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Advancing Geothermal Energy in the OECS for Economic Development and Resilience

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ABSTRACT

The Caribbean region is seeking effective solutions to its energy challenge of dependence on imported fossil fuels despite the availability of renewable energy resources in most countries. This has made the region on a whole, vulnerable to the exogenous shocks from volatile and increasing global energy prices which can limit economic development and the pursuit of a better standard of living for the region. Building resilience in energy supply and infrastructure, particularly through the use of indigenous renewables, supports country's strategies to cope with such shocks. Geothermal energy is a priority for the Members of the Eastern Caribbean States (OECS) and currently eight (8) Member States are actively working on geothermal energy projects. The success of these projects will transform both the energy and economic landscapes of the region. Success would mean a marked increase of renewable energy in the energy mix with its associated benefits. However, geothermal energy has additional benefits such as a small land footprint and the ability to co-exist with other land uses. This is particularly important within the Small Island Developing State (SIDS) context. In addition, geothermal energy has high availability which means it can be used to provide baseload a noted advantage over wind and solar energy. Further geothermal energy has a reduced vulnerability to the impacts of Climate Change such as strong winds. To date, significant resources and time have already been put into developing the region's energy resources with some more needed to realize operating geothermal plants.

Geothermal energy development is a relatively novel undertaking for the region and requires specific interventions to help de-risk such projects. Partnerships with reputable investors and developers offer a good solution, especially as regional governments are unable to financially back these investment programmes on their own. In addition, capacity building, appropriate regulatory frameworks and a conducive policy environment will all support geothermal energy progress. Given the small size of the region and the associated limitations, this paper explores the strategies, benefits and considerations of regional cooperation amongst OECS members to help de-risk geothermal energy for economic growth and resilience. It will explore the main components of an efficient and proactive regional mechanism to coordinate, manage and facilitate activities and measures to support national efforts in geothermal energy in the OECS. It examines how regional cooperation and integration can be accomplished through geothermal energy development in a single economic space for islands.

1. INTRODUCTION

There is a heightened interest and effort to support geothermal energy in the Eastern Caribbean in recent times. The number of development partners working on geothermal energy has increased and there is increased public engagement of subject of geothermal power. The increased level of financing available for geothermal energy development, a critical component for supporting geothermal exploration is a clear indication of the importance now being placed on geothermal energy in the region. In most cases these developments form part of a broader overall plan to develop the region's renewable energy sources and support the transition from a fossil fuel- based economy to one powered by sustainable energy sources. Sustainable energy, and more explicitly renewable energy, is of particular importance to the Eastern Caribbean because it presents an opportunity to transform the physical, social and economic landscapes of the region.

Geothermal energy, in terms of actually installed capacity is largely underdeveloped in the Caribbean and to date the sole geothermal plant is located on the island of Guadeloupe, a French department who most recently joined the OECS, in March 2019 (OECS, 2019). The other OECS Member States with significant geothermal energy prospects have signaled their clear intention to pursue geothermal development as part of their overall sustainable energy goals. This is understandable given the unique advantages geothermal energy offers over other renewable energy sources. Geothermal power plants can provide baseload generation and is able to react fast to changes in demand, contributing to a resilient, integrated and cooperative regional energy system. In addition to generating electricity, the secondary heat produced by the process can also be used directly (IRENA, 2019). These characteristics means that geothermal energy can help address energy security, poverty as well as support and attract businesses. In addition, the overall environmental impact is positive as geothermal plants have a comparatively small footprint on the landscape compared with other technologies with the same generating output and emits no greenhouse gases.

There is a strong connection between energy and the fiscal, social, and technical systems it supports (Roege, Collier, Mancillas, McDonagh, & Linkov, 2014). Recently, widespread and persistent disruptions in energy systems have highlighted the extent of this dependence and the vulnerability of increasingly optimized systems to changing conditions. The 2017 hurricane season underscored the need for resilient infrastructure in the region. Hurricanes Harvey, Irma, and Maria caused loss of life and widespread destruction throughout the Caribbean, affecting critical infrastructure, services and entire communities. Ready access to electricity is of vital importance immediately after a disaster to aid recovery efforts and to hasten the process to normalcy. Solar systems can provide a good solution as they do not require imported fuel which may not be available immediately after a storm. However, solar systems if not adequately designed and installed can be vulnerable to damage from hurricanes, as can be seen from the effects of 2017 in the Caribbean (Burgess & Goodman, 2018). Geothermal energy development is currently being factored as part of the energy resilience plans for the region.

2. INTEGRATION AND COOPERATION AT THE OECS LEVEL

Integration has long been recognized as an imperative for the small islands of the Caribbean to thrive. The OECS Member States, like most SIDS, tend to experience a unique combination of economic, social and environmental vulnerabilities. Their economic vulnerability stems from the existence of small domestic markets and a narrow natural resource base resulting in undiversified economies. The economies of OECS are highly open and are therefore quickly and strongly affected by global trade and financial volatility and economic downturns. This ultimately has negative impacts on economic growth and resilience. Nevertheless, global best practice demonstrates that these challenges can be addressed through deepened integration and collaboration at the regional level.

Integration in the Caribbean is supported through the OECS architecture which came into being through the signing of the Treaty of Basseterre on 18th June 1981 by Antigua and Barbuda, Dominica, Grenada, Montserrat, Saint Kitts and Nevis, Saint Lucia and Saint Vincent and the Grenadines. In 2001, the Members of the Organisation decided to deepen their cooperation and formed an Economic Union through the Revised Treaty of Basseterre which is focused on accelerating growth and development among themselves. OECS as an International Inter-governmental Organisation has seen significant growth and progress over the years. The Economic Union has continued to grow in membership and new areas of cooperation. Currently the OECS has six independent members and five non-independent members comprising three British Overseas Territories and two French Departments. The main objectives of the OECS revolve around economic harmonisation and integration, protection of human and legal rights, and the encouragement of good governance among independent and non-independent countries in the Eastern Caribbean. The OECS also seeks to promote harmonization of key policies such as (i) Environment, (ii) Energy and (iii) Trade. Geothermal energy development has the potential to support greater integration and collaboration within the OECS, particularly in the three policy areas mentioned.

The Economic Union seeks to create a single financial and economic space comprising Protocol Member States (OECS Revised Treaty of Basseterre, 2010). The objectives include ensuring that economic and social progress and cohesion are balanced and sustainable in the Union and this is complemented by harmonious development of economic activities through inter-sectoral linkages within and between Protocol Member States. Of particular relevance to the energy sector is the objective of continuous economic growth and expansion through the optimal utilisation of domestic and Economic-Union-wide resources. This is supportive of efforts to accelerate improvement in the standard of living and reduction of poverty and to increase levels of economic and social stability.

3. GEOTHERMAL ENERGY AND ECONOMIC DEVELOPMENT IN THE OECS

The high cost of imported energy is a major barrier for the economic growth and competitiveness of the OECS region. Electricity prices in most of the OECS are among the highest in the world primarily because the countries are small and have isolated electricity markets that depend on imported fuel oil for electricity generation. The high cost of energy has a ripple effect, as it negatively impacts the operations of businesses and the quality of life in the region. This is particularly evident in revenue-generating sectors such as tourism and manufacturing. The challenge of meeting growing demand for electricity while diversifying the energy generation mix is also a major issue for development. The scientific evidence does indicate that most OECS Member States have good potential to develop reliable, lower-cost power generation alternatives, as a means to improve energy security, affordability and resilience.

Although geothermal exploration is still ongoing, the findings of the World Bank suggests that the Caribbean has a geothermal potential of over 900 MW (World Bank, Energy Sector Management Assistance Program, 2018). Development of these geothermal resources provides a considerable opportunity to transform the electricity matrixes of these islands. Currently eight OECS Member States are actively pursuing geothermal energy projects with new six fields and a total of 195 MW planned for development over the next 10 years. Amongst renewables geothermal energy has the greatest potential to single handedly transform the energy landscape of the region. Figure 1 shows the capacities of planned geothermal projects in the Caribbean.

Successful development of the region geothermal energy resources is expected to promote economic development, enhance energy security and help stabilize the cost of electricity. In this regard, countries are not subject to the volatility of international oil prices, and this reduces the outflow of a significant percentage of the Gross Domestic Product on imported fuels. The findings of a recent study by the Inter-American Development Bank (IDB) which examined five countries in the OECS , showed that if the countries studied are able to exploit their estimated geothermal potential to meet their baseload demand for electricity, they could significantly reduce their electricity tariffs (Gischler, Janson, Gonzalez, Cordoba, & Santana, 2017). According to this study, the average estimated levelized cost for a 10–20 MW geothermal plant is between US$0.08 and US$0.15 per kWh as compared to the average electricity tariffs in the Eastern Caribbean of US$0.34 per kWh in 2014. Additionally, the price of electricity generated from geothermal sources is also less volatile than electricity generated from fuel oil a perceived benefit for business and investors. Overall the study concluded that the development of geothermal projects in the study will have a positive impact on the economies of the beneficiary countries. The main and most tangible benefits are the reduction in the average tariff to customers and also the reduction in the importation of fuel oil. The study estimated that the implementation of the proposed projects will lead to an average tariff reduction of betweenUS$0.02 per kWh to US$0.13 per kWh. Implementing the projects will lead to a reduction of fuel oil imports of an estimated value between US$8 million and US$21 million for each project and a total of US$51 million for the first phases of the projects identified. This would ultimately result in financial savings in the OECS which could directed towards new projects and expansions of other sector for economic growth.

On a macroeconomic level the transition from an energy importing region to an energy exporting region could dramatically change the economics and the way of revenue generating of the whole region. The OECS Economic Union allows for the free movement of goods, people and capital. Energy as a good or service could be moved and traded as a commodity feely if the excess energy from geothermal exploration would be made available as tradable resource. The geothermal resources of Dominica and Saint Kitts and Nevis are estimated far more than their demand (Gischler, Janson, Gonzalez, Cordoba, & Santana, 2017). The option of interconnection via electric submarine cables or the transformation of the energy excess in other useful products like hydrogen,

chemicals or other storable products would open up the options for inter-island trade schemes. The energy surplus from geothermal energy and the use of conversion technologies would allow for decoupling of power from the electricity sector for use it in other sectors such as transport. Guadeloupe for instance, has indicated its intention of supporting the growth e-mobility at the national level with increased capacity for geothermal energy (Pouget & Laffont, 2019). These new opportunities and income resources could heavily influence the entire economic dynamics as a "game changer" in the Eastern Caribbean region. This opens up opportunities for the new revenue generating streams for the national economies through export of geothermal energy. Potential economic benefits in this regard include diversified economies and reduction of market risks. These efforts would also serve to decarbonize economic development of the region.

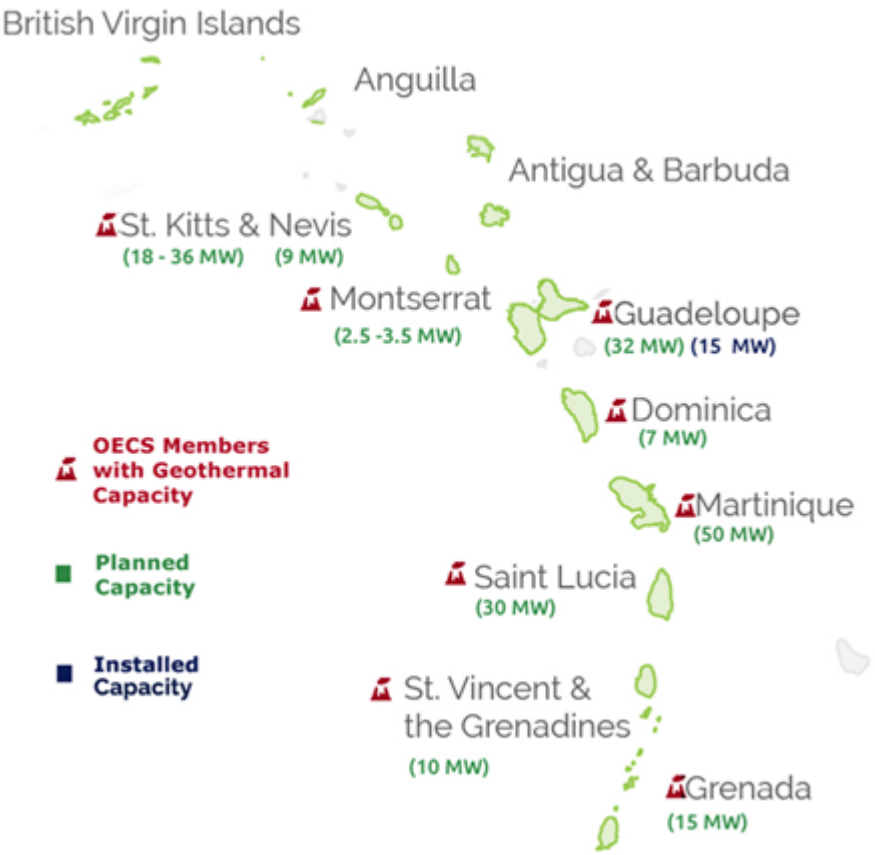

Figure 1: Planned Geothermal Projects in the OECS (OECS, 2019)

Another potential economic benefit of geothermal energy in the OECS is the creation of jobs. The whole process of geothermal energy development from exploration to plant construction and operation provides a wide range of unskilled and highly skilled employment opportunities. There are some indirect employment opportunities which may also emerge due to geothermal projects and these spin-off opportunities could have a positive impact on the communities where the geothermal resources are located and the entire islands. Within the OECS most of the geothermal resources are locate in rural areas which experience unemployment and the absence of strong economic activity. Ultimately, a multiplier effect on the economy can be created by geothermal energy developments as additional economic activity continue to be generated by the initial investment for geothermal energy.

4. THE NEED FOR ENERGY RESILIENCE IN THE OECS

Energy fuels development and energy access has a direct influence on the physical, social and economic conditions of a country. Renewable energy including geothermal energy is expected to provide significant benefits to the OECS region including increased energy security and energy resilience. Furthermore, economic stability is dependent on the effective functioning and resilience of energy systems (Molyneau, Brown, Wagner, & Foster, 2016). Given that energy is such as important contributor to quality of life, it is important that energy access and supply are protected and strengthened to ensure continuity and ease of delivery. The Hurricane season of 2017 firmly underscored the need for resilience in all sectors but particularly for the energy sector in the Caribbean. Energy systems can be vulnerable to a number of other hazards including earthquakes and rising sea levels. The impacts from damaged electricity infrastructure and energy-powered systems can affect several aspects of basic human physical and social life such as food preservation and water supply. Essential recovery services, transportation and hospital operations can also be negatively impacted, hence it is important that energy resilience be considered in energy planning for especially for small islands as the OECS.

Resilience in its broadest sense, refers to strengthening the ability of human and non-human systems to withstand and respond to changes. Resilience does not merely refer to an adaptive capacity to respond to disruptive challenge in a small scale of time, but

also means a sustainable capacity to ecological remediation in a whole life cycle scale (Wang, et al., 2017).As a concept, resilience has been identified as a useful indicator of sustainability and robustness, but it has proved difficult to measure (Molyneau, Brown, Wagner, & Foster, 2016). In the context of energy, since the energy system has a significant role in the interaction process between nature environment and human society, the concept of "resilience" can definitely be drawn to the energy system as a measurement to evaluate the trade-off performance of available energy technologies embodied in various energy systems (Wang, et al., 2017). There is an absence of existing approaches to assess the resilience property of any energy system quantitatively and comprehensively (Wang, et al., 2017) but there is a general consensus of the need to build resilience in the energy sector of the OECS.

A resilient energy system will exhibit adaptive capacity to respond disruptions by means of minimizing vulnerability as well as exploiting beneficial opportunity (O´Brien & Hope, 2010). Building resilience within the region's energy infrastructure itself, will support the resilience of other sectors allowing them to function with minimal disruption in terms of their energy source. In addition, the successful incorporation of sustainable energy measures into the productive sectors will build economic resilience and strengthen the revenue generating capacity of the OECS. Sustainable energy use will also reduce the region's greenhouse gas emissions, thereby contributing to climate resilience.

The opportunities to build the resilience of the power systems in the power systems in the OECS can be considerable given that the electricity infrastructural needs of developing countries. This will require both technical and financial investments which may not be readily available in the region. However, strengthening of the existing infrastructure will improve the ability of the power network to withstand shocks and to recover quickly from a disruptive event. Such efforts may also be extended to help the systems to adapt to the impacts of similar future events. The analysis from the 2017 hurricane season provided several recommendations for building resilience in the energy sector including reinforced poles, subterranean cables, the use of smart grids and the integration of renewable energy. The diversification of production through the incorporation of renewable energy such as geothermal energy build energy resilience by increasing energy security of supply. This reduces the vulnerability of the power system which is essentially the probability of disruption due to likelihood of a hazard and potential impact it may have on the power system.

4.1 Building Energy Resilience through Geothermal Energy

Geothermal energy is mainly used for heating/cooling and electricity generation, both of which can contribute to energy resilience in the OECS. The focus of the region has largely been on the development of geothermal energy for power production as a means of providing energy at a predictable and affordable cost from a domestic renewable source. Geothermal power plants operate similar to traditional thermal plants in the region which use imported diesel. However, the successful development of a geothermal plant would eliminate the need for an external source of fuel. This has important implications in the context of building energy resilience as the probabilities for interruptions of fuel supply are reduced. Geothermal energy also has a high availability of 24 hours a day, 365 days a year and this allows geothermal power plants to serve as "baseload" power sources. On the point of fuel security for the region, the development of geothermal plants could be seen as means of strengthening the energy resilience of the region as they the potentially provide hundreds of years of fuel onsite in the form of subterranean geothermal fluids and heat. This renewable energy source could be viewed as a fuel source that can provide greater than a 90-day fuel supply that could facilitate operations during emergencies, extreme weather conditions, or natural or man-made disasters (US Geothermal Energy Association, 2017). However, consideration would have to be given to other requirements for energy production such as a system of delivery to transmit the power produced and other elements necessary to convert the fuel available into usable power.

Geothermal energy can also provide a range of flexible services to the grid which serve to increase resilience. Ancillary services and grid benefits provided by geothermal energy in this regard, include power regulation, load following or energy imbalance, spinning reserve, non-spinning reserve, storage, and replacement or supplemental reserve (US Geothermal Energy Association, 2017). The fact that geothermal plants can operate continuously at up to 98% capacity because they have a constant source of "fuel" and require little downtime for maintenance is of special interests to islands such as the those of the OECS. In planning their energy mixes, a major concern for the incorporation of renewable energy, such as solar and wind which are also in abundance but are intermittent in nature. This can pose problems for grid instability and has implications for how much renewable energy can be accommodated on the grid of islands. On the contrary, these instability concerns are not present for geothermal energy and it can readily displace fossil fuel generating capacity. Furthermore, as indicated geothermal energy offers operational flexibility which assists with integrating intermittent resources, such as wind and solar, to the grid which could support the overall sustainable energy transition for the OECS.

4.2 Direct Use of Geothermal Energy for Resilience

Successful geothermal energy development could potentially build economic resilience for the OECS not only through the provision of cheaper sources of electricity for economic development but in addition, the direct use of geothermal energy could support industries such as tourism, manufacturing and agriculture. Direct use of geothermal resources focusses on the use of heat energy from surface or subsurface sources of water naturally heated from the ground. This can be undertaken in areas of conditions of lower flow rates and temperatures as compared to the areas used for electricity generation. Recent developments show that geothermal direct utilisation can bolster the development of economic activities in the areas near the resource location, thereby providing employment for local communities. The positive spillover effects include improving the trade balance and protecting businesses and consumers from the risk of volatile prices and energy shortage (IRENA, 2019).

A preliminary assessment of the potential for direct use for geothermal energy in Saint Lucia in 2019 identified the most relevant applications for direct use to be in the tourism and agriculture sectors. This included the development if heat spas and crop drying or processing to reduce post-harvest crop losses and improve the food value chain. The study looked at 3 possible projects based on available capacity and local conditions. The preliminary estimates for potentially earnings from expansion of the current natural spas heated by geothermal energy was US$2.5 million per annum. The projected revenues from seaweed drying using geothermal direct heat was US$440,000 per year. The final project idea investigated by the study focused on direct use for cocoa drying. Based

on the island's current cocoa drying capacity (31 tons per year) and a potential 20 percent increase in production, it was estimated that the potential annual project revenues could approach $25,000 per year (Deloitte Financial Advisory Services, LLP, 2019). This study was based on the conditions in Saint Lucia but given the shared similarities within the OECS it is easy to project the application and potential benefits throughout the region.

4.3 Dominica: A Case Study for Geothermal Energy and Resilience

Dominica is one of the more advanced islands in the OECS with respect to its geothermal energy plans. Coincidentally, Dominica was one of the islands most impacted by Hurricane Maria in 2017 and who has made significant attempts to build resilience across all sectors and notably in its energy sector. The current power system in Dominica has an installed capacity of 26.7 MW and is dependent on imported fossil fuels although there is some degree of renewable energy in the form of hydro-power (Gischler, Janson, Gonzalez, Cordoba, & Santana, 2017). The island has a relatively high cost of electricity of about US$33 per kWh, one of the highest in the world. The country has long considered the incorporation of geothermal energy as part of its long-term energy strategy, but plans have been delayed for various reasons.

Hurricane Maria damaged approximately 75 percent of the power network on the island severely impacting the quality of life (Geodominica, 2019). As part of a comprehensive strategy for recovery, Dominica has committed to become the "the first climate-resilient country in the world". This vision is captured in the National Resilient Development Strategy which contains a critical component on energy diversification (Geodominica, 2019). In July 2019, the Dominica Geothermal Development Company Ltd published a Request for Bids for the construction of a 7MW geothermal plant. The construction of the plant under the Geothermal Risk Mitigation Project is a key component of Dominica's resilience agenda and is expected to significantly lower electricity costs in Dominica and increase the share of renewable energy in the country's energy mix from 25 to 51 percent, reducing greenhouse gas (GHG) emissions by 38,223 tons of CO2 per year. Success would mean the development of the first geothermal power plant in the Caribbean in 30 years (World Bank, 2017) and will identify a clear road map for private sector investment in geothermal development. Dominica's plans are not limited to increased resilience for the island, but the country also has intentions of exporting its excess geothermal energy to its neighbours.

5. DE-RISKING GEOTHERMAL ENERGY PROJECTS IN THE OECS

Geothermal energy development has been constrained globally largely due to high level of risk perceived to be associated with its development. A recent study, Schinko and Komendantova (2016) showed that the economic feasibility of a renewable energy project hinges on the availability of affordable project financing, which itself depends on risk perceptions by private investors. Amongst renewables geothermal energy projects are particularly susceptible to risks and there are various risks of varying degrees throughout all phases of a geothermal development (Sanyal, Robertson-Tait, Jayawardena, Huttrer, & Berman, 2016). Research efforts have focused on the two major risks that distinguish geothermal from most other power generation technologies, the resource or exploration risks and financial risks (Gehringer & Loksha, 2012). These risks present challenges to the development of the geothermal resources in the OECS, but the other risks must however not be underestimated given that a range of factors must work together to ensure the success of a project.

The solutions to these challenges in the region have been led by the national governments, intergovernmental agencies, developments partners and the private sector. This has led to development of various business models in the region, though government in all cases has played a critical role in help to develop de-risking strategies. A distinct challenge to geothermal energy in the OECS has been the region's extremely small market size which has negative implications for the cost competitiveness of geothermal power production. The low electricity demand on the islands requires smaller geothermal generation plants and this constrains the ability of many geothermal developers to enter the region, since some developers have minimum project requirements that start at around 30 MW. For example, the small market size on Dominica and Saint Kitts and Nevis, has discouraged geothermal investment in those countries, in spite of large estimated resources (World Bank, Energy Sector Management Assistance Program, 2018). Saint Vincent and the Grenadines who is now undertaking exploratory drilling, has addressed this through the establishment of St. Vincent Geothermal Company Limited, which is owned by Reykjavik Geothermal and the Government of Saint Vincent (Cariaga, 2019).

Over the past 5 years a number of development partners including the World Bank, the Government of New Zealand and the Caribbean Development Bank have been working in the region to help address both the financing and resource risk issues. Development partner financing through grants and concessional financing have proved useful in this regard. The efforts of the Caribbean Development Bank (CDB) were recently recognized in this area. The CDB has worked with the Inter-American Development Bank to establish the Sustainable Energy Facility for the Eastern Caribbean in 2015 to support renewables development, including geothermal power. This includes concessional financing of US$19 million from the Clean Technology and a grant from the US$3 million Global Environmental Facility (World Bank, Energy Sector Management Assistance Program, 2018). The CDB's GeoSmart Initiative which recently received a top industry award for driving geothermal energy in the region, aims to reduce the financial, technical and institutional barriers to geothermal energy development in five Eastern Caribbean states – St. Vincent and the Grenadines, Saint Kitts and Nevis, Grenada, Saint Lucia and Dominica. This initiative has helped build capacity and strengthen institutions to better implement and manage geothermal energy initiatives (Caribbean Development Bank, 2019).

In December of 2018, the Organisation of Eastern Caribbean States Commission together with International Renewable Energy Agency (IRENA), The Caribbean Development Bank (CDB), the International Geothermal Association (IGA) and the World Bank collaborated on a building capacity initiative on the United Nations Framework Classification (UNFC) for the region. The training workshop presented the UNFC geothermal specifications as part of a harmonized framework to qualify estimates of geothermal energy at the global level (OECS, 2019). This was held in conjunction with a geothermal energy dialogue brought together key experts and decision-makers in geothermal energy from the region to help advance and initiate a regional cooperation for geothermal energy. Technical cooperation within the region for geothermal energy is also being advanced as a means of building

capacity and sharing best practice. The Regional Council of Guadeloupe has advanced plans for the establishment of a regional Center of Excellence for geothermal energy (Pouget & Laffont, 2019). This Center of Excellence is expected to provide training to the other islands to assist with the geothermal projects.

6. ENHANCING INTEGRATION USING GEOTHERMAL ENERGY

One of the five strategic objectives of the OECS Commission (the administrative body of the Organisation) for the current triennium (2019-2021), centers on advancing, supporting and accelerating regional trade, economic and social integration through the Revised treaty of Basseterre (OECS Revised Treaty of Basseterre, 2010). The OECS defines regional integration as the process where neighbouring states enter into an agreement to cooperate through common institutions and rules. Such efforts have helped the OECS region derive several benefits across the economic, security, political and social arenas. Over the years, the OECS has made several gains as a result of regional integration in the areas of education, the environment, health care and tourism. Some of these benefits include the removal of barriers to free trade in the region, enabling the free movement of people, labour, goods and capital across national borders and adopting harmonized regional positions on policy matters such as climate change, health and foreign policy (OECS Revised Treaty of Basseterre, 2010). In the context of the Economic Union cooperation, two major achievements that stand out are (i) the development and implementation of harmonised environmental policies and (ii) pooled procurement in the area of pharmaceuticals to benefit from economies of scale.

Cooperation in the area of renewable energy is increasingly entering the regional integration conversation as it has been recognised that it can provide additional benefits not only to mitigate climate change but to help advance the economic development goals of the region. The development of geothermal energy in the region can enhance regional integration and cooperation in the OECS in a number of ways. Firstly, the islands pursuing geothermal energy, although at different stages have many shared similarities particularly with respect to challenges. Geothermal energy is still a new area for the region and consequently there is a dearth of relevant experience and skills to support it. To this end, a shared vision and collaborative effort can help to optimize technical and financial resources, share best practices and create a holistic approach for development. Additionally, there could be opportunities to benefit from economies of scale. Ultimately, the objective of regional integration is to support the individual national goals of each Member State. Geothermal energy has emerged as a priority for the islands pursuing it especially in the context of economic development. Hence, geothermal energy can help achieve the broader goal of integration which is to support the national goals of economic development in the region.

The OECS has experienced a decline in both competitiveness and the rankings of Ease of Doing Business in recent times. This has had negative implications for the economic union and single economy as it makes it difficult to attract investors and businesses. The high operating costs, especially those attributed to high energy costs can have deleterious impacts on the viability of the Economic Union. Successful development of geothermal energy resulting in reduced electricity tariffs could help revive the economic union and facilitate the growth, expansion and movement of business through the region. This will create a healthier environment for investment which can only serve to support the goals of the single economic and financial space. Geothermal energy could therefore serve to renew interest in the economic union which is at the heart of integration. One of the objectives of the economic union speaks directly to “economic growth, development and international competitiveness by the convergence and coordination of the economic policies of Protocol Member States”(OECS Revised Treaty of Basseterre, 2010).

7. CONCLUSION

Pursuing geothermal energy in the OECS adds a new dimension to cooperation and addressing emerging challenges and opportunities for regional integration. Improved economic conditions is the main driver for regional integration and geothermal energy provides the OECS with a solution to address its challenges of energy security and affordability in the region whilst improving competitiveness, economic growth and resilience. As progress on geothermal energy in the OECS continues, and more data becomes available, the link between geothermal energy and resilience will become clearer. This will then help develop a more holistic definition of resilience and integration within the OECS context. The future of small islands in this region requires pursuing their development goals together where they can benefit from economies of scale, improve energy security and build resilience in decades ahead. Geothermal energy is well placed to form an integral part of this sustainable vision for region.

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