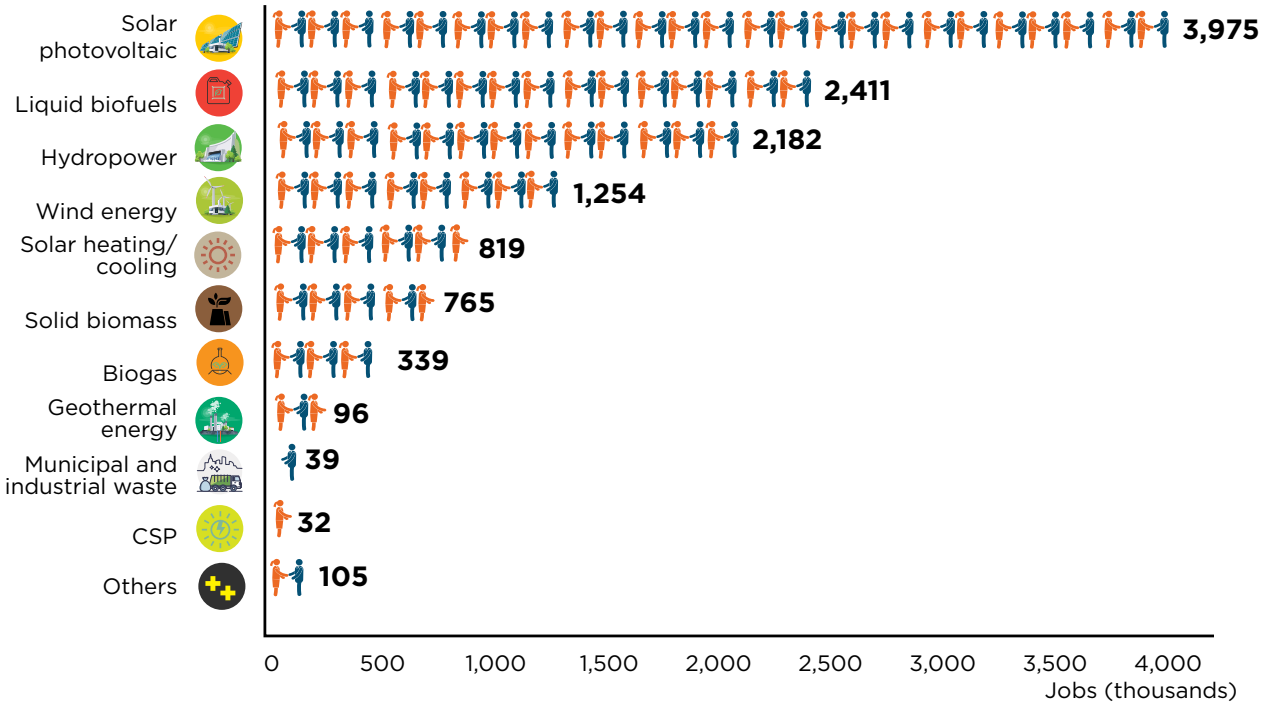
Advancing the Caribbean Solar PV Assembly Project

FIGURE 1: CLEAN ENERGY JOB CREATION
SOURCE: IRENA, 2021



> As several Caribbean leaders passionately expressed to COP 26 audiences, failure to act swiftly to address climate change will have dire implications for the region

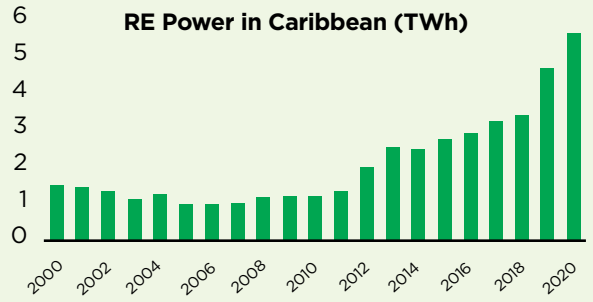
Globally, investments in the clean energy sector continue to be dominated by investments in renewable energy applications. Within the renewable energy space, data for 2021 shows that solar is dominating new investments and beating all other technologies. According to data from Bloomberg New Energy Finance (BloombergNEF), investment in large and small-scale solar projects rose to a record-breaking $205 billion, up 19% from 2020, and solar installations were approximately 185GW in 2021, up from 144GW in 2020. With these investments come significant economy-wide benefits.

The clean energy sector, especially solar and energy efficiency, provides several opportunities for meeting climate change goals. It has the potential to absorb significant new job entrants with low and medium skills for installation, maintenance, and construction services. The solar PV industry creates more jobs than any other sector within the clean energy space (Figure 1 illustrates).

Along with the creation of jobs and reduced carbon emissions, the clean industry offers new avenues for revenue generation, increased entrepreneurial activity and adoption of new technologies that will increase economic activity and ultimately bolster national GDP across the Caribbean. As territories grapple with economic recovery plans, there is a greater need to look closely within the region and capitalise on the abundant natural and human resources that exist to manage our major economic burden - energy expenditure.

Furthermore, the Caribbean has been increasing its demand for renewable energy (RE) and solar energy in particular, to support its Nationally Determined Contributions (NDCs) targets and in pursuit of CARICOM's regional energy targets.

FIGURE 2: CARIBBEAN RENEWABLE ENERGY POTENTIAL
BP STATISTICAL REVIEW, 2021



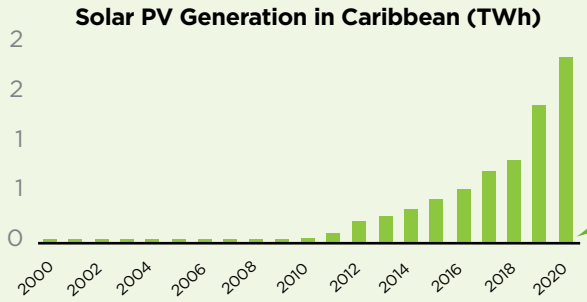


Figure 2 shows the trend in both RE overall and solar PV generation in the Caribbean over the last two decades.

Because the Caribbean region spends an estimated 40% of its foreign exchange on fuels for electricity generation and transportation, a home-grown investment which provides jobs and enables the energy transition is a uniquely synergistic solution to solving multiple challenges. Growing capacity in renewables therefore provides a platform from which other innovations can be developed and layered upon.

In fact, IRENA (2019) estimated that to meet the RE targets set out in Caribbean NDCs by 2030, an estimated US$16 billion will be required. The IDB (2019) noted that the net benefits of renewable energy investments in the Caribbean by 2040 are equivalent to US$18.4 billion.

Post the COVID-19 economic contraction, the pursuit of energy independence will become even more urgent. Conservative estimates value the region's solar energy industry at US$7.9 billion over the next 10 years. Yet, that level of investment may only lead to an average 57% renewable energy penetration (see Figure 2). The region must be seen as more than a destination for clean energy technology and carve out its own space along the entire clean energy value chain.

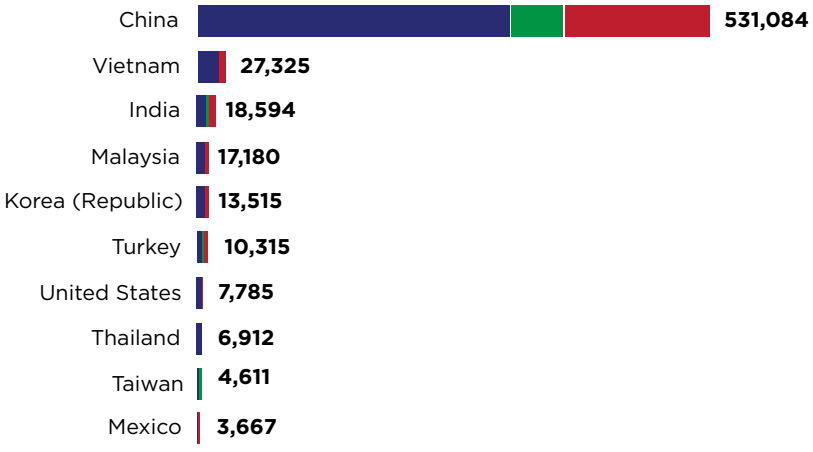
Chinese - Caribbean Solar PV Module Trade

In a February 2022 report from the USDOE, entitled "Solar Photovoltaics Supply Chain Deep Dive Assessment" it was highlighted that 69% of modules produced globally came from the top 10 manufacturers, all but two of which (Hanwha Q Cells, First Solar) are Chinese. Figure 3 shows the dominance of China among the top 10 manufacturers globally.

US$18.4BN
NET BENEFITS OF RENEWABLE ENERGY INVESTMENTS IN CARIBBEAN BY 2040 (IDB 2019)

US$16BN
TO MEET THE RE TARGETS SET OUT IN CARIBBEAN NDCS BY 2030 (IRENA 2019)

FIGURE 3: CRYSTALLINE SILICON MODULES (MW/YEAR), 2021
SOURCE: BLOOMBERGNEF



ON THE GREEN AGENDA

What is more interesting is that most new capacity additions are also being developed in mainland China – further contributing to its dominance of the solar PV manufacturing supply chain.

The demand profile for modules from mainland China shows that imports are increasing as countries shift toward the implementation of solar PV projects at the residential, commercial and utility scale to meet their targets and assist in their overarching decarbonisation policies.

Figure 4 shows Chinese panels imported by CARICOM countries for the last seven years. While the overall market is small, it shows that the demand profile is still very concentrated in a few countries. Even during the pandemic for the 2020 to 2021 period, overall demand increased each year.

Figure 5 shows that while Jamaica and Haiti represent the largest CARICOM markets, the Dominican Republic and Cuba have the largest demands regionally for solar modules, accounting for 70% of the Caribbean demand profile, with the Dominican Republic alone representing almost 50% of the total regional demand profile. As outlined earlier, significant capital is required to achieve targets set by the region and thus the demand outlook is positive with significant growth prospects into the future.

FIGURE 4: PV EXPORTS FROM CHINA (MAINLAND) TO CARICOM COUNTRIES (US$MM)
SOURCE: BLOOMBERGNEF

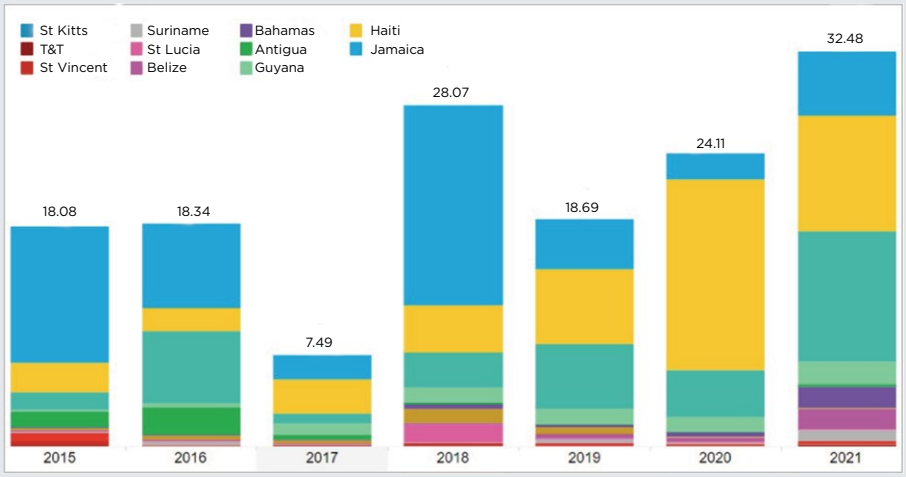
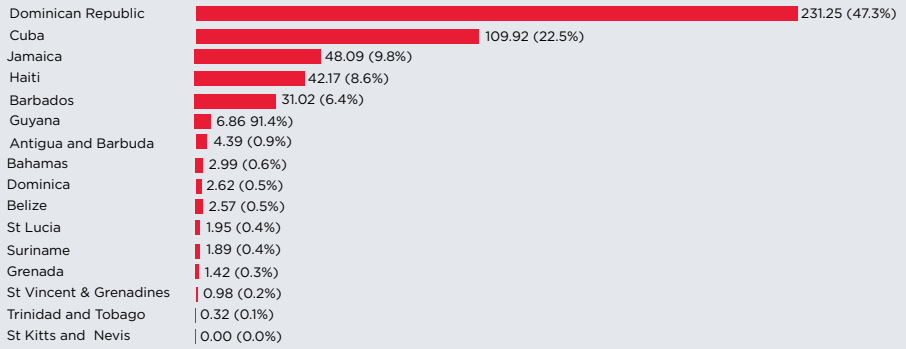


FIGURE 5: CARIBBEAN SOLAR PV MODULE IMPORTS FROM CHINA (US$MM)
SOURCE: BLOOMBERGNEF



Efforts to Advance Solar PV Manufacturing

To support the energy transition and to ensure that local investments realise a sustainable future for our industrial sector, National Energy has been leading the conceptualisation and development of sustainable energy opportunities through projects spanning energy efficiency and the solar energy value chain. These projects include National Energy as a Super ESCO, attraction of solar OEM component assembly, alternative fuels, emerging energy solutions and utility-scale renewable energy technology.

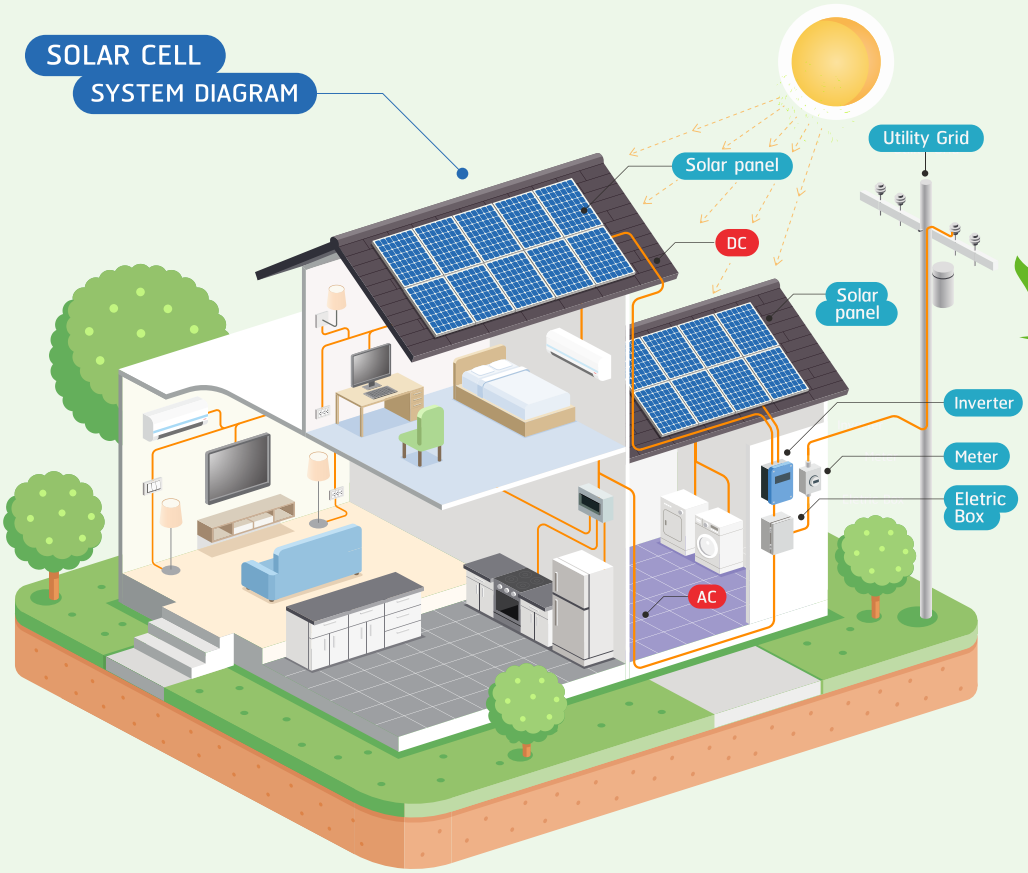
Moreover, The NGC Group has been focusing significant investment and research on renewable energy (RE), energy efficiency (EE) and emissions reduction. Collaborative efforts with the GORTT, academia, energy companies and international organisations have been a focal point for The Group in advancing its Green Agenda and the energy transition.

Previous feasibility studies conducted showed that Trinidad and Tobago has the potential to attain first-second quartile production costs with respect to the production of the following key components of the Solar PV Value Chain:

- Metallurgical Silicon
- Polysilicon
- Float glass
- Integrated PV manufacturing (ingot-wafer-cell-module)

Drawing upon the local technical expertise, strong business environment and low costs of production, Trinidad and Tobago could seek to become an attractive destination for solar PV manufacturing in the Western Hemisphere.

Advancing the Caribbean Solar PV Assembly Project | CONTINUED



Capturing the Caribbean market provides access to a skilled labour force in a region primed for investment, with easy access to North and South American markets. As a strategic initiative, capital investment and incentives are available to support the delivery of a Solar PV assembly facility. As the price per unit of solar decreases the reach of solar increases, requiring existing players to quickly scale or sacrifice new market share.

Given these factors as well as the desire to continue to look for opportunities to create an RE manufacturing cluster in the Caribbean, National Energy has continuously sought opportunities for the establishment of solar PV manufacturing to support the region. As such, in 2020, a Memorandum of Cooperation was executed between National Energy and the Caribbean Climate-Smart Accelerator (CCSA) to identify potential investors and collaborators and to develop market and financing opportunities to support the first leg of the clean energy industry in Trinidad and Tobago. This initial project will be the development and establishment of a Caribbean Solar Assembly facility in Trinidad and Tobago to serve the Caribbean region.

With a typical development timeline of 12 – 18 months for a large-scale assembly facility, it is envisaged that an experienced manufacturer/ developer with industry knowledge and extra regional market access will strengthen the overall success of the endeavour.

This initiative represents a consolidation of demand across at least 15 Caribbean territories, working together to create a single market for solar that ultimately provides an investment opportunity for their people, pooling their buying power to access not just solar but development and investment as well. Caribbean demand for energy and in particular, demand for solar, justifies the exploration of a solar assembly facility to feed the region's solar appetite.

Whilst the solar PV industry remains highly competitive and dominated by Chinese manufacturers, the pandemic exposed the risks associated with over-reliance on a supply chain that is entrenched in a single geographic location. Reshoring or diversifying the supply chain will reduce supply risks in the future and affords the region a chance to suitably configure a truly Caribbean Solar Assembly facility.

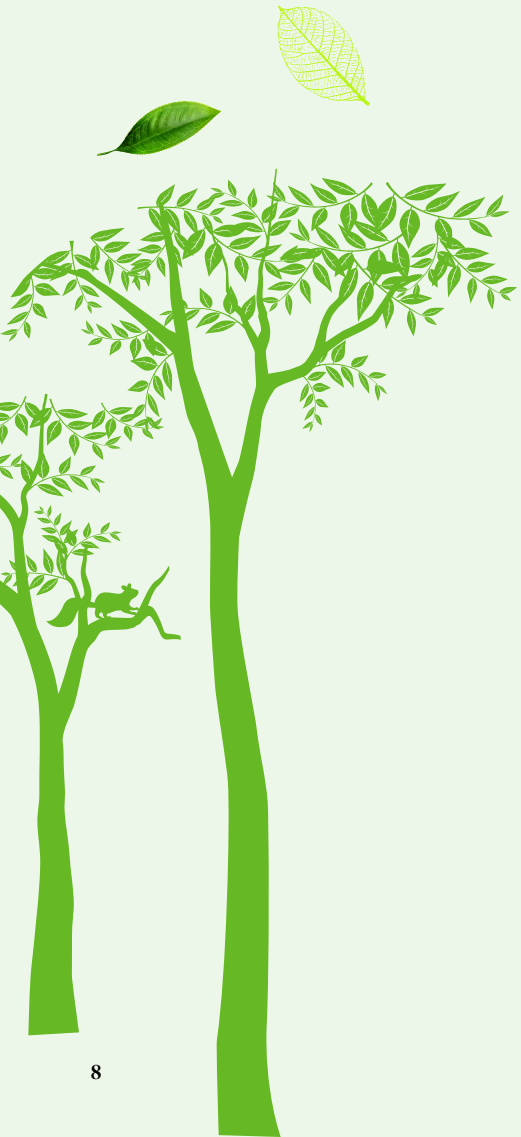
At the Eighty-Second Special Meeting of the Council for Trade and Economic Development [Energy], Special Strategic Session - Achieving Regional Energy Security Through Enhanced Cooperation and Integration: Considerations for a Regional Approach to Energy Security - A Pragmatic Approach to Regional Energy Integration, Caricom Member States "Endorsed the Caribbean Solar Assembly Concept, presented by the Caribbean Climate-Smart Accelerator (CCSA), recognising the value proposition and benefits that Member States can derive from the venture."

ON THE GREEN AGENDA

Through the efforts of the Caribbean Climate-Smart Accelerator (CCSA), the Rocky Mountain Institute (RMI) has also expressed its support for the concept. The RMI estimates that roughly 40GW of solar PV, coupled with other clean energy technologies will be required to transition the entire Caribbean region to 90% clean energy by 2040. Further, regional Investment Promotion entities are prepared to assist in this effort to provide a seamless operational establishment.

Current Pursuit of Potential Investors for PV Assembly Facility

After extensive work by National Energy's Sustainable Energy Development (SED) Division, Caribbean Climate-Smart Accelerator (CCSA) and InvesTT, a detailed investment prospectus for a Caribbean Solar Assembly facility, strategically located in Trinidad and Tobago was developed.



The investment concept is founded on the fact that the Caribbean needs to invest approximately US$8 billion in solar to meet its energy transition ambitions. If established, this facility will satisfy the consolidated demand for renewable energy from at least 15 Caribbean territories.

The ownership of the plant would depend on the level of equity the project developer wishes to retain, notwithstanding the regional interest to participate in the investment. The size of the facility and the investment required are negotiable, although it is anticipated that capital expenditure of at least US$25 million will be required for a competitively sized assembly facility.

The investment prospectus includes information on, inter alia: advantages of establishing the facility in Trinidad and Tobago; country projections for investment in solar across the Caribbean; a Caribbean fact sheet; and potential opportunities.

This investor prospectus has generated interest among investors locally, regionally, and internationally who all expressed some level of interest in various aspects of the proposed PV assembly facility. As such, discussions are ongoing with a few of the interested entities to enable them to better understand the project and make a decision about going forward.

De-risking Asian-Centric PV Module Supply

While a 2021 article from the World Economic Forum pointed out that just-in-time supply, more nimble manufacturing, and automation have led to solar becoming one of the cheapest sources of electricity globally, they were quick to note that "the solar industry is now grappling with supply chain issues that could significantly impact its future".

With increasingly competitive pricing and net-zero targets driving the growing demand for solar photovoltaics, new manufacturing supply-chain models are under consideration to increase local resilience and to ensure continuity of supply. In fact, according to the World Economic Forum, the search for reduced costs and greater capacity expansions have led many prospective manufacturers to explore alternative manufacturing arrangements to gain a competitive edge or support the speed of the transition.

The region is placed at a long-term disadvantage as the manufacturing supply chain is concentrated in mainland China, relegating our region to a consumer of modules. Given solar module importance in realising the transition, having some regional supply options are vital in the event of a supply disruption or spike in raw material costs. It was earlier reiterated that given the increased demand outlook and if Asian capacity is unable to keep up with future demand spikes, having capacity located within the region will further allow us to continue our transition unabated or at least reduce wait times and cost of project development in some instances.

Therefore, despite the intense competition that exists in the solar PV manufacturing landscape, the desire for creating localised clusters of solar PV manufacturing is not unique. For example, in November 2021, Saudi Arabia inaugurated the largest solar PV module factory in the Middle East with a capacity of 1.2 GW at a cost of $186.9 million.

The factory, according to the Saudi Arabian deputy energy minister, is aimed at "boosting investments in solar energy and diversifying energy sources in our country, in addition to enabling integration with relevant government agencies and the private sector to support the creation of a domestic renewable energy industry".[1]

Further, in February 2022, flexible PV module manufacturer Power Roll opened its solar film manufacturing facility in England with plans to reach 30MW productive capacity by the end of 2022. Power Roll indicated that this initial facility was meant to "demonstrate the manufacturing process to Power Roll's licensing partners as well as producing pilot output for testing and demonstration".[2]

Also, the National Renewable Energy Laboratory (NREL) Fall 2021 Solar Industry Update report, estimates as much as 12-15 gigawatts (GW) of module assembly capacity can come on stream in the US over the 2021 to 2024 period, supported in part by incentives from the US government.

Conclusion

The benefits of manufacturing activity are well established. The manufacturing sector is the sector that accelerates technological innovation, and its demise negatively affects the growth of all other sectors (Su and Yao, 2017). It is also the sector that has significant backward and forward linkages with other sectors in an economy and is therefore seen as an engine of economic growth. It is these positions which drive National Energy's relentless pursuit and correlated promotion of an export-oriented solar PV assembly facility, and eventually an overall clean energy manufacturing base, within Trinidad and Tobago.

As such, while we acknowledge that this is a difficult road, we are reminded of the speech by our first Prime Minister who indicated at the sod turning ceremony of ISCOTT in 1977 that we are taking the more difficult road and embarking on a journey to build up our downstream natural gas industry. What is similar today is that we are met with another crossroad and must decide if as a nation and region we will allow ourselves to be relegated to an importer and installer, or if we will seek to build an industry with a manufacturing base. National Energy has explored multiple avenues, with the current approach being that of an assembly facility, given the importance of manufacturing and the potential supply chain development in the regional solar industry, and even in the wider renewable technology space.

As discussions continue with potential investors/developers, National Energy concedes that a significant collaborative effort across local and regional partners is needed to create an enabling environment for the development of a clean energy industry to serve the Caribbean. We are hopeful that this venture can soon be materialised and become the platform upon which the entire local and regional clean energy technology production and supply base is built. ■

References:

BloombergNEF (2022). Interactive Datasets. Accessed: February 2022.
BP Statistical Review of World Energy (2021)
IRENA (2021) - Renewable Energy and Jobs Annual Review 2021
NREL (2021). "Fall 2021 Solar Industry Update"
PV Magazine (2021 / 2022)
Su, D., & Yao, Y. 2017. "Manufacturing as the Key Engine of Economic Growth for Middle Income Economies." ADBI Working Paper Series No. 573. Asian Development Bank Institute.
US DOE (2022). "Solar Photovoltaics Supply Chain Deep Dive Assessment"
World Economic Forum (2021) – "To lead the green energy future, solar must clean up its supply chains". WEForum.Org.

[1] https://www.pv-magazine.com/2021/11/19/solar-module-factory-with-1-2-gw-capacity-inaugurated-in-saudi-arabia/

[2] https://www.pv-magazine.com/2022/02/25/new-flexible-solar-module-factory-begins-operations-in-the-uk/