Case Study 9

The CIS Solar Tower Project

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Changing Behaviour

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Changing Behaviour

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Case Study 9:

The CIS Solar Tower Project

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Summary of the case

The CIS Solar Tower project is a renewable energy initiative established by the Co-operative Financial Service (CFS) in Britain in 2004. The project aimed to resolve the damaged building structure, which had existed six months after the building was built in 1962. In cooperation with the organisation's ethos and business strategy, it had decided to adopt the solar photovoltaic panels to resolve the problematic issue.

Initially the main target for the initiative was the building as a whole. As a grade listed building, there were concerns over the new development. Guidelines and restrictions were made to ensure the preservation of historical feature and value of the building. The emblematic and symbolic significance of the building and the issue of climate change have both been seen as priorities for the participating organisations and stakeholders.

The project's cost was approximately £5.5 million, with significant financial support from national government and public agencies. The media frequently published the claim that the initiative was the largest solar tower in Europe. The project has received considerable and widespread praise and support for adopting the renewable energy system. But despite this, the environmental contribution generated from the solar technology has been uncertain.

Step 1: Context of CIS Solar Tower Project

National context in general

The United Kingdom or commonly known as the UK or Britain, is a sovereign island country. It has the fifth largest economy in the world and the population of over 60 million people. Population has been growing at a fast rate and it is predicted that it will continuous to increase due to immigration, birth rate and long life expectancy. However, anticipated demographic trends in Britain are likely to cause significant challenges and tensions in the near future where the growing population will, without purposive action to the contrary, result in the inevitable in crease in resource consumption and pollution that UK affluence generates (Vidal, 2007).

The claim has been made that the UK has been proactive and outspoken about the issue of climate change (Mitchell, 2008). Over recent years, the government has increased its focus on energy use and environmental protection issues. In line with this, the government has produced a range of policies to stimulate the development of sustainable energy technologies (Mitchell and Woodman, 2004).

The government has promoted the 2006 UK Climate Change Programme as the key strategy for its work on tackling climate change; it sets out the policies and measures which the UK is using to cut its emissions of greenhouse gases (DEFRA, undated). Overall, the UK government has agreed with other Member States to an EU-wide target of 20 per cent renewable energy by 2020 - including a binding 10 per cent target for the transport sector. The European Commission has proposed that the UK share of this target would be to achieve 15 per cent of the UK's energy from renewables by 2020 which is equivalent to almost a ten-fold increase in renewable energy consumption from current levels. (BERR, undated) Furthermore, the UK has proposed setting binding targets for reducing carbon dioxide emissions through the Climate Change Bill 2007. These include:

- A 60 per cent cut in carbon dioxide emissions from 1990 levels by 2050
- A 26-32 per cent cut by 2020.
- Five-year carbon budgets will be established from 2008 to 2023, this will set binding limits on carbon dioxide emissions ensuring every year's emissions count.

The UK plan to cut down on carbon dioxide is strongly related to its production (and consumption) of energy. Although renewable energy sources have not played a major role in the UK historically, there is potential for significant use of tidal power and wind energy. The government has set out the UK's Energy Efficiency Action Plan 2007, which aims to bring together current and planned policies and measures to improve energy efficiency and meet the energy saving targets. As part of its goal to reduce emissions, the government aims to generate at least 10 per cent of electricity from renewable sources by 2020. To meet the 10 per cent target, approximately 10,000 megawatts of renewable energy will need to be generated (BERR, undated). The UK has a temperate climate, with plentiful rainfall all year round; therefore the government's renewable energy policy reflects the realities of the British weather; for instance the government has invested significantly more money on wind farms then solar power (The Guardian, 2004).

The total capacity for solar photovoltaic (PV) in the UK was approximately 6 megawatts (rated in 2003), while Germany has generated almost 400 megawatts of solar power. Despite the government's commitment to renewable power, the UK is still far behind in this field.

Local and specific context

The CIS's Solar Tower project has a significant impact to the local area as the building was once the largest building in the UK outside of London; furthermore, the solar project is the largest vertical solar cladding project in Europe (Walters, 2005). Therefore, as an iconic landmark in Manchester, it required substantial support from the local community, public agencies and government.

Historically, the Northwest of England had been a prominent industrial centre in the UK. The city of Manchester was born of the Industrial Revolution; it took the lead in the world's textile manufacture and production in the late 18th century until the 1960s. With its past, the Northwest region has aspirations to take a 'lead' on climate change and energy issues. According to the Manchester City Council (undated) the city has aims to become the UK's greenest city by making a greater rate of progress in improving environmental performance than other UK cities.

In particular, the region has strong interests in promoting energy efficiency solutions, mainly for the economic purpose. According to the Northwest Development Agency (2003), the region will mainly focus on developing the energy efficient market in the next few years as part of a major regional push to boost the Northwest's energy industry and meet government targets on climate change. Furthermore, the success or otherwise of the CIS Solar Tower project was linked to attempts to boost local regeneration effects in Manchester, which already had support from the regional development agency and the Government Office for the Northwest.

The status of the CIS Tower has long been of architectural and historic interest. The history can be dated back to 1952, when it was built as the central office of the Co-operative Insurance Society. The building has remained as the headquarters for the organisation ever since. The CIS merged with the Co-operative Bank and the internet bank Smile in 2002 to form Co-operative Financial Services (CFS). Their interest in renewable energy technologies was strongly associated with its history within the co-operative movement, which has a strong focus on environmental issues and social responsibility (Hudson, 2007).

The specific context of the Solar Tower project primarily relates to the built environment. According to Hudson (2007) there is increasing pressure for the existing building stock, including historic buildings, to incorporate measures that directly or indirectly reduce carbon emission production. Moreover, in the UK, it is estimated that approximately 50 per cent of greenhouse gas emissions are due to constructing, occupying and operating buildings. As the result, there is a growing pressure to adopt or incorporate energy saving and low carbon technologies into existing buildings.

Step 2: Focuses of CIS Solar Tower Project

General issues, initiator and problem definition

The CIS Solar Tower project began in 2004 and was completed in May 2006. The project cost £5.5 million, which was supported by an £885,000 grant from the Northwest Regional Development Agency (NWDA) and a £175,000 grant from the national Department of Trade & Industry (The Co-operative Bank, undated). The building is covered by 7,244 80w photovoltaic panels, with the potential to create 180,000 units of renewable electricity each year. Although it is not sufficient enough to power the entire CIS building, which houses more than 4000 staff, CFS claimed, the power will be enough to make nine million cups of tea. Despite the financial effort and general praise for the project, it was widely predicted that the energy saved on electricity bills as a result of the solar installation will likely never recover the initial fee (Citizen 21, 2007 and Green, 2007).

There were several partners involved in the delivery for the Solar Tower project; these included Solar Century, Arup, Sharp, EC Harris, and Capita Symonds. The initiative was pioneered by Solarcentury, the solar photovoltaic (PV) company, it was requested by CFS to 'develop a solution' for ventilated PV rain cladding. Arup then employed Solar Century to act as PV consultants, providing specialised PV knowledge, and recommended the supplier Sharp Electronics to manufacture the solar modules. EC Harris was responsible for the project management and planning supervision for the project. It played a pivotal role in the planning and delivery of this technically innovative and challenging initiative.

The main problem that the project aimed to address was the damaged mosaic tiles that clad the CIS Tower. The tower was built in 1962 and originally clad in 14 million mosaic tiles, inspired by the steel buildings of Chicago skyline. Nevertheless, the tiles began to fail, exposed the concrete structure to weather damage, it has also became a significant health and safety issue, therefore a long-term repair plan was needed. However, as the tower is a Grade II listed building, the long-term treatment systems for buildings of special architectural or historic interest must comply with conservation rules (The Twentieth Century Society, undated).

The idea to over-clad the tower in photovoltaic panels was proposed by Gary Thomas, Head of Property and Facilities, who believe the solar solution to be the most cost-effective solution to repairing the deteriorating façade of the building, whilst respecting heritage concerns. In line with CFS's policy and social responsible brand image, solar power was chosen as the solution to resolve the existing problem and help towards the renewable target.

Goals, objectives, targeted behaviours and target groups

The goals and objectives of the project were to find a long-term solution for the failing mosaic tiles, as well as promote sustainable development to combat the effects of climate change by implemented renewable energy system.

Initially, the Solar Tower project had no particular target other than the building itself. Nevertheless, the project is part of the group's sustainability management systems, which has a wide range of stakeholders who follow its ecological policy. The group has taken on the climate change issue as their main business strategy. It has engaged in a number of environmental activities. For instance, it has set targets to reduce the group's energy consumption by 20 per cent by 2012, and to generate 15 per cent of energy from the group's own renewable sources (The Co-operative Group Sustainability report 2006). Overall, the group's actions aim:

- To focus on its own activities as co-operatives and to measure and reduce its emissions from the organisation's operations.
- To involve the organisation's own members by informing and motivating them to adopt a lower carbon lifestyle.
- To participate and encourage members in campaigns and lobbying. (Burlton, undated)

Step 3: Design of the Project

What knowledge and ideas informed the design of the project?
At the beginning of the mosaic cladding failure, a survey was carried out by Arup - a global firm of designers, engineers, planners and business consultants - in 2002 to examine the problem and has found over 719 areas of failure. Several solutions were suggested, such as to replace the mosaic throughout or remove the mosaic and paint the exposed concrete.

The group explored these solutions, all of which had many disadvantages, such as the cost and risk of continued failure. Given the costly façade problem that the organisation was compelled to solve, as part of the organisation's sustainable business strategy and environmental ethos, the solar tower project seemed to be the most appropriate solution. In addition, the project was also intended to demonstrate how solar power can be easily incorporated into any building refurbishment to provide a cost effective alternative to conventional building materials. According to the Co-operative Group's Sustainability report (2006) their approach to address the issue of climate change is five-fold, focusing on energy efficiency, renewable energy consumption and generation, carbon offsetting, the provision of finance and public policy lobbying.

As a business co-operative, the group has been known for its strong ethics, values and social focus. The formation of the organisation was based on a shared co-operative heritage; the co-operative movement was founded in the 19th Century and focused on a set of philosophical principles, which included social responsibility. The principles have been reflected in the Co-operative Financial Services' (CFS) sustainability practice, which was largely built during the 1990s (Article 13, 2005). The group's environmental strategy feature details of its annual targets and achievement in relation to climate change issues, which has been published annually since 2003.

The concept for the Solar Tower project was developed through a combination of research, experiences and ideas based on the organisation's strategy. The introduction and adoption of solar power was part of a much wider organisational vision, based on three main agendas:

- Practicality
  - Proven technology in an innovative context
  - Solution to real problems, and the need to stabilise the mosaics in a way which addresses the listed building context
- Economic viability
  - Extensive funding support from the government and public sector
  - Energy cost savings: on-site generation of clean power
  - Income renewable obligation certificates from ROCs: tradable
- Stakeholder engagement
  - Renewable energy as a political agenda
  - Architecturally significant and important
  - As a iconic smart energy building
  - Enhances sustainability agenda in the Northwest region of England

(Gerhard, 2006 http://www.arbeitundklimaschutz.de/pdf_downs/PV2006/04Gerhard.pdf)

Research conducted on target group
In the late 1980s, much of the UK banking industry suffered from a reputation crisis, as well as experiencing profitability issues. The Co-operative Financial Service (previously known as the Co-operative Bank) sought to address the concerns by assessing its co-operative heritage and reinvigorating the group's brand with a modern interpretation of co-operative values (Article 13, 2005).

Followed by the group's commitment to reform, it conducted research and found that a significant proportion of customers stated ethical reasons as being their main motive for joining (Reeve et al, undated). The finding was to be a key driver for the organisation engaging in the future development of ethical policy.

In response to growing customer concerns for environment-related issues, the organisation conducted an ecological audit in 1996, which aimed to define the priority ecological areas for action. The audit highlighted eight priorities, of which six were deemed to be high priority, this included paper disposal, energy and transport and so on. The audit team made recommendations regarding the data required to monitor these issues. An Environmental Steering Group was set up to oversee work on the ecological priority areas and to develop an action plan for each issue. Furthermore, regular checks were made to ensure progress against organisational targets, such as reduction of carbon dioxide emissions and so on (Article 13, 2005).

In 1997, the organisation established the Partnership Approach, focusing on social responsibility and ecologically sustainable issues. Subsequently, the publication of the first Partnership Report and survey were sent to the bank's then 1.2 million customers. Around 98,000 responses received, with 97 per cent of responses expressing positive support for the Partnership Approach.

In 2000, the organisation began a major study of energy use in its premises, which aimed to develop a more sustainable energy policy. An energy management scheme was established to examine both energy consumption and CO_2 emissions. The findings of the study seemed to be 'adequate', considering the history of the building, it nevertheless still constituted a major consumption of energy (Hudson, 2007).

What barriers, motives and capacities did the project aim to target?

The Solar Tower project involved a number of business partners and supporters, their role and interests can be summarised as follows:

Table 1

Organisations	**Motivation (s)**	**Aims & Objectives**	**Capacities**
The Co-operative Group	To tackle the health and safety issues caused by the failed mosaic tiles. To explore more sustainable uses of energy within the organisation (Hudson, 2007)	Adopt a long term solution for the existed building problems. To achieve energy targets through the use of renewable energies. To demonstrates the viability of solar panels installation	The project was worth £5.5 million, including over £4 million of non government funds.
Renewables North West	?	?	?
NWDA	To ensure the Northwest is a pioneering region for sustainable development	To promote renewable energy and energy efficient solutions in order to meet national and regional targets in the area	Provided £885,000 grant to the project.
Energy Saving Trust (Department of Trade & Industry)	To encourage renewable energy solutions. To promote the Major PV Demonstration Project	To create a long-term, sustained and viable market for solar photovoltaic. To raise the profile of photovoltaic technologies.	Provided £175,000 grants to the project.

Business partners:

- EC Harris - To provide project management and planning supervision services
- Capita Symonds - Duties unknown
- Arup - Provided consultation, conducted survey, research and assessment, co-ordinate between the organisation and business partners.
- Solarcentury - Developed solutions for ventilated solar cladding and acted as PV consultants for the project.
- ISG Interior Exterior- Provided refurbishment and other construction works.
- Sharp - Manufactured the 80 W polycrystalline panels /solar modules.

The intervention method/instruments and activities used

Based on the available resources and information, it seems that there are no obvious instruments used in this project. Nevertheless, the project had been widely publicised and it had received much positive coverage from both the local and national media. Additionally, CFS, its partners and other stakeholders have published material to explain and promote the project (The co-operative group, Solarcentury and NWDA).

Participation, commitment, monitoring and evaluation

CFS submitted the Solar Tower proposal to the Planning Permission authority in Manchester. As the building has significant historical value, an advisory panel was set up to review the project plan and to ensure the guidelines were followed. One consideration was based on the Planning Policy Guidance 15 (PPG15) grounds for granting listed building consent on consideration of 'the extent to which the proposed works would bring substantial benefits for the community, in particular by contributing to the economic regeneration of the area or the enhancement of its environment' (Hudson, 2007).

Table 2 highlights participant roles and feedback from the planning permission process.

Table 2: Advisory Panel

Stakeholders	Roles	Feedback/Concerns
Planning and Conservation / Manchester City Council	Review and evaluate the project plan and granted the planning permission.	Dismissed the replacement of the mosaic solution and approved the solar power installation.
English Heritage	Ensure the historic interest of the building must be preserved (e.g. retain the original cladding systems)	No particular concerns and approved the project after a site visit.
Commission for Architecture and the Built Environment (CABE)	Review planning proposal and provide consultation	Concerned for the vertical spacing of the solar panels, position and its impact on the building's overall rhythm.
The Manchester Conservation Areas and Historic Buildings Panel	Review and assess the project plan	Expressed some reservations over the overall contrast of the building appearance. It also questioned the choice of cladding colour and visual design, but had approved the project at the end.
The Twentieth Century Society	Review and assess the project plan	Critical of the project plan, and was sceptical to the solar power solution. The main concern was the effect of the PV cladding on the building's appearance. Although not opposed to the project, they were unable to fully endorse it.

Links to other programmes and policy

As already stated, the CIS Solar Tower is part of much wider programme of action. From the national level, the UK government has established several climate change policies and sets targets for renewable energy system development. The CFS has its own environmental strategy and targets to meet, along with the support from the local government and regional government agency, the CIS Solar Tower can been seen as the inspiration to encourage other environmental activities. It is certain that the promotion of photovoltaic technology was one of the key factors that granted the project approval, on the basis of substantial benefits to the community under PPG 15 (Hudson, 2007). As well as being the largest solar photovoltaic project in Europe, it would be used as a highly visible example to address the government's climate change and sustainable development agenda and to demonstrate the potential of the technology.

Step 4: Process of project

Interaction between the different stakeholders of the project

The interaction between the different stakeholders had been highlighted in the participation and commitment section, which has covered the roles and involvements of stakeholders. There are other actors who can be considered in the project, such as the employees and clients of the organisation, even though they played a less vital role in the overall project development, but it is essential for the CFS to meet their expectations. The following table outlines the overall relationship:.

Table 3: Stakeholders' Expectations

Stakeholders	**Expectations**	**Involvement**
Business Partners (e.g. Solarcentury, Arup, EC Harris, etc)	Raise the business profiles Financial benefit Expand Business opportunity	Delivered the project outcome
Government, public agency and authorities (e.g. BEER, NWDA, MCC)	To meet the climate change policies targets Promote the renewable energy solution	Provided financial assistance
Architectural and built environment authorities or associations (e.g. CABE, English Heritage, etc)	Ensure the project has met the planning guidelines Preservation and conservation of the building	Reviewed, assessed the project plan
Client/Customer of CFS	Continued support for the organisation's business based on its existing focus for environmental sustainability and ethical trading	None
Employees	Unknown	Unknown

Project manager's responses to issues and problems

As mentioned before, the project received essential support and approval from the advisory panel and the public sector. However, there have been some critical responses to the project. Several issues were raised and can be summarised as follow:

- The effectiveness in energy generation and the targets for CO_2 emissions reduction were not properly substantiated.
- There were limited understandings of the full scale of photovoltaic panels, such as their durability, disposal and toxicity and other technical factors.
- These options were not fully examined and had not been given sufficient consideration.

Step 5: Outcome of the project

Overall, the project was successfully delivered. Its original objectives were mostly achieved and the results were generally accepted. Table 4 highlights them in further details:

Table 4: Objectives and Outcomes

Objectives	Outcomes
To identify a long term solution for the failure of mosaic cladding	A survey was carried out and several options were suggested: • *Replace the mosaic throughout and install stress relief joints.* • *Remove the mosaic and paint or render the exposed concrete.* • *To preserve the mosaic under an over cladding system* (Hudson, 2007). The third option was favoured; however, during the project planning, many seemed to suggest that the solution could only be seen as the temporary solution.
Resolve the health and safety issue caused by the failed mosaic tiles	The implementation of the Solar PV cladding would cover the existed mosaic cladding, which would prevent the façade from flaking off.
Preserve the building's historical features and listed status	Although the appearance of the building had been altered as the result of the photovoltaic colour, the result was generally acceptable based on the historical building guidelines.
Support work to set and achieve national and global emissions reduction targets	Installation of the Solar PV cladding. The output from the project was predicted at 183,000KWh per year. However, there are no official published figures of the actual contribution made towards the energy requirements of the building.

Effectiveness

The effectiveness of the project and its outcome can be examined from two perspectives:

- Environmental effectiveness

It is unclear about the impact of the photovoltaic technology and the result of energy consumption of the building. The CFS has so far been ambiguous about the capacity of the solar cladding system. It was previously projected that at least 10 per cent of the CIS Tower would be powered, although many critics (Hudson, 2007 and Murph, 2007 and Green Planet Solar Energy, undated) stated that such a contribution was acceptable the contrasting position takes into account the vast financial investment and widespread publicity the project received.

- Cost effectiveness

Critics, such as Manchester Civic Society Forum, have questioned the use of public fund to support a commercial company. It was suggested that the funds could have assisted other environmental schemes which could have made better use of public money (Hudson, 2007). But nevertheless, the project has raised the profile of the organisation and the region, demonstrated the use of potential solar photovoltaic system, and these outcomes cannot be measured solely from a financial perspective, but can offer potential opportunities in the future.

Step 6: Analysis and conclusions

The CIS Solar Tower received much attention for its environmental ambition. Although the delivery of the project was considered successful, there has been much scepticism about the reality of its environmental and energy efficiency contribution. There has been very limited in-depth information and resources about the project. The details for the design of the program, development process and outcome of the project are difficult to identify. Most of the available sources in relation to the project were published through media channels, such as the BBC and the Manchester Evening News newspaper, which provide limited detailed information. Nevertheless, the CIS Solar Tower project has demonstrated the potential of solar power responses to energy efficiency and consumption issues in organizations and their buildings.

Given that the CIS solar system has only been in operation since mid-2006, performance and environmental outcomes need to be assessed over a longer-term timeframe, particularly to inform the organisation's future policies and plans to enhance the capacity of its solar system.

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