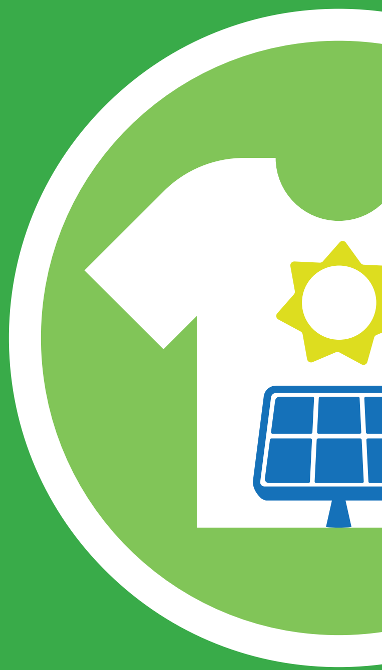
STAR
Sustainable Textiles of the Asian Region

Advocating for Improved Renewable Energy Regulations in Garment Producing Nations



STAR Position Paper

A Position Paper: Sustainable Textiles of the Asian Region Network

Oct 2024

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LIST OF ACRONYMS

BGMEA	Bangladesh Garment Manufacturers and Exporters Association
BKMEA	Bangladesh Knitwear Manufacturers and Exporters Association
CAPEX	Capital Expenditure
C&I	Commercial and Industrial
ESG	Environmental and Social Governance
FiT	Feed-in-Tariff
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit (German Society for International Cooperation)
GW	Gigawatt
ITC	Investment Tax Credit
kW	Kilowatt
kWh	Kilowatt-hour
MNRE	Ministry of New and Renewable Energy (India)
MW	Megawatt
NREL	National Renewable Energy Laboratory
OPEX	Operational Expenditure
PPA	Power Purchase Agreement
PV	Photovoltaic
RE	Renewable Energy
REPP	Renewable Energy Performance Platform
RPS	Renewable Portfolio Standards
RTS	Rooftop Solar
SDGs	Sustainable Development Goals
SECI	Solar Energy Corporation of India
STAR	Sustainable Textiles of the Asian Region (STAR) Network
VA	Voluntary Agreements
USD	United States Dollar

FOREWORD

All nine STAR members contributed to this paper. The foreword has been developed by two:

By Mr. Ken Loo, Secretary General of TAFTAC

As the Secretary General of the Textile, Apparel, Footwear & Travel Goods Association in Cambodia (TAFTAC), I am pleased to introduce this important position paper on renewable energy adoption in the garment and textile industries across STAR Network member countries. This paper, a result of thorough collaboration and research, serves as a key resource for advancing sustainable energy solutions.

In Cambodia, as in other STAR member countries, the transition to renewable energy—particularly rooftop solar—has been challenging due to high upfront costs, regulatory barriers, and limited financing options. However, with the insights and recommendations provided here, we are better positioned to advocate for policies that can drive meaningful progress. This paper offers succesful case studies of what has worked in other nations, and practical steps for overcoming these challenges and supporting the adoption of cleaner, more efficient energy practices.

TAFTAC, along with the other STAR Members, is fully committed to this collective effort, and we will continue to work with our regional partners to advocate for, and promote sustainable solutions that benefit both our industries and the environment.

By Ms. Rosaline (Daw Khine Khine Nwe), Secretary General of MGMA Myanmar

As Secretary General of the Myanmar Garment Manufacturers Association (MGMA), I am proud to contribute to this position paper on renewable energy in the garment and textile sector. Myanmar, like other STAR Network countries, is facing challenges in the transition to sustainable energy, and this paper outlines the key obstacles and opportunities that lie ahead.

The barriers to renewable energy, such as high costs and complex regulations, are real, but they can be addressed through better policies, access to financing, and regional cooperation. This paper provides clear (albeit broad) recommendations that will help our industries take practical steps toward adopting rooftop solar and other renewable energy technologies, reducing our reliance on traditional energy sources and supporting environmental sustainability.

MGMA is committed to playing its part in this effort, and we are ready to work with our partners across the STAR Network to make these goals a reality. Together, we can help build a more sustainable and resilient future for our industries and our countries.

A. EXECUTIVE SUMMARY

The STAR Position Paper & Toolkit for Advocating Improved Renewable Energy (RE) Regulations in Garment Producing Nations is an initiative aimed at empowering STAR members to promote sustainable energy practices within the textile and garment industry.

This document serves as both an advocacy tool and a position paper (a statement of commitment from the STAR Members), providing insights and actionable knowledge to drive the adoption of RE, particularly rooftop solar (RTS), in major garment-producing countries. The paper addresses the pressing need for effective policies, regulations, and programs that facilitate RE adoption in these regions. By analysing both successful and unsuccessful RE initiatives, the paper provides lessons and case studies to guide advocacy efforts at national and regional levels.

The paper also makes the case that sustainability can very much be a competitive advantage: Going green isn't just about the environment—it's about staying competitive. The paper argues that garment producing nations who embrace renewable energy will be better positioned in global markets, where sustainability is increasingly a key demand from buyers and consumers alike. The STAR Members in turn call for and are ready to support initiatives that make the industry more sustainable.

The paper is based on comprehensive desk research and consultations with STAR Members and experts from the GIZ Project Development Programme (PDP). Preliminary findings were shared at the STAR Trade & Sustainability conference in Bangkok on June 5th, 2024, followed by additional feedback during a final virtual engagement.

Key Challenges: This paper highlights three main barriers to Rooftop Solar (RTS) adoption across STAR member countries. Overcoming these challenges is essential to creating a supportive environment for RTS investments and advancing sustainable energy goals within the textile and garment sectors. The challenges include:

1. The most significant challenge is the high upfront cost of RTS installations, which is typically beyond the reach of small businesses without financial support. Adoption is further limited by the lack of accessible financial products like low-interest loans, subsidies, and grants. Existing financing options often carry high interest rates and short repayment terms, discouraging potential users. Additionally, steep import duties on RTS components substantially increase system costs, adding to the financial burden.

2. Another major obstacle is the complex and often unclear regulatory environment, making it difficult to secure the necessary permits and approvals for RTS installations. The lack of supportive policies, such as net metering and tax incentives, reduces the financial viability of RTS systems. Furthermore, frequent and unpredictable changes in policies and incentive programs create uncertainty, deterring investment in RTS projects.

3. Adoption is also hindered by a widespread lack of awareness and understanding among potential users. Many are unaware of the benefits and practicality of RTS systems, leading to low adoption rates. Misconceptions about the reliability, efficiency, and maintenance requirements of solar energy further complicate the issue. Additionally, the shortage of trained and certified professionals for RTS installation and maintenance affects the quality and reliability of these systems.

Strategic Recommendations/Key Asks: This paper offers tailored recommendations for each STAR member country, from the perspectives of the STAR Members themselves, emphasizing the need to broaden financing options, simplify regulatory frameworks, and increase awareness of renewable energy benefits. It also underscores the importance of regional cooperation, advocating for the creation of a digital knowledge platform, the harmonization of technical standards across the region, and the formation of a regional solar procurement consortium.

B. BACKGROUND AND RATIONALE FOR THE STAR POSITION PAPER

The STAR Position Paper & Toolkit for Advocating Improved Renewable Energy Regulations in Garment-Producing Nations is designed to empower STAR member associations in advancing sustainable energy practices within the textile and garment industry. This initiative reflects our collective commitment to driving effective policies, regulations, and programs that promote the adoption of RE, particularly RTS, across key garment-producing countries.

As members of the STAR Network, we are resolute in our mission to make our supply chains more sustainable—a task that demands strategic action and informed insights. This position paper consolidates extensive research on RE initiatives, analysing both successes and challenges, and presenting case studies that offer critical lessons for our advocacy efforts at national and regional levels. By providing STAR members with comprehensive, actionable knowledge on RE initiatives, this document serves as both an advocacy tool and a unified position paper, articulating our collective voice and our shared demand for enhanced support for RE projects.

Our goal through this policy paper is to create a practical guide for engaging with government counterparts, enabling our members to advocate more effectively for improved policies and support mechanisms in our respective regions of influence and operations. With our substantial influence and broad membership base, STAR associations are uniquely positioned to drive policy enhancements, but efforts have sometimes been limited by a lack of clear strategic insights. This position paper is an attempt to bridge the gap, equipping us to lead positive changes toward sustainable production practices across the garment and manufacturing industries.

C. STATEMENT OF INTENT OF STAR MEMBERS

We, the members of the Sustainable Textile of the Asian Region (STAR Network), representing producer associations from Bangladesh, Cambodia, China, Myanmar, Pakistan, and Vietnam, are united in our commitment to driving the green energy transition within the textile and garment industry. Launched by the GIZ FABRIC project, our network is committed in its mission to promote sustainability and lead the shift towards cleaner, more efficient energy practices.

In alignment with the United Nations Sustainable Development Goals (SDGs), particularly Goal 12, which focuses on ensuring sustainable production and consumption patterns, we acknowledge the critical need for a swift transition to green energy sources. As pivotal players in the textile and garment industry, we are acutely aware of our responsibility to reduce our carbon footprint and adopt sustainable practices that benefit both our environment and our communities.

Through the STAR Network, we aim to work closely with our respective governments to expedite this transition.

We are dedicated to sharing best practices, promoting innovation, and advocating for policies that encourage the adoption of green energy solutions. By collaborating as a united front, we are confident in our ability to build a more sustainable and resilient industry that contributes positively to our economies and the planet.

We look forward to engaging in meaningful dialogue and forging strong partnerships with governments, industry stakeholders, and civil society to accelerate the green energy transition in the textile and garment sector.

STAR Member	Representative
BGMEA	Mr. Miran Ali
BKMEA	Mr. Ehsan Fazlee Shamim
CNTAC	Dr. Liang Xiaohui
MGMA	Mrs. Khine Khine New (Rosaline)
PHMA	Mr. Junaid Esmail Makda
PTEA	Mr. Azizullah Goheer
TAFTAC	Mr. Ken Loo
TMA	Mr. Muhammad Muzzammil Hussain
VITAS	Ms. Mai Tu Yet

D. METHODOLOGY AND APPROACH

The methodology for this paper combined extensive desk research with consultations involving STAR members and country representatives from the PDP. The engagement with these stakeholders was intended to gather additional practical insights and the most up-to-date perspectives on RE initiatives, complementing the research findings.

The initial findings were presented and discussed at the STAR conference in Bangkok, Thailand, on June 5th, 2024. Feedback from this event was instrumental in refining the paper, ensuring it addressed the key concerns of stakeholders. Following the conference, a final virtual engagement was held on August 12th, 2024, where updates were shared, and additional feedback was gathered from all involved parties, including STAR members. The insights from these discussions were integrated into the final document, ensuring it accurately reflects the collective experiences and priorities of STAR members.

Though it is of course challenging putting forward recommendations for 6 diverse countries, this approach has resulted in a broad tool for advocating improved RE regulations in garment-producing nations, grounded in the real-world experiences of industry stakeholders. It also makes the statement (from the STAR Members), that they are committed to supporting the transition to renewable energy sources.

E. ALIGNMENT WITH KEY FINDINGS FROM FPC'S DECARBONIZATION WHITE PAPER

The STAR Paper considers and builds upon the Fashion Producer Collective (FPC) Paper, "From Catwalk to Carbon Neutral: Mobilizing Funding for a Net Zero Fashion Industry", published in March 2024 (Wickramasuriya, 2024). The STAR Network has collaborated with the FPC in the past. The STAR Network endorsed the FPC paper and supported its outreach, recognizing its alignment with the current STAR Paper's views.

The Fashion Producer Collective (FPC)

The Fashion Producer Collective (FPC) is a collection of self-organized producer-led projects focused on sustainability in the fashion sector. Participating producers represent a range of perspectives and join as individuals not formal representatives of their companies. The FPC, as with the STAR Network, is also supported by the GIZ FABRIC Project.

FASHION PRODUCER COLLECTIVE

The FPC Paper underscores the need for a comprehensive approach to climate action in the fashion industry. It calls for shared responsibility in addressing climate change, emphasizes the importance of adaptation and resilience alongside decarbonization, and suggests restructuring supply chain funding to promote sustainability. The report identifies obstacles to decarbonization, and the necessity for a collective approach to decarbonization:

Table 1:Key Hinderances to Decarbonization Efforts

STAR Member	Representative
Capital expenditure (CAPEX) risk not shared	Manufacturers said that, on the one hand, the full burden and risk of capital investments tended to fall on them whilst, on the other, they struggled to raise the requisite funding.
Lack of solutions beyond debt	Many manufacturers, especially in the small and medium enterprise (SME) sector, said their high leverage and limited company size placed debt out of reach. Without other (non-traditional) funding options, and the sharing of climate action risk-reward, industry-wide decarbonization will lag and falter.
Burden of increased operating expenses (OPEX) not shared	When decarbonization projects add to their operating costs (short-term or otherwise) without the option of sharing these among value chain participants, including consumers, manufacturers worry they cannot invest without making unworkable margin cuts.
Business cycle risk	Interviewees said they typically do not have much visibility into the order pipelines beyond a season. The fashion industry's cyclical nature thus reduces the span during which investment practically occurs.
Debt affordability	Lack of access to lower-cost US dollar or euro funds keeps domestic financial markets in manufacturing countries from supporting decarbonization. Other obstacles were high double-digit interest rates applicable in local currencies and, to a degree, the absence of financial system transparency and depth resulting in poor local capacity and resources.

STAR Member	Representative
Lack of tools to derisk investment and debt	An estimated 45% of Tier-1 entities and nearly 30% of Tier-2 entities are in developing countries where adverse macroeconomic conditions have led to elevated country and equity risk premiums, making them riskier to potential lenders. Some manufacturers cannot raise funds because of the risk profile of their organization or of a given project.
Lack of local policies for RE and energy transition	Some respondents in certain jurisdictions lamented the lack of reliable legal frameworks, the adverse impact of certain domestic energy policies and the absence of physical infrastructure to support specific decarbonization strategies.

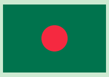
F. INTRODUCTION TO STAR NETWORK

The STAR Network is the first inter-Asian network of producer associations, established in 2016 with the support of the GIZ FABRIC Project. It brings together nine associations from Bangladesh, Cambodia, China, Myanmar, Pakistan, and Vietnam. Representing over 35,000 members and around $400 billion in export value, the STAR Network serves as a platform for dialogue and trust-building, helping its members find solutions to common challenges, particularly those related to sustainability.

The network aligns with the globally agreed Sustainable Development Goals (SDGs), especially Goal 12, which focuses on ensuring sustainable production and consumption patterns. In response to the ongoing globalization and complexity of textile and garment supply chains, the STAR Network aims to foster a better understanding of industry mechanisms, with the goal of jointly shaping a sustainable and growth-oriented future for the sector.

Currently, the STAR Network consists of 9 members, across 6 countries: Bangladesh, Cambodia, China, Myanmar, Pakistan and Vietnam.

Table 2: STAR Network Member Countries

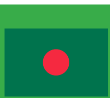
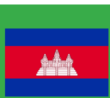
Country	Associations
	BGMEA: Bangladesh Garment Manufacturers and Exporters Association BKMEA: Bangladesh Knitwear Manufacturers and Exporters Association
	TAFTAC: Textile, Apparel, Footwear & Travel Goods Association in Cambodia
	CNTAC: China National Textile and Apparel Council
	MGMA: Myanmar Garment Manufacturers Association
	PHMA: Pakistan Hosiery Manufacturers & Exporters Association PTEA: Pakistan Textile Exporters Association TMA: Towel Manufacturers Association of Pakistan
	VITAS: Vietnam Textile and Apparel Association

G. ENERGY OVERVIEW AND CHALLENGES FOR STAR NETWORK MEMBER COUNTRIES

The STAR member countries exhibit a diverse array of energy landscapes, characterized by varying levels of installed capacity, energy mix, and consumption patterns. Despite these differences, common challenges persist across the region, including financial barriers, technical and infrastructure limitations, and regulatory complexities. These challenges hinder the effective adoption and integration of RE sources in garment sector, particularly rooftop solar, which is seen as a critical component for achieving sustainable energy goals for the garment sector.

The following table provides a detailed snapshot of key energy indicators, including total installed capacity, energy mix, electricity generation, energy imports, sector-wise power consumption, installed rooftop solar capacity, energy costs, and prevailing energy trends. Additionally, it highlights the specific challenges faced by each country in the RE sector and outlines potential key actions to address these barriers and promote a more robust and sustainable energy infrastructure across the STAR member countries.

Table 3: Overview of Energy Sector in STAR Network Member Countries (Bangladesh[1], Cambodia[2], China[3], Myanmar[4], Pakistan[5,6,7] and Vietnam[8])

Indicators/ Countries						
Total Installed Capacity (MW)	24,911 (2023)	4,649 (2023)	2,920,000 (2023)	7,100 (2022)	42,931.83 (2023)	80,555 (2023)
Total Electricity Generation (GWH)	88,450 GWh	16,751.29 GWh	8,909,000 GWh	17,319 GWh	129,473.20 GWh	271,679 GWh
Generation Mix (%)	**Coal:** 10.81% **Furnace oil:** 26.06% **Natural gas:** 45.65% **Power Imports:** 10.66% **Solar:** 1.84%	**Coal:** 27.96%, **Fuel oil:** 10.06% **Hydro:** 38.52% **Solar:** 9.39% **Fuel oil:** 8.60% **Biomass:** 1.05%, **Imports:** 14.45%	**Hydro:** 14.4%, **Nuclear:** 1.9%, **Solar:** 20.9% **Thermal:** 47.6%, **Wind:** 15.1%,	**Coal:** 2% **Natural Gas:** 50% **Hydro:** 45% **Solar:** 3%	**Hydro:** 18% **Nuclear:** 20% **Thermal:** 58% **Renewable:** 4%	**Coal:** 33% **Gas:** 9% **Hydro:** 28% **Oil:** 1% **RE:** 27% **Import:** 1.2% **Diesel and others:** 0.2%

1. Bangladesh Power Development Board, Annual Report, 2023

2. Electricity Authority of Cambodia, Salient Features of Power Development in Cambodia, 2023

3. Climate Energy Finance, 2023 China Electricity Mix Yearly Review, 2023

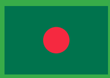
4. World Bank, In the Dark: Power Sector Challenges in Myanmar, 2023

5. Ministry of Energy (Power Division), Yearbook 2022-2023, 2023

6. Tehmina Asad, Pakistan Energy Outlook, 2023

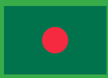
7. National Electric Power Regulatory Authority, Performance Evaluation Report, 2023

8. Vietnam Electricity (EVN), Annual Report 2022-2023, 2023

Indicators/ Countries						
Sector Wise Power Consumption (%)	**Domestic:** 55.69% **Industrial:** 27.63% **Commercial:** 11.09% **Agriculture:** 2.64% **Other sectors:** 2.95%	**Residential:** 93%, **Small business, service, commercial, industrial:** 5% **big medium commercial and industrial:** 0.2%, **and others**	**Industry:** 58% **Residential:** 17% **Service:** 16% **Others:** 9%	**Residential:** 46% **Industrial:** 28% **Others:** 26%	**Residential:** 46% **Industrial:** 27% **Agricultural:** 12 **Commercial:** 7% **Other:** 7%	**Industrial:** 53% **Transport:** 17% **Residential and commercial:** 30%
Installed Rooftop Solar Capacity (MW)	0.366MW under net-metering scheme	Around 200MW according to MME[9]	27300MW in 2021[10]	181 MW (Utility scale solar only)	1,055.03 MW under net-metering scheme	9,730.87 MW by end of 2020
Energy Costs (USD/kWh)	Average Bulk Electricity Supply Cost 0.05/ kWh	Industrial and agricultural consumers connected at MV: 0.1370 USD/kWh	Residential ~0.071, Industrial ~0.011 USD/ kWh (April-May 2022)	Residential: 0.019 USD/ kWh. Business: 0.051 USD/kWh	~0.16 USD/ kWh	Range from 0.065 to 0,071 USD/kWh depending on voltage level
Overall Sector Specific Challenges	•Fuel supply constraint, •Dependence on imports, •Substantial losses in the transmission and distribution systems.	•Unstable power supply and system, •High electricity prices	•Grid lock: there's growing strain on its electricity distribution and transmission.	•Severely affected by the ongoing political turmoil, •Power supply-demand gap, constrained, •Network capacity, •Financial losses.	•High dependent on imported fossil fuels, •Transmission and distribution system damaged, •Circular debt,	•Energy shortage and blackouts, •Operational challenge, •Congestion and overload

9. The Electricity Authority of Cambodia has recently announced that all solar system owners must declare their systems. This will enable the authority to monitor the actual capacity for better future planning.

10. Energy Central, China: Rooftop solar energy to power nation's green development, 2022

Indicators/ Countries						
Challenges to Uptake of RE	•High interest rates and short loan tenures making investment into RTS projects challenging. •In comparison to utility-scale solar projects, RTS seems disproportionately affected by high import duties ranging from 11.2% to 58.6% on different accessories.	•Contractual agreements' legal standing is unclear as per current regulations, with potential uncertainty about long-term benefits versus leasing costs and restrictions on direct on-site PPAs.	•Factories in certain areas must use a minimum amount of grid electricity, otherwise they can't use self-generated electricity. In parts of China, selling surplus RE energy back to the grid is difficult, especially for garment industry developers.	•Regulatory framework does not specifically target the RTS business and lacks a net metering scheme.	•Government's announcement to transition from net metering to gross metering for RTS has raised concerns. The shift aims to address financial challenges but may discourage RTS, potentially increasing electricity costs.	•The frequent changes to the FiT and other incentive schemes have created a perception of a variable market, discouraging long-term investment.

1. Specificities of Energy Requirements in Garment and Textile Sector

The energy requirements within the garment and textile sectors may differ due to different processes and specific energy demands. The textile sector commonly requires substantial heat, while the garment manufacturing process may require increased electricity to support the operation of cutting, sewing, and packaging machinery. Different renewable energy technologies are applicable and relevant to each specific sector. The following table presents general information on the processes and energy requirements within these two sectors.

Textile sector

Sector Specificities	Description
High Thermal Energy Demand	Renewable energy sources like solar may be less efficient in providing the consistent high-temperature heat required. While solar thermal systems can contribute, their intermittent nature and lower temperature outputs compared to fossil fuels could make them less reliable without significant energy storage solutions.
Intermittency and Reliability	Renewable energy sources are intermittent, leading to potential production disruptions unless supplemented with energy storage systems or backup power from non-renewable sources. Due to this, possibility of having grid connected RE technologies is a key.
Space Requirements	The installation of renewable energy systems, such as solar panels or wind turbines, requires substantial space. This requirement may pose a challenge in densely populated industrial areas wherein textile factories are typically located. Additionally, if the facility is not under the ownership of the factory operator, this circumstance can present an additional obstacle to investing in renewable energy.
Energy Storage and Grid Integration	Storing renewable energy (e.g., via batteries) or integrating it into the grid can be costly and technically challenging. Textile plants often run 24/7, so the need for reliable energy storage or grid solutions is critical.
Capital Investment	Transitioning to renewable energy technologies often requires substantial upfront investment, which can be a barrier for many textile manufacturers where heat consumption is very high.

Sector Specificities	Description
Low-Energy Processes	These processes require electricity for machinery rather than heat, making them more compatible with renewable energy sources such as solar. However, if a factory has low energy demand, this may not justify the high initial investment in renewable energy infrastructure.
Intermittency and Peak Demand	The operation of garment factories requires uninterrupted electricity supply, particularly during high-production periods. The intermittent nature of renewable energy technologies may pose challenges in meeting peak electricity demands, unless complemented by reliable storage or backup systems. Consequently, integrating RE technology with the existing grid infrastructure emerges as an ideal solution to address these concerns.
Energy Quality and Stability	Some garment processes, like digital printing, require stable electricity with minimal fluctuations. Renewable energy sources can cause voltage fluctuations, impacting the quality and consistency of output unless mitigated by advanced power conditioning systems.
Supply Chain Coordination	The garment sector often operates on tight schedules with synchronized supply chains. Any interruption or inconsistency in energy supply from renewables can ripple through the supply chain, causing delays and inefficiencies.

While solar energy offers ease of implementation, its availability can present certain limitations. In light of this, other renewable energy technologies, such as biomass and biogas, may present viable alternatives depending on specific requirements and geographic conditions. However, these technologies also face challenges, including geographic constraints, availability of feedstock, infrastructure costs, and potential environmental impacts. With careful planning and adequate capital investment, these technologies can be effectively integrated to meet energy demands across sectors. The table below outlines the general suitability of various renewable energy technologies for the garment and textile industries.

RE technologies	Textile sector	Garment sector
Biomass	Particularly effective in providing the high thermal energy needed for processes like dyeing, bleaching, and finishing.	Typically, less commonly used in the garment sector because the energy demand here is primarily electrical rather than thermal.
Biogass	Can utilize waste products from the textile process, creating a circular energy system.	Applicable more to smaller or off-grid facilities.

Despite the differences between the two sectors, their fundamental operations and principles are generally similar. Furthermore, compared to other RE technologies, it is evident that RTS holds the most relevance for both sectors concerning capital investment and ease of implementation. As a result, the primary focus of this report will be on RTS technologies.

H. SITUATIONAL ANALYSIS

2. Overview of Typical Policies and Programs

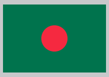
This section provides a brief overview of policies and programs aimed at promoting RE in the industrial sector with particular relevance to the garment sector. The sector has significant potential for adopting RE technologies, which can be achieved through the implementation of supportive policies and programs. These initiatives are designed to encourage the use of RE sources, facilitate investment in RE projects, and ensure that the necessary infrastructure and workforce are in place to support the transition to cleaner energy.

The following table summarizes key policies and programs that promote RE, and the next section provides information on the availability of these policies in STAR member countries to facilitate a better understanding of the existing situation.
Table 4: Key Policies and Initiatives that Support RE Adoption

Policy Framework	
Feed-in-Tarif (FiT)	FiT is a policy mechanism that promotes the adoption of RE sources by offering long-term, guaranteed, above-market-rate payments to RE producers.
Net Metering	Net metering is a scheme utilized when the owner of a solar photovoltaic (PV) system produces more energy than they consume. Excess energy is sent to the grid, and the system owner receives credits to offset future electricity usage.
Tax Incentives	Tax incentives and rebates are standard policy instruments used to incentivize the adoption of RE technologies. One example is tax exemption and tax credits.
Voluntary Agreements (VA)	VA are policy measures governmental bodies use to incentivize the advancement and adoption of renewables.
Wheeling	Wheeling involves transferring electrical power through a utility's transmission or distribution system between grid or network service areas, providing a cost-effective way to obtain cleaner power and enabling industrial facilities and factories to procure clean, private power while still supporting the utility.
Renewable Portfolio Standards (RPS)	RPS also known as a Renewable Electricity Standard (RES), is a regulatory mandate to increase the production of energy from renewable sources such as wind, solar, biomass, and geothermal.
Workforce Training and Certification	Workforce training and certification programs aimed to ensure that the necessary skills and knowledge are available among relevant individuals to implement RE projects.
Investment Framework	
Financing options (PPA, Lease, On-bill Financing)	Regulation with a standardized Power Purchase Agreement (PPA) entails a governing framework that outlines the interaction between RE producers and electricity buyers, such as industrial facilities or other large energy consumers.
Risk Sharing Schemes	A risk-sharing facility is a financial mechanism that helps to share or mitigate the risks associated with solar investments and makes projects bankable.
Special Credit Lines	Special credit lines that provide access to affordable credit and loans specifically for solar energy projects.

Some policies and programs outlined above are currently already implemented in some STAR member countries. While some are in the early stages of development, others still need to be made available. To gain a comprehensive understanding of the current availability of these policies and programs, the table below provides a summary of their status in STAR member countries.

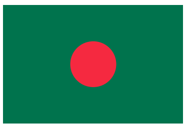
Table 5: Status of Key Policies and Programs in STAR Network Member Countries

Factors/Countries						
Policy Framework						
Vision, Objectives, And Target	Green	Green	Green	Yellow	Green	Green
Feed-In-Tariff	Green	Red	Green	Red	Red	Red
Net Metering	Red	Red	Yellow	Red	Green	Red
Tax Incentives and Rebates	Yellow	Yellow	Green	Yellow	Yellow	Yellow
Voluntary Agreement	Red	Red	Green	Red	Yellow	Yellow
Wheeling Mechanism	Red	Red	Green	Red	Red	Green
RPS	Red	Red	Green	Red	Red	Red
Training & Certification	Yellow	Yellow	Green	Yellow	Yellow	Green
Investment Framework						
Direct PPA	Yellow	Yellow	Green	Red	Yellow	Green
Solar Lease	Yellow	Red	Green	Red	Yellow	Yellow
Risk Sharing Schemes	Yellow	Red	Green	Red	Yellow	Yellow
Special Credit Lines	Yellow	Red	Green	Red	Yellow	Yellow

Legend – Red: Not in place, Yellow: Partially implemented or need further improvement, Green: In place

3. Key Challenges in RE Uptake in STAR Member Countries

The transition to RE within the STAR member countries faces several significant barriers that hinder the widespread adoption of sustainable energy solutions in garment sector. These barriers span financial, technical, infrastructure, institutional, regulatory, awareness, and capacity dimensions. Addressing these challenges is critical for development of a conducive environment for RE investments and ensuring the successful integration of renewable sources in the sector. The following sections outline the key barriers and provide detailed insights into each category. The information presented is based on desk research and primarily on interviews conducted with STAR members and PDP experts.

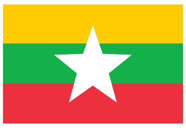


Barriers	Description
Financial	• The textile and manufacturing sectors often face high interest rates and short loan tenures, making investing in RE projects challenging. Financing schemes, although available, are not widely known or easily accessible to these industries. Perceived risks of financiers result in high collateral requirements, affecting the loan approval process further creates barriers. • The high upfront costs of RE technologies such as solar panels and inverters are a deterrent. The financial burden is exacerbated by high import duties on these components (ranging from 11.2% to 58.6% on different accessories). Compared to utility-scale solar projects, rooftop solar appears disproportionately affected by high import duties.

Barriers	Description
Technical and Infrastructure	• Integrating RE sources with the existing grid infrastructure was reported to be complicated. Textile and manufacturing industries, which require reliable and uninterrupted power, find it risky to rely on intermittent renewable sources without a modernized grid. • The RE technologies available are imported, and it was reported that some tailoring to local needs is required. This leads to higher costs and technical challenges in implementation and maintenance.
Institutional and Regulatory	• The lengthy and complicated approval processes for RE projects deter industries from investing. There is also a lack of clear guidelines on permissions and grid integration. • Multiple institutions with overlapping responsibilities lead to fragmented efforts and inefficiencies. This lack of coordination makes it difficult for industries to navigate the regulatory landscape.
Awareness and Capacity	• There is limited awareness among textile and manufacturing companies about the benefits and feasibility of RTS This leads to hesitation and resistance to adopting new technologies.

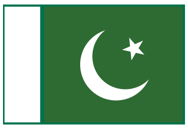
Barriers	Description
Financial	• Financing for rooftop solar systems in Cambodia faces high costs, with equity costs at about 17% and debt costs at about 10%, significantly higher than leading countries like Germany. This deters potential investors. • There is limited support from commercial banks and financial institutions for solar investments, contributing to the financial barriers for rooftop solar projects.
Technical and Infrastructure	• Electricity utilities have expressed concerns about the scalability of rooftop solar due to potential increased grid loads, which could affect grid stability and reliability. The study of Power Development Master Plan for 2022-2040 has indicated that national power grid system of Cambodia can absorb a maximum solar power of up to 3,115 MW, which is equal to 29.8% of potential sources of total domestic electricity energy in 2040.
Institutional and Regulatory	• There are no established net metering or FiT mechanisms for rooftop solar, except for a single project completed in 2014. This limits the financial viability of rooftop solar systems.
Awareness and Capacity	• There is a shortage of locally trained professionals who can design, install, and maintain REsystems, particularly tailored for the textile and manufacturing sectors.

Barriers	Description
Financial	• In China, two key financial models are currently utilized. The first, direct investment, is not widely favoured, while the second, the co-invest or joint venture system, is a popular business model in China. However, for some small and medium-sized companies, even the co-finance joint venture typically requires approximately 20% of the investment. Consequently, companies encounter challenges in financing upfront costs, and assistance in this regard would be advantageous.
Technical and Infrastructure	• Grid Limitations: Electricity utilities have expressed concerns about the scalability of rooftop solar due to potential increased grid loads, which could affect grid stability and reliability.
Institutional and Regulatory	• In many regions of China, the sale of surplus electricity generated by RTS back to the grid is not widely accessible. This poses a significant challenge for RTS developers, particularly those operating within the garment sector. Small and medium-sized enterprises aiming to establish RTS installations encounter this obstacle. • Furthermore, certain regions enforce a mandatory minimum electricity consumption requirement for factories sourced from the grid. Failure to meet this minimum consumption threshold renders these entities ineligible to utilize self-generated electricity from RTS.



Barriers	Description
Financial	• Tariffs for renewable and non-renewable electricity projects in Myanmar are negotiated on a project-by-project basis rather than having a prescribed feed-in tariff system. This lack of standardization results in each project being evaluated on its merits. • Low electricity tariffs imposed by relevant electricity supply corporations (e.g., YESC) on end-consumers present a significant obstacle to the development of rooftop solar systems (RTS). • Limited availability of capital is a critical obstacle to the expansion of clean energy projects in Myanmar. Small and medium-sized enterprises struggle to access capital.
Technical and Infrastructure	• The consequences of conflict-damaged power infrastructure have affected the stability of the entire transmission system. Major cities such as Yangon, Mandalay, and Nay Pyi Taw are experiencing power outages, while industrial zones throughout the country are preparing for severe power cuts and rising fuel prices. According to some reports, this situation is making it difficult to have grid-connected RTS, limiting investment into RTS.
Institutional and Regulatory	• Myanmar's regulatory framework does not specifically target the solar rooftop business, and the absence of a net metering scheme further compounds the issue. In addition, historically, Myanmar has not used the standardized form of Power Purchase Agreement (PPA), relying instead on project-specific negotiations. As a result, executed PPAs exhibit varying levels of sophistication.

Barriers	Description
Awareness and Capacity	• There is prevalent scepticism or misconception regarding solar energy among businesses in Myanmar. This scepticism stems from prior instances where businesses adopted a do-it-yourself approach, leading to the procurement of substandard equipment, employment of unqualified engineering, procurement, and construction companies, and neglect of system maintenance. Consequently, the premature malfunction of solar installations has fuelled numerous misconceptions within the Myanmar business community. • Myanmar lacks skilled professionals and technical experts in the RE sector. Specific engineering, procurement, and construction companies receive solar equipment that sometime fails to meet international standards. Developing local capacity through training programs and knowledge exchange initiatives is crucial to overcoming this challenge.



Barriers	Description
Financial	• The recent communication from the Pakistani government announcing the intended transition from net metering to gross metering for rooftop solar panels has raised significant concerns. This policy shift, which appeared to be motivated to address financial challenges within the energy sector, seeks to discourage the utilization of rooftop solar panels by modifying the compensation mechanism for the electricity generated by consumers. Nonetheless, the potential ramifications of this decision could exacerbate the already high cost of electricity and hinder the development of RE in Pakistan. Presently, under the net metering system, consumers can offset their electricity consumption with the power generated by their rooftop solar panels.
Technical and Infrastructure	• RE growth in the country has been concentrated in a few geographical locations, and such large clusters need anticipatory grid planning and extensive infrastructure improvement, requiring dedicated 132 kV and 220 kV substations. This is limiting the development of RTS in garment factories located in such clusters.
Awareness and Capacity	• Pakistan needed more skilled professionals and technical experts. It was reported that there are so many installers in the market these days, and many are reported not to provide quality work. Many who have installed solar systems face challenges in getting the desired results.

Barriers	Description
Financial	• Limited access to financing options and lack of attractive financial products for solar energy projects. Banks and financial institutions may offer limited loan products for solar installations, and there is a lack of attractive business models.
Technical and Infrastructure	• Grid Limitations: There are concerns about the scalability of RTS due to increased grid loads. Network congestion can reduce returns on utility-scale solar projects and negatively impact RTS development programs and installations.
Institutional and Regulatory	• Frequent changes to the incentive schemes have created a perception of a variable market, discouraging long-term investment. The expiration of the FiT in December 2020 and the lack of a new, stable incentive structure have further compounded this issue. • Complex Regulatory Approval Processes: The complexity of the regulatory approval process hinders project timeliness, making it challenging for developers to plan and execute rooftop solar projects efficiently.

I. OVERVIEW OF EFFECTIVE POLICIES AND PROGRAMS

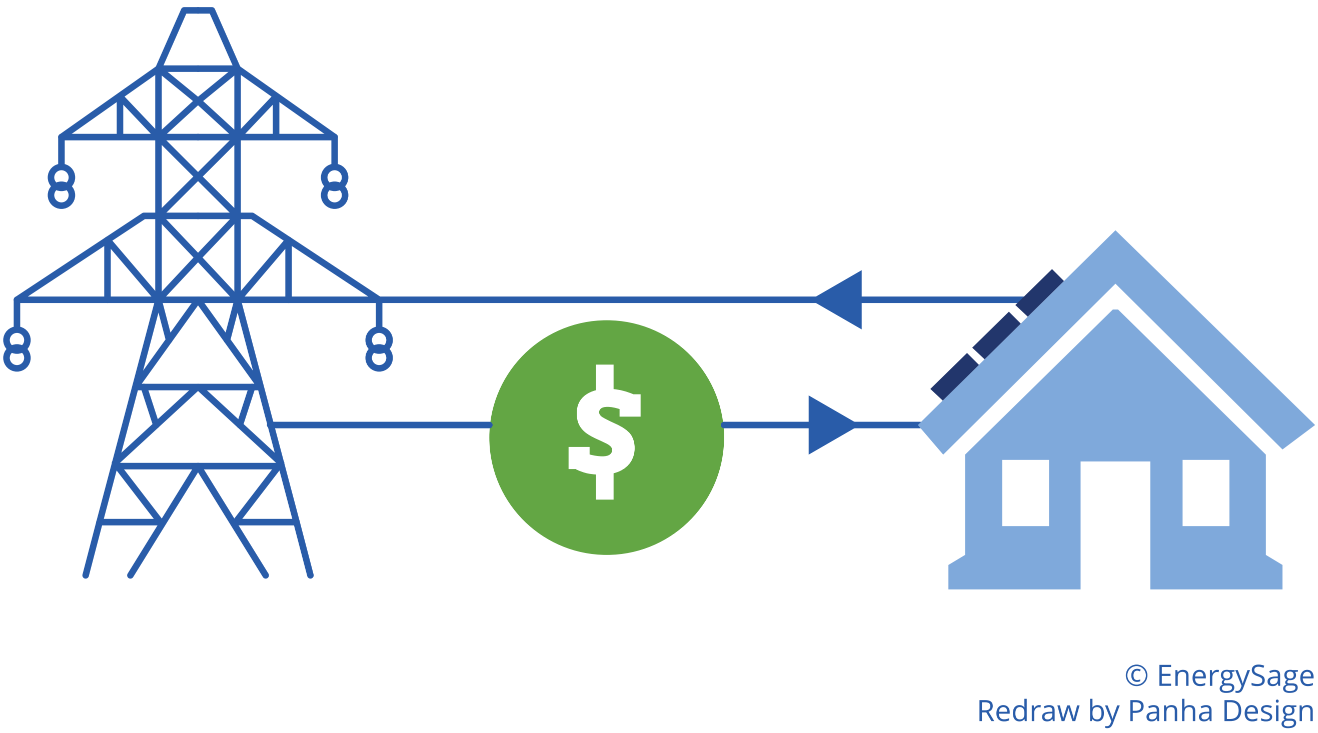
The earlier section informs STAR members on effective policies and programs promoting RE in the garment sector. This section includes case studies demonstrating the impact, advantages and disadvantages, and the reasons for implementing specific policies. Additionally, to illustrate the effectiveness and success of policies, additional case studies are provided for each policy and program, showcasing where these policies have been effective and how.

1. Policy Framework

1.1. Feed-in-Tariff

Feed-in-Tariff (FiT) is a policy mechanism that promotes the adoption of RE sources by offering long-term, guaranteed, above-market-rate payments to RE producers. FiT is a unique electricity tariff structure typically set above the standard electricity tariff offered by utility companies. This arrangement allows industrial facilities with solar PV installations to sell surplus electricity back to the grid at a higher rate than the tariff for electricity sold by the utility to end consumers. FITs have gained widespread adoption as a RE policy globally.

Figure 1: How FiT works, Source: EnergySage



PROS	• Provides a guaranteed, long-term price per unit of solar electricity fed into the grid, creating a stable revenue stream for solar owners. • Can be designed to offer differentiated rates based on system size, technology, or other factors to target specific industry.
CONS	• Can be more complex to administer and require more government oversight than net metering. • Tariff levels may need frequent adjustments to avoid over-subsidizing solar as costs decrease.

The case for implementing FiT:

Feed-in tariff (FiT) is a crucial policy mechanism for advancing RE deployment. This predictable revenue stream **reduces financial risks** associated with investments in RE projects, facilitating the rapid expansion of RE capacity. Furthermore, the premium rates established by FiTs **create an incentive for ongoing improvement in renewable energy cost-effectiveness and performance.** As RE becomes increasingly cost-competitive, FiTs can support shifting the policy focus from pure subsidies to market-based incentives. Thoughtfully designed FiT programs, with regular review and adjustment of tariff rates, can represent an effective and cost-efficient policy solution for promoting clean energy technologies.

CASE STUDY #1: The Success Feed-in Tariffs in Promoting Rooftop Solar in Vietnam

Vietnam's adoption of a FiT program for rooftop solar has markedly accelerated the deployment of RE across the country. Designed to encourage solar energy adoption among households and businesses, the FIT policy guarantees a fixed, attractive price for solar power fed back into the national grid. This incentive has been instrumental in Vietnam's strategy to increase RE contributions to 10% of its total power supply by 2030.

Introduced at a rate of $0.0935 per kWh for a 20-year period, the FIT policy was applicable to systems installed on residential, commercial, and industrial buildings. By simplifying administrative procedures and providing technical support, the government ensured a smooth adoption process. As a result, Vietnam saw a rapid increase in rooftop solar installations, with over 9 GW of solar power installed by the end of 2020, predominantly from rooftop systems.

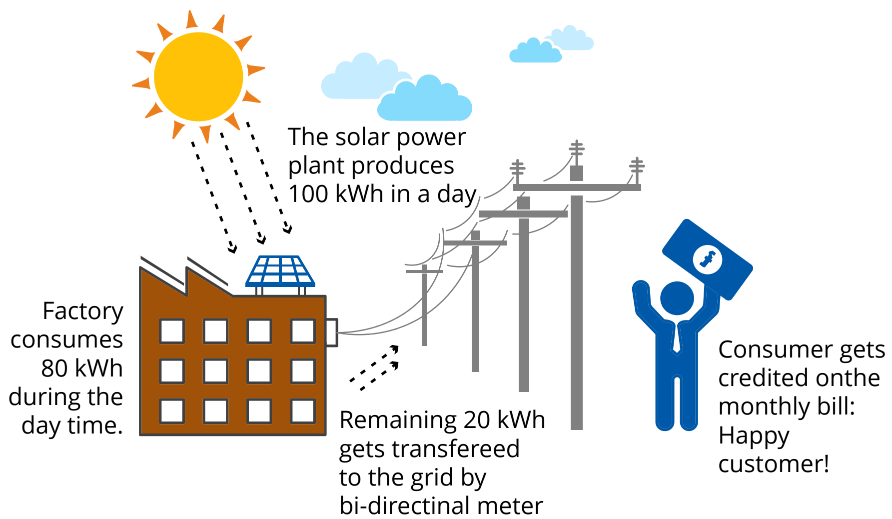
The economic impact of the FIT policy has been significant, reducing electricity bills for consumers and creating thousands of jobs in the solar sector. Small and medium-sized enterprises, in particular, have benefited from reduced operational costs. Environmentally, the widespread adoption of rooftop solar has substantially cut carbon emissions and alleviated pressure on the national grid, reducing reliance on coal-fired power plants.

However, the program faces challenges such as grid capacity limitations and the need for infrastructure improvements to manage the variability of solar power. With the initial FIT period having concluded, uncertainty regarding the future of FITs or the potential implementation of a net-metering scheme, along with evolving policy directions, could influence long-term investment decisions.

1.2. Net Metering

Net metering is a billing mechanism enabling customers with REsystems, like solar PV, to earn credits for excess electricity sent back to the grid. When a solar PV system generates more energy than consumed, the surplus is fed into the grid, and customers receive credits to offset future electricity use. This credit system, measured in kilowatt-hours (kWh), values the exported electricity at the customer's retail rate. Net metering typically employs a bidirectional meter or two unidirectional meters to track energy production and consumption accurately.

Figure 2: How Net Metering Works, Source: CleanMax / Redrawn by: Panha Design



PROS	• Simpler to implement than feed-in tariffs - customers just receive bill credits for solar electricity. • Encourages solar owners to optimize system size for on-site consumption. • Provides a transparent, predictable value for solar electricity that mirrors retail electricity rates.
CONS	• The value of exported solar electricity is tied to the retail rate, which may not fully reflect the grid benefits of distributed solar.

The case for net metering:

Net metering allows customers with RE sources to offset their electricity bills by receiving credit for the surplus electricity they generate and feed back into the grid. This makes RTS investments more financially viable, reducing the payback period and increasing the overall return on investment for customers.

However, power distribution companies (Discoms) are hesitant to support solar rooftop growth due to concerns about losing customers and disrupting their traditional business. To address this, the government needs to introduce incentive schemes to encourage Discoms to play a facilitative role in the sector. Additionally, Discoms need support in terms of capacity building to understand and prepare for the implications of solar energy on load curves, and to realign their traditional business models to participate in the solar rooftop value chain. They also need to adapt to emerging areas such as storage, electric vehicles, smart grid, and smart homes. Capacity cap should be removed.

CASE STUDY #2: Net Metering in California, USA

Net Energy Metering (NEM) is a traditional billing arrangement used in California, since the 1980s for rooftop self-consumption of solar power. Under the original compensation mechanism, excess energy generated in a month is kept as credits to be used for the next bill, and any remaining credits at the end of the year are compensated. Early stages of legislative and regulatory changes aimed to increase the adoption of solar energy. However, concerns arose in 2012 about potential under-collection of utility revenue and cost-shifting. As a result, NEM 2.0 was introduced in 2016, substantially changing the NEM program. Later, California's investor-owned utilities implemented a new solar billing structure called NEM 3.0, which reduces export rates by 75%, increasing the payback period of home solar.

The policy encourages homeowners to pair solar panels with battery storage to become more self-sufficient and contribute to a more resilient electricity grid. Despite being less favorable than previous policies, NEM 3.0 solar systems in California still offer greater energy cost savings than in any other state, especially when paired with home battery storage. California's largest utility, pacific gas & electric, reported that the number of rooftop solar connections to its system reached a record high in 2022. There was a 20% increase in solar installations from the previous year, with approximately 750,000 private solar customers connecting to the grid. This number is the highest among all utilities in the United States. (Foushee, 2023)

CASE STUDY #3: Experience in the Philippines with Net Metering

Southeast Asia's power markets usually follow a single-buyer model. In contrast, the Philippines' power distribution sector is highly competitive, with approximately 150 distribution utilities serving its vast archipelago. Privatization of power generation and distribution followed the passage of the Electric Power Industry Reform Act in 2001. However, the Philippines' net metering program, introduced in 2013, has failed to stimulate significant deployment of distributed photovoltaic (DPV) technology. Only 1,400 customers have joined the program, and the installed capacity of DPV is approximately 10MW, which is below expectations. This low uptake is primarily because the net metering program excludes larger commercial/industrial customers due to the 100kW cap on the size of DPV systems that can enroll in the program. Furthermore, regulatory requirements, such as Distribution Impact and Distribution Asset Studies, are costly and time-consuming. The permitting and interconnection processes are lengthy, complicated, and non-standardized. Small-scale DPV systems also suffer from a lack of financing options. (USAID, 2017)

1.3. Tax Incentives

Solar tax credits and rebates encompass financial incentives governments offer to promote the adoption and utilization of solar energy systems. These incentives mitigate the initial cost of solar installations, rendering solar energy more economically viable for commercial entities. As of 2024, the United States Investment Tax Credit (ITC) permits a 30% deduction from the cost of solar systems installed on residential and commercial properties. Both residential and commercial solar installations, including essential equipment for solar energy generation, such as solar panels, qualify for these incentives.

In the United States, solar tax credits are widely used. This mechanism entails a dollar-for-dollar reduction in the amount of income tax owed. For instance, the claim of a $1,000 federal tax credit results in a corresponding $1,000 reduction in federal income taxes owed. Furthermore, the federal tax credit is occasionally denoted as an Investment Tax Credit (ITC), although it distinguishes itself from the ITC extended to businesses that own solar systems.

PROS	• Efficient when well implemented.
CONS	• Implementation issues (proper pricing and amount of tax credit). • Lack of fairness as taxpayers bear the burden of the subsidies.

The case for tax incentives:

The solar tax credit constitutes a critical financial incentive that can significantly contribute to the advancement of the solar energy industry. Its importance to the industry lies in its ability to enable businesses to offset a substantial portion of their solar photovoltaic system installation expenses against their income taxes, thereby making solar energy more financially viable. Moreover, by reducing the overall cost of solar energy, the tax credit improves the return on investment and payback period for solar customers, thereby stimulating wider adoption. Additionally, the availability of the tax credit stands as a fundamental driver for the rapid expansion of the solar market, attracting investments, fostering innovation, and catalyzing employment opportunities within the industry.

CASE STUDY #4: Solar Tax Credit for Industries

GreenTech Manufacturing, a medium-sized manufacturing company located in San Diego, California, decided to implement a solar photovoltaic (PV) system at their facility in 2022. The primary objectives were to reduce operational expenses, safeguard against escalating energy costs, and elevate their sustainability credentials. The company's smart investment in a 500-kW solar PV system at their San Diego site, with a total expenditure of USD 750,000, was a testament to their commitment to sustainability. The installation was completed in March 2022, and the Investment Tax Credit (ITC) provided a credit equivalent to 26% of the total system cost, reducing the initial system cost to USD 555,000. GreenTech Manufacturing forecasted annual electricity savings of USD 100,000, resulting in an approximate payback period of 4.4 years. In terms of environmental impact, the 500-kW system is anticipated to yield approximately 800,000 kWh annually, offsetting approximately 570 metric tons of CO_2 emissions annually. Moreover, the installation markedly augmented GreenTech Manufacturing's sustainability profile, enhancing its standing among customers and stakeholders with environmental concerns.

The implementation of financial incentives in China has led to the development of a multifaceted rooftop solar policy aimed at integrating solar energy into urban infrastructure. This initiative involves ambitious targets and collaborative models. The policy focuses on retrofitting existing buildings with PV systems and empowering local authorities to engage with solar developers to achieve sector-specific targets. As a result, there has been a significant increase in distributed solar installations, potentially contributing approximately 100GW of installed capacity. The success of this approach is illustrated in a case study below. Therefore, similar efforts by STAR member countries have the potential to yield comparable results.

CASE STUDY #5: Whole-County Pilot Rooftop DPVG Development in China

China's rooftop solar policy is a multifaceted approach aimed at integrating solar energy into the urban infrastructure through ambitious targets and collaborative models. Public buildings and factories in cities are set to see 50% of their rooftops covered by solar panels by 2025, while a parallel initiative seeks to retrofit existing buildings with PV systems. This is operationalized through a pilot scheme that empowers local authorities to partner with solar developers and meet sector-specific targets by 2023, which includes a staggered plan covering government buildings, educational and health institutions, industrial and commercial spaces, and rural households.

The policy has already shown a tripling of distributed solar installations in early stages, with the potential for the pilot to contribute around 100GW of installed capacity. This could skyrocket to 600GW if expanded nationwide, suggesting a significant role for rooftop solar in meeting China's renewable capacity goals. Developers, under this policy, engage with building owners through two primary models: direct purchase of panels by residents or leasing of rooftop spaces. The former is favored as it promotes better care and ownership of the installations.

Financial incentives are largely carried by state-owned enterprises, with building owners guaranteed income from the power they sell, providing a strong incentive structure across the value chain. One challenge is grid capacity to handle the surge in power generation; this concern is being addressed as part of the program's iterative development.

China's commitment to a decentralized approach involves local governments identifying buildings for solar installation and negotiating contracts, allowing for regional and sectoral tailoring of the solar deployment. This hands-on approach is bolstered by financial incentives that significantly reduce installation costs, with the bulk being shouldered by state entities and building owners receiving a steady income from sold power.

As a result, China has installed 87.4 GW of solar capacity, with over 51 GW coming from distributed PV projects. (Ye, 2023)

1.4. Wheeling

Wheeling refers to transferring electrical power through a utility's transmission or distribution system between grid or network service areas. In the realm of RE, wheeling offers an efficient means of procuring cleaner power at a more cost-effective rate compared to fossil fuel-based power. Essentially, wheeling enables industrial facilities and factories to procure clean, private power while continuing to support the utility.

This mechanism allows an electricity generator, such as a solar PV system, to supply power to a consumer directly via the grid. To utilize the utility's grid for wheeling, a specified Wheeling Tariff is imposed, which is subsequently added to the final cost of electricity for the consumer.

The benefits of wheeling encompass the capacity to cater to diverse power demands without being constrained by ground or roof space in the immediate vicinity. Furthermore, wheeling enhances efficiency and value, as it permits the utilization of areas with abundant solar resources but minimal environmental and social impact, thereby enabling lower-cost, cleaner energy when required. As wheeling becomes more prevalent, it facilitates the creation of RE hubs, contributing to further reductions in electricity costs.

PROS	• Wheeling allows for the efficient use of RE resources by enabling the transfer of electricity from areas with high generation potential to areas with high demand. • Small-scale producers can generate revenue by selling excess electricity to distant consumers or the grid. • No limitations such as limited space of rooftop to install RTS.
CONS	• Existing grid infrastructure may need significant upgrades to handle the additional load and complexity introduced by wheeling. • The costs associated with wheeling, including transmission fees, can be high and may deter small-scale producers.

The case for wheeling:

If your business or facility consumes a substantial amount of electricity and is connected to the grid but lacks space for an on-site solar PV facility, wheeling can serve as an alternative for obtaining clean energy on-site. Wheeling allows you to source RE from a remote solar PV farm, ensuring that your business can still benefit from clean energy without the need for physical space to install solar panels. This solution is particularly advantageous for businesses located in urban areas or confined spaces where installing a large solar array is impractical.

If achieving 100% RE aligns with your strategic business objectives, wheeling solar energy can enhance the integration of RE, reduce carbon emissions, and bolster business sustainability. By utilizing wheeled energy, businesses can meet their RE targets more effectively, demonstrating a commitment to sustainability and environmental responsibility. This approach not only helps in achieving corporate social responsibility goals but also improves the company's image and attractiveness to environmentally conscious consumers and investors.

The cost benefits of wheeling are also significant. By positioning solar PV farms in areas with the highest solar irradiance, the cost of supplying electricity through wheeling can be more economical than typical grid tariffs. This means that businesses can potentially reduce their energy costs while simultaneously supporting RE initiatives. Lower energy expenses can lead to improved financial performance and competitiveness in the market, making wheeling an attractive option for cost-conscious businesses seeking sustainable energy solutions.

CASE STUDY #6: Wheeling in South Africa and India

South Africa's Case:

South Africa has been facing significant challenges with its electricity supply, including frequent power outages and an aging coal-based infrastructure. To address these issues and promote sustainability, the South African government has encouraged the adoption of RE sources. Wheeling has been a key component of this strategy, enabling the transmission of renewable electricity from producers to consumers across the country.

Key Players:

1. RE Producers: Independent Power Producers (IPPs) generate electricity from renewable sources such as solar and wind.
2. Eskom: The state-owned utility company that owns and operates the national transmission and distribution grid.
3. Corporate Consumers: Large industrial and commercial entities seeking to procure RE directly from IPPs.

Implementation:

- RE Independent Power Producer Procurement Programme (REIPPPP): Launched by the South African Department of Energy, this program attracted significant investment in RE projects.
- Wheeling Agreements: Eskom facilitated the wheeling process by allowing IPPs to transmit electricity through its grid to end consumers. These agreements outline the terms, conditions, and costs associated with using the grid infrastructure.

India's Case:

The regulatory framework for wheeling in India is primarily governed by the Central Electricity Regulatory Commission (CERC) and State Electricity Regulatory Commissions (SERCs). Key regulations include open access, wheeling charges, and renewable purchase obligations (RPOs).

In Karnataka, Tata Power Renewable Energy Limited (TPREL) and Infosys have partnered for a wheeling project. TPREL, a subsidiary of Tata Power, supplies solar and wind power to Infosys' facilities in Karnataka through a power purchase agreement.

Infosys benefits from stable and potentially lower electricity costs, TPREL secures a long-term revenue stream, and the Karnataka Power Transmission Corporation Limited (KPTCL) earns from the wheeling charges.

1.5. Renewable Portfolio Standards

The Renewable Portfolio Standard (RPS) is a regulatory policy requiring utilities to source a specific percentage or quantity of their electricity from renewable sources by a set deadline. These targets are typically increased over time to encourage steady growth in RE production. Interviews with stakeholders and PDP representatives highlighted that government support, through mandatory targets or RPS, could drive investment in RTS and introduce initiatives to attract investors to RTS projects to meet these targets. RPS has been effectively implemented in many countries, setting specific goals for electricity generation from renewable sources like solar energy. These standards apply to all electricity providers, including investor-owned utilities, municipal utilities, and electric cooperatives, with varying requirements depending on the jurisdiction. Non-compliance with RPS mandates usually results in penalties, and adherence is ensured through monitoring and enforcement mechanisms, including reporting obligations and financial penalties.

In the United States, numerous states have adopted RPS policies with varying targets. For example, California's RPS mandates that 60% of electricity must come from renewable sources by 2030. In the European Union, binding RE targets require member states to achieve specific percentages of energy consumption from renewables by set deadlines, such as 32% by 2030 under the revised Renewable Energy Directive. China has also established mandatory RE quotas for its regions and provinces, requiring a certain percentage of electricity consumption to come from non-fossil sources.

PROS	• RPS policies create a stable demand for RE, which encourages investment and development in the sector, driving technological advancements and cost reductions.
CONS	• The initial implementation of RPS can lead to increased costs for consumers.

The case for RPS:

Implementing the RPS requires a specific proportion of electricity to be derived from renewable sources, thereby amplifying the demand for solar energy installations. This surge in demand expands the market for small-scale solar companies, fostering business growth and attracting new entrants to the solar market. Consequently, small companies have increased opportunities to prosper. Industries and factories are incentivized to adopt solar energy to comply with RPS requirements, leading to greater investment in solar installations. Adopting solar energy allows factories to reduce their dependence on grid electricity, resulting in long-term energy cost savings and enhancing their competitive edge.

RPS initiatives often come with financial incentives such as grants, tax credits, and rebates to support RE projects. These incentives benefit small solar companies by reducing costs and boosting profitability. The consistent demand driven by RPS increases investor interest, making it easier for small solar companies to secure funding for expansion and innovation. Factories can take advantage of subsidies and tax benefits to install solar systems, which lowers the initial capital investment and makes solar investments more financially appealing.

RPS provides a predictable market for solar energy, allowing small solar companies to develop business strategies and investments with greater confidence. The regulatory certainty provided by RPS reassures factories and industries to invest in solar energy projects, knowing that there will be ongoing support and sustained market demand for RE.

CASE STUDY #7: Impact of RPS on RTS Growth

Belmark Inc., a medium-sized manufacturer located in De Pere, Wisconsin, specializes in the production of pressure-sensitive labels, flexible packaging, and folding cartons. In accordance with Wisconsin's RPS, which mandates that 10% of the state's energy must originate from renewable sources, Belmark undertook a strategic initiative to reduce operational costs by installing a 1 MW rooftop solar array at its manufacturing facility. This project became financially viable due to state incentives and tax credits aimed at promoting RE initiatives. As a result, the solar installation significantly decreased the company's electricity expenses and allowed for the offsetting of approximately 1,200 tons of CO2 annually, aligning with Belmark's sustainability objectives. Furthermore, this initiative contributed to Wisconsin's progress in meeting its RPS targets by enhancing the state's RE capacity.

Another example of successful implementation under RPS is Sierra Nevada Brewing Co., a craft brewery located in Chico, California. California's RPS mandates that 60% of electricity come from renewable sources by 2030. In response to this requirement, Sierra Nevada installed a 1.5 MW rooftop solar array and additional ground-mounted solar panels. The decision to invest in solar energy was incentivized by California's RPS policies, as well as federal and state tax incentives for RE. The government and utility's interest in promoting solar energy facilitated a swift process for permits, installations, and other certification procedures. Additionally, the tax credits provided to companies for the installation of RE technologies reduced their capital investment, highlighting the effectiveness of RPS targets in stimulating the growth of RE.

1.6. Workforce Training and Certification

The case for workforce training and certification:

Workforce training and certification are essential for the success of rooftop solar deployment. Proper training ensures that installers are skilled in safety protocols, reducing the risk of accidents and ensuring compliance with industry standards. This leads to higher quality and more reliable solar installations, which are crucial for building customer trust and satisfaction.

Certified professionals adhere to best practices and streamline procedures, resulting in efficient and timely installations. This not only reduces costs but also enhances overall productivity. Additionally, certifications act as a quality benchmark, providing assurance to customers about the installer's competence and expertise.

Furthermore, a well-trained and certified workforce is familiar with local and national regulations, ensuring smooth project approvals and compliance. For example, some STAR member countries already mandate workforce training and certification. Cambodia, for instance, has emphasized in its recently launched regulation on the use of rooftop solar that all service providers must obtain a license and that all installations must meet stringent safety and quality standards.

The continuous learning encouraged by certification programs also drives innovation and keeps the workforce adaptable to emerging technologies and market trends. Investing in workforce training and certification stimulates local economies by creating jobs and increasing wages for skilled workers. It also attracts more business and investment, contributing to the growth and stability of the solar industry.

2. Investment Framework

2.1. Direct PPA

Regulation of power off-takers with a standardized Power Purchase Agreement (PPA) entails a governing framework that outlines the interaction between RE producers and their off-takers, such as industrial facilities or other large energy consumers. This regulatory framework serves as a common mechanism to advance the implementation of RE technologies by establishing a transparent and foreseeable market structure for RE producers and off-takers. Its primary function is to mitigate investment risks and foster the engagement of RE producers within the power industry.

In a solar PPA, the business owner does not buy or lease the solar panels. Instead, the panels are owned, installed, and maintained by a third-party company. The business owner is billed by this company for the electricity generated by the panels, based on measured metering. Typically, these prices are lower than the electricity rates from the local utility, but this is not always guaranteed. If the panels do not generate enough electricity to meet the business's needs, the owner will still receive a bill from their utility company for the additional electricity required.

PROS	• Reduced up-front cost, and predictable energy cost. • Immediate savings on electricity.
CONS	• PPA contracts typically have long durations, often 15-25 years, which can limit the customer's flexibility to switch energy providers or move to a new location. However, this can be also discussed and agreed in the contracts.

The case for PPAs:

A PPA can incorporate an existing asset previously under a feed-in tariff, which is a government subsidy, and can also replace an expired contract. RE projects often require funding from a third party, typically a financial institution. Securing this funding relies on providing adequate collateral, and in the absence of a government subsidy, a solar PPA can offer the necessary reassurance.

Third-party lenders, such as banks, credit providers, or finance companies, are crucial in financing RE projects. For instance, constructing a standard 1 MW solar plant may require an investment of USD 1-1.5 million, necessitating the involvement of a credit provider, particularly a bank, for sustained project financing.

When finance providers require a certain level of confidence in a renewable project, a PPA can effectively provide the needed assurance. This involves a buyer committing to pay a fixed price per megawatt hour (MWh) for the electricity generated by the renewable asset over a long-term period, typically 10-20 years.

From the lender's perspective, evaluating counterparty risk is crucial. This means assessing the creditworthiness of the energy seller to ensure uninterrupted operation over the subsequent 10-20 years. Lenders consider counterparties capable of financing the cash flows as "bankable."

CASE STUDY #8: Impact of Standardized Power Purchase Agreements (PPAs) on RE Growth in India

India's strategic implementation of standardized Power Purchase Agreements (PPAs) has played a crucial role in bolstering the RE sector, particularly in solar and wind energy. Facing a growing demand for energy and environmental sustainability targets, these agreements have streamlined investments and accelerated project deployment across various states.

Previously, the Indian RE sector struggled with fragmented regulations and varied financial terms across regions, which deterred potential investors and slowed down project developments. Recognizing these challenges, the Ministry of New and Renewable Energy (MNRE) spearheaded the standardization of PPAs to create a more investor-friendly environment.
Standardized PPAs introduced by MNRE provided a uniform contract template that detailed clear tariff structures, equitable risk allocation, and long-term agreements typically extending for 25 years. These elements combined to enhance the predictability and financial viability of renewable projects, making them more attractive to a broad spectrum of investors and financial institutions.

The implementation of standardized PPAs has significantly boosted investor confidence, with RE investments in India reaching approximately USD 6 billion in 2020 alone. The clear and consistent framework reduced the complexities associated with project negotiations and approvals, leading to a quicker turnaround in project commissioning. For instance, the installed RE capacity in India surged to around 150 GW by the end of 2022, making substantial strides towards the national target of 175 GW by 2022.

Some of the notable examples include:

- The Solar Energy Corporation of India (SECI) has successfully utilized standardized PPAs to develop large-scale solar parks such as the Bhadla Solar Park in Rajasthan, one of the largest globally with a capacity of over 2,245 MW.
- In the wind sector, the introduction of standardized PPAs through competitive auctions has significantly reduced tariffs, making wind energy more competitive and affordable.

Despite these advancements, the sector faces ongoing challenges like regulatory inconsistencies and delays in payments, which affect the financial sustainability of projects. Continued refinement and adaptation of PPAs in response to evolving market and technological conditions will be essential to sustain growth and achieve the ambitious goal of installing 450 GW of REby 2030.

2.2. Solar Lease

2.2.1. OPEX Model

Solar leases offer a similar structure to PPAs but with a focus on leasing the solar system itself rather than paying for the cost of electricity. In the solar leasing model, customers, whether homeowners or C&I entities, enter into an agreement where they pay a fixed monthly fee to use a solar system that is owned, installed, maintained, and operated by a leasing (solar) company. Homeowners benefit from this hassle-free arrangement by adopting solar with minimal or no upfront costs and can enjoy the possibility of reduced electricity bills all without the burden of maintenance. Similarly, C&I properties take advantage of this model by locking in fixed energy costs, contributing to their sustainability goals, and reducing energy expenses without impacting their balance sheets due to the absence of required capital investment.

Figure 4: How Solar Leasing OPEX Model Works

Solar Developer

- Pay for solar PV system
- Owns, operates and maintains solar py

Customer

- Provides rooftop for solar PV
- Buys solar energy generated over contract duration
- Buys additional electricity needed from the grid

Electricity Retailer

- Continues to provide electricity from grid
- May purchase excess solar generated from developer

PROS	• Zero Investment is required. • The solar leasing company is responsible for system maintenance and any repairs during the contract term. • The end user is not working to pay off the panels over time (like a loan) • There is no payback period.
CONS	• Lease payments consume a large portion of end user electric bill savings. • End user long-term savings are much lower than those achieved with a cash purchase or solar loan. • Since the lease provider owns the solar panels, only the company can take advantage of solar rebates and tax incentives. • Solar leasing contracts often have an escalator clause, which means end user monthly payments can increase over time.

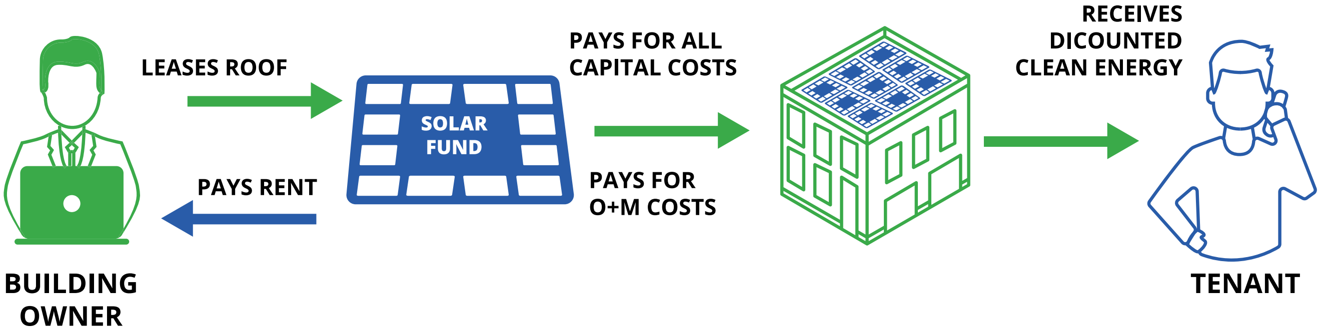
CASE STUDY #9: Solar Leasing Practice from the USA

A solar developer in Kansas City offers solar leasing with full performance service starting from planning, permitting, installation, and monitoring. Once the solar system is functional, it generates power throughout the day, offsetting the building's electricity usage. If the facility consumes more energy than what the solar panels are currently producing, it supplements it from the grid. For instance, a three-story office building in Kansas City, MO, uses over half a million kWh of electricity annually, paid for by the property owner. Artisun Solar installed a 150.22 kW system comprising 406 solar panels, which generates 207,270 kWh annually. This installation saves the owners USD 19,529 in the first year alone, and with Missouri's steadily rising electricity rates, the building owner should save USD 851,584 in future electricity costs conservatively. Using an average CAP Rate of 9% (estimated for scenario purposes, actual rate unknown), the commercial solar system adds USD 215,907 to the total property value. (Kiefer, 2021)

2.2.2. Solar Lease (CAPEX)

In the CAPEX solar leasing model with transfer of ownership at the end, a third party owns the solar installation and leases it to the property owner, with the potential for ownership to transfer to the lessee at the end of the lease term, often at a reduced cost. For homeowners, this typically means a fixed monthly lease payment that lowers upfront costs and offers long-term benefits through eventual ownership. For C&I entities, it allows for the adoption of solar with minimal initial investment, securing lower energy rates, and providing a return on investment upon transfer of ownership. This approach not only facilitates environmental stewardship for commercial building owners but also enhances their corporate social responsibility. Without any upfront cost to the building owner, leasing underutilized rooftop space generates additional revenue over 20 years or more. Additionally, developers can offer buildings discounted electricity via community programs or direct PPAs, further reducing energy costs for building owners.

Figure 5: How Solar Leasing CAPEX Model Works, Source: SolarCFO



When considering a solar lease, it is important to evaluate its advantages and disadvantages thoroughly. One major advantage is the ability to offload the costs of financing, installation, and maintenance to a provider. This includes that any repairs during the leasing period are the responsibility of the provider. Additionally, the legal system owner is the only party eligible for certain financial benefits such as state tax credits. It is thus essential to weigh the pros and cons to determine whether a solar lease is a viable option.

PROS	• No upfront cost required. • The solar leasing company is responsible for system maintenance and any repairs during your contract term.
CONS	• Lease payments consume a large portion of end user electric bill savings. • End user long-term savings are much lower than those achieved with a cash purchase or solar loan. • Since the lease provider owns the solar panels, only the company can take advantage of solar rebates and tax incentives, until the system is transferred to the end user. • Solar leasing contracts often have an escalator clause, which means end user monthly payments may increase over time.

2.3. Aggregator Model (Bulk Purchase, PPA and Guarantor)

The Aggregator model leverages collective demand to secure financing and operational efficiencies for RTS projects within industrial parks. This model, already being tested in Thailand and Vietnam, simplifies the transition to solar energy by serving as a conduit between individual solar projects and the wider energy market.

2.3.1. CAPEX Model

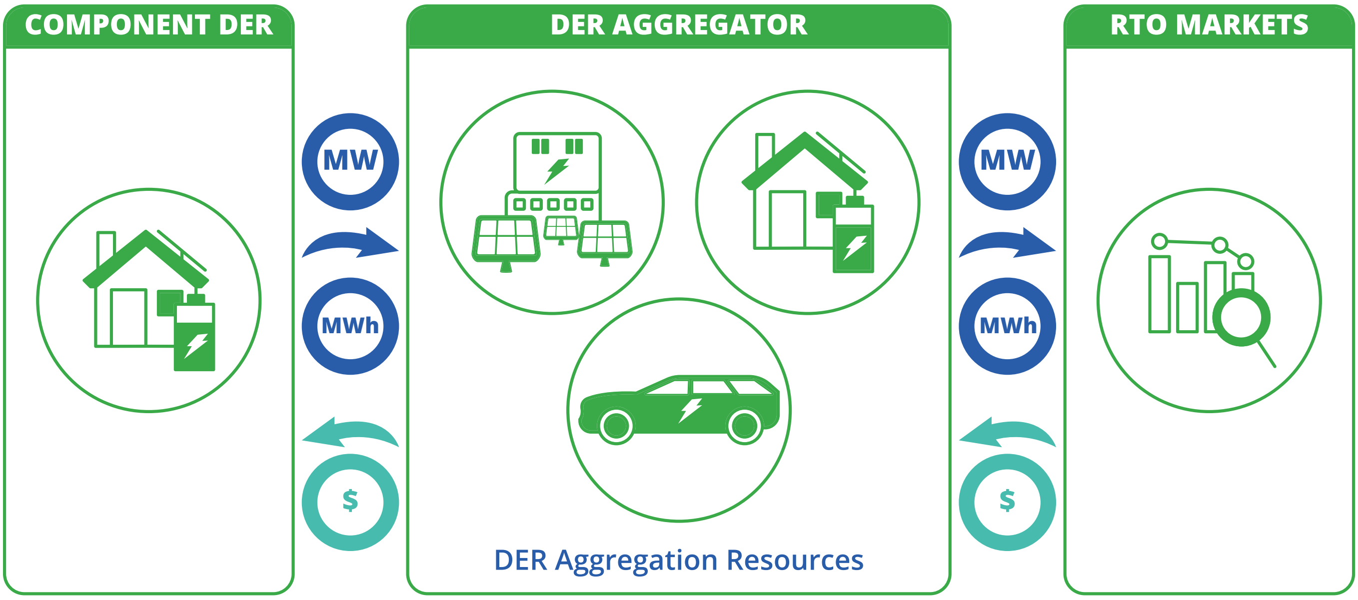
Sub-Model I: Aggregator Financer Model

The process of financial aggregation refers to the bundling of multiple assets together for the purpose of financing or refinancing. This is done based on the anticipated future cash flows that the assets are expected to generate. In essence, financial aggregation is a means of leveraging the potential of multiple assets to secure funding from investors or lenders, which can be used to facilitate growth, expansion, or other strategic initiatives. By pooling together assets with complementary characteristics, businesses and organizations can create diversified portfolios that are more resilient to market fluctuations and other risks.

Sub-Model 2: Aggregator Guarantor Model

This sub-model is another aggregator model option, where the IP Operator acts as a guarantor for the project, offering either full or partial guarantees. This guarantee has the potential to reduce the cost of capital for tenants, making the projects more viable. The model's strengths lie in the IP Operator's capacity to provide financing services that can retain tenants by mitigating project risks and reducing capital costs.

Figure 6: Example of How a DER Aggregation Operates in Practice, Source: Federal Energy Regulatory Commission



The diagram above serves as an example of how DER (Distributed Energy Resources) aggregations operate in practice. The left box shows a single component DER, which is likely a small-scale energy resource like a RTS, electric storage, or electric vehicle charging equipment. In the middle box, these resources are brought together by a DER aggregator, whose job is to ensure that the aggregation or bundle of DER resources is large enough to meet the market rules. The combined unit of this aggregation becomes a direct market participant. The component DER generates energy products such as megawatts (MW) or megawatt-hours (MWh) that are then provided to the DER aggregator, who bundles them together and delivers them to the regional market (RTO market). The compensation money flow goes in the opposite direction: from the RTO market back to the DER aggregator and eventually back to each individual DER and its owner.

PROS	• No upfront cost required. • The solar leasing company is responsible for system maintenance and any repairs during your contract term.
CONS	• Lease payments consume a large portion of end user electric bill savings. • End user long-term savings are much lower than those achieved with a cash purchase or solar loan. • Since the lease provider owns the solar panels, only the company can take advantage of solar rebates and tax incentives, until the system is transferred to the end user. • Solar leasing contracts often have an escalator clause, which means end user monthly payments may increase over time.

CASE STUDY #10: Solar Aggregation Facility in USA

An aggregator plays a significant role in bringing standardization to the solar industry. It is akin to SolarCity in the USA, where end customers, EPCs, and component manufacturers can interact on a single platform. SolarCity has received commitments for its USD 250 million financing facility from a group of lenders, including BofA Merrill Lynch as the sole structuring and syndication agent. The aim is to finance over 200 MW of solar power systems for homeowners and businesses. This is one of the largest aggregation facilities for distributed generation solar projects and the third such facility entered into by SolarCity. SolarCity has raised funds sufficient to finance more than USD 4 billion in solar projects.

The loan is backed by high-quality and long-term customer receivables, enabling the company to deploy, aggregate, and season a defined pool of assets. Once the solar assets are fully deployed, SolarCity plans to refinance the facility in the securitization market.

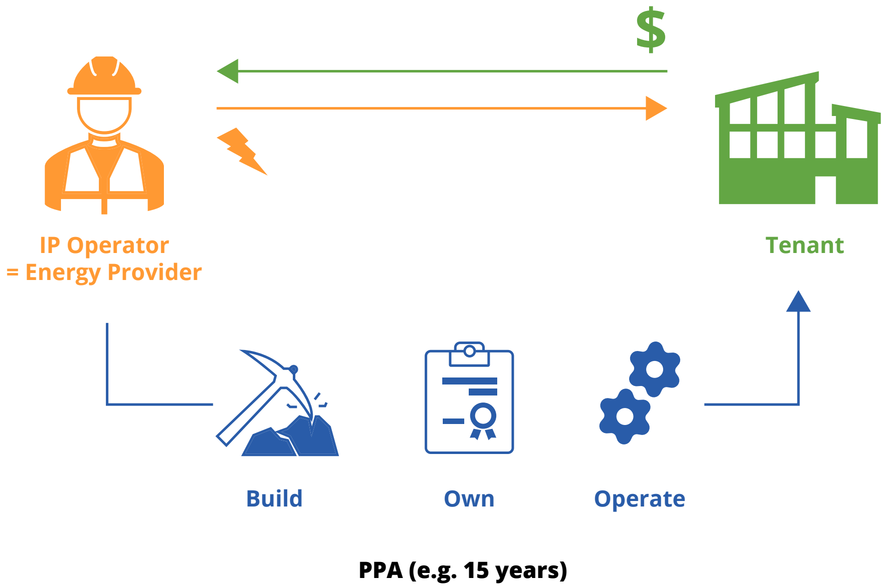
2.3.2. OPEX Model

The aggregator model simplifies the transition to solar energy by leveraging the power of collective demand or providing innovative financing solutions, effectively serving as a conduit between individual solar projects and the wider energy market. This approach is particularly advantageous for homeowners, granting them entry into community solar systems where the consolidated demand can significantly lower the costs and barriers to solar energy access. For C&I clients, the aggregator model expands into various sub-models tailored to meet specific business needs. The benefits of this model are heavily dependent on market rules and regulations.

Sub-Model I: Energy Service Operator

An IP Operator invests in, owns, and operates rooftop PV or other generation facilities, supplying energy to tenants. This operator also provides decommissioning services. The model's comparative advantage lies in the IP Operator's intimate knowledge of the customer, including their creditworthiness, which translates into lower customer management costs. The IP Operator distinguishes itself from competitors by offering end-of-life and decommissioning services and filling the knowledge gap for tenants regarding RE technologies and procurement procedures.

Figure 7: Example of a PPA OPEX Model



CASE STUDY #11: Investing in RTS for Industrial Park in Vietnam

Thang Long Industrial Park II Corporation, a Vietnamese subsidiary of Sumitomo Corporation, was successful in attracting a loan for RTS development. On March 24, The Japan Bank for International Cooperation signed a General Agreement for an investment credit line amounting to approximately USD 29 million (JBIC portion). On March 30, a Loan Agreement of up to approximately USD 8 million was signed based on the credit line. The credit line is intended to support the expansion project of Thang Long Industrial Park II and the rooftop solar power generation project to be conducted by TLIP2 in the Hung Yen province in the north of Vietnam. The loan will finance the funds necessary for TLIP2 to install and operate rooftop solar power generation systems with a total installed capacity of 20MW peak in Thang Long Industrial Park II. TLIP2 will then sell the generated electricity to its tenant companies. Additionally, they plan to support demonstration projects on how to manage tens of MW of RTS inside the park with the help of on-site stationary batteries.

Bulk Procurement Support – PPA and Services

The IP Operator acts as an intermediary in this model, organizing tenders and granting long-term access rights to third-party service providers in return for a fee. The competitive advantage here is that the IP Operator can invest time and effort in vendor searching, a task that would otherwise fall to tenants. They can also offer tenants a streamlined service, managing all licensing and registration requirements.

PROS	• Greater buying power and greater access to large projects and options suited to individual needs. • Reduced energy pricing. • Lowered transaction costs. • Partnering with other companies in investing in a portfolio of energy projects limits. • Exposure to risk.
CONS	• Implementation relies on enabling state legislation. • Administrative costs. • Smaller buyers may have a less attractive credit rating as compared to larger organizations—some developers will attach a risk premium when selling to smaller buyers.

2.4. Special Credit Lines

Many governmental bodies and financial institutions offer specialized credit lines and loan programs to promote investment in energy efficiency enhancements and RE initiatives. The primary objective is to make clean energy solutions more financially feasible for businesses.

These credit lines are typically provided at reduced interest rates, protracted repayment terms, and more advantageous borrowing conditions than conventional commercial loans. This facilitates the economic viability of energy efficiency retrofits and RE installations.

PROS	• Relatively cost-efficient. • Awareness spreading and long-term effect. • Works best under financial markets at a low maturity.
CONS	• May be terminated due to lack of funds. • Efficient program design is crucial.

The case for special credit lines:

Systems often entail higher upfront capital costs. Consequently, this financial disparity may render them less economically feasible for many individuals and businesses. Specialized credit lines have been established to mitigate this initial cost obstacle. In specific scenarios, the entity funding the energy upgrades may not be the direct beneficiary of the subsequent long-term energy savings, as exemplified by a landlord investing in efficiency measures for a rental property. Hence, these credit lines are designed to accommodate such circumstances and can be specifically tailored to finance particular equipment or technology, such as solar rooftop installations. Furthermore, conventional financing products may need more to incorporate the societal and environmental benefits of clean energy. The specialized credit programs aim to rectify these market deficiencies.

J. RECOMMENDATIONS AND KEY ASKS

The paper highlights several common challenges that hinder the adoption of renewable energy, particularly RTS, across STAR member countries.

Strengthening Collaborative Regional Efforts

Recognizing that each STAR member country has made individual strides in advancing RE adoption, there is a pressing need to promote collaborative and collective regional efforts. By working together, STAR members can accelerate the adoption of RE within the region, capitalizing on each country's unique strengths. Some STAR member countries have achieved notable progress in specific areas of RE, offering valuable expertise that others can leverage. It is therefore crucial to not only maximize these strengths within the STAR initiative but also to actively facilitate the sharing of knowledge and best practices across the region. This collaborative approach will significantly enhance the widespread adoption of RE and RTS, benefiting all member countries.

To this end, the following key recommendations have been developed to promote regional efforts aimed at advancing RE adoption, with a particular focus on RTS:

- **Digital Knowledge Platform** – Establish a platform for sharing best practices, case studies, and data on solar rooftop projects across the region, enabling access to valuable insights and experiences.
- **Harmonization of Technical Standards** – Work towards regional harmonization of technical standards for solar panels, inverters, and other equipment, which will reduce costs, improve efficiency, and facilitate easier cross-border collaboration.
- **Training Programs and Knowledge Exchange** – Organize training programs focused on solar energy solutions tailored for the garment sector. These programs should help factory owners, engineers, and financial officers understand the technical and financial benefits of RTS.
- **Garment Sector Solar Financing Program** – Launch a regional financing program specifically for the garment industry, providing low-interest loans, grants, or leasing options for solar rooftop installations to make the transition to solar energy more accessible.
- **Regional Solar Procurement Consortium** – Form a consortium of garment manufacturers to collectively negotiate better prices for solar panels and installation services. Bulk purchasing can lower costs and streamline the adoption process.
- **Standardized Contracts and Guidelines** – Develop standardized contracts and guidelines for solar rooftop installations in the garment sector, simplifying the process for companies to adopt and implement solar projects.
- **Export Market Incentives** – Consider implementing incentives or trade benefits for garment manufacturers that adopt solar energy, positioning them as sustainable suppliers in the global market.

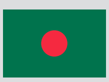
The table below provides an overview of these obstacles and measures that typically were found to be effective in addressing these barriers in other countries. Each STAR member country can implement tailored measures that address its specific challenges and opportunities, drawing on regional best practices while adapting them to local contexts to ensure the successful adoption of renewable energy and rooftop solar solutions.

Intervention Area	Measures	Key activities
Financial Measures	Expand Financing Options	• Increase availability and awareness of financing schemes with longer loan tenures and lower interest rates. • Introduce subsidized loans, grants, and promote green bonds for RTS projects.

Intervention Area	Measures	Key activities
	Reduce Costs	• Lower or eliminate import duties on RE components to reduce initial capital costs.
	Develop Attractive Financial Products	• Promote leasing and PPA options. • Encourage public-private partnerships and equity partnerships to share investment costs.
Policy and Regulatory Reforms	Streamline Approval Processes	• Simplify and accelerate regulatory approval processes for RTS projects. • Establish clear guidelines and provide support for grid integration.
	Supportive Policies	• Maintain and introduce consistent net metering and FiT schemes. • Set clear and specific targets for rooftop solar within national RE plans. • Work with policymakers to allow the sale of surplus electricity back to the grid and remove minimum consumption requirements. • Create standardized PPAs.
Technical and Infrastructure Improvements	Grid Modernization	• Invest in modernizing the grid to handle increased loads and ensure stability and reliability. • Implement smart grid technologies to manage network congestion and optimize RTS integration.
	Set Quality Standards	• Implement strict quality standards and certification requirements for solar equipment and installations. • Establish regular maintenance programs to ensure long-term performance.
Awareness and Capacity Building	Raise Awareness	•Conduct targeted awareness campaigns to educate stakeholders about the benefits and feasibility of RE. •Highlight successful case studies and potential cost savings.
	Develop Technical Capacity	•Develop training programs to increase the number of skilled professionals capable of designing, installing, and maintaining REsystems. •Facilitate knowledge exchange initiatives and workshops to enhance local expertise.
Market Development	Increase Market Transparency	•Provide clear information on the benefits, costs, and processes involved in RTS installations. •Develop standardized contracts and procedures to reduce complexity and increase investor confidence.

Star Member Country Specific Recommendations and Key Asks

The detailed summary below provides specific recommendations and key asks for each STAR member country to adopt RE, with a particular focus on RTS. These recommendations are based on best practices drawn from successful case studies and have incorporated input from STAR representatives and PDP experts.

Intervention Area	Measures	Key activities
	Financial Measures	• **Expand financing schemes:** Increase the availability and awareness of financing schemes specifically designed for RE projects in the textile and manufacturing sectors. This could include longer loan tenures and lower interest rates. • **Reduce import duties:** Lower or eliminate import duties on RE components to reduce initial capital costs. This will make RE projects more financially viable for these industries.

	Policy and Regulatory Reforms	• **Streamline approval processes:** Simplify and accelerate the approval processes for RTS. Provide clear guidelines and support for industries to obtain necessary permissions to integrate with the grid.
	Awareness and Capacity Building	• **Raise awareness:** Conduct targeted awareness campaigns to educate industry stakeholders about the benefits and feasibility of RE. Highlight successful case studies and potential cost savings. • **Build technical capacity:** Develop training programs to increase the number of skilled professionals capable of designing, installing, and maintaining RE systems in the textile and manufacturing sectors.
	Market Development	• **Develop business models:** Create and promote business models that incentivize both utilities and industries to invest in RE projects. This can include third-party ownership models and performance-based incentives.
	**Enhance Support from Financial Institutions**	• **Subsidized Loans and Grants:** Introduce subsidized loans and grants for RTS projects to lower financing costs. Government and international organizations could collaborate to offer these financial products. • **Green Bonds:** Promote the issuance of green bonds specifically aimed at financing RE projects, including rooftop solar. • **Capacity Building for Banks:** Train commercial banks and financial institutions on the benefits and financial viability of RTS investments to encourage more supportive financing options.
	Pilot Projects	• Implement pilot programs to demonstrate the successful integration of RTS with the grid, providing valuable data and building confidence among stakeholders.
	Implement Supportive Policies	• **Net Metering:** Introduce net metering schemes to make RTS financially viable for businesses. • **Simplify Approval Processes:** Streamline the regulatory approval processes for RTS projects to reduce administrative burdens and encourage faster deployment.
	Increase Awareness and Education	• **Awareness Campaigns:** Launch targeted awareness campaigns to inform textile and manufacturing companies about the benefits, feasibility, and financial incentives for RTS.
	**Advocate for Policy Reforms**	• **Grid Access:** Work with policymakers to create regulations that allow the sale of surplus electricity generated by RTS back to the grid. This would incentivize more RTS installations. • **Minimum Consumption Requirements:** Lobby for the removal or reduction of mandatory minimum electricity consumption requirements from the grid, allowing factories to utilize self-generated electricity fully.
	Financial Measures	• **Grants and Low-Interest Loans:** Establish government or industry-backed grant programs and low-interest loans to help SMEs cover the upfront costs of RTS installations. • **Public-Private Partnerships:** Promote partnerships between the public sector and financial institutions to offer favorable financing terms for RTS projects • **Equity Partnerships:** Encourage larger corporations or investment funds to partner with SMEs, reducing the financial burden on smaller companies by sharing investment costs. • **Risk Mitigation Funds:** Create funds to mitigate the financial risk associated with RTS investments, making them more attractive to potential investors.
	Promote Direct Power Purchase Agreements (DPPAs)	• Work with regulators to enable and simplify the establishment of DPPAs, allowing companies to directly purchase RE from RTS installations. • **Pilot Programs:** Implement pilot programs to demonstrate the feasibility and benefits of DPPAs, encouraging broader adoption.
	Increase Market Transparency	• **Standardization:** Develop standardized contracts and procedures for RTS installations and DPPAs to reduce complexity and increase confidence among potential investors and users.

	**Reevaluate Metering Policies**	• **Maintain Net Metering:** Advocate for the continuation of the net metering system, which allows consumers to offset their electricity consumption with the power generated by their rooftop solar panels. This policy encourages the adoption of RTS and makes it financially viable. • **Consultative Approach:** Engage stakeholders, including consumers, industry experts, and policymakers, in discussions to find a balanced approach that addresses the financial challenges of the energy sector without discouraging RE investments.
	Introduce Financial Support Mechanisms	• **Incentives and Subsidies:** Provide subsidies, tax breaks, and incentives for installing RTS to reduce the financial burden on consumers. • **Low-Interest Loans and Grants:** Establish financial support programs, such as low-interest loans and grants, specifically aimed at promoting the adoption of rooftop solar systems.
	Enhance Technical Standards	• **Set Quality Standards:** Implement strict quality standards and certification requirements for solar equipment and installers to ensure high-quality installations.
	Capacity Building Programs	• **Training and Certification:** Implement training and certification programs for solar installers and technicians to ensure they have the necessary skills and expertise. This will improve the quality of installations and maintenance services. • **Knowledge Exchange:** Facilitate knowledge exchange initiatives, such as workshops and partnerships with international experts, to enhance local expertise in the solar energy sector.
	**Expand Access to Financing**	• **Develop Specialized Loan Products:** Collaborate with banks and financial institutions to create loan products specifically tailored for solar energy projects. These products should feature favorable interest rates, longer repayment periods, and lower collateral requirements.
	Establish Incentive Programs	• Offer tax breaks and incentives for businesses and households that invest in RTS, making solar installations more financially appealing.
	Upgrade Grid Infrastructure	• **Smart Grid Technology:** Implement smart grid technologies to manage network congestion and optimize the integration of RTS into the grid.
	Stabilize Incentive Schemes	• **Consistent Supportive Policies:** Ensure consistency in supportive policies such as FiT and avoid frequent changes to maintain investor confidence and encourage long-term investment.
	Simplify Regulatory Processes	• **One-Stop-Shop:** Establish a one-stop-shop for all necessary approvals and permits related to RTS installations, making it easier for developers to navigate the regulatory landscape.

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STAR
Sustainable Textiles of the Asian Region

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