

# Strategic Recommendations and Roadmap for Regional Solar PV and SHC Qualification and Certification Frameworks in the SPC Region

**PROJECT TITLE:** “Development of regional solar energy qualification frameworks and curricula in ECOWAS, EAC and the Pacific Community”

**PROJECT REFERENCE:** Structuring of an International Network of Solar Technology and Application Resource Centres (UNIDO Project ID: 190370)



## Executive Summary (EN)

The following document "Strategic Recommendations and Roadmap for Regional Solar PV and SHC Qualification and Certification Frameworks" focuses on advancing solar energy specifically in the region of the Pacific Community (SPC).

It lays out a strategy for advancing solar qualifications and certifications in the Pacific Islands. This strategy is crafted to reflect the unique needs and contexts of the region, ensuring that the qualifications are pertinent, adaptable, and supported across the Pacific Islands. The approach is rooted in a deep understanding of the region's specific workforce and skill requirements in the solar industry, emphasizing the need for qualifications tailored to these demands.

This strategy incorporates a blend of inclusivity and collaboration, involving industry experts across the region in the development process. It also underscores the importance of a flexible qualification structure that can cater to the diverse educational, work, and cultural needs of different Pacific Island countries. Standardisation and accreditation of solar qualifications on a regional level are highlighted, ensuring consistency and recognition across countries.

An ongoing review and feedback integration process is outlined, ensuring that the qualifications evolve with technological advancements and changing industry needs. The emphasis is on creating a robust, responsive, and integrated framework for solar qualification and certification, aligning with the distinct requirements and contexts of the Pacific Islands. This includes expanding in-country training, forming partnerships with local and international bodies, integrating certification with regional projects, and raising program visibility.

Central to the document are strategic recommendations, which are designed to enhance the adoption and effective utilisation of solar photovoltaic (PV) and solar heating and cooling (SHC) technologies in the region. They encompass technology deployment, skill development, policy formulation, and public-private partnerships. The strategies are tailored to address the unique challenges and opportunities within the SPC region, emphasizing sustainable and inclusive growth.

A comprehensive roadmap accompanies these recommendations, providing a detailed implementation plan. This roadmap outlines a step-by-step approach to implementing the suggested strategies. It includes timelines, key milestones, and potential challenges, providing a clear path for stakeholders to follow. The roadmap also considers the need for collaboration among different sectors and the importance of aligning these initiatives with the region's broader economic and environmental goals.

In summary, the document presents a thorough set of recommendations and a strategic roadmap for advancing solar PV and SHC qualifications and certifications in the Pacific region, positioning the solar industry for sustainable growth, technological adaptation, and resilience in alignment with inclusive and environmentally conscious practices.

## Résumé exécutif (FR)

Le document "Strategic Recommendations and Roadmap for Regional Solar PV and SHC Qualification and Certification Frameworks" (Recommandations stratégiques et feuille de route pour les cadres régionaux de qualification et de certification en matière d'énergie solaire photovoltaïque et de chauffage et de refroidissement solaires) se concentre sur l'avancement de l'énergie solaire dans la région SPC spécifiquement.

L'initiative se poursuit par une stratégie complexe visant à faire progresser les qualifications et les certifications solaires dans les îles du Pacifique. Cette stratégie est méticuleusement élaborée pour refléter les besoins et les contextes uniques de la région, en veillant à ce que les qualifications soient pertinentes, adaptables et soutenues dans l'ensemble des îles du Pacifique. L'approche repose sur une compréhension approfondie des besoins spécifiques de la région en matière de main-d'œuvre et de compétences dans l'industrie solaire, soulignant la nécessité de disposer de qualifications adaptées à ces besoins.

Cette stratégie intègre un mélange d'inclusivité et de collaboration, impliquant des experts de l'industrie dans toute la région dans le processus de développement. Elle souligne également l'importance d'une structure de qualification flexible qui puisse répondre aux divers besoins éducatifs, professionnels et culturels des différents pays insulaires du Pacifique. La normalisation et l'accréditation des qualifications solaires au niveau régional sont mises en avant, afin de garantir la cohérence et la reconnaissance entre les pays.

Un processus continu de révision et d'intégration du retour d'information est décrit, garantissant que les qualifications évoluent avec les progrès technologiques et les besoins changeants de l'industrie. L'accent est mis sur la création d'un cadre solide, réactif et intégré pour la qualification et la certification solaires, qui s'aligne sur les exigences et les contextes distincts des îles du Pacifique. Il s'agit notamment de développer la formation dans le pays, de former des partenariats avec des organismes locaux et internationaux, d'intégrer la certification dans les projets régionaux et d'accroître la visibilité du programme.

Les recommandations stratégiques sont au cœur de l'initiative. Ces recommandations sont conçues pour favoriser l'adoption et l'utilisation efficace des technologies solaires photovoltaïques et solaires de chauffage et de refroidissement. Elles portent sur le déploiement des technologies, le développement des compétences, la formulation des politiques et les partenariats public-privé. Les stratégies sont adaptées pour répondre aux défis et aux opportunités uniques de la région SPC, en mettant l'accent sur une croissance durable et inclusive.

Une feuille de route complète accompagne ces recommandations et fournit un plan de mise en œuvre détaillé. Cette feuille de route présente une approche progressive de la mise en œuvre des stratégies proposées. Elle comprend des calendriers, des étapes clés et des défis potentiels, offrant ainsi aux parties prenantes une voie claire à suivre. La feuille de route tient également compte de la nécessité d'une collaboration entre les différents secteurs et de l'importance d'aligner ces initiatives sur les objectifs économiques et environnementaux plus larges de la région.

En résumé, le document présente un ensemble complet de recommandations et une feuille de route stratégique pour faire progresser les qualifications et les certifications solaires PV et CRS dans la région SPC, en positionnant l'industrie solaire pour une croissance durable, l'adaptation technologique et la résilience en alignement avec des pratiques inclusives et respectueuses de l'environnement.

## Abbreviations

ACER - Australian Council for Educational Research  
BTVET - Business, Technical, Vocational Education, and Training  
CBA - Competence-Based Assessment  
CFEE - Certificat de fin d'études élémentaires  
DFPT - Department of Vocational and Technical Training  
DIT - Directorate of Industrial Training  
EACAT - Credit Accumulation and Transfer system  
EPRA - Energy and Petroleum Regulatory Authority  
EQAP - Educational Quality and Assessment Program  
GSES - Global Sustainable Energy Solutions  
GN-SEC - Global Network of Regional Sustainable Energy Centres  
GNQF - Gambia National Qualifications Framework  
IPAC - Industry Programme Advisory Committees  
ISA - International Solar Alliance  
ISAC - Industry Standards Advisory Committees  
IRENA - International Renewable Energy Agency  
LMD - Licence-Master-Doctorat  
LDC - Least Developed Countries  
MoBSE - Ministry of Basic and Secondary Education  
MoHERST - Ministry of Higher Education, Research, Science and Technology  
NACTE - National Council for Technical Education  
NEQMAP - Network on Education Quality Monitoring in the Asia-Pacific  
NUC - National Universities Commission  
NVA - National Vocation Awards  
NZQA - New Zealand Qualifications Authority  
PCREEE - Pacific Centre for Renewable Energy and Energy Efficiency  
PICTs - Pacific Island Countries and Territories  
PIF - Pacific Islands Forum  
PPA - Pacific Power Association  
PQAF - Pacific Quality Assurance Framework  
PQF - Pacific Qualifications Framework  
PRQS - Pacific Register of Qualifications and Standards  
PV – Photovoltaics  
QF – Qualification Frameworks  
RQF - Regional Qualification Frameworks  
SEIAPI - Sustainable Energy Industry Association of the Pacific Islands  
SHC - Solar Heating and Cooling  
SIDS - Small Island Developing States  
SITESA - Solomon Islands Tertiary Education and Skills Authority  
SPC - The Pacific Community  
SPREP - Secretariat of the Pacific Regional Environment Programme  
SQF - Samoa Qualification Framework  
UNIDO - United Nations Industrial Development Organisation  
UNESCO - United Nations Educational, Scientific and Cultural Organisation  
USP - University of the South Pacific  
VQF - Vanuatu Qualifications Framework  
VREP - Vanuatu Rural Electrification Project  
WDA - Workforce Development Authority  
WIRE - Women in Renewable Energy Network  
TVET - Technical and Vocational Education and Training

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## Introduction

High quality capacities and processes in the solar field are fundamental prerequisites for the long-term sustainability of solar markets and investments. They also underpin the trust of consumers, suppliers, and financiers. Such improvements directly affect the quality of infrastructure, and thus contribute to an effective and inclusive energy transition. A well-structured qualification framework has the potential to create local solar jobs, generate income, and empower domestic companies to participate in global or regional value chains of solar manufacturing and servicing<sup>1</sup>.

However, currently the qualification frameworks (QF) for photovoltaic (PV) and solar heating and cooling (SHC) are often underdeveloped, being insufficiently detailed, incomplete, or lacking in comprehensive coverage necessary to fully support the development of expertise in these areas, and institutions offering quality curricula and training tailored to the diverse needs of experts along the solar energy value chain are lacking. It is not uncommon for experts to travel to other countries or regional universities to receive academic training on renewable energy solutions. This fragmentation in the field of solar energy qualification leads to duplication of efforts or, worse, critical gaps in expertise.

Recognising these challenges, there is a strong case for addressing the issue of solar energy qualification regionally in a harmonised manner. These frameworks contribute to the comparability, quality, and transparency of qualifications, making it easier to recognise diplomas and certificates across borders.

The harmonisation of certification schemes of both solar products and services is crucial because it directly impacts the development of regional solar skills. It ensures that high-quality training is delivered to professionals capable of preparing, implementing, operating, and maintaining solar energy systems. International organisations such as the International Electrotechnical Commission (IEC), International Energy Agency (IEA) and the International Organisation for Standardisation (ISO) have worked extensively to develop internationally acceptable certification standards for solar products.

To tackle these multifaceted challenges, UNIDO and the ISA have embarked on the "Structuring of an International Network of Solar Technology and Application Resource Centres" project, funded by the Government of France. The overarching objective of this project is to create a robust network of institutional capacities within ISA Member States.

To maximise its impact and create economies of scale, STAR C has adopted a regional approach. This approach aims to harmonise solar qualification frameworks across borders, fostering collaboration and synergy among neighbouring nations.

Previous interventions by UNIDO in the realm of quality infrastructure and qualification programmes within these regions have already demonstrated the advantages of regional approaches. UNIDO has actively supported several economic communities, including the Economic Community of West African States (ECOWAS), the East African Community (EAC), and the Pacific Community (SPC), in the establishment of qualification frameworks (QF) and certification policies. These efforts have also involved the development of solar skills within the regional energy Centres under the Global Network of Regional Sustainable Energy Centres (GN-SEC) programme. The STAR C project is an integral part of UNIDO's south-south and triangular activities within the GN-SEC platform. Importantly, the project will build upon the institutional infrastructure and lessons learned from previous interventions.

Recognising the significance of solar energy, UNIDO has embarked on a comprehensive initiative to advance solar energy skills, certification, and QF. This initiative fosters a harmonised approach to solar energy development across three distinct regions: ECOWAS, EAC, and the Pacific region.

### 1.1 Scope of the activity

The scope of this document in enhancing solar qualification and certification actions encompasses a multifaceted approach aimed at improving the overall quality and reliability of solar energy systems. This

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<sup>1</sup> International Network of Solar Technology and Application Resource Centres (STAR C) | Global Network of Regional Sustainable Energy Centres (GN-SEC). <https://www.gn-sec.net/pt-pt/node/12432>



includes the development of concrete recommendations to refine and standardise solar qualifications and certifications. Such recommendations will focus on upgrading capacities and processes, ensuring that regional best practices are adopted and implemented nationally. A key aspect of this approach is the creation of a clear roadmap for the regional solar qualification and certification processes. This roadmap will detail governance structures, enforcement mechanisms, and strategies for effective information dissemination at the national level. Additionally, the scope of this activity will be broadened to include cross-cutting areas such as gender sensitivity, integration of digital technologies, and incorporating climate change adaptation measures. Considering these factors, the quality frameworks designed will enhance the solar energy sector's efficiency and reliability and ensure it is inclusive, future-proof, and environmentally sustainable.

The Baseline Assessment conducted as part of this initiative is a critical foundation for developing targeted solar qualification and certification frameworks. This assessment comprehensively analysed existing legislation, standards, and regional capacities and needs. It paid particular attention to the unique aspects of each region, including the maturity levels of solar markets and distinct climate conditions. Based on these findings, the initiative developed tailored frameworks and curricula for solar PV and SHC training, which are intended to enhance regional adoption and implementation at the national level, ensuring that high-quality training is delivered to professionals involved in preparing, implementing, operating, and maintaining solar energy systems.

The assessment document provided several key insights into the current state and future solar qualification and certification prospects in various regions. These insights included:

1. **Quality Standards' Importance:** The document underscored the crucial role of product and service quality standards in the solar field.
2. **Challenges in Developing Countries:** Developing regions face significant challenges in assuring product quality across the solar value chain. These include gaps in qualification and know-how, and a need for more experience in quality installations, which are vital for effective solar energy deployment.
3. **Need for Specialised Qualification and Certification Schemes:** The document emphasised the necessity for reliable and specialised qualification and certification schemes that address the needs of various stakeholders in the solar value chain, including consumers.
4. **Fragmentation and Lack of Training Institutions:** There is a noticeable lack of institutions offering quality curricula and training tailored to the diverse needs of experts in the solar energy sector.
5. **Regional Harmonisation and Collaboration:** The document highlighted the success of regional approaches, as seen in some African economic communities, in harmonizing qualification and certification standards.
6. **Comprehensive Approach to Solar Skills and Certification:** The document underscored the comprehensive approach needed for advancing solar energy skills, certification, and qualification frameworks.

These insights from the document paint a picture of the current challenges and potential strategies for improving solar energy qualification and certification, particularly in regions currently underserved and facing unique difficulties.

## 2. Strategic Recommendations for Enhancing Solar Qualification and Certification

In the dynamic and evolving solar energy landscape, the Pacific Islands region stands at a crucial juncture. The regional framework for solar qualifications and certifications is already established and in use, yet there is a recognised need to reinforce it. Building upon the existing foundation, the development and enhancement of solar qualifications and certifications within this region demand a strategic approach, one that is deeply rooted in the principles of need, outcomes, flexibility, collaboration, and regional ownership. This document outlines a comprehensive strategy for advancing solar qualifications and certifications tailored to meet the unique needs and contexts of the Pacific Islands. The focus is on improving the existing framework so that it not only addresses the immediate requirements of the solar industry but also anticipates future developments and challenges. By adhering to these guiding principles, the Pacific Islands region can

establish robust, adaptive, and widely supported processes for solar energy education and training. These processes will not only elevate the quality and relevance of qualifications but also foster a sense of unity and shared purpose among the diverse countries within the region. The following strategic recommendations aim to build a resilient and integrated solar thermal and PV qualification and certification framework, ensuring that the region remains at the forefront of sustainable energy development. The following are approaches already adopted by EQAP. Gaps and improvements are highlighted to ensure that qualifications are relevant, adaptable, and broadly supported across the region.

- a. **Flexibility in Qualification Structure:** The diverse contexts of different Pacific Island countries should be acknowledged by incorporating flexibility in how qualifications can be achieved. While maintaining a core set of outcomes, some level of localisation (up to 50%) should be allowed to address specific educational, work, and cultural needs.
- b. **Inclusive and Collaborative Development:** The development of solar qualifications should involve industry experts from across the region, facilitated by bodies like Industry Standards Advisory Committees (ISAC) or Industry Programme Advisory Committees (IPAC). All member countries should have the opportunity to contribute to developing and finalising the qualifications, ensuring a truly regional and inclusive approach.
- c. **Accreditation and Standardisation:** Ensure that solar qualifications are accredited on a regional framework like the Pacific Qualifications Framework (PQF) and adhere to the Pacific Quality Assurance Framework (PQAF). This standardisation promotes consistency in qualification quality and facilitates recognition across different countries.
- d. **Regional Ownership and Delivery:** Recognise the joint ownership of the qualifications by all region member countries. Enable countries to adopt these qualifications as national qualifications, while ensuring that delivery providers are approved through rigorous quality assurance processes, either by the Educational Quality and Assessment Program (EQAP) or national quality assurance agencies.
- e. **Continuous Review and Feedback Integration:** Establish mechanisms for ongoing review and feedback collection on the solar qualifications. Regularly update the qualifications to reflect technological advancements, market changes, and evolving industry needs.
- f. **Expansion of In-Country Training:** Address the critical need for more accessible in-country training programs. Expand the availability of training courses across the Pacific, particularly in remote areas, to enable more local companies and individuals to obtain the necessary skills and certification.
- g. **Partnerships with Local and International Bodies:** Strengthen collaboration with organisations like the University of the South Pacific (USP), the Sustainable Energy Industry Association of the Pacific Islands (SEIAPI) and local industry associations, universities and training institutes. Utilise these partnerships to facilitate practical training sessions and subsidise course fees, making certification more attainable for participants from various sectors.
- h. **Integration with National and Regional Projects and Policies:** Work closely with national and regional projects like the Vanuatu Rural Electrification Project (VREP), Tonga Village Network Upgrade/NNUP, and Renewable Energy Project, etc. to incorporate certification requirements into subsidy schemes and include a certified training programme for project personnel in the project outputs. This approach ensures that installers and designers involved in significant regional projects are adequately certified.
- i. **Raising Program Visibility:** Increase the profile of certification programs through active marketing and awareness campaigns. Collaborating with government ministries, utility companies, and private industry can help in elevating the program's visibility and perceived value.
- j. **Encouraging Certification Post-Training:** Implement follow-up mechanisms and incentives to encourage participants to apply for certification after completing training courses. This could involve support in the application process or recognition of certified individuals and companies in industry networks.
- k. **Mandatory Certification for Quality Assurance:** Advocate for policy changes where governments and donors require solar systems to be designed and installed by regional (e.g PPA and SEIAPI) and / or national accredited professionals. This would ensure adherence to international product standards and regional guidelines, enhancing the quality and reliability of solar installations.



- l. **Online and Blended Learning Opportunities:** Leverage technology to offer online and blended learning courses through institutions like the University of the South Pacific's (USP) Pacific Technical and Further Education (Pacific TAFE) and National Universities in Papua New Guinea, Samoa, Solomon Islands, Tonga, etc . This approach broadens access to training, especially in geographically dispersed regions.
- m. **Continuous Collaboration with Stakeholders:** Engage continuously with government departments, donors, and relevant stakeholders to continuously review and align the training and certification programs with regional needs and standards. This includes enforcing compliance with international product standards and regional installation guidelines. Engage with the Secretariat of the Pacific Community's EQAP team and national qualification boards to explore the feasibility of offering a Diploma level qualification for individuals who have already completed Certificate 4 in Sustainable Energy. This step aims to provide a pathway for further education and specialisation in sustainable energy.
- n. **Training of Trainers and Equipment Provision:** Identify the need for training trainers to deliver the Level 5 training effectively. This would involve not only enhancing the pedagogical skills of trainers but also equipping them with the necessary tools and equipment to conduct practical sessions.

These activities underscore the commitment to improving the quality and scope of sustainable energy training in the Pacific region. While they present significant opportunities for educational advancement and skill development in the renewable energy sector, they also highlight the need for additional funding and resources to realise these objectives fully. Addressing the financial constraints will be a critical factor in successfully implementing these proposed activities.

## 2.1 Enhanced Solar Thermal and PV Technology Certification Process

While solar thermal energy has not been as widely adopted in the Pacific region compared to other renewable energy sources like solar PV or wind power, and there is not a notable lack of demand for training on the topic of solar thermal energy in the Pacific region, the interest and potential for its utilisation are growing. In the Pacific region, where abundant sunlight presents a promising opportunity for renewable energy, the advancement of solar thermal processes holds significant potential for sustainable development.

In addition to solar thermal, solar photovoltaic (PV) energy also plays a crucial role in the Pacific's renewable energy strategy. Solar PV systems convert sunlight directly into electricity and are increasingly popular due to their falling costs and ease of installation. In regions like the Pacific, where islands face unique energy security challenges and have abundant solar resources, solar PV can provide a quick and effective solution to meet energy needs without the infrastructural demands of traditional power systems. However, to fully harness this resource, improvements are needed in the efficiency, affordability, and scalability of solar technologies in every country. As one of the largest countries in the region, Australia has been actively exploring solar thermal and PV energy as part of its renewable energy portfolio. Several solar thermal projects, including concentrated solar power (CSP) plants, have been proposed or are in various stages of development in regions with favourable solar resources, such as South Australia and New South Wales. Simultaneously, Australia has also seen a significant increase in solar PV installations, both at residential and commercial scales, driven by supportive policies and incentives. Fiji has shown interest in solar thermal energy as part of its efforts to reduce reliance on imported fossil fuels and promote renewable energy development, alongside increasing the installation of solar PV panels to reduce reliance on imported fossil fuels and promote renewable energy development. The government has supported initiatives to deploy solar water heating systems in residential and commercial buildings, particularly in urban centres like Suva and Nadi. Like Fiji, Samoa has recognised the potential of solar thermal and PV energy to address energy security and environmental sustainability challenges. The government has implemented policies and programs to incentivise the adoption of solar water heating systems, particularly in rural areas where access to electricity and conventional fuels may be limited. Vanuatu, like other Pacific Island nations, faces challenges related to energy security and climate change. The government has prioritised renewable energy development, including solar thermal initiatives, to diversify the energy mix and reduce reliance on imported fuels. Both

nations have also been integrating solar PV systems, particularly in rural areas where access to electricity and conventional fuels may be limited. The government-led incentives typically support the adoption of both solar water heating systems and photovoltaic installations. While specific initiatives may vary, several other Pacific Island nations have expressed interest in solar thermal energy as part of their renewable energy strategies. Overall, the integration of both solar thermal and solar PV technologies is essential for the Pacific region to fully harness its solar energy potential. This dual approach allows for a more resilient and diversified energy strategy that can adapt to the different needs and environmental conditions across the islands. International assistance programs, regional collaborations, and partnerships with development agencies continue to support efforts to promote renewable energy deployment, including both solar thermal and PV, in these countries. International assistance programs, regional collaborations, and partnerships with development agencies support efforts to promote renewable energy deployment in these countries.

Recommendations to enhance solar processes in the Pacific region include:

- a. **Climate-Specific Designs:** Develop solar thermal systems that are specifically designed to withstand the unique climate conditions of the Pacific region, including high humidity, salt spray, and tropical cyclones. This may involve using corrosion-resistant materials, robust mounting structures, and appropriate insulation to ensure durability and reliability.
- b. **Localised Solutions:** Prioritise the development of localised solar thermal solutions that are tailored to the needs and preferences of Pacific Island communities. This may include decentralised solar water heating systems for individual households, community-based solar thermal projects, and off-grid applications in remote areas.
- c. **Adaptation to Island Contexts:** Consider the spatial constraints and land availability in Pacific Island nations when designing solar projects. Explore innovative solutions such as rooftop solar water heating systems, floating solar arrays, and integrated solar-diesel hybrid systems to maximise energy production while minimizing land use.
- d. **Develop Integrated Solar Solutions:** Promote the integration of solar PV with other renewable sources like wind and hydropower to create more stable and reliable energy systems and explore the potential of hybrid systems that combine solar PV and thermal technologies to maximize energy output and efficiency.
- e. **Resilience Planning:** Integrate resilience planning into the design and implementation of solar projects in the Pacific region. This includes considering the potential impacts of extreme weather events, sea level rise, and other climate-related risks on solar infrastructure and implementing measures to enhance resilience and mitigate vulnerabilities.
- f. **Community Ownership and Engagement:** Foster community ownership and engagement in solar projects by involving local stakeholders in the decision-making process, from project planning to implementation and operation. Empower communities to take an active role in managing and benefiting from solar thermal energy initiatives, ensuring that projects align with their priorities and aspirations.
- g. **Capacity Building and Knowledge Transfer:** Invest in capacity building initiatives to develop local expertise in solar technology, including training programs, workshops, and knowledge-sharing platforms. Provide opportunities for hands-on learning, skills development, and peer-to-peer exchanges to build a skilled workforce capable of designing, installing, and maintaining solar thermal systems in the Pacific region.
- h. **Partnerships and Collaboration:** Strengthen partnerships and collaboration between governments, development agencies, non-profit organisations, research institutions, and the private sector to leverage resources, expertise, and networks for advancing solar energy in the Pacific region. Foster cross-sectoral collaboration and information sharing to accelerate progress towards shared goals and objectives.
- i. **Policy Harmonisation:** Promote policy harmonisation and alignment across Pacific Island nations to create an enabling environment for solar thermal and PV energy development. Coordinate efforts to establish supportive policy frameworks, regulations, standards, and incentives that encourage investment, innovation, and market growth in the solar thermal sector while addressing common challenges and barriers.

- j. **Data Collection and Monitoring:** Enhance data collection, monitoring, and evaluation efforts to track the performance, impacts, and effectiveness of solar projects in the Pacific region. Establish robust monitoring systems to collect data on energy generation, cost savings, emissions reduction, and socio-economic benefits, enabling evidence-based decision-making and continuous improvement.
- k. **Sustainable Financing Mechanisms:** Explore innovative financing mechanisms to overcome barriers to investment in solar thermal and PV projects in the Pacific region. This may include leveraging climate finance, green bonds, carbon credits, and public-private partnerships to mobilise funding for solar thermal initiatives while ensuring affordability, accessibility, and sustainability.

## 2.2 Effective Communication Strategies for Solar Certification Awareness

Effective dissemination of solar qualification and certification information is critical to ensure broad awareness and understanding among stakeholders. This can be achieved through well-planned awareness campaigns and diverse communication channels.

Various Pacific Island nations, including Fiji, Samoa, and Tonga, have launched **renewable energy campaigns** to promote the adoption of clean energy technologies among the general public. These campaigns often include public awareness activities, community engagement events, and educational materials distributed through multiple channels such as social media, radio, television, and print media. Governments and utility companies in countries like Vanuatu, Palau, and the Cook Islands have implemented **energy efficiency programs** aimed at educating consumers about energy-saving practices and technologies. These programs often include energy audits, appliance labelling schemes, and public outreach campaigns to encourage behaviour change and reduce energy consumption.

Non-profit organisations, development agencies, and academic institutions in the Pacific region organise workshops, seminars, and **training programs** focused on solar energy technologies. These initiatives aim to build local capacity in solar PV installation, maintenance, and project management, with participants ranging from government officials to community members.

Regional organisations such as the SPC and the Pacific Islands Forum Secretariat (PIFS) organise **energy forums, conferences, and workshops** to facilitate knowledge exchange, collaboration, and capacity building among Pacific Island countries. These events provide platforms for policymakers, experts, and practitioners to discuss energy challenges and opportunities, share best practices, and explore innovative solutions to advance the energy transition in the region.

The focus should be on the implementation of awareness campaigns that clearly communicate the importance and benefits of solar certification to a **broad range of stakeholders**, including potential solar professionals, industry players, policymakers, and the general public, where the advantages of accreditation will be emphasised, such as improved quality of solar installations, increased consumer trust, enhanced safety, and the long-term sustainability of solar investments. To maximise the effectiveness and impact of the campaign, it's essential to harness **various communication channels**. This approach should leverage digital platforms, such as social media, websites, and online forums, to reach a broad audience efficiently. Complement these online efforts with face-to-face activities like workshops and seminars. These in-person events offer detailed information and practical experiences on solar certification, effectively catering to specific audience needs. Technical training sessions can be organised for installers, while informational briefings for policymakers and investors will broaden the campaign's reach and deepen its influence. For this purpose, **collaboration with universities, colleges, and vocational training centres** to integrate information about solar certification into their curricula is vital. They should be the core of this activity, leading consistent and Continuous Communication, providing regular updates about the latest developments in solar certification standards and processes, and establishing feedback mechanisms where stakeholders can express their concerns, ask questions, and provide suggestions regarding solar certification. This two-way communication fosters a sense of community and involvement. The below roadmap outlines this process in phases detailing where the different actors can contribute. Nevertheless, all the dissemination process must be reinforced with collaborative efforts for broader reach, creating **partnerships with industry and government bodies**. Their endorsement can lend credibility and attract wider attention.

By implementing these dissemination strategies, stakeholders across various sectors can be educated and informed about the significance of solar certification, thus fostering a more robust and qualified solar industry. This approach enhances the understanding and adoption of solar certification and supports the overall growth and sustainability of the solar energy sector.

## 2.3 Cross-Cutting Areas in the Design of Quality Frameworks

### a. Gender Inclusivity:

Gender inclusivity in the energy sector is an important aspect of sustainable development in the Pacific region. While there are still challenges to overcome, efforts are underway to promote gender equality and women's participation in energy-related activities. Regional organisations such as the SPC and the Secretariat of the Pacific Regional Environment Programme (SPREP) facilitate collaboration and knowledge sharing on gender and energy issues in the Pacific region. These organisations support capacity-building initiatives, research, and policy advocacy efforts to mainstream gender in energy planning and implementation across multiple countries. Across the Pacific region, the energy landscape is characterised by a strong regional component, yet development in this field often faces challenges in achieving uniform progress across states. While regional cooperation and initiatives have been established, there remains a prevailing approach of individual state focus, hindering cohesive advancement. This introduction highlights the dichotomy between regional collaboration and state-centric approaches within the Pacific's energy sector, underscoring the need for harmonised efforts to foster sustainable development and equitable energy access throughout the region. In the Pacific region, several advanced initiatives focusing on gender inclusivity in the energy sector have been implemented. For example, Fiji and Tonga have made significant strides in integrating gender considerations into their energy policies and programs. The government has established gender-responsive targets and indicators in its National Energy Policy and developed gender mainstreaming guidelines for energy sector planning and implementation. Initiatives such as the Women in Renewable Energy Network (WIRE) promote women's participation in the renewable energy sector through training, mentorship, and advocacy. Papua New Guinea has launched the Women in Energy Program to address gender disparities in the energy sector and promote women's empowerment. The program provides training, mentorship, and business support to women entrepreneurs in the energy industry, particularly in rural and remote areas. It also works to strengthen the capacity of government agencies and utilities to mainstream gender in energy policies and programs.

Overall, these initiatives demonstrate a growing recognition of the importance of gender inclusivity in the energy sector and the implementation of targeted strategies to address gender disparities in access to energy services, participation in decision-making, and economic opportunities in the Pacific region.

Strategies that ensure equal opportunities and fair representation for all genders must be implemented to achieve this. In order to foster an inclusive environment, from developing gender-sensitive training materials to creating specialised programs and policies, each of these strategies is designed to break down barriers and create a more equitable landscape in the solar energy industry.

- **Equal Opportunities and Representation:** Develop strategies to ensure equal opportunities and representation for all genders in solar energy training and certification programs. This might involve offering scholarships or incentives to encourage participation from underrepresented groups.
- **Gender-Sensitive Training Materials:** Ensure that training materials and methodologies are gender-sensitive and do not perpetuate stereotypes. Incorporating case studies and examples that highlight the contributions of diverse individuals in the solar sector can be effective.
- **Development of Inclusive Policies:** Create and enforce policies that promote gender inclusivity within solar energy training and certification programs. This could include setting targets for female participation and ensuring gender balance in decision-making roles.
- **Specialised Training Programs:** Offer technical training programs or incentives aimed at increasing the participation of women and other underrepresented groups in the solar sector.
- **Vocational Workshops from Early Ages:** Introduce vocational workshops focused on solar technologies at early educational stages. These workshops should be designed to spark interest and provide foundational knowledge in renewable energy. By targeting young learners, these workshops

can play a pivotal role in shaping future generations' perceptions and capabilities in the solar energy field, ensuring a diverse and well-prepared workforce. This early engagement can also help normalize the presence of all genders in technical roles, laying the groundwork for a more inclusive industry.

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#### b. Digitalisation:

Following the emphasis on gender inclusivity, the next pivotal aspect in the development of solar energy training and certification is digitalisation. This facet is crucial in adapting to the rapidly changing technological landscape of the solar energy sector.

In the Pacific region, digitalisation initiatives in the energy sector are gaining traction, albeit at varying levels of advancement. Some key areas where digitalisation is making an impact in the Pacific's energy sector include:

- **Smart Grids:** Implementation of smart grid technologies enables utilities to monitor, control, and optimise the distribution of electricity more effectively. Smart grids enhance grid reliability, reduce energy losses, and accommodate the integration of renewable energy sources such as solar and wind power. Countries like Fiji and Samoa are exploring smart grid solutions to modernise their electricity infrastructure and improve energy efficiency.
- **Remote Monitoring and Control Systems:** Remote monitoring and control systems leverage digital technology to monitor energy infrastructure remotely and perform real-time diagnostics and maintenance. These systems enhance the reliability of energy infrastructure, reduce downtime, and optimise asset management. Pacific Island nations, including Vanuatu and Tonga, are investing in remote monitoring solutions to manage their energy assets more efficiently.
- **Renewable Energy Integration:** Digitalisation plays a crucial role in integrating renewable energy sources such as solar and wind power into the energy grid. Advanced forecasting, modelling, and control systems enable grid operators to manage the variability and intermittency of renewable energy generation more effectively. Countries like Papua New Guinea and the Solomon Islands are exploring digital solutions to facilitate the integration of renewable energy into their energy systems.
- **Energy Management Systems:** Energy management systems (EMS) utilise digital technology to optimise energy consumption, improve energy efficiency, and reduce costs in buildings, industries, and communities. EMS platforms provide real-time monitoring, analytics, and control capabilities to identify energy-saving opportunities and implement demand-side management strategies. Pacific Island nations, including Fiji and Samoa, are implementing EMS solutions to reduce energy consumption and greenhouse gas emissions.
- **Customer Engagement and Energy Services:** Digitalisation enables utilities to engage with customers more effectively and offer innovative energy services such as demand response programs, energy efficiency incentives, and personalised energy management tools. Digital platforms and mobile applications empower consumers to monitor their energy usage, receive personalised recommendations, and participate in energy-saving initiatives. Utilities in countries like Tonga and Vanuatu are leveraging digital channels to enhance customer engagement and promote energy conservation.

Embracing digital tools and platforms not only modernises the delivery of training and certification processes but also ensures efficiency and wider accessibility. Incorporating digital literacy as a fundamental component of training programs, investing in robust digital infrastructure, and utilizing advanced data management techniques are essential steps.

These measures will guarantee that participants are well-equipped with the necessary digital skills, making the certification process more adaptable, accessible, and in tune with the demands of the modern energy industry.

- **Incorporation of Digital Tools:** Utilise digital tools and platforms in the delivery of training and certification processes. This could include online courses, virtual simulations for practical training, and digital platforms for certification exams.



- **Data Management and Analysis:** Employ digital solutions for data management and analysis, enabling more efficient tracking of training outcomes, certification renewals, and ongoing professional development.
- **Digital Literacy and Training:** Incorporate digital literacy as a core component of solar energy training programs. This ensures that all participants are skilled in using digital tools essential in the modern energy sector.
- **Investment in Digital Infrastructure:** Invest in digital infrastructure to facilitate online learning, virtual simulations, and automated certification processes, making training and certification more accessible and efficient.
- **Consider integrating Internet of Things (IoT), artificial intelligence (AI) and Industry 4.0: The integration of such technologies and concepts** into the energy sector holds significant potential for the future development of the region. These technologies could revolutionise energy systems management, predictive maintenance, and energy efficiency, driving further innovations and sustainability in the renewable energy sector.

### c. Climate Change Adaptation:

Building on the foundations of gender inclusivity and digitalisation, another vital dimension in solar energy training and certification is Climate Change Adaptation. The Pacific region is particularly vulnerable to the impacts of climate change, including sea-level rise, extreme weather events, and ocean acidification. Consequently, numerous initiatives have been developed to enhance climate change adaptation efforts across various countries in the region. Some of the most advanced initiatives on climate change adaptation in the Pacific region, along with the countries where they are being implemented, include:

- **Climate-Resilient Infrastructure Projects in Fiji:** Fiji has been at the forefront of implementing climate-resilient infrastructure projects to adapt to the impacts of climate change. Initiatives such as the Fiji Roadmap for Accelerated Climate Action (FRACC) prioritise the construction of resilient roads, bridges, and buildings that can withstand extreme weather events and rising sea levels.
- **Community-Based Adaptation Programs in Vanuatu:** Vanuatu has implemented community-based adaptation programs to strengthen the resilience of local communities to climate change impacts. Projects such as the Vanuatu Coastal Adaptation Project (VCAP) focus on building climate-resilient infrastructure, enhancing food security, and promoting sustainable livelihoods in vulnerable coastal areas.
- **Early Warning Systems in Tonga:** Tonga has invested in early warning systems to improve disaster preparedness and response capabilities in the face of climate-related hazards. Initiatives such as the Tonga Climate Resilience Sector Project (TCRSP) focus on strengthening meteorological services, installing weather monitoring equipment, and enhancing community awareness and preparedness for extreme weather events.

These initiatives represent just a few examples of the diverse climate change adaptation efforts underway in the Pacific region. While progress may vary across countries, the shared goal is to build resilience, protect vulnerable communities and ecosystems, and ensure sustainable development in the face of climate change impacts.

This aspect involves embedding resilience and adaptive strategies into the training curriculum, focusing on how solar installations can be designed and maintained to endure climate-related challenges. The curriculum should not only teach technical skills but also emphasise sustainable practices and the role of solar energy as a climate-friendly solution. Additionally, it's vital to foster research and development in solar technologies that are resilient to the impacts of climate change. This approach ensures that the training is current and forward-looking, preparing participants to respond to the evolving environmental challenges effectively.

- **Resilience and Adaptation in Curriculum:** Integrate climate change resilience and adaptation strategies into the training curriculum. Teach how solar installations can be designed and maintained to withstand climate-related challenges, such as extreme weather events.
- **Promoting Sustainable Practices:** Emphasise the role of solar energy as a climate-friendly solution and encourage sustainable practices throughout the training and certification processes.



- **Curriculum Integration:** Integrate climate change adaptation and resilience-building strategies into the training curriculum, teaching how to design and maintain solar installations in the face of climatic changes.
- **Research and Development Support:** Encourage and support research and development in solar technologies that are resilient to climate change impacts.

All these dimensions seamlessly converge into a holistic approach, wherein the integration of cross-cutting areas aims to achieve a unified objective. By aligning quality frameworks with national and regional policies on gender equality, digital transformation, and climate change adaptation, we ensure a cohesive and policy-supported framework. It's crucial to regularly assess and update these frameworks, maintaining their relevance and efficacy in addressing these diverse yet interconnected areas. This involves conducting periodic reviews and actively seeking feedback from participants and stakeholders. Ultimately, it's essential to maintain the flexibility of these frameworks, enabling them to adapt and evolve with new developments and insights in these critical aspects.

By integrating these cross-cutting areas into the design of solar energy qualification and certification frameworks, the solar industry can become more inclusive, technologically advanced, and resilient, ultimately contributing to a more sustainable and equitable energy future. The solar energy sector can ensure its qualification and certification frameworks are technically robust, socially inclusive, and environmentally resilient.

## 1. Enhanced Roadmap for Solar Energy Development in SPC

The development of the roadmap for the SPC begins with a comprehensive stakeholder analysis, a crucial initial step to ensure effective implementation and adherence to the regional framework. This analysis involves identifying key players who will influence and be impacted by the advancement of solar PV and thermal training standards. By understanding the roles, interests, and capacities of these stakeholders, including national qualifications boards, technical institutions, and regional energy and education ministries, the roadmap can be tailored to effectively address the diverse needs and challenges of each member country. This structured approach is vital in aligning national policies with regional objectives, facilitating accreditation, enhancing training quality, and promoting certification standards across the Pacific region. For example, international bodies such as UNIDO and ISA could focus on capacity building and technical assistance measures and strengthen local and regional actors such as PCREEE to support regional harmonisation through policy harmonisation workshops.

**Table 1.1 Stakeholder analysis**

Stakeholder Analysis Matrix						
Stakeholder Name	Impact <i>How much does the project</i>	Influence <i>How much influence do they</i>	What is important to the	How could the stakeholder contribute the	How could the stakeholder block the	Strategy for engaging the stakeholder
Energy specialised regional bodies	High	High	Harmonizing solar energy qualifications and certifications in SPC.	Facilitating regional renewable energy policies and standards.	Island-specific regulatory and logistical challenges.	Policy harmonization workshops and regional cooperation.
Government Bodies and Regulatory Authorities	Medium	Medium	Implementation of regional solar standards and training.	Enforcing consistent solar installation and maintenance standards.	Varying infrastructure and energy policy across islands.	Regular inter-governmental dialogue and policy workshops.
Educational institutions and Training service providers	High	Medium	Developing localized solar energy training and curricula.	Offering accredited solar technician and engineering programs.	Limited resources and access to updated training materials.	Partnerships for resource sharing and curriculum development.
Industry and Employers	Medium	Low	Adoption of skilled labor with standardized training.	Promoting local and regional solar projects and investments.	Economic constraints and limited industrial base.	Industry-led training initiatives and regional business forums.
Academia	Low	Medium	Research on sustainable energy solutions for island communities.	Conducting localized energy research and providing expertise.	Geographical isolation and lack of research funding.	Collaborative research projects and academic exchanges.
NGO and international bodies	Low	High	Supporting energy independence and sustainability in island nations.	Capacity building, technical assistance, and advocacy.	Limited local presence and operational challenges.	Strengthening local partnerships and community projects.

The roadmap for the SPC is designed to enhance solar energy qualifications in the Pacific region. It addresses the unique challenges and opportunities within the Pacific Island Countries and Territories (PICTs), building upon existing regional frameworks and training programs. This plan aims to harmonise standards, elevate training quality, and ensure broader recognition of qualifications across the region. Its phased approach focuses on aligning frameworks, building capacity, expanding specialised training, and advocating for standardised licensing, all aimed at supporting sustainable energy development in the Pacific.

The SPC roadmap for advancing solar energy qualifications is structured into four distinct phases, each tailored to address specific needs and goals in the Pacific region:

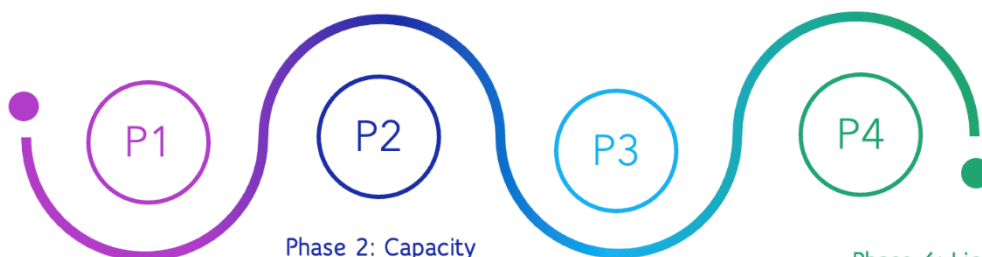
1. **Phase 1: Framework Alignment and Accreditation:** Focuses on aligning regional training standards with national qualifications, ensuring consistency and accreditation across member countries.
2. **Phase 2: Capacity Building and Training of Trainers:** Aims to enhance the capabilities of trainers and educators, upgrading their skills to deliver higher-level courses effectively.
3. **Phase 3: Expansion of Specialised Skillset Courses:** Centres on broadening the range of specialised courses available, catering to the growing industry demand for advanced skills in solar energy systems.
4. **Phase 4: Licensing and Certification Advocacy:** Involves working with national authorities to advocate for the recognition of these new qualifications and promoting standardised licensing practices.

Each phase is integral to developing a comprehensive and robust framework for solar energy training in the Pacific, contributing to the region's sustainable energy goals. For each phase of the SPC roadmap, considering its specific context and challenges, the plan would detail:

- a. **Players & Responsibilities:** Assign organisations such as SPC's EQAP, national qualifications boards, and regional technical institutions to specific roles, ensuring they drive actions in their areas of expertise and influence.
- b. **Activities:** List precise actions like conducting regional framework assessments, developing training programs, and engaging with national authorities for course accreditation and licensing. These are some of the activities that an organisation such as PCREEE is well placed to lead on.
- c. **Timeframe:** Establish clear timelines for each phase, providing start and end dates to ensure timely progress and implementation.
- d. **Strategic Recommendations Integration:** Each activity will be aligned with overarching strategic goals, such as enhancing regional qualification standards and fostering industry-specific training quality.

This approach ensures that the roadmap is not only comprehensive and context-specific but also actionable, with each stakeholder understanding their role in achieving the collective objectives of enhancing solar energy qualifications in the Pacific region.

## ROADMAP FOR ENHANCING SOLAR QUALIFICATION AND CERTIFICATION WITHIN THE SPC



### Phase 1: Framework Alignment and Accreditation

- Objective: To align the regional training standards with national qualifications and ensure accreditation across member countries.
- Outcome: Achieve a harmonized and recognized regional framework for solar energy training and certification.

### Phase 2: Capacity Building and Training of Trainers

- Objective: To upgrade the capabilities of trainers and educators for delivering higher-level and updated solar PV and thermal training courses.
- Outcome: A well-equipped pool of trainers capable of delivering advanced solar energy training, leading to improved educational standards across the region.

### Phase 3: Expansion of Specialized Skillset Courses

- Objective: To broaden the range of specialized training courses, addressing the specific skill requirements of the solar energy industry.
- Outcome: Diversified and industry-relevant training offerings that cater to the evolving needs of solar energy technicians and professionals.

### Phase 4: Licensing and Certification Advocacy

- Objective: To collaborate with national authorities for the recognition of new qualifications and to promote standardized licensing practices in solar energy.
- Outcome: Establishment of recognized and standardized licensing procedures, leading to a more regulated and professional solar energy sector in the Pacific region.

### Phase 1: Framework Alignment and Accreditation

- **Players & Responsibilities:** SPC Educational Quality and Assessment Programme (EQAP) and national qualifications boards, national universities.
- **Activities:** Assess current adoption levels of the regional framework, facilitate accreditation of training standards in member countries.
- **Timeframe:** Immediate to Q3 2024.

**Strategic Integration:** Align with regional qualification requirements, advocate for accreditation within national frameworks.

### Phase 2: Capacity Building and Training of Trainers

- **Players & Responsibilities:** SPC, PCREEE, and technical institutions like TIST, Universities, Training Institutes.
- **Activities:** Develop a training-of-trainers program for Level 5 Diploma skills, upgrade existing courses.
- **Timeframe:** Q4 2024 - Q2 2025.

**Strategic Integration:** Enhance training quality to meet industry demand for higher-level qualifications.

### Phase 3: Expansion of Specialised Skillset Courses

- **Players & Responsibilities:** USP Pacific TAFE, SEI-API, local training providers, and national universities.
- **Activities:** Offer specialised courses for grid-connected and off-grid systems, ensure courses are accredited and recognised within national frameworks.
- **Timeframe:** Q3 2025 - Q2 2026.

**Strategic Integration:** Address industry needs for specialised, hands-on training to upskill technicians.

### Phase 4: Licensing and Certification Advocacy

- **Players & Responsibilities:** National energy and education ministries, PCREEE, SEI-API, national universities.
- **Activities:** Work with national authorities to recognise Level 5 qualifications for specialised licensing, promote certification programs.
- **Timeframe:** Q3 2026 onwards.

**Strategic Integration:** Ensure that advanced training leads to recognised qualifications and certifications, encouraging industry standards and safety.

This roadmap aims to systematically elevate the solar PV and thermal training to meet the evolving demands of solar PV and thermal training to meet the evolving demands of the industry in the Pacific region. The stages are designed to foster compliance with established regional frameworks, expand the scope of training, facilitate the recognition of qualifications, and advocate for standardised licensing, ultimately leading to an empowered workforce equipped to support the growth of sustainable energy in the Pacific.

## 2. Conclusion

Developing and enhancing solar energy qualification and certification frameworks are vital to ensuring the long-term sustainability and success of solar markets and investments, particularly in developing countries. The challenges in these regions, including the lack of qualification, know-how, and experience regarding quality installations, underscore the pressing need for specialised qualification and certification schemes. Regional harmonisation and collaboration, as demonstrated by various economic communities, provide a successful model for fostering cross-border learning and quality services in solar energy.

The STAR-C project, initiated by UNIDO and the ISA, is poised to make significant contributions by focusing on the ECOWAS, EAC, and SPC/PIF regions. Based on lessons learned from previous interventions, its regional approach emphasises collaboration, partnerships, and regional ownership. The project recognises the importance of sustainable energy development and aligns with global efforts to combat climate change.

Moreover, the strategy emphasises the importance of flexibility in qualification structures to accommodate the diverse contexts of different Pacific Island nations. While maintaining core competency standards, there's room for customisation to cater to each country's specific educational, work, and cultural needs. Collaboration and inclusivity are central themes throughout the strategy. It advocates for the involvement of industry experts from across the region in developing solar qualifications, ensuring a truly collective and region-wide approach. The goal is to create qualifications that resonate with each island nation's specific needs and aspirations. Standardisation and accreditation are key components to promote consistency and recognition of qualifications across the region. By adhering to established regional frameworks and quality assurance standards, the strategy aims to elevate the overall quality of solar education.

Furthermore, regional ownership is highlighted, proposing that all member countries jointly own qualifications. Countries are encouraged to adopt these qualifications as national standards while maintaining rigorous quality assurance processes for education providers. Continuous review and feedback collection mechanisms are suggested to keep qualifications aligned with evolving industry trends and technological advancements. This ensures that qualifications remain relevant and responsive to the changing demands of the solar sector in the Pacific Islands. In addition to these strategic recommendations, the document provides practical suggestions for advancing sustainable energy development in the region. These include expanding local training opportunities, forming partnerships with relevant organisations, integrating certification requirements into regional projects, raising awareness about certification programs, and offering online learning options to reach geographically dispersed regions. Overall, the strategy aims to create a robust and adaptable framework for solar qualifications and certifications in the Pacific Islands, tailored to the region's unique needs and challenges, focusing on inclusivity, practicality, and collaboration.