Gender and energy needs assessment report for the Alfred Sadd Memorial College – Solar Hybrid System

EU-GIZ ADAPTING TO CLIMATE CHANGE AND SUSTAINABLE ENERGY PROJECT

KIRIBATI

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Gender and energy needs assessment report for the Alfred Sadd Memorial College – Solar Hybrid System

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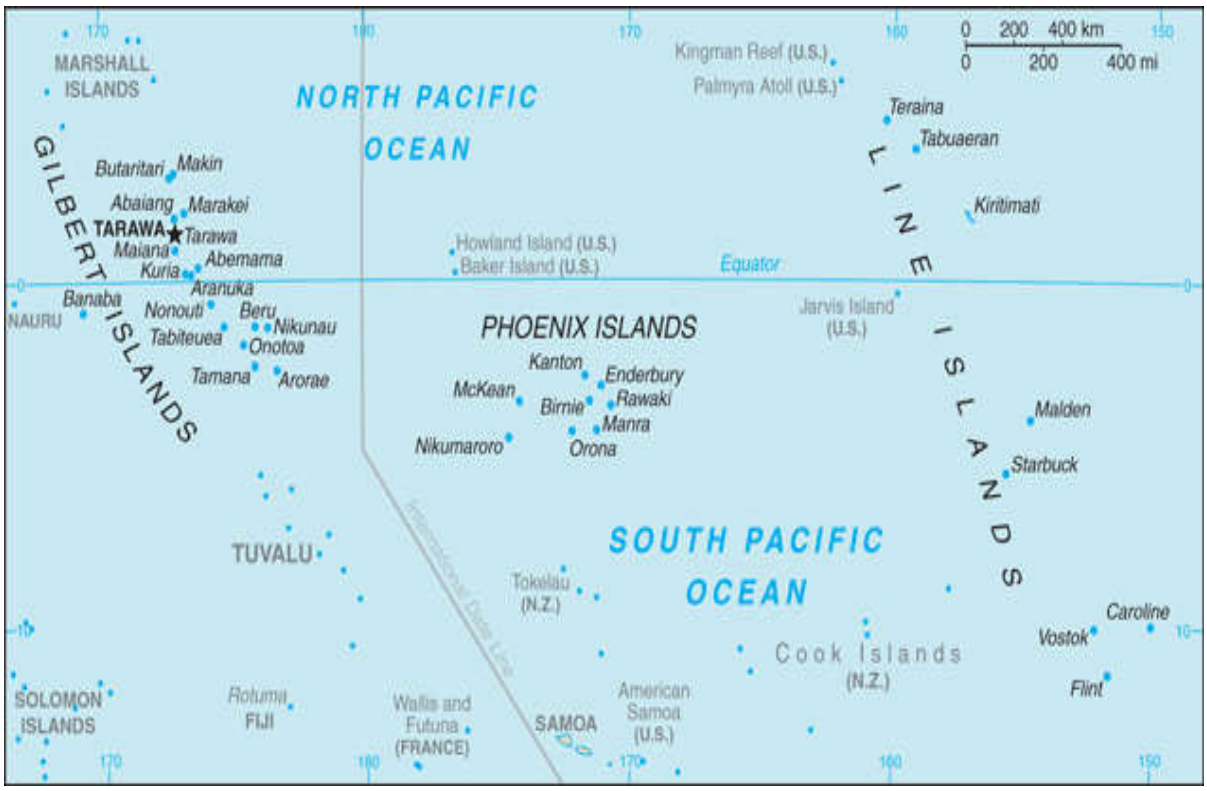

Map of Abemama

Source: http://www.janeresture.com/abemama/

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Abbreviations

ACSE	Adapting to Climate and Sustainable Energy
AUD	Australian dollars
ASMC	Alfred Sadd Memorial College
CFL	Chlorofluoroscent
ft	foot
GIZ	German International Cooperation
GWG	Governance Working Group
ICC	In-Country Coordinator
Kw	Kilo Watts
kWh	Kilo-watts hour
KUC	Kiribati Uniting Church
MTSS	Meleangi Tabai Secondary School
RAK	Reitakia Ainen Kiribati

Executive Summary

The Alfred Sadd Memorial College (ASMC) is one of the four[1] boarding secondary schools established and administered by the Kiribati Uniting Church (KUC), previously known as the Kiribati Protestant Church (KPC).

Providing a reliable and affordable sources of electricity in rural boading schools is the outcome of the EU-GIZ ACSE project which aligns to the Government of Kiribati Renewable energy target of 100% use in rural boarding schools. In 2014 seven boarding schools were recipients of a EDF 10 funded project that enabled the installation of solar PV grid systems. These secondary schools were the Immaculate Heart College in Taborio (North Tarawa), St Joseph Secondary School on Abaiaing, Stephen Whitmy High School at Morikao on Abaiang, Kauma High School in Abemama, Teabike Seconday College in Tabiteuea South, Hiram Bingham High School on Beru and George Eastman High School in Nonouti. In 2016, installation for the Chevalier Secondary School was completed by the Energy Planning Unit at Abemama supported by the Italian Government. The two remaining boarding schools are the ASMC and the Meleangi Tabai Secondary School (MTSS) in Tabuaeran which are the targetted schools in this project.

This energy and gender assesment report reviews the status of the energy gender needs of the ASMC school and its community (staff and families) as of February 2017. During the assessment, the community comprised of 40 people, 19 male and 21 female. There were 18 houses, 8 of these houses were still vacant but expecting 4 of these houses to be occupied. The energy needs of all households and students are included in this report.

The Joint Scoping Mission, refer to Annex 1 for the mission programme was undertaken by the Project Manager, Koin Etuati, from SPC, the implementing partner in this project, Craig Bohm, Technical Advisor, and Tarakabu Tofinga, the ACSE In-Country Coordinator for Kiribati, both from GIZ who administers the project on behalf of the European Union (EU).

The mission's purpose was to collect data that would assist in (i) ascertaining and confirming the energy needs of the school and the households, (ii) confirm the proper site and preparatory work prior to the installation of the solar PV hybrid system, (iii) assess the current power distribution and its maintenance and operational plan (iv) establish the Governance Working Group as a decision making body during and after the project implementation, (v) conduct a gender analysis of the school and households energy needs and (vi) create awareness on the project, renewable energy uses and energy efficiency and conservation. This report covers the findings of the mission as they relate to components (i) School energy needs, (iv) Governance Working Group (v) Gender Analysis and (vi) Energy Awareness.

Below is a summary of the findings of the scoping mission inlcuding the current daily energy demands and future energy demands.

Year School Established	2014	2014 registered as Secondary school catering for Form 4 to 6. Previously built in 1995, as a Vocational school
Principal	2015–2017	Mr Birita Mamoe

[1] Rongorongo High School, Stephen Whitmy High School, George Eastman High School and xxx on Christmas Island

Total Number of Students	68 (2017) 38 boys and 30 girls	63 (2016) 57 boys and 6 girls
Total number of Households /Families	40 (Feb 2017) 19 males and 21 females	
Number of Houses	18 (2017)	
Current source of electrical power	Yahnmar Diesel generator – 15kVA (12kW – based on 15kVa and capacity factor of 0.8)	20 litre fuel tank Consumes 4 litres of fuel for 2 hours of operation Operations hours is 3 hours during school days[2]
Fuel consumption and cost	400 liters per term (13 weeks)	Cost of $280 per drum Total Annual cost is $1680.00[3]
School Administration electrical appliances	Lights, computers, printers, photocopier, amplifier, projector for power point presentations	
Households electrical appliances	Lights, laptops (use for school and watching movies), mobiles	1 household has washing machine, deck, tv for moves but uses own gen-set to operate these appliances
Current daily average energy load	22.04 kWh – school 4.3 kWh – households Total: 26.34kWh	Future demand for school based on increasing number of lights in classrooms, those with 1 lights to two lights, lights for planned buildings – Chapel and dining room for students. Also include freezers fro the kitchen and the shop.
Future demand daily average energy need	36.84 kWh - school 19.64kWh – households	The staff quarters energy needs increases due to the predicted availability of laptops for 12 teachers, use of TV and deck for watching movies and increased number of light for the kitchen or cooking place.

[2] The 3 hours of access to electricity would allow students to study and staff and families to prepare their meals and also prepare for lesson plans and other chores.

[3] The PDD stated that for the ASMC an average of AUD580 per month or an annual cost of AUD6,960 is spent of diesel for the power gen set

Introduction

The ASMC was established in 1995, as the Tannakoroa Vocational School and in 2004 was rebuilt at the current site at Etan te Rawa, next to the airport. The school is one of the 10 boarding secondary schools in Kiribati and currently caters for Form 4 to 6 Art and Science students. The school also offers vocational training in electricity and carpentry. In 2017, ASMC is introducing Commerce as a new stream.

There are 12 staff including supporting staff (cooker, warden, matron and power technician). The staff are on contract basis for 3 years which can be renewed if teachers do not opt to move to other schools.

A preliminary energy assessment of the school was conducted in 2015 during the design phase of this project. At that time, the school has a Yanmar 7kW diesel generator set (gen-set) which was replaced in February 2017, with a 15kVA (or equivalent to 12kW[4]) second hand genset.

By the time the present assessment was undertaken, at the direction of the government, some major work on the electrical distribution line had been undertaken. The school had upgraded the underground electricity distribution lines from single to three-phase lines, had built and installed distribution boxes around the school compound and had upgraded the AC cabling in most schoool buildings. There are some transimission wiring replacements to be done to the remaining four houses, not yet occupied. However a proper electrcal wiring assessments is to be conducted as to ascertain that the wiring at the school is up to standards.

The aim of the ACSE project is providing a solar PV hybrid system to provide reliable and affordable electricity to the school. This will allow for more time to study after sunset, provide lighting to the school buidings and to meet the energy needs of all students, staff and households to improving school performance and livelihoods to the community. The gender integration into the energy assessments was to identify the gender needs of the school and community that will inform the technical designing of the system in particluar the solar PV size that will be able to meet the current energy needs and future energy needs of the school administration and the school households.

[4] http://www.dieselserviceandsupply.com/Power_Calculator.aspx#kvatokw)

Survey tools and approaches

The SPC Project Manager conducted the households survey, facilitated a focus groups discussion with the Governance Working Group (consisting of the Principal, Power technician and a member of the School Council. A one day workshop was held with the wider school community to ascertain the wider needs of women and of the school administration.

The data obtained from the survey, focus group discussion and the workshop was tabulated into an excel sheet and analysed to capture the baseline energy uses, electricial appliances available and their power usages (watts). A gender analysis approach identifying the energy needs for practical, productive and strategic needs and interests was used to project the future energy demands for the school and households. Using the same worksheet with related variables, the data was tabulated to provide the baseline energy needs and the future energy demand for the school.

A stocktake of all electrical equipments in all buildings were collected by the GIZ team, including observation on the electrical wirings, availability of light switches and power points. This information is vital as it provides an assessment of the distribution lines and any upgrading required prior to the installation of the solar PV hybrid system.

Figure 1: SPC Energy policy Officer conducting household surveys

Figure 2: Participants – Gender and Energy Workshop

Social economic background

At the time of the survey, there were 40 people, staff and families (19 males and 21 females) residing at the ASMC school compound. The students had not yet arrived due to late shipping schedule from the main island, Tarawa; however, there were 60 students that have enrolled.

Out of the 40 people, there were 7 (2 males and 5 females) that are below 10 years of age, 8 (6 males and 2 females) that are of between 10 16 years of age, 15 (6 males and 9 females) that of between the ages of 17 to 45 years of age and 8 (3 males and 5 females) that are of the above the ages of 45 years of age.

The younger generation below 16 years of age attends school at the Junior Secondary School and Primary schools. The community is made up of quite middle age and older generation. It seems that there are quite equal number of middle age teachers and retired teachers teaching at the school. The school provides education to Form 4 to 6 and therefore the student ages ranges from 16 to 18 years of age.

In terms of teachers (respondent) to the school attained, out of thirteen households interviewed, there are 7 staff that attained tertiary level qualifications, 4 staff reached secondary level and 1 primary school (cooker).

Gender Division of Labour

The gender division of labour within the school community is similar to other islands in Kiribati where caring for family chores such as cooking, washing are perceived to be the women's role. However within the school community, there are two houses where members are only men and two houses with only women. So gender roles in these cases have changed as men are cooking and washing. In the traditional setting, men's role are more of masculine work such as building houses and fishing. As this is a school community, gender roles are interchanged, both men and women teaches, in cases men do washing and cooking as well. However where a women needs for masucline work, such as building a small house or table for cooking, these are always done by youth, and in most casses money is paid to carry out these roles.

The survey noted that women who are not engaged in teaching are active in productive activities such as weaving, coconut oil production, house thatches making and pillow cases and copra. However, there are no men involved in productive activities except when helping women with copra cutting. It was noted that all men inteviewed were working for the school except that of one household.

Table 1 provides the gender roles played by both men and women at ASMC.

Table 1: Gender roles by women and men

	Practical Needs	Productive Needs	Strategic Needs
Women	Cooking and food preparation	Weaving	Meetings organised by RAK (Church Women Group)
	Washing	String making	Church functions for both men and women
	Cleaning the house and compound	Sewing	
		Oil making	
		Teaches (paid work)	
		Copra – pays for coconut and responsible for drying	
Men	Collect firewood	Teaches (paid work)	
	Fishing	Copra – as a family work – cuts opens and dry and then	

		weighs to get monehy – usually shared by family	

It is anticipated that the project will contribute to improving the income generating (productive needs) of women since they will have more time for weaving and sewing at night time when the lighting hours are increasing at night time. Sometimes women play bingo, as an income generating activity as well as leisure.The avalability of lights through the solar hybrid system would allow women to organise bingo or other productive activiites at more convenient times or to add greater flexibility as to when they gather to play bingo or carry out other productive and strategic needs.

There are times during the school calendar that the use of gen-set is longer than the normal hours and these events were captured during the workshop and captured in Figure 3. At times of exams, the photocopier will be used more often. Also visitors and parents stays at the school compound for two to three days during the maneaba day, the independence week, Easter holidays and/or during the end of the year graduation.

Schools Calender Events

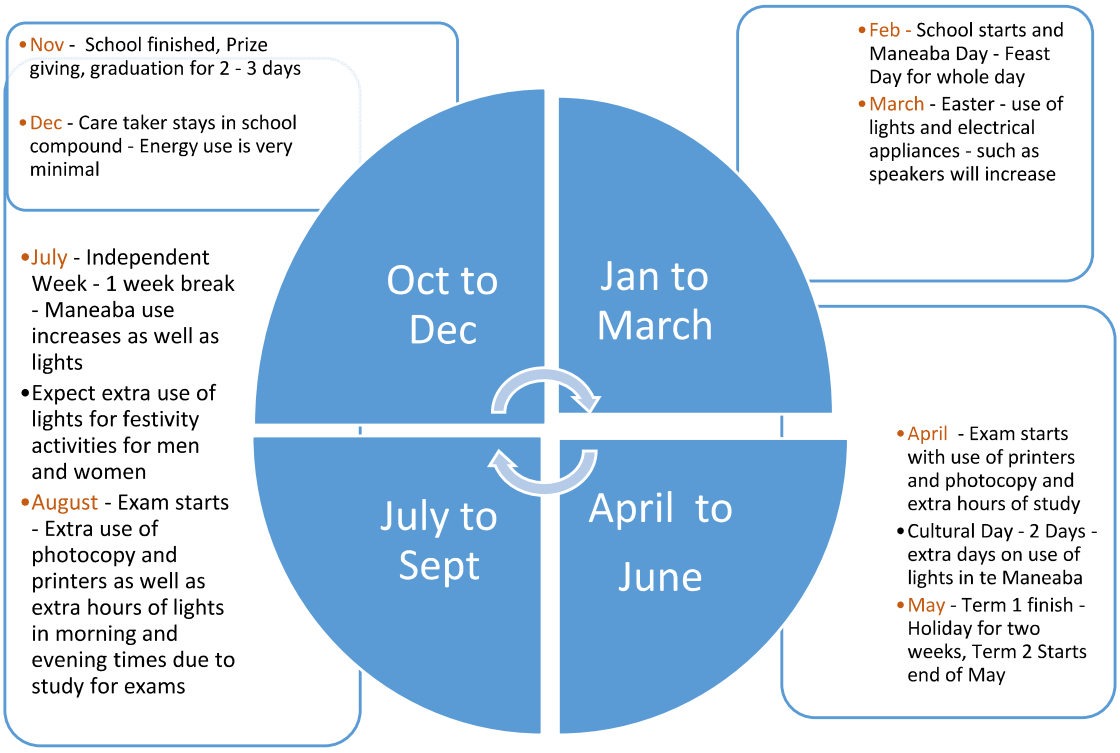


Figure 3: ASMC school calender for 2017

Resources ownership

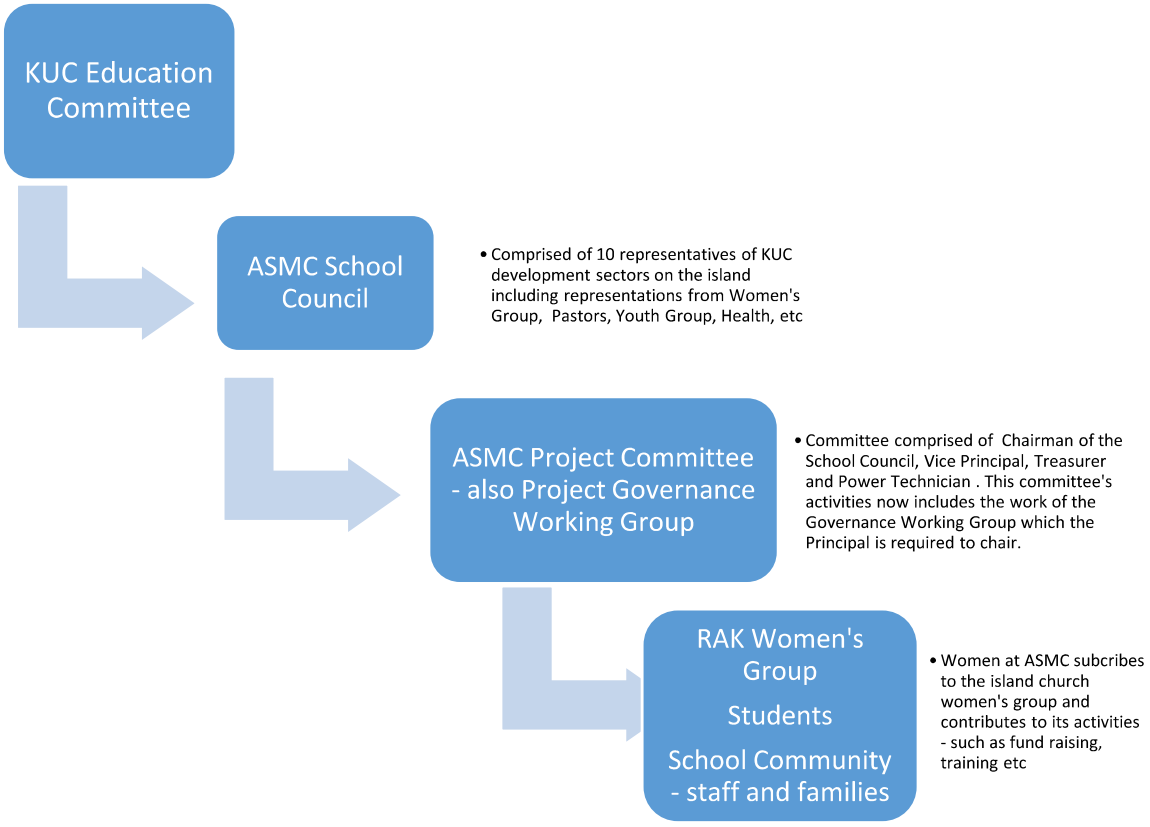
All resources within the school compound such as houses, wells, electricity are owned and controlled by the school. Sometimes maintenance of houses are not carried out as scheduled by the school due to lack of finance. Some households(women) carried out maintenance at their own expenses. All households have access to portable solar lights which are provided by the school through the Taiwan grant. All solar lights are given to new staff but the school does not control its usage.

The school decides on what appliances can be used by the households and these will be the case as well if the solar hybrid energy system is operational. Women expressed the needs to have longer operational hours for the system in the weekends, so kids have more time to watch movies, when not attending schools.

During the survey it was noted that one house had more electrical appliances compared to the most households as they are using a small generator sets for using safety lights, TV, deck and washing machines. This shows the energy needs and access to the different electrial appliances depends on a households ability to afford. The school management decided to put a cap on the household energy uses to a 2amps. In addition, the school has a solar PV water system that pumps water to an overtank and then get distributed to the houses and to the two dormitories. However, each household is provided with shared well water which is used when water is not available through the solar pump system. Women expressed that the solar PV water system design does not provide adequate water to the whole school community.

School Governance

Figure 4: ASMC Governance Structure



The school is governed by the ASMC School Council where school operational matters such as enrolment, budgets, school event calendars, et cetera are discussed and endorsed. The school is community-owned by the KUC where the highest decision making body lies with its Education Committee, comprised of a Chairperson selected from higher institutions such as University of the

South Pacific, the Principals from the six KUC secondary schools[5] and the Secretary of Education. The Secretary of Eduction is based at the KUC Headquaters at Antebuka, South Tarawa. Figure 4 provides governance structure for the ASMC.

School Administration Infrastructure

The school administration structures/buildings is comprised of permanent-block/concrete and local-thatched buildings. Eight concrete block buildings are classrooms (see Figure 2) and two are the general office and library while one block is the girls dormtory. These buildings have tin roofs with ceilings that helps reduce the heat during day time. There are plenty windows to allow for natural light and air ventilations. and natural lights during day time, however at night time, we were informed that classrooms with only 1 x 4 ft fluorescent (fluoro) light does not provide enough illumination for reading and doing homeworks. Three other permanent infrastructures are the maneaba, a kitchen or a serving room and a power house. The maneaba is a multi purpose building as it is used everyday as a dining area for student and on Sundays is for church services. Every day, the maneaba is used for school assembly, gatherings and as a study area for students at night.

The local buildings include the boys dormitory and all of the staff quarters. Refer to Figures 5,6 & 7. There are no electrical wirings in the boys dormitory and it was noted that this building is to be relocated to another site as the existing site was chosen as a suitable site for the new solar PV hybrid system. There are future plans to building a dining room and a chapel for the school and these projects are still in the pipeline. Table 2 provides a description of all school buildings excluding staff quarters.

Figure 5: Classrooms of concrete block buildings with tin roof

Table 2 School Building description for permanent concrete houses with internal electricy wirings

Reference to the ASMC map	Area (m^2) - External Dimension	Provide description of the buildings to comfort - Heat (roofing, height of ceiling to ground, insulation roof, insulation wall, ventilation),	Recommendations and Expectations

[5] There are five KUC secondary schools, William Goward Memorial College on South Tarawa, Hiram Beingham High School on Beru Island, Witmey High School on Abaiang Island, George Eastman High School on Nonouti Island, Spivy Senior Secondary School on Kiritititimati Island and ASMC on Abemama Island

		Lighting (lights installed, number of lights required)	
Class room 1 (Map reference 7b)	37.5	tin roof, block wall concrete floor, no internal dividers, ceiling is fixed (Masonite), ventilation is okay, no power point, no light switches, no power sockets, no circuit breaker	To install light switches
Class room 2, 3 & 4 (Map reference 6a)	120	1 building with three room. A tin roof, block wall concrete floor, no internal dividers, ceiling is fixed (masonite), ventilation is okay. Had one light switch per room, no power sockets and no circuit breaker, Water tank located at the western side of the building	
Class room 11b	80	tin roof, block concrete with masonite ceiling, one room adjourned the class room and then separated into two rooms. Papers everywhere. No switches, 1 double power point, one single circuit breaker	To install light switches
Class room 12a	37.5	tin roof, block concrete with masonite ceiling. No switches, no double power point, no circuit breaker	To install light switches
classroom 12 b	37.5	tin roof, block concrete with masonite ceiling. No switches, no double power point, no circuit breaker	To install light switches
classroom 13a	106	tin roof, block concreate with masonite ceiling, no light switches, no power points, no circuit breakers	To install light switches
classroom 13b	106	tin roof, block concreate with masonite ceiling, no light switches, no power points, no circuit breakers	To install light switches
Office 11a	24	Adjacent to classroom 11b - tin roof block concrete. Electric wiring not yet finished so presuming 1x 20 Watt light , a single light switch, a single power point and single circuit breaker,	Complete wiring
General Office room Ref 4b	40	tin block concrete with ceiling, no light switch, one single power point, no circuit breaker, there is one CB radio, with solar panel, circuit breaker and solar battery	Install light switch
Library Ref 4a	60	tin block concrete with no ceiling, one light switch, two double power point, no circuit breaker, there is one CB radio, with solar panel, circuit breaker and solar battery	The library to be converted to a computer room so a need for more power points.
Maneaba Ref 2	330	tin roofing iron, no external walls, tile concrete floor, no light switches, 4 circuit breakers, 1 double power point with a single switch	Light switched and 2 power points required
Kitchen Serving Room/store room Ref 1a	32	tin block concrete, with walls separating the store room from the food preparation room, 1 circuit breaker, no power point and no light switch	Install a light switch and add more lights
Cooking Fire hut Ref 1b	9	tin roof, tin walls on two sides only, no concrete floor, no light, no light switches, no circuit break, no power	Install light switches
Cooking shelter Ref 1c	6	local materials, local roof, elevated platform - te bwia, no light, no light switches, no circuit break, no power	Need a light with switch and additional light

Generator Room Ref 5a	16	tin roof, tin walls , timber frame, concrete floor, generator room has one double power point, has a circuit breaker	To install a light and a switch for night time and power point for computers
Workshop Ref 5b	35	tin roof, block walls, concrete floor, no ceiling, has windows and double door, no lights, no power point, no switches – note that this room will be modified to house the batteries and circuitry for the solar PV system	May require power points and lights
Store/shop Ref 3	6	tin roof, mix of walls - plywood and tin	To install a power point so that a freezer can be operated
Industrial Art Class room Ref 7a	87.5	tin block concrete, with ceiling, no switch light, one single power point and 1 double power point and 1 circuit breaker	To install light switch
Boys Single toilet Ref 9	1.3	Tin roof, concrete floor and block wall. No lighting	Need a light and switch
Boys Bathroom Ref 10	8	tin block and tin walls and concrete floor – top open	Need to install safety light outside
Boys Dorm Ref 8	100	local materials, thatch and walls	To be removed from the existing site to make space for the solar panels but need lights and switches
Girls dormitory Ref 14a	133	tin roof, block concrete (without the toilets), no ceiling, no power point, one light switch, there is a safety lights with battery and a 3 watts LED light x 12 V	
Girls washroom Ref 14 b	16	tin block, concrete (part of Girls dormitory), no ceiling, no light switches, no power points, serviced by separate 12 volt DC light connected to the battery in the main dormitory room, but not properly fitted and inadequate for the room	Needs proper lighting including switches and light fittings and possibly power points
Dining Room to be build			6 x 2 feet lights (20 watts)
Chapel to be build		)	1 power point 8 x 2 feet lights (20 watts

Figure 6: School Households Buildings – sleeping hut (with walls), eating place (bwia- hig platform) and cooking hut

Figure 7 Boys dormintory made up of local materials

School Energy System

The energy survey conducted and assessed the current and demand energy needs for the school administration (classrooms, administration and office buildings, powerhouse and dormatories) and the school households (staff quarters). The project aims to prioritise the energy for the school use while the household demand is second priority as there are other alternatives such as solar home systems, some of which are already in use.

It is expected that the project meets its core objective of providing relibale source of energy for the school needs only and that the system will last to its expected lifetime of more than 5 years for battery replacement.

The project team and school management agreed that offering free, unmetered electricity 24 hours per day to households could promote rampant growth in energy consumption by the households. This was the experience of similar boarding schools in Kiribati that the project team had visited. The principal therefore decided to cap the household energy consumption at a reasonable 4 amps per household using circuit breakers managed by the school administration. This makes the household energy demand in the future predictable and equitable between households and allows the school to plan to use any energy surplus to expand the electricity-based services of the school (for computers, printers, common rooms etc).

During the time of the visit, students had not yet arrived, and the power generator that provided electricity is turned on at night times for two hours only. The limitation on the gen-set is based on the amount of fuel that the staff could afford per night which is 4 litres of fuel (diesel) per night.

The power technician is well experienced with the electrical work and has installed the distribution boxes and also replaced some of the distribution lines and also found replacement of the old genset to the second hand one at a cost of AUD 15,000.00, see Figures 8a & 8b. There are remaining distribution wires to be replaced mainly for the staff houses. The school has carried out the recommendations provided during the initial assessments of the distribution lines with the lines to be upgraded from 1.5mm single phase line to a 3 mm three phase line and that different parts of the school be split onto different phases.

Figure 8 : Pictures of current gen set

Figure 9: Pictrue of Gen Set.

Maintenance and Servicing

Maintenance and servicing of the exisiting Yanmar diesel gen-set is an ongoing activity undertaken every 300 hours of running time by the energetic and competant school power technician. The Oil filter/oil system cost $50.00 per servicing and the service includes cleaning the gen-set and all connections.

The project team considered that the genset was in good working order and was well maintained by the current school hierrachy, and in particular by the power technician.

Other electrical maintanence and repairs are usually fuse repairs which also cost money. All electrical repairs and installations are undertaken by the power technician, a qualified electrician and his students. They have been very active in wiring 240 volt AC power into the new school buildings and upgrading the wiring in older buildings. The power technician has a sound understanding of electrical systems, including 3 phase systems, but no experience with solar hybrid systems.

The power technican had never seen a solar hybrid system, and he and the principal expressed the need for additional support to maintain the new system when it was operational. The project team committed to helping find a way to provide the school with additional maintenance support possibly from either from within the KUC system, or from an external contractor.

The project team informed the power technician and the school principal that in other projects, students were were engaged in the maintenance of the solar systems that with cleaning of the panel and batteries. The power technician and school principal thought this was a good idea.

Some students are doing vocational in the field of electrical and mechnical and it is all agreed that it was important to engage these boys and girls with the solar hybrid maintenance and training once the systemsis installed. This topic would be reviewed in future missions to the school.

Staff houses are not paying for any tariff on the energy system, however there may be option of staff paying for electricity use in the future if they would like to access more than the restricted use of electricity which is 4 amps the principal determined the school would provide to each household from the solar PV system. The survey noted that households have solar lightings which is used after gen-set is turned off however there is need to also consider the need for electricity for other use but have to be within the limited specifications.

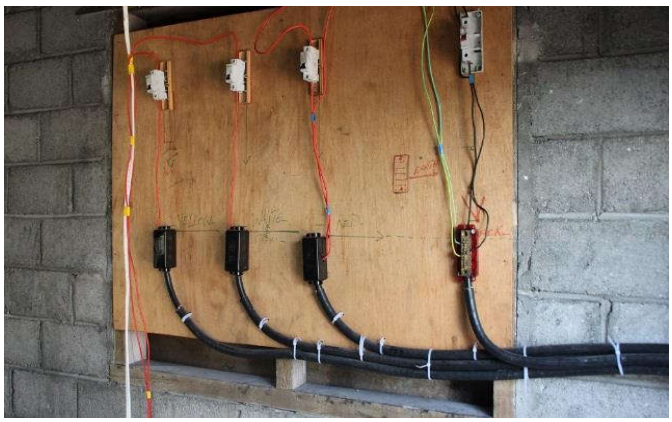


Figure 10: Map of 3 phases distribution network

Gender Analysis

Energy Demands – School Administration

The total baseline daily energy use for the school administration is 22.15kWh and full detail is provided in Annex 2, The energy use are for lights in all classroooms, general office, maneabla, library, girls dormitory and use of electrical office equipment including photocopier, laptops, desktops.

The total future energy demand is provided in Annex 3, a total of 59.17kWh an increase of 37.02 kWh or 62.5%.

The energy future demands for the school collated in provided through a gender persepective and is provided in table 3.

Table 3. Schools Administration Gender and Energy Needs Analysis

Practical Needs	Productive Needs	Strategic Needs
Increase number of lights (4ft) in classrooms – increase to two (2) linear fluoro lights	Shop owned by the school – should have lights at night so have long time to open.	Entertainment – use of PA system will continue
More lights in dormitories so better lighting use at night. Currently there is no lights at boys dormitory. Street lights for safety at nights	Lap top charging – current status is student use staff houses to charge laptops and mobiles causing overloads of power boards	Church Service – require an extra lights at the Maneaba (meeting place) that would hang over the pulpit. Lights in a chapel if built.
More power points needed at the general office for use of computers and photocopier.	Computer uses for school assignment can be charged	Solar system training and maintenance to include both boys and girls
Lighting uses – for kitchen for better lightings after sunset. Lights at the students dining hall (to be built) Freezer needs for food storage	Use a freezer for food and cold drinks to sell	Increase Internet usage as the school is getting 20 computers[6]

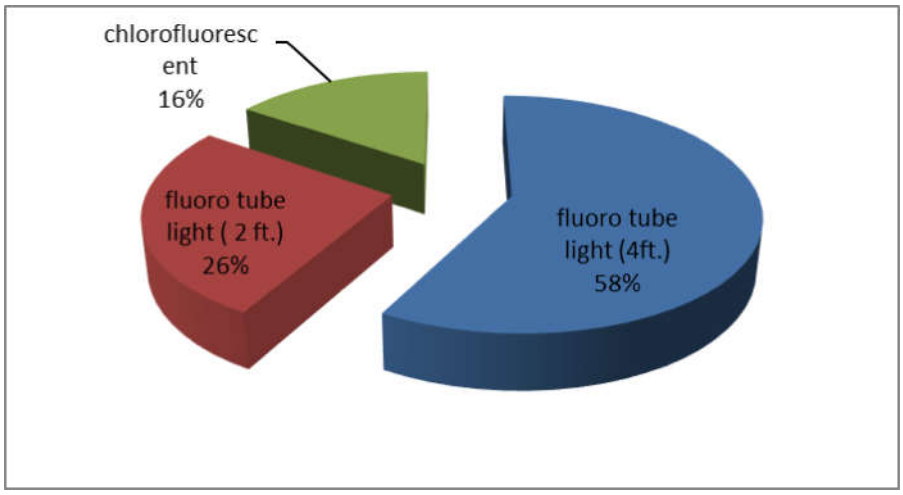
[6] The school is expecting 20 computers donated to the school and to be used for computer classes as well as internet use. Access to internet is quite expensive and it might be years for the school to have good internet access.

Refrigerator for food storage in kitchen such as fish and chicken	Washing of clothes – student and staff to pay use of washing machine	Project in pipelines – a chaplain and a dining area for students – additional energy use for lights

Energy Demands – School Households

The baseline energy demands for the school households is summarised in Annex 3 showing a daily energy use of 4.30kWh. The energy use is limited to use of light at the sleeping house and kitchen as depicted in Figure 12.

Figure 11: Share of energy use at households level



The future energy demand of the school households is summarised in Annex 4 showing an increase daily energy demand to 19.64kWh. These energy needs are also categories into gender interests or needs; practical needs, productive needs and strategic needs in table 4.

Figure 13 Women's group discussing households energy needs

Figure 12: Men's grooup discussing households energy needs

Table 4: School Households gender and energy needs analysis

Practical Needs	Productive Needs	Strategic Needs
Lights is needed in the cooking huts as some households do not have lights at cooking place – recommended a CFL or LED.	Women needs extra time for lights at night to carry out productive activities such as weaving and sewing	Entertainment needs on Sundays – watch movies so turn on power at daytime for at least 3 hours at day time.

Women need extra time for lights in the morning and at night time for preparating food for households	Both men and women teachers need extra lights to complete school plans and work	Lap top charging and use for shool lessons and plans
Street lightings to safety when women moved to maneaba at night time.		Solar system training and maintenance to include student (boys and girls) and community members (women and men)

Table 5 provides the different views of men and women on the lighting needs and electricity uses

Table 5. Gender and energy needs analysis

	Women's Group	Men's Group	Comments
Lighting needs	Sleeping house – 2 ft linear fluoro light (cfl) Eating house – 2 ft cfl Cooking hut – 2ft linear tube CFL/LED for toilet/bathroom	Sleeping house – 2 ft linear fluoro light Eating house – 2 ft linear fluoro light Cooking hut – 2ft linear fluoro light Not agreed to have lights in toilet/bathroom as solar lantern can be used	There is a need for installation of safet/street lights between the maneaba, the girls and boys dormitories and also for household at the eastern side of the school compound.
Power time use	Monday to Saturday – 3 hours at night Sunday – 9 hours (include electricity use at day time to use laptop to prepare school and watch movies	Men did not consider the entertainment use on Sunday however agreed that this may be good for children as well so they do not play and walk around the compound on Sundays.	The school is to provide light switches for all classrooms and staff quarters so it is ready when the solar PV system is installed. The usual practice is that the gen-set is like a switch on and off for all lights. This has to change as lights need to be turned on only when required and turned off when not in need.
Limitation on electrical appliances	Use of high energy consumption appliances should be prohibited. These included kettle, ice box, iron and rice cookers.	Men have similar views inlcuding the need for houses to have light switches.	
	All houses are to have switches lights can be turn off lights when not in use		
	All houses should have 1 power point each, a single power point. The households electricity use will be limited to 3 or 4 Amph for each household.		

Other Needs

Essential services such as health center, primary schools and wharf are quite far from ASMC . The women expressed the need for the school to have proper transport such as truck to visit these places when in need. The principal agreed that the school does not own a truck and is currently looking at

options for procuring one as its needs to transport its students to the airport, or wharf, and, more importantly to the health center.

There is a need for a vigorous awareness on energy efficiency and conservation. This would entail changing less efficient appliances to more efficient appliances such as using a two feet tube light compared to the existing 4 ft tube lights at homes. A proper testing of lux or illumination will need to be conducted so people have proper lighting at homes.

In addition energy conservation measures and awareness on behaviroural changes towards energy use is highly recommended as the demand would be increasing once reliability and affordability of the energy is realised.

Solar PV System Design

The team noted the government desire, and logical to adapt the technical specifications of the existing Chevalier system including its sizing of 25kw system. The project will work with EPU to align the technical specifications to that of Chevalier that has been proven to be compliance with the environment and climate in Kiribati, however it will needs to design a system according to the specific needs of the school administration and households and will consider the gender analysis as well as the findings from the cost benefit analysis.

The team is yet to clearly identify how the system will be serviced once it is installed; however, it is vital that the school and the KUC should invest in building the capacity of a local techncian for future serving and maintenance. There are five (5) KUC secondary school on Kiribati with solar PV hybrid systems and it would be beneficial to have in place a central back up support to all the school's system. The project will continue to work with the KUC leadership to identify practical maintenance options.

The solar pv size option based on the gender analysis approach i.e consider the practical, the productive and strategic needs and interests of the recipients (the school administration and school households)and the long term future energy needs (for a chapel and dininng hall) is a 30kW solar hybrid system. However, there may be constraint on the budget, which maybe a challenge. The budget is Euro 89,700.00 for ASMC which may not be sufficient. The following options are provided for consideration however the priority is to cater for the school needs. A cost benefit analysis is also to be conducted for the different sizes and this CBA will provide information that is economicall feasible out of the three options. Table 6 provides three options for considerations.

Table 6: Different options based on the energy demands and sizing of the system

Options for solar pv size	Details on energy demand for Administration and Households	Daily average use/load (kWh)	Installed PV capacity (kW)
Option 1 – Baseline Load	Current Energy Demand	School : 22.06 Community: 4.30	10.54
Option 2 –School Demands	Future Energy Demand:	School: 53.25 Households: 4.30	23.02
Option 3: School and Communty demand	Long Term (10 – 15 years) Future Energy Demand	School: 53.25 Households: 21.95	30.08

Annexes

Annex 1: Joint Scoping Mission Programme- ASMC

Date: 30th January 2017; Monday			
No.	**Time**	**Schedule**	**Remarks**
1	Morning (0800hrs ~1230hrs)	Team arrive at Tarawa from Fiji & check in at Tarawa Boutique; Bairiki	Pick up transport arrange by ICC through OB
2	Afternoon (1330 ~ 1500hrs)	Team briefing	Overview of TOR for finalized program (update/last minute adjustments)
3	1500hrs ~ 1630hrs	Follow-up to confirm meeting with appointees (KUC/MOE/MPWU etc)	Give round of calls confirming meeting
Date: 31st January 2017; Tuesday			
No.	**Time**	**Schedule**	**Remarks**
1	0830hrs ~ 0930hrs	Courtesy call & meeting with Secretary OB	Mike Foon (OIC)
2	0930hrs ~ 1030hrs	Courtesy call & meeting with EU-NAO (MFED); Mr Teriba Tabee/Secretary	Introduce and update on the Kiribati ACSE project Teriba (On Leave)
3	1030hrs ~ 1130hrs	Courtesy call & meeting with Secretary MPWU	Confirmed (OIC) Energy Planning Unit – OIC
4	1130hrs ~ 1230hrs	Meeting with Energy Planning Unit/MPWU	Overview of project activities/MOA – Project Officer recruitment, etc Overview of SPC/GIZ Procurement Process and Procedures
5	1230hrs ~ 1330hrs	Lunch	
6	1330hrs ~ 1500hrs	Meeting with Kiribati Solar Energy Company (KSEC) CEO or technical staff	To have overall impression of KSEC capacity as key service provider & update on recent solar projects –Confirmed _ (Tawita Airam)
7	1500hrs ~ 1630hrs	Team debriefing & report writing	Team/individual
Date: 01st February 2017; Wednesday			
No.	**Time**	**Schedule**	**Remarks**
1	0830hrs ~ 1030hrs	Meet with KUC Director of Education (Kibau)	MOU (OB/KUC) & Abemama Joint Scoping Mission
2	1030hrs ~ 1230hrs	Meet with MOE Secretary/Director of Education (MTSS Principal??!!)	MOU (OB/MOE) & Tabuaeran Joint Scoping mission –March – April 2017
3	1230hrs ~ 1330hrs	Lunch	
4	1330hrs ~ 1530hrs	Presentation to the Parliament Select Committee on Climate Change	Overview of ACSE Program/Project & 2017-2018 Work- plan and objectives of project
5	1530hrs ~ 1630hrs	Debriefing/report writing	
Date: 02nd February 2017; Thursday			
No.	**Time**	**Schedule**	**Remarks**

1	0900hrs ~ 1230hrs	Presentation to KNEG (ACSE Project Steering Committee)	Status/update of overall ACSE & 2017 – 2018 Work plan *1st Project Steering Committee Meeting - to seek endorsement of the 2017 – 2018 Work Plan and activities , etc*
2	1230hrs ~ 1330hrs	Lunch	
3	1330hrs ~ 1530hrs	Finalize program/activities for Abemama trip	
5	1530hrs ~ 1630hrs	Final errands prior to Abemama trip	Team/Individual
Date: 03rd February 2017; Friday			
No.	**Time**	**Schedule**	**Remarks**
1	Morning	Depart Tarawa/Arrive Abemama	
2	Noon (before lunch)	Meet with Council Clerk, Mayor & Island technician (NOTE: Can be shifted to afternoon)	Overview of program/introduce ACSE and invite rep to the Governance Working Group (GWG) meeting
3	1230hrs ~ 1330hrs	Lunch	
4	1330hrs ~ 1530hrs	Meet with ASMC Principal discussing MOA & TOR for GWG (NOTE: Can be straight after arrival)	Draft MOA to be available & identify members of the GWG. Draft TOR (roles/responsibilities) for GWG to be provided & discussed
5	1530hrs ~ 1630hrs	Debriefing & Report Writing	Team/individual Assess the electrical network distribution. Take pictures and the existing plan. Photo points
Date: 04rd February 2017; Saturday			
No.	**Time**	**Schedule**	**Remarks**
1	Morning (0900hrs ~ 1100hrs)	Visit Chevalier College	Assess the solar hybrid system installation and benefits to the school installed under the Kiribati Italian Renewable Energy Project (KIREP)
2	Lunch	Lunch	
3	Afternoon	Free time/at leisure	
Date: 05th February 2017; Sunday			
No.	**Time**	**Schedule**	**Remarks**
1	Morning	Free/at leisure	
2	Afternoon	Visit Kauma Adventist High School for existing solar system	SDA observe Sabbath on Saturdays and free on Sundays
4	Afternoon (later) (1400hrs~ 1600hrs)	Meet with ASMC Management/staff/ technician	
Date: 06th February 2017; Monday			
No.	**Time**	**Schedule**	**Remarks**
1	0830hrs ~ 1030hrs	Meet with ASMC management/staff & technician	Establishment & appointment of GWG members. First meeting of the GWG

2	1030hrs ~ 1130hrs	Preliminary site survey (facility site) & meet with school technician	Establish photo points Review of school's energy systems Maintenance and Operational Arrangement
3	1130hrs ~ 1230hrs	Gender/Energy need assessment exercise	Collation of data/baseline information
4	1230hrs ~ 1330hrs	Lunch	
5	1330hrs ~ 1430hrs	Gender/Energy need assessment exercise continued	Facilitated discussions, survey, questionnaires
6	1430hrs ~ 1630hrs	Work with ASMC GWG	Draft Community Engagement Plan
Date: 07th February 2017; Tuesday – Workshop and Training – energy and gender needs			
No.	**Time**	**Schedule**	**Remarks**
1	0900hrs ~ 1230hrs	Training Workshop on sustainable energy linked to GOK policy and school solar hybrid project	Audience include student, staff & community members Koin to Draft Program
2	1230hrs ~ 1330hrs	Lunch	To be provided by Team to workshop participants
3	1330hrs ~ 1500hrs	Training workshop continued	
4	1500hrs ~ 1630hrs	Wrap-up Meeting with Principal, Management & GWG	
Date: 08th February 2017; Wednesday			
No.	**Time**	**Schedule**	**Remarks**
1	Morning	Settlement of payments/invoices Depart Abemama & Arrive at Tarawa	OB to pick up at airport
2	Lunch	Lunch	
3	1400hrs ~ 1530hrs	Meet with visiting EU delegation	Together with Teriba or separately
4	1530hrs ~ 1630hrs	Debriefing/report writing	Team/Individual
Date: 09th February 2017; Thursday			
No.	**Time**	**Schedule**	**Remarks**
1	0830hrs ~ 0930hrs	Courtesy call to Secretary MELAD (KI09)	
2	0930hrs ~ 1130hrs	Meet with ECD/MELAD (Chemical Waste Management Unit) Visit waste management facility	Develop Battery Waste Management Plan
3	1230hrs ~ 1330hrs	Lunch	
4	1330hrs ~ 1530hrs	Meeting with Director of Lands & Key technical staff (KI09)	Rapid assessment of current institutional capacity, state of equipment etc
5	1530hrs ~ 1630hrs	Debriefing/report writing	Team/individual
Date: 10th February 2017; Friday			
No.	**Time**	**Schedule**	**Remarks**

1	0830hrs ~ 0930hrs	Meet with Geology/Coastal Management Division of Ministry of Fisheries	Formerly Minerals Division/MFMRD as implementing partner for KI09
2	0930hrs ~ 1230hrs	KI09 discussions (Craig/Tarakabu) Trip Report writing (Koin)	
3	1230hrs ~ 1330hrs	Lunch	
4	1330hrs ~ 1630hrs	Team reporting/trip reflections	Key achievement/improvements & plan for MTSS/Tabuaeran mission
Date: 11th- 12th February 2017; Saturday/ Sunday			
No.	**Time**	**Schedule**	**Remarks**
1	All day	Free/leisure time	
Date: 13th February 2017; Monday			
No.	**Time**	**Schedule**	**Remarks**
1	0830hrs ~ 1230hrs	Craig leave for Fiji Technical Reporting requirements (Koin)	Training on Technical and Project Tracking Tools, (jointly with ICC)
2	1230hrs ~ 1330hrs	Lunch	
3	1330hrs ~ 1530hrs	Financial Reporting requirements	Financial Reporting templates with PO, MPWU Accounts & ICC
5	1530hrs ~ 1630hrs	Write up Trip Report	

Annex 2: Summary of Current Energy Load of School Administration

Room	Equipment	Quantity	Hours Equipment on Load per day	Equipment Ratings – Loads (watts)	Daily Load – Max (kW)	Use (kWh) per day	No. of days in month	Use (KWh)/month
Classroom Premises								
Class room 1 (Map reference 7b)	fluoro (4 ft)	1	3	45	0.045	0.15	20.00	2.93
	Fluoro (2 ft.)	1	3	23	0.023	0.07	20.00	1.50
Class room 11b	Fluoro (4 ft.)	3	3	45	0.135	0.44	20.00	8.78
class room 12a	Fluoro (4 ft.)	1	3	45	0.045	0.15	20.00	2.93
classroom 12 b	Fluoro (4 ft.)	1	3	45	0.045	0.15	20.00	2.93
classroom 13a	Fluoro (4 ft.)	2	3	45	0.09	0.29	20.00	5.85
classroom 13b	Fluoro (4 ft.)	3	3	45	0.135	0.44	20.00	8.78
Classroom 6a, 6b, 6c	Fluoro 2 x 4 ft.	6	3	45	0.27	0.88	20.00	17.55
Office 11a	fluoro(2 ft.) - electrical connection yet to be completed	0	3	23	0	0.00	20.00	0.00
General Office room Ref 4b	Fluoro (4 ft.)	1	3	45	0.045	0.15	20.00	2.93
Library Ref 4a	Fluoro (4 ft.)	2	3	45	0.09	0.29	20.00	5.85
Maneaba Ref 2	Fluoro (4 ft.)	6	3	45	0.27	0.88	20.00	17.55
Kitchen Serving Room/store room Ref 1a	Fluoro (4 ft.)	1	3	45	0.045	0.15	30.00	4.39
Cooking Fire hut Ref 1b	no lights	0	0	0	0	0.00	30.00	0.00
Cooking shelter Ref 1c	no lights	0	0	0	0	0.00	30.00	0.00
Generator Room Ref 5a	no lights	0	0	0	0	0.00	30.00	0.00
Workshop room	no lights	0	0	0	0	0.00	30.00	0.00
Store shop/Ref 3	no lights	0	0	0	0	0.00	30.00	0.00
Industrial Art Class room Ref 7a	Fluoro (2 ft.)	2	3	23	0.046	0.14	30.00	4.14
Boys Single toilet Ref 9	no lights	0	0	0	0	0.00	30.00	0.00
Boys Bathroom Ref 10	no lights	0	0	0	0	0.00	30.00	0.00
Boys Dorm Ref 8	no lights	0	0	0	0	0.00	30.00	0.00

Room	Equipment	Quantity	Hours Equipment on Load per day	Equipment Ratings – Loads (watts)	Daily Load – Max (kW)	Use (kWh) per day	No. of days in month	Use (KWh)/month
Girls dormitory Ref 14a	Fluoro (4 ft.)	4	3	45	0.18	0.54	30.00	16.20
	LED light	1	5		0		30.00	0.00
Girls washroom Ref 14 b	LED light	0	0	0	0	0.00	30.00	0.00
Office equipment - will be in idle mode all the time, however the school should practice energy efficiency and conservation	printer	3	3	100	0.3	0.90	30.00	27.00
	photocopy	1	3	1280	1.28	3.84	30.00	115.20
	Scanner	1	1	45	0.045	0.05	30.00	1.35
	fax machine	1	0.5	95	0.095	0.05	30.00	1.43
	CPU for computers	1	3	90	0.09	0.27	30.00	8.10
	desk top flat screen monitors	4	3	30	0.12	0.36	30.00	10.80
	laptops for teachers	4	5	75	0.3	1.50	30.00	
School PA systems	Speaker x 1	1	4	700	0.7	2.80	30.00	84.00
	Speaker x 2	1	4	700	0.7	2.80	30.00	84.00
	Amplifier and mike	1	4	1200	1.2	4.80	30.00	144.00
TOTAL SCHOOL ADMINISTRATION ENERGY NEEDS (BASELINE)					**6.29**	**22.15**		**571.85**

Annex 3: Summary of Future Energy Demand of School Administration

Room	Comments	Equipment	Quantity	Hours Equipment on Load per day	Equipment Ratings load (watts)	Daily Load - Max (kW)	Energy Use per day (kWh)	No. of days in month	Use (KWh)
Classroom Premises									
Class room 1 (Map reference 7b)		fluorescent tube light (4 ft)	2	5	45	0.09	0.45	20.00	9.00
		fluorescent tube light (2 ft)	2	5	45	0.09	0.45	20.00	9.00
Class room 11b		fluorescent tube light (4 ft)	6	5	45	0.27	1.35	20.00	27.00
		fluorescent tube light (4 ft)	3	5	45	0.135	0.68	20.00	13.50
class room 12a		fluorescent tube light (4 ft)	2	5	45	0.09	0.45	20.00	9.00
classroom 12 b		fluorescent tube light (4 ft)	2	5	45	0.09	0.45	20.00	9.00
classroom 13a		fluorescent tube light (4 ft)	2	5	45	0.09	0.45	20.00	9.00
classroom 13b		fluorescent tube light (4 ft)	3	5	45	0.135	0.68	20.00	13.50
Classroom 6a, 6b, 6 c	Principal advise to be similar size to dormitory	fluorescent tube light (4 ft)	6	5	45	0.27	1.35	20.00	27.00
Office 11a		fluorescent tube light (2 ft)	2	5	45	0.09	0.45	20.00	9.00
General Office room Ref 4b		fluorescent tube light (4 ft)	2	5	45	0.09	0.45	20.00	9.00
Library Ref 4a		fluorescent tube light (4 ft)	2	5	45	0.09	0.45	20.00	9.00

Room	Comments	Equipment	Quantity	Hours Equipment on Load per day	Equipment Ratings load (watts)	Daily Load - Max (kW)	Energy Use per day (kWh)	No. of days in month	Use (KWh)
Maneaba Ref 2	1 additional light required for church services	fluorescent tube light (4 ft)	11	5	45	0.495	2.48	20.00	49.50
Kitchen Serving Room/store room Ref 1a	1 additional light added	fluorescent tube light (4 ft)	2	5	45	0.09	0.45	30.00	13.50
Cooking Fire hut Ref 1b	need to put wiring to this house	fluorescent tube light (2 ft)	2	5	23	0.046	0.23	30.00	6.90
Cooking shelter Ref 1c	need to put wiring to this house and school needs to upgrade the kitchen	fluorescent tube light (2 ft)	1	5	23	0.023	0.12	30.00	3.45
Generator Room Ref 5a	need to put in security light	fluorescent tube light (2 ft)	1	4	23	0.023	0.09	30.00	2.76
Workshop room		fluorescent tube light (2 ft)	1	4	23	0.023	0.09	30.00	2.76
Store shop/Ref 3		fluorescent tube light (2 ft)	1	4	23	0.023	0.09	30.00	2.76
	Safety	CFL Light	1	10	7	0.007	0.07	30.00	
Industrial Art Class room Ref 7a		fluorescent tube light (2 ft)	2	5	45	0.09	0.45	30.00	13.50
Boys Single toilet Ref 9		fluorescent tube light (2 ft)	1	2	23	0.023	0.05	30.00	1.38

Room	Comments	Equipment	Quantity	Hours Equipment on Load per day	Equipment Ratings load (watts)	Daily Load - Max (kW)	Energy Use per day (kWh)	No. of days in month	Use (KWh)
Boys Bathroom Ref 10		fluorescent tube light (2 ft)	1	3	23	0.023	0.07	30.00	2.07
Boys Dorm Ref 8		fluorescent tube light (4 ft)	4	5	45	0.18	0.90	30.00	27.00
Girls dormitory Ref 14a		fluorescent tube light (4 ft)	4	5	45	0.18	0.90	30.00	27.00
	safety	LED light	1	10	7	0.007	0.07	30.00	2.10
Girls washroom Ref 14 b	safety	LED light	1	10	7	0.007	0.07	30.00	2.10
Dining Room	currently uses the maneaba as dining area	fluorescent tube light (4 ft)	4	4	45	0.18	0.72	30.00	21.60
Chapel	currently uses the maneaba for church service. Estimate time of use is 2 hours per day	fluorescent tube light (4 ft)	2	2	45	0.09	0.18	30.00	5.40
		fluorescent tube light (2 ft)	2	2	23	0.046	0.09	30.00	2.76
Office equipment - will be in idle mode all the time, however the school should pratice energy efficiency and conservation		printer	3	3	100	0.3	0.90	30.00	27.00
		photocopy	1	3	1280	1.28	3.84	30.00	115.20
		Scanner	1	1	45	0.045	0.05	30.00	1.35
		fax machine	1	0.5	95	0.095	0.05	30.00	1.43
		CPU for computers	1	3	90	0.09	0.27	30.00	8.10
		desk top flat screen monitors	4	3	30	0.12	0.36	30.00	10.80
		Projector	1	1	1800	1.8	1.80	30.00	54.00
		Speaker x 1	1	4	700	0.7	2.80	30.00	84.00

Room	Comments	Equipment	Quantity	Hours Equipment on Load per day	Equipment Ratings load (watts)	Daily Load - Max (kW)	Energy Use per day (kWh)	No. of days in month	Use (KWh)
School PA systems		Speaker x 2	1	4	700	0.7	2.80	30.00	84.00
		Amplifier and mike	1	4	1200	1.2	4.80	30.00	144.00
		Freezer - Kitchen	1	3.6	800	0.8	2.88	30.00	86.40
									0.00
Productive interest		Freezer - Shop	1	3.6	800	0.8	2.88	30.00	86.40
		Washing machine	1	5	450	0.45	2.25	30.00	67.50
		laptops charging for student	10	3	75	0.75	2.25	30.00	67.50
Strategic Interest									
		laptops for teachers	12	5	75	0.9	4.50	30.00	135.00
RAK -women's group held meetings in the evenings. This extra energy needs includes extra light use in the maneaba during the Easter (March), 1 week independent (July) and graduation (Nov)		Maneaba use for meetings, festive activities, easter, independence days, graduation)	11	3	45	0.495	1.49	30.00	44.55
Student and teachers use		Computers for internet	20	7	75	1.5	10.50	30.00	315.00
TOTAL SCHOOL DEMAND/NEEDS						15.11	**59.17**	1280.00	1671.77

Annex 4: Summary of Current Energy Load of School Households

Staff Quarters									
	Teachers	Equipment	Quantity	Hours Equipment on Load per day	Equipment Ratings – Loads (watts)	Daily Load – Max (kW)	Use (kWh) per day	No. of days in month	Use (KWh)/month
Staff House - Eastern	House 1- Power Technician)	Fluoro (4 ft.)	2	3	45	0.09	0.27	30.00	
	House 2 - Teacher- Art	Fluoro (4 ft.)	2	3	45	0.09	0.27	30.00	8.10
	House 3 – Cooker	Fluoro (2 ft.)	1	3	23	0.023	0.07	30.00	2.07
	House 6 – Matron	Fluoro (4 ft.)	2	3	45	0.09	0.27	30.00	8.10
		Fluoro (2 ft.)	1	3	23	0.023	0.07	30.00	2.07
	House 7 - Teacher – Science	Fluoro (4 ft.)	2	3	45	0.09	0.27	30.00	8.10
		Fluoro (2 ft.)	1	3	23	0.023	0.07	30.00	
	House 10 –vacant	Fluoro (4 ft.)	0	0	0	0	0.00	30.00	0.00
Staff Houses - Western	House 1- Guest House	Fluoro (4 ft.)	2	3	45	0.09	0.27	30.00	8.10
	House 2 - Principal	Fluoro (4 ft.)	2	3	45	0.09	0.27	30.00	8.10
	House 3 – Kiribati	Fluoro (4 ft.)	1	3	45	0.045	0.14	30.00	4.05
		Fluoro (2 ft.)	1	3	23	0.023	0.07	30.00	2.07
		Chlorofluorescent	3	9	36	0.108	0.97	30.00	29.16
	House 4 - Librarian	Fluoro (4 ft.)	2	3	45	0.09	0.27	30.00	8.10
	House 5 - Registry Clerk/Warden	Fluoro (4 ft.)	1	3	45	0.045	0.14	30.00	4.05
		Fluoro (2 ft.)	2	3	23	0.046	0.14	30.00	4.14
	House 6 - Art/Geography	Fluoro (2 ft.)	2	3	23	0.046	0.14	30.00	4.14
	House 7 - Religious Education	Fluoro (4 ft.)	1	3	45	0.045	0.14	30.00	4.05
		Fluoro (2 ft.)	1	3	23	0.023	0.07	30.00	2.07
	House 8 - Carpenter	Fluoro (2 ft.)	2	3	23	0.046	0.14	30.00	4.14
TOTAL ENERGY HOUSEHOLDS ENERGY NEEDS(BASELINE)						**1.22**	**4.30**		**118.71**

Annex 5. Summary of Future Energy Demand of School Households

Room	Comments	Equipment	Quantity	Hours Equipment on Load per day	Equipment Ratings load	Daily Load - Max	Energy Use per day (kWh)	No. of days in month	Use (KWh)
Staff Quarters									
Staff Houses - Eastern	House 1- Power Technician (closes to ocean)	fluorescent tube light	2	5	23	0.046	0.23	30.00	6.90
	House 2 Teacher- Art	fluorescent tube light	2	5	23	0.046	0.23	30.00	
	House 3 Cooker	fluorescent tube light	2	5	23	0.046	0.23	30.00	6.90
	House 4 Vacant- Repaired	fluorescent tube light	2	5	23	0.046	0.23	30.00	6.90
	House 5 Vacant	fluorescent tube light	2	5	23	0.046	0.23	30.00	6.90
	House 6 Matron	fluorescent tube light	2	5	23	0.046	0.23	30.00	6.90
	House 7 Teacher - Science	fluorescent tube light	2	5	23	0.046	0.23	30.00	6.90
		fluorescent tube light	1	5	23	0.023	0.12	30.00	
	House 8 Vacant	fluorescent tube light	2	5	23	0.046	0.23	30.00	6.90
	House 9 Vacant	fluorescent tube light	2	5	23	0.046	0.23	30.00	6.90
	House 10 Vacant	fluorescent tube light	2	5	23	0.046	0.23	30.00	6.90
Staff Houses - Western	House 1-Guest House	fluorescent tube light	2	5	23	0.046	0.23	30.00	6.90
	House 2 Principal	fluorescent tube light	2	5	23	0.046	0.23	30.00	6.90
	House 3 Kiribati Teacher	fluorescent tube light	1	5	23	0.023	0.12	30.00	3.45
		fluorescent tube light	1	5	23	0.023	0.12	30.00	3.45
	House 4 Librarian	fluorescent tube light	2	5	23	0.046	0.23	30.00	6.90
	House 5 Registry Clerk/Warden	fluorescent tube light	1	5	23	0.023	0.12	30.00	3.45
		fluorescent tube light	2	5	23	0.046	0.23	30.00	6.90
	House 6 - Art/Geography Teacher	fluorescent tube light	2	5	23	0.046	0.23	30.00	6.90

	House 7 Religious Education	fluorescent tube light	1	5	23	0.023	0.12	30.00	3.45
		fluorescent tube light	1	5	23	0.023	0.12	30.00	3.45
	House 8 Carpenter	fluorescent tube light	2	5	23	0.046	0.23	30.00	6.90
Cooking Huts	18 houses	CFL Light	18	5	7	0.126	0.63	30.00	18.90
Increase in Demand from Teachers	Teachers now access to Power with many hours on their hand - Using 2 Amp restriction gives allowance for 720 Watts	DVD Deck	17	3	60	1.02	3.06	30.00	91.80
		TV Screen - 21 inch	17	3	110	1.87	5.61	30.00	168.30
		phone charger	17	1	5	0.085	0.09	30.00	2.55
		Stereo/radio	17	4	60	1.02	4.08	30.00	122.40
		Laptop	12	2	75	0.9	1.80	30.00	54.00
TOTAL					**340**	**5.90**	**19.64**		**139.65**

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