**Regional**

**Sustainable Energy Facility (SEF) for the Eastern Caribbean Expanded - (SEF Expanded)**

**(RG-L1112)**

**And**

**Green Climate Fund (GCF) Grant for the Sustainable Energy Facility for the Eastern Caribbean Expanded - (SEF Expanded)**

**(RG-G1013)**

**And**

**Republic of Italy (REI) Grant for The Sustainable Energy facility for the Eastern Caribbean Expanded - (SEF Expanded)**

**(RG-G1015)**

**Technical Annex**

This document was prepared by the Project Team.

1. Introduction

## SEF Program & CDB’s GeoSmart Initiative

* 1. The **SEF Program** is comprised by the Sustainable Energy Facility (SEF) for the Eastern Caribbean approved by the IDB in October 2015 (SEF-2015), and the proposed operation, the Sustainable Energy Facility for the Eastern Caribbean Expanded (SEF-Expanded) which is a complement to SEF-2015.
  2. The objective of the SEF Program is to radically change the energy matrix of the six Eastern Caribbean Countries (ECC), namely Antigua and Barbuda (A&B), Dominica (DOM), Grenada (GRE), Saint Kitts and Nevis (SKN), Saint Lucia (SL), and Saint Vincent and the Grenadines (SVG) by reducing their dependency on fossil fuels for power generation and the cost of electricity. However, the SEF Program places emphasis on developing Geothermal Energy (GE), a RE source for which five of the ECC are known to have potential (all except A&B) and which has the largest potential for displacing liquid fossil fuels in the region.
  3. The Program has the potential to change the energy matrix of the beneficiary countries and increase energy security, which is critical for these economies that are tourism-dependent if they are to improve their competitiveness and fiscal and macroeconomic stability.
  4. To this end, the SEF Program includes an array of financing mechanisms to support each country depending on the stage of geothermal development they are at.
  5. Both the SEF-2015 and the SEF-Expanded are structured as Global Credit Loans (GCL) to the Caribbean Development Bank (CDB) by which IDB provides a loan financed with Ordinary Capital (OC) resources, in the case of the SEF-2015, as well as loans and grants financed by other donors’ resources, for these to be provided by CDB as loans and/or grants to GE sub-projects in the ECC. CDB’s own resources complement, as local counterpart, the SEF Program structure.
  6. **CDB GeoSmart Initiative (GSI).**  To make these multiple sources of funding available to GE projects in the ECC, CDB is coordinating its efforts for supporting geothermal energy development under its GeoSmart Initiative. Under this heading of GeoSmart Initiative CDB provides various financing instruments that are appropriate to address the level of risk associated with each stage of the geothermal development. Initial funding available for geothermal development is from the SEF-2015, which therefore represents initial resources of CDB-GSI. This is to be complemented by the SEF-Expanded. CDB on its own as well as CDB and IDB together, have continued and will continue their joint efforts to mobilize additional resources as part of the CDB-GSI by seeking parallel financing from various donors, funds and bilateral facilities.
  7. The table below summarizes the results obtained so far in each of the five ECC.

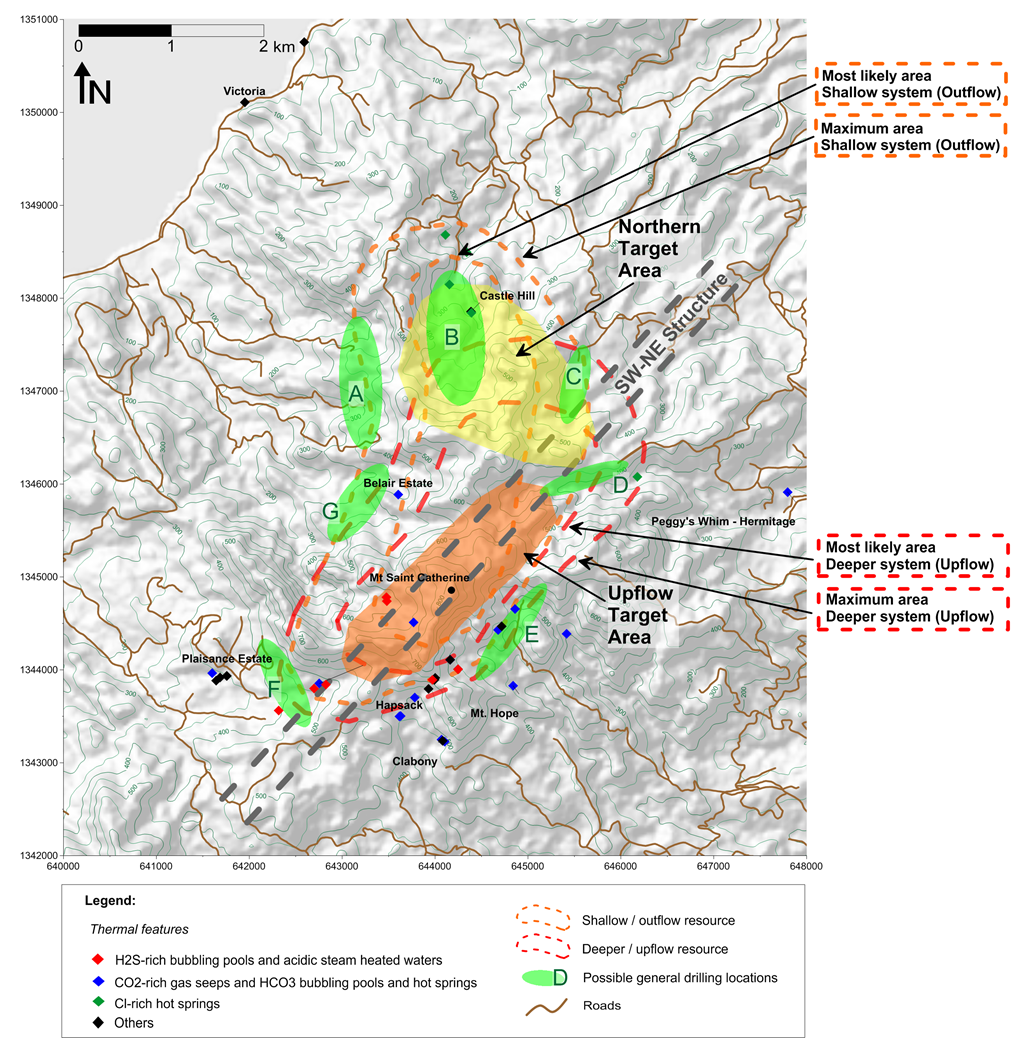
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| --- | --- | --- | --- | --- | --- | --- |
| **Country/ Island** | **Location** | **Temperature** | **Slim-holes drilled** | **Plant size** | **PPA** | **Private Partner** |
| **GRE** | Northern Grenada | 200°C - 290°C | None; 3 planned | 15MW | No | Not selected yet |
| **SVG** | Mount Soufriere | >230°C | Skipped | 10MW | Currently in negotiations (expected to conclude end of 2017) | Consortium comprising Reykjavik Geothermal (RG), and Emera Caribbean Inc. (ECI) |
| **Nevis** | Hamilton Estate | 250° – 260°C | 3 | 9MW | Signed | Nevis Renewable Energy International |
| **St. Kitts** | SW flank of Mt Liamuiga | >200°C, | None | Resource for 27MW or 18MWe (50% and 90% probability respectively) | No | Teranov |
| **SL** | Belle Plaine – Saltibus & Fond St Jacques | ~240°C | None; 4 planned | 25 – 30MW | Negotiations have commenced | ORMAT |
| **DOM** | Roseau Valley | 242°C | 3 in 2013 & 2 full size wells | 7MW | Currently in negotiations (expected to conclude end of 2017) | None – Support from Govt of New Zealand |

1. Geothermal Energy Sub-projects

## Grenada (GRE)

* 1. A comprehensive geothermal investigation program was undertaken by Jacobs New Zealand Ltd in 2015 to assess the existence of a geothermal system in Grenada. The investigation was completed to a high standard, typical of the international geothermal industry practice for a pre-drilling surface exploration program combining geology, geochemistry and 60 station MT geophysics survey. Additional geophysical work was recommended in 2015 to refine the geological understanding and proposed boundaries of the field, thus improving the likelihood of success in exploration drilling. An additional geophysical survey comprising 40 MT stations was completed in late 2015.
  2. Commencing in 2015 and with funding from the Japan International Cooperation Agency (JICA), a 100-station gravity survey and environmental baseline monitoring work were undertaken. The results of the Jacobs’, and JICA’s surface studies indicate that the Grenada resource has sufficient surface manifestations over a wide area to give high confidence that a geothermal system exists, but the surface exploration study leaves uncertainty as to the resource temperature, the nature of permeability, and hence the location and extent of any productive resource.
  3. All geoscientific data indicates that the most promising geothermal area of Grenada is centered on the Mount Saint Catherine volcano, in the northern-central part of the island. The heat source is interpreted to be related to the magma that was the source for the Mt. St. Catherine volcano up to 0.94 million years ago. The results indicate the presence of a considerable, high-temperature resource (200°C to 290°C) with a GE potential adequate to support a plant of at least 15 MW (and possibly up to 50MW). A plant of this capacity could displace 55% of the total electricity generation from diesel, contributing to stability in tariffs and enhanced energy security.
  4. A preliminary scoping study for environmental assessment was undertaken by JICA in 2015 which identified a provisional list of potential impacts and issues. Environmental impacts are to be expected on air quality, water quality, waste, noise, protected area, ecosystem/flora and fauna, hydrology, topography, geology, landscape, and climate change.
  5. It was recommended that a slim hole campaign be pursued due to uncertainties in the extent of the geothermal reservoir and the challenges of raising funding for a government led full size well exploration drilling campaign. Seven broad areas were identified as potential locations for the drilling of deep slim hole wells. This was shortlisted to three areas by the JICA team, following an initial assessment of the access requirements and availability of water.
  6. The exploration drilling campaign will comprise the drilling of up to three slim-hole wells to a nominal depth of 1500 meters (m). Drilling will be undertaken from three distinct locations in the northern half of Grenada at elevations of 300 to 400m above sea level. The proposed drilling locations are on private agricultural land(s) and as such, land leasing or acquisition will be required. Each of the sites is physically separated from the other (two sites are approx. 1 kilometer (km) apart, with the third approx. 4km away), with separate access ways and located within different water catchments and communities. All sites are located nearby, but outside the Central Forest Reserve area. Access is mostly via tarmacked public roads with the last sections (up to 0.5km) comprising of well-formed four-wheel drive tracks, which will require upgrading.
  7. In 2016, Jacobs completed an infrastructure assessment which verified that it is feasible to access the three areas for drilling and provided a preliminary cost estimate for upgrading public roads and developing well pads. In this study, it was determined that the provision of a reliable water supply is one of the major challenges to overcome and further work is required to define how this will be achieved.

**Figure 1: Site Selection for Test Drilling (C, D and F)**



* 1. **Recent Developments and Progress**
     1. **A Geothermal Development Roadmap** has been prepared which outlines the major steps, timelines and budget required to realize geothermal power in Grenada. The next major step is exploration (slim-hole) drilling to test the conceptual models of the geothermal system and verify the existence, temperature, permeability and extent of the resource. A critical element of the Roadmap is the environmental and social impact assessment (ESIA), which must be completed before actual test drilling can commence. This will identify the potential significant adverse environmental and social impacts associated with the slim-hole drilling phase, as well as to identify mitigation strategies.
     2. **A Geothermal Project Management Unit (GPMU) is** being established with support from CDB-GSI using GEF resources of SEF-2015. This is being established within the Energy Division of the Ministry of Finance and Energy.
     3. **ESIA:** Procurement process for the consultants to conduct the ESIA has begun and the study is projected to be conducted over 2017-2018.
     4. **Exploration Drilling Plan:** The Government of New Zealand has funded the preparation of an exploration drilling plan. The plan considers the major elements required to implement the campaign including the human and financial resources required, procurement approach, Government responsibilities, and an estimate of costs and sources of financing. It also provides the basis and rationale for the decisions on well design, drilling targets, the drilling sequence and decision processes, data requirements and guidance on the drilling contract and procurement scheduling.
     5. **Exploratory drilling campaign** is scheduled to commence in late 2018

## Saint Vincent & the Grenadines (SVG)

* 1. On 13 May 2014, the Government of SVG (GoSVG) signed a Letter of Intent (LOI) with a consortium comprising Reykjavik Geothermal (RG), based in Iceland, and Emera (Caribbean) Incorporated (ECI)[[1]](#footnote-1) formerly Light & Power Holdings (LPH) based in Barbados. The project involves the evaluation of the geothermal resource, the drilling and testing of geothermal wells, the construction of a 10 – 15 MW geothermal power plant, the construction of new transmission lines to connect the power plant to the grid, and the operation of the power plant at the Soufriere volcano.
  2. A comprehensive desk study was undertaken with focus on a geographic cross section between the Wallibou hot spring area and the summit of Mount Soufriere. The study utilized information from previous studies, together with other data sources and remote sensing techniques, to provide the most complete data set to date on the possible deep and hot geothermal resource under Mount Soufriere.
  3. Geochemical analysis indicated a geothermal resource with temperature of >230°C. Subsequently, geophysics surveys (resistivity surveys utilizing Magneto-telluric and Transient Electromagnetic Methods) were carried out in 2013 and 2014 on 45 locations mainly on the eastern side of La Soufriere[[2]](#footnote-2). Results revealed a resistivity structure that is comparable with that of high enthalpy geothermal fields across the globe that could yield temperatures of about 230°C - 240°C at a 1,000 to 1,200-meter depth under the area around the summit of the mountain[[3]](#footnote-3) and half way down the slopes. The recommendation was to drill the exploratory wells in locations closer to the summit with the higher resistivity while, if drilling is successful, the re-injection well would be located at a lower elevation (approximately 500 meters below the exploratory wells).
  4. An infrastructure assessment report was produced by Stantec of Barbados, which indicated that the cost of developing infrastructure to support a project on the Leeward (western) side of the island was prohibitive while relatively minor works would be required on the Windward (eastern) coast to facilitate a project. Generally, from an infrastructure and access point of view, a Windward site was determined to be the preferred location for the drill pad and possible power station. It was concluded that the Windward Highway[[4]](#footnote-4) infrastructure was generally adequate and better suited for the transportation of the containers, equipment and the drill rig to a drilling site on the eastern side of the island. The tunnel at Byera Hill was found to be adequate in size for the passage of the containers and drill rig.
  5. A site selection process was undertaken to identify the most suitable sites for drilling and ultimately the construction of the geothermal power plant. Nine sites were identified as potential drilling sites using LiDAR imaging. These sites were evaluated based on the following criteria: (a) Proximity to the geothermal resource; (b) Access to cooling water for drilling and power plant; (c) Risk from volcanic activity; and (d) Constructability including the size of the site and accessibility. Two sites (Sites 1 and 3)[[5]](#footnote-5) were shortlisted for exploration drilling due to the proximity to the geothermal resource, good access from the existing road, and a sufficiently large flat area for drilling and eventual power plant development.
  6. Once the two sites were selected, geotechnical investigations were undertaken based on soil samples retrieved from seven test pits of 5.5m deep and analyzed at a soils laboratory in St. Lucia. The geotechnical investigations concluded that both sites were generally suitable for the proposed geothermal development and formulated a series of recommendations for development of Sites 1 and 3.
  7. Three options for the size of the geothermal plant were considered and compared against the base option of diesel generation, within the context of the country’s current and projected overall electricity demand. The analysis indicated that an overall plant size in the range of 10-15 MW is best suited to be integrated into the grid to meet the electricity demand. A plant of 10MW capacity has been identified as the target for the development. Therefore, exploratory drilling will seek to confirm geothermal resources that can support a plant of this size.
  8. Preliminary engineering was undertaken to determine the cost of interconnecting the proposed geothermal plant to the local electric utility’s (VINLEC) existing grid[[6]](#footnote-6). Interconnection can be achieved through the construction of ~40km of new 33kV transmission lines, along with the construction of a new substation at the geothermal plant. VINLEC is state owned and has indicated its preference to fund, own, operate and maintain the transmission and substation interconnection facilities.
  9. The consortium presented the geothermal development business case to the GOSVG in July 2015. The business case proposed to go directly to production well drilling (skipping slim-hole drilling). The development will be jointly owned by the consortium and GOSVG through an established joint venture between GOSVG, ECI and RG, the St. Vincent Geothermal Company Limited (SVGCL). SVGCL is a Special Purpose Vehicle (SPV), operating as a Public Private Partnership (PPP) that was incorporated in November 2015 under the laws of SVG to develop, construct, own, operate and maintain a geothermal power plant. GOSVG is expected to fund a 25% equity interest in SVGCL. The remaining equity interest will be funded by ECI (56.25%) and RG (18.75%).
  10. **Recent Developments/Progress**
      1. Approved funding for test drilling phase: SVGCL has secured funding for the drilling stage. In May 2016, CDB approved US$15 million (US$9.5 million from the CTF resources under SEF-2015, and remainder from DFID as parallel financing) to support exploratory drilling in SVG. The purpose of the undertaking is to assess the geothermal resource and provide the requisite information to decide on its viability for exploitation for power generation. The GoSVG has also received approval of a concessional loan of US$15 million from The International Renewable Energy Agency (IRENA) and the Abu Dhabi Fund for Development (ADFD). Funding for the construction of a geothermal power plant is expected to comprise a minimum of 30% equity and the remainder debt financing.
  11. **Negotiation of Power Purchase Agreement**: Since October 2016, SVGCL and VINLEC have been negotiating a power purchase agreement which conclusion is estimated by the fourth quarter of 2017. Thereafter civil works should commence and it is estimated that drilling activities will commence by the first quarter of 2018.

## Nevis

* 1. Geological studies and geochemical analysis in Nevis provide good indications of a geothermal resource. Geophysical surveys comprising, magneto-telluric (MT), Transient Electromagnetic (TEM), and Controlled Source Audio Magnetotellurics (CSAMT), conducted on the western side of the island identified a shallow conductive layer and possible fault zones and were used to target three slim-hole wells drilled in 2008. These established the occurrence of a high temperature geothermal resource and temperatures of 250° – 260°C were intersected by two of the wells.
  2. Overall, the results from the slim-hole wells, which are widely-spaced, suggest a substantial geothermal resource exists on Nevis, suitable for power production if good permeability can be found.

**Figure 2: Slim-hole well in Nevis**



* 1. The original concession holder (West Indies Power) failed to meet its obligations under the Concession Agreement and subsequently had the concession revoked. In 2014, the Nevis Island Administration received assistance from the US State Department and ran a competitive Request for Proposal (RFP) process to award a concession for a nominal 10MW project. Nevis Renewable Energy International was selected to develop the project, with NEVLEC expected to take a small equity stake.
  2. The developer has appointed various technical advisers to guide the development and is presently raising finance to progress the development through an additional slim hole well and subsequently production well drilling. The US State Department has provided some financial assistance to the project through appointment of technical and commercial consultants and is continuing to provide support to the Government.
  3. **Recent Developments and Progress**
     1. **A power purchase agreement (PPA)** has been signed between NEVLEC and the developer which sets out the main commercial terms, including a tariff. The developer has stated they will raise equity and debt finance for the geothermal drilling, project development and grid connection (including constructing the transmission line). The developers have signaled their willingness to pursue an approach which is compatible with support under CDB-GeoSmart Initiative.
     2. **Slim-hole well to commence in 2017**: the relevant funding for the drilling of a slim-hole well is in place and test drilling will commence in third quarter 2017.
     3. **an EPC contractor has been competitively procured**, however, not yet contracted.
     4. **an ESIA for the test drilling stage has been completed**, in line with international standards.
     5. **production wells**: following a successful completion of the test drilling, NREI proposes to drill two production wells and a re-injection well at the N3 site (Hamilton Estate). The developers are interested in securing funding support for production well drilling.

## St. Kitts

* 1. In September 2015, the Government of the Federation of Saint Kitts and Nevis (GOSKN) and Teranov, a geothermal services company based in Guadeloupe, signed a Memorandum of Understanding and Road Map (MOU). Also in 2015, the Government passed an Amendment to the Electricity Supply Act (ESA), which incorporates clauses that govern the exploration and exploitation of geothermal resources, renewable energy resources, and third-party generation in Saint Kitts. In 2016, a Draft Geothermal Exploration, Exploitation, Production, Licensing, and Incentivization Agreement (the Draft Geothermal Agreement) was prepared, to be signed by the Government and Teranov. This agreement is under analysis and discussions by the two parties and has not been signed to date.
  2. In this context, Teranov prepared a preliminary business plan for a 20MWe geothermal development in Saint Kitts. In April 2017, Teranov submitted the preliminary business plan to the Government. The original plan per the Roadmap was for Teranov to implement drilling targets and drilling engineering by the end of 2016, thereby obtaining all the necessary information to secure financing for the exploratory drilling campaign. The Figure below shows a map of St. Kitts and the area where Brimstone Hill and Mount Liamuiga are located.

**Figure 3: St. Kitts and Nevis: Location of St. Kitts Geothermal Site**

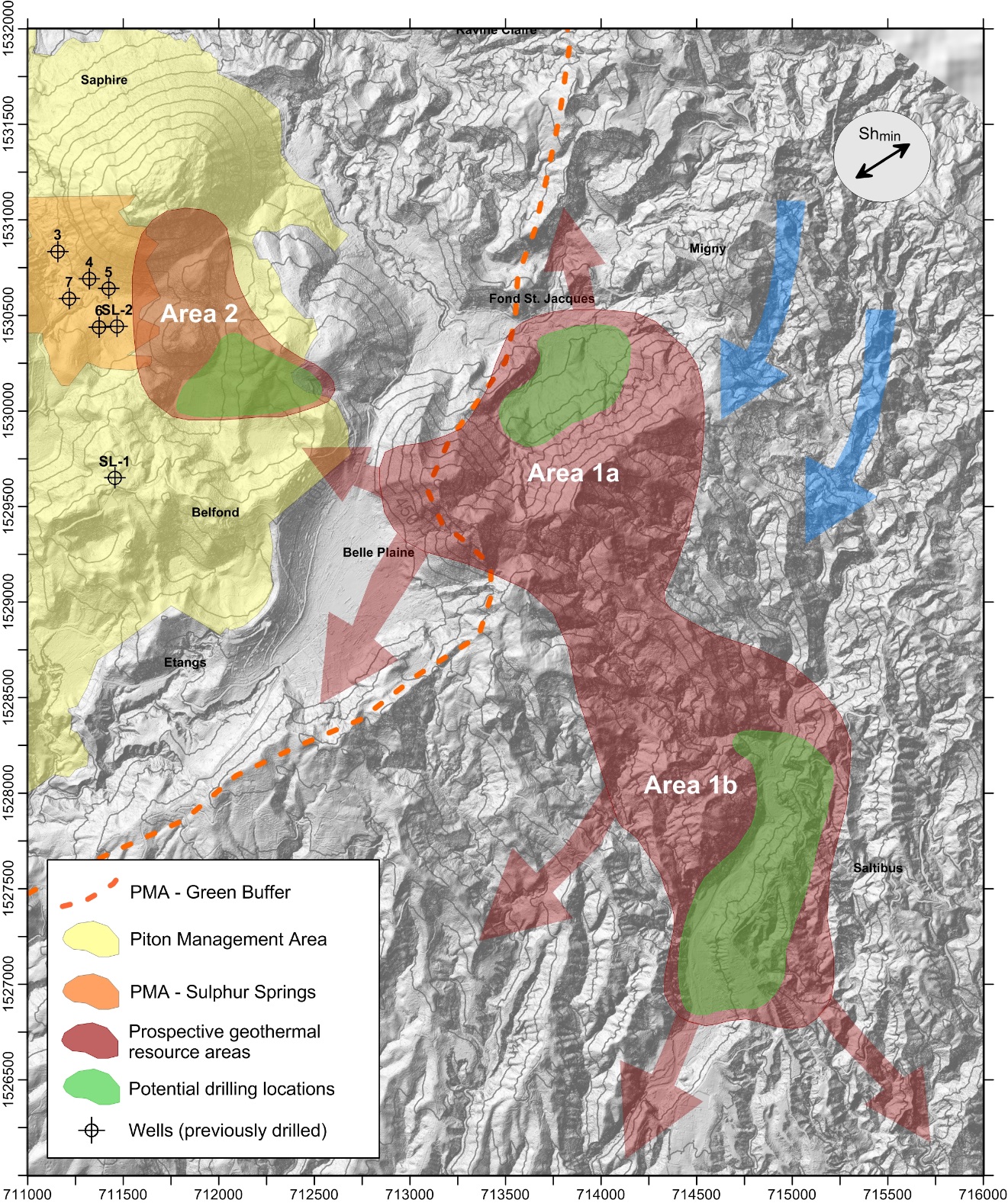
# St

* 1. The project would be developed using a public-private partnership (PPP) structure between the St. Kitts Electricity Company (SKELEC), Teranov, and, potentially, a third partner. The parties would form a Joint Venture Company (JVC) for this purpose. The JVC would sign a Power Purchase Agreement (PPA) with SKELEC for the electricity generated by the geothermal plant. The Government would grant two concessions to the JVC: one to explore the geothermal resource, and another one to exploit the resources and operate the geothermal power plant. The business plan proposes setting up a concession area of 17 square kilometers, plus a bordering non-surface occupancy (NSO) area of 11 square kilometers.
  2. The proposed approach is to carry out technical pre-feasibility studies by building advanced 3D geological and flow models of naturally or hydraulically fractured geothermal reservoirs. Of a total budget of US$2 million, which includes geological, geochemical, geophysics studies, interpretation of data, and the creation of a conceptual model of the resource, Teranov states as of June 2017 it has invested US$1.25 million in surface studies and preliminary resource assessment.
  3. Teranov has begun the resource assessment phase, and preliminary results are currently undergoing a peer review by Geothermal Resource Group (GRG) —whose personnel are proposed as part of the project team in the preliminary business plan. Preliminary results produced by Teranov show that the reservoir temperature exceeds 200°C, a 50 percent probability of the resource being able to support a 27MWe, and a 90 percent probability of the resource being able to support a 18MWe. Once the peer review is finalized, the resource assessment studies will need to be completed.
  4. The exploration phase is planned to include three slim holes of 3.5 inches and one full-size well of 9 inches. Slim holes are proposed due to their appropriateness and advantages for areas with very few surface manifestations, such as Saint Kitts. The full-size well would be used to confirm the resource identified with the slim holes.
  5. **Recent Developments and Progress**
     1. **Agreement:** In May 2016, Teranov and the Government of St. Kitts drafted an agreement for the license to exploit the geothermal resource in the island. The draft agreement outlines the proposed terms for a license and incentives.
     2. The projected timeline for the project is from September 2015 to 2020.
     3. **Surface Studies:** The first studies began in September 2015 in Brimstone Hill, going to the top of Mount Liamuiga. These included surveys and surface data acquisitions in Geology (rock sampling), Geochemistry (fluid and gas sampling and analysis), and Geophysics (magnetotelluric, gravimetric, aero-magnetism, IR). A geothermal resource was assessed based on data processing (MT 1D & 3D inversion, Joint MT-Gravity 3D inversion, data integration, and geological modeling). An independent preliminary peer review conducted by GRG in October 2016 of the results of the surface studies concluded that the “Brimstone Hill prospect presented an Inferred Geothermal Resource with an estimated generation potential of 18-36MWe”.[[7]](#footnote-7) [[8]](#footnote-8) However, the report recommended areas for further analyses to increase confidence. This is currently being done by Teranov.
     4. An ESIA study to finalize the pre-drilling exploration phase, allowing the development to advance to the exploratory drilling phase is targeted. The procurement process for a consultancy for the ESIA for the test drilling phase has commenced.
     5. **Agreement:** Teranov and GOSKN are discussing a draft geothermal energy development agreement.
     6. **Structure of the Project:** A PPP arrangement is being pursued.

## St. Lucia

* 1. Like other ECC the government of St Lucia (GOSL) has identified geothermal energy development as a priority RE option.
  2. Geothermal exploration of the Soufrière Volcanic Zone in the period 1970-1990 confirmed, through exploration drilling, the existence of a high-temperature geothermal system under Sulphur Springs, situated within the ~15 km2 Quaboag Depression near the coastal town of Soufriere and approximately 20km South of the capital, Castries However, the intersected geothermal system was deemed unsuitable for commercial-grade power generation due to high concentrations of magmatic volatiles and the associated acidity.
  3. In 2014, the Government of St. Lucia entered into a Partnership Agreement with the Government of New Zealand and requested technical assistance to evaluate the geothermal potential of the island. In collaboration with the World Bank, surface exploration activities have been completed including two magnetotelluric (MT) surveys comprising 200 points, aeromagnetic, LiDAR, geochemistry and geological surveys. The exploration campaign is the most comprehensive to be completed in the country in the last 30 years.
  4. The results of the survey were discussed and agreed with the Technical Advisory Group comprising World Bank, Jacobs and Ormat geoscientists, resulting in the following image of the location of 3 areas of potentially exploitable resource, Area 1 (a & b) and Area 2. The blue arrows indicate areas where water recharges the postulated system, with brown area indicating possible extension of the system.

**Figure 4: Potential geothermal resource development areas and the Piton Management Area. (source Jacobs 2016)**



* 1. The findings of the campaign identified a 3 - 6 km2 prospective area extending from the south of the Qualibou Depression and indicate that the most prospective area to focus future geothermal exploration is the area surrounding Belle Plaine, Fond St Jacques and extending to the SE towards Saltibus. Elevated heat flow in this region is indicated by >250°C measured downhole temperatures from SL-1, which is interpreted to have been drilled in a low-permeability region approximately 1.5 km to the west of the prospective upflow.
  2. The prospective area extending southeast from the southern wall of the Qualibou Depression does not exhibit thermal manifestations and its presence is inferred by the results of the MT survey. The lack of significant surface manifestations is in accordance with the deep nature of the clay cap formed above this system and is explained by the abundant rainfall (~2000 mm) and steep elevation gradients from the central highland areas. These phenomena have likely resulted in a pronounced S-SW directed regional groundwater flow and the development of a thick succession of cool aquifers that suppress expressions of the deeper geothermal activity in the region.
  3. GOSL with assistance from development partners is pursuing key activities that would allow for informed decision on if and how to proceed with the next stage of development – exploration drilling to confirm the resources. This includes completion of a pre-feasibility study, transaction advisory, ESIA and raising funds for a slim hole exploration campaign expected to comprise of four wells. Ormat remains engaged in the process and has negotiated (but not signed) an agreement with UNEC who has an outstanding MOU with the Government for geothermal exploration rights.
  4. Resources mobilized to date include, $2.250 million in grants from the Global Environment Facility and the SIDS DOCK, $1.575 million from the Government of New Zealand (GoNZ), the Clinton Climate Initiative (CCI), and the GoSL[[9]](#footnote-9) towards the Geothermal Resource Development Project in Saint Lucia.
  5. **Recent Developments/Progress**
     1. In 2015/6, St Lucia amended the Electricity Supply Act to allow participation of private sector generators. Regulations continue to be drafted and implemented, including legal framework for geothermal development.
     2. St Lucia’s government changed in 2016, which has resulted in some slow-down of the project. Support continues to be available through the GEF grant money and will be used to appoint an Exploration Management Consultant in late 2017, with responsibility for progressing and supervising the exploration drilling campaign.
     3. **ESIA:** The ESIA baseline data and study for the test drilling phase is in progress and is expected to be finalized by end of 2017.
     4. **Feasibility Study:** The pre-feasibility study is also in progress and draft report is also scheduled for submission in December 2017.
     5. **Schedule for Test Drilling**: Test drilling is scheduled for the second half of 2018. World Bank is lead arranger and is targeting a $22m funding package comprising monies from CTF, IDA loan and UK DFID grant.
     6. **Structure of the Project:** A PPP arrangement is contemplated following a government led slim-hole exploration campaign.

## Dominica

* 1. Over the past 10 years the Government has proven, by drilling, the existence of a commercially exploitable geothermal resource in the Roseau Valley. Three slim-hole wells (WW-01, WW-02 and WW-03) were drilled in 2011-2012 using grant funds provided by the European Union and Government’s own funds. Two full-size wells (WW-P1 and WW-R1) were drilled in 2013-14 and all the wells were tested in 2013-2014 using government funds and a $9M loan from Agence Française de Développement (AFD).
  2. These wells provide positive indication of a resource suitable for use in the production of electricity. Production and reinjection capacity has been demonstrated, but has not been demonstrated at the actual operating conditions required for the proposed 7MWe plant.
  3. Following two rounds of unsuccessful negotiation with private partners, the Government has taken the initiative to progress the development of the geothermal project with its own resources and support from the international community. In 2017 the Government established the Dominica Geothermal Development Company (DGDC) to achieve the aim of developing and operating a 7MWe geothermal power plant for domestic use.
  4. DGDC will enter into a concession agreement with the GoCD for the use of the geothermal resource; construct and operate the plant and enter into a PPA with DOMLEC for the sale of geothermal electricity. GOCD has signaled its intention to divest the plant once it is fully operational and established.
  5. **Recent Developments/Progress**
     1. **Structure of the Project:** With support from the World Bank and the Government of New Zealand, GOCD is advancing the plant construction phase. The 7MW geothermal project is being implemented by DGDC who was established in mid-2017 by the Government of Dominica as a Special Project Vehicle to develop the project. The Government is 100% shareholder in the company and their role is as equity provider and lender to the company. To date geothermal project development technical advisory services have been provided by Jacobs New Zealand Ltd, who were appointed by the Government of New Zealand to assist with project preparation.
     2. **Financing:** The estimated cost of the development is US$35m [a single EPC contract of US$29m & $6m consulting contracts/owners’ costs]. Finance of $15m will be provided by the Government of Dominica as equity, with and the remaining US$20M coming from funds managed by the World Bank including IDA loan ($8m), UK DFID grant ($10m) and SIDS Dock grant ($2m). New Zealand has invested approximately $2m through in-kind assistance and has contracted the Project Manager for the DGDC, who is seconded into the company.
     3. **Geothermal Power Plant Procurement:** The technical specifications for the plant have been prepared as part of a bidding package to be provided to potential EPC contractors. An international open market approach is proposed with single stage, single envelope evaluation process.
     4. **ESIA:** An ESIA has been funded by the Government of New Zealand. The first draft has been completed and was scheduled for public disclosure in late 2017, however this will be delayed.
     5. **Operations & Maintenance strategy:** An operations and maintenance strategy has been developed which would see the EPC contractor provide on-site support for a couple of years to train locally based staff. Support from international consultants will be required for reservoir management.
     6. **Schedule for Construction**: Construction is scheduled to commence by June 2018 with targeted completion date of last quarter of 2019. The impact of hurricane Maria will undoubtedly cause this schedule to be delayed.

1. Emera Inc. of Halifax, Nova Scotia holds 80% of the interest in ECI. ECI is traded on the Barbados Stock Exchange. [↑](#footnote-ref-1)
2. The terrain around La Soufriere is very heavily forested and several areas were inaccessible. This limited the work of the survey team, especially on the leeward (West) side of the island. More comprehensive coverage was possible on the windward (East) side of the island. [↑](#footnote-ref-2)
3. The survey indicates that the geothermal resource is closest to the surface at higher elevations with the results indicating the presence of a clay cap, with interface 1000m below surface level, at an elevation of 600m above sea level. [↑](#footnote-ref-3)
4. Low hanging vegetation and overhead power lines will require clearance prior to the use of this route. [↑](#footnote-ref-4)
5. Whereas Site 1 is on land owned by GoSVG, Site 3 is on land that was recently sold by GoSVG and therefore would have to be repurchased. [↑](#footnote-ref-5)
6. Electricity will be sold to VINLEC under a 25-year Power Purchase Agreement (PPA). [↑](#footnote-ref-6)
7. Geothermal Resource Group. Draft Press Release. November 22, 2016. [↑](#footnote-ref-7)
8. We don’t have access to the full results of this independent review [↑](#footnote-ref-8)
9. This includes an estimated $800K from GoNZ, $500K from CCI, and $275K in-kind contribution from the GoSL. [↑](#footnote-ref-9)