SECTOR ASSESSMENT (SUMMARY): RENEWABLE ENERGY SUBSECTOR

Sector Road Map

1. Sector Performance, Problems, and Opportunities

1. The Cook Islands is a Pacific island country divided into two island groups with an estimated total population of 18,600 people, including 13,900 permanent residents. The Northern group consists of seven low-lying, sparsely populated coral atolls; the Southern group consists of eight fertile volcanic islands. About 92% of the population lives in the Southern group, which includes the main island of Rarotonga. Economic and social development is hindered by the country's limited size, isolation and distance from markets, a lack of natural resources, periodic devastation from natural disasters, and inadequate infrastructure.

2. The Cook Islands is heavily dependent on diesel-powered generators—they constitute about 99% of its electricity generating capacity. Total installed capacity is 11.75 megawatts, and the distribution network comprises 80 kilometers of 11-kilovolt underground cables and 200 kilometers of low-voltage (0.415 kilovolts) distribution lines. On Rarotonga, more than 99.00% of households are connected to a grid, 4.34% have additional solar photovoltaic home systems, and 0.40% use small diesel generators. On the outer islands, about 99.00% of households are connected to a grid, and 8.71% have additional solar photovoltaic home systems and small diesel generators.[1] According to long-term price forecasts for the world's oil products, the price of diesel oil is estimated to increase by an average 2.9% a year up to 2040.[2] This anticipated trend puts at risk the sustainable economic and social development in a country that heavily relies on diesel generators for electricity supply.

3. Households, businesses, and hotels account for about 75% of total electricity load demand. The Southern islands, especially Rarotonga and Aitutaki, account for 98% of load demand. Current electricity demand in the Cook Islands is around 33.0 gigawatt-hours, unchanged since 2008. But growing visitor numbers, particularly in Rarotonga and Aitutaki, and a change in home appliances to electric cookers and blast freezers for fishing products in the outer islands mean that load demand is forecast to increase modestly to 38.5 gigawatt-hours by 2020.[3]

4. The current average electricity tariff is $0.63 per kilowatt-hour (kWh). Under the tariff regulations, the utilities can pass on fuel costs directly to consumers and charge an inflation-indexed nonfuel tariff. It consists of a nonfuel component of $0.28 per kWh and a variable fuel surcharge component of $0.35 per kWh. Because of limited affordability in the outer islands, except for Rarotonga, the government subsidizes a part of the electricity generation cost, which in 2013 accounted for about 2% of national budget expenditure.[4] Despite the subsidy, the average electricity tariff in the outer islands is $0.57 per kWh, amounting to as much as 4% of

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[1] Ministry of Finance and Economic Management. 2012. *Census of Population and Dwellings*. Avarua, Rarotonga.

[2] The United States Department of Energy in 2013 forecast that the average gallon price for diesel oil will increase to $7.44 in 2040, from $2.61 in 2010 (1 gallon = 3.79 liters).

[3] According to tourism and migration statistics of the Government of the Cook Islands, the number of visitors increased from 101,229 in 2009 to 121,207 in 2013.

[4] The government annually subsidizes the deficit in the power systems of the outer islands, which cover around 20% of the total population. The subsidy is based on estimated annual revenue from electricity sales and estimated annual generation cost. To avoid oversubsidizing, the government sets a benchmark by using the electricity tariff on Rarotonga, the main island, to estimate annual revenue from electricity sales.

annual household and 15% of annual business expenditure.[5]

2. Government's Sector Strategy

5. In 2003, the Government of the Cook Islands issued the National Energy Policy, which aims to facilitate reliable, safe, environmentally acceptable, and cost-effective sustainable energy services. The National Sustainable Development Plan, 2007−2010 prioritized reducing the country's reliance on fossil fuels by using technically feasible and financially viable renewable energy. Since 2009, the government has implemented a policy that allows end-use customers to install grid-connected solar home systems. Given the high electricity tariffs, this is a strong incentive and led to the addition of about 800 kilowatts of installed capacity by 2013.

6. In 2011, the government issued the Cook Islands Renewable Energy Chart (CIREC), which sets a target of supplying 50% of inhabited islands with energy from renewable sources by 2015, and 100% of the inhabited islands by 2020, in line with the priorities of the National Sustainable Development Plan, 2011−2015.[6] In 2012, the government also launched the CIREC implementation plan (CIRECIP), which incorporates a development schedule for electricity generation from renewable sources. The total investment required to execute the CIRECIP in full is estimated at around NZ$220 million (Table 1).[7]

Table 1: Load demand, applicable renewable energy technology

	Total H.H.	Total Pop.	Load Demand (kWh)		Assumed Technology	Indicative CAPEX (NZ$ mil.)
			2015	2020		
Southern Group Total	***4,130***	***17,970***	***32,428,300***	***37,897,516***		***213.10***
Mitiaro	145	220	62,300	75,800	PV/DSL back-up	1.70
Mangaia	177	640	579,000	705,000	PV/DSL back-up	3.40
Atiu	158	570	456,000	555,000	PV/DSL back-up	3.00
Mauke	106	390	288,000	351,000	PV/DSL back-up	3.20
Aitutaki	535	2,250	3,060,000	3,190,000	PV/wind/DSL back-up	16.90
Rarotonga	3,009	13,900	27,983,000	33,020,716	PV/wind/Bio/hydro/ DSL back-up	184.90
Northern Group Total	***335***	***1,465***	***511,850***	***607,889***		***7.84***
Palmerston	18	60	28,500	34,600	PV/DSL back-up	0.60
Rakahanga	24	140	64,400	78,300	PV/DSL back-up	1.00
Pukapuka	97	510	20,900	25,500	PV/DSL back-up	1.80
Nassau	32	120	27,200	31,824	PV/DSL back-up	0.90
Suwarrow	1	5	850	995	PV/DSL back-up	0.04
Maihiki	97	370	291,000	340,470	PV/DSL back-up	1.80
Penryhn	66	260	79,000	96,200	PV/DSL back-up	1.70

Bio = biomass- and biogas-based power generation, CAPEX = capital expenditure, DSL = back-up diesel generator, H.H.= households, Pop = population, kWh = kilowatt-hour, PV = solar photovoltaic power.
Source: Cook Islands Renewable Energy Chart Implementation Plan, 2012.

7. However, to meet the ambitious renewable energy diffusion target, the CIRECIP recognizes the need to strengthen the institutional and technical capacity for renewable energy projects in planning, design, construction, and operation and maintenance; coordination between

[5] Ministry of Finance and Economic Management. 2008. *Household Expenditure Survey*. Avarua, Rarotonga.
[6] The Government of the Cook Islands. 2011. *Cook Islands Renewable Energy Chart*. Avarua, Rarotonga.
[7] The Government of the Cook Islands. 2012. *Cook Islands Renewable Energy Chart Implementation Plan*. Avarua, Rarotonga.

government agencies and departments; and policy management to coordinate international development partners in a well-planned manner.

8. The CIRECIP also recommends institutional strengthening to increase private sector participation. The legal and regulatory framework in the energy sector allows private sector involvement through power purchase agreements with the utilities. Private participation in renewable energy investments is critical in helping finance the goals of the CIRECIP by 2020, especially in Rarotonga and Aitutaki, the major load centers in the Cook Islands. The capacity of the Renewable Energy Development Division (REDD) of the Office of the Prime Minister, which is responsible for implementing the CIRECIP, needs strengthening to conduct renewable energy technology assessments and set adequate off-take tariffs for power purchase agreements in projects funded by the private sector.

9. Developing energy efficiency standards and regulations is another policy action in the CIRECIP necessary to reduce the size requirements of power plants, reduce peak-load demand, and minimize diesel fuel consumption during peak hours. REDD plans to issue a demand-side energy efficiency policy within 2014, based on outputs of ongoing technical assistance (para. 12), to develop effective policy intervention in energy efficiency, which is recognized as a critical step in eliminating market barriers to rational electricity use. REDD also plans to issue an implementation plan for its energy efficiency policy in 2015, which involves (i) promoting rational electricity use by targeting large consumer groups and (ii) bolstering energy audit, monitoring, and evaluation frameworks.

10. Combined with the measures outlined above (paras. 8 and 9), updating the CIRECIP is essential for firm up the renewable energy investment plan, especially for Rarotonga. This entails reasonable load demand forecasts that reflect possible changes in electricity use by major consumers, and least-cost renewable energy technology assessments to implement the investment plan cost-effectively while ensuring stable electricity supply.

3. ADB Sector Experience and Assistance Program

11. The Asian Development Bank (ADB) has played a lead role among international development partners in supporting mini-grid renewable energy development and demand-side energy efficiency in the Pacific region in the past 5 years (2009−2013)—with 9 loans totaling about $225 million, 9 grants totaling about $40.47 million, and 21 technical assistance (TA) projects totaling $34.47 million—to improve the region's energy security, deliver renewable energy technology, improve affordability of energy services, and reduce greenhouse gas emissions by the power sector.

12. In particular, ADB has provided regional TA, including to the Cook Islands, to reduce reliance on imported diesel fuels.[8] It has supported the introduction of low-energy light bulbs in all residential homes and raised public awareness of the advantages of such energy-efficient light bulbs. The TA successfully set a benchmark for long-life, voltage-tolerant compact fluorescent light (CFL) bulbs and established a system for recycling used bulbs. By 2013, CFL and similar energy-efficient light bulbs accounted for around 60% of residential lighting in the Cook Islands. The second phase of this TA is now under implementation in the Cook Islands,

[8] ADB. 2008. *Technical Assistance for Promoting Energy Efficiency in the Pacific*. Manila (TA 6485-REG, approved on September 12).

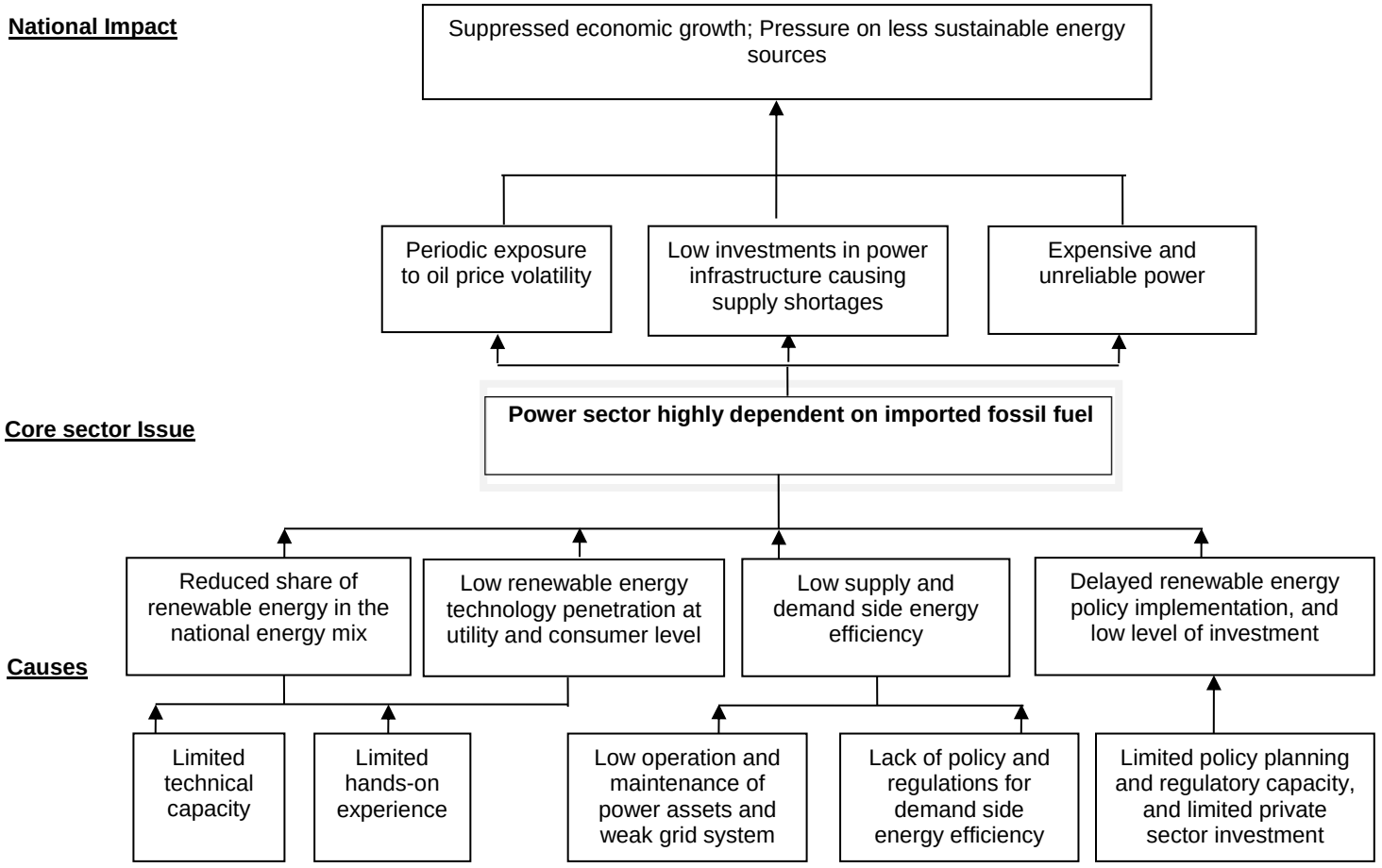
mainstreaming energy efficiency practices and scaling up effective energy efficiency measures.[9] Lessons from the process will also help optimize institutional strengthening for implementing the CIRECIP, along with the proposed Renewable Energy Sector Project.

13. Renewable energy development is an operational priority area in ADB's Pacific Approach, 2010–2014.[10] ADB will support renewable energy development and energy cost savings, and will also support developing a sound energy policy and sector strategies. The country operations business plan, 2014–2016 for the Cook Islands also puts priority on renewable energy development for sustainable use and management of natural resources and the environment.[11]

14. The Cook Islands has a clearly articulated renewable energy development plan, and a well-established institutional framework for its implementation. However, it is essential to develop grid-connected renewable energy systems on all islands in parallel with institutional strengthening and policy reforms. The proposed project will help not only finance grid-connected solar photovoltaic systems in six islands of the Southern group, but strengthen immediately needed institutional and project management capacity in priority areas (paras. 8−10).

[9] ADB. 2011. *Technical Assistance for Promoting Energy Efficiency in the Pacific (Phase 2)*. Manila (TA 7798-REG, approved on March 31).
[10] ADB. 2010. *Pacific Approach of the Asian Development Bank, 2010–2014.* Manila.
[11] ADB. 2013. *Country Operations Business Plan: Cook Islands, 2014–2016.* Manila.

Problem Tree for Energy–Renewable Energy Subsector



Source: Asian Development Bank estimates.

Sector Results Framework (Energy Sector, 2014–2016)

Country Sector Outcome		Country Sector Outputs		ADB Sector Operations	
Outcomes with ADB Contributions	**Indicators with Targets and Baselines**	**Outputs with ADB Contributions**	**Indicators with Incremental Targets**	**Planned and Ongoing ADB Interventions**	**Main Outputs Expected from ADB Contributions**
Sustainable use and management of natural resources and the environment	100% of islands convert energy system from diesel fuel to renewable energy source by 2020 50% of islands convert energy system from diesel fuel to renewable energy source by 2015	Reduced dependence on imported fossil fuels for power generation Increased supply of clean and reliable power	Diesel imports for power generation reduced by 3.35 million liters by 2015, from 6.70 million in 2012 Power supplied from renewable sources sufficient to meet the needs of 2,050 households by 2015, from 1,025 in 2012	Planned key activity areas: Clean energy and energy efficiency Planned projects 2014–2016: Clean energy ($11.8 million in one project) Ongoing projects with approved amounts by the end of 2013: Energy efficiency (total of $0.42 million)	Renewable energy system to be constructed on the islands of the Southern group. Institutional capacity is strengthened to implement the CIRECIP. Demand-side energy efficiency practice is scaled up.

ADB = Asian Development Bank, CIRECIP = Cook Islands Renewable Energy Charter Implementation Plan.
Source: Asian Development Bank estimates.