energy reduction and GHG targets. GEMS complements each individual site's energy management system regardless of maturity level. GEMS is being rolled out in BSC which is a non-energy intensive multi-national manufacturing corporation in the life sciences industry.

4.1 GEMS introduction

The GEMS methodology [30] results in a simplified, understandable, systematic, repeatable and scalable decision support framework addressing the complexities unique to decision-making on capital investments in global multi-site organisation. The GEMS methodology is based on three foundation elements and four pillars as outlined in Figure 2.

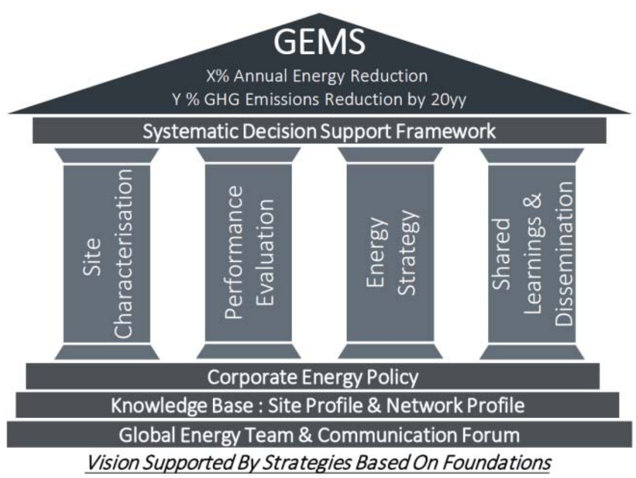

Figure 2. GEMS overview

The GEMS methodology is ideally positioned to implement a corporate energy policy (foundation) and associated energy strategy (pillar) as outlined in section 3.

4.2 GEMS energy policy foundation

BSC (GEMS) energy policy forms part of the corporate sustainability policy and represents top management's commitment to drive and fund optimal network energy performance and reduce carbon emissions across all its sites in support of global efforts aligned to the Paris Agreement on climate change. The policy was outlined and defined by the global energy manager and has been approved by top-management.

BSC's boundary is Scope 1 and Scope 2 Emissions as defined by the GHG Protocol.

BSC will document GEMS in its 2016 sustainability report which is distributed internally and externally to all relevant stakeholders, apart from being publicly accessible through BSC webpage. The energy policy is reviewed and updated (if required) annually.

4.3 GEMS energy strategy pillar

'SMART' Targets

BSC has set the following target:

- 35% reduction in CO_2 by 2019 compared to 2009 baseline;

Note: Under GEMS renewable electricity, renewable energy and carbon neutral or positive targets are under review.

Energy Strategy Roadmap

Using GEMS as the framework, the 'Energy Strategy' pillar navigates the roadmap to potential carbon neutrality using the C^3 approach.

Cut energy use: under the governance of GEMS, in 2016 alone BSC invested over US$5 million into strategic energy infrastructure yielding US$2.25 million in long term operational annual savings and reducing CO_2 emissions by over 4% (3,866t of $CO_{2\text{-eq}}$ emissions avoided).

Convert to renewables: this is a high-impact low-cost approach, BSC is currently reviewing all existing energy provider contracts to assess potential for supply from renewable sources.

Compensate unavoidable CO_2: BSC will review implementation of Carbon off-set projects when the 'Cut' and 'Convert' initiatives are mature.

Energy Strategy Enablers

Decision-making process: under GEMS, BSC implemented a DSF as the cornerstone of the decision-making strategy where operation savings, sustainability targets and business continuity are part of the assessment criteria [32]. It is worth noting the NPV on a high impact EEM (Tri Generation plant) increased by 40% when all the non-energy benefits were accounted for. These included cost avoidance of CO_2 emissions, reduced running costs and maintenance of exiting HVAC equipment and business continuity improvements. The impact of a specific EEM on the overall company and site sustainability target is listed in the DSF results despite being already implicit via internal carbon pricing; such is the qualitative nature of the carbon emissions performance.

Investment strategy: BSC has proposed a dedicated fund to support their long-term goals (calculated as internal carbon pricing times their carbon emissions times multiple year payback periods). This creates good practice and aligns to the 'Cut' phase of the C^3 roadmap. Both, company capital and PPA are used in their strategy, with PPA model typically used for longer term returns. NPV and IRR are fundamental financial metrics for project assessment. Future energy forecasting is based on the associated sites previous 5 year historical trends unless exceptional circumstances applies. Production disruption period of 1hour is agreed on a site by site basis proportional to the overall value of the site value of production.

Energy management system Support: The GEMS energy audit and energy maturity level parameters are set by the Global Energy Management Team. BSC has eleven LEED certified buildings including platinum for their global headquarters. BSC main distribution centre in Quincy, US, is ENERGY STAR certified. In 2016, the 'Newsweek Green Ranking' listed BSC in 21st position in the US, an improvement of 8 places from 2015.

Verify: Metrics and monitoring

GEMS utilises six enterprise level KPI's to track performance at an individual site and Global level as follows; Energy usage, energy management maturity level, green real estate, carbon footprint, green energy, cleaner energy.

Promote and disseminate the strategy

GEMS utilises a dedicated pillar to perform all aspects of 'shared learning and dissemination'. GEMS logo and tag-line *'At BSC patient care begins with Planet care"* are direct outcomes of this pillar.

Conclusions and Future work

The methodology outlined contains the key components of a long term corporate energy policy and strategic roadmap to address the barriers and support the drivers identified in the literature review. The energy strategy helps reduce the gaps identified in the literature around decision making practices and the non-energy benefits. Both policy and strategy build on best practices identified from recognised leaders in sustainability within their industry sector.

Future work will focus on evolving the methodology to enable further deployment in other organisations.

Acknowledgements

This publication has emanated from research supported in part by a research grant from Science Foundation Ireland (SFI) under Grant Number SFI/12/RC/2289 through a TP agreement between the SFI Centre for Ireland's Big Data and Analytics Research, ZuTec Inc. Ltd and Boston Scientific Corporation.

Notes

1 In non-energy intensive organisation, energy costs are < 2% of the turnover or <5% of production costs [2], [9].

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