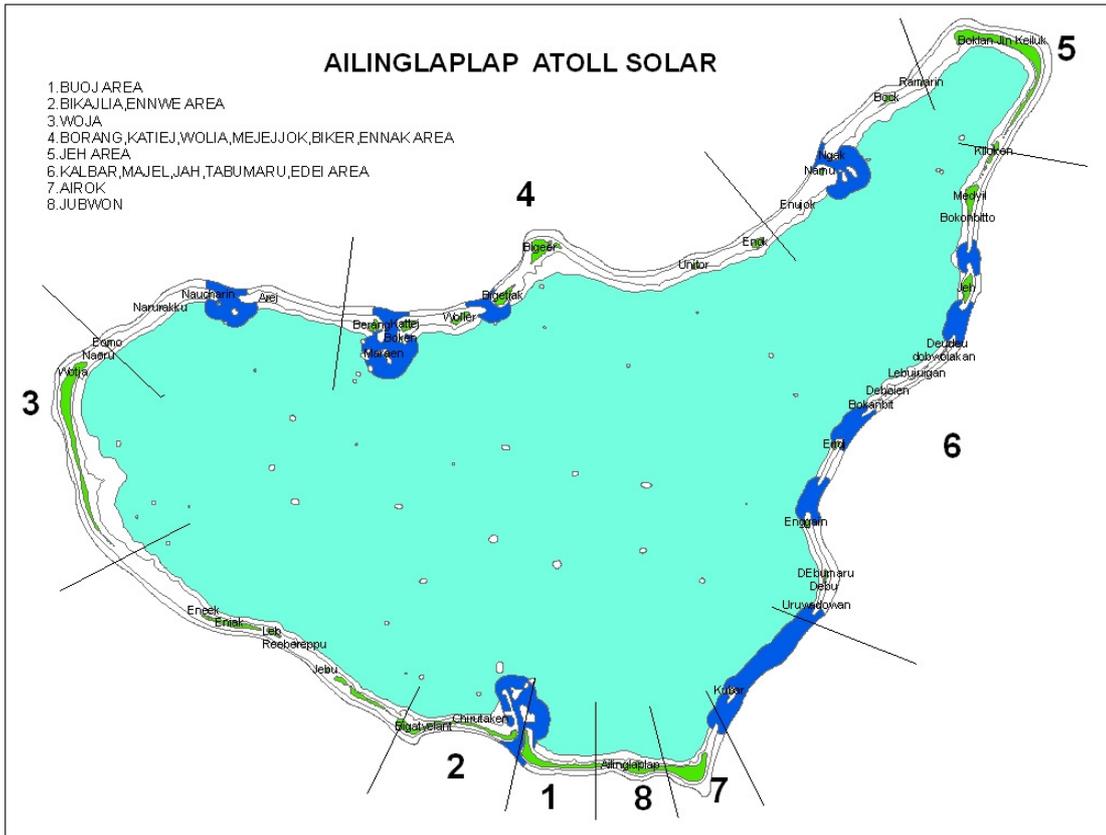


# REPORT OF THE INSTALLATION OF THE EU REP-5 SOLAR PROJECT AT AILINGLAPLAP ATOLL REPUBLIC OF THE MARSHALL ISLANDS



The installation of the European Union (EU) REP-5  
Solar project for Ailinglaplap, Marshall Islands  
Installed by Marshalls Energy Company (MEC)

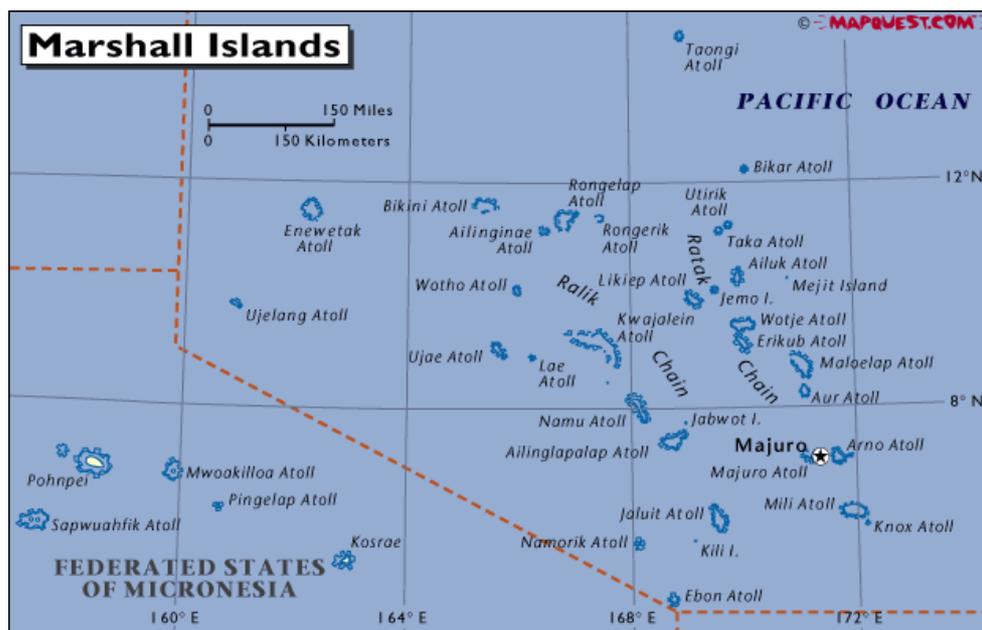
## DESCRIPTION OF PROJECT

### SHORT HISTORY

The European Union (EU) REP-5 project, involving five ACP (Pacific) countries is being carried out in the Federated States of Micronesia, Nauru, Niue, Palau, and Republic of the Marshall Islands. The REP-5 project was in the pipeline for five or more years before it was eventually implemented. Some recipient countries began to think it may never get off the ground at all. The reasons for the delay appeared to be an uncertainty as to which organization would get to administer the funds for this project. The Forum Secretariat and the Pacific Power Association were in the for-front of this debate. Finally the EU appointed the Forum Secretariat for the task. A consortium of EU companies were hired as the Project Management Unit (PMU) and based in Suva, Fiji for the project duration. The PMU consortium is lead by IT Power and includes Transénergie and Ademe.

Eventually, in 2006, tender documents for the solar project were prepared and sent out to bid. For the Marshall Islands, CBS Power Solutions, a Suva based Fijian company with offices also in Seven Hills, NSW, Australia, won the bid to supply the hardware for the solar home systems (SHS) and the Marshalls Energy Company (MEC) was awarded the transportation and installation of the supplied systems for the Marshall Islands portion of the REP-5 project.

The Republic of the Marshall Islands (RMI) consists of two groups of 29 atolls and five raised coral islands extending 750 miles (1200 km) north-south and 800 miles (1300 km) east-west, with the capital Majuro located 2000 miles (3200 km) from Honolulu. The 1999 census recorded 50,840 people. Due to considerable emigration to the US, net population growth has been low; the current estimated population is 54,000, with roughly 51% residing on Majuro and 20% on Ebeye in Kwajalein atoll with the balance of the people, 29% residing on the outer atolls and islands.



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## SITE INVESTIGATION

In June of 2006, a survey of the number of houses in Ailinglaplap was done by Gwen Legros, from IT Power, REP-5 PMU office in Pohnpei, and Billy Schutz from MEC, Majuro. Every settlement across Ailinglaplap atoll was visited, every house was photographed and the people interviewed.

In that trip we gathered the following information;

- GPS location of each house,
- Current power source (for lighting and entertainment) of the household,
- Appliances owned and operated,
- Solar equipment installed together with number and capacity of batteries,
- The number of persons living in each house.



Gwen & Billy onboard the survey vessel

It was interesting to find that the population had not increased at all since the 1999 census. Details of this survey are contained in a separate excel file.

During the initial survey the Ailinglaplap Local Government offered the two person survey team every possible assistance. The mayor had arranged for councilors from each of the different wards or districts visited to come out and offer their help. They walked with us throughout the villages providing details such as persons' names, land titles, and land boundaries, and all other information required for the survey.



Gwen with local assistance team

The mayor and other council members need to be recognized for their most valuable contribution to the success of the solar installation process.

## MATERIAL ARRIVAL

The system equipment, supplied under contract by CBS Power Solutions of Fiji, arrived from several sources and CBS supplied staff from the Fiji and Australia offices to be on hand when each shipment of components arrived in Majuro. Their priority was to ensure the safe and clean arrival of all the components and to inventory the complete stock of materials with MEC and RMI Government staff. Delays were experienced with each of the shipments once they arrived because the materials were consigned to Government ministries. Coordination between the ministries staff with paperwork procedures and protocols caused the shipments to accumulate storage charges with the Ports Authority. Eventually payments were made and import tax status was sorted allowing the cargo to be released.

The materials were delivered to the MEC storage yard where they were sorted and stored into additional storage containers so that the shipping containers could be returned to the ports authority.

Panels, poles and non-sensitive items remained stored in containers at the MEC storage yard.

The consignment of batteries caused problems in that they had to be removed from the shipping containers and stored in a cooler environment.

These were relocated to a storage warehouse at another location on Majuro Atoll. Every battery was checked for arrival voltage and many were found to be on the low side of their rated capacity which may have been caused by the heat in the shipping containers. A charging system was set up allowing MEC staff to charge multiple batteries each and every day of the week until all 960 batteries had been recharged at least once prior to installing in Ailinglaplap. This process continues today with the system spares provided.



For more than two months MEC staff worked on assembling components into the battery boxes to save time on site. Mounting boards and the charge controllers were preinstalled and system cables pre-cut with terminations made based upon the measurement made during the sample installations. The household controls were also pre-mounted on plywood backing ready for installation.

## SAMPLE AND TRAINING UNITS – Jelter Island

In the bid document the supplier (in our case CBS Solutions of Fiji) was required to install five complete solar system units as a requirement to provide training of the MEC technicians on how the provided components are all connected together into the full specified system. Additionally they had to confirm that the supplied components met the required output ratings specified.



The contract documents required the supplier to install the five sample units on the recipient atoll as part of the actual project but this turned out to be impossible to achieve. The only way to Ailinglaplap was by ship because the nation's only airplane was still grounded for maintenance and would continue to be out of action for many more months. Additionally no vessel was available at the time to take the equipment to Ailinglaplap and MEC staff were involved with an E8 Renewable Energy training workshop here on Majuro. The decision was approved by the Contracting Authority (Ministry of Finance) and the PMU to allow the five systems to be installed on Majuro Atoll. This was carried on one of the small northern islets called Jelter, on which the residents have no access to power. The island is a 20 min boat ride from the end of the road at Laura village.



Jelter provided an outer islands situation, close to home, which is similar to any of the outer islands. It was also in close proximity to sources of hardware supplies should additional materials be required. Four sample systems were installed on the island by CBS staff as they trained MEC technicians. A fifth unit was installed outside our main office in Majuro, and serves as reference should anyone show interest in what a EU Solar Unit may look like as well as allowing the technicians based in our office to investigate technical problems radioed in from Ailinglaplap in the future. The installation and training process went quite well with both CBS and MEC satisfied with the components and the installation process. The CBS engineers were able to return to Fiji. Additional systems were eventually installed on Jelter to supply the rest of the small community. A total of 8 systems were used.



## MOBILISATION

The installation process included the transportation of all the equipment to Ailinglaplap Atoll under a contract between the Contracting Authority, the RMI Ministry of Finance and the Marshalls Energy Company (MEC). The installations commenced with the departure from Majuro of MEC personnel and the solar equipment supplied by the EU, for the Southern part of Ailinglaplap on June 16<sup>th</sup> 2008. Nearly one week was needed to load the vessel with all the items required for the installation process and this included many items MEC had to source from local vendors. Items such as cement, reinforcing bars, lumber and plywood, etc. all had to be procured at the time of vessel loading due to the lack of storage space available to MEC.



The vessel used to transport solar materials to Ailinglaplap was a local landing craft that was chartered for the operation. Ailinglaplap is 160 N-miles west of Majuro and it took the vessel 24 hours for the trip to Ailinglaplap. Several days were required to unload all the items by hand at several locations. The island community all helped with this operation. The materials were transported and carried to copra warehouses and empty school classrooms as well as rented houses for storage.

The total volume of materials needed for Ailinglaplap could not be all loaded onto one trip so a second charter of the same vessel followed on July 22<sup>nd</sup>. The delays between the first sailing and the second were due to a lack of vessels and the only vessel being available was on emergency fuel deliveries to the power plant on Ebeye Island in Kwajalein Atoll.



More MEC personnel and solar equipment for the Western and Eastern parts of the atoll were delivered on the second trip. The vessel had just reached Ailinglaplap lagoon, on the second trip, when an emergency call from Namu Atoll was received. Namu is an atoll about 70 miles North West of Ailinglaplap. The emergency involved a maternity case with delivery complications. The medical authorities in Majuro summoned the closest vessel in the area to divert and deliver the stricken mother to Kwajalein, another 60 miles to the North West. With a full load of PV materials, plus our personnel, the vessel diverted and headed north for Namu Atoll.

The delay amounted to three days, after which the vessel returned to its normal track and proceeded to deliver solar materials to Woja and Jeh on Ailinglaplap atoll. The baby and its mother were later reported to be doing well.

A demobilization trip was also needed to travel to the island teams to collect any surplus systems, equipment and tools as well as MEC staff members and to return them to Majuro. All materials were put into storage for future use or to complete the spare parts systems in storage.

A very minor number of system components failed to work properly when the complete system was activated. These were mostly charge controllers and light bulbs. Approximately 4 charge controllers and 40 light bulbs were found to be defective.



## INSTALLATION DIFFICULTIES

Installation of the solar home systems proceeded without hindrance, except for the occasional call to Majuro for more screws, clips, and clamps, etc., as one would normally expect. This created minor delays due to the materials having to be dispatched by boat to the island. Luckily there was a brief period when the local plane also flew and provided a couple of weeks of flights which assisted in getting items to Ailinglaplap.

MEC has had enough experience at solar installation that few to no problems were encountered in Ailinglaplap.

The atoll Mayor, whom we had contacted and extensively briefed before the move to Ailinglaplap, was on site, assisted by his deputy. The other councilors were likewise ready to perform their prescribed roles of assistance and did a great job as our link to the community.



The whole village came out and assisted the unloading of solar equipment from the vessel. The men, who were appointed to work as technical laborers, were ready, willing, and very able. We had the best of the labor force available on Ailinglaplap because there is no other industry present so all those very keen to work showed up.

The Local Government driver, seconded to us along with his pickup truck, worked to our time schedule without hindrance and distraction. Not knowing that wages were in store for him as well as the others he was extremely grateful when he too was called to sign for a pay cheque.



There were the usual local “bush” politicians who would try and maximize their personal and family gains from such projects by using their positions and influence to push for sons, nephews or relatives to be employed or otherwise gain extra benefits from the project. While causing some minor irritation, most of these issues were dealt with without much drama.

The local workers were hired and formed into teams of 4 men. With a clever one selected as a team leader. The first few days were used in sorting out all the materials and reviewing the locations of all the systems to be installed. The recipient houses were all surveyed again to locate the best position for the solar panels and these positions marked with pegs. This allowed the teams to proceed with installing a large number of poles in advance. Once the pole location was determined, along with the location of the house internal panel board, lights, switches etc, the teams commenced installing these components while the concrete surrounding the pole hardens.



This process continued as the teams moved from house to house completing the systems. The MEC supervisors roamed among the teams doing quality checks on the installation process as well as supervising the progress. Many of the occupants of the houses also willingly assisted the teams in the installation process so that they could gain a better understanding of how the system worked.



As systems were completed they were left for several days to allow for system checks and for the batteries to gain additional charging with a prolonged trickle charge period. Once the checks had been performed and approved then the system was switched on and the operating procedures / restrictions were explained to the occupants of the house.





The more densely populated areas are areas 1, 8, and 7, on the south side. The second most populated is area 3, (Woja), to the West, followed by area 5, (Jeh) in the East. Areas 4 and 6 are the strings of little islets along the fringing reef at the northern and eastern sides of the atoll. Areas 4 and 6 are sparsely populated and dwellings are widely spread out. The areas in between (that are not numbered) are not inhabited.

For installation Ailinglaplap was divided into three Installation Districts so as to make the whole exercise more manageable. The first trip, which departed in June, carried materials for district A. The second trip (in July) carried materials for districts B, and district C.

**Installation District A:** comprised of areas, 2, 1, 8, 7, and 4. Material for this District arrived on the first trip from Majuro.

**Installation District B:** comprised of area 3 only. Materials for areas 2 and 3 arrived by second trip from Majuro.

**Installation District C:** comprised of areas 5, and 6. Materials for areas 5 and 6 arrived by second trip from Majuro.

## **SOLAR MATERIAL SUPPLIED**

The solar home system for one household comprised of the following components and activities.

Supplied by CBS Power Solutions:

- 2 x 100 Watt peak solar modules.
- 2 x 180 AH x 6volts Hawker sealed AGM batteries,
- 1 x 30 Amps Morningstar (ProStar 30) charge and discharge controller.
- 3 x 11 Watt x 12volt C. F. light, complete with fitting
- 1 x 13 Watt x 12volt C. F. light, complete with enclosed fitting for outdoor operation.
- 1 x 12volt LED night-light.
- All necessary cables, switches, fastenings and pole were included.

Supplied by MEC:

- Survey, administration
- Sorting, storage, preassembly
- Crating, loading and shipping
- Unloading, storage
- Installation, installation materials, public awareness
- System checks
- Training of islanders
- Demobilization and spares storage

The supplied items, when connected together, formed an ideal and practical household lighting system suitable for the average size home in the outer islands of the Marshalls. The system offered 3 lights within the house. One light for outside that doubled as a work light and for nighttime security. Lastly, there is an LED light that may be left on all night to provide a low level of interior illumination for the sleeping area. With the five lights operating at per normal household needs, there remains a little power for an hour or two of TV entertainment. The use of radios and dry cell battery (NiCD or NiMH) recharging are also permissible.

The package can supply lighting for a small home for many years provided its usage remains within the limits of its design.

## TRAINING

MEC has developed a tradition of training local workers when an atoll wide solar installation occurs. We bring in our supervisors from Majuro, but pick up the rest of our working crew from the atoll being visited. This does not only bring some employment opportunity to the islanders, but also offers them a chance to refine their basic skills and understanding of solar power. Most islanders have some knowledge of electricity and understand positive from negative. Several have their own PV solar home lighting system, although small and crudely installed; and most were dangerously wired. The training they receive while working with our more experienced MEC installers results in improvements in their workmanship and enhanced their greater understanding of the solar power system.

MEC Training Staff involved in the project:

Billy Schutz	Solar Engineer
Anton Ataia	Area A Leader
Jimmy James	Area A Technician

Tommy Keju	Area B Leader
Brandon James	Area B Technician
Roby Kijenmej	Area B Technician

David Riklon	Area C Leader
Manuk Thomas	Area C Technician
Tomy Peter	Area C Technician



Carl Belele and Terry Henry, wire a house at Katiej, Alinglaplap.

All the workers selected underwent a familiarization day with the equipment as it was unpacked and assembled into two sets to be used to provide power for the accommodation quarters and base camp. The second unit was used to recharge batteries for cordless power tools and other items of equipment used by the team. All the village workers participated in the construction of these systems and the internal wiring of the houses. The workers were then divided into four man teams with a team leader selected and they proceeded to start installing the systems in the villages. The Majuro technicians supervised several teams each selecting the system site for each house and ensuring each team had the required materials for each location. As the systems were completed the Majuro technician would run quality and system checks before powering up the systems to charge the batteries before activating the system to the house owner for use.

## WORK FORCE

The work force for the entire installation program comprised of islanders from Ailinglaplap. MEC staff from Majuro comprised of three supervisors for each of the three districts of installation.

One hundred and eighteen (118) persons found employment for the period June 17<sup>th</sup> to September 6<sup>th</sup>, 2008. This brief period of employment provided a profound injection of cash into the atoll community at a time when the world economy was causing dramatic rises in basic food items, supplies and petroleum products.

Many of the local work force had some form of previous work experience in the urban centers as well as within the atoll itself when schools or churches needed building, etc. The skill levels were very good and they quickly understood the basic fundamentals of the process.

Of those that all ready had some sort of solar systems in place, many were keen to learn if they had been using the equipment efficiently or not. Most found that they were using the systems wrongly. Many multiple battery systems all ready existing in Ailinglaplap were found to be wired wrongly such that many were not even getting the benefit of a second or more batteries. The on site training sessions helped the locals immensely to resolve these issues.



Installation of the support pole



Installation of the support pole



Installation of the support pole

## TECHNICIANS

MEC appointed a total of nine (9) permanent staff village technicians throughout Ailinglaplap.

The distributions of technicians were as follows:

Areas 1, 8, 7: we appointed a total of two technicians to the combined area. This combined area, although the most populated and the longest stretch of continuous land, about 13 miles, has good roads and abundance of available transportation. Our men are also equipped with bicycles for transportation. Should the workload increase in time, an extra technician can easily be recruited.

Area 2: we appointed one technician. There are 39 installations here. This area is about 4 miles long so a bicycle was part of the technician's tool kit.

Area 3: (Woja) has two technicians appointed. Also equipped with bicycles as the island is continuous and stretches for 5 miles.

Areas 4 and 6: these are the most difficult and inaccessible areas. These are the fragmented islets fringing the barrier reef to the North and West of Ailinglaplap Atoll. We placed two technicians in Area 6, one on the little islet of Majel, which has about 20 homes and the other on Jah islet, about 15 homes.

Area 5: (Jeh) also has two technicians and bicycles. This area is about 3 miles with 78 homes.

The smaller neighboring islets, with one or two homes each, will have to rely on the availability of a boat from the other locations to bring a technician over when needed.

The RMI Solar program requires that the local technicians are paid for 5 hours work per day for 5 days per week. The remaining hours and days of the week are to allow the technician the opportunity to fulfill his subsistence farming/fishing requirements. Therefore the appointment of local technicians has to also consider the number of systems on an island that can financially support a technician. At \$12 per month rental for the systems, a minimum of 9 systems is required to cover the payroll of just one technician. The balance of the funds collected is to be deposited in a fund to source replacement parts throughout the life of the program. An additional grant program is being funded separately to secure sailing canoes for all the technicians to use so they can easily travel between the islands servicing systems etc.

## CUSTOMER REACTIONS

The joy of the solar installation program is the gratitude of the system recipients. Many people of this more affluent island cannot get over the fact that they do not need to turn off the generator at the end of an evening. “It takes a little getting used to”, some would say. The oddity of all this is light without the noise from a generator.

Other people say they can now clean and salt fish when their fishermen return at nights. Fishing is generally better at night than during the daytime. Lots of fish can be spoiled if not cleaned and salted for preservation early enough.

The copra cutters were also grateful for the lights. The coconut meat, which was drying in the sun or in the hot air dryers the previous day, can now be removed from the shells at night. This removal exercise makes for easier handling the next day when the meat only is further dried to the required moisture content. This new cooler and lighted work period allows for quicker cycling times and therefore increased production and potentially increased revenues.

But the most pleasing of sights after the installations were done is to see people reading at night time. Adults reading magazines and children bent over their school exercise books. The children can now have their share of play during sunlight hours, and leave what study is required to the evenings. After the evening meals, a World Teach volunteer would have children at her home for further tutorials and study. This has never happened before to the children and people of this chiefly and culturally rich atoll. Except of course for the lucky few whose parents might afford a generator.

On a separate excel file is the completed list of all household names and locations of SHS installations on Ailinglaplap atoll.

