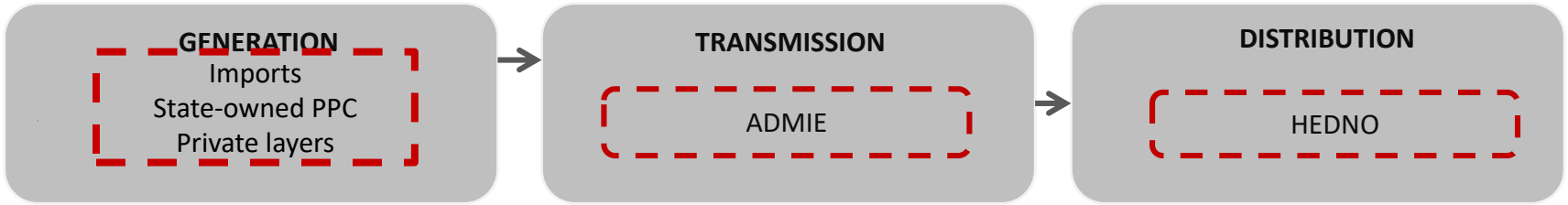
3.4.13 Greece

- Industry structure, institutional framework and key players
- Growth in capacity, production and consumption, 2006–21
- Forecasted demand and addition to generation capacity, 2022–31
- Growth in transmission network and capacity, 2008–21
- Forecasted transmission network length and capacity, 2022–31
- Forecasted investment in the transmission network, 2022–31

Industry structure, institutional framework and key players

- There have been two major rounds of structural reforms in Greece's electricity industry, in 2005 and in 2011, following the energy market directives of the European Union (EU). The state-owned Public Power Corporation (PPC) has been restructured; private sector participation in the generation and supply segments has increased; the independent transmission operator (ITO) model has been adopted in the transmission and distribution segments; and partial deregulation and liberalisation of the wholesale and retail markets have been achieved.
- However, PPC, through its subsidiaries, continues to dominate the generation and supply segments and owns the transmission and distribution networks. Nonetheless, in the generation segment, several new independent power producers (IPPs) are now active. Mytilineos Group is the largest IPP in Greece, followed by Elpedison Energy SA, Heron Thermoelectric, Corinth Power SA, Protergia SA and Motor Oil Hellas AE.
- Greece adopted the ITO model for the transmission segment in February 2012, replacing the independent system operator (ISO) model previously in place. With this, the responsibility of management, operation, development and maintenance of the transmission networks was shifted from the erstwhile Hellenic Transmission System Operator (HTSO) to Independent Transmission System Operator S.A., known as Anexartitos Diacheiristis Metaforas Ilektrikis Energeias (ADMIE) in Greek.
- An organisational model similar to that in the transmission segment has also been adopted in the distribution segment. Hellenic Electricity Distribution Network Operator SA (HEDNO) was set up in 2012 as the fully-owned but autonomous subsidiary of PPC, responsible for operation, maintenance and development of the country's distribution networks.
- In June 2017, the Greek government allowed the State Grid International Development Limited (SGID) of China—a subsidiary of State Grid Corporation of China (SGCC)—to acquire a 24% equity stake in ADMIE for EUR324 million. In November 2019, China signed an agreement with Greece expressing its interest in the HVDC interconnection project between mainland Greece and Crete. SGCC also expressed its interest in purchasing another 20%% stake in ADMIE's subsidiary—Ariadne Interconnection which is implementing the Crete–Attica project.
- The Ministry of Environment, Energy and Climate Change (MEECC) was created in 2009 as the central authority for energy policy making in Greece. The sector's independent regulator, Regulatory Authority of Energy (RAE), was set up in 2000. The regulatory institution was strengthened by the Energy Law of 2011.

Greece's electricity industry structure



Growth in capacity, production and consumption

- As of end-2021, Greece had an estimated installed generation capacity of 17,811 MW, of which 42% was based on renewable energy, 40% was thermal energy and rest was based on hydropower. During 2006–21, electricity production and consumption declined at a CAGR of 0.31% and 0.21%, reaching 48,104 GWh and 52,336 GWh in 2021 respectively.

Table 1: Installed capacity, generation and consumption, 2021E

Installed capacity (MW)	17,811
Generation (GWh)	48,104
Consumption (GWh)	52,336

Figure 1: Installed electricity capacity by technology, 2021 (%)

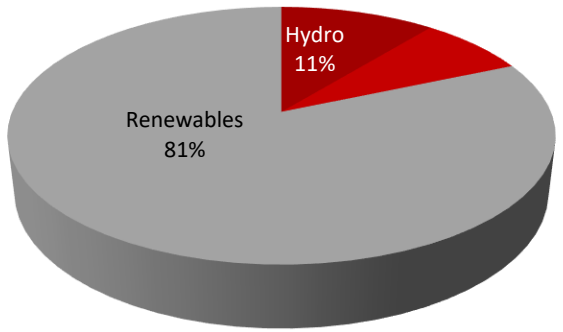


Figure 2: Growth in installed capacity, 2006–21 (MW)

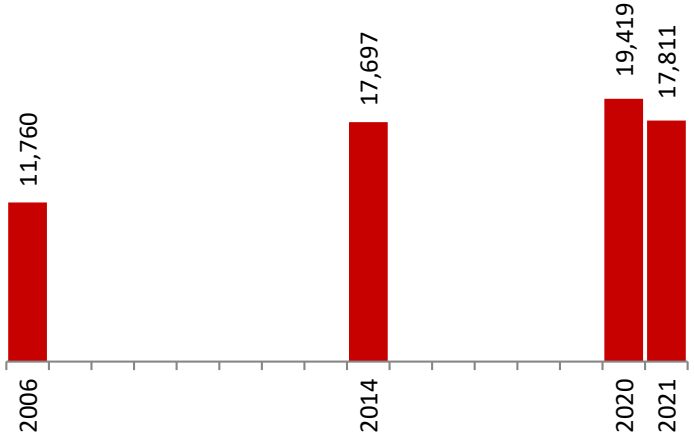
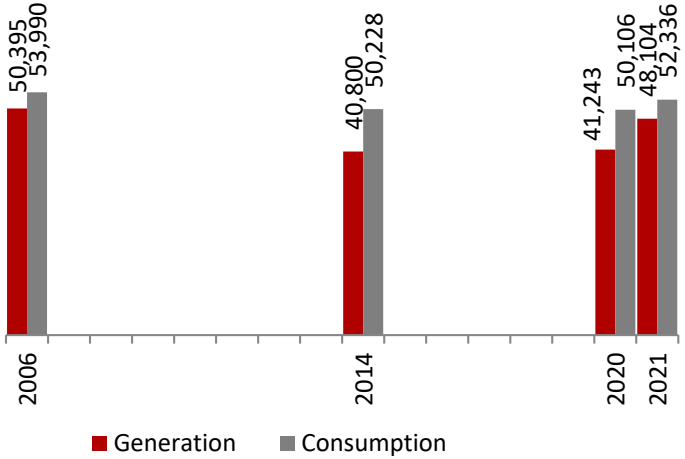


Figure 3: Growth in generation and consumption, 2006–21 (GWh)



Note: E- 2021 data has been estimated
Source: Regulatory Authority of Energy, Greece; ENTSO-E; Global Transmission Research

Forecasted demand and addition to generation capacity

Figure 4: Expected addition to generation capacity, 2022-31 (MW)

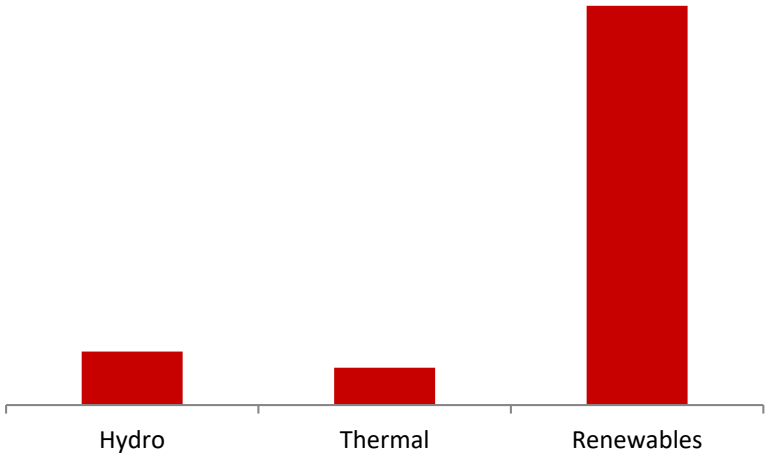
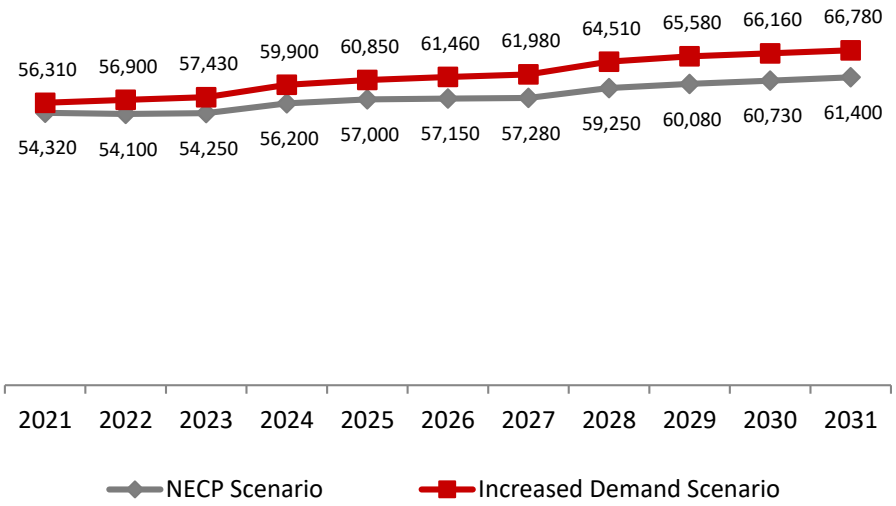


Figure 5: Forecasted growth in electricity demand (GWh)



Source: ADMIE; RAE; Global Transmission Research

- As per NECP scenario of draft Ten Year System Development Plan (TYNDP) 2022–2031 submitted by ADMIE to RAE, the electricity demand in Greece is likely to increase at a CAGR of XX%. In the increase demand scenarios, electricity demand is expected to grow at XXX%.
- According the draft plan, XX MW of generation capacity is expected to be commissioned in the country during the 2022–31 period. This includes XX MW of renewable capacity, XX MW of hydro capacity and XX MW of thermal capacity.

Growth in transmission network and capacity

- As of December 2021, Greece transmission network is estimated to comprise XX km of line length, XX MVA of transformer capacity and XX substations at 110 kV to 400 kV voltage levels. The majority of the network, or about XX% of the total line length, comprises XX kV lines. Further, XX km of network was either underground or comprises undersea cables.

Table 2: Transmission line length and transformer capacity, 2021E

Transmission line length (km)	**XXX**
150 kV AC	**XXX**
- OHL	**XXX**
- UGC	**XXX**
-USC	**XXX**
400 kV AC	**XXX**
-OHL	**XXX**
-UGC	**XXX**
400 kV DC	**XXX**
-OHL	**XXX**
-USC	**XXX**
Transformer capacity (MVA)	**XXX**
150/66/20 kV	**XXX**
400 kV	**XXX**
Substation (No.)	**XXX**

Figure 6: Transmission line length by voltage (%)

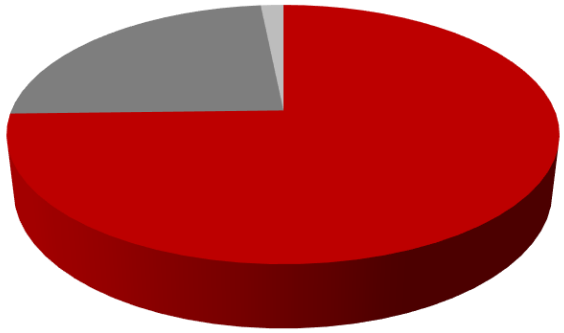


Figure 7: Growth in transmission line network, 2008–21 (km)

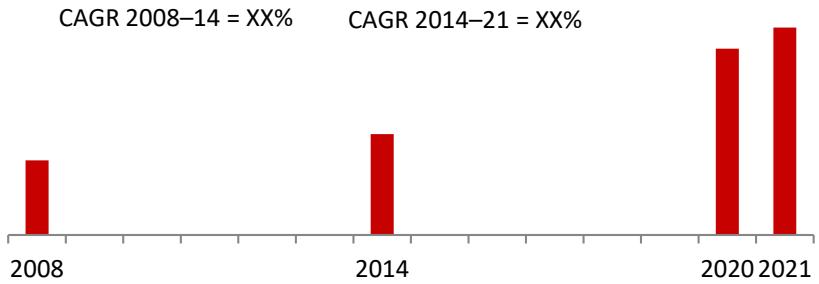
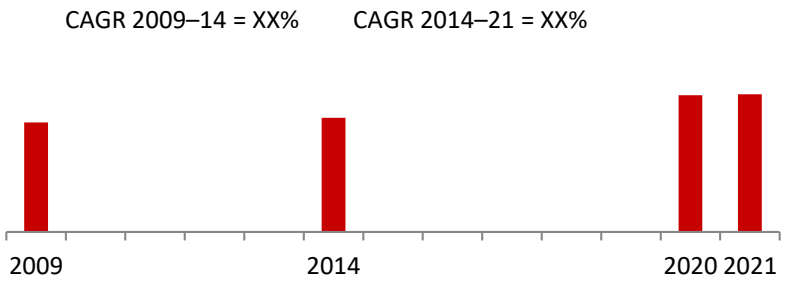


Figure 8: Growth in transformer capacity, 2009–21 (MVA)



Notes: E- Data has been estimated for 2021; OHL – overhead line; UGC – underground cable; USC – undersea cable; AC - alternating current; DC - direct current
Source: ADMIE; Global Transmission Research

Forecasted growth in transmission network and capacity

- As per Global Transmission estimates, about XX km new transmission line length is likely to be added during 2022–31, XXX MVA transformer capacity and XX substations during 2022–31.

Table 3: Planned transmission network additions, 2022–31

Voltage	2022–26	2027–31	2022-31
Transmission line length (km)	**XXX**	**XXX**	**XXX**
– 150 kV DC USC	XXX	XXX	XXX
– 150 kV AC USC	XXX	XXX	XXX
– 400 kV AC OHL	XXX	XXX	XXX
– 525 HVDC USC	XXX	XXX	XXX
– 500 kV HVDC USC	XXX	XXX	XXX
– 600 HVDC OHL	XXX	XXX	XXX
– 600 HVDC UGC	XXX	XXX	XXX
– 600 HVDC USC	XXX	XXX	XXX
– 220/500 AC/320 DC USC	XXX	XXX	XXX
Transformation capacity (MVA)	**XXX**	**XXX**	**XXX**
– 150 kV			XXX
– 400 kV			XXX
Substations (No.)			**XXX**

Figure 9: Planned line length addition (km)

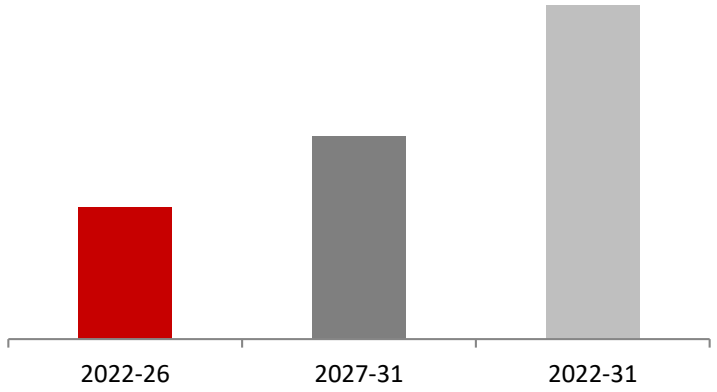
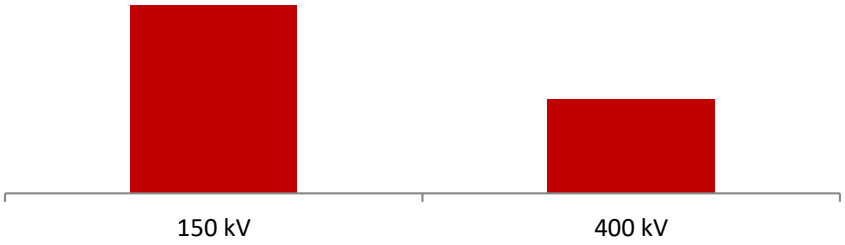


Figure 10: Planned transformer capacity addition, 2022-31 (MVA)

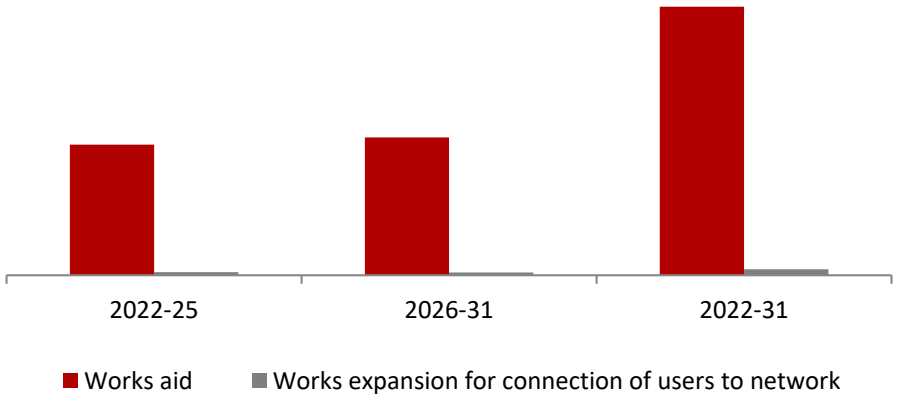


Note: In case of interconnectors, only line length in the Greek territory has been considered. Data excludes line lengths of reconstruction projects.
Source: ADMIE; ENTSO-E; Global Transmission Research

Forecasted investment in transmission network

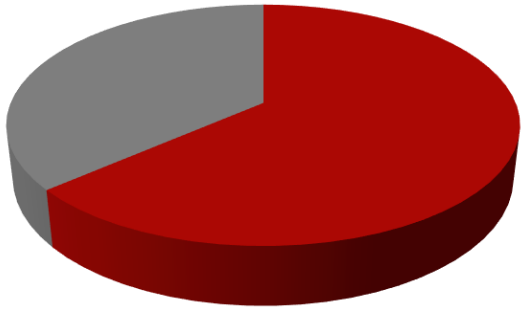
- As per the estimates of ADMIE, about EURXXX million will be invested in Greek transmission grid during the period 2022-31. Of this, XX% will be invested on network strengthening projects while XX% will be spent on network expansion projects.

Figure 11: Planned investment in transmission network and capacity for 2022–31 (EUR million)



Source: ADMIE Global Transmission Research

Figure 12: Planned investment in transmission network and capacity for 2022–31 by voltage (%)



Total investment: EURXXX million

- The Greek electricity sector has been making steady progress over the few years, particularly after equity stake dilution in ADMIE. Importantly, the islands of Paros, Syros and Mykonos were connected with the mainland in 2018 while work on connecting the other isolated islands is also underway at a brisk pace. The end of the isolation of the islands will help the overall economic growth through promotion of tourism. Particularly, ADMIE's investment plan for the next decade aims at make the network more reliable on the islands, reduce electric bills and be more environmental friendly.
- As Greece works on delivering the goals chalked out in its recently released its national strategy for the energy sector, renewables will play a greater role in the Greece's final energy consumption (XX%) and electricity consumption (XX%) by 2031. With integration of greater intermittent capacities into the grid, grid investments have to be stepped up commensurately.