PART 2

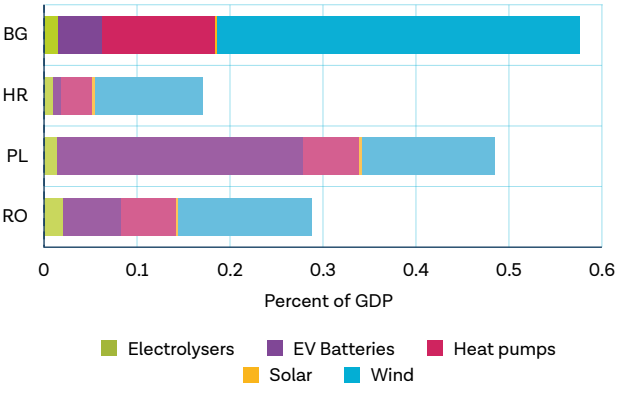
Clean Tech Value Chains

Using Trade Data to Guide a Complex Policy Space

Zooming in on Bulgaria

The EU RER 10 *Clean tech value chains: Using trade data to guide a complex policy space* shows that Bulgaria has some participation in clean tech value chains but there is ample room to grow. The EU RER 10 shows that, relative to its GDP, Bulgaria exports the most in clean tech among the 4CEEs[1] studied, at almost 0.6 of GDP, principally in the wind technology value chain (Figure 1).[2] However, while manufactured goods by Poland and Romania show higher degrees of complexity, clean energy technology exports by Bulgaria tend to be dominated by low or extremely low level of complexity, signaling lower stages of sophistication in its manufacturing (Figure 2). Nonetheless, Bulgaria competitively exports a number of products characterized by strong external demand (Figure 3), signaling potential to capitalize on the transition to the green economy. It also exports a high number of products with high onshoring attractiveness (OAS),[3] particularly in wind and heat pump value chains (Figure 4). Bulgaria, while showcasing a lower number or products in the five (5) clean tech value chains[4] analyzed in the report overall, seems to have opportunities concentrated in the wind value chain components, but, in comparison, shows very limited onshoring potential in solar value chains.

FIGURE 1 Exports of Net-Zero Technologies by Value Chain



Source: WB staff calculations.

1 World Bank Group EU Regular Economic Report 10 (EU RER) focuses on 4 Central and Eastern European (4CEEs) EU member states: Poland, Romania, Bulgaria, and Croatia.

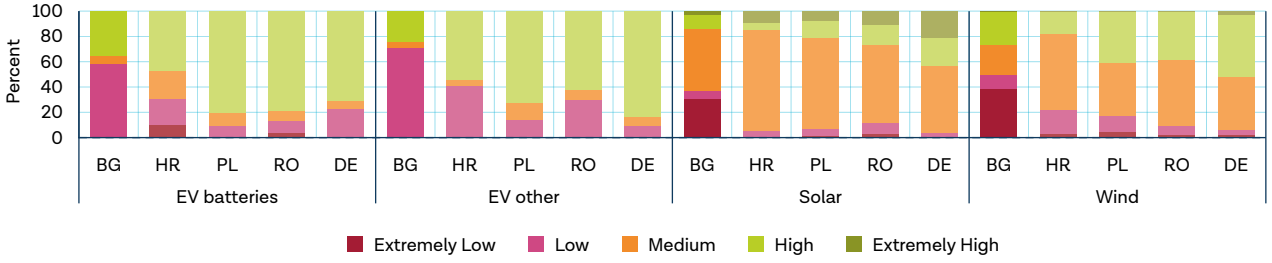
2 For the purpose of this report, the products that either produce, store or deliver low-carbon energy will be referred to as 'clean energy technologies' in line with the IEA, or 'clean tech' for short. The EU nomenclature includes 'clean technologies', 'net zero technologies', 'green technologies', among others. Note that in line with the emerging nomenclature, 'technologies' here refer to products: capital goods, consumer goods and intermediate goods, and not 'productive' knowledge.

3 Please refer to EU RER 10 Part II for more details. Onshoring attractiveness is a composite index that summarizes 18 demand, supply, and ease of market access variables, and is generated using Principal Component Analysis (PCA). PCA reduces the dimensionality of the dataset by transforming a large set of variables into a smaller set still containing most of the information. We select the maximum number of components (eigenvectors or factors) with eigenvalues greater than one.

4 The clean tech value chains mapped in this report are electric vehicle (EV) battery, heat pumps, wind, solar PV, and electrolyzers.

FIGURE 2 Exports of Clean Technologies by Complexity

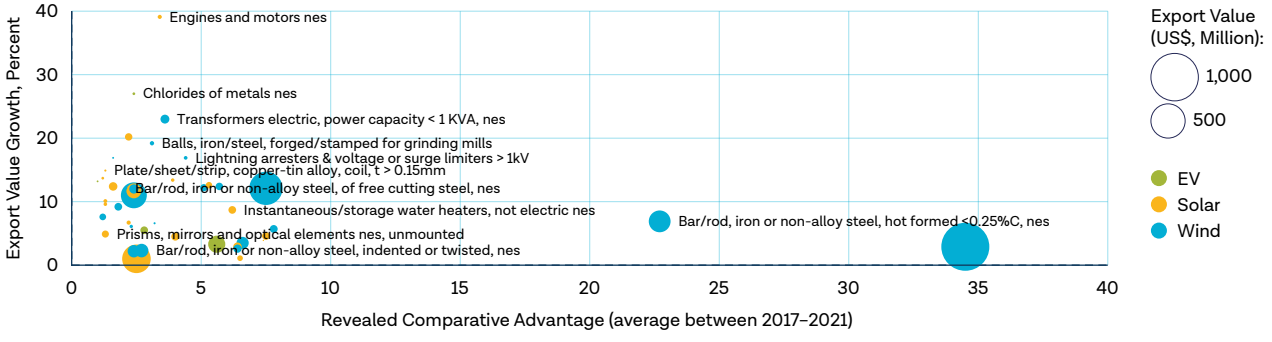
Share of respective technology's exports, 2022



Source: Green Value Chain Explorer (WB internal) and WB calculations.

Note: for panels a and b, the results are shown for three out of five clean tech manufacturing exports: EV, solar PV, and wind, in line with the current functionality of the GVCE tool. b. Extremely Low=-3<PCI<-1, Low=-1<PCI<1, Medium=1<PCI<3, High=3<PCI<5, Extremely High=5<PCI<7.

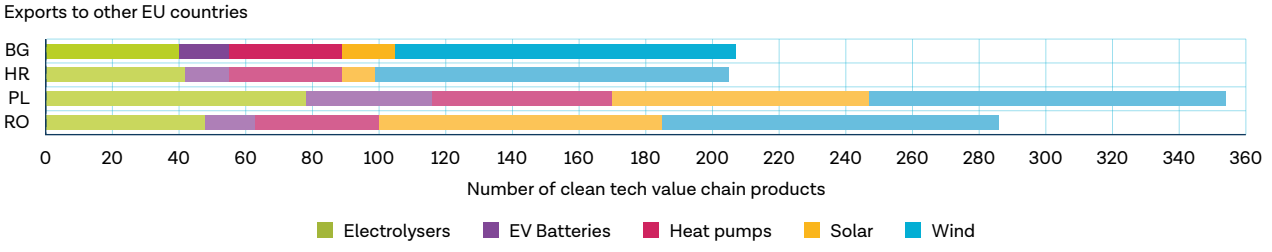
FIGURE 3 Product with clean tech export competitiveness (RCA ≥1), selected sectors



Source: Green Value Chain Explorer

Notes: EV results shown for EV battery only (excluding other EV components); growth rates truncated at 50 to exclude minor outliers showcasing high growth rates from a small base.

FIGURE 4 Unique value chain components with high onshoring attractiveness score



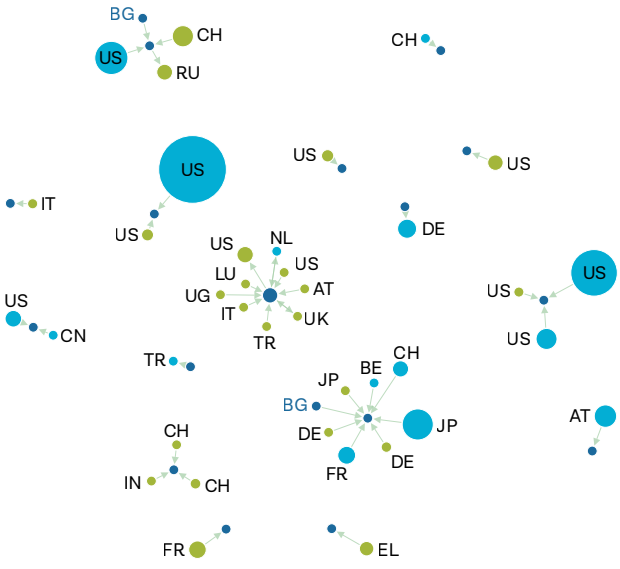
Source: World Bank calculations.

Firm network analyses conducted in the EU RER 10 Part 2 show that Bulgaria, along with Croatia and Romania, while integrated into the network of clean tech value chains, is less connected compared to Poland. Despite some overall 'connectedness' (please see the report for definitions and methodology), Bulgarian firms currently have a limited role and limited potential as an emerging intermediary in the clean tech value chains because of a smaller, less diverse, and weaker links in its international buyer/supplier network, among other factors. Bulgarian firms have only 17 distinct supplier countries and buyers from only 7 buyer countries. In comparison, Poland has very diverse connections to suppliers in 34 distinct economies and buyers from 35 countries, across North America, Europe, and East Asia. This paucity of diversity in its supplier network exposes Bulgaria to decision making or shocks originating in a few foreign firms based in a few countries. Nonetheless, its lower number of linkages with other countries suggests that, while it is part of the net-zero value

chain, there is potential for Bulgaria to enhance its connectivity and influence within the network, also by emulating Poland in its ability to build a richer domestic ecosystem.

Bulgarian firms in clean tech value chains demonstrate limited integration within the domestic economy and rely heavily on foreign suppliers, with only 25 percent of their supplier network being domestic. Bulgarian firms in clean tech import most or all of their inputs, signaling the potentially limited spillovers from targeted government policies in support of firms, as government support is likely to activate supply chains abroad, rather than trickle down to domestic suppliers and create more jobs or attract more investment. As a result, it is important for Bulgaria to also consider horizontal policies that aim to strengthen the economy overall. Understanding broader, i.e., not value chain-specific, factors that may limit linkages to important domestic suppliers would be needed prior to concrete considerations for any form of targeted policy.

FIGURE 5 Bulgaria intermediation in green value chains

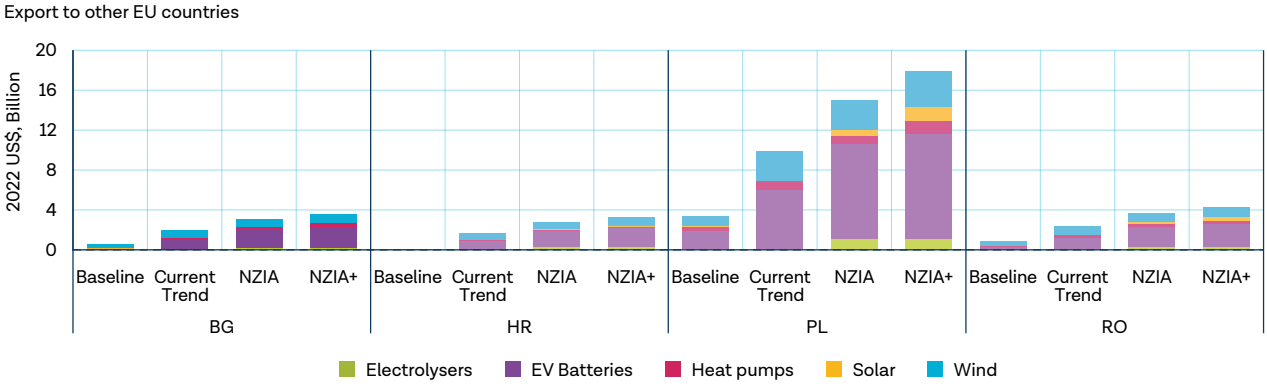


Source: World Bank calculations using FactSet.

Note: Segments of the global green tech value chain that involve 4CEE firms. The green nodes represent a company located in the respective country; the blue nodes represent key companies in the clean tech sector, while the size of each node reflects the betweenness centrality of the companies in the overall network

Simulations conducted in the EU RER IO Part 2 show that Bulgaria could potentially more than triple its clean energy technology-related exports to the EU from 2022 level, under current EU policies; and even quintuple them if Net Zero Industrial Act targets for onshoring production are achieved. Clean tech exports could grow from under US$ 1 billion (0.6 percent of GDP) in 2022 to almost US$ 4 billion (2.8 percent of GDP) by 2030 (Figure 6), with battery technology expected to dominate exports at 60 percent of total clean tech exports followed by wind at 25 percent of total clean tech exports. Simulations anchored in EU policy targets suggest that US$1 billion in investments are required to meet its production and export potential. However, there are risks in the implementation of EU policy because of insufficient coordination and financing at the EU level, and constrained domestic fiscal space. Moreover, the diversity of manufactured products at various stages of production in the clean tech value chains makes it difficult to use targeted policies.

FIGURE 6 Annual exports to EU27, by value chain, 2022 actual and 2030 simulations



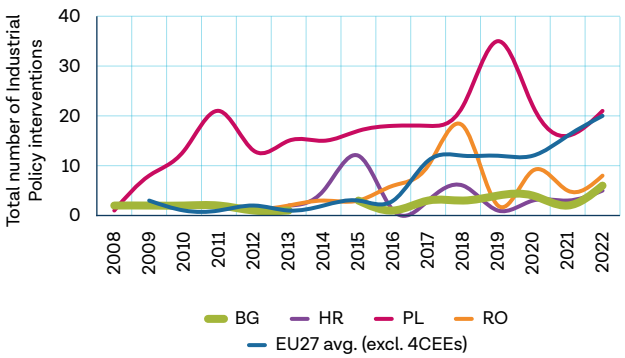
Source: World Bank calculations.

Bulgaria may face many challenges in reaping the benefits of the green transition. In targeted investor surveys conducted by the World Bank, Bulgaria was ranked lowest among the 4CEEs across half of the identified drivers of investment attractiveness because of its market size and prospective

trends, its smaller and less diversified supplier network, its poorer connectivity and infrastructure quality, the higher cost and lower availability of suitable land, and its low climate resilience.

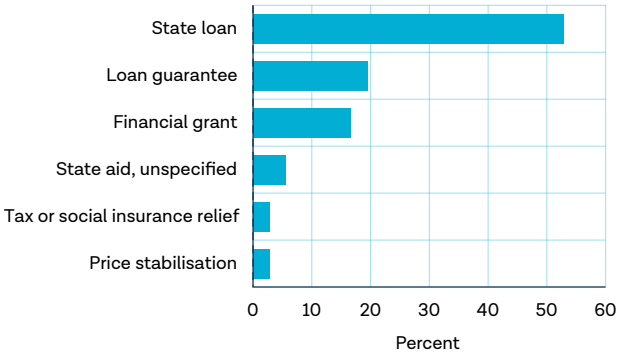
Bulgaria has room to make use of the broader industrial policy toolkit. The analysis of the types of implemented industrial policy shows that Bulgaria deploys industrial policy less often than the EU average, and when it does, the toolkit almost exclusively relies on domestic subsidies, especially in the form of state loans (Figures 7 and 8). The broader policy toolkit presented in the EU RER could complement subsidies with tools targeting the supply side, demand side and governance. On the supply side, this includes performance standards, where subsides for specific firms come with conditions; and policies targeting all firms such as improving the availability of skills, well-functioning capital markets, entrepreneurship and innovation policies, the latter already strongly supported by the EU. On the demand side, available policies include strengthening product standards, improving consumer awareness, and public procurement to conditions. As with the selection of sectors to target, if at all, the selection of policies should be done carefully and in a coordinated fashion, with a view to implementing complementary policies that can help make any individual policy more effective. Strengthening the governance (coherence between policies, and enabling bodies), and the overall state capacity is therefore important for creating the conditions for such coordinated policy implementation.

FIGURE 7 Annual industrial policies passed in each of the 4CEEs and the EU average (simple)



Source: World Bank calculations based on Juhasz et al. 2022.

FIGURE 8 Composition of industrial policy interventions in Bulgaria



Source: World Bank calculations based on Juhasz et al. 2022.

More knowledge about the domestic and international policy space would help, and so would a coordinated policy approach at the EU level. The analysis of global clean tech value chains and the specific types of participation by individual countries is currently difficult to capture given the limitations of the existing data. The EU RER shows some ways in which these value chain relationships can be approximated, but Bulgarian policy makers could benefit from investing in getting a detailed understanding of the existing and potential participation in global value chains to inform a targeted policy strategy. EU level coordination would also help in that it could help minimize the fallacy of composition risks (too many countries crowding into the same product space) while overlooking other critical parts of the value chains.