Moldova energy storage applications

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Total energy supply (TES) includes all the energy produced in or imported to a country, minus that which is exported or stored. It represents all the energy required to supply end users in the country. Some of these energy sources are used directly while most are transformed into fuels or electricity for final consumption.

Energy production includes any fossil fuels drilled and mined, which can be burned to produce electricity or used as fuels, as well as energy produced by nuclear fission and renewable power sources such as hydro, wind and solar PV. Bioenergy - which here includes both modern and traditional sources, including the burning of municipal waste - is also an important domestic energy source in many countries.

Imports, particularly of fossil fuels like oil, natural gas and coal, make up an important part of the energy supply in many countries. Countries that rely heavily on imported energy may be vulnerable to supply disruption from external events such as the Covid-19 pandemic and the war in Ukraine. In countries that export large amounts of energy, falling energy prices can also cause major economic shocks.

Energy sources, particularly fossil fuels, are often transformed into more useful or practical forms before being used. For example, crude oil is refined into many different kinds of fuels and products, while coal, oil and natural gas can be burned to generate electricity and heat. Other forms of transformation, such as extracting gas or oil from coal, play a relatively minor role in the energy systems of most countries.

Another important form of transformation is the generation of electricity. Thermal power plants generate electricity by harnessing the heat of burning fuels or nuclear reactions - during which up to half of their energy content is lost. Renewable power sources generate electricity directly from natural forces such as the sun, wind, or the movement of water.

Total final consumption (TFC) is the energy consumed by end users such as individuals and businesses to heat and cool buildings, to run lights, devices, and appliances, and to power vehicles, machines and factories. It also includes non-energy uses of energy products, such as fossil fuels used to make chemicals.

Some of the energy found in primary sources is lost when converting them to useable final products, especially electricity. As a result, the breakdown of final consumption can look very different from that of the primary energy supply (TES). Both are needed to fully understand the energy system.

The sectoral breakdown of a country"s energy demand, which is based on its economy, geography and history, can greatly impact its energy needs and which energy sources it relies on to meet those needs - such as fueling automobiles, heating or cooling homes or running factories.

The transition of the Moldovan power system from one that depends on imports and fossil fuels to one that is

more self-reliant on domestic, renewable resources requires actions in two main areas. Firstly, an environment must be created that removes barriers for entry, encourages investment and mobilises finances for the deployment of renewable technologies. Secondly, Moldova needs to transition its power system to one that is flexible so that it can integrate the developing shares of variable renewables.

Power system flexibility is defined as "the ability of a power system to reliably and cost-effectively manage the variability and uncertainty of demand and supply across all relevant timescales, from ensuring instantaneous stability of the power system to supporting long-term security of supply" (IEA, 2019a).

Flexibility is already an important characteristic of all power systems, as they have been required to be able to respond to changes in electricity demand or sudden generation or transmission equipment failure. However, with the increasing prominence of VRE in global power systems, there has been a growing need to actively evaluate their inherent flexibility while planning and transforming systems to become more flexible.

There are four main flexibility resources: power plants (both conventional and VRE), electricity networks, storage and distributed energy resources. Appropriate policy, market and regulatory instruments are required to harness their full potential for flexibility. These options can be grouped into several categories of actions at various levels of decision making, as depicted below.