



Institute For Economic Justice POLICY BRIEF



FROM DEPLOYMENT TO DEVELOPMENT: LOCALISING GHANA'S SOLAR PV PRODUCTION NETWORK

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Executive summary

Ghana's solar photovoltaic (PV) market is expanding rapidly, with installed capacity increasing from 2.5 MW to 248 MW between 2016 and 2025. However, most of the economic value associated with this expansion continues to accrue outside Ghana. Domestic firms remain concentrated largely in distribution, installation, systems integration, operations and maintenance, while key components are predominantly imported.

This brief argues that the challenge is not whether Ghana should pursue localisation, but how localisation can be achieved in a way that is commercially viable and capable of creating sustainable domestic value. Experiences from leading manufacturing countries demonstrate

that competitiveness emerges through the gradual accumulation of skills, technology, finance, supplier networks and market scale. Localisation should therefore not be understood as an immediate transition to full-spectrum manufacturing, but as a process of progressively expanding domestic participation in activities where Ghana can realistically build and sustain competitive capabilities.

To support this process, the brief recommends that government, in collaborate with industry and other relevant stakeholders, establish a phased localisation framework focused on commercially viable opportunities; align procurement and fiscal policies with localisation objectives; expand access to targeted industrial finance; strengthen skills, quality infrastructure and technology-transfer mechanisms; leverage regional market opportunities under AfCFTA; and establish a dedicated mechanism to coordinate, monitor and drive the implementation of solar PV localisation initiatives.

1. Introduction

Ghana's solar photovoltaic (PV) sector is expanding rapidly. Over the past decade, installed solar capacity has increased from 2.5 MW to 248MW as of the end of 2025.¹ This expansion extends beyond utility-scale projects, with solar technologies increasingly being deployed in households and other distributed applications. Ghana records a significant increase in the number of households using solar power from approximately 2,300 in 2001 to 23,000 in 2021.² Commercial and industrial uptake is also growing, reflecting increasing interest in solar PV among

businesses seeking alternative and supplementary sources of electricity.^{3,4}

Despite this growth, Ghana's solar market remains highly import-dependent. Available trade data from the UN Comtrade also point to a sustained increase in imports of solar PV-related products. Additionally, domestic module assembly remains limited.^{5,6} This means that increased deployment does not automatically translate into a corresponding expansion of domestic productive capability or value capture.

The expansion of Ghana's solar market draws attention to a distinction between deployment and development. Different actors therefore participate at different stages of the production process and capture different forms and levels of value. The Global Production Network (GPN) framework provides a useful way of analysing these relationships because it focuses not only on where production occurs, but also on how value is created, enhanced and captured, and how firms and institutions influence opportunities for upgrading.⁷

In this brief, localisation refers to the progressive expansion of Ghanaian participation across the solar PV value chain through domestic component production, assembly, engineering services, operations and maintenance, quality assurance, technology transfer, skills development and end-of-life management. Localisation is not synonymous with local ownership alone. Rather, it concerns the extent to which the economic, technological and employment benefits generated by solar expansion are retained within the domestic economy. Against this backdrop, this brief examines how Ghana can maximise the domestic value created by the growth of its solar PV market.

This brief draws on findings from our research on Ghana's solar PV sector and is structured in six distinct sections.^{8,9} The remainder of the brief is structured as follows. Section 2 examines the global dynamics of the solar PV production network. Section 3 assesses Ghana's current position within the network and the factors shaping localisation prospects. Sections 4 and 5 discuss pathways for progressive value capture and identify opportunities for localisation and domestic

value creation. Section 6 concludes and presents policy recommendations.

2. The global dynamics of the solar PV production network

The solar PV industry is a highly globalised segment of the clean energy economy, characterised by geographically dispersed production networks, specialised manufacturing processes, and significant concentration of technology ownership and production capacity. The production network spans a series of interconnected stages, beginning with the extraction and processing of raw materials and extending through polysilicon production, wafer manufacturing, cell production, module assembly, installation, operations and maintenance, and end-of-life management.¹⁰ Participation across these stages, however, is highly uneven. While solar PV systems are deployed in countries around the world, activities associated with

higher levels of value creation, particularly technology development, advanced manufacturing and component production, remain concentrated among a relatively small number of countries and firms. Countries therefore differ not only in the stages of the production network in which they participate, but also in their capacity to capture and retain value from those activities.^{11,12}

China has become the dominant manufacturing centre within this network, supported by large domestic markets, integrated supply chains, technological capabilities, industrial finance and sustained public policy support. Its firms benefit from economies of scale and vertically integrated production systems that allow them to compete aggressively in global markets.¹³ Other countries, including India and the United States, have also introduced industrial policies aimed at expanding domestic solar manufacturing capacity. As shown in Table 1, Chinese firms occupy most positions among the world’s leading solar PV manufacturers.

Table 1: Top Solar PV Manufacturers (2024)

Rank	Manufacturer	Country/Headquarters	Score (out of 100)
1	Jinko Solar	China	90.6
2	JA Solar	China	89.8
3	LONGi	China	86.5
4	Canadian Solar	Canada/China	84.0
5	Trina Solar	China	83.7
6	DMEGC Solar	China	83.0
7	Astronergy	China	78.2
8	Boviet Solar	Vietnam	76.3
9	Risen Energy	China	74.2
10	Qcells	South Korea	73.9
11	Adani Solar	India	72.8

Rank	Manufacturer	Country/Headquarters	Score (out of 100)
12	TCL Solar	China	70.8
13	Tongwei	China	70.7

Source: WoodMac (2025)¹⁴

Consequently, new entrants face significant barriers to participation in higher-value segments of the production network, where competing effectively requires capabilities that have often been built and refined over many years.^{15,16}

For Ghana, the implication is that localisation cannot simply mean reproducing every stage of the solar PV value chain domestically. The more relevant policy question is where Ghana can build competitive capabilities within the wider production network, deepen domestic value capture and create pathways for firms to progressively upgrade into more sophisticated activities.

3. Ghana's place within the solar PV production network

Ghana's participation in the solar PV production network is concentrated largely in downstream activities. Domestic firms are primarily engaged in distribution, systems integration, installation, operations and maintenance, with limited participation in module assembly and very little involvement in upstream activities. Most solar modules, inverters, batteries and other major system components are imported, reflecting the country's limited participation in manufacturing and component production.^{17,18}

While this position has supported the relatively rapid diffusion of solar technologies in Ghana, it limits the extent to which Ghana captures value from the expansion of the solar market. Ghanaian firms capture value largely through project development, installation, maintenance and related services, while higher-value activities remain more closely associated with foreign

technology providers, manufacturers and financiers. The policy challenge, therefore, is not simply to expand solar deployment, but to deepen Ghana's participation in the production network in ways that increase domestic value capture.

Three factors are particularly important:

1 Scale and market size: The viability of domestic manufacturing depends first on whether sufficient and predictable demand exists to support production at commercially viable scale. Ghana's solar market is growing, but remains relatively small compared with the domestic markets that supported manufacturing expansion in countries such as China and India. While demand is increasing, current deployment levels may not provide sufficient scale to sustain highly capital-intensive manufacturing activities across the full production network. The relevant market, however, need not be confined to Ghana. Access to regional markets can expand the potential scale of production and may be particularly important for products where Ghana has the potential to develop a competitive niche. Regional integration and access to the wider West African market could therefore expand the potential scale of selected manufacturing activities, provided that Ghanaian producers can meet the required quality and cost standards.

2 Cost competitiveness: Scale alone does not guarantee viable manufacturing. Domestic production must also be able to compete with imported alternatives, either on price or through sufficiently valuable differences in quality, reliability, service or other attributes. For Ghanaian firms, a lack of access to such

structural advantages can translate into higher unit costs, particularly during the early stages of production. A product may therefore be technically manufacturable in Ghana without being economically competitive. Where domestic production costs substantially exceed the landed cost of imported alternatives, maintaining production may require prolonged tariff protection, subsidies or other forms of state support.

3 Technology and capital requirements: Solar PV manufacturing spans activities with very different requirements. Upstream production of polysilicon, wafers and cells involves highly specialised processes, substantial capital investment, advanced equipment, technical expertise and sophisticated supplier ecosystems. Module assembly and the production of selected balance-of-system components present comparatively lower technological and capital barriers. Ghana's prospects for entering higher-value manufacturing are constrained by costly short-term finance, limited access to patient capital, weak R&D support and continued dependence on imported technology and expertise.^{19, 20} This suggests that highly capital-intensive upstream activities are unlikely to offer the strongest near-term localisation opportunities, whereas activities with lower technological barriers and closer links to existing domestic capabilities may provide more realistic entry points for progressive upgrading.

4. Localisation as a strategy for progressive value capture

These constraints do not imply that Ghana should abandon localisation or remain permanently concentrated in downstream activities. Rather, they indicate that localisation should be pursued strategically, based on the conditions under which domestic participation can create and retain value without imposing costs that undermine the broader expansion of solar deployment.

Participation in a global production network does not require every activity to be performed domestically. Even highly competitive manufacturing industries are organised through internationally fragmented production systems, with firms specialising in particular activities while sourcing other inputs from elsewhere. For Ghana, the objective should therefore not be self-sufficiency across the entire solar PV production network, but progressive expansion into activities where domestic capabilities can be developed and sustained competitively.

This means identifying segments that offer a credible combination of market opportunity, cost competitiveness, and manageable technological and capital requirements. Where these conditions are favourable, targeted policy support can help firms enter, build capabilities and move into higher-value activities over time. Where they are not, forcing domestic production may simply increase costs without generating durable industrial capability.

The question is consequently not whether Ghana should localise, but where localisation can generate the greatest sustainable domestic value, under what conditions, and with what degree of policy support. This provides the basis for assessing specific segments of the solar PV production network and identifying those that offer the strongest prospects for localisation in Ghana.

5. Opportunities for localisation and value creation

The opportunities for localisation span a range of activities with different capital, technological and capability requirements. These opportunities can therefore be considered as having a progression from strengthening existing domestic capabilities and supply relationships to expanding participation in production, specialised services and higher-value activities. The following areas represent the most relevant opportunities for Ghana within this progression.

- 1 Strengthening existing technical and engineering capabilities:** The most immediate opportunities lie in activities where Ghanaian firms already have a presence. As solar deployment expands, demand will increase for system design, feasibility studies, energy audits, project development, installation, operations and maintenance, and performance monitoring. These activities require technical expertise and industry knowledge but generally involve lower capital requirements than large-scale manufacturing, making them accessible entry points for domestic firms. Strengthening participation in these activities can also provide a foundation for further upgrading, thus enabling firms to while enabling firms to accumulate knowledge, build supplier relationships and develop capabilities that support movement into more sophisticated functions over time.
- 2 Building domestic value chains:** Solar deployment creates demand beyond the core equipment itself, including for fabrication, construction, electrical works, logistics, warehousing, packaging and other project-related services. Ghanaian firms with capabilities in metal fabrication, construction and electrical installation can participate in the production of mounting structures, support frames, enclosures and other balance-of-system components. This creates an opportunity to connect existing domestic industries and service capabilities that sit outside the traditional solar PV manufacturing value chain to the wider production network, thereby increasing the share of solar-related expenditure and value retained within the domestic economy.
- 3 Selective expansion into assembly and component production:** As capabilities deepen, Ghana can explore selected forms of assembly and component production where technological and capital requirements are more manageable. Module assembly may offer an entry point because it is less technologically intensive, while still providing scope for learning and deeper participation in the production network.
- Similar opportunities may exist in selected electrical components and battery integration where market demand and domestic capabilities support commercial viability.
- 4 Expanding localisation through circular economy activities:** As Ghana's installed solar base continues to grow, increasing volumes of solar panels, batteries and associated components will eventually reach the end of their useful lives. This creates potential opportunities in panel and battery recycling, material recovery and specialised waste management activities. Developing capabilities in these areas would allow domestic firms to participate in a segment of the solar ecosystem that is expected to expand as renewable energy deployment increases. Circular economy activities can build on existing waste-management, recycling and industrial capabilities while creating new avenues for domestic value creation. Early investment in collection systems, refurbishment capacity, recycling infrastructure and supporting regulatory frameworks could also position Ghana to capture value across a larger share of the solar technology lifecycle. In addition to creating economic opportunities, these activities can help address emerging environmental challenges associated with the disposal of end-of-life solar equipment, while supporting the recovery and reuse of valuable materials.
- 5 Using partnerships to deepen capabilities and value capture:** Strategic partnerships can accelerate localisation by linking domestic firms and institutions to the technologies, knowledge and capabilities required for upgrading. Joint ventures, supplier-development arrangements, collaboration among academic institutions and industry, relationships with foreign technology providers can support learning in production, engineering, quality control and product adaptation. Evidence from Ghana shows that local solar firms already rely on vertical relationships with foreign manufacturers and suppliers, as well as project-based collaboration

with other domestic firms, although many of these relationships remain relatively informal and transactional.^{21,22}

The policy objective should therefore be to deepen these relationships so that they generate sustained technology transfer, supplier development and independent domestic capabilities rather than one-off project participation. Partnerships can also help extend localisation into emerging activities such as refurbishment, recycling and material recovery, linking firms, research institutions, waste-management actors and regulators across the solar lifecycle. centres, certification programmes, university–industry partnerships, testing laboratories, applied research and specialised renewable energy consulting.

Conclusion and recommendations

Ghana's expanding solar market creates an opportunity to increase domestic value capture and build productive capabilities. However, deployment alone will not deliver industrial development. Domestic participation remains concentrated largely in downstream activities, while higher-value manufacturing and technology functions are located elsewhere in the global production network. However, moving upstream is constrained by high capital requirements, technological intensity, limited access to long-term finance, and the scale advantages of established global producers.

Localisation should therefore be

pursued as a gradual process of upgrading, building from existing capabilities into related services, domestic supply chains and selected production activities where Ghana can develop a credible basis for competitiveness. A phased approach, supported by appropriate finance, technology, supplier relationships and market development, can enable Ghana to retain more value from solar deployment while strengthening the capabilities needed for deeper participation in the wider solar economy.

This brief offers the following policy recommendations to create the conditions for competitive domestic participation, capability development and progressive value capture within Ghana's solar PV sector:

- 1 Establish a phased solar localisation and upgrading framework:** Government should develop a time-bound framework that identifies priority activities for localisation based on market potential, existing domestic capabilities, cost competitiveness, technological and capital requirements, and opportunities for learning and upgrading. The framework should distinguish between activities that can be pursued immediately, those requiring capability development, and highly capital- or technology-intensive segments that are unlikely to be competitive in the near term. This would provide greater discipline to localisation policy and help direct public support towards activities

with credible prospects for sustainable value creation.

2 Create targeted industrial finance for solar-related production and upgrading: Government, development finance institutions and commercial lenders should develop financing instruments suited to industrial investment, including equipment finance, guarantees, blended finance and patient capital. Financing should prioritise commercially viable assembly, component production and technology-upgrading investments rather than general support to the sector. This responds directly to the parent study's finding that costly, short-term domestic finance limits firms' ability to invest in production capacity, technology and upgrading.

3 Use partnerships and procurement to build technological capability: Public solar projects and partnerships with foreign firms should be structured to generate capability development rather than one-off local participation. Procurement and investment agreements can incorporate requirements or incentives for technology transfer, joint production, local engineering participation, supplier upgrading and collaboration with research institutions. This would help turn existing relationships with OEMs and foreign partners into pathways for sustained learning and movement into higher-value activities.

4 Strengthen testing, certification and quality infrastructure: Ghana should invest in the testing, certification and standards infrastructure required for domestic firms to produce components that meet recognised technical and safety requirements. Existing regulatory standards provide a foundation, but deeper localisation will require domestic capabilities to test, certify and continuously improve locally produced goods. Quality infrastructure is particularly important if Ghanaian firms are expected to compete beyond the domestic market.

5 Develop localisation around regional rather than domestic market scale: For some production activities, Ghana's domestic market alone may be insufficient to support commercially viable scale. Localisation planning should therefore incorporate ECOWAS and AfCFTA markets from the outset, including regional standards alignment, export market development and stronger commercial links between Ghanaian firms and regional buyers. Regional market access should be treated as an integral part of the industrial strategy rather than an eventual outcome of localisation.

6 Establish a mechanism to coordinate and track industrial upgrading: A designated institutional mechanism should coordinate implementation and track whether localisation policies are actually increasing domestic

value capture and firm capability. Monitoring should go beyond local ownership or local-content percentages to include domestic production, value added, technology transfer, firm upgrading, exports and participation in higher-value activities. The larger study identifies weak implementation, fragmented responsibilities and limited operational roadmaps as important constraints on existing localisation ambitions.

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