CASE STUDY

Gone with the wind? - An ambitious wind energy project to power the Greater Malé region that never materialised

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Abstract

Maldives announced one of the most ambitious renewable energy projects so far, in 2009, with a plan to invest in a 200-million-dollar wind farm in Gaafaru lagoon (Burulu Falhu), north Malé Atoll, to be managed and operated by a US-based firm, Falcon Energy and its consortium partners. The project was designed to provide a 75-megawatts of wind-generated energy to the Greater Malé region and resorts in the area. The announcement of the project culminated in a lot of public hype and hope for reducing the country's dependence on fossil fuel for energy generation and as a major step towards achieving a carbon-neutral economy. The technical feasibility, environmental impact assessments, and required funding possibilities were all pointing towards the project's practicality. However, after the initial excitement of the project launching has subsided, the project slowly moved to doldrums and never saw the light of the day. At a later stage, there were rumours of project cost-estimation requiring a higher initial investment as planned, and news of a Chinese firm taking over the project from Falcon energy. Why did the project never materialise? What were the reasons behind the lack of enthusiasm to pursue this project and overcome the challenges? This case study provides a contextual background to the project, its potential environmental and economic benefits and the possible factors that contributed towards its failure to launch.

Keywords: wind energy, renewable energy, sustainability, carbon neutral

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Introduction and background

Maldives is one of the most vulnerable countries to the devastating effects of climate change, global warming and sea-level rise. Being land scarce and extremely low-lying, the risks posed to the country from intensifying and destructive weather events are extreme (Climate Change Knowledge Portal, 2021). With a population dispersed over nearly 200 inhabited islands scattered over a large geographic area, providing adequate transportation connectivity between islands and the generation of electricity for the population had always been a key challenge for the government. Due to lack of investment in renewable energy sources in these sectors, Maldives has continuously relied exclusively on imported fossil fuels for transportation and power generation sectors (Asiand Development Bank, 2020). During the last few decades, the proportion of fuel remained close to 20% of all merchandise imports (Ministry of Housing, Transport and Environment, 2009). Therefore, moving away from fossil fuels towards more sustainable energy sources has remained a major policy target for the country from a public policy perspective.

Figure 1: Map of Gaafaru and north Malé Atoll

On 2 November 2009, in a bid to make the Maldives a carbon neutral nation, Maldivian President Mohamed Nasheed unveiled a $200 million (US) foreign direct investment project, which was designed to produce clean electricity for

North Malé atoll, including the capital Malé, the international airport island of Hulhule', Hulhumalé and a number of luxury tourist resorts in the region (The President's Office, 2009b). Under the 20-year agreement with Falcon Energy, a US based company, the project was expected to build and operate a 75-megawatt wind farm in Gaafaru lagoon (Burulu Falhu) in the north of Malé Atoll (Figure 1). The project included a 50MW liquefied natural gas plant as a power back-up for calm days in which sufficient energy is not produced by the wind turbines, as well as laying of laying of submarine cables to link the electricity created by the wind farm to the main electricity grid of the State Electric Company (STELCO). It was planned that on windy days, excess electricity generated by the turbines will be used to run a water desalination plant, which will produce bottled drinking water (The President's Office, 2009b). The combined benefits of this project could have, therefore, multiple dimensions that can help enhance the socio-economic landscape of the country.

In announcing the project, President Nasheed said that:

> *"We want the Maldives to be the place to test renewables. We want the Maldives to be the place to build renewables. We want the Maldives to be the place to invest in renewables. We will position the Maldives as a showcase for renewable energy" (The President's Office, 2009b).*

He also said, "We want the Maldives to be a winner of the 21st century" (The President's Office, 2009b). These ambitious statements also reflected the government's position on creating more opportunities for Maldives to set an example for other countries to adopt more environment-friendly development trajectories.

The project was to be managed by a well-established company in the field of wind power generation. Falcon Energy, the company which was to lead the project, and its partner WGS was reported to have commissioned onshore and offshore wind farms totalling 1,500 MW over the past ten years, in Britain, Spain, Portugal, Ireland and Canada. General Electric (GE Energy) is one of the world's leading suppliers of power generation and energy delivery technologies, with 2008 revenue of $29.3 billion (GE, 2022). Based in Atlanta, Georgia (USA), GE Energy works in all areas of the energy industry including coal, oil, natural gas and nuclear energy; renewable resources such as water, wind, solar and biogas; and other alternative fuels. Numerous GE Energy products are certified under eco-magination, GE's corporate-wide initiative to aggressively bring to market new technologies that will help customers meet pressing environmental challenges (GE, 2022).

Despite the significant size of the project and the required investments, the government and the project team were very upbeat about the practicality and feasibility of the project. The project was anticipated to be completed and operational by August 2013 (Minivannews, 2009).

Anticipated benefits of the project

The project is deemed to provide massive benefits in many different forms and to various sectors. In addition to the obvious environmental benefits of reduced dependency on fossil fuels and the direct economic benefit of cheaper electricity production, the project was also expected to create additional jobs and other related benefits to the community. At the local level, the project was expected to provide an economic windfall for the population of Gaafaru, such as maintaining the wind farm equipment and facilities (Raajje News, 2009). These opportunities can significantly transform the overall living condition of the island community.

Figure 2: A poster signage of the project

Chris Goodall of Oxford Climate Associates, who developed the Maldives' carbon neutral plan, said the Gaafaru project would reduce the Maldives' carbon dioxide emissions by up to 25% (Energy Matters, 2009). This would be a giant step towards making the country carbon neutral and promoting sustainable energy production. The project's local lead, Maizan Omar Manik, told Minivan News the Gaafaru wind farm is expected to completely replace the electricity currently produced and provided by STELCO, and should save the government about US$50 million a year (Minivannews, 2009).

The relevant stakeholders and partners of the project were also very upbeat and optimistic about the overall benefits of the project and its feasibility. For example, Kishore Jayaraman, President and CEO, GE Energy, India Region, said:

> *"It is a moment of great pride for all of us at GE Energy to be associated with the Maldives government's goal to realize their vision of green energy development. To boost investment in renewable energy, it is essential to introduce clear, stable and long-term policies and the Maldives government is providing that necessary policy support. GE looks forward to undertaking a feasibility study to determine the potential of this region" (The President's Office, 2009b).*

He also stated that:

> *"At GE, we understand that renewable energy will be an integral part of the world energy mix. The world needs reliable, affordable and clean supply of electric power with zero greenhouse gas emissions, which is why GE continues to drive investment and research in cutting-edge technologies to power the world responsibly. Our commitment is to help our partners and customers design and implement renewable energy solutions for their unique energy needs" (The President's Office, 2009b).*

Hassan Zahir, Chairman of STELCO, said during the launch of the project that:

> *"STELCO is pleased to be a part of this major project in renewable energy. We are committed to diverse electricity generation to renewable sources, and to make Maldives a carbon neutral country within a decade, as planned by the President his Excellency Mohamed Nasheed. Hence, today we are taking an important step to achieve this goal, and are confident that it will help to drive in others in the power sector to invest in renewable energy sources" (The President's Office, 2009b).*

These statements and declarations reflected the general sentiment at the policy and technical level in relation to the project and its perceived benefits. There was very little doubt in anyone's mind that the project would drastically change the face of energy generation in the country.

Technical feasibility

In setting up the wind farm, one of the most fundamental considerations is the availability of adequate wind speed in the locality where the wind turbines are to be installed. The required minimum average wind speed for a utility-scale power plant using 2010 technology is approximately 6 m/s, according to some estimates (Aleem, 2010). A general approach in calculating the energy output uses a cubed measure (meaning that the energy output is the cube of the respective wind speed). In other words, if the wind speed is doubled, it will result in an eight-fold increase in the energy output, and vice versa. This means that a difference of just 1 km/h in wind speed could significantly bring down productivity in the wind farm.

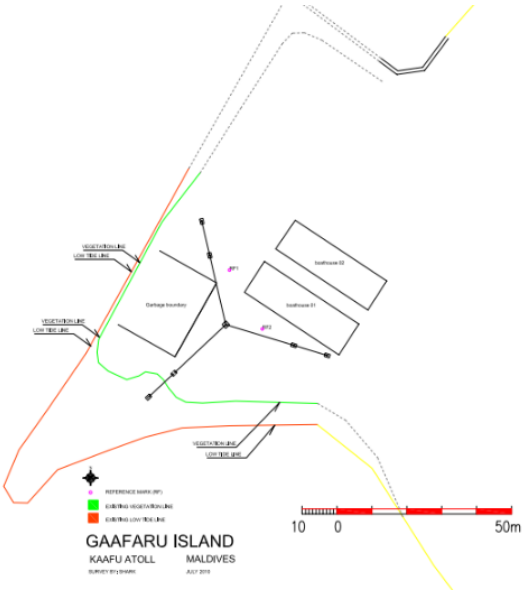

Figure 3: Location of the wind assessment mast at Gaafaru

At the inception of the project, GE Energy was to carry out a technical feasibility assessment, and based on the results of the study it planned to develop a comprehensive proposal around GE Energy's power generation technology for the project and technical assistance for both wind turbine generators and back up liquid fuel generator.

As part of the feasibility assessment, a mast was setup in Gaafaru island in 2010 to measure wind speed at 40 and 80 meters (see the map where the mast was set-up). The environmental feasibility assessment carried out by an independent firm in relation to the mast indicated that the positive impacts

and benefits of the project are enormous, including the possibility of collecting long term regional weather data that is not presently available in Maldives, promotion of renewable energy and increasing the awareness of renewable energy among the public, and indirect social benefits from the project that results in increased visitors to the island by the project personnel (Aleem, 2010). The report also identified that if data collected in this phase is adequate and feasible, the wind farm project in Gaafaru will take place and hence will bring enormous economic benefits to the island and the country. The potential for any negative environmental impacts were calculated to be negligible or very minor, whilst bringing in innumerable social and economic benefits (Aleem, 2010).

Figure 4: Graphic representation of the turbines to be installed in Gaafaru lagoon

According to figures published in a 2003 report by the US National Renewable Energy Laboratory (NREL), North Malé Atoll has an annual average wind speed of 4.9 m/s (17.7 km/h), with the maximum average wind speed recorded of 8 m/s (28.8 km/h). The Gaafaru wind farm is expected to run on a minimum wind speed of 5.7 m/s, and is therefore expected to run at 85 percent productivity (Minivannews, 2009). Additionally, it was also estimated that with the improvements in technology since NREL's report, the minimum efficient level of wind speed is considered to be at 3.5 m/s. Based on these, the plan was to install wind turbines at a height of 80 meters, with the propellers reaching a diameter of 50 meters. At this height, the wind is far stronger, providing a higher level of efficiency (Ortega, 2010).

Economic and financial feasibility

The economic feasibility of a potential wind farm is considered to depends on the purchase price of the electricity produced at the locality. Given that Maldives relied 100% on imported fossil fuel for energy production, the potential savings and economic benefits of switching to renewables is extremely high. Assuming the total project is to cost anywhere between US$200-300 million and the estimated total saving for STELCO of US$50 million per year, it is safe to assume that the project investment would have been covered within 5-6 years at most. Even including the maintenance and other related ongoing expenses, the project break-even could be safely achieved within a decade.

Speaking at the launching of the project, President Nasheed said:

> *"I understand that the Falcon Group project alone is going to save us 40 million dollars of diesel imports. So, this is going to ease our balance of payments by 40 million dollars. This is going to ease electricity prices by I understand some… I am told that Falcon would be charging 1.92 Rufiyaa per unit to STELCO, that is much lower than STELCO's present production cost. And therefore, we will be able to maintain electricity prices as they were when we came into government" (The President's Office, 2009a).*

This reduced charging of electricity tariffs is also expected to bring in enormous benefits not only to the households in the region, but also reduce the overall business costs, generating further economic benefits.

Financing such a mega project should be another key consideration. While there was very little reported about the financing mechanisms for the project, it is understood that the Falcon Energy and the consortium along with the Government of Maldives would be raising the required funds from various sources. It was also reported that Falcon Energy group is investing most of the money needed to fund this project, and the funds are expected to come from international banks (Ortega, 2010).

Politics of renewable energy

Climate change has been causing huge shifts in geopolitics and industry with undeniable evidence of damage to the atmosphere and the climate due to our unquenched thirst for fossil fuels. At the same time, new technological advancements have paved the way for a boom in renewable energy across the globe (Financial Times, 2021). When the new government came to power in

2008 after the first-ever multiparty democratic elections, it made a significant commitment to make Maldives carbon neutral and to move away from fossil fuels, with a target of going carbon neutral by 2020 (Climate Action, 2010). The government was also keen to play the role of global environmental champion, hence had a strong motive to demonstrate its commitment to renewable energy.

Despite the highly dispersed nature of the population and inhabited islands, Maldivians have enjoyed universal access to electricity since 2008 (The World Bank, 2020). However, given the lack of investment in renewable energy sources till then, there was a heavy reliance on imported diesel and isolated island-based grids, which has driven up the costs of electricity generation. The government continued to provide fuel and electricity subsidies, which add to the government's fiscal burden, while at the same time keeping electricity tariffs among the highest in the South Asia region (The World Bank, 2020). New and cheaper methods of energy production would seem to have an inherent appeal to both the government and the public. Yet, the project had its fair share of detractors.

When transitioning from one system of energy production to another, there is a need to address other system components such as institutional arrangements, governance structures, social, cultural and planning approaches (Strachan et al., 2010). STELCO had a monopoly on power generation in greater Malé region, while the islands and resorts maintained their own electricity generation. There was no centralised grid system. Changing the status quo, therefore, was not an easy task for the government.

By the time of the announcement of the project, there seems to have been a high level of enthusiasm and drive from relevant stakeholders such as STELCO to make the project a reality. For example, at the launching ceremony of the project, the managing director of STELCO at the time said the wind farm would serve both as a source of renewable energy to the most demanding region of the country but as a monument to the Maldives (REVE, 2009). The technical feasibility and benefits of the project were not in doubt and the potential gains and benefits were widely accepted at this stage.

However, within a short period of time, there seems to have a significant 'change of heart' for some key stakeholders. While no specific reasons were cited, the level of resistance to the project among key stakeholders can be identified from documented sources. For example, within a short period of time after the launch of the project, STELCO had conveyed their concern

that the installation of renewable power projects resulted in burning of more fuel as diesel generator sets operated at the low end of the efficiency curve (Climate Investment Fund, 2019). Although there were no specific details of this new-found fear, it was evident that the utility company was not too amenable to a large-scale renewable energy roll out and was reticent to private energy generation from renewable energy sources compromising their existing monopoly. There was not adequate effort to address and overcome this negative perception of renewable energy and to align motivations between utility management and the government. (Climate Investment Fund, 2019).

Community resistance to locally sited wind energy schemes is another common barrier in such projects (Ogilvie & Rootes, 2015). Was there any resistance from the local community level to the development of the wind energy project? While there was no evidence of any organised resistance to the project at the community level in Gaafaru or in the Greater Malé region, anecdotal evidence shows a high level of scaremongering driven by political opponents was present in both locations. Some of the anti-campaign messages went as far to claim that the people of the island would feel small earthquakes or tremors due to the windmills and this could have negative impacts on the quality of life of the people in the island, according to island community members. However, no scientific evidence to support this claim was ever presented, and it is also highly unlikely that the community level resistance has had any influence on the project-related decisions.

Politics plays a crucial role in shaping public policy stances, particularly, when large investments, multiple stakeholders and significant socio-economic impacts are involved. With the Maldives in transition to a democratic government only as recent as 2008, many aspects of governance and public accountability remained in an unsteady state at the time of the project launching. Political opposition has not had time to find their feet in meaningful and critical engagement with public policy. Rather, there was a strong current of squelching and sabotaging projects of the new government through residual power bases and vestiges of the previous government – now in the opposition (Didi, 2012; Kumar, 2010). There were reports indicating the difficulty faced by the government in implementing policies and programmes due to the blocking tactics of the opposition (Kumar, 2010).

The project in the doldrums?

After the initial hype of the project, the level of enthusiasm seems to have waned significantly. Although a wind mast was installed in Gaafaru island to

measure the wind speed, shortly after the project launching, other aspects related to the project did not catch much headline for the next year. Any efforts or challenges faced in financing the project or additional research on the technical feasibility remains opaque. There were later reports indicating that the project is likely to go beyond the initially projected budget and would most likely require at least US$370 million based on revised estimations of the required investment (Minivannews, 2009). However, there was no indicating that any decision to scrap the project was in the pipelines.

Then, after about two years, in 2011, newspapers started reporting that the Chinese electrical manufacturing firm XEMC will take over the Gaafaru wind farm, following the behind-the-scenes collapse of the agreement between GE and Falcon Energy the year before. Under the new agreement between XEMC and the STELCO, XEMC will install turbines capable of generating 50 megawatts and submarine cables servicing the greater Malé area, under a build, own and operate arrangement (Archive.mv, 2011). According to STELCO the project was awarded to the Chinese company as part of Maldives' ambition to become the world's first carbon neutral country by 2020 (Archive.mv, 2011).

Under the new arraignment, the company will generate 50 megawatts of wind energy for the Malé area and a Liquefied Natural Gas (LNG) plant is to be built to provide 30 megawatts of energy on windless days to prevent service disruption. The work on the project was to begin within the three months after the new agreement was signed (EcoBusiness, 2011). But strangely, after a short period of time, new reports emerged that according to STELCO, XMEC is scouring areas in Malé Atoll to locate the wind turbines and LNG plant, indicating that the initial decision to host the turbines in Gaafaru is now under reconsideration. However, no details were shared to the public on the fate of the project.

Blame game and the failed project

In 2011, news surfaced that Falcon Energy Consortium is preparing to take legal action against the government's termination of a US$370 million project to develop a wind farm at Gaafaru, in North Malé Atoll (Minivannews, 2011). According to the news reported in local papers, the company claims that they have already invested nearly US$1 million (MVR 15 million) in meteorological masts and initial readings (Minivannews, 2011). However, there was no indication that the legal case was pursued.

On the other hand, STELCO insisted that there was no private partnership agreement signed with GE and Falcon Energy, and that the project was cancelled after concerns were raised by the public over Falcon's legitimacy (Minivannews, 2011). The new deal with the Chinese firm XEMC was a result of an open tender, after terminating the arrangement with Falcon Energy. Some local newspapers also reported that Steven David Jones, managing director of the Falcon Energy Consortium, expressed his "big shock" when the Maldivian government signed the deal with XEMC (Minivannews, 2011). Interestingly, at this stage, several questions emerged in local media about the credentials and credibility of Falcon Energy.

Conclusions

This case study demonstrates the precarious nature of implementing large investment projects with international partners, especially when the arrangements are done in a rush without due diligence. Notwithstanding the urgency for Maldives to switch to renewable energy sources, the challenge still remains in attracting significant level of investment in the sector, including wind, wave and solar energy.

Since the failed wind farm project, there has not been any new progress in investments in this area. The proposed project with XEMC also did not materialise. It is not clear if the government has sought any new wind power projects since. However, there is an increasing focus on investing in solar PVE projects, which are more cost-effective from an investment perspective. As of today, the utility of wind in the Maldives remains an open debate.

Case Study Teaching Guide

This case study can be used in teaching several subject/ discipline areas, at undergraduate and postgraduate levels. Some of the potential themes include:

- Project planning and management
- Project feasibility and financing
- Public policy management
- Economics of renewable energy
- Politics of renewable energy
- Sustainable Development Goals (SDGs)

Learning objectives and key issues

Using this case study in teaching can be targeted to achieve the following broad learning objectives.

- To explore the potential for developing more sustainable projects in the Maldives.
- To critically analyse the challenges of implementing high stake, mega projects.
- To recognise the public policy dynamics related to mega projects and to incorporate learning from past designs that did not work
- To identify commercialisation and entrepreneurial strategies in designing and implementing renewable energy projects
- To get insights into new approaches to design and manage major projects.

Teaching strategy

In teaching the case study, students can be asked to critically analyse the case and address core issues that can be discerned. For this, a number of trigger questions can be used by the lecturer as part of the case discussion. The case can also be used as a group task, requiring each group to address a different dimension of the case. Alternatively, the case can also be used as part of multiple cases addressing different dimensions related to the lesson. At the end of the case analysis, it is essential that the lecturer provides a consolidated summary or take-home lessons.

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