

# EMPOWERING

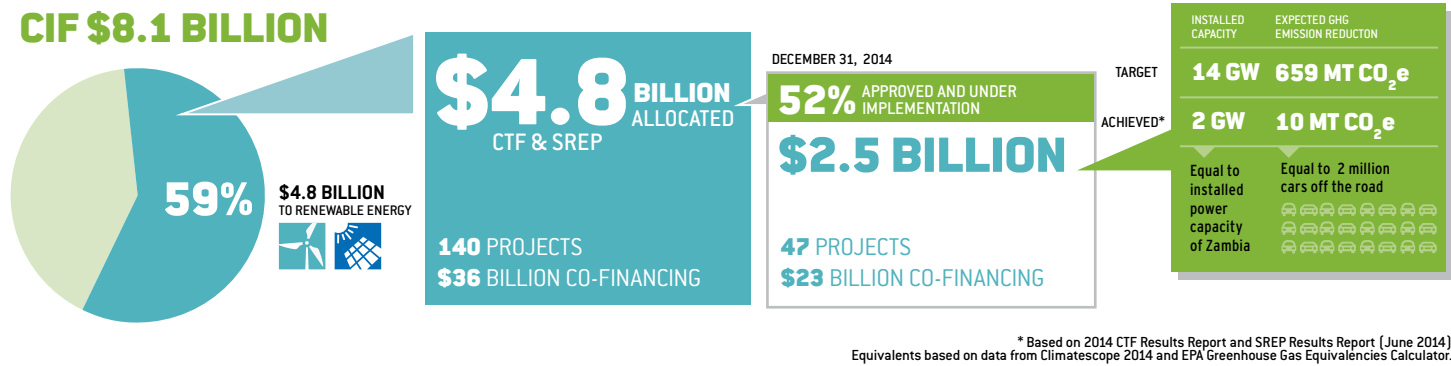
An aerial photograph showing a vast solar farm in the foreground, with rows of solar panels stretching across a field. In the background, there's a winding river, agricultural fields, and a small town under a blue sky with scattered clouds.

## RENEWABLE ENERGY DEPLOYMENT

POWER GENERATION AND OTHER ENERGY INDUSTRIES ACCOUNT FOR 35 PERCENT OF GLOBAL GREENHOUSE GAS EMISSIONS—MORE THAN ANY OTHER SECTOR.<sup>3</sup> YET NEARLY ONE IN FIVE PEOPLE ON THE PLANET STILL LACK ACCESS TO ELECTRICITY. THREE BILLION PEOPLE RELY ON WOOD, COAL, CHARCOAL, OR ANIMAL WASTE FOR COOKING AND HEATING. RENEWABLE ENERGY HAS THE POTENTIAL NOT ONLY TO REDUCE GREENHOUSE GAS EMISSIONS, BUT TO LEAPFROG OLD APPROACHES TO ENERGY GENERATION AND USE, REDUCE DEPENDENCE ON EXPENSIVE AND POLLUTING FOSSIL FUEL IMPORTS, INCREASE ENERGY ACCESS, AND OPEN NEW SOURCES OF ECONOMIC GROWTH.

Close to 60 percent of CIF funding is focused on renewable energy development. A total of \$4.8 billion in financing from the CTF and SREP is allocated for 140 public and private sector renewable energy projects in 33 countries. Technologies include wind, geothermal, bio-energy, hydropower, and solar, including concentrated solar power (CSP) and solar photovoltaic (PV).

FIGURE 2 CIF RENEWABLE ENERGY PORTFOLIO



"WE HOPE THIS [FUNDING FROM SREP] WILL OPEN MORE ECONOMIC ACTIVITIES, ESPECIALLY IN THE RURAL AREAS, AND SHIFT PRODUCTIVITY, ESPECIALLY OF WOMEN, FROM SUBSISTENCE AGRICULTURE TO OTHER ECONOMIC ACTIVITIES IF ENERGY IS PROVIDED FOR THEM."

**COLIN BECK**  
Ambassador of Solomon Islands to the U.S. and UN

To date, \$2.5 billion for 47 projects is approved and under implementation. CIF financing is expected to contribute to over 14 gigawatts (GW) of new generation capacity and attract \$23 billion in co-financing.

Some of these early projects are already producing results as specified in the **2014 CTF Results Report** and **2014 SREP Results Report**. Although these reports show progress, they are preliminary and do not reflect the full scope of CIF investments. It is still too early to see results from 20- to 30-year projects or from those involving infrastructure yet to be constructed or put into operation.

**DEMAND IS STRONG**

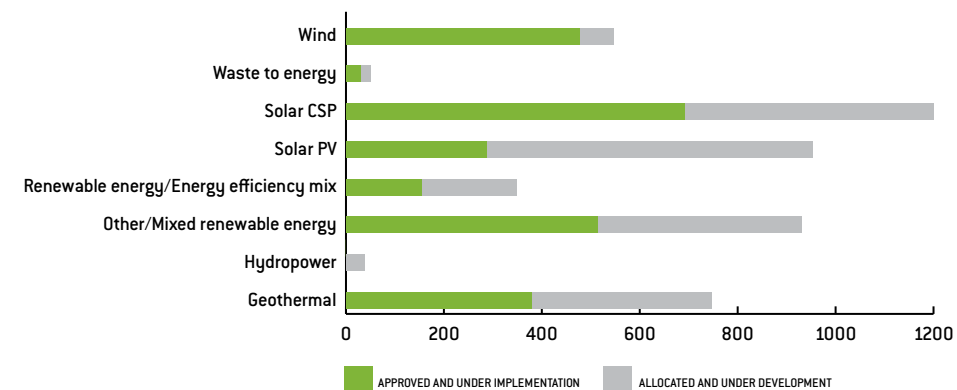
The demand for CIF support for scaling up renewable energy solutions is strong. In 2014, 14 developing countries in Africa, Asia, Latin America, and the Caribbean (of 40 that applied for consideration) were invited to participate in the SREP, expanding the SREP

to 27 countries, the most of any CIF funding window. New SREP countries are Bangladesh, Benin, Cambodia, Ghana, Haiti, Kiribati, Lesotho, Madagascar, Malawi, Nicaragua, Rwanda, Sierra Leone, Uganda, and Zambia.

The growth in the SREP shows global recognition of the potential of renewable energy to expand energy access. The SREP is proving valuable as a central platform on which many countries are consolidating discussions on national renewable energy policy, planning, and enabling environments.

In 2014, Norway and the United Kingdom pledged up to an additional \$286 million<sup>4</sup> to the SREP, bringing the SREP to \$796 million in total pledges and supporting new investment plans as they are presented to the SREP Sub-Committee for endorsement. Investment planning is already under way in Ghana, Haiti, Nicaragua, and Rwanda, with more missions expected in 2015.

FIGURE 3 CIF IS SUPPORTING A RANGE OF RENEWABLE ENERGY TECHNOLOGIES



BOX 1 LOW EMISSIONS INVESTMENT PLANNING

Government officials and key stakeholders from new SREP countries were among the first 53 participants to take a new online course on Low Emissions Investment Planning (LEIP). It was released in December 2014 by the CIF in partnership with the Carbon Finance Assist Trust Fund and the World Bank Group's Climate Change Group and e-Institute. Available with facilitation in 2015, or self-paced, the e-course provides policy makers, planners, and climate change practitioners practical guidance on how to design, finance, and implement a low emissions investment plan based on the experiences of CTF and SREP countries. Topics covered include the following:

- Initiating stakeholder engagement
- Scoping country context
- Prioritizing sector options
- Developing project concepts
- Implementing, including monitoring and reporting

Also in 2015 the CIF, in collaboration with the government of the Netherlands, is conducting a meeting for new SREP countries to learn about the investment planning process and to hear from others that already have endorsed investment plans and are implementing projects and programs. See page 35 for more on the SREP.

The United Kingdom also pledged an additional \$187 million to the CTF in 2014, bringing the CTF to \$5.3 billion in total pledges. This will help bridge a funding gap in the CTF pipeline, which has been allowed to be overprogrammed to accelerate project development and approvals.<sup>5</sup> Despite the support, the CTF may still experience a funding shortfall starting in July 2015. See page 34 for more on the CTF.

**CONCENTRATED SOLAR POWER**

CSP uses mirrors to reflect and concentrate the sun's rays to produce heat, which then generates steam that powers turbines and

produces electricity. CSP can be combined with cost-effective energy storage solutions to produce power when the sun is not shining, overcoming intermittency concerns and potentially displacing fossil fuel-based generation because it can provide reliable power around the clock. However, CSP is an expensive technology and has a limited track record, particularly in emerging markets.

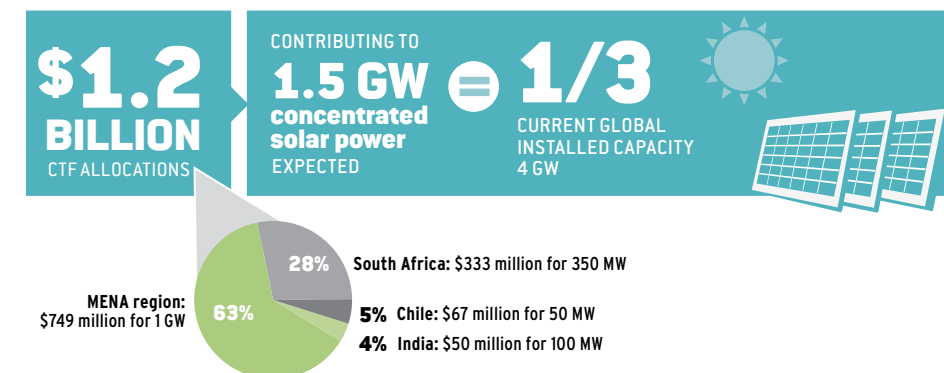
The CTF is a leader in driving global investments in CSP. CTF financing of \$1.2 billion, expected to attract an additional \$8.4 billion in co-financing, is allocated to early CSP projects in Chile, India, and South Africa and the MENA region (Algeria, Egypt, Jordan, Libya, Morocco, and Tunisia) with projected generation capacity of 1.5 GW, or more than one-third of the current global CSP capacity of 4 GW. The CTF's CSP investments are intended to establish a record of performance for the technology, thereby lowering perceived risk and reducing future project costs for private sector CSP investors and developers.



"THE SREP SUPPORT WILL HELP US TO HAVE A SUCCESS STORY FOR SCALING UP IDENTIFIED RENEWABLE ENERGY TECHNOLOGIES AND MAKING ARMENIA MORE ENERGY SECURE."

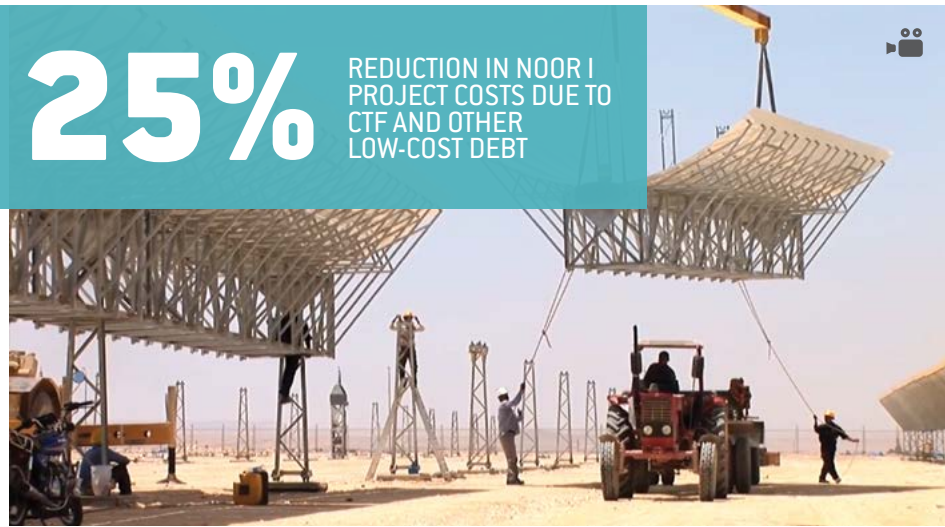
**AREG GALSTYAN**  
Deputy Minister of Energy and Natural Resources, Armenia

FIGURE 4 CIF INVESTMENTS IN CONCENTRATED SOLAR POWER



# 25%

REDUCTION IN NOOR I PROJECT COSTS DUE TO CTF AND OTHER LOW-COST DEBT



## MOROCCO

In Morocco, \$435 million in CTF concessional funding, channeled through the African Development Bank (AfDB) and World Bank, is supporting the phased construction of the Noor CSP plant. It is Morocco's first utility-scale solar energy complex and a critical step of the Moroccan Solar Energy Program, which aims to install 2 GW of solar power by 2020. The Noor CSP complex expects to achieve over 500 megawatts (MW) installed capacity, reduce carbon emissions by 760,000 tons per year, and supply power to 1.1 million Moroccans by 2018.

Phase I construction began in 2013, and the first 160 MW solar power station is scheduled to come into operation by the end of 2015. The low-cost debt provided by the CTF (\$197 million) and other international financial institutions reduced Phase I project costs by about 25 percent compared to financing available from commercial banks in the market. The winning bid was 25 percent lower than initial cost projections: \$0.18 per kilowatt-hour (kWh) compared to \$0.24 per kWh. This will help reduce strain on public finances by lowering the amount of subsidy that the Moroccan government required, from \$60 million to \$20 million per annum.

Financial analysis conducted by the AfDB and World Bank in the preparation of the Noor II and III shows that the CTF contribution of \$238 million will lower the CSP levelized cost of electricity by about 10 percent.

## SOUTH AFRICA

With \$500 million from the CTF, South Africa is on its way to realizing some of its clean energy goals. South Africa is working to add 20 GW of new, renewable power generation capacity by 2030, of which 3.3 GW is expected

to come from CSP. South Africa has committed 66 percent of its CTF investment plan to CSP to stimulate markets and give confidence to other lenders. CTF \$250 million, channeled through the AfDB and World Bank, is considered a catalyst in revitalizing the 100 MW Eskom project in Upington, which was put on hold in 2009 during the global recession. Another \$83 million in CTF financing, channeled through the AfDB and International Finance Corporation (IFC), is supporting some of the first independent power producers in the country, including the 100 MW Xina Solar One project (AfDB), the 100 MW KaXu Solar One project, and the 50 MW Khi Solar One project (IFC).

Configured to meet the South African peak load demand, the 100 MW Xina Solar One project will use parabolic trough technology and a superheated steam cycle and have a storage capacity of 1,650 MWh (equivalent to approximately 5.4 hours of full capacity operation). The project is expected to save annually about 400,000 tons of CO<sub>2</sub> emissions and 188,000 tons of coal if the alternative were to be a coal-powered plant.

## BOX 2 THE ROLE OF PUBLIC FINANCE IN CONCENTRATED SOLAR POWER

The CTF is investing heavily in the development of CSP and seeks to understand how public financing can be used most effectively to scale up CSP deployment and reduce its cost. A year-long study carried out by the Climate Policy Initiative (CPI) on behalf of the CIF concluded in 2014 with a series of case studies, stakeholder dialogues, and reports.

Research<sup>6</sup> shows that if international finance institutions and committed national governments joined forces to deploy 5 to 15 GW of CSP, it could reduce its electricity production costs by around 14 to 44 percent and make CSP competitive in countries like Morocco and South Africa. Recommendations for closing the viability gap include the following:

FOR NATIONAL GOVERNMENTS	FOR INTERNATIONAL FINANCING INSTITUTIONS
<ul style="list-style-type: none"> <li>Design policy to ensure that the cost of support falls to reflect decreasing costs over time</li> <li>Ensure that support can be sustained over time, to avoid boom and bust cycles</li> <li>Remunerate flexible power supply from CSP to reflect its benefit to the energy system</li> </ul>	<ul style="list-style-type: none"> <li>Target public funding to mitigate risk for early stage CSP technologies, which carry high investment risk but great potential for future cost reductions or energy system benefits</li> <li>Harmonize loan and regulatory requirements among lenders</li> <li>Reduce foreign exchange hedging costs of loans by international financial institutions to developers</li> </ul>



## SOLAR PHOTOVOLTAICS

Solar PV is considered one of the most scalable and sustainable forms of renewable energy in the world. Effective measurements of irradiance can be undertaken beforehand, and proven PV technologies have been developed over time leading to significant cost reductions. The cost of PV modules has been divided by five in the last six years; the cost of full PV systems has been divided by almost three. In the last ten years, cumulative installed capacity has grown at an average rate of 49 percent per year, bringing total global capacity to over 135 GW in 2013.<sup>7</sup>

CIF countries are taking advantage of the falling costs and versatility of solar PV technologies. Fourteen countries and two regional programs in Africa and Latin America and the Caribbean plan to invest approximately \$950 million from the CTF and SREP, which is expecting at least \$8 billion in co-financing. Solar PV generation projects range from large, grid-connected applications in countries like Thailand and Honduras to smaller, off-grid solutions in rural areas, such as in Mali and Vanuatu. Another CTF \$200 million is supporting the solar energy boom in Rajasthan, India, by financing the transmission infrastructure needed to get new power to users—an expected 4,300 MW.

## THAILAND

A major focus of Thailand's Renewable Energy Accelerator Program, a private sector initiative under Thailand's CTF investment plan, was to support the development of the Thai solar sector. As part of this effort, IFC blended \$8 million in commercial financing from its own resources with \$4 million in concessional finance from the CTF to support expansion of one of the early solar PV developers

in Thailand, the Solar Power Company Group (SPCG). Financing from the CTF and IFC enabled SPCG to mobilize additional financing from local banks and bring 12 MW in utility-scale solar power capacity over the finish line. It also helped reduce long-term project finance risks for lenders and sent positive signals to the local financial markets for utility-scale solar. Today, SPCG is one of Thailand's largest solar farm developers with over 250 MW installed solar capacity and plans to expand beyond Thailand.

For her pioneering efforts that have helped transform Thailand's solar power sector, in December 2014 the United Nations Framework Convention on Climate Change (UNFCCC) honored Dr. Wandee Khunchornyakong, CEO of the SPCG, with a prestigious Momentum for Change (M4C) award. She is one of three winners in the Women for Results category, which recognizes projects that demonstrate the critical leadership and participation of women in addressing climate change.

## HONDURAS

Under the CTF Dedicated Private Sector Programs (DPSP, see page 28), the \$95 million Utility-Scale Renewable Energy Program-Solar PV is designed to address barriers encountered by private sector investors in the emerging markets of Africa and Latin America and the Caribbean. These include first-mover risk, higher total project costs compared to fossil fuel projects, unattractive feed-in tariffs, and regulatory and market risks.

First to advance under the program is an IFC-financed project in Honduras with SunEdison Inc. to construct and operate three facilities producing 81.7 MW of utility-scale solar PV power. The project will help diversify Honduras's energy mix and provide



"FINANCING BY IFC, THE CLEAN TECHNOLOGY FUND, AND OTHER PARTNER BANKS WAS CRITICAL TO THE REALIZATION OF OUR TARGET TO HAVE 204 MW OF SOLAR GENERATING CAPACITY OPERATIONAL BY 2013."

DR. WANDEE KHUNCHORNYAKONG  
CEO, Solar Power Company Group

much-needed energy to the national grid under 20-year power purchase agreements with Empresa Nacional de Energia Electrica, the state-owned electricity generation, transmission, and distribution company. It is the largest renewable energy development in Central America to date, expected to generate approximately 168 gigawatt-hours (GWh) of energy annually and establish a solid foundation of solar PV capacity in Honduras. It is expected to be commissioned by the second half of 2015, supported by CTF \$19.5 million and financing from other sources, including \$48 million from IFC, for a total financing package of \$146 million.



## GEOTHERMAL

Geothermal power can provide stable base load energy at low operational costs and competitive prices. Although it is one of the cheapest renewable energy options available (levelized cost of geothermal electricity is around \$0.09-0.13 per kWh), geothermal expansion is limited by high early risk and the time- and cost-intensive exploration phase of development. Most private investors are unwilling to take on those risks. Moreover, many countries lack the technological and performance records needed to secure commercial financing.

The CIF is allocating \$746 million for geothermal investments in 11 countries and across the Latin America and Caribbean region. Strong interest in co-financing these investments—over \$7.5 billion expected—reveals a dynamic project pipeline with the potential to lead to the development of 2.9 GW of geothermal capacity, roughly one-quarter of current global installed capacity. CIF funding is supporting some of the first large-scale geothermal development projects in Armenia, Chile, Dominica, Ethiopia, and Tanzania.

### KENYA

In Kenya, a top government priority is to improve access to affordable energy. Approximately 65 percent of Kenyans do not have access to basic energy services, and existing energy supply is heavily and unsustainably dependent on hydroelectric power. To meet growing energy demand, Kenya is increasingly turning to other

renewable energy solutions, particularly geothermal. Kenya has an estimated geothermal potential of nearly 7,000 MW—around three times Kenya's annual energy use. As of 2014, installed geothermal generation capacity was 241 MW, but the government plans to increase it to 5,530 MW by 2030.

SREP \$25 million, administered by the AfDB, is supporting expansion of the Menengai geothermal power plant by covering exploratory drilling. Phase I drilling is under way and expected to prove 400 MW, which developers aim to add to the national grid by 2017. Another \$20 million from the SREP private sector set-aside (see page 28) was allocated in 2014 to help finance the 140 MW Olkaria IV project, the first public-private partnership geothermal project in Kenya.

SREP financing will help cover payment default risk. If successful, this transaction could spark the beginning of a new paradigm in the financing of energy infrastructure in Kenya.

### INDONESIA

Indonesia aims to increase the share of renewable energy in its primary energy supply from 5 percent in 2010 to 25 percent by 2025. Current installed geothermal capacity is 1.3 GW, less than 5 percent of Indonesia's total geothermal potential, which is estimated at more than 29 GW (equivalent to 40 percent of the global geothermal resource base). CTF funding is facilitating commercial lending that is expected to lead five geothermal projects totaling 750 MW to financial closure, setting a benchmark for commercial bank



**500,000 HOUSEHOLDS**

EXPECTED TO BENEFIT FROM 320 MW SARULLA GEOTHERMAL POWER PROJECT IN INDONESIA

lending. The CTF is also providing risk capital to help other projects complete the exploratory drilling phase of development.

In particular, CTF \$80 million, administered by the Asian Development Bank (ADB), is supporting the 320 MW Sarulla geothermal power project, the largest single-contract geothermal power project in Indonesia. Upon completion in 2018, it will avoid 1.3 million tons of CO<sub>2</sub> emissions per year and provide 500,000 households with access to clean energy. Given the few precedents

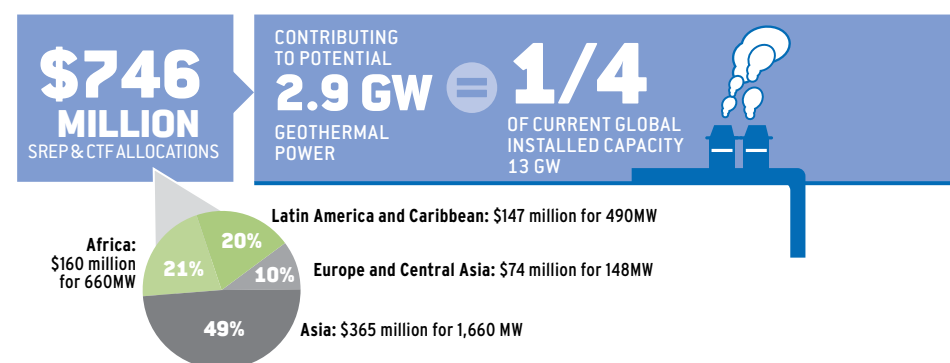
in the sector and constraints in the capital markets, the Sarulla geothermal project required an innovative finance structure to help address the risk profile of a first-mover private sector investment. Concessional funding from the CTF helped bridge the financing gap between the commercial lenders and the equity investors and augmented the project's debt capacity. It also provided flexibility in connection with the timing of funding and payment under those facilities.

### MEXICO

With \$235 million in allocations under the CTF DPSP, the Utility-Scale Renewable Energy Program-Geothermal focuses on mitigating the drilling and resource risks for geothermal project development in several regions of Africa, Asia, and Latin America and the Caribbean. Funds from this program are supporting NAFIN, Mexico's national development bank, in implementing a geothermal financing and risk transfer facility designed to scale up investments in geothermal power generation projects. Mexico ranks fourth in the world in geothermal electricity production at 958 MW of installed capacity. Yet this represents only 2.5 percent of the country's total power generation capacity, and it is operated entirely by the state electric company, the Comisión Federal de Electricidad, with no participation of the private sector.

The facility will provide a range of financial structures tailored to meet the specific needs for each project's stage of development, including risk mitigation mechanisms and various forms of support for exploration, drilling, field development and construction, and operation phases of private geothermal projects. Expected results included 300 MW of new geothermal capacity and 33 million tons of CO<sub>2</sub> emissions reductions. CTF \$54.3 million is supporting the project along with \$54.3 million from the Inter-American Development Bank (IDB) and other co-financing for a total financing package of \$120 million.

FIGURE 5 CIF INVESTMENTS IN GEOTHERMAL POWER



### BOX 3 THE ROLE OF PUBLIC FINANCE IN GEOTHERMAL

In 2014, the CIF commissioned the Climate Policy Initiative (CPI) to undertake a body of analytical work—including a series of stakeholder dialogues, case studies, and reports—leading to recommendations on how public finance and public policy can be employed to scale up geothermal deployment. The study continues in 2015, but early findings<sup>8</sup> include the following:

- Up to 90 percent of geothermal project investments utilize some aspect of public debt or equity support. Much of the current support targets the operational phase, but public

resources might be better used to address the risk in the exploration and field development phases.

- The public sector should provide a regulatory framework that is conducive to development of such projects, make resource data available, foster price incentives, and ensure political acceptability of the tariff.
- No single project development model predominates; the CIF/CPI work aims to yield greater understanding of (cost-)effectiveness of different public policy and investment tools and project development.