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Newsletter of the Sustainable Energy Industry Association of the Pacific Islands

Issue 2 • August 2021

Update on Regional Solar Training

The unavailability of in-country technical training for solar technicians has been an ongoing issue for the Pacific Solar Industry. Assisting in the establishment of training in-country is a major priority of the SEIAPI executive committee.

SEIAPI has been continually planning and realizing solar training prospects for the betterment of the sustainable energy industry.
Recent and current activities include:

- In the short term, GSES is offering the online design and install grid connect PV and stand-alone power systems (theory courses) at a reduced price for those in the Pacific region. If you are interested in doing a course, kindly contact Mr. Sandip Kumar (sandip.kumar@gses.com.au).

- Through funding support by GIZ, the Pacific Power Association now has the license to the GSES face to face training material, and it allows GSES (which acts as the SEIAPI secretariat) to sign one-on-one agreements with Pacific Training Centres to have access to the material. Under this agreement, GSES has been working with the Solomon Islands National University (SINU); and the Community College of Micronesia (Pohnpei). The pandemic has caused some delays however both Training Centres will be offering training in the near future.

- SEIAPI is working with USP Pacific TAFE (University of the South Pacific, Suva, Fiji) to establish a Solar Training Centre at USP campus in Suva. At this stage, it is anticipated that USP will also offer online theory training to allow more people from Pacific Island countries and territories to undertake training. Discussions are underway to set up a practical Training Centre in Fiji.

- In Vanuatu, Solar Training has previously been conducted by Mr. Wade Evans, who is now with the Vanuatu Institute of Technology (VIT) and SEIAPI is currently having discussions with him on offering solar training at the VIT.

- Christian Lohberger, the President of the Solar Energy Association of PNG is currently liaising with donors about establishing solar training in PNG, SEIAPI has been closely working with Christian to enable training plans get realized in PNG.

If you work for a training institute and would like to introduce solar training courses, please contact the SEIAPI secretariat for further discussions at secretariat@seiapi.com.

SEIAPI revitalises the Accreditation Scheme

From April to June, 2021, a sub-committee was tasked to revise the SEIAPI/PPA Certification & Accreditation Program given the need to adapt to the current widely deployed RE technologies in the Pacific, to align to the recently developed Technical Guidelines under SEIDP for the Pacific Power Association (2018 to 2020) and to reinforce the Program such that it improves on its co-ordination and management features. Eventually, it is anticipated that more Technicians, Engineers and Tradesman will be accredited in the long term and this will be one of the main pillars in the implementation of sustainable RE systems in the Pacific.

Interestingly, the SEIAPI Certification & Accreditation program was first launched in May 2012 and it was relaunched in 2014 as the PPA/SEIAPI Certification & Accreditation program. Mr. Geoff Stapleton, the Secretary of SEIAPI and Managing Director of GSES, Australia, had been involved with the Australian accreditation scheme since its inception in 1993 and through his involvement with the Institute of Sustainable Power (ISP), he had indirect involvement with the creation of the original rules for the North American Board of Certified Energy Practitioners (NABCEP USA). He was able to bring the lessons already learned from those schemes in developing the rules/guidelines for SEIAPI Certification/Accreditation Program. Mr. Stapleton, in consultation with the SEIAPI executive committee, developed the rules/guidelines for the SEIAPI certification/accreditation program based on his long-term experience with similar programs.

The then, SEIAPI/PPA Certification & Accreditation Scheme will now be known as the SEIAPI/PPA Accreditation Scheme as recently endorsed by the SEIAPI Executive committee together with the revisions to the existing program. The individuals & organizations on the relevant technologies will now be accredited with adherence to the revised SEIAPI/PPA Accreditation Scheme effective from 1st July 2021.

Briefly, some important updates to the accreditation program include:

- Changes to technologies under which accreditation is available in the revised scheme. The current technologies include:
    - Grid Connected PV Systems
    - Stand-Alone PV Power systems
        - ✓ Level 1 - Solar Home Systems
        - ✓ Level 2 - Stand-alone systems with/without Inverters
        - ✓ Level 3 - PV/ Diesel Hybrid Power systems
    - Green Residential Buildings
        - ✓ Energy efficiency and Energy Audits
    - Mini/Micro PV Grids

- Changes to application requirements for individuals and organizations pursuing provisional and full accreditation.

- Consideration of individuals with proven relevant experience (10 years plus) and relevant qualifications practicing in the industry for provisional accreditation.

- Introduction of application fees for individuals and organizations for pursuing provisional and full accreditations and renewals given the considerable administration work involved.

- Introduction of penalty and revocation for not pursuing full accreditation.

- Revision of case study proforma which is now much simplified to ease submission requirements for full accreditation pathway.

- Other important rule changes to boost the scheme and ensure more compliance

The Provisional Accreditation for individuals and organizations is valid for one year which then requires pursuing and obtaining a full accreditation which is valid for 3 years. This will then have to be renewed every three years. The updated SEIAPI/PPA Accreditation program and relevant forms are available from the SEIAPI website (http://www.seiapi.com/). The program document entails all necessary information relevant to the accreditation program.

Caption: Credible Solar Installation Works: A proof of accredited installers

To strengthen the Accreditation Program, the SEIAPI executive committee is working with stakeholders on establishing more Training Centres throughout the Pacific. Discussions have commenced with Training Centres in PNG, Fiji and Vanuatu with more to follow in the coming days (as mentioned in the first article).

SEIAPI wishes to support the Sustainable Energy Industry with more training avenues and at the same time, promote adoption of technical guidelines on RE/EE to strengthen the regional capacity in order to have sustainable RE systems designed and installed in the Pacific. This will assist in the wider deployment of RE technologies throughout the Pacific region

The Framework for Energy Security & Resilience in the Pacific (FESRIP): 2021-2030

Article By: Mr. Peter Johnston

Pacific regional organizations, led by the Pacific Community (SPC), have developed a new ten-year framework for regional support for national energy sector development for the Pacific island countries and territories (PICTs). This article briefly explains the background, the emphasis and how it might be relevant for SEIAPI members.

Background

During the 1980s-1990s, there were numerous studies of national and regional energy issues in the Pacific, financed by, or directly carried out by the donor community. Most PICs developed national energy policies (or energy sections of national economic plans) during this period, and there were a number of short-term donor assistance projects to support both energy policy development and infrastructure. From the early 1980s, there has been a lead CROP agency for energy, initially a small unit at the South Pacific Bureau for Economic Cooperation (SPEC) which later became the Pacific Islands Forum Secretariat (PIFS). In 1998, responsibility shifted to the Pacific Islands Applied Geoscience Commission (SOPAC) and then about 2010 to SPC (which absorbed SOPAC), where it remains today. However, there was no coordinated CROP approach or agreement on how to work together to assist the PICTs improve energy policies and their implementation until 2002. Improved coordination and cooperation within CROP made sense as the Secretariat of the Pacific Regional Environment Programme (SPREP), the Pacific Power Association (PPA) and the University of the South Pacific (USP) were, and are, all active within the energy sector, PPA being the only CROP agency dealing exclusively with energy, serving the region's electric power utilities. Each tended to work with the PICTs somewhat in isolation from the others' efforts and they often competed for the same limited funds.

Several plans, policies or frameworks for energy, and supplementary papers, have been developed, led by the CROP lead energy agency, between 2000 and 2015:

- The *Pacific Islands Energy Policy and Plan* (2002);
- The *Pacific Islands Energy Policy* (2004) and an associated *Pacific Islands Energy Strategic Action Plan:* 2005-2007 (2005);
- *Towards an Energy Secure Pacific—a Framework for Action on Energy Security in the Pacific* (FAESP): 2010-2020 (2011) and its *Implementation Plan for Energy Security in the Pacific: 2011-2015* and later an *Enhanced Implementation, Coordination, Monitoring and Evaluation and Reporting for the Framework for Action on Energy Security in the Pacific* (2015) but apparently never formalized or implemented.

The 2002 *Pacific Islands Energy Policy and Plan* and its 2004 update provided a broad voluntary framework within which PICTs and the CROP organizations agreed to work. The vision was quite broad: "Available, reliable, affordable, and environmentally sound energy for the sustainable development of all Pacific Island communities."

The 2010-2020 FAESP framework was "designed to provide guidance to PICTs to enhance their national efforts to achieve energy security and, in line with the principles of the Pacific Plan, to clarify how regional services can assist countries to develop and implement their national plans." An independent review of the FAESP in 2019 concluded that energy sector coordination and collaboration among CROP agencies had not been particularly effective, its implementation plan rarely guided CROP actions, governance and oversight mechanisms were useful for networking and information exchange but not for cooperation or coordination of activities, and reporting was inadequate with no independent monitoring or evaluation. SPC developed a broad range of energy security indicators which provided a good overview of national energy data, but they did not adequately reflect energy security at the national level or changes over time. A key issue was that SPC, the CROP energy lead, simply lacked the resources, financial and staffing, to adequately implement the framework.

The 2011-2030 Framework for Energy Security & Resilience in the Pacific (FESRIP)

Following the 2019 review, the CROP agencies, led by SPC and supported by the Pacific Region Infrastructure Facility (PRIF), developed a new regional framework, the FESRIP, focusing on energy access, with improved energy security and resilience to climate change. FESRIP's long-term goals are wide-ranging, and broadly similar to those of the earlier frameworks: "universal access to secure, robust, sustainable and affordable electricity, transport fuel and household energy services that are resilient to climate change and natural disasters, and are increasingly supplied by renewable resources, with improved energy efficiency, and upgraded energy infrastructure and improved technologies."

FESRIP consists of two volumes. Volume 1, which is fairly concise, is the framework itself. It covers the roles of key parties, the types of actions suitable for implementation at regional or multi-country level, the nature of energy security and resilience, information sharing, coordination and advisory mechanisms, etc. Volume 2, which runs to about 120 pages, includes a series of six 'Issues and Background Papers' and annexes. The second volume may be of interest to SEIAPI members as it provides context to the energy sector in the region, with sections covering:

1. Emerging Issues and Opportunities for the Region's Energy Sector: the 2020's & Beyond;
2. Measuring Energy Security and Climate Change Resilience in the Pacific;
3. Implications of the COVID-19 Pandemic on the PICT Energy Sector;
4. Improving Gender Equality in the PICT Energy Sector;
5. The Energy Sector and the Evolving Context of Regionalism in the Pacific; and
6. Energy Initiatives Appropriate for a Pacific Regional Approach

The Volume 2 annexes also include a discussion of SPC's formal mandate as lead energy agency; PICTs and the CROP agencies at times seem to forget or ignore SPC's actual role. It's interesting to note that petroleum fuels accounted for 80% of the region's commercial energy use in 2017 (the last year for which data were available for all countries and territories when the draft was written in 2020), about the same as in 2000. Similarly, overall PICT electricity generation was 72% reliant on petroleum fuels in 2000 and this remained unchanged in 2017 (ranging from 63% in Melanesia and 75% in Polynesia, to 96% in Micronesia). Despite considerable investment in RE, the region's electrical energy security has not appreciably improved in the past twenty or so years as petroleum-fueled generation grew at about the same rate as renewables. The countries are also far from achieving their emissions reductions as specified in the Nationally Determined Contributions (NDCs) to which they have committed.

What differs substantially from earlier regional energy polices or frameworks?

Regional frameworks guide the CROP agencies but do not actually bind them to priorities the actions of FESRIP within their own work programmes. Each CROP agency is driven by its own governing council, internal priorities versus resources, and actual requests from the PICTs. Reviews suggest that the previous framework was not especially effective. However, there is potential for improved coordination and cooperation: for the first time, the new framework has been formally endorsed and signed by all CROP CEOs as well as endorsed by the Chair of the Pacific Energy Ministers' Meeting. It will be tabled at the Pacific Forum Leaders meeting in August 2021 in Fiji for consideration and final endorsement, assuming the meeting is held, considering the Covid-19 situation in Fiji.

The FESRIP in principle provides a framework, a mandate and broad areas of priority for the energy sector activities of CROP members, particularly SPC, PPA, SPREP and USP. It does not, of course, bind the sovereign countries or territories, but rather is meant to assist them to develop and implement their own goals. FESRIP describes the sort of actions that can be more effective and less costly if provided at a multi-country level but the issue of inadequate resources remains. The donor community has tended to increase national support at the cost of regional efforts in recent years, and this imbalance is unlikely to significantly change without formal requests from the PICs and territories. In addition, PIC (though not territories') investment in renewable energy is driven in part by national NDC commitments, supported globally through funds for mitigating climate change through reduced emissions. There are good arguments that

PICTs, which have barely contributed to climate change, should prioritize climate adaptation efforts over mitigation, and this could be an area of tension over the next decade for regional assistance.

There are other limitations to what FESRIP on its own can achieve. Improving energy security and resilience is inseparable from appropriate actions to combat climate change. These sectors have been treated as relatively separate in terms of analyses and investments, and must work in unison. Transport accounts for roughly 40% more petroleum fuel use in the region than electricity supply does, but transport and energy policy remain separate. Since the earlier 2010-2020 FAESP was written, there are at least eight new Pacific centres, organizations or programme with a strong energy component; effective cooperation and coordination may become both more difficult and more vital. And finally, national and donor emphasis in recent years has quite reasonably been on a transition to renewable energy, with little or no external assistance for helping PICTs manage its increasing volume of petroleum fuel supply and the safety of deteriorating bulk storage facilities. Both the energy sector challenges and opportunities for the region are considerable

SPC will be arranging a workshop in September to discuss developing pathways and opportunities for research and innovation to support PICTs and regional agencies in implementing FESRIP priorities at country level, and strengthening partnerships and supporting the development of concept notes for project proposals. I'm sure SEIAPI members are welcome to contribute their views. Contact Akuila Tawake akuilat@spc.int if you are interested.

Peter Johnston is a Fiji-based SEIAPI Executive Committee member. He carried out the review of the 2010-2020 regional energy framework, benefitting considerably from an earlier 2014 mid-term review of its implementation plan by Katerina Syngellakis, Thomas Jensen and Alan Illingworth. Peter and Tongan consultant Apisake Soakai prepared a two-volume working draft of the 2021-2030 FESRIP in 2020 under CROP guidance. This was updated by Thomas Jensen for the CROP agencies in April 2021 and finalized by SPC and its partners. All of the documents referred to in this article are, or soon should be, available at http://prdrse4all.spc.int/. The FESRIP will be available in both English and French.

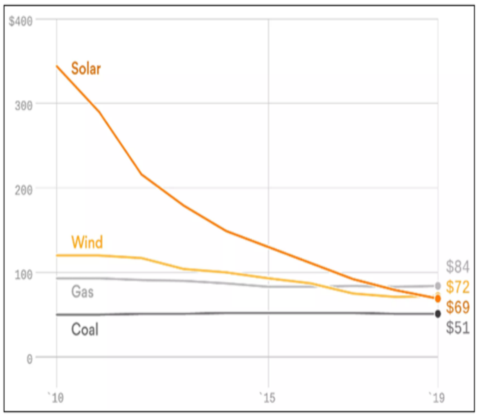

Figure: Levelised Electricity Cost – Asia-Pacific 2010-2019 (US$/MWh)

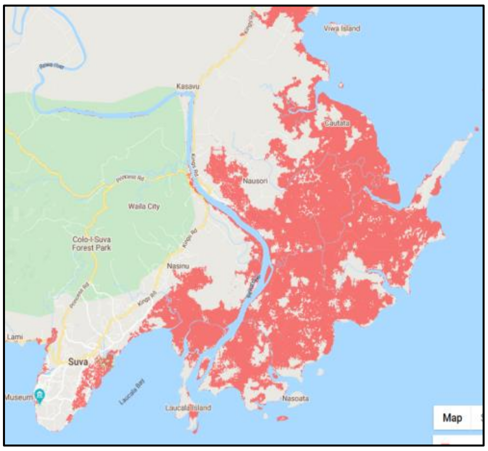

Figure: Suva Fiji & SE Viti Levu in 2050 Under Optimistic Assumptions
(Red shaded areas are under water)

Wintua / Lorlow Microgrid Malekula, Vanuatu

An article by PCS, Vanuatu

Caption: Wintua/Lorlow Micro-grid System in Vanuatu

The project has electrified Wintua and Lorlow Communities in South West Bay, Malekula with a robust 24/7 electricity supply.

The Project encompassed design, supply, installation and commissioning of a Solar PV Microgrid System, based on a power consumption of 191kWh per day, 2 days Battery Autonomy and underground distribution network and metering to support 168 buildings.

The low voltage three phase distribution network includes a total of 3300m of distribution cabling. The battery bank is rated 499kWh powered by 75kWp of PV, in a mix of AC and DC coupling.

This project is the largest off-grid Microgrid undertaken by PCS Limited to date. The site survey, design, equipment procurement had proceeded as planned. The first barge and initial works (namely Powerhouse and other civil works), commenced onsite on 17 Feb 2020. With the General Election that was scheduled for 19 Mar, our team demobilized as planned, several days earlier. And this is when the world and the weather decided it was time to take a break for a few months:

- 'State of Emergency' declared due to Covid-19 on 26 Mar 2020 and no domestic travel was allowed for next 14 Days.
- Cyclone Harold – 6 Apr 2020 – Crews redirected for emergency communication and power works.
- Second Barge – original ETA 30 Mar 2020 – actual ETA 18 May 2020.

Once we got back on the ground and were able to continue, things went smoothly, with power available for Vanuatu Independence Day, July 30, at a number of residences and buildings. The full Microgrid was launched on 22 September 2020.

This build was a challenge for PCS, both as its largest undertaking to date, but also with the associated challenges of Covid and Cyclone Harold. Proudly, the PCS team has come through this stronger, we are technically more capable, we are more empathetic and we are a proud Ni-Vanuatu tea.

Off Grid Solar Power System in Port Vila, Vanuatu

An article by Solar Fiji

Caption: Off grid PV System installation in Port Villa.

Solar Fiji (SEIAPI member) has engineered, designed and installed a large residential Off Grid Solar Power System in Port Vila, Vanuatu.

The customer wanted a system that would last him 20+ years without any major issues, as such, the said system consists of high-quality products available in the Pacific market.

The system was engineered to power 2 residences, consisting of a large swimming pool, water pumps and filtration system, many fridges and freezers, fans, lights, air conditioning units and a beautiful tree house which has all the luxuries.

The system is also backed up by a 15kVA Generator set, which is connected to the Victron Quattro equipment on auto-start functionality.
The system installation was undertaken by Pita Tamani, Iliesa Lotawa, Tony Pecora and was commissioned by Ciaram Granger.

The 22.56kWp PV (60.8kWh battery storage) System consists of the following equipment:

- 48 x Sunpower X21 470W Solar Panels – a total of 22.56kWp.
- 16 x SimpliPhi 3.8kWh Lithium Ferrous Battery Bank – a total of 60.8kWh

Victron Energy Control equipment including:

- 2 x Victron Quattro 48/15000 Inverter Chargers
- 1 x Victron Smart Solar MPPT 250/100 Charge Controller
- 1 x Victron Smart Solar MPPT 150/45 Charge Controller
- 1 x Victron Colour Control for remote monitoring and visual display
- 2 x Fronius Primo 8.2kWp AC Inverters

The Off Grid Power System is expected to offset most of their generator usage, and the system is expected to pay itself back in 7 years.

The system has a 15% return on investment and will save the customer about $1,672,180.00 Vanuatu Vatu in its first year alone.

A Mini-Grid Power System for Yasawa High & Yasawa Primary School, Naviti Island

An article by CBS Power Solutions (Fiji) Pte Limited

Access to 24-hour electricity became a reality for Yasawa High School and Yasawa Primary School in August, 2020 through the Rural Electrification Program in Fiji. The program was funded by the EU-GIZ Adaptation to Climate Change and the Fiji Government under the ongoing project portfolio titled "Fiji Sustainable Energy Hybrid Power Project (FSEHPP)". The FSEHPP aims to help rural communities establish sustainable power systems, reduce GHG emissions and ease financial burden related to the high cost of fossil fuel.

Fig. 1 Part of the 30kWp roof-mounted solar plant

At the time of the initial site visit, both Yasawa High and Yasawa Primary School, separated by a footpath, had a combined total of 358 residents made up of staff and students. Yasawa High, a boarding school, had a diesel generator that catered for few dormitories and staff quarters for 3-4 hours during nightfall while a solar system powered the school photocopier and computers during school hours. On the other hand, Yasawa Primary School had no electricity source at all. Moreover, the fuel was/is purchased from Lautoka, then transported by boat to Naviti Island. As a result, fuel cost per litre concludes to be 10% to 30% higher than the fuel costs in Fiji's urban centers.

As the project implementation arm of the FSEHPP, the Fiji Department of Energy (DoE), had partnered with CBS Power Solutions (Fiji) PTE Ltd for the construction of the "30kWp Solar & Diesel Generator Mini Grid System at Yasawa High School, Naviti Island, Yasawa Group".

The final approved power system design encompassed a 30.36kWp solar plant, 259kWh of Battery Storage and a 44kVA diesel generator working in concert through a control system to produce electricity around the clock.

Fig. 2 SMA inverters, GNB storage, comms. System & solar switchboard room

All components were initially assessed for suitability to Fiji's harsh tropical climate and the local utility Grid Standards before procurement. The major components procured consisted of S-Rack Anodized Aluminium Roof-Mount solar structures designed to withstand Category 5 Cyclones, Trina solar panels, SMA Sunny Tripower solar inverters, SMA Sunny Island battery inverters, SMA Data Manager with remote communications enabled, GNB Sonnenschein solar batteries, a Cummins generator with auto-start functionality, Everexceed standalone solar street lights and SparkMeters for user metering and vending with remote communication enabled. Furthermore, an underground LV distribution network was installed in addition to house wiring for 40 buildings and switchboard installations at Yasawa High School and Yasawa Primary School, bringing about a complete mini-grid power system.

Due to the remoteness of the site, many challenges were faced by CBS during the course of the project. To start with, the island did not have an existing wharf or jetty on which to off-load the cargo from the barge. To circumvent this, CBS off-loaded the cargo off-shore using a forklift and an excavator to carry project materials to site as seen in Fig. 3.

Fig. 3 Excavator carrying cargo to shore

Furthermore, since the school was heavily dependent on rain water for drinking and sanitary needs, CBS could not deploy a large number of staffs despite the need for heavy trenching and cabling works necessary for the LV distribution network.

Safety and hygiene were paramount since there were very weak telecommunication network with no Health Facilities available close to the Island.

Fig. 4 Official opening plaque

The site was officially commissioned in August 2020 by the Honourable Minister for Infrastructure, Mr Jone Usamate. Thus far, the objectives of the project are being achieved. Yasawa High and Primary School now uses 24/7 sustainable, affordable energy with reduced GHG emissions which has equally promoted quality education in remote schools by encouraging students in neighbouring islands to come in as boarders and get access to similar facilities as urban schools.

Technical Tip

PV Isolator Sizing example with AS5033:2014 (Amendment 2 Changes)

Using the data sheet for ZJ Benny BYH-32 1000V, decide whether this isolator can or cannot be used on the following systems. Assume that this system has a ***non-separated inverter (Transformer less).***

Scenario

Two strings of 19 Yingli Panda 280 modules. This isolator will be installed outside. The minimum temperature of the cell is 0°C.

Voc of Module = 38.9V

Isc of Module = 9.61A

We can wire the strings in 2 ways:

i. We can use just one 4-Pole DC isolator for 2 strings.

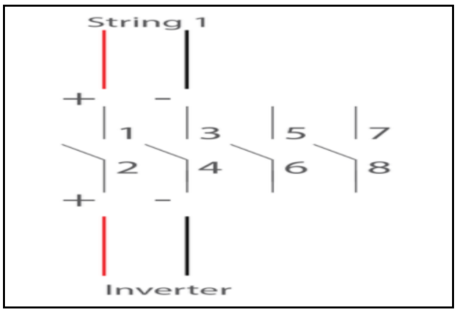

Figure: Installing two strings on a 4-Pole Isolator. String 1 on poles 1 to 4 and String 2 on poles 5 to 8.

OR

ii. We can use two 4-Pole DC isolator, one for each string.

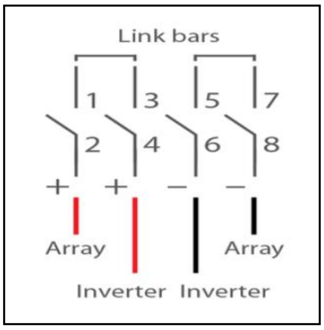

Figure 2 Installing one string on a 4-Pole Isolator

Yingli Panda Module Characteristics:

Voc = 38.9V

Isc = 9.61A

γ = -0.31 %/°C

$$Vmax = Voc + \gamma * Voc * (Tmin - Tstc)$$

$$Vmax = 38.9 + \left(\left(\frac{0.31}{100}\right) * 38.9 * (25 - 0)\right) = 41.91V$$

$$Varray = 41.91V * 19 = 796.29V$$

Identification	Rating data
Switch, unenclosed - catalogue number (with DC-PV2 rating)	BYH.1-32, BYH.2-32
Specific dedicated individual enclosure - catalogue number (with minimum IP56NW rating)	BYH-32 IP66NW
Assembly of switch and specific dedicated individual enclosure - catalogue number	/
I_{th} rated thermal current, unenclosed, at 40°C shade ambient air temperature	32 amps
I_{the} rated thermal current, indoors, at 40°C shade ambient air temperature, in a specific dedicated enclosure	32 amps
I_{the} rated thermal current <u>outdoors</u> at 40°C shade ambient air temperature <u>without solar effects in</u> a specific dedicated enclosure rated IP66NW	32 amps
I_{the} solar current value outdoors at 60°C shade ambient air temperature (see D.8.3.11,table D3), with solar effects in a specific dedicated enclosure rated IP66NW	29 amps

<u>OPTION (i) INSTALLING TWO STRING ON ONE 4-POLE DC ISOLATOR:</u>

ZBENY

Data according to AS60947-3: 2018

Main Contacts		Type	BYH-32	Appendix B5
Rated thermal current I_{the}		A	32	Making &
Rated insulation voltage U_i		V	1000	Breaking
Distance of contacts (per pole)		mm	8	5x
Rated operational current Ie (DC-PV2)				operations
1 pole 1	300V	A	25	100
	400V	A	10	40
	500V	A	8	32
	600V	A	8	32
	800V	A	3	12
	1000V	A	2	8
4-pole 2 pole in series 4	500V	A	32	128
	600V	A	13	52
	700V	A	9	36
	800V	A	9	36
	900V	A	9	36
	1000V	A	9	36
2-pole 4 parallel poles 2H	500V	A	40	160
	600V	A	/	/
	700V	A	/	/
	800V	A	/	/
	900V	A	/	/
	1000V	A	/	/
2-pole 4 pole in series 4B	500V	A	32	128
	600V	A	32	128
	700V	A	32	128
	800V	A	32	128
	900V	A	32	128
	1000V	A	32	128

ZBENY PV SOLUTIONS

1. **Thermal Effects:**
   The maximum current of this system is 1.25x9.61x2 = 24.025A.
   This isolator is outdoors with solar effects; therefore, it can break a current (Ithe) of 29A.

2. **Operating Conditions:**
   2 poles with 800V rating can break a maximum operational current of 9A.

3. **Fault conditions:**
   1 pole rated at 800V can break a fault current (Imake, Ibreak) of 12A.
   Therefore, just one 4-Pole DC isolator **cannot** be used in this configuration for 2 strings.
   Let's look at the other option.

OPTION (ii) INSTALLING ONE STRING ON ONE 4-POLE DC ISOLATOR:

ZBENY

Data according to AS60947-3: 2018

Main Contacts		Type	BYH-32	Appendix B5
Rated thermal current I_{the}		A	32	Making &
Rated insulation voltage U_i		V	1000	Breaking
Distance of contacts (per pole)		mm	8	5x
Rated operational current Ie (DC-PV2)				operations
1 pole 1 1⁄	300V	A	25	100
	400V	A	10	40
	500V	A	8	32
	600V	A	8	32
	800V	A	3	12
	1000V	A	2	8
4-pole 2 pole in series 4 1⁄ 2⁄	500V	A	32	128
	600V	A	13	52
	700V	A	9	36
	800V	A	9	36
	900V	A	9	36
	1000V	A	9	36
2-pole 4 parallel poles 2H 1⁄ 2⁄ 3⁄ 4⁄	500V	A	40	160
	600V	A	/	/
	700V	A	/	/
	800V	A	/	/
	900V	A	/	/
	1000V	A	/	/
2-pole 4 pole in series 4B 1⁄ 2⁄ 3⁄ 4⁄	500V	A	32	128
	600V	A	32	128
	700V	A	32	128
	800V	A	32	128
	900V	A	32	128
	1000V	A	32	128

ZBENY PV SOLUTIONS

1. **Thermal Effects:**
   The maximum current of this system is 1.25x9.61 = 12.01A.
   This isolator is outdoors with solar effects; therefore, it can break a current (Ithe) of 29A.

2. **Operating Conditions:**
   4 poles in series with 800V rating can break a maximum operational current (Ie) of 32A.

3. **Fault conditions:**
   2 poles in series rated at 800V can break 36A.
   Therefore, one 4-Pole DC isolator can be used in this configuration for each string. Which means we will use total 2 DC Isolators, one on each string.

A EULOGY FOR THOMAS LYNGE JENSEN

Thomas L Jensen

With sadness, we note the death on July 16th of Thomas Lynge Jensen, who was an energy advisor with UNDP for over twenty years, initially in Samoa and later throughout the Pacific as the Regional Energy Programme Specialist. He had been ill since early 2020 and died peacefully in his sleep in Aarhus, Denmark, in the presence of his wife Togi and family. He had BSc and MSc degrees in Political Science from Aarhus University, and an MSc from the University of Birmingham in International Development.

Thomas was well known in the region, and to SEIAPI members, as an enthusiastic, competent, thorough and friendly person, who was consistently honest in his writings and in discussions. He was always learning something new, very interested in sustainable energy issues and opportunities and in the nature and limitations of development efforts. He carried out many surveys on household energy use, reviewed a wide range of energy projects and policies, and developed numerous aid-funded energy projects within the region. He was a warm-hearted person, always generous with his time, held the Pacific within his heart and was an admirable model of what an adviser should be. Thomas's final work was an update in early 2021 for CROP agencies of the draft *Framework for Energy Security & Resilience in the Pacific: 2021-2030.*

As one SEIAPI member wrote, "I always joked that if your document passed the Jensen review, it must be good."

May he rest in peace.

SEIAPI
Sustainable Energy

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