



Cook Islands Renewable Energy Chart Implementation Plan

Island Specific

This Implementation plan is outlined specific to each island of the Cook islands which articulates the costs, technology, time lines, and the processes. It is noted this document must be read in conjunction with the 'Cook Islands Renewable Energy Chart Implementation Plan' towards 2020.



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Executive Summary

Government of The Cook Islands has taken an audacious step towards transforming its country from dependency to fossil fuel as an energy source to a future of Renewable Energy means as its source of electrical power generation. To guide it in its progress towards achieving this target, it has developed an Implementation Plan that is; island specific, simple to understand and succinct.

This implementation Plan cannot be read on its own but with the backdrop of the "Cook Islands Renewable Energy Chart Implementation Plan." This report provides the analytical data, advice and comments from which this island specific Implementation Plan has been developed.

The island specific plans will indicate information that is pertinent to the "how" of the roll out of the Renewable Energy projects on each island:

Island Energy Sector set up:

This data indicates the electric distribution, generation and customer details of the island.

Technology Type:

There are various proven renewable energy technologies of which a specific type will be identified here for each island.

Cost:

The projects have indicative costs (capital & operational) based on scoping studies already undertaken on several islands, the local knowledge of each island electrical infrastructure and available electrical data of each island. The full cost will be determined once a full project study has been completed.

Project Time line:

This is self-explanatory in that a timeline, of a beginning and an end, will be indicated for each island project.

Governance:

Accordingly, the projects involve various stakeholders. The processes and reporting lines along with identified responsibilities will be outlined.

Approach:

The transformation for each island will be undertaken in two approaches; the Northern and Southern Group of islands will be undertaken in a one goer approach as they are small enough to do so with the exception of Aitutaki and Rarotonga. Both these islands will have a phased transformation over time to the year 2020.

The island specific implementation plan is a living document and will be amended as time and progress ensues. A monitoring and evaluation of timelines and data will be undertaken every year to keep it current.

Introduction

There is no secret to the intentions of the Government of the Cook Islands in relation to its power shift towards a Renewable Energy future. Government has established a Renewable Energy Development Division with the Office of the Prime Minister as an indicator of leadership; and has openly voiced to the International Community, the Region and the Country of its commitment to achieving, by Renewable Energy means, the electricity demand of the country by 2020.

Government, in its endeavour to achieve its Goal, has produced the "Cook Islands Renewable Electricity Chart" the "Cook Islands Renewable Energy Chart Implementation Plan" as its guiding papers to which the Island Specific Implementation Plan is developed.

To fully appreciate the degree of complexity and scope of the project it would be advisable to read the aforementioned papers.

The purpose of this Plan is to convey, in its simplest form, to the reader what is to be undertaken and how it will be done for each island.

Governance

Over the last 20 or so years the Ministry of Energy never operated within a stable environment in that it never could find a permanent place in the whole machinery of government. The Ministry, supported by the Energy Act 1998 and National Energy Policy 2003, underwent further restructuring in 2011 by the establishment of a Renewable Energy Development Department (REDD) within the Office of the Prime Minister and the regulatory functions of the Ministry remained with the Ministry of Infrastructure and Planning. During this same period the Government established its renewable energy goal. The Cook Islands had now established vision, leadership, and commitment in renewable energy.

REDD is tasked to roll out the Implementation Plan working in conjunction with Te Aponga Uira (Power Company on Rarotonga), The Island Administration and Councils (11) who are responsible for their island energy needs, the Donor partners, Aid Management Division of the Ministry of Finance and Economic Management (MFEM) and the Renewable Energy Committee chaired by the Prime Minister.

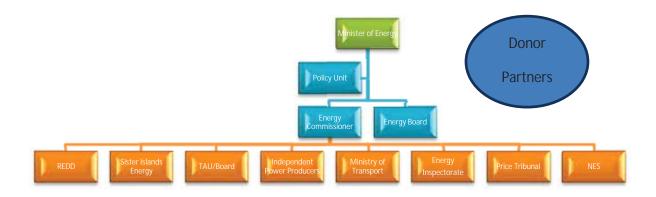
When rolling out the renewable energy projects the following studies are generally required to be undertaken. They may be grouped together or done individually – time and expertise driven. A tendering process (governed by established tendering processes – National & Donor) is undertaken. This process will be undertaken, grouping islands together for a one approach, or individually for the more complex and bigger islands such as Rarotonga and Aitutaki. The tendering process would be for the purpose of undertaking the following studies/reports:

a. Scoping/Project Feasibility Study

- b. EIA report
- c. Verification study
- d. Design study
- e. Procurement & Installation
- f. Installation Supervision
- g. Terminal Report

The timeline for this process can be elongated for up to 3 months to finalize the successful tender and therefore REDD has taken measure and will continue to do so to harmonize donor partner processes along with National processes towards achieving its project timelines.

In ensuring there is a holistic coordinated approach to rolling out the IP, a proposed further restructuring of the energy sector is in the planning stages.



The above proposal would improve upon an already defragmented energy sector and increase synergy between all stakeholders.

IP: Rakahanga



Northern Group: 1,250 km north of Rarotonga.

Area: 4 sq. km

III CONTRACTOR O	EDMINISTER	THE REAL PROPERTY.								
				Infrastru	cture					
Power S	ystem		• 1 x 27	KVA Gener	ator					
			415 V - 3 Phase low voltage underground reticulation system							
Electricity Statistics										
Installed Capacity	Maximum Demand	Sales	Daily Supply	Cus	tomers		Fuel Use	Fuel	Reported Losses	
(kW)	(kW)	(kWh)/ yr	(hrs)				I/kWh	kl	%	
		J.		Domestic	Comme	rcial				
56	18	76,000	18	50	17		?	?	9?	
Tariff Structure										
	Dor	nestic			Commercial					
42	2 c/kWh, p	lus 12.5%	6 VAT		62 c/kWh, plus 12.5% VAT					
			Е	lectricity	Ratios					
Total		Population	on '0	00 kWh/Pe) kWh/Person		'000 kWh/Household/yr			
Househo	lds									
		77		0.99				1.5		
50										
				Activ	ity					
Technolo	gy:	•		Mini Grid S	System					
		:	Battery s One new	storage / diesel bac	k up					
Timeline:		20)12 - 2013							
Cost:		NZ	Z\$1.2 milli	on						
Donor:		PE	C Fund							

IP: Pukapuka



Northern Group: 1,300 km northwest of Rarotonga Area: approx 3 sq. km

Infrastructure

Power System

Some Solar PV Stand alone with Battery Storage for each household. 21 kW Diesel Generator for Government premises only. No reticulation system.

	Electricity Statistics ¹										
Installed	Maximum	Fuel	Reported								
Capacity	Demand	(kWh)/yr	Supply	Domestic Commercial		Use	kl	Losses			
(kW)	(kW)	. , ,	(hrs)			I/kWh		%			
21	?? estimated	Estimate required	24	?	?	N/A	?	N/A			

Tariff Structure² Commercial **Domestic** 95 c/kWh, plus 12.5% VAT 75 c/kWh, plus 12.5% VAT

	Electricity Ratios										
Maximum Demand kW	Total Households	Total Population	'000 kWh/Person	'000 kWh/Household/yr							
??	97	450	?	?							

¹ Estimated ² Estimated based on other Islands.

	Activity								
Technology:	Solar PV Mini GridBattery storageDiesel Generator Back up								
Timeline:	2012 - 2014								
Cost:	NZ\$1.83m								
Donor:	PEC Fund (Government of Japan)								
Approach:	One Goer								

IP: Nassau



Northern Group: 1,300 km northwest of Rarotonga

Area: 1.2 sq. km

	Infrastructure									
Power Sy	/stem		1 x 21 kW [No reticula	Diesel Ge	nerator					
			Ε	lectrici	ty Statistics					
Installed Capacity (kW)	Maximum Demand (kW)	Sales (kWh)/yr	Daily Supply Dome		ustomers c Commercial	Fuel Use I/kWh	Fuel kl	Reported Losses %		
21	10	39,000	24	?	N/A	?	?	?		
	Tariff Structure									
	Do	mestic				Com	mercial			
(95 c/kWh,	plus 12.5%	% VAT		75	c/kWh, p	lus 12.5%	% VAT		
				Electri	city Ratios					
Maximur Demand kW		eholds	Total Population		'000 kWh/Person		'000 kWh/Household/yr			
10		32	75		0.5?			1.2?		

	Activity									
Technology:	Solar PV Mini Grid									
	Battery Storage									
	Diesel Generator back up									
Timeline:	2013 - 2014									
Cost:	NZ\$0.9m									
Donor:	PEC Fund									
Approach:	One Goer									

IP: Manihiki

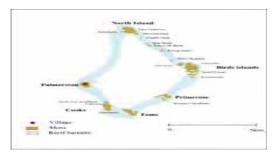


Northern Group: 1,160km north of Rarotonga Area: 4 sq. km

Infrastructure							
Power System	2 x Power Stations (Tauhunu & Tukao) 2 x 68 kW Diesel Generator in Tauhunu						
	1 x 68 kW Diesel Generator in Tukao						
	Underground reticulation system						

				Electricity	y Statistics	5				
Installed Capacity (kW)	Maximu Deman		Daily Supply (hrs)	Cust Domestic	omers Commercial			Reported Losses %		
136	50	300,000	24	?	?	?	?	?		
Outer Island Tariff Structure										
	Domestic Commercial									
56 c/k	Wh, plu	s 12.5% VAT			78 c/kW	/h, plus 12	2.5% VA	Т		
Electricity Ratios										
Maximur Demand kW		Total Households	Total F	Population	'000 kWh/Person		,000	'000 kWh/Household/yr		
30		97		243	1.2			3.1		
					Activity					
	Technology: Solar PV Mini Grid Battery Storage Diesel Generator back up 2012 - 2013									
Timeline		2012 - 2013								
Cost:		NZ\$1.2m								
Donor:		PEC Fund & N	ZAID							
Approach	า:	One Goer								

IP: Palmerston



Northern Group: 500km northwest of Rarotonga Area: 2.6 sq. km

	Infrastructure									
Power S	System)			esel Genera					
Underground reticulation system										
						Statistics				
Installed Capacity	Maxin Dema		Sales	Daily Supply		tomers	Fuel Use	Fuel	Reported Losses	
(kW)	(kV	/)	(kWh)/yr	(hrs)	Domestic	Commercial	I/kWh	kl	%	
21	8		28,700	14	?	?	?	?	9?	
Tariff Structure										
	Domestic Commercial									
58 c/kWh, plus 12.5% VAT 74 c/kWh, plus 12.5% VAT								% VAT		
Electricity Ratios										
Maximu		Tota		Total Population		'000 kWh/Person		'000 kWh/Household		
Demand		Hou	useholds							
kW	′									
8			18		60	0.5		1.6		
					Act	ivity				
Technolo	ogy:	• S	olar PV Mi	ni Grid						
		• B	Battery Stor	rage						
		• [Diesel Gene	rator as b	ack up					
Timeline	e:	2013	3 - 2014							
Cost:		\$0.6m								
Donor:		SIDS	-STOCK (R	equire fur	ther funds	or a donor p	artner to PI	GGAREP)		
Approac	h:	One	Goer							

IP: Penrhyn



Northern Group: 1400 kms north by north east of Rarotonga.

Area 9.8 sq. kms

				Infra	str	ructur	е				
Power S	ystem	1:	x 68 Kw Di	iesel Ge	nera	erator in Tetautua erator in Omoka ation system					
	Electricity Statistics										
	Installed Capacity (kW)	Maximu m Demand (kW)	Sales (kWh)/y r	Daily Supply (hrs)		Domes		Commercial	Fuel Use kWh/l	Fuel kl	Reported Losses %
Omoka	68	48	88,000	18		N/A		N/A	2.4	40	9
Tetautua	48	20		18							
Tariff Structure											
	Domestic						Commercial 50 c/k/M/b, plus 13 F9/ MAT				
	54 c/kWh, plus 12.5% VAT Electricity Ratios										
	Maximum Demand kW		Total		Total Population		'000 kW/person		'000 kW/househol		sehold/yr
Omoka	35	66		20	203		0.4		1.3	1.3	
Tetautua	15				\ ot	is dits d					
Technology: Timeline:			Activity Solar PV Mini Grid Battery storage Diesel Generator back up 2012 - 2014								
Cost:	Cost:			NZ\$1.7m							
Donor:		Dor	nor Fundir	ng has n	ot b	een sed	cure	d			
Approach	ղ:	One	e Goer								

IP: Mitiaro



Southern Group: 228 km northeast by east of Rarotonga

Area: 22.3 sq. km

				Infrasti	ructure				
Networ	·k			Diesel Gene					
	Electricity Statistics								
Installed Capacity (kW)	Maximu Demar (kW)	(kWh)/yr	Daily Supply (hrs)	Cust	omers Commercial	Fuel Use I/kWh	Fuel kl	Reported Losses %	
77	39	120,000	24	?	? N/A		?	9?	
				Tariff St	tructure				
	Domestic Commercial					cial			
	75 c	/kWh, plus 1:	2.5% VA T			95 c/kW	າ, plus 1	2.5% VAT	
				Electrici	ty Ratios				
Maximu Demand kW		Total Households	Total P	opulation	'000 kWI	'000 kWh/Person		'000 kWh/Household/yr	
39		145		189	0.	.5		0.8	

	Activity
Technology:	Solar PV Mini Grid
	Battery Storage
	Diesel Generator Back up
Timeline:	2012 - 2013
Cost:	NZ\$1.7m
Donor:	NZAID
Approach:	One Goer

IP: Atiu



Southern Group: 187 km northeast by east of Rarotonga. Area: 27 sq. Km

				Infras	tructure			
Power S	System			v Diesel Ge h voltage o	nerator verhead retic	ulation sys	tem	
				Electricit	ty Statistics	3		
Installe d Capacit y (kW)	Maximum Demand (kW)	Sales (kWh)/y r	Daily Supply (hrs)	Cus	tomers Commercial	Fuel Use I/kWh	Fuel kl	Reported Losses %
242	100	332,000	24	?	?	?	?	9?
				Tariff S	Structure			
	С	Oomestic				Com	mercial	
	48 c/kWh	ı, plus 12	.5% VA T		6	8 c/kWh, p	lus 12.5%	VAT

		Elec	tricity Ratios	
Maximum Demand kW	Total Households	Total Population	'000 kWh/Person	'000 kWh/Household/yr
100	158	480	0.7	2.1
			Activity	
Technology:	• Batte	PV Mini Grid ry Storage I Generator Bac	k up	
Timeline:	2012 – 20			
Capital Cost.	NZ\$3.0m			
Donor:	No fundi	ng has been seci	ured	
Approach:	One Goe	r		

IP: Mauke



Southern Group: Access: flights from Rarotonga

Area: sq. Km

				Infrast	ructure			
Power:	System		1 x 130 kw 3.3kV unde		nerator LV overhead re	eticulation	system	
			E	Electricity	y Statistics			
Installed Capacity (kW)	Maximum Demand (kW)	Sales (kWh)/y r	Daily Supply (hrs)	Cus	ctomers Commercial	Fuel Use I/kWh	Fuel kl	Reported Losses %
130	90	220,000	24	?	N/A	?	?	9?

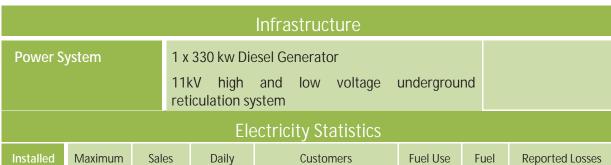
		Tariff	Structure	
	Domestic		(Commercial
45	c/kWh, plus 12.5	% VAT	55 c/kW	/h, plus 12.5% VAT
		Electri	icity Ratios	
Maximum Demand kW	Total Households	Total Population	'000 kWh/Person	'000 kWh/Household/yr
90	106	310	0.7	2.1
		А	ctivity	
Technology:	• Batte	r PV Mini Grid ery Storage el Generator back	up	
Timeline:	2012 – 2	2015		
Cost:	NZ\$3.19	⁰ m		
Donor:	No fund	ing has been secu	red	
Approach:	One Goo	er		

IP: Mangaia



Southern Group: 177 km southeast of Rarotonga

Area: 51.8 sq. km



Capacity (kW)	Demand (kW)	d (kWh)/y	Supply (hrs)	Domestic	Commercial	I/kWh	kl	%
330	120	441,000	24	?	?	?	?	9?
				Tariff Str	ucture			
		Domestic				Comme	ercial	
	58 c/kW	h, plus 12.	5% VAT		74 c	/kWh, plus	12.5%	VAT
			E	Electricity	y Ratios			
Maximun Demand kW		otal ouseholds	Total P	opulation	'000 kWh	/Person	kWh	'000 n/Household/yr
120		177		573	0.7			2.5
				Activ				
Technolog	gy:	•	Solar PV & V Battery Stora Diesel Gener	age				
Timeline:		201	2 - 2014					
Cost:		NZ\$	3.4m					
Donor:		No	unding secu	ired				
Approach	1:	One	Goer					

IP: Aitutaki



Southern Group: 264 km north of Rarotonga

			Infrastructure			
Power System		3 x Diesel	Generator			
		11kV unde	erground,			
		3.3kV und	erground & LV overhead	d reticula	tion syst	tem
		Е	lectricity Statistics			
Installed Maximum	Sales	Daily	Customers	Fuel	Fuel	Reported Losses

Capacity (kW)	Demand (kW)	(kWh)/yr	Supply (hrs)	Domestic	Commercial	Use I/kWh	kl	%
880	620	3,291,000	24	650	100	?	?	9?
				Tariff St	ructure			
	Dom	estic				Commer	cial	
69 c/kW	h, plus 12	.5% VAT		69 c/kWh, p	olus 12.5% V <i>A</i>	AT, 1 st 100	00kWh,	53 c/kWh above
				Electricit	y Ratios			
Maximui Demand		al seholds	Total Po	oulation	'000 kWh/F	Person	'000	kWh/Household/yr
kW								
620		535	20	035	1.6			6.2
				Acti				
Technolo	ogy:	• Ba	ittery Stoi	Wind Mini G rage erator back u				
Timeline	:	2012	- 2015					
Cost:		NZ\$1	6.9m					
Donor:		No fu	nding sec	ured				
Approac	h:	Phase	ed					

IP: Rarotonga



Area: 67.39 sq. km

						Infras	tru	ucture				
Power S	ystem			1 x 1	200 k\	W Diese	l G	enerator (der	rated)			
				1 x 9	00 kW	/ Diesel	Ge	nerator (dera	ited)			
				1 x 2	000 k	W Diese	l G	enerator (der	rated)			
				2 x 1	500 k\	W Diese	I G	enerator (der	rated)			
				2 x 8	00 kW	/ Diesel	Ge	nerator (dera	ited)			
				2 x 4	00 kW	/ Diesel	Ge	nerator (dera	ited)			
				14,32	20 kV	4 (70.7 k	(m)	overhead re	ticulatior	system	1	
					Ele	ectricit	y :	Statistics				
Installed	Maxim		Sales		aily	(Cust	tomers	Fuel	Fuel	Reported Losses	
Capacity (kW)	Demar (kW)		(kWh)/yr		pply nrs)	Domest	tic	Commercial	Use I/kWh	KI	%	
9500	4800		28,830,000		24	?		?	?	?	9?	
						Tariff S	Str	ructure				
			Domestic					Commercial				
	56 c	/kV	Vh, plus 12.	5% V	/AT			78 c/kWh, plus 12.5% VAT				
			s stepped ta									
			Elec					ctricity Ratios				
Maximu Demand		To Ho	tal ouseholds		Tota			'000 kWh/P	erson	'000	kWh/Household/yr	
kW												
480	0		3009		13	097		2.1			9.6	

Activi	ity
Technology: Opportunity will be given to Independent Power Producers (IPP) & Power Purchasing Agreements (PPA).	 Solar PV, Wind, Bio Mass, Waste to Energy Network Battery Storage Diesel Generator back up
Timeline:	2012 – 2020
Cost:	NZ\$208m
Donor:	Te Aponga Uira (requires donor partner)
Approach:	Phased Out

ANNEX

Figure 1 Project Timelines for each island

COOK ISLANDS	Exp	TOTAL	AL 2012 2013 2014 2015 2016 2017 2018 2019 2020
		S,	0.1 0.2 0.3 0.4 0.1 0.2 0.3 0.4 0.1 0.2 0.3 0.4 0.1 0.2 0.3 0.4 0.1 0.2 0.3 0.4 0.1 0.2 0.3 0.4 0.1 0.1 0.2 0.3 0.4 0.1 0.1
Standard Mini-Grid Design	Capex	0.2	0.2
Rakahanga	Capex	96:0	96
Manihiki	Capex	2.2	22 Transaction grant
Mitiaro	Capex	1.67	67 Manihiki
Penrhyn	Capex	1.69	69 Nassau
Pukapuka	Capex	1.83	1
Palmerston	Capex	0.64	- Suwarrow
Nassau	Capex	1.14	1
Mangaia	Capex	3.43	1
Atiu	Capex	3.04	Macine Ocean
Mauke	Capex	3.04	40
Aitutaki	Capex	16.89	Palmerston
Rarotonga	Capex	184.7	
Project Management	Opex	27.3	
Longerterm	Opex	9.3	19Kuitea Musico
monitoring, evaluation, reporting, training	orting, tra	aining	
TOTAL	Capex	221.4	
	Opex	36.6	9 %
		258	58

Figure 2 Indicative Cost of each Sister Island Project

0.1 0.1 02 03 04 0.1 0.1 0.1 2020 0.4 0.1 0.1 0.1 0.1 0.1 0.1 0.1 04 01 02 03 04 01 02 03 04 01 02 03 04 01 2019 0.4 2018 0.4 2017 0.4 02 03 2016 0.4 04 01 0.0 0.0 0.0 0.1 0.2 0.2 0.4 0.5 0.5 0.4 0.5 0.3 0.2 0.1 0.1 0.0 0.1 0.3 0.3 0.9 2.0 2.0 2.0 3.0 2.4 2.0 1.5 0.3 0.1 02 03 2015 4.7 0.0 0.1 0.1 0.3 0.3 0.3 2.0 0.1 0.0 02 03 04 01 0.2 0.4 0.5 0.5 0.5 0.5 0.3 0.1 0.1 0.1 0.2 0.5 0.7 0.7 0.7 2014 20.1 0.0 0.0 0.0 0.4 0.5 0.5 0.2 0.1 0.1 0.4 0.4 0.5 0.2 0.1 0.3 0.3 0.3 0.1 04 01 0.1 0.2 0.5 0.5 0.5 0.3 0.1 0.1 0.1 0.4 0.5 0.5 0.1 02 03 04 01 02 03 2013 13.7 0.1 0.1 0.2 0.5 0.1 0.2 0.1 0.0 0.1 0.1 2012 0.1 0.1 0.1 0 36.74 0.2 1.0 1.14 16.9 3.5 3.5 43.74 TOTAL 2.20 0.6 3.2 monitoring, evaluation, reporting, training \$m Capex Opex Opex Exp Standard Mini-Grid Design Project Management North & South Sister Islands onger term-Rakahanga Palmerston Pukapuka Mangaia Manihiki Penrhyn Aitutaki Mitiaro Nassau Mauke TOTAL

Figure 3

Indicative Cost of the Rarotonga Project

Rarotonga	Exp	TOTAL	2012	-	2013	2014	2015	2016	2017	2018	2019	2020
		\$m	01 02 03	04 01	02 03 04	Q1 Q2 Q3 Q4 C	01 02 03 04	01 02 03 0	Q4 Q1 Q2 Q3 Q4	4 01 02 03 04	1 01 02 03 04	01 02 03 04
Waste to Energy	Capex	0.1	1 0.0 0.1									
Energy Storage	Capex	0.1	1 0.0 0.1									
Network Options - Renewables to 50%	Capex	0.2	2 0.1 0.1									
PPA or Alternate Framework	Capex	0.2	2 0.1 0.1									
Net Metering Development	Capex	0.1	1 0.0 0.1									
Establish Project Team	Capex	0.2	2 0.0 0.1 0.1									
Project Program to 2020	Capex	0.1	1 0.1									
Confirm Strategy	Capex	0.1	1 0.1									
Implement Network Stage 1	Capex	10.0		0.2 0.5 0.5	1.5 2.5 2.5	1.5 0.5 0.3						
Implement Private Sector Generation	Capex	83.7		0.1 0.2 0.5	1.5 2.5 4.0	4.0 4.0 4.0 4.0 3	3.7 3.2 3.0 2.5	2.5 2.5 2.5	2.5 2.5 2.5 2.5 3.	3.0 4.0 4.0 4.0 4.0	0 4.0 2.5 2.0 1.0	0.5
Implement Network Stage 2	Capex	10.0	0				0.5 1.0 2.0 2.5	2.2 1.5 0.3				
Implement TAU Control & Generation	Capex	45.2	2		0.1	0.5 1.2 1.5 2.0 2	2.0 2.0 2.0 2.0	2 2.5 2.0	2.0 2.0 2.0 2.0 2.	2.0 2.0 2.0 2.0 2.0	0 2.0 2.0 1.5 1.0	0.5 0.3 0.1 0.0
To be determined	Capex	34.7	7	0.3 0.3	0.3 0.5 0.5 1	.2 1.5 1.4 1.2	1.0 1.0 0.2 0.2	0.5 0.8 2.5	2.8 2.8 2.8 2.8 2.	3 1.3 1.3 1.3 1.3	3 1.1 0.9 0.5 0.1	
Project Management	Opex	23.7	7 0.0 0.1 0.3	0.3 0.6	0.7 1.0 1.1	1.2 1.1 1.2 1.0 0	0.9 0.9 0.7 0.7	0.7 0.7 0.7	7.0 7.0 7.0 7.0 7.0	7.0 7.0 7.0 7.0 7.	7 0.7 0.7 0.7 0.6	0.5 0.3 0.3 0.0
Longer Term	Opex	5.8	0.1	0.1 0.1 0.1	0.1 0.1 0.2	0.2 0.2 0.2 0.2 0	0.2 0.2 0.2 0.2	0.2 0.2 0.2	0.2 0.2 0.2 0.2 0.2	2 0.2 0.2 0.2	2 0.2 0.2 0.1 0.1	0.1 0.1 0.1 0.1
monitoring, evaluation, reporting, training												
TOTAL	Capex	184.7	7 0.0 0.7 0.7 1.0	7 1.0 1.3	3.3 5.5 7.1	7.2 7.2 7.2 7.2	7.2 7.2 7.2 7.2	7.2 7.3 7.3	7.3 7.3 7.3 7.3 7.	7.3 7.3 7.3 7.3 7.3	3 7.1 5.4 4.0 2.1	1.0 0.3 0.1 0.0
	Opex	29.€	29.5 0.0 0.1 0.2 0.4 0	2 0.4 0.7	0.8 1.1 1.3	1.4 1.3 1.4 1.2 1	1.1 1.1 0.9 0.9	0.9 0.9 0.9	0.9 0.9 0.9 0.9 0.	0.9 0.9 0.9 0.9	9 0.9 0.9 0.8 0.7	0.6 0.4 0.4 0.1
		214.2	3.1	_	21.1	34.1	32.8	32.7	32.8	32.8	21.9	2.9

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Figure 4

Summary of possible Technology types and approach to roll out of each island project

Appliances Appliances	×	×	×	×	×	×	×					
Efficiency Efficiency	×	×	×	×	×	×	×	×	×	×	×	×
Others (bio, waste to energy)	0	0	0	0	0	0	0	0	0	0	0	0
Hydro Pumped Storage								×	0	×	×	×
Diesel Back Up	×	×	×	×	×	×	×	×	×	×	×	×
Wind	0	0	0	0	0	0	0	×	×	×	×	×
Battery Storage	×	×	×	×	×	×	×	×	×	×	×	×
Solar PV	×	×	×	×	×	×	×	×	×	×	×	×
Peak Demand kW	18	29	21	36	8	50	39	100	06	120	620	2000
Island	Rakahanga	Pukapuka	Nassau	Manihiki	Palmerston	Penrhyn	Mitiaro	Atiu	Mauke	Mangaia	Aitutaki	Rarotonga
	One-Goer Approach											Phased Approach

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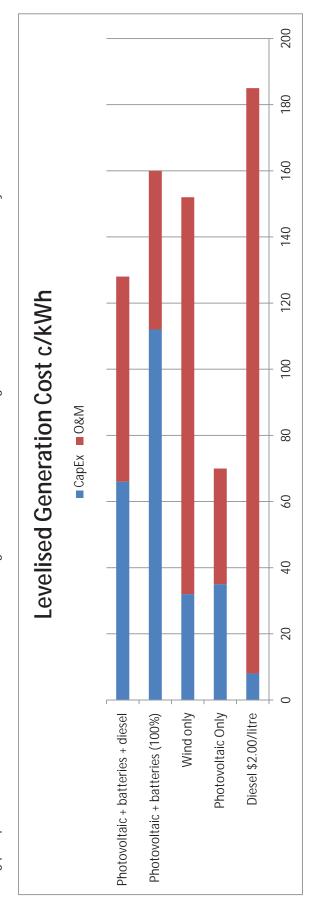
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sland	Maximum	Total	Indicative	Population/	kwh	kw/	kw/	kwh/	kWh/	-
	Demand Kw	Demand Kw Households Population	Population			Person	Household Person	d Person	Hous	Household
Rakahanga	18	51	77	1.5	76,000)	0.2 0.4		282	1490
ukapuka	29	76	453	4.7	33,649		0.1 0.3		74	347
Vassau	21	32	73	2.3	39,420		0.3 0.7		540	1232
Manihiki	36	16	243	2.5	300,000)	0.1 0.4		1235	3093
Palmerston	8	18	09	3.3	28,733		0.1 0.4		479	1596
Penrhyn	20	99	203	3.1	124,000		0.2 0.8		611	1879
Mitiaro	39	145	189	1.3	120,000		0.2 0.3		635	828
Atiu	100	158	481	3.0	332,000	30	0.2 0.6		069	2101
Mauke	06	106	307	2.9	220,000)	0.3 0.8		717	2075
Mangaia	120	177	573	3.2	441,000		0.2 0.7		770	2492
Aitutaki	620	535	2035	3.8	3,291,000)	0.3 1.	1.2 16	1617	6151
Rarotonga	2000	3009	13097		4.4 28.828.000		0.4	1.7 22	2201	9581

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Figure 7

The following plot presents an indication of the levelised cost of generation for the technologies considered most immediately viable on the Outer Islands.³

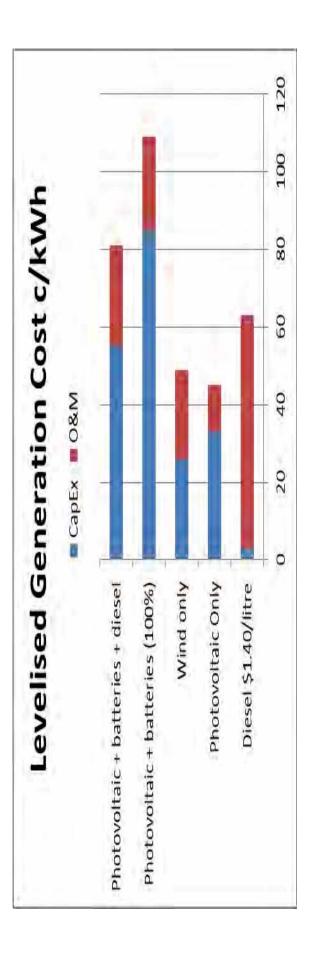


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³ Assumes Outer Island Councils do not pay tax other than VAT.
Diesel at \$2 per litre.
Based on Rakahanga Power Study Report December 2006 and other sources.
Allowances are included for both capital and operating costs for the remote locations and small scale effects.

Figure 8

The following table ranks the levelised unit costs for the options which meet two screening criteria4 (maturity of technology and social or environmental showstoppers)⁵. All options will benefit from improving information as projects are implemented.



⁴ TAU pays corporate tax. (Diesel at \$1.40 per litre)

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⁵ Situational Analysis on Cook Islands Renewable Energy Implementation Plan towards 2020.