Distributed energy systems dili

In the previous chapter, we introduced that Distributed Renewable Energy (DRE) is the most promising model to bring sustainable energy to All. Figure 2.1 schematizes the paradigm shift from non-renewable/centralised energy generation systems to renewable/distributed energy generation unit. Let us see better why DRE is environmentally, socioethically and economically sustainable compared with the dominant centralised and non-renewable energy generation systems.

If we look at centralised and non-renewable systems, namely, large-scale plants using fossil fuels as oil and coke, they are environmentally unsustainable because they are based on exhausting resources, so forth fastening resources depletion. Furthermore, these exhausting resources result in high greenhouse gases emission (CO2 emissions), through several processes along their life cycle, which determine global warming. Finally, they are responsible for other pollution problem during extraction and transportation processes due to their linking.

If we now look at renewable and distributed resources, such as small-scale solar and wind generation units, they are more environmentally sustainable because they use locally available and renewable energy sources, thus resulting in a reduced environmental impact compared to the various processes of extraction, transformation and distribution of fossil fuels. Furthermore, they have much lower greenhouse gases emissions in use. To conclude, compared to centralised systems, local energy production and distribution increase reliability and reduce distribution losses.

Centralised energy systems could be defined as large-scale energy generation units (structures) that deliver energy via a vast distribution network, (often) far from the point of use (Fig. 2.2).

Decentralised energy systems could be defined as characterised by small-scale energy generation units (structures) that deliver energy to local customers. These production units could be stand-alone or could be connected to nearby others through a network to share resources, i.e. to share the energy surplus. In the latter case, they become locally decentralised energy networks, which may, in turn, be connected with nearby similar networks (Fig. 2.3).Footnote 2

Distributed energy system could be defined as small-scale energy generation units (structure), at or near the point of use, where the users are the producers--whether individuals, small businesses and/or local communities. These production units could be stand-alone or could be connected to nearby others through a network to share, i.e. to share the energy surplus. In the latter case, they become locally distributed energy networks, which may, in turn, be connected with nearby similar networks (Fig. 2.4).

Solar Energy is the most abundant of renewable energies, and it is available at any location, with higher values/yields closer to the Equator, e.g. 1400-2300 kWh/m2 in Europe and US and around 2500 kWh/m2 in

Tanzania, East Africa [11]. The total solar irradiation of the sun is about 50 million Gigawatt (GW) (Fig. 2.6).