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Hard Talks in ECE Countries on How to Increase Renewable Energy Uptake

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FOREWORD

The wider deployment of renewable energy will play a key role in the attainment of Sustainable Development Goal 7 calling for ensuring access to affordable and clean energy for all by 2030.

The United Nations Economic Commission for Europe (UNECE) organizes *ad hoc* policy dialogue events, the so-called "Hard Talks", with the aim to promote an open dialogue between all involved stakeholders on how to increase sustainable energy uptake and promote renewable energy investments in specific UNECE countries.

This publication explores the outcomes of Hard Talks carried out in Azerbaijan, Bosnia and Herzegovina, Georgia, Kazakhstan, Serbia and Ukraine, from 2016 until early 2019. The study provides an outline of the energy profiles, renewable energy status, targets and policies of selected UNECE countries. Accordingly, it analyses the barriers against fostering more renewable energy investments and the solutions and recommendations for unlocking the renewable energy potential as derived from the Hard Talks.

Although the UNECE region comprises countries considerably diverse and distinct in terms of their energy system, they share similar barriers when it comes to increasing the deployment of renewable energy technologies. Countries face a number of power market, permit, social acceptance, resource and technology, grid/transmission, counterparty, financial sector, political and currency/macroeconomic risks against increasing their renewable energy shares. This study is intended to share experiences of specific UNECE countries and support ongoing efforts of the whole UNECE region to develop its renewable energy portfolio and provide recommendations to achieve the countries' renewable energy commitments.

Olga Algayerova
Executive Secretary
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ACKNOWLEDGEMENTS

Since 2016, UNECE implements ad hoc Renewable Energy “Hard Talks” in countries of the region with the aim to promote a demand-driven multi-stakeholder dialogue regarding the actions needed to promote renewable energy investments. This report highlights the barriers identified through the Hard Talks, along with the solutions and recommendations that should be put forth in order to speed up the process to substantially increase the renewable energy uptake.

Anastasia Ioannou and Francesca Martella Kehl are the main authors of this study. Gianluca Sambucini coordinated and contributed to this publication.

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Executive Summary

The UNECE region comprises countries with great potential for Renewable Energy (RE) deployment, well-established RE markets including sound market environments and well-developed infrastructure for deploying RE, as well as those that have recently started to substantially increase the RE uptake. UNECE organizes *ad hoc* Renewable Energy "Hard Talks" in countries of the region with the aim to promote a demand-driven debate regarding the actions the country needs to take in order to increase investments in sustainable energy and, in the long-term, to increase substantially the uptake of renewable energy. For the last years, Hard Talks have been organized in Georgia (December 2016), Ukraine (December 2016), Azerbaijan (October 2017), Kazakhstan (April 2018), Bosnia and Herzegovina (December 2018) and Serbia (March 2019).

This paper focuses on a number of selected UNECE Member States located in South East Europe, Eastern Europe, Caucasus and Central Asia (including the countries that hosted the Hard Talks). It reviews the energy profiles of the selected countries, the RE status, including costs, investments and existing policies. The study highlights barriers identified through the Hard Talks, along with the solutions and recommendations that should be put forth in order to overcome the identified barriers. Finally, a set of solutions for wider deployment of RE technologies are outlined.

Energy profiles of selected UNECE countries

- Countries of South-East Europe (i.e. Albania, Bosnia and Herzegovina, Serbia, Montenegro) have high shares of RE in their energy mixes, obtaining more than 22% of their respective Total Final Energy Consumption (TFEC) from renewable sources. For example, hydropower accounts for 100% of Albania's electricity generation since 2008.
- High contribution of RE is mainly driven by either a high share of hydropower or the use of biomass in heating.
- On the contrary, in Ukraine and Kazakhstan, RE share in TFEC is below 4%.
- UNECE countries located in South and Eastern Europe, the Caucasus and Central Asia still rely primarily on fossil-based resources for the vast majority of their energy supply. Azerbaijan, Kazakhstan and the Russian Federation are major oil and gas exporters.
- Many countries in the region like Bosnia and Herzegovina, Kazakhstan, Montenegro, the Russian Federation, Serbia and Ukraine are dependent upon their coal reserves. Belarus and the Russian Federation have peat deposits.
- Overall, considerable shares of RE in the total energy mix can be found in several UNECE countries, namely Bosnia and Herzegovina (26%), Georgia (27%) and Serbia (22%), according to the REN21 UNECE Renewable Energy Status Report (which was focused on 17 of the 56 UNECE countries).

Renewable energy status, costs, investments and jobs created

- An almost 12% growth is foreseen in the global renewable power capacity additions in 2019, driven by the accelerating pace of solar photovoltaic (PV) and wind energy technology. This is the fastest pace since 2015, reaching almost 200 gigawatt (GW), while solar PV additions are anticipated to increase by over 17%.
- In 2018, the global weighted-average Levelized Cost Of Electricity (LCOE) coming from all commercially available renewable power generation technologies experienced steep declines.

- Global weighted-average LCOE of:
  - Onshore wind in 2018 decreased by 13% relative to 2017 (reaching $0.56/kWh).
  - Offshore wind decreased by 1% relative to 2017, and by 20% relative to 2010.
  - Solar PV decreased by 13% from 2017 ($0.085/kWh). In just 8 years, from 2010 to 2018, the global weighted-average LCOE for solar PV went down by a staggering 77%.
  - Concentrated Solar Power (CSP) experienced a 25% drop compared to 2017.
  - Hydropower decreased by 11% relative to 2017.
- The year 2018 was the ninth successive year in which investment in renewables exceeded $230 billion. This investment is 11% less than that of 2017, which could be driven in part by falling solar costs and changes in China's photovoltaic (PV) market. As the world leader of global investment in RE, China accounted for 32% of the global total investment, down 37% relative to 2017.
- During the year 2018, investments in Europe grew by a remarkable 39%, reaching USD 61.2 billion – the highest level in the previous two years.
- In 2018, 11 million people were directly or indirectly employed by the global RE sector. Total global employment increased by 6.7% compared to 2017. Solar PV is responsible for the biggest share (in 2018 solar PV accounted for 3.6 million jobs, with 3 million of these jobs located in Asian countries).

Renewable energy policy in UNECE region

- More than 150 countries have adopted targets related to the shares of RE in the power sector, 47 countries in the heating and cooling and 41 countries in the transport sector.
- Across the selected countries the following RE targets have been set:
  - Albania: 38% of TFEC by 2020
  - Bosnia and Herzegovina: 40% of TFEC by 2020 (achieved in 2014 with 42.3% of energy originating from renewable resources)
  - Serbia: 36.6% of electricity consumption and 27% of TFEC by 2020
  - Azerbaijan: 20% of electricity consumption and 9.7% of TFEC by 2020
  - Georgia has not yet a formal National Renewable Energy Action Plan (NREAP) setting targets for shares of RE in the electricity or total energy consumption. Draft NREAP states that RE share should increase from 27.9% in 2014 to 30% by 2020
  - Kazakhstan: 3% of TFEC (or 2,000 MW capacity additions) by 2020, 10% by 2030, and 50% by 2050
- A few countries (namely Azerbaijan, Kazakhstan, Bosnia and Herzegovina) have allocated RE targets per technology. The power sector received the most attention in relation to heating/cooling and transport sectors in 2018.
- Targets for the heating and cooling sectors do not tend to be as ambitious and widely adopted as for the power sector.

Barriers impeding the deployment of renewable energy in selected UNECE countries

- In Ukraine, the lack of a long-term goal beyond 2030 does not provide the necessary market signals to investors.
- Poor governance and instability of the country reduces investors' confidence in Serbia and Ukraine.
- Social resistance, such as "Not In My Backyard" (NIMBY) syndrome, lack of technical local capacity and data on RE potential were reported in Georgia, Serbia and Ukraine.
- In Azerbaijan and Georgia, a comprehensive, transparent and horizontally applicable support scheme for RE generation is currently missing.

- Low bankability of RE projects in Ukraine, Kazakhstan and Serbia, together with limited experience of local banks with RE financing and project finance structures, result in high interest rates and securities required from local banks to provide financing.
- The form and content of the Power Purchase Agreement (PPA) currently being issued (i.e. not having a standardised template, terms inducing legal and financial risks at the pre-development stage and lacking transparency) have also been regarded as bottlenecks against the bankability of the projects in Azerbaijan, Georgia, Serbia and Ukraine. In Kazakhstan, strict deadlines apply to PPAs on securing permits and initiation of project construction.
- Lengthy and complex permitting procedures were reported in Georgia, Serbia and Ukraine, with same level of complexity applying to even smaller-scale projects.
- Barriers associated with access to the grid included the lack of pre-established legal and technical standards for connection with the grid and lack of an updated Grid Code in Azerbaijan, Kazakhstan, Georgia and Serbia. In Kazakhstan and Serbia, network congestion issues and lack of grid capacity infrastructure were also regarded as key barriers. Finally, the existence of market distortions (subsidies on fossil fuels, tariff cap on conventional generation) remains a major bottleneck in Kazakhstan and Serbia.
- Examining countries' challenges in RE development revealed the following nine major types of challenges: power market risk, permits risk, social acceptance risk, resource and technology risk, grid/transmission risk, counterparty risk, financial sector risk, political risk and currency / macroeconomic risk.

Recommendations for uptake of renewable energy investments in selected UNECE countries

- The formulation of a comprehensive NREAP incorporating mid-term capacity goals for each technology type and methods to reach them, along with explicit commitment by policy makers to pursue specific, long-term RE targets aiming for 2030 and beyond to provide the appropriate market signals to market actors (Ukraine and Georgia).
- The implementation of public outreach and awareness raising activities for RE as part of the RE development strategy, together with technical education programs, courses, degrees and advanced learning activities for professionals to address the social acceptance and technical capacity barriers, respectively.
- The assessment of the RE potential by region/city (Atlas) to provide a data-driven basis for project development.
- The bankability of a RE project could be promoted by several ways, such as the development of a support scheme that includes measures by technologies, the establishment of a transparent calculation method of Feed-in Tariffs (FiT) with protection against future retroactive regulatory changes and the consideration of global returns on investment for similar projects. The adoption of the internationally standardized PPA template including several provisions (e.g. PPAs to be signed before construction of the plant, to guarantee the purchase of fixed annual amount, transparent procedures for tendered concessions, etc.) and a stable investment environment (support measures, connection terms, etc.) can also promote the bankability of the project.
- The establishment of "one-stop-shops", could address the permitting process complexity, while fast-track procedures could be considered for small-scale RE projects.
- PPAs must follow International Standards in terms of the number of permits and timescale of permitting processes.
- As far as access to the grid is concerned, RE connection access could be regulated so that the grid connection permit is included in the permitting process before project take-off. Definition of technical standards for RE integration and transparent and fair connection costs would

enhance investors' confidence, together with the conformity of the distribution network unbundling according to EU legislation and best practices.

- As a result of the Hard Talks, a number of actions were taken by the host countries. As such, Kazakhstan has introduced policies to increase transparency and reduce investors' risk. These included policies for the RE auction scheme, integration of a national systems operator, secure PPA agreements, tariff indexation to account for interest rate and currency fluctuation, and a land plot granting regime. Hard Talks in Georgia and Ukraine resulted in the relevant national authorities renewing their commitments to ensure a clear roadmap and policy framework for deploying renewables on a larger scale and for a wider range of renewable technologies (e.g. wind, solar, biomass, including Combined Heat and Power plants (CHPs)).

Possible solutions for wider deployment of renewable energy

- A range of solutions based both on the Hard Talks recommendations and the latest studies on the wider integration of renewables are also discussed.
- Relevant solutions include:
  - Establishment/enhancement of policies in sectors other than electricity, namely the transportation and heating/cooling sectors, as well as in other sectors, such as distributed/small-scale generation, net-metering, community/cooperative projects.
  - Development of Action Plans (formally known as NREAP) outlining the targets per each technology and the measures for reaching them.
  - The implementation of a support scheme based on FiTs/ Feed-in Premiums (FiPs) can help unlock investments; however, in more developed RE markets, competitive capacity auctions could be established. An Independent Authority supporting the policy scheme could also facilitate the periodical adaptation of the FiT/FiP.
  - Improving/facilitating resource potential assessment and technology adoption.
  - Addressing grid inadequacies and appropriate infrastructure towards wider integration of renewables.
  - Carrying out social awareness and public outreach activities, as well as programs to develop human capacity (e.g. formal education and professional training schemes).
  - Improving access to financing and streamlining the PPA terms according to International Standards will increase the bankability of the projects and attract foreign investments.
  - Implementation of innovative business models and enabling technologies, taking into account the needs from existing infrastructure of the country.

1. Introduction

1.1 Global energy trends with a focus on renewable energy

In 2018, global energy demand grew at its fastest pace since the start of the decade by 2.3%. This increase was due to a relatively strong global economy, which grew by 3.7%, and to higher heating and cooling demand in some parts of the world. India, United States and China were mainly responsible for such a rise in global energy demand, accounting for almost 70% of the demand increase. A rise in world fossil fuel consumption also resulted in an increase in global energy-related carbon dioxide emissions. During the year 2018, CO_2 emissions grew by approximately 1.7%[1].
Natural gas saw an increase at its fastest rate since 2010: in 2018, demand for natural gas grew by 4.6%, mainly due to the global energy demand increase and coal phase-out efforts. The United States are the main UNECE member driving this increase demand for natural gas, primarily destined for power generation and buildings. Similarly, global demand for oil grew by 1.3% despite higher prices than in 2017. These latest statistics describing trends and movement in the energy world reveal once again the slow pace at which the world is moving for the energy transition. The reality is that financial investments to this day still heavily revolve around fossil fuels. Since the adoption of the Paris Agreement, USD 1.9 trillion have been invested by 33 global banks in support of fossil fuels companies. Global subsidies for fossil fuel consumption increased at an estimated 11% in 2017 from the previous year, totaling approximately USD 300 billion. This represents double the support renewable power generation receives. While some countries have revised their fossil fuel subsidy scheme in some capacity since 2015, the majority of the world still embraces and strengthens fossil fuel subsidies. Many UNECE member States still rely heavily on fossil fuel subsidies, providing subsidies of more than USD 100 million each. Additionally, lobbying efforts delay or impede the RE market: one report from Influence Map assessed that lobbying expenses made to control policies addressing climate change from oil and gas companies amounted to USD 200 million each year[2].

1.2 Energy profiles of UNECE countries

The UNECE region comprises 56 countries in Europe, North America and Asia. It is considered to be a promising region for the deployment of RE technologies. While the UNECE region comprises countries with already well-established RE markets and infrastructure, it also includes countries, which have recently started to substantially increase their uptake of RE. In fact, South East and Eastern Europe, the Caucasus, Central Asia and the Russian Federation are all very diverse regions in terms of their population, economy, as well as social and political characteristics. Similarly, their energy systems are also diverse even though they were developed in a similar fashion. Azerbaijan and Kazakhstan are countries with significant fossil fuels resources; Albania and Kyrgyzstan are important hydropower electricity producers and have significant potential for RE development; Belarus and Georgia are important transit countries for oil and gas routes[3]. The UNECE region covers a population of more than 300 million people, with the Russian Federation accounting for almost half of this. The region also includes countries of small size and population, such as Montenegro with 622,000 inhabitants. The study focuses on a number of selected UNECE Member States located in South East Europe, Eastern Europe, Caucasus and Central Asia.

Geographical and climatic conditions, as well as natural resources, vary greatly across the region resulting in diverse energy mixes for each country. Overall, the region's extensive and rich energy resources hold an important position in the global supply of fossil fuels. Azerbaijan, Kazakhstan, the Russian Federation, Turkmenistan and Uzbekistan are major net energy exporters with considerable oil and gas reserves[4]. Many countries in the region like Bosnia and Herzegovina, Kazakhstan, Montenegro, the Russian Federation, Serbia and Ukraine are dependent upon their coal reserves. Additionally, Belarus and the Russian Federation have peat deposits. Overall, UNECE countries located in South and Eastern Europe, the Caucasus and Central Asia primarily rely on fossil-based resources for the vast majority of their energy supply. Considerable shares of RE in their total energy mix can be found in several UNECE countries, namely Bosnia and Herzegovina (26%), Georgia (27%) and Serbia (22%). Either a high share of hydropower or the use of biomass in heating mainly drives high contribution of RE. On the contrary, in Ukraine and Kazakhstan, RE share in TFEC is below 4%, according to the REN21 UNECE Renewable Energy Status Report (which was focused on 17 of the 56 UNECE countries). In 2014, the 17 identified UNECE countries represented only 0.2% of global RE investment while accounting for 4.9% of global GDP[5]. This statistic highlights the great potential for RE development in the region.

1.2.1 South East Europe

For the purpose of this report, the countries taken as representatives for South and Eastern Europe are Albania, Bosnia and Herzegovina, Montenegro and Serbia. These countries have high shares of RE, obtaining more than 25% of their respective TFEC from renewable sources. For most of these countries, hydropower represents the backbone of RE use in the region.

1.2.1.1 Albania

Albania is entirely reliant on hydropower for its electricity production. In fact, since 2008, hydropower accounts for 100% of its electricity generation. In 2016, total electricity produced by hydropower was of 7,782 GWh[6]. This represents a window of opportunity for decarbonizing Albania's energy sector. Albania has put in place several policies in support of RE. However, Albania's renewable mix is predominantly taken up by hydropower, making the country's electricity output vulnerable to yearly precipitation.

While renewables power 100% of Albania's electricity, the energy mix of the country still primarily relies on fossil fuels. In 2016, the biggest share of the TFEC was taken up by oil products with 1,178 thousand tons of oil equivalent (ktoe) consumed. The share of energy provided by biofuels and waste has remained relatively constant and small in the last decade (274 ktoe in 2016). Coal experienced a small increase in the energy mix starting from 2009, and as of 2016 represents 51 ktoe of TFEC. Geothermal combined with solar and natural gas represent the smallest shares of energy, providing respectively 13 ktoe and 10 ktoe in TFEC in 2016.

1.2.1.2 Bosnia and Herzegovina

In Bosnia and Herzegovina, the electricity mix is mainly dominated by coal-based thermal (five lignite power plants in the country) and large-scale hydropower. In 2016, Bosnia and Herzegovina recorded 2,180 megawatt (MW) of net installed hydropower capacity and 2,156 MW of lignite[7]. These figures are not reflective of the actual generation levels. Because hydrological conditions tend to vary greatly

based on yearly rainfall, electricity generation comes about 60% from coal and the remaining from hydropower. Diversification of renewable sources is important for increasing the country's resilience. Electricity demand in the country is projected to increase and government authorities plan to meet growing population needs with fossil-based energy sources, in particular with coal. The transition to RE is therefore challenged by the country's extraction of coal resources and vested interest in coal consumption.

Another hurdle to RE development is Bosnia and Herzegovina's reliance on fossil fuels. In 2016, oil products still represented the biggest share of TFEC, with 1,501 ktoe. Behind electricity, which took away the second biggest share of TFEC in 2016 with 953 ktoe, biofuels and waste represented a large percentage of the country's energy mix, accounting for 581 ktoe. Coal and natural gas represented 380 ktoe and 136 ktoe respectively in 2016. Heat produced the smallest share of energy with 126 ktoe of its TFEC.

1.2.2 The Caucasus

1.2.2.1 Azerbaijan

Azerbaijan constitutes an energy-independent country: it meets all energy requirements from domestic production of crude oil, oil products, natural gas and hydro energy. Additionally, the country is a net-exporter of oil, gas and electricity. In 2017, Azerbaijan produced 38.8 million tons of oil equivalent (Mtoe) of crude oil (ranking 26th worldwide) and 17 Mtoe of natural gas (18.2 billion cubic meters)[8]. Azerbaijan is one of the highest energy self-sufficient countries (energy production is more than four times its energy demand) in the world, exporting 80% of its hydrocarbon production.

The energy mix of Azerbaijan is still dependent on fossil fuels, which account for 80% of TFEC. Natural gas is its main fuel. In 2015, natural gas represented by far the largest share of Total Primary Energy Supply (TPES), taking up 67%. Oil has the second largest share, accounting for 31% of TPES, while hydro and biofuels and waste only provide 1% each of energy supply. As for the electricity mix, natural gas dominates again. In 2015, 25 terawatt-hour (TWh) of electricity came from natural gas (86%), while only 7% of the electricity mix was supplied from RE sources.

In terms of its TFEC, in 2010 the renewable share was 4.4% and decreased to 2.1% in 2014. This decline is in part due to seasonal year-on-year changes in hydropower production, which makes up 1,132 MW of Azerbaijan's 1,267 MW of installed renewable power capacity. For the other renewable sources, Azerbaijan reported in 2017 an installed capacity of 66 MW of wind, 38 MW in biomass and 34.6 MW of solar PV.

Despite its current reliance on fossil fuels, Azerbaijan has committed to reduce CO_2 emissions and increase the share of renewables in its energy mix. By 2020, Azerbaijan plans to produce 20% of its electricity consumption and 9.7% of its TFEC from RE sources. The country's Nationally Determined Contribution (NDC) is to cut emissions by 35% by 2030 compared to the year 1990's baseline.

In order to achieve these goals, Azerbaijan has a concrete plan to invest in its RE infrastructure. As stipulated by the Strategic Road Map and Action Plan for 2016-2020, which was adopted in 2016, Azerbaijan plans to install new generation capacity equaling 350 MW of wind, 50 MW of solar and 20 MW of bioenergy.

1.2.2.2 Georgia

Georgia has a limited domestic energy production. In 2015, it reported a production of 1.3 Mtoe, mostly coming from hydro (0.7 Mtoe). Biofuels and waste accounted for 0.4 Mtoe whereas oil, gas and coal accounted for some 0.2 Mtoe. To meet its energy demand, Georgia imports mostly natural gas and oil. In 2015, the share of natural gas in TPES was 43%, followed by oil (26%), hydro (16%), biofuels and waste (9%) and coal (6%)[9].

Despite its reliance on natural gas imports, Georgia actually has the potential to position itself as a RE leader in the region. In fact, the share of renewables in the electricity mix is among the highest in the world. In 2015, 78% of the electricity in Georgia came from renewable sources. Hydropower is the main source for electricity as it accounts for more than 80% of electricity production and more than 30% of TFEC. However, studies suggest that only 20% of Georgia's hydropower potential is currently in use. Additionally, Georgia as a country has great untapped potential for the other renewables like solar, wind and geothermal. During the summer and the spring, Georgia exports some of its electricity to Turkey, while in the winter during high energy demand months, it requires electricity imports. A diversification strategy for renewables including wind firm expansion will help solve the supply security problem as wind is typically stronger during the winter. In fact, the estimated total potential of hydropower is about 15,000 MW with a total production potential of 50 TWh per year. The average annual electricity generation potential of wind is estimated at 4 TWh, while the installed capacity is of 1,500 MW.

In the beginning of 2018, the Ministry of Energy of Georgia was merged with the Ministry of Economy and Sustainable Development. In addition to energy related issues, the Ministry is also the focal point for the issuing of authorization for RE projects, management of land and property, control and supervision of facilities with increased risk. In April 2017, Georgia officially joined the Energy Community and in May they announced their NDC. They pledged to reduce greenhouse gas (GHG) emissions by 15% below BAU for the year 2030. This target is set to increase up to 25%, contingent upon the status of global agreement.

Georgia has an investor friendly climate, but government policy is not viewed as stable, and permits and agreements could be improved or required. Georgia has implemented a net metering program, which has led to small hydro power plants (SHPPs) as local communities have been resistant to large scale hydro projects.

1.2.3 Central Asia

1.2.3.1 Kazakhstan

The energy mix of Kazakhstan comprises five major segments: oil, gas, coal, power generation and nuclear by uranium extraction. According to a country analysis performed by the US Energy Information Administration (EIA), Kazakhstan's total proved primary energy reserves in oil amounted to 4.2 billion toe in 2018[10]. In addition to its fossil fuel resources, Kazakhstan's proven reserves of uranium were estimated at the energy equivalent of over 10 billion toe, which combined with fossil fuels yields a total of primary energy resources for production of 32 billion toe. This figure represents about 3.6% of the world's total, making Kazakhstan a top producer of crude oil (16th) and natural gas (23rd). Similarly to Azerbaijan, Kazakhstan's energy production exceeds well over its energy demand, rendering it one of the major energy exporters. In fact, during the year 2016, Kazakhstan ranked 7th

among the largest coal exporter in the world, 12th among the largest crude oil exporter and 20th among the largest natural gas exporter.

In its transition to a "Green Economy" model, Kazakhstan announced that 3% of its TFEC will be derived from RE sources by 2020, 10% by 2030 and finally 50% by 2050. In 2016, the country estimated a total installed RE capacity of 2,855 MW, including 2,688 MW of large-scale hydropower, 98.52 MW of wind and 57.3 MW of solar PV[11].

In order to prepare the ground for new RE developments in the country, Kazakhstan sought to adjust its legislation concerning renewables in 2016. It enacted the law on "amendments and additions to some legislative acts of Kazakhstan on the transition of the Republic of Kazakhstan to the green economy". This law amendment, as well as other legislative acts taken by Kazakhstan in 2016, aim at supporting investors from the RE sector whose equipment costs generally come in foreign currency.

Additionally, Kazakhstan hosted a successful round of RE auctions in May 2018 for the first time. This brought ten wind energy projects for a total of 20 GW of capacity. The total capacity to be auctioned in 2018 was 1 GW. These RE auctions are a result of some of the RE specific policies discussed during UNECE organized Hard Talks, which also allows countries to exchange expertise on other policies like secure PPA and other forms of energy tariffs.

1.2.3.2 Kyrgyzstan

The TPES in Kyrgyzstan in 2015 was 4.0 Mtoe, with oil being the primary fuel in the energy mix (41%), followed by coal (29%), hydro (24%) and natural gas (6%). The TFEC was 3.3 Mtoe, with its first energy resource being hydropower (11 TWh, equivalent to 1.0 Mtoe in 2015)[12]. In terms of fossil fuels, Kyrgyzstan's largest production is in coal (about 0.7 Mtoe), whereas crude oil and natural gas productions are smaller. Unlike Kazakhstan, domestic energy production does not meet its population requirements as it covers up to 45% of the country's needs. In order to compensate its energy requirements, Kyrgyzstan relies on imports of oil products (1.5 Mtoe of net imports in 2015), mostly diesel and gasoline. Based on hydropower production availability, Kyrgyzstan also needs to import electricity, especially during the winter seasons. The imports mostly come from the Russian Federation for oil and from Uzbekistan and Kazakhstan for gas.

Hydroelectric and thermal generators dominate the country's electricity mix. Hydropower generates more than 85% of electricity production, rendering Kyrgyzstan one of the countries with the highest shares of renewables in electricity generation in the world. The thermal generators include two CHPs.

Despite the importance of hydropower in electricity generation, the RE potential for Kyrgyzstan is not yet fully tapped. Solar and wind could take up significant shares in the energy mix given the country's climate and natural resources. The Ministry of Economy estimates the irradiation of the land to be of about 1,000 – 1,700 kWh per square meter, with direct sunlight exposure for about 2,800 hours a year. This would yield a solar energy potential of 490 GWh for heating and 22 GWh for electricity. The potential for the other renewables is relatively smaller: 45 GWh for wind, 8 GWh for small hydropower and 1.3 GWh for biomass.

1.3 Global agreements for climate change

Regional energy co-operation is decisive for the uptake of RE in the UNECE countries. Co-ordination on RE is limited to the Energy Community member countries, and therefore only applies to the transposition of EU legislation, in particular legal obligations to implement the EU Renewable Energy Directive and binding RE targets in 2020. The 2018 EU Renewable Energy Directive elaborated a

definition for the term “renewable energy communities” as well as the basis for developing national rules to support community-based projects. As of 2017, the member countries for the Energy Community include the countries of South East Europe as well Moldova, Ukraine and Georgia.

A Renewable Energy Coordination Group (RECG) was established by the Energy Community Secretariat in 2015 with the mandate to serve as a dialogue platform between Contracting Parties and Observer Countries to foster the implementation of the RE Directive. Some countries in South East Europe like Albania, the Republic of North Macedonia, Montenegro and Serbia have EU candidate status. Out of those, two countries (Montenegro and Serbia) have initiated negotiations, which have accelerated the pace of RE policy in the area.

UNECE has contributed actively across the region in helping countries achieve their RE targets. Since 2014, the Group of Experts on Renewable Energy (GERE) has been active with the mandate to focus on regulatory and policy dialogue and the exchange of best practices on RE sources, with a view to increasing the share of renewables in the global energy mix. The activities carried out by GERE include the Hard Talks, a dialogue platform that brings together major stakeholders from public and private sectors to identify key barriers for RE uptake.

Another fundamental aspect of regional co-operation is cross-regional trade in electricity. Investment in the transmission network is crucial to support the increased integration of RE in the electricity sector. To this aim, the Central Asia South Asia Electricity Transmission and Trade Project (CASA-1000) was created to foster the conditions necessary for sustainable electricity trade between Tajikistan, Kyrgyzstan, Afghanistan and Pakistan. This flagship project is co-financed by the World Bank and the European Bank for Reconstruction and Development (EBRD).

Beyond the regional collaboration, global agreements are extremely important as they represent commitments to international responsibilities. Under the Paris Agreement, UNECE countries directly support the uptake of renewables by establishing and abiding by their NDCs. UNECE helps member countries in developing specific tools for estimating CO_2 emissions, notably in the transport sector.

In the UNECE region, six countries – Armenia, Kyrgyzstan, Moldova, Montenegro, the Russian Federation and Tajikistan – are partner countries of the UN based Sustainable Energy for All (SEforALL) initiative. This project contributes directly to the achievements of the Agenda 2030 on Sustainable Development by working towards universal energy access, improvement of energy efficiency and increase of RE use. As of right now, Montenegro and Tajikistan are the only countries that have performed and completed rapid assessment and gap analysis under the initiative.

Table 1. Energy overview of selected UNECE countries[13]

	Total energy (ktoe)	Non-renewable energy (ktoe)	Renewable energy (ktoe)	Renewable energy share (%)	Net energy imports (Mtoe)
Albania	2257	1306	951	42%	0.45
Azerbaijan	14307	14033	274	2%	-43.13
Bosnia and Herzegovina	7078	6026	1052	15%	2.13
Georgia	4799	3590	1209	25%	3.49
Kazakhstan	81749	80612	1137	1%	-82.18
Kyrgyzstan	3846	2857	989	26%	2.04

Serbia	15440	13439	2001	13%	4.58
Ukraine	94106	69246	3616	4%	27.72

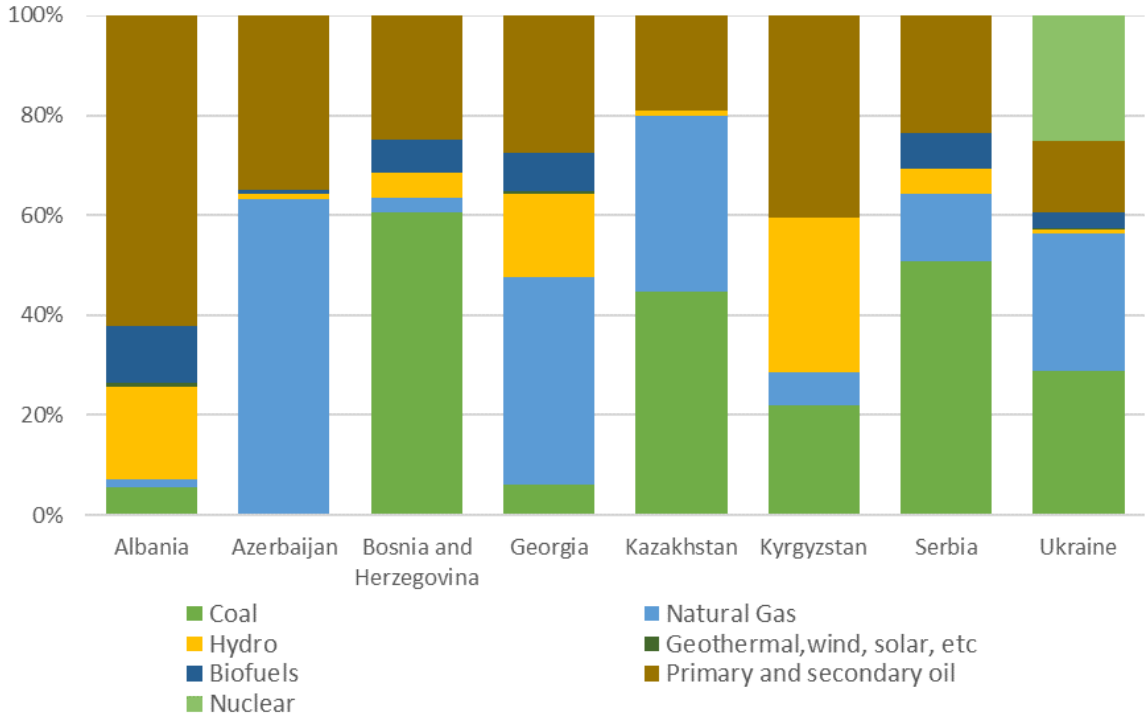


Figure 1 Total Primary Energy Supply mix of selected UNECE countries in 2017[14]

2. Renewable energy status of UNECE countries

2.1 Energy consumption from renewable energy

Renewable energy is becoming increasingly cost-competitive in the global energy market. For many countries, electricity coming from new wind and solar PV power plants was cheaper than power coming from traditional fossil fuel-based plants by the end of the year 2018. The LCOE is an indicator for the decline of RE costs. In 2018, the global weighted average LCOE decreased for all commercially available renewable power generation technologies. For CSP, LCOE decreased by 26% from 2017, by 14% for bioelectricity, 13% for both solar PV and onshore wind, 11% for hydropower, and 1% for both geothermal and offshore wind.

A study conducted by the energy and environmental policy firm Energy Innovation in the United States concluded that local wind and solar were able to replace approximately 74% of the coal fleet at an immediate savings to customers – making the United States enter a "coal cost crossover"[15]. This was supported by stable policy initiatives supporting renewables, as well as by technology improvements and decreasing installations costs.

The share of RE in the TFEC of energy is on the rise, but the world is still not on track to achieve the targets of the Sustainable Development Goal (SDG7) for affordable and clean energy. The Intergovernmental Panel on Climate Change (IPCC) Special Report published in 2018 warned that the impacts of 1.5 degrees Celsius will be greater than anticipated. The report states that the actions required to prevent global warming from

exceeding 1.5 degrees Celsius will mean "rapid, far-reaching and unprecedented changes in all aspects of society"[16]. The report includes multiple different pathways to limit global warming, but all of them embrace a drastic uptake in renewables and a worldwide shift to clean energy.

The International Energy Agency (IEA) has foreseen a double-digit growth in the global renewable power capacity additions in 2019, driven by the accelerating pace of solar PV and wind energy technology. As such, IEA expects almost 12% increase in renewable capacity additions this year. This is the fastest pace since 2015, reaching almost 200 GW, while solar PV additions are anticipated to increase by over 17%[17].

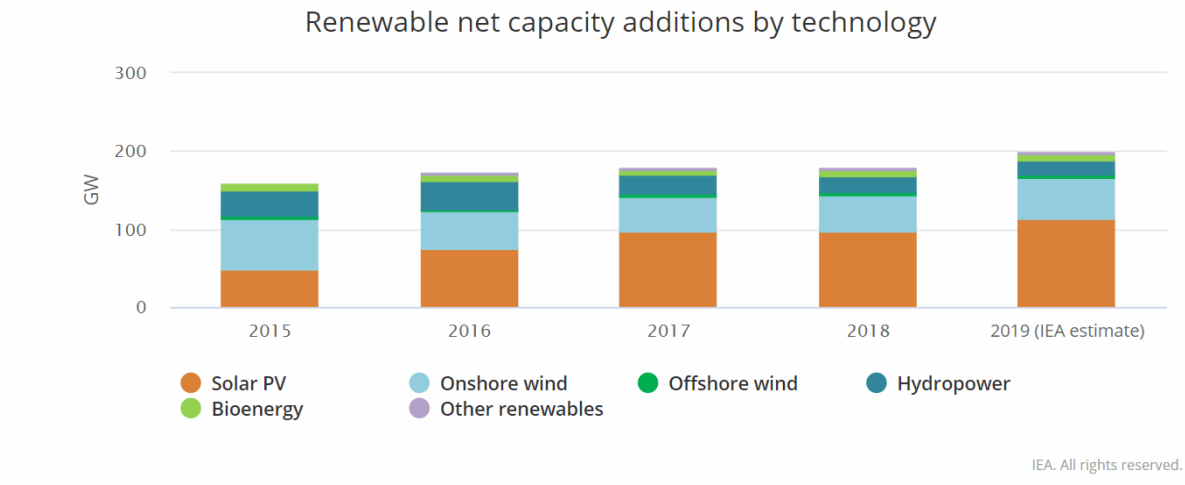


Figure 2 Net capacity additions of RE, 2019[18]

In 2017, RE accounted for an estimated 18.1% of TFEC of energy. Modern renewables, defined as solar, hydropower, wind, geothermal, modern biofuel and ocean power represented 10.6% of TFEC, while traditional biomass use for cooking and heating accounted for 7.5%. Among the modern renewables, the biggest share was taken up by thermal energy (biomass, solar, geothermal heat), representing 4.2% of TFEC. Hydropower accounted for 3.6%, while other sources like combined wind and solar, and transport biofuels accounted for 2% and 1%, respectively.

These statistics reveal only a small increase in the overall share of RE for both modern renewables and traditional biomass. Between 2006 and 2016, there has been a modest 0.8% annual growth, mainly resulting from a negligible change in the traditional use of biomass paired with global energy demand growth. These two factors have contributed to the slowing down of combined share of RE in TFEC of energy despite the rising demand for renewables, in particular for electricity generation.

In 2018, for the first time in the last two decades, RE net capacity additions did not exceed those of the previous year. An estimated 181 GW of renewable power capacity was added in 2018. This stalling in renewable growth comes after a long and sustained trend of increased new renewable capacity each year – capacity added has increased since 2001 by ten times. The slowing down of global renewable net capacity additions raises concerns over the pressing energy transition the world needs to make.

In terms of total capacity, RE is currently responsible for about one-third of total installed power generation capacity worldwide. In 2018, 64% of new installations were coming from renewable sources of energy, thereby continuing a four-year long trend where net additions of renewable power were above 50%.

In the heating and cooling sector, modern RE demand has not grown significantly. In 2016, modern RE sources accounted for 10% of the total heating and cooling demand. Between 2013 and 2017, renewable electricity demand increased by 25%, whereas modern renewable heat demand grew just a little less than 5%. Within these same years in the transportation sector, consumption of biofuels from ethanol and

biodiesel grew around 18%[19]. However, these statistics are not entirely revealing of the energy trends within transport as both ethanol and biodiesels started from a small share.

The electrification of the heating and transport sectors represents an important window of opportunity for the expansion of RE use as well as the increased integration of variable renewable energy (VRE). Sector integration and a nexus approach considering other fields impacted by energy generation are crucial for the sustainable development and future of renewables. That is why policy makers members of UNECE and beyond are encouraged to consider these aspects when crafting energy regulations and incentives.

Furthermore, because of the interconnectedness of the power grid, large-scale RE projects can have significant transboundary impact (direct, in the case of hydropower, or indirect in the case of non-hydro RE), and good transboundary relations become key for their development.

Adopting a nexus approach suggests maximizing the positive synergies that exist across sectors and countries (these can open up new financing opportunities) related to RE deployment, while minimizing environmental problems and/or risks to human health. The Nexus assessment methodology provides an overview of the interdependencies across water, energy, food, and the related ecosystems[20], along with the uses, needs, economic and social benefits, potential synergies, impacts and trade-offs at both the national and transboundary levels. Table 2 summarizes the key cross-sectoral benefits (water sector, agriculture, forestry, rural development), the environmental and social impacts and the transboundary impact across different RE technologies.

Table 2. Maximising synergies: opportunities for investing in RE while achieving cross-sectoral benefits (Source:[21])

Type of RE	Benefits for water sector, agriculture, forestry, rural development	Environmental & Social impact	Transboundary impact
Hydropower	The construction of multi-purpose hydropower (medium to large) can provide multiple benefits: • Enhanced flood control/ flow regulation • Enhanced drought resilience • Improved access to water (for different uses, primarily irrigation) • Ensured environmental flows (ideally backed by appropriate legislation) • Stable production of energy (also needed to integrate VREs).	Large hydro can significantly benefit local communities, but it is often the case that these end up bearing most of the costs (notably loss of land) and see little benefits in terms of impact on local economy. When it comes to micro hydropower, the cumulative environmental impact of scattered installations vis-a-vis low production levels makes this technology highly controversial, particularly (but not only) in environmentally valuable areas.	Coordination of hydropower cascades (existing and future) can improve flood control and potentially damages from low flows at transboundary level.
Bioenergy (biomass, biogas)	Wood biomass a highly valuable RE source. Potential for heat and CHP production at different scales. Improving the sustainability of biomass means: 1) sustainable forestry (protection/valuing of resource) and 2) sustainable value chain (investments in transformation/production processes and efficient utilization). Notably, one of the objectives of forestry sector	The sector holds concrete opportunities for rural development and job creation in a field where local knowledge and skills are already well-developed. Furthermore, it can provide access to clean cooking facilities in developing countries.	Sustainable forestry a means for flood protection and sediment control. Protection of transboundary forests can be

	should be ensuring sustainable fuel supply to producers in the long-term (e.g. fast-growing trees/bushes). Bioenergy is also a way of adding value to waste and agricultural and forestry residues in particular.	Many benefits would derive from biomass efficiency (most notably the decrease of indoor and outdoor pollution) but this is not currently incentivized.	a regional climate mitigation effort.
Wind and solar	Small-scale, community-level projects could improve access to energy (e.g. remote villages or touristic areas) and clean solutions for productive uses (e.g. irrigation, pumping). The use of clean energy in agriculture could support the development of green-branded agricultural productions. The possibility of net metering would provide a significant incentive.	Power production from wind and solar would reduce reliance on technologies with higher environmental impacts. New technologies can bring new employment opportunities and a growth of green jobs. Utilizing locally available sources and consuming them nearby decreases the need for long transmission and distribution line construction, operation and maintenance, decreasing thereby energy losses.	Adopting a regional approach to large wind and solar development (leveraging the existing transmission infrastructure between countries) would allow for a more optimal use of resources.

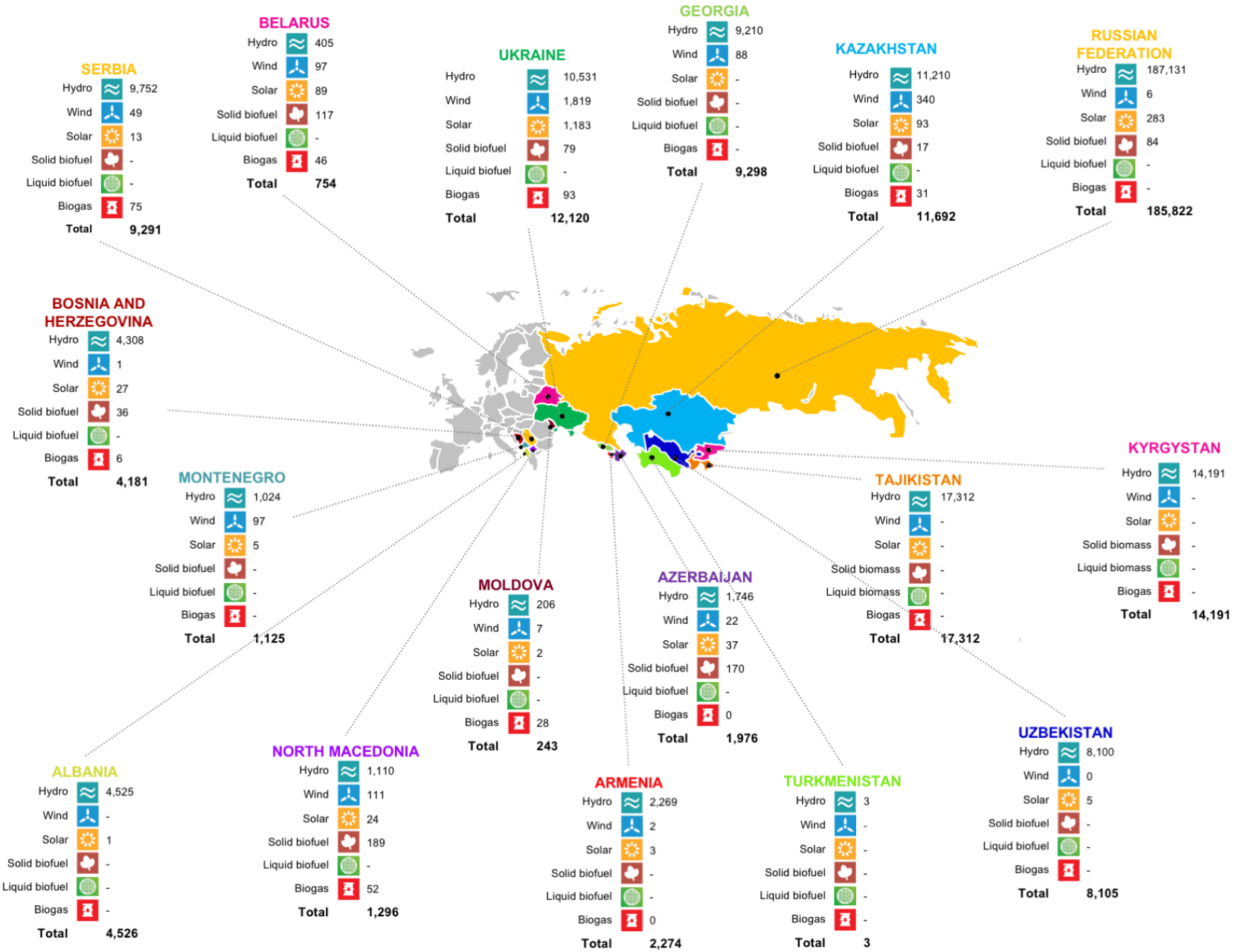
RE developers are under increasing scrutiny regarding the environmental and social impact of the project, having to undertake a series of administrative procedures for permitting, construction and licensing. Lengthy and burdensome permitting procedures were reported in Georgia, Serbia and Ukraine, with same level of complexity applying to even smaller-scale RE projects.

Policy risk remains a key barrier against increasing the investments in RE projects. The lack of feasible, tangible mid-term targets and a concrete action plan on how to achieve them as well as the lack of a long-term goal beyond 2030 do not provide the necessary market signals. A comprehensive, transparent and horizontally applicable support scheme for RE generation is still missing in some UNECE countries, such as Georgia. Poor governance and instability of the country reduces investors' confidence in Serbia and Ukraine. Social resistance (NIMBY concerns), lack of technical local capacity and RE potential data can also have important impact on the competitiveness of renewables.

Today, in some UNECE countries, this pressure is not sufficiently balanced by incentives to RE investments: environmentally friendly RE solutions (e.g. waste valorization) and RE investments by non-energy investors (e.g. in agriculture) are not explicitly incentivized, and market distortions (subsidies on fossil fuels, tariff cap on conventional generation) do not allow the unlocking of the RE investments. Subsidies to fossil fuels in Kazakhstan and Serbia were reported to be a major barrier against the deployment of renewables[22].

The benefits and urgency of switching from fossil-based energy sources to renewables are now well documented. Not only do renewables represent a way to achieve a low-carbon energy transition, but they are also increasingly the most cost-competitive option compared to coal. RE also brings a cascade of multiple benefits, including improved public health with better air quality, increased resilience and job creation within the green economy.

Figure 3 Renewable Electricity Generation (GWh) by Country, 2018[23]



2.2 Investments in renewable energy

The year 2018 was the ninth successive year in which investment in renewables exceeded USD 230 billion as well as the fifth in which it topped USD 280 billion. According to BloombergNEF (BNEF)[24], global investment in renewable power and fuels was estimated to amount to a total of USD 288.9 billion. This investment is 11% less than that of 2017, which could be driven in part by falling solar costs and changes in China's PV market. As the world leader for global investment in RE, China accounted for 32% of the global total investment, down 37% relative to 2017. However, 19 countries reported investments of more than USD 2 billion, some of which are UNECE countries. As an example, Ukraine experienced substantial investments for the first time[25]. During the year 2018, some overarching trends in RE investment were kept. The overall investment in renewable power capacity (including all hydropower) far exceeded that in fossil fuel and nuclear power capacity once again. Additionally, the renewable source attracting the most investment remains solar power, which accumulated a total of USD 139.7 billion in 2018[26].

Global investment in RE amounted to $279.8 billion in 2017, resulting in cumulative investment $2.9 trillion since 2004 (Figure 3). China led the investments in RE amounting to $126.6 billion (i.e. 45% of the global total), the majority of which was invested to solar energy projects (53GW). On the other hand, Europe indicated a decline of 36% in investments compared to 2016. The reduction of investments in Europe was triggered by the end of subsidies for onshore wind and the big gaps between auctions in the UK; as well as the reduction in cost per installed MW and the uncertainty over the shift to auctions for onshore wind projects in Germany. This resulted in dropping total investments to 65% and 35% in the two countries, respectively[27].

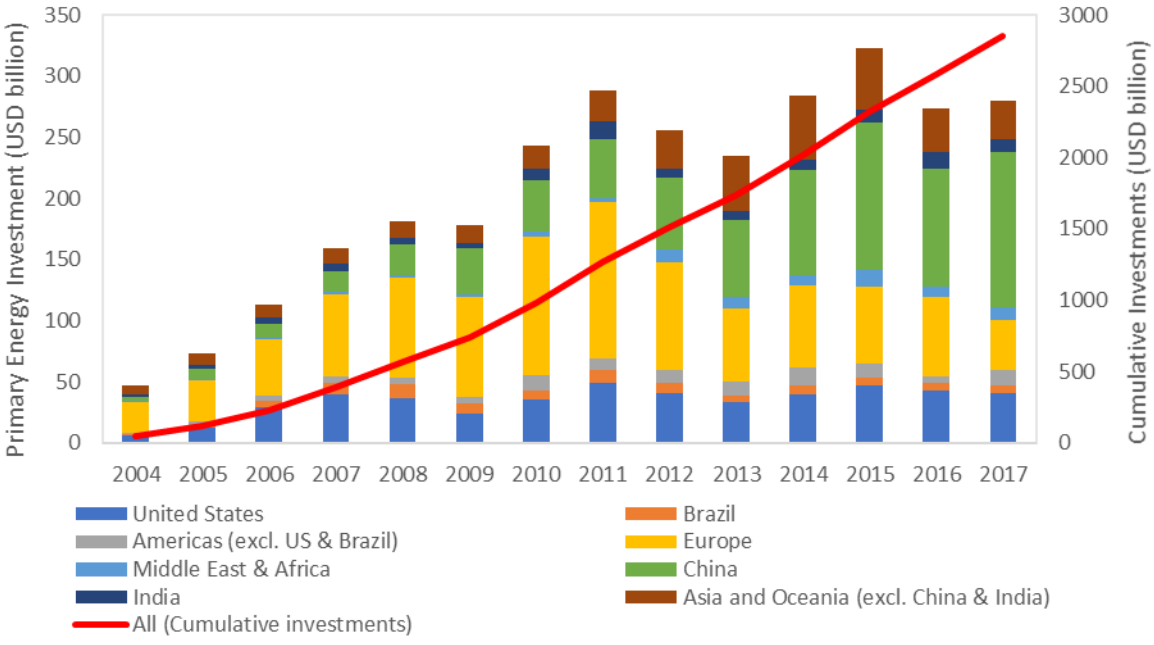


Figure 4 Investments in renewable energy[28]

Renewable energy investment trends greatly varied by region. However, overall investment in 2018 increased both in developed countries and in developing countries: up to 11% in developed countries and up to 6% in developing countries, with the exception of China, which experienced a steep drop in

investment for renewables. This overarching increase signals that more countries, especially in Asia, Eastern Europe, the Middle East and Africa, are tapping into the growing market and potential of RE.
During the year 2018, investments in Europe grew by a remarkable 39%, reaching USD 61.2 billion – the highest level in the previous two years. According to the 2019 REN21 Global Status Report, this trend is a result of three main causes. Scandinavian countries experienced an increase in onshore wind projects financings, aided by corporate PPAs. Secondly, financing in solar PV plants was allowed to grow in Spain thanks to securement of electricity prices or though PPAs. Finally, offshore wind investment made a comeback in Europe, notably in countries such as Belgium, Denmark, the Netherlands and the United Kingdom where five offshore wind projects total more than USD 1 billion combined.
The United Kingdom was Europe's largest contributor to RE investment in 2018. It financed two main offshore wind power projects and one coal-to-biomass conversion plant, making their investment reach USD 8.3 billion. Unlike countries like Spain, the Netherlands, Sweden where RE investment saw substantial increases, Germany and France experienced declines of 45% and 4% respectively.
Investments in the United States bumped up 1% totaling USD 48.5 billion – the highest it has ever been since 2011. A 15% increase in wind power investment contributed to this overall increase. As the Production Tax Credit incentive is nearing its end, developers in the country are trying to finance large wind power projects while they can still qualify for the incentive.
Just like investments in RE are region dependent, they also vary greatly depending on the technology they entail. As in previous years, in 2018 investments for renewables revolved around solar PV and wind power. However, unlike in 2017 where investment in solar PV far exceeded that of wind power, 2018 saw the gap closing, resulting in solar PV accounting for 48% of investment and wind power for 46%. The main factor behind this is the 22% dip in dollar commitments to solar power.
The United States experienced its highest level of wind power investment – an increase of 2% totaling USD 134.1 billion. For onshore wind, investments jumped up 2% relative to the previous year, reaching a record high total of USD 109.8 billion. And for offshore wind power, investment was up 7%, to USD 24.6 billion[29].
Investment in biomass and waste-to-energy saw an increase even if comparatively small compared to the other technologies. In 2018, it increased by 54% in 2018, totaling USD 8.7 billion. Notably, several sizeable waste-to-energy plants got approved and received funding. In fact, Belgrade's waste-to-energy plant is set to produce up to 30 MW of electricity, resulting in an overall 80% reduction of natural gas consumption[30].
Investments in biofuels went down to USD 3 billion, a decrease of 7%. R&D (Research & Development) represented the biggest share of financing for biofuels. In the United States, two ethanol plants received a total of several hundred million dollars for financing.
Small hydropower encountered some difficulties for financing in 2018. Investment in the technology fell down to USD 901 million, representing a 75% loss. While investment in ocean power technology grew by 12%, the total dollar amount remained relatively small (at USD 203 million). Developers of this technology lack the adequate financial and policy support required for ocean power energy.
Investment for large hydropower projects of more than 50 MW resulted to be less strong than in previous years. It was down 60% from 2017, totaling around USD 16 billion in 2018. This is mainly because 2018 saw no major multi-gigawatt dam projects being financed.

2.3 Renewable energy costs

In 2018, the global weighted-average cost of electricity of most commercially available renewable power generation technologies experienced steep declines (as shown Figure 4). A recent report published by the International Renewable Energy Agency (IRENA) reveals that in most parts of the world today, renewables are the lowest-cost source of new power generation[31]. This trend is expected to pick up in a growing number of countries. The IRENA Database for Renewable Cost also demonstrates that since 2010, LCOE from several renewable technologies – bioenergy, geothermal, hydropower, onshore and offshore wind – have all gravitated in the range of fossil fuel-fired power generation costs. Solar PV's LCOE reached the fossil fuel cost range in 2014.

Onshore wind saw prices drop in 2018. The global weighted-average LCOE of projects commissioned for onshore wind in 2018 decreased by 35% relative to 2010 and by 13% relative to 2017, reaching $0.56/kWh. Costs of electricity from onshore wind are now situated within the lower end of the fossil fuel cost range. The factors contributing to this decline in LCOE are the reductions in total installed costs as well as improvements in the average capacity factor. Technology developments and innovation have continued to drive down costs. Furthermore, the development of a more competitive supply chain has contributed to the reduction of LCOE. Since 2014, there has been a significantly high number of projects commissioned with an LCOE of between $0.03 and $0.04/kWh. These projects have competitive installed costs and are located in areas of great wind potential.

Offshore wind power experienced less pronounced declines in costs than onshore wind. However, the global weighted average LCOE for offshore wind still did decrease by 1% relative to 2017, and by 20% relative to 2010. In the UK, strike prices awarded through the second 2017 Contracts for Difference (CfD) auction for offshore wind energy projects, have fallen by nearly 50% since the first UK's CfD auction in 2015. Indicatively, the average price awarded during the first CfD round (in 2015) for offshore wind was £117.14/MWh, while in the 2017 CfD auction, Dong Energy was awarded a CfD deal amounting to £57.50/MWh for the development of Hornsea Project II, while Innogy secured the development of Triton Knoll project at the price of £74.75/MWh[32]. The total installed cost in 2018 was 5% lower than that of projects commissioned in 2010. This declining trend is attributed to the combination of different factors. Innovations in technology, improvements in installation and logistics and the shift to economies of scale have all accelerated the drop in offshore wind power cost. The market for this technology remains relatively thin as most offshore wind projects are concentrated in a handful of countries. For example, Europe, as the largest producer of offshore wind, saw a 14% drop in LCOE, with Belgium being the country with the sharpest LCOE drop. Offshore wind power still faces some challenges in terms of declining costs. The deployment of offshore wind farther from coast and into deeper waters, as well as the difficulties associated with small-scale production, have kept prices up. These struggles are addressed with innovation in turbine technology, larger turbine ratings, greater experience with project development and economies of scale.

Solar PV, the RE technology that attracts the most investment, has been experiencing continuous dramatic declines in electricity costs. In 2018, the global weighted-average LCOE of solar PV was $0.085/kWh, a 13% decreased from 2017. In just 8 years, from 2010 to 2018, the global weighted-average LCOE for solar PV went down by a staggering 77%. In 2018, solar also accounted for 94 GW of added capacity, totaling more than half of total renewable power capacity additions for that year. The cost reductions in 2018 were primarily due to crystalline silicon module price decline, combined with a slightly increased average capacity factor, which sits at approximately 18%. The decrease in solar PV module prices resulted from ongoing reductions in balance of system costs. Just like the global

weighted-average LCOE, the global weighted-average for total installed cost of utility scale solar PV dipped by 13% in 2018 – from $1389/kWh in 2017 to $1210/kWh in 2018. Another surprising trend concerns the learning rate of solar PV, which reached record high levels in 2018 compared to all other renewable power technologies, reaching 37% as of January 2019. Current PPA and auction price data indicate that price of electricity could fall even further in 2020, reaching $0.048/kWh.

In 2018, concentrated solar power (CSP) experienced a 25% drop in its global weighted average LCOE compared to 2017. On the other hand, relative to 2010, the LCOE decline was amounted 46%. In 2018, LCOE reached $0.185/kWh. Having the lowest total installed capacity among RE technologies, CSP still faces significant challenges in driving its cost for electricity down. Nevertheless, the global weighted-average total installed cost declined by 28% in 2018. Just like for the other technologies, a decrease in installed cost was paired with an increase in weighted-average capacity factor for CSP. In 2018, capacity factor grew from 39% in 2017 to 45%. The small number of CSP projects commissioned in a year lends itself to year-on-year variability. However, the decline in installed costs is likely to persist in the future given the high number of CSP commissioned by the Chinese market. Finally, CSP has the potential to achieve the lowest LCOE by integrating storage and improving the overall utilization of the projects power block and associated investments.

Within the UNECE region, and specifically the focus countries of this report, hydropower often represents the primary source of RE. Hydropower offers low-cost electricity and flexibility and ability to respond quickly to load changes. In 2018, the global weighted-average LCOE of hydropower was $0.047/kWh. This figure represents an 11% dip relative to 2017, while a stable LCOE for hydropower can be observed between the years 2010 and 2013. Costs began to rise from 2014 onwards, due to the increased total installed cost in Asian countries, excluding China, India and Japan. Furthermore, current sites for hydropower projects may be located in remote areas, farther from grid infrastructure and transmission lines, pushing costs up. Nevertheless, the global weighted-average total installed cost of hydropower did reduce in 2018 by 16% compared to 2017, totaling $1,492/kW. The associated global weighted-average capacity factor varies greatly by region and by the size of the project. Between 2010 and 2018, the capacity factor varied between 44% and 51%, before stabilizing at 47% during 2018.

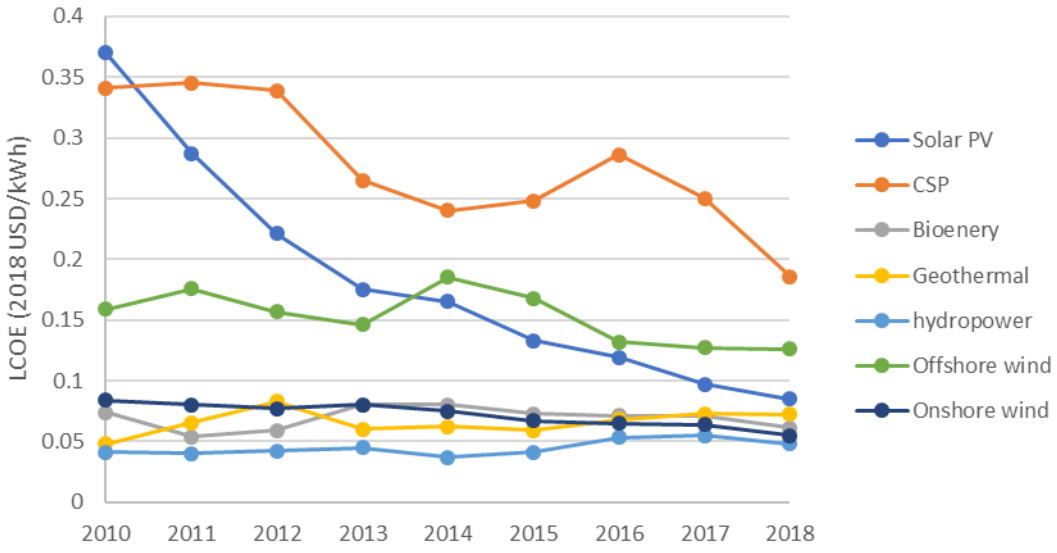


Figure 5 LCOE of renewable power plants [33]

2.4 Jobs created

One of the main drivers for the annual investment increase relates to the RE employment potential. In fact, 11 million people were directly or indirectly employed in 2018 by the global RE sector according to IRENA's annual review *Renewable Energy and Jobs*[34]. This figure also includes a better estimate of off-grid solar located in some regions of developing countries. This estimate reveals that total global employment went up about 6.7% compared to 2017. However, jobs tied directly or indirectly to the field of renewables remain concentrated in a handful of countries, namely China, Brazil, the United States, India and countries part of the European Union.

The leading market for RE is in China. In fact, China accounts for 39% of global RE jobs and employs 4.1 million people in the sector, slightly less than it did in 2017[35]. This dip is mainly a result of the decline in employment for solar PV in China. However, the diverse geographic footprint of generation capacities represents an opportunity to increase the number of jobs in more countries around the world.

In terms of RE technology, solar PV takes away the biggest share, accounting for a third of the total RE workforce. According to the annual IRENA report, in 2018 solar PV was responsible for 3.6 million jobs, with 3 million of these jobs residing in Asian countries. The report also noted a decline in solar PV employment within the European Union: in 2017 jobs declined in the region by 5%, contributing to a drop of more than 10% in installations. Following solar, liquid biofuel also accounts for a large share of the total RE workforce. In 2018, worldwide employment in biofuels was reported 2 million, increasing by 6% from 2017 data. Most of these jobs are related to the planting and harvesting of feedstock. Although jobs at fuel-processing facilities are typically fewer than those at the feedstock supply, they offer better pay as they require higher technical skills. Most of the global biofuel employment is concentrated in the South American continent: Latin America, with Brazil as the top biofuel employer, accounts for half of global employment in liquid biofuels. Onshore and offshore wind combined generate 1.16 million jobs worldwide, a 1% increase from 2017. With the largest installed capacity, hydropower directly employed over 2 million people in 2018. The sector experienced a 3% growth compared to 2017, even if the pace of construction was reported to have slowed down in key countries. Among the top employer in the sector, the Russian Federation and the European Union account for an important share of the worldwide labor force in the hydropower sector, accounting for 4% each of the global share.

3. Renewable energy policy targets and policy instruments

3.1 Renewable energy targets

Renewable energy targets are set to demonstrate Government's short-term and long-term commitment to achieve the transition to sustainable energy. Targets vary in terms of their formulation and jurisdictional level. They can be set at a multi-national level (such as the Paris Agreement target of keeping the global temperature rise this century well below 2 degrees Celsius above pre-industrial levels), at a national level (for example, focusing on specific RE quotas), as well as at a regional/municipal level through regional action plans.

More than 150 countries had adopted targets related to the shares of RE in the power sector, 47 countries in the heating and cooling and 41 countries in the transport sector.

In the context of the United Nations Framework Convention on Climate Change (UNFCCC), many UNECE member States have committed to increase their use of RE as mandated by the SDG 7.2, which aims to increase substantially the share of RE in the global energy mix by 2030. To this end, member states, part of the Energy Community, were required to prepare a NREAP by 2013 compliant to the European Union (EU) Directive 2009/28/EC. The NREAPs set targets in terms of the share of renewables in the TFEC by 2020 towards reducing GHG emissions in line with their NDC to the UNFCCC. The NREAPs also discuss state policies and strategies aimed at meeting these targets and establish benchmarks for the main energy-consuming economic sectors including electricity production, heating/cooling, and transportation[36].

3.1.1 South East Europe

3.1.1.1 Albania

The NREAP in Albania has set a RE target of 38% of TFEC by the year 2020. To reduce its carbon footprint, Albania plans to cut its emissions by 11.5% compared to the baseline scenario in the period of 2016 and 2030 as outlined by their NDC. In 2014, 33% of TFEC originated from renewable sources[37].
For 2020, Albania has pledged 100% of electricity coming from renewable sources. Hydropower represents the vast majority of the country's domestic electricity production capacity, with imports supplementing electricity consumption. As a result, Albania is susceptible to yearly rainfall. In 2017, a lack of rainfall provoked a hydropower production fall of 37%, while in 2016 Albania was a net exporter of electricity[38]. One way to address Albania's reliance on rainfall availability is to improve the country's diversification of RE generation. However, this is possible only with proper investment into renewables and the implementation of effective policies.
Albania has in place various schemes intended for the uptake of renewables such as Feed-in Tariff (FiT) and Feed-in Premium (FiP). A previous UNECE report found that the 2007 FiT for SHPPs was set too high, becoming a financial burden to the state-owned utility. The FiT was, then, reduced to 30% after a loss of €32 million in 2012-2013.

3.1.1.2 Bosnia and Herzegovina

Bosnia and Herzegovina has made significant RE pledges in the last few years. It has set a target of achieving 40% RE for its TFEC by 2020, which it achieved in 2014 with 42.3% of energy originating from renewable resources. Furthermore, as stated by their NDC, Bosnia and Herzegovina is to reduce its carbon emissions to 3% below 1990 emissions, or in other words 23% below the BAU scenario by 2030. The country's current quotas for RE are modest with few state policies really supporting renewable's expansion. Yet, the technical potential for RE is there. In fact, the current quota for solar PV is only 16.2 MW, while according to IRENA solar PV has a cost competitive capacity of 1 GW. For wind, IRENA estimates its potential to be from 2.5 to 5.9 GW, but the lack of a bankable PPA represents a limiting factor for RE development.
Not only do fossil-based electricity subsidies keep retail prices artificially low thereby making the entrance of renewables comparatively less competitive, but they also keep the transmission grid unfavorable to the integration and variability of RE[39]. Lifting electricity subsidies could represent a way to attract investment capital, but could also place unfair financial burden on the individuals due to

higher energy bills. To prevent a negative impact due to energy market liberalization, a compensation mechanism should be envisaged.
Despite FiTs and FiPs being some of the highest in the region, PPAs have not proven to be reliable enough to attract large-scale investment. Another deterrent for investment is the high risk associated with renewable project development: it often takes more than a year to obtain a permit for renewables project. Finally, while net metering exists, surplus RE production does not qualify for remuneration.

3.1.1.3 Serbia

Serbia plans to obtain 36.6% of its electricity consumption and 27% of its TFEC from RE sources by 2020. However, coal is still the dominant fuel in the country's electricity generation mix with 3.9 GW of capacity. After coal, hydropower takes up a significant share of the mix, followed by gas power plants, with 2.9 GW and 353 MW respectively. Serbia has made significant commitments for the uptake of RE: its NREAP impose a 30% carbon emissions cut below its 1990 level by 2030. IRENA supports the country's energy transition: it has found that Serbia has a cost competitive RE potential of 6.9 GW for solar PV and 5.6 GW for wind[40].
While Serbia has exceeded some of its targets for the solar capacity, it still lags behind in terms of its targets in the deployment of other RE technologies. By the end of 2015, Serbia had installed 10.8 MW of solar PV, surpassing its NREAP solar commitment; however, the country did not reach its biomass commitment of 143 MW, achieving only 5 MW. Serbia's NREAP stipulated 500 MW of wind capacity to be installed by 2020, while 25 MW has been installed by the end of 2017[41].
In 2016, Serbia inaugurated a new PPA model and a one-stop-shop for construction permits. A series of plans are underway to support wind generation capacity expansion, but significant progress needs to be made for the achievement of Serbia's targets.

3.1.2 The Caucasus

Azerbaijan and Georgia were chosen as the representative countries of the Caucasus. They have both significant RE potential which remains untapped. Although Azerbaijan's energy sector is dominated by fossil fuel, the country has pledged to add renewable capacity (most notably wind generation) towards achieving sustainable economic growth and ensuring energy security. Georgia aims to further expand its hydro capacity, and supplement electricity capacity with wind power during the low hydropower production winter months[42].

3.1.2.1 Azerbaijan

Azerbaijan in not a member of the Energy Community, but has committed to carbon emissions reduction and the integration of RE. In 2015, Azerbaijan submitted its Intended NDC as part of the COP21 Paris Agreement, aiming at 35% reduction in the level of greenhouse gas emissions compared to 1990. Targets for the development of RE were reflected in the "Strategic Road Maps for the National Economy and Main Economic Sectors" (SRM), which outlined the short-, medium- and long-term goals for the development of the economy and eleven key sectors. By 2020, Azerbaijan must meet 20% of its electricity consumption as well as 9.7% of its total energy consumption from RE sources. In terms of RE capacity, the country aims to reach a cumulative amount of 2GW by 2020. Azerbaijan's energy mix is dominated by fossil fuels (constituting 80% of TFEC) rendering the energy sector the major

source of CO2 emissions. RE share was 4.4% of TFEC in 2010 and 2.1% in 2014, while the variation is attributed to the seasonal and year-on-year changes in hydropower production, which makes up 1,132 MW of Azerbaijan's 1,267 MW of installed renewable power capacity. In 2017, Azerbaijan reported a total installed capacity of 66 MW of wind, 38 MW in biomass, and 34.6 MW of solar PV. The country has developed and implemented policies to promote RE in line with the environmental goals for the reduction of carbon emissions , as well as to diversify the energy mix and enhance the energy security of the country.

To reach the 2020 goals, Azerbaijan intends to install 350 MW of wind, 50 MW of solar, and 20 MW of bioenergy in accordance with the Strategic Road Map and action plan for 2016-2020. Nevertheless, further legislation is required to attract investment capital for renewables projects. This includes transparent and efficient permitting, defining responsibilities of the various state agencies, competitive FiTs, purchasing power agreements within international standards, and dedicated financing facilities for RE[43].

The Phase 2 of the Shah Deniz gas field, which will allow exportation of natural gas from Azerbaijan to the EU and Turkey, is expected to come online in 2020. Funds obtained from oil and gas exports are allocated to the State Oil Fund of the Republic of Azerbaijan (SOFAZ) to finance state infrastructure projects, such as RE development.

3.1.2.2 Georgia

As of April 2017, Georgia has officially joined the Energy Community; however, there is not yet a formal NREAP setting targets for shares of RE in the electricity or total energy consumption. According to the draft NREAP, RE share should increase from 27.9% in 2014 to 30% by 2020 in a gross final energy consumption. Starting with a comprehensive nationwide RE resource assessment, particular emphasis will be placed on biomass energy from solids, hydro, solar and wind[44].

Georgia's NDC outlines the unconditional reduction of its GHG emissions by 15% below the Business as usual scenario (BAU) for the year 2030. This is equal to reduction in emission intensity per unit of GDP by approximately 34% from 2013 to 2030[45]. In 2011, Georgia's energy sector accounted for 54.7% of total GHG emissions. The country can increase its revenues from electricity exports by increasing its hydro production, which is still the most cost-effective RE resource, while additional wind generation capacity could provide more power during the winter months when hydro production is reduced, and energy demand is higher.

In Georgia, the hydropower plants (HPP) generate about 80% of electricity. Their output changes in different seasons depending on water level in the rivers. Period from May to August is a period of high water discharge and high electricity generation when electricity excess goes for export (in 2015 about 4% of generated electricity, or 400 million KWh, was exported to Turkey). During the fall-winter period of peak demand the supply gap is covered with electricity produced by thermal power plants or electricity imported from the neighbouring countries.

According to recent estimates, with its 300 rivers suitable for electricity generation Georgia has a total annual potential capacity around 15,000 MW and annual generation is estimated at 50 TWh, however only some 20% of its potential is currently used. In addition to hydro the annual installed wind capacity is estimated at a level of 1,500 MW; annual solar potential of some 110 MW and capacity of middle and low temperature geothermal waters is estimated at a level of 200 to 250 million. cubic meters. With its 300 rivers suitable for electricity generation, hydropower's annual generation capacity has been estimated at 50 TWh and total annual potential capacity around 15,000 MW, according to recent estimates; yet only 20% of this potential has been utilized. In 2017, hydro accounted for approximately

80% of current electricity generation, and 16.5% of the TPES[46]. During winter months due to high energy demand, security of electricity supply is an issue due to depleted storage in reservoirs, sometimes requiring electricity imports, while during summer and spring electricity is exported to Turkey (in 2015 about 4% of generated electricity was exported to Turkey). Wind energy generation (having an estimated potential of 1.5 GW in the country) is considered an alternative diversification strategy to reduce the electricity import need, considering that wind power is typically higher during winter months. Towards this direction, investments in wind power capacity are expanding. A 20.7 MW wind farm project called Kartli located outside of Tbilisi was completed in 2016, as a joint venture between the state-owned Georgian Energy Development Fund and the Georgian Oil and Gas Corporation with partial financing from the European Bank for Reconstruction and Development (EBRD). Finally, the annual solar potential in the country has been assessed at 110 MW. RE policies of the country are still to be harmonized with the Energy Community ones, adopting a more structured approach to obtaining permits and agreements, such as PPAs.

3.1.3 Central Asia

3.1.3.1 Kazakhstan

In 2013, Kazakhstan's Ministry of Environment and Natural Resource issued the "Action Plan for the Development of Alternative and Renewable Energy in Kazakhstan 2013-2020" to support the RE sector and attract new investments. In 2016, the country took additional steps to amend its legislation on RE through the law on "amendments and additions to some legislative acts of Kazakhstan on the transition of the Republic of Kazakhstan to the green economy" and the law on "supporting the use of renewable sources of energy" towards creating a RE reserve fund, and improving the mechanisms for connecting renewable sources to national electric grid. Kazakhstan's RE strategy aims at 3% RE share of the TFEC (or new 2,000 MW investment) by 2020, 10% by 2030, and 50% by 2050.
In 2018, Kazakhstan reported a total installed RE capacity of 3,088 MW, including 2,756 MW of large-scale hydropower, 122 MW of wind and 209 MW of solar PV (more than three times the capacity installed in 2017). One of the main instruments to achieve these investments will be the RE Auction Mechanism according to the Minister of Energy of Kazakhstan, Mr. Kanat Bozumbayev[47].

3.1.3.2 Kyrgyzstan

Though Kyrgyzstan does not have NREAPs to this date, there are several state programs in place specifically targeting the energy efficiency and energy saving situations in the country. They help improve the tariff policy as well as the institutional and regulatory frameworks[48].
The recent Development Program entitled "UNITY. TRUST. CREATION" aimed at the period 2018-2022 has as its focus to ensure energy security for the country. Its main objective is to "provide the economy and the population with reliable and modern energy supply; and enhancement of the country's export potential". Among the key steps for the full implementation of this Development Program, energy experts have identified the following crucial actions: elaborate the concept for the Development of Fuel and Energy Sector by 2030, develop a medium term tariff policy for the period 2018-2021 and ensure full collection of payments for supplied electricity for all categories of consumers. The central achievement of the Program is the improvement of the quality of life of Kyrgyz people through better energy access and energy security.

Furthermore, the energy sector in Kyrgyzstan is undergoing several reforms, notably pushed by the following two strategies: the Energy Sector Development Strategy for 2012-2015 and the Action Plan for Energy Sector Reforms for 2013-2014. The Development Strategy identified key measures and tactics, such as through the implementation of tariff methodologies, to increase accountability of the energy sector and of its stakeholders.

3.1.4 Eastern Europe

3.1.4.1 Ukraine

Ukraine's NREAP is in force since 2014[49] and it sets the targets of use of RE sources until 2020, as well as the means of their achievement. Ukraine's overall target is to achieve 11% of share of energy generated from renewable sources in gross final energy consumption. 12.4% of heating and cooling demand to be met by RE sources. Electricity demand must be covered by at least 11% from RE sources, while by 10% in transport demand.

Table 3. Renewable Energy Targets as in NREAPs

Country	Sector/Technology	NREAP Targets	Actual values in 2018
Azerbaijan	Energy	• 9.7% of total energy consumption by 2020	1.7% share of total RE supply in total energy consumption (2017)[50]
	Electricity	• 20% of electricity consumption from RE sources by 2020 (cumulative renewable power capacity of 2GW by 2020)	8.1% of total electricity production (2018) [51] 1.267 GW cumulative renewable power capacity (by 2017)
	Wind	• 350 MW of new generation capacity by 2020	50.3 MW net additions (2018)[52]
	Solar	• 50 MW of new generation capacity by 2020	6.50 MW net additions (2018)
	Bioenergy	• 20 MW of new generation capacity by 2020	0 MW net additions (2018)
Georgia	Energy	• 30% share of RE in a gross final energy consumption by 2020 (according to draft NEEAP)[53]	-
Kazakhstan	Energy	• 3% alternative sources (solar and wind) in energy production by 2020, 10% by 2030 and 50% by 2050	-
	Hydropower	• 539 MW at 41 hydroelectric power stations by 2020	29 MW net additions (2018)
	Wind power	• 1,787 MW at 34 wind-power stations by 2020	121.5 MW total capacity (2018)
	Solar power	• 731.5 MW at 28 solar electric plants by 2020	209 MW total capacity (2018)
	Bioenergy	• 15.05 MW at 3 bioelectric stations by 2020	1 MW total capacity (2018)
Serbia	Energy	• 27% of gross final energy consumption by 2020	20.6% (2017)
	Electricity	• 37% of gross final energy consumption by 2020	28.7% (2017)

	Heating and cooling	• 30% of gross final energy consumption by 2020	24.4% (2016)
	Transport	• 10% of gross final energy consumption by 2020	1.2% (2017)
Ukraine	Energy	• 18% of primary energy by 2020, 11% of final energy by 2020 and 25% of final energy by 2035	4.1% (of TFEC) in 2015
	Electricity	• 11% of generation by 2020, 20% by 2030 and 25% by 2035	4.4% (2015)
	Heating and cooling	• 12.4% of gross final energy consumption by 2020	-
	Transport	• 10% (including electricity in transport) by 2020	-
Bosnia and Herzegovina	Energy	• 40% by 2020	8.9% (2016)
	Hydropower	• 120 MW by 2030	25 MW net additions (2018)[54]
	Solar PV	• 4 MW by 2030	3 MW net additions (2018)
	Wind power	• 175 MW by 2030	51 MW net additions (2018)

3.2 Policy instruments

For the achievement of RE targets, Governments around the world have enacted support policies and measures aiming to unlock the wider deployment of RE investments. Policy instruments and measures are adjusted to the decreasing cost trajectories of the technologies and the expanding integration of variable RE into the electric grids. As discussed in the previous section, more and more countries allocate the RE targets per different sector, namely the electricity, heating and cooling and the transport sector. However, progress is not uniform across countries and sectors. Some developing countries are still lagging while policies promoting RE uptake in the electricity sector remain the dominant option for policy makers[55], while policies addressing the heating/cooling and transport sector are typically fewer. There are many types of RE policy instruments, implemented at different levels (e.g. international, national, subnational and regional), such as targets, regulatory policies including FiTs/FiPs, tendering schemes and renewable portfolio standards, as well as public financing and fiscal incentives which includes tax incentives, tax investment credits.

3.2.1 Power sector

RE promoting policies in the power sector have received the most attention in 2018. The decarbonization of the power system along with the increasing electrification of different end-use sectors are currently transforming the global energy system.

Governments around the world have redirected their RE policy attention towards promoting renewable power integration. All countries, regardless of their economic development, have identified renewable power sources as a way to effectively decarbonize the electricity sector and improve energy access. The policies devised to promote the development of renewable power have evolved in parallel to technology advances and falling costs.

The combination of two major phenomenon drives forward the global energy transition: the increasing electrification of end-use sectors – heating, cooling and transport – paired with the decarbonization of the electricity supply. Renewable power suppliers rely on regulatory policies, such as feed-in policies and renewable portfolio standards (RPS), to guarantee market access and cost-

competitiveness for renewable technology. Policies tend to be targeted to the specific project they are supporting, namely large- versus small-scale, centralized versus distributed, yet experts have noticed that many of the same price-reduction or technology maturation trends are present in each of the market segments.

A challenge for renewable power policy makers remains accounting for system costs and benefits in support mechanisms. To match the pace of declining technology costs, policy makers have updated long-standing fixed-price policies and have made other adjustments concerning price. Also because of falling prices, policy makers have preferred to opt for competitive auctions instead of traditional fixed-price policies in order to manage capacity levels and allocate renewable technologies in areas for optimal generation.

In fact, in 2018, 48 countries held renewable power auctions, whereas in 2017 only 29 countries had used this policy instrument. Policy makers have used auctions not only to award contracts at minimum prices, but also to create tenders that would meet various national goals concerning RE generation. In addition, auctions mechanisms represent a way to help the local community: they can be designed in such a way as to guarantee the active role and participation of local communities.

Like all the major development in the RE sector, the biggest renewable power auction in 2018 took place in China. Other significant developments happened around the world during the year 2018. A contract was award in the Netherlands for up to 750 MW of grid-connected offshore capacity and several offshore wind power auctions were held in Europe and in the USA.

Beyond auctions, FiT policies remain an important way to integrate renewables in the power sector at the national and sub-national level. By the end of 2018, 11 countries, states or provinces had FiT. This policy scheme's help is now often limited only to countries with nascent RE markets. FiT can support also other renewable technologies, which encounter high upfront costs that are usually not included in the auctions.

Smaller-scale RE projects are helped by policies that support grid networks access as well as remuneration for surplus renewable electricity. This last policy is known as net metering or net billing at the residential and commercial levels. These mechanisms are primarily adopted for small-scale rooftop solar, yet they can also apply for small-scale wind turbines. REN21's GSR identified 66 countries where net metering practices existed by the end of 2018. In the UNECE region, Romania recently adopted new rules for net metering of renewable installations up to 100 kilowatts. Spain adjusted its net metering policy in order to simplify the procedures and encourage broader use of this scheme.

However, some challenges remain. Policy makers have had to revised rates as renewable technology costs continue to fall. They have also had to adjust the utility fees charged for connection to the grid. On this matter, the EU passed a law in 2018 that prohibits any grid connection related fees for all prosumers with systems of 25 kilowatt or smaller.

Finally, fiscal incentives are equally important in addressing some of the barriers for RE deployment. Grants, rebates, tax credits etc. are fiscal ways to support renewable technologies, for both small- and large-scale residential renewable installations.

The introduction of a wide range of RE policy instruments is responsible for the growing renewable electricity market in the UNECE region. These major RE promotion schemes and measures can be regrouped in two main categories: financial and non-financial schemes. On the one hand, non-financial schemes foster the deployment of renewables by upgrading the current infrastructure, making market entry and integration easier[56]. Officially communicated renewable electricity expansion goals, guaranteed grid access, priority feed-in, net-metering and net billing are all non-

financial instruments that encourage RE development. Guaranteed grid access benefits especially independent power producers (IPP) and autoproducers; however, it may be limited by a minimum or maximum capacity. Priority feed-in schemes require utilities to purchase RE. Net metering and net billing are instruments that work by crediting the producers of renewable electricity for the electricity surpluses they feed into the grid. This "extra" RE either becomes credit for future electricity demand (net metering approach), or direct financial compensation at agreed rate (net billing approach).

On the other hand, financial schemes generate direct investment incentives. General financial support schemes refer to investment subsidies, credit grants, lower interest rates, tax credits or exemptions, and government R&D[57]. Other financial support mechanisms target the sales price of renewable electricity, helping it compete with other conventional energy sources, notably fossil fuels. These mechanisms can be organized around the following three categories: price-based, quantify based or hybrid promotion schemes.

Price-based promotion schemes include FiTs or premiums: these schemes provide long-term, stable remuneration for generating renewable electricity and feeding it into the grid. Remuneration can either be under a fixed tariff or at the electricity market price.

Quantity-based promotion schemes are essentially quotas. Examples of this type of RE policy instrument are renewable portfolio standards and renewable obligations. Usually, these quotas systems are combined with trading systems for green certificates or RE certificates. The price for these certificates is determined by the market, based on the total number of traded, supplied and demanded certificates, which in turn is subject to the RE quota of a given country[58].

Hybrid promotion schemes feature elements from both the price-based and quantity-based instruments. An example of this are auctions. Auctions are public bidding processes whereby long-term beneficial contracts are granted for the purchase of renewable electricity, the so-called PPAs. They can require either an agreed amount of renewable electricity or the electricity output of an auctioned amount of installed renewable electricity capacity. Auctions give the opportunity to legislators to control the expansion of installed renewable electricity capacities. Unlike auctions, which are awarded solely on price, criteria, tendering procedures award long-term contracts based on various factors.

45 UNECE countries have official RE expansion goals in place, and 33 UNECE countries grant unlimited grid access to utilities, IPPs and small-scale auto production. Priority feed-in schemes operate in 25 UNECE countries.

Simply introducing promotion schemes does not necessarily translate into significant RE uptake. These policies need to be predictable in order to be effective: by being constant and stable, the risk associated with renewable investing will lower, thus attracting more financial support, especially from outside sources. Additionally, these policies need to be well-integrated with the existing market structure as well as other existing energy policies.

3.2.2 Transport sector

Although the transport sector accounts for 1/3 of the TFEC, RE has the lowest penetration across all three sectors accounting for 3.4% in 2017, while EA projects an increase to 3.8% in 2023[59]. Application of renewables in the transport sector comes mostly from biofuels, while increasing electrification of transport modes in the road (through electric cars, buses) and in rail is fueled mostly from a low base. Fuel ethanol provides the highest share of biofuel production growth followed by biodiesel and hydrotreated vegetable oil (HVO). Projections in biofuel production estimate a 15% increase (165

billion liters) by 2023, with biofuels still having a share of almost 90% of RE demand[60]. Finally, electrification of the transport modes (electric cars, buses and rail) from RE sources is expected to provide almost 33% of the energy demand for transportation. Electrification allows for the integration of renewables in other means of transportation such as trains, light rail, trams and electric vehicles.

Policies supporting the uptake of renewables in the transport sector largely aim at promoting sustainable fuels (e.g. biofuels such as ethanol and biodiesel through blending mandates, biofuel obligations and a variety of fiscal incentives and public financing measures), transport technologies (e.g. electric vehicles) as well as addressing the reduction in transport demand and shift in less energy-intensive means of transportation. EU has set the target in every EU country 10% of the transport fuel to come from renewable sources such as biofuels, while fuel suppliers are also obliged to decrease the GHG intensity of the EU fuel mix by 6% by 2020 in relation to 2010[61].

Technologies using alternative fuels in the road and rail transport are supported by grants provided to end-users, tax incentives, roll-out of sustainable fuels/charging infrastructure, vehicle standards, low carbon fuel standards, zero-emissions vehicle standards, Obligations or mandates for the share of renewable fuels, fuel taxes based on the life cycle GHG emissions, public procurement of renewable carriers.

Biofuel blend mandates set binding targets for blending biofuels in petrol. Up to 2018 mandates existed in at least 70 countries at a national and regional level. Nevertheless, it must be noted that biofuels must be produced in a sustainable way in order to reduce GHG emissions. Towards this direction, the EU has enacted rigorous sustainability criteria for biofuels and bio liquids. These include different provisions, including measures against the negative direct impact that the production of biofuels may have due to Indirect Land Use Change (ILUC). In 2015, new rules came into force to reduce the risk of ILUC (through the Renewable Energy Directive 2009/28/EC and the Fuel Quality Directive 2009/30/EC)[62].

Electric vehicles have a significant potential to increase the integration of renewables; however, the measures introduced to scale up EVs were not linked to the promotion of RE. Except for Austria, no other countries have introduced a policy directly relating integration of renewables to EVs.

3.2.3 Heating and cooling sector

Policies focusing on RE in the heating and cooling sector have been relatively fragmented and usually implemented alongside with energy efficiency policies. They mainly include policies promoting the use of renewable heat technologies, reducing energy consumption, increasing the use of efficient lighting and appliances and integration of renewables in buildings. Most common renewable-energy-relevant policy instruments in the heating/cooling sector include: Targets, building codes (renewable heat with high efficiency standards in new buildings), financial incentives, energy taxes, regulatory measures, public awareness, capacity building, fiscal incentives & grants (tax incentives), RPS, production-based incentives. Renewable heating and cooling technologies must overcome numerous barriers against conventional technologies (mainly fossil fuel-based options) to become competitive. General barriers affecting all RE technologies include high capital costs and subsidies for fossil fuels, as well as more technology-specific barriers (such as space requirement for biomass boiler, split incentives in privately rented buildings). In district energy systems the lack of existing network and the structure of the urban environment can affect the adoption of centralised renewable heating and cooling schemes[63].

Targets for RE in the heating and cooling sector do not tend to be as ambitious and widely adopted as in the power sector. For example, Serbia has set a 37% renewables share in gross final energy

consumption in the power sector, while 30% in the heating/cooling and 10% in the transport sector by 2020[64]. EU has established a target to cover its 32% of total energy consumption by RE sources by 2030, establishing a minimum share of 14% renewable fuels for transportation and a 1.3% annual increase in renewables-based heating and cooling[65].

The Building code is a regulatory policy instrument (pursuant to EU Directive 2002/91/EC on the Energy Performance of Buildings) focusing on the energy efficiency of the building sector. This is a cross-sectoral measure addressing the household and the tertiary sector and introduces an integrated design to improve the energy efficiency of buildings through specific actions, including covering part of the energy consumption with energy supply systems based on RE sources, electricity and heat cogeneration, district or block heating systems, and heat pumps with seasonal performance factor (SPF). The final product on the requirements and the auditing is the Energy Performance Certificate, which is mandatory in case of purchase, sale and lease of buildings and all buildings of the public sector and affects the assessed value of new and existing buildings influencing investments notably. 85 countries have adopted building certification programmes, with increasing number of voluntary certification for buildings as a way to increase their value[66]. The revised EU Directive, which came into force in 2018, established stronger long-term renovation strategies, aiming at decarbonizing the national building stock by 2050, by incorporating smart technologies, i.e. automation and control systems and devices that regulate temperature at room level, among others[67].

Financial incentives include a range of grants, low-interest loans and tax incentives (production tax credits, tax reductions in sales, energy). A number of tax exemptions are in place to favor deployment of renewables. For example, in Switzerland subsidies per unit of renewable district heat were provided in Bern and for connections to district heating networks in Zurich[68]. In Kazakhstan, RE developers receive tax benefits (corporate tax, property tax, land tax) and investment subsidies (30% of actual costs related to installation and equipment)[69]. Companies producing Combined Heat and Power (CHP), district energy systems, as well as energy from other RE sources (such as biofuels) are offered tax exemptions in their operating profits.

4. Key barriers against fostering more renewable energy investments in UNECE countries

4.1 Introduction

Renewable Energy “Hard Talks” are organized in countries of the region and focus on what the host country needs to change to increase investments in RE technologies. Hard Talks are prepared in cooperation with host countries, local counterparts and other partners, e.g. European Union, USAID, the Renewable Energy Policy Network for the 21st Century (REN21), dena (the German Energy Agency) and other key partners. They facilitate an open exchange dialogue between major players of the public and private sector in the energy field (i.e. policy decision makers, project developers, investors and technology providers). Participants can discuss key issues, identify priorities and propose concrete recommendations for policy changes needed to overcome political, legal, regulatory, technical barriers and take advantage of untapped RE potential.

This chapter presents the key challenges identified through the Hard Talks against the scaling-up of RE investments.

4.2 Experiences from specific sub-regions

Hard Talks carried out across different countries of the UNECE region, have revealed key barriers hindering the full unfolding of RE potential of the focus country.

4.2.1 South East Europe

4.2.1.1 Serbia

Serbia's RE targets are not likely to be reached by 2020 (27% of RE in gross final energy consumption). No FiP system is in place yet, while the current FiT scheme is due to expire by 2019 and the intention is to move towards an auction system to identify projects. Policy uncertainty discourages new investment. Furthermore, grid congestion is a limiting factor for regional interconnections. Market distortions have also been identified, namely high fossil fuel subsidies creating artificially low electricity prices discouraging new wholesale market participants, while currently there is no incentive for customers to move from the dominant supplier to other smaller ones. Administrative procedures for permitting and licensing are quite lengthy despite the simplifications been made, as the process involves multiple authorities; moreover, large- and small-scale RE projects follow the same administrative process despite the lower level of complexity of small projects. In Serbia, there is a relatively high level of social and political resistance towards specific RE technologies, especially against small hydro projects. Added benefits from renewables are not yet understood by the public, who perceive subsidies to RE as an extra burden to their electricity bills. There is currently insufficient implementation of the planning, construction, operations and maintenance processes. There are no local manufacturing firms offering relevant services, while the country lacks local technical expertise. In terms of access to finance, there is limited availability of local or international capital for green energy infrastructure as very few lenders are available, and the cost of capital remains high. Commercial banks, as opposed to developmental banks, do not have the experience or capacity to assist developers with project bankability and long-term financial sustainability. Due diligence processes for commercial banks are lengthy and there is lack of experience with small-scale and distributed projects. As in other countries examined, several issues related to the Grid Code and management exist, due to grid operators' limited experience in intermittent RE and the lack of standards for the RE integration to the grid.

4.2.1.2 Bosnia and Herzegovina

Although a National Energy Action Plan (NEAP) exists with targets for the RE share in the total final consumption by 2020, there are no fixed goals for each individual sector. There is currently lack of a day-ahead market and electricity prices are regulated by Republika Sprska, while there is no competitive procurement mechanism for RE projects. Artificially low electricity prices induced by market distortions, namely subsidies to conventional generation technologies, have also been indicated as a barrier against the attainment of RE penetration targets. Additional bottlenecks include the lack of institutional coordination to efficiently and transparently administer RE-related licensing and permitting procedures and the lack of public access to information and participation in decision-making procedures for legislation, plans, policies, programs and specific activities. Although there is large, cost-competitive RE potential, no measures are in place to actively exploit it, there is lack of inter-sectoral dialogue on biomass and lack of adequate potential mapping for wind and solar

resources. Biomass value chain needs to be better organised. As in other countries investigated, Bosnia and Herzegovina lacks local content (domestic equipment manufacturers) and biomass technologies are relatively obsolete. Priority of connection and dispatch for renewables is not respected in practice. Furthermore, the country lacks modern efficient grid management and transmission infrastructure, resulting in difficulties to integrate intermittent RE sources. The Trans-European Networks - Energy (TEN-E) Regulation is not transposed, making general infrastructure development and interconnection planning difficult. Although the tariffs are publicly available, there is not a unified calculation methodology of the tariffs. As far as the financing is concerned, private capital (debt and equity) is low in the sector. Other barriers distinguished include the difficulty of cooperation and coordinated action between entities, the low "Ease of Doing Business" index of the country and the poor institutional capacities.

4.2.2 The Caucasus

4.2.2.1 Azerbaijan

In Azerbaijan, after the accident at the Mingachevir Thermal Power Plant on 3 July 2018[1], some of the main inadequacies of the energy system were revealed. The lack of RE stations to compensate for power disruption during periods of extreme heat, and the poor performance of the responsible organizations not acting in accordance with the strategic development plan were identified as key factors. Another factor was related to alternative energy policy, which has not been aligned with the country's energy security policy[70]. Although the "Strategic Road Map in the Public Utilities Sector of the Azerbaijan Republic" adopted in December 2016, outlines the key milestones, there is a need for more thorough research on the targets, as well as for more detailed planning on the Road Map's implementation[71]. Moreover, the framework for implementation of RE policy is fragmented. There are currently four main legislative documents governing electricity; however, none of them deals explicitly with RE. There are also a number of secondary legislation instruments regulating specific aspects of electricity generation by renewable sources (e.g. investment protection, environmental protection, taxation, etc.). Furthermore, there is lack of a comprehensive and transparent support scheme, as the FiT calculation process is unclear, while projects can be negotiated and agreements with investors can be concluded on a case-by-case, bilateral basis, undermining the transparency of the process. These facts render investors reluctant to invest even in potentially viable projects. The permitting procedure is not easily accessible to foreign investors. As far as the transmission and distribution grid is concerned, not well-regulated technical standards for connection of RE impede the wider deployment of intermittent renewables. The existing Grid Code needs updating and there is lack of technical capacity from the grid operator to integrate RE in cost-efficient connection terms. Finally, the bankability of RE projects is currently jeopardised by high interest rates and high securities requirement from the part of local banks, but also by the fact that the Power Purchase Agreement (PPA) model currently in effect is not according to International Standards.

4.2.2.2 Georgia

In Georgia, the investor friendly tax environment has brought investments, but government policy is not viewed as stable. One of the main issues has been the lack of national RE strategy and the lack of

[1] Electricity was cut off in most of Azerbaijan inducing serious problems in majors cities such as Baku

concrete, quantifiable and tangible targets for the integration of renewables by 2020 and beyond. Social acceptance of RE is still low, as the public lacks an understanding of the benefits of RE. Common issues with Azerbaijan are identified in Georgia in terms of lack of local technical expertise. Stakeholders indicated the lack of a comprehensive, transparent and horizontally applicable scheme to all interested investors, as projects are negotiated, and agreements are concluded on a case-by-case basis by the Ministry of Energy. The same applies to the PPA, which is not standardized but negotiated on a case-by-case basis. Furthermore, the methodology and the monitoring of tariffs calculation is not transparent and accessible to all parties. This business culture induces financial and legal risks in the final terms creating an unattractive environment to international investors. Further administration-related barriers identified include the lack of a transparent and comprehensive mapping of permits and licensing processes required before and after the implementation of the project. Access to the grid is also a barrier for Georgia as there is currently lack of pre-established technical standards for connection, lack of regulation for the access of RE to the grid, other issues regarding physical access to the grid (including long waiting times) and insufficient grid capacity for distributed generation

4.2.3 Central Asia

4.2.3.1 Kazakhstan

Similar barriers are identified in Kazakhstan with specific targets for renewables existing but with no medium or long-term action plan on how to reach them and limited legal framework stability. Electricity market structure in Kazakhstan is based on a model with high prominence of the state participation. There is a tariff cap on conventional generation that needs to be re-examined in relation to RE. The purchase of electricity relies on conditional customers. PPAs suffer from a series of bankability issues, including strict timelines to secure permits and begin construction. In terms of access to the grid, there is currently lack of specific connection standards for RE in the Grid Code, which induces uncertainty both to the Transmission System Operator (TSO) and the developers. Furthermore, within the connection agreement there is no clarity on the rights and obligations of both parties, hence the allocation of responsibility for non-compliance is uncertain. A significant barrier refers to the network congestion and potential instability from the integration of large scale of renewables, as there is currently no planning for the long-term effect on the grid. The current connection system disincentivizes the grid operator to proceed with connection, as RE generation is exempted from paying for grid costs. Furthermore, due to the limited experience with RE financing and project finance structures, the banking sector could be unconvinced about project bankability and its long-term viability, hence remains reluctant to provide financing to large-scale renewable projects.

4.2.4 Eastern Europe

4.2.4.1 Ukraine

The policy action in Ukraine seems to lack tangible midterm goals to achieve the set RE targets. As large-scale RE investments require over 10 years of payback, investors miss the market signals coming from a long-term goal beyond 2030 (sustained political commitment is needed to achieve the 11% target by 2020), which should be reaffirmed in practice by concrete policy measures, legislative actions and detailed planning. In Ukraine, investors are subject to counterparty risk given the fragile state of

the country's economy, which makes it difficult for investors to find insurance against this risk type. Furthermore, international practices commonly provide guarantees on the Green tariff to power generating developers during the financing stage of the project (before major investments take place). However, according to the current legislative procedures in Ukraine, the producer is obliged to first commission the project and then sign the PPA to receive the Green tariff, increasing the investment risk of project developers. PPAs are signed every year with a state-owned company called "Energorynok". This process is not in line with international power contracts and exposes investors and financiers to additional project risks. Balancing cost according to the law on electricity market in Ukraine shall be borne by the producers of RE. Private investors have raised their concerns due to the lack of high-quality wind data (inducing revenue risks), nascent penetration of RE in the market, lack of forecasting technologies as well as the lack of an established ancillary service provider and buyer of the produced electricity. Access to the grid requires a long, bureaucratic process, which significantly lengthens the time needed to complete a project. Lack of a transparent and time efficient system of approvals, permits and local government engagement have also been identified as existing barriers. Ukraine's high potential in biomass heating and co-production of heat and power remains untapped due to the absence of a competitive heat market in the country. Finally, access to finance originating from Ukrainian Banks foresee high interest rates (up to 24%), which are not attractive to investors.

4.3 Categorisation of key barriers

Examining countries' challenges in RE development revealed the following nine major challenges: Power Market Risk, permits risk, social acceptance risk, resource and technology risk, grid / transmission risk, counterparty risk, financial sector risk, political risk, currency / macroeconomic risk.

4.3.1 Power Market Risk

A key concern for RE investment revolves around the market outlook of a given country. Lack of or uncertainty regarding governmental RE strategy and targets will greatly deter financial support. Many countries among the 17 UNECE countries still do not have a clear national RE strategy and lack concrete, quantifiable and tangible targets for the integration of renewables by 2020 and beyond. Azerbaijan, Georgia, Kazakhstan and Ukraine are countries that are especially set back because of their RE governmental strategy. While some countries like Azerbaijan, Kazakhstan and Bosnia and Herzegovina have established specific targets for renewables (without however fixed goals for each individual sector) or have enacted a National Energy Action Plan (NEAP), no medium or long-term action plan on how to reach them has been set. For example, in Azerbaijan, the "Strategic Roadmap for Public Utilities" adopted in 2016 outlines key milestones; yet, the plan for their implementation is not consolidated and lacks intermediate targets. Additionally, some countries in the region struggle to achieve their RE targets. For example, Serbia is not likely to achieve its target of 27% of RE in gross final energy consumption by 2020. Furthermore, a unified comprehensive legal framework is missing, representing a major obstacle for the development of renewables under a stable and predictable energy market.

In terms of support schemes, several UNECE countries experience some problems regarding transparency and management of tariffs. The process of tariff calculation is unclear and not transparent both in Azerbaijan and Georgia. These conditions around support schemes pose serious financial and legal risks in the final terms creating a hostile climate for international investors. In Kazakhstan, the electricity market is characterized by a high State intervention. Conventional

generation has a tariff cap – this practice should be revised in terms of RE. Even if the tariffs are publicly available, Bosnia and Herzegovina encounters the same problems as the other aforementioned countries. The lack of a unified calculation methodology of the tariffs represents a bottleneck for RE deployment. Similarly, in Serbia the FiT scheme is due to expire by 2019 and there is no FiP system in place yet. Overall, several countries experience the limitations due to the design of standard PPAs and PPA tendering procedures. Azerbaijan and Ukraine both have PPAs in place that do not follow international standards. This practice negatively impacts the investment climate as foreign financiers will be exposed to greater project risk. In Georgia, the situation is similar: rather being standardized, PPA systems are granted on a case-by-case basis, thus increasing project risk and insecurity.
Furthermore, several market distortions are directly obstructing the integration of RE into the energy market structure. Such distortions are high fossil fuel subsidies creating artificially low electricity prices discouraging new wholesale market participant[72]. In Serbia and Bosnia and Herzegovina, electricity prices have been artificially brought down by such government subsidies. In Ukraine, because large-scale RE investments require over 10 years of payback, investors often do not catch the market signals coming from a long-term goal beyond 2030. Another barrier associated with the power market in the UNECE region is the country's ability to put RE policies effectively in practice: in the countries investigated, priority of connection and dispatch of renewables were seldom respected.

4.3.2 Permits Risk

A recurring barrier to renewables is tied to institutional and administrative procedures. This can refer to a lack of institutions or authorities dedicated to renewables and complicated licensing procedures[73]. Other administrative and bureaucratic impediments include problems associated with land acquisition and permission, inadequate planning processes and unclear and inefficient permitting processes.

These problems were highlighted in this report's area of focus. The conditions around permitting procedures for RE projects in the UNECE region are often labor-intensive, requiring complex processes and long-term frames. In fact, the administrative procedure for permitting and licensing can be quite lengthy and bureaucratic. In Serbia, despite an effort to simplify such procedures, large and small-scale RE projects are required to have the same administrative process despite the difference in size and complexity. As a result, foreign investors are disincentivized to engage in renewable projects in countries with risks associated to permitting conditions. A lack of transparency for the permit approval system has also been identified as an existing barrier. In Ukraine, obtaining permits to access land and start building are non-transparent and unpredictable processes, with procedures that can vary from region to region. Additionally, legal deadlines are often not enforced[74].

4.3.3 Social Acceptance Risk

Despite the widely recognized benefits of RE and their key role in achieving climate targets, social acceptance of RE technologies remains a limiting factor for their expansion and implementation. Stemming from a lack of public understanding about RE, there exists social and political resistance, contributing to the development of the NIMBY syndrome. This phenomenon describes opposing attitudes from those who live closest to the proposed location of a RE project. NIMBY attitudes have often been associated with wind projects development[75]. These negatives attitudes can seriously create a hostile climate for RE deployment: a lack of acceptance alone can increase costs, delay or even cancel renewable projects[76]. Within the UNECE region, experts identified that an awareness

about the advantages of renewable heat is still lacking, yet the harms of fossil heating supply – such as health risks from polluting stoves – are not discussed enough[77].

This type of social constraint was especially identified in Georgia and in Serbia. Small hydropower projects in Serbia were met with resistance. Additionally, introducing RE into households was perceived as expensive relative to conventional energy sources – such as inexpensive but inefficient wood burning. The lack of effective public access to information impedes RE development: the public, who regards these subsidies as an additional financial burden on their electricity bill, does not yet understand added benefits from renewables. Finally, the systematic exclusion of the public in the decision making process concerning legislation, plans, policies, programs and specific activities of renewables contributes to a heightened social acceptance risk.

4.3.4 Resource and Technology Risk

Another key barrier against fostering more RE investments is tied to the resource and technology risk associated to a country. The assessment of resource potential is crucial to increase investments from the private sector as it provides reliable and quantifiable data for resource supply.

For example for wind energy, output greatly depends on wind speeds and other regional specific climate characteristics. Wind turbines therefore require more local scale or area specific detailed data that is seldom available, rather than broad scale wind regime data[78]. In the case of wind power, local topographic data is particularly valuable in that it provides a better indicator for total energy output (as wind turbines on hills produce more output than wind turbines in valleys, even if distance is just merely of a few meters). Because granular and precise data is required for optimal modeling of the system output, many projects are not able to procure such high level of quality data and thus suffer from technological risks[79]. Similarly, for solar energy it is hard to find reliable irradiation data, which complicates the calculation of generated output and the return on investment. In the case of geothermal RE, the barrier lies in the proper delineation of the reservoir. In addition to the aforementioned technological risks, research shows that there is still a lack of human resources specifically trained for RE. Proper human training and skills development is essential to the success of any renewable projects, regardless of the technology employed[80].

In the context of Serbia, RE potential assessment on a locational basis could especially help the country better manage its biomass sector. In Ukraine, the lack of high-quality wind data (inducing revenue risks), nascent penetration of RE into the market, and absence of forecasting technologies have been identified as key impediments to RE development in the region. Countries in the UNECE region face additional investment barriers when it comes to the planning, construction, operations or maintenance of a RE project. In fact, many countries in Southeast Europe, Central Asia and Caucasus suffer from suboptimal plant design and implementation for RE capacity building. Private investors looking to get involved in the region have raised their concerns over the lack of local manufacturing firms offering relevant services. One of their main recurring concerns pertained to the lack or insufficient technical expertise – in particular the lack of skilled and experience local staff. Uncertainties associated to securing land and limitations in civic infrastructure increase the investment risk, slowing down RE deployment.

In terms of hardware associated risk, additional bottlenecks include the purchaser's lack of information on quality, reliability and cost. In Bosnia and Herzegovina, the RE sector suffers from a lack of technology transfer as there are no inter-sectoral dialogues happening. Furthermore, the country is set back in output performance due to obsolete biomass technologies.

4.3.5 Grid / Transmission Risk

Infrastructure barriers refer to the challenge of successfully integrating renewables into the energy system. Barriers tied to the system flexibility and the limitation of the power grid can significantly impact the speed of RE uptake. A weak grid in connection with wind energy specifically refers to a power supply system where grid capacity limits the amount of wind energy that can be integrated[81]. A lack of required upgrades for transmission and distribution infrastructure can have the serious result of curtailing renewable power or even suspending any RE project[82]. Another bottleneck is restricted grid connection, which is a significant problem for the development of distributed technologies as well as in cases of vertically integrated power sectors[83]. The same concern applies to the heating and cooling sectors: a lack of organized district infrastructure sets back developments in these sectors.
All Hard Talks hosting countries – as of 2019: Azerbaijan, Georgia, Kazakhstan, Serbia, Ukraine and Bosnia and Herzegovina – have reported issues with their grid code and management. Most of them struggle with a lack of technical standards for the integration of intermittent, RE into the grid. Furthermore, limited experience or suboptimal operational track record of grid operator represents a major challenge for countries as they make efforts to increase the renewable share in the energy mix. As with the other countries investigated, Kazakhstan identified multiple challenges concerning its grid systems. Within the connection agreement for the Grid Code in Kazakhstan, there is little clarity on the rights and obligations of both parties, hence the allocation of responsibility for non-compliance is uncertain. As a result of this uncertainty and lack of accountability, there is an increase in the perceived risk associated to the grid and to RE investment. Just like other countries, Georgia signaled additional issues with regards to grid management – such as limited physical access to the grid (including long waiting times), as well insufficient grid capacity for distributed generation. Ukraine noted a similar type of grid management challenge. Because access to the grid requires a long, bureaucratic process, the time needed to complete a RE project is significantly long, thus invariably impacting the efficiency and performance of any renewables implementation.

4.3.6 Counterparty Risk

The counterparty risk relates to the credit and default risk induced by the power off-taker, which is typically the electric utility[84]. The bankability of the project is enhanced by a credible counterparty, e.g. a financially strong public, state-owned entity or industrial off-taker. In case the state of the economy of the country is not credible, private investors in RE projects are subject to a relatively high level of counterparty risk and a form of insurance needs to be sought to address policy and power off-taker risks. MIGA is a Multilateral Investment Guarantee Agency – a member of the World Bank Group (WB), which offers mainly political risk insurance and credit enhancement guarantees to help investors protect foreign direct investment in developing countries. Private insurance can also be used, however, it is very expensive and sometimes not available[85].

4.3.7 Financial Sector Risk

Financing the energy transition will require an increasing number of investments in RE projects. One of the challenges of the coming period will be how investors will keep their assets profitable under no government price support, transacting exclusively through private sector power purchase agreements and market electricity prices. This uncertainty about the future revenues is likely to affect the financing of the projects by increasing the return rates of debt and equity capital.

There are two main financing structures behind RE projects, namely the on-balance-sheet carried out by a utility, independent power producer or other investor and the non-recourse project finance, which typically consists of a large debt share (originating from institutional investors), and a smaller equity share owned by developers and other investors. Up to early 2017 interest rates were kept at considerable low levels. The low interest rates have pushed down the levelized cost of electricity and have attracted new capital investors, e.g. institutional investors into the financing of the projects. Interest rates vary across projects, industries and countries, and depends on many factors ultimately boiling down to the lenders' risk perception. This becomes particular crucial for projects deployed in countries with fragile economy where high interest rates (reaching 30% per annum) and high securities requirements from local banks render local financing difficult. During the latest years world interest rates have started to rise. Indicatively, the 10-year rates in the U.S. was 2.2% in July 2016 and has risen to more than 3.5% in early 2018. Although capital costs of technologies have declined, if this trend continues, debt financing will be a major challenge in the future.

Limited experience and capacity of national financial systems is another barrier against the uptake of RE projects in some UNECE countries, despite the potential economic and commercial benefit, which is translated into higher cost of financing and in extension higher capital costs for renewable projects. Investors often perceive RE risks (namely regulatory, counterparty, political, currency, liquidity and delay in grid interconnection and transmission) as high. The risk perception increases the risk premium resulting in higher cost of capital. Finance institutions should provide relevant investment risk mitigation instruments to enable the mobilisation of capital in RE investment. Finally, in some cases, large-scale investments usually bear higher transaction costs (for example long and costly due diligence for commercial banks to approve loan) while financial regulation restrain illiquid and riskier investments[86].

4.3.8 Political Risk

Barriers related to the political framework and market regulation are the most important when it comes to unlocking investments in RE systems.

The instability of the political framework and market regulation governing the energy sector can slow down the uptake of RE. Investors are very sensitive to the impact of political risks and to the uncertainty due to regulatory instability. A comprehensive and reliable regulatory system for RE can create a healthy environment for investors to develop projects and attract new investments.

Unanticipated modifications in policies promoting RE deployment, such as the retroactive removal of FiTs, have previously compromised the RE investments in UNECE countries (i.e. Spain or the Czech Republic). To mitigate such risks, investors seek special protection against such changes. To this end, special provisions included in the PPA could guarantee producers that any changes in existing policies will not be of a retrospective nature or that a compensation will be provided in case the legislation/support scheme changes and to actually get the compensation in a reasonable time.

In countries with an unstable political system or inadequate rule of law, investors seek special political risk mitigation instruments against risks related to government action. Providers of political risk insurance (MIGA) typically cover the following types of political risk:

- War, terrorism and civil disturbance, namely losses caused by coups d'état, revolution, insurrection, sabotage and terrorism.
- Inconvertibility of the local currency and transfer restriction due to government action.

- Breach of contract, meaning losses arising from the utility's breach or repudiation of a contract (e.g. breach of a PPA by a government entity).
- Expropriation including losses from government action like nationalization or confiscation, which reduce investors' ownership or control over an asset.
- Not honoring of financial obligations referring to losses resulting from a failure of a sovereign, sub-sovereign, or state-owned enterprise to make a payment such as a loan repayment or an equity injection[87].

Policy design and implementation for renewable electricity and heat should also aim at removing obstacles associated with bureaucracy, permit and monitoring procedures, processing times, transparency, and market design. Furthermore, UNECE countries have to face their individual situations and conditions of the energy market, RE potential, and access to resources. In order to develop a comprehensive RE strategy, Governments need to provide appropriate signals to investors by demonstrating clear political commitment and regulations tailored to the market structure, market organisation and infrastructure. Once a country has set its RE targets, formulated the corresponding strategies and ensured a stable policy framework, the required capital can be channeled into the sector.

4.3.9 Currency / Macroeconomic Risk

The currency risk entails the potential change in exchange rates, which can induce a problem to investors that have financed their project with debt denominated in EUR or USD while revenues are earned in local currency. In case the local currency is devaluated, profitability of the investment can be severely compromised. Although legislation provides for the proper exchange mechanism to be in place (for example, in Ukraine the FiT is adjusted quarterly based on the average EUR/UAH exchange rate of the preceding month to protect investors against foreign exchange risk by the National Bank of Ukraine[88]), this risk may create a discomfort to investors on the applicability of this rule. In Ukraine, investors have faced a similar situation in the past when the government halted compensating producers as per the FIT/EUR exchange for 7 months[89]. As a result, many producers found difficulties in meeting their loan obligations.

5. Lessons learnt for unlocking the renewable energy potential

5.1 Introduction

A key outcome of the Hard Talks is the derivation of solutions to improve the investment climate through policy recommendations. In this chapter, the lessons learnt from the UNECE countries hosting the Hard Talks are initially outlined; accordingly, the chapter focuses on how can UNECE countries increase the market uptake of renewables, listing a number of solutions towards the integration of renewables in the energy mix of the country.

5.2 Lessons learnt from UNECE countries

5.2.1 Azerbaijan

The Hard Talk carried out in Azerbaijan concluded on a number of recommendations towards enhancing the investments in RE technologies. Among them, a study on RE options to meet targets

considering the advantageous synergies between natural gas and renewables needs to be developed. This study shall inform mid- and long-term targets included in the NREAP, demonstrating a clear vision regarding the involvement of the private sector. The new Action Plan should be included in the updated "State Program on the use of alternative and RE in Republic of Azerbaijan", which outlines the government's strategy on alternative and RE sources.

Accordingly, a comprehensive, unified legal instrument to regulate renewables needs to be established to incorporate current best practices adapted to the context of Azerbaijan. Stability and transparency of the investment environment (including support measures, connection terms, etc.) and its uniform application to all interested parties is of vital importance for enhancing the confidence of investors.

A "special fund for renewable energy" (funded with additional export revenues of natural gas saved using RE) should be established to support payments to RE producers. This needs to be done by considering international best practice with national regulators and examining the option of introducing an Independent Regulatory Authority. Other uses of RE for example in transport, heating and off-grid solutions for remote areas also need to be considered together with the energy efficiency and environmental impact nexus.

RE tariffs should consider global return on investment for similar projects incorporating the specificities of the Azerbaijani economy. Donor-funded technical assistance for the development of a computation methodology of the tariffs could be requested, while a concise guide describing the project development process would provide a more accessible environment to foreign investors.

An updated Grid Code has to be introduced with the support of donors. Furthermore, data on connection points and available capacities should be provided to interested parties and technical standards including the type of connection method for the integration of intermittent RE technologies into the grid should be clearly defined.

Towards the same direction, grid expansion should take place where renewable resources (e.g. wind) are available to allow integration of distributed generation from RE. Education programs providing knowledge validation and certification should be adopted. As far as the access to finance is concerned, capacity-building active local banks should be realised to allow funding for RE projects. Standard template of PPA accommodating specific requirements of different RE technologies should also be adopted.

5.2.2 Kazakhstan

In Kazakhstan, a set of priority actions were proposed to further foster the development of RE in the country. To begin with, the existing energy strategy should be further developed to be aligned with climate objectives and should link other sectors such as water and agriculture. Furthermore, ensuring the independence of a regulatory body in charge of market operation, tariffs, licenses, service quality and competition could further support RE investment. A separate agency for RE deployment dedicated to the monitoring, enforcement and evaluation should also be introduced. Market distortions induced by subsidies for conventional generation technologies should be removed to reflect the true cost of energy of the technologies. Furthermore, adopting a new PPA template with more realistic timeframes for beginning of construction, bank step-in rights, arbitration, compensation for early termination and take-or-pay rules, among others, could enhance market access and PPA bankability. Labour- and time-intensive permits and authorizations have to be simplified by the introduction of a "one-stop shop".

Assessment of resource potential needs to be realized through the preparation and online publication of relevant data on a locational basis namely an atlas of RE potential. Investments in grid infrastructure

should be transparent and fair based on international standards. To this end, transmission system tolerances and ability to integrate RE should be investigated and planned for the long term, considering RE proliferation and regional interconnections. Grid expansion costs should be allocated according to the "beneficiary pays" principle, which claims that all beneficiaries of a given transmission project– namely, electricity producers, power customers, and end-users – have to bear the cost of grid expansion.

Access to finance could be enhanced through capacity building in the banking sector on appropriate lifecycle financial modelling for RE projects. Banks should develop products to hedge against political and currency fluctuation risks, while governments should formulate clear, transparent, legal and regulatory frameworks on investments and provide incentives to attract foreign investments.

Because of the Hard Talks in Kazakhstan, the country has introduced policies to increase transparency and to reduce investors' risk. These included policies for the RE auction scheme, the integration of a national systems operator, secure PPAs, tariff indexation to account for interest rate and currency fluctuation, and a land plot granting regime.

5.2.3 Serbia

Experts participating in the Hard Talk held in Serbia concluded to several key country-specific policy recommendations.

The review and active monitoring of the progress of RE targets should be carried out. NREAP needs to be revised with long term, ambitious and inter-sectoral targets beyond 2020, along with the adoption of roadmaps on how to achieve these targets.

Policy support for renewables should be introduced based on latest EU guidelines, including policies for other RE sectors such as transport, heating and distributed small-scale net-metering projects.

A market-based support scheme (FiP/CfD) with transparent and fair auction rules need to be introduced. As in the case of Kazakhstan and Azerbaijan, PPA duration and bankable provisions have to be reviewed and revised according to international standards and access to the balancing markets should be facilitated. Regional trading through interconnections should be enhanced and TSO/DSO (Distribution System Operators) unbundling concerns should be addressed.

As in Kazakhstan's case, fuel subsidies in Serbia need to be removed, while regulatory oversight of market activities and participants on the relation between operational expenses and wholesale price should be introduced. Market rules that help reveal and properly allocate costs according to the "beneficiary pays" principle should also be established along with a transparent pricing structure.

Administrative burden could be addressed by establishing a "one-stop-shop" where all the permits and authorizations can take place, the introduction of an electronic permitting process and the simplification of the permitting processes for small-scale projects.

Recommendations regarding the preparation and publication of RE potential assessment maps on the locational basis are also applicable in the context of Serbia. To further tap into the biomass potential of the country, the value chain of the technology should be explored, and inter-sectoral linkages need to be better understood.

Similar recommendations were provided with regards to the streamlining of the Grid Code, the connection processes with RE and expansion of grid infrastructure. The introduction and enforcement of priority connection and dispatch rules for RE should be enforced.

As far the financing sector is concerned, international cooperation with investors to attract foreign capital, manufacturers to participate in project development as equity holders and assume part of the

financing risk and the participation of developmental banks shall increase RE access to finance. Relevant capacity building activities to the banking sector and adjustment of financing terms for small scale projects were also applicable recommendations for Serbia.

5.2.4 Ukraine

In the case of Ukraine, outcomes of the discussions concluded to the following key recommendations. The lack of tangible mid-term goals in the Ukrainian policy framework should be addressed by the development of sector-specific roadmaps covering power generation, heating (including co-production of heat and power) and biofuels for transportation.

Lack of a competitive heat market in Ukraine is one of the major barriers against introduction of biomass in the heating sector. Overcoming this barrier would necessitate the diversification of the Ukrainian heat market in line with international practices.

The status of biofuels should be re-evaluated from a classification and taxation point of view. Furthermore, a comprehensive assessment of RE potential by region to provide data-driven basis for project development should be undertaken. A project development facility building on the results of the RE atlas could be instrumental in providing technical assistance, building capacity and financing comprehensive mapping. The collaboration of the International community with the State Agency on Energy Efficiency and Energy Saving (SAEE) and Ministry of Regional Development would be vital in moving this issue forward.

Bankability barriers in Ukraine could be overcome by implementing a set of credit enhancement measures to mitigate counterparty risk, such as through bilateral and multilateral agencies, e.g. Partial Risk insurance guarantee (WB) or Political Risk Insurance mechanisms (MIGA), Export Credit Agencies (ECAs), sovereign Guarantees, etc.

While the top level of government would need to be involved, the National Bank of Ukraine should take the leading role in overcoming the issue of counterparty risk. The PPA timing issue can be resolved by the draft Electricity Market law through establishing the Green Tariff regime according to which, terms are locked-in after securing the necessary permits but before the construction of the plant begins. Regarding the specific amount of the FiT, it should be flexible to change dynamically to adjust with the market conditions. However, these changes should be made in the context of a pre-established and transparent methodology. As in other countries, PPA template should be revised and aligned with international standards. The revised PPA should include provisions for curtailment compensation and international arbitration in third country.

Project financing conditions in Ukraine and access to financing from the local banks should be improved. This could be realised through the introduction of a financing program of RE projects via a special-purpose fund. Financing could be facilitated by inclusion of certain projects (e.g. retrofitting DH with biomass / co-production of heat and power) under the Energy Efficiency fund.

5.2.5 Georgia

Barriers and recommendations in Georgia were classified into three groups, namely the overarching issues, bankability and project development.

The overarching issues refer to the wider governance and support for RE investment. Government needs to formulate a comprehensive NREAP in line with Energy Community obligations and finalize the National Energy Efficiency Action Plan (NEEAP). The adoption of the Law on Renewable Energy according to the EU Directive (2009/28/EC) and the explicit commitment to specific, long-term RE

targets (up to 2020 and 2030 or other) could set the grounds for wider RE deployment. As far as the barriers on social acceptance of renewable energies are concerned, public outreach and awareness raising activities for RE should be implemented as part of RE development strategy. Technical capacity for RE project development could be enhanced through technical education programs, courses, degrees and advanced learning activities for professionals. Resource Mapping activities are important for the assessment of the RE potential by region/city (Atlas) in sectors not already available, to provide data-driven basis for project development.

Recommendations about the bankability of the RE project aim at increasing the ability of the project to get financing at a viable rate. Furthermore, a support scheme, which will include measures and capacity goals by technologies, should be developed and capacity goals for each technology type and methods to reach them. Investment environment (support measures, connection terms, etc.) should be stable and known in advance. Green energy certificates, tax exemptions, etc. should also be considered. Transparent calculation of FiT and consideration of global returns on investment could be effective measures also in Georgia. Finally, FiTs should be secured against any future retroactive regulatory changes. The adoption of the international standard PPA template together with provisions (e.g. PPAs to be signed before construction of the plant, to provide guaranteed purchase of fixed annual amount, transparent procedures for tendered concessions, etc.) were additional recommendations to enhance the bankability of the project.

Finally, the project-development related recommendations are oriented towards facilitating RE project development. This could be realised through the increased participation of private developers in project development: identification, pre-development and feasibility research. Introducing a "one-stop shop", fast-track procedures for small-scale RE projects and a state-sponsored "Manual for RE permitting" to assist investors appreciate the steps to be followed, time and costs required could significantly save investors' time. Connection points and available capacities should be readily available and publicly accessible. Technical standards for RE integration should be defined and adopted, along with transparent and fair connection costs. The distribution network unbundling should follow EU legislation and best practices.

5.2.6 Bosnia and Herzegovina

Outcomes of the Hard Talks in Bosnia and Herzegovina comprised a set of priorities that the country should act upon. First, the 2020 and 2030 targets need to be clear amongst local institutions but also towards the Energy Community (EnC), along with the methodology to quantify biomass consumption in households and progress made towards the targets. Removing market distortions, such as fossil fuel subsidies (especially coal) is a prerequisite for the energy transition, together with the implementation of the WB6 (Western Balkan six countries) Roadmap, adopted by the Bosnia and Herzegovina Council of Ministers. Amended Law on Transmission of Electric Power, Regulator and Electricity Market in line with EnC requirements and obligations, as well as the law and regulations on district heating and heat energy systems should be adopted. Furthermore, the country should implement a support scheme based on FiP and set capacity auctions for large-scale wind/solar projects, auctions on pre-selected projects for hydro and finally set administratively fixed FiP for small RE systems, including biomass. Biomass sector should be further incentivized on the production side (especially regarding heat and co-production of heat and power) and the fuel side (incentives to produce modern feedstocks).

As far as the permitting and licensing procedures are concerned, they need to be time-efficient, simplified, streamlined and rationalized. Implementation of the recommendations provided by the

Energy Investment Activity (USAID EIA) and the GIZ's Promotion of Renewable Energy (GIZ ProRE) would allow the removal of obstacles for the investment in the energy sector. Furthermore, inter-institutional coordination and monitoring is essential for improving the permitting process. Enhancing the social acceptance of RE could be realized through the establishment of net billing of distributed/small scale RE as well as effective public access to information and participation in decision-making for legislation procedures and for specific projects.

A common recommendation among most countries, including Bosnia and Herzegovina comprises the accurate mapping and assessment of RE potentials in the region, taking also into account environmental limitations in spatial planning, such as protected areas. The establishment of a clear, transparent and verifiable methodology for long-term monitoring of biomass potential and data shall improve quality, reliability, consistency and reporting of the statistics. To address the grid/transmission issues identified, the unbundling of TSO/DSO has to be prioritized. The issues of power balancing due to introduction of intermittent RE and grid losses needs be addressed, for example by incentivizing loss-reducing capacity deployment approaches and technologies. Counterparty risk can only be addressed by increasing investors' confidence. To this end, RE procurement should transition from a subsidized to a market-based approach. PPA template has to be in line with international best practices on bankability. Access to capital can be reinforced through adopting alternative investment structures, such as communal energy initiatives or cooperatives.

Table 4. List of barriers and corresponding recommendations resulting from the Hard Talks

	Barriers	Recommendations	AZ	KZ	GE	RS	UA	BA
Power Market Risk	Lack of a transparent policy framework/national RE strategy	• Formulate a clear, transparent, legal and regulatory framework on RE investments • Formulate a NREAP in line with the Energy Community (EnC) obligations • Adopt EU Directive (2009/28/EC) on Renewable Energy • Adopt Law on Transmission of Electric Power, Regulator and Electricity Market in line with EnC requirements and obligations. • Adopt Law and regulations on district heating and heat energy systems.	√		√			
	Lack of legal framework/ policy scheme regulating RE investments	• Establish a "special fund for renewable energy" to support payments to RE producers. • Introduce an Independent Regulatory Authority in charge of market operation, tariffs, licenses, service quality and competition. • Introduce a separate agency for RE deployment dedicated to the monitoring, enforcement and evaluation. • Consider other policy schemes such as Green energy certificates, tax exemptions, etc. • Introduce policy support for renewables based on EU guidelines, including policies on transport, heating and distributed small-scale net-metering projects. • Introduce a market-based support scheme (FiP/CfD) with transparent and fair auction rules. • Introduce regulatory oversight of market activities, participants and the relation between operational expenses and wholesale electricity price. • Introduce a financing programme of RE projects via a special-purpose fund • Set capacity auctions for large-sale wind/solar projects, project-specific auctions on pre-selected projects for Hydro • Include additional mechanism for community energy initiatives and self-consumption. • Consider increasing the money inflow of the fund for encouraging the construction of RE based generating facilities.	√		√			
	Lack of comprehensive, transparent and horizontally	• Stability and transparency of the investment environment (including support measures, connection terms, etc.) and uniform application to all interested parties. • Incentivize further the biomass sector either at the production side (especially regarding heat and co-production of heat and power) or the fuel side (incentives to produce modern feed stocks).	√		√			

Barriers	Recommendations	AZ	KZ	GE	RS	UA	BA
applicable support scheme							
Market distortions	• Remove market distortions, such as subsidies on fossil fuels to reflect the true cost of energy of the technologies.		√		√		√
Lack of transparency/monitoring in the calculation methodology of the tariffs	• Promote a transparent calculation methodology of FiTs. • Tariffs should consider global return on investment for similar projects incorporating the specificities of the national economy. • Secure FiTs against any future retroactive regulatory changes. • Adjust FiTs to market conditions.	√		√			√
Lack of feasible, tangible mid-term targets with a concrete Action plan on how to achieve them and the progress made towards their achievement	• Develop study on RE options to meet targets considering the advantageous synergies between natural gas and renewables. • Align existing energy strategy with climate objectives and link other sectors such as water and agriculture. • Develop a policy framework with measures by technologies. • Capacity goals for each technology type and methods to reach them. • Review and monitor progress towards achievement of RE targets. • Revise NREAP with long term, ambitious and inter-sectoral targets beyond 2020 • Adopt roadmaps on how to achieve targets. • Develop sector-specific roadmaps covering power generation, heating and transportation. • Need to have clarity amongst local institutions but also towards the Energy Community (EnC) on the methodology to quantify biomass consumption in households and progress made towards the targets. • Deploy methodology to quantify biomass consumption in households and progress made towards the targets.	√	√	√	√	√	√

	Barriers	Recommendations	AZ	KZ	GE	RS	UA	BA
	Lack of market signals coming from a long term goal beyond 2030	• Inform mid- and long-term targets included in the NREAP with a clear vision regarding the involvement of the private sector. • New Action Plan to be included in the updated "State Program on the use of alternative and renewable energy in Republic of Azerbaijan". • Commit to pursue specific, long-term RE targets (2020 and 2030). • Investment environment (support measures, connection terms, etc.) should be stable and known in advance					√	
	High prominence of the state participation	• Gradually move away from subsidised approach to market-based approach for RE procurement, to ensure long-term financial sustainability of the support scheme.		√	√			
Permits risks	Complex, time-consuming permitting procedures	• Introduce "one-stop shop" to simplify labour- and time-intensive permits and authorisations. • Introduce a state-sponsored "Manual for renewable energy Permitting" to save investors' time. • Introduce electronic permitting processes. • Simplify, streamline and rationalize permitting and licencing procedures. • Improve the quality of studies required for permits. • Strengthen inter-institutional coordination and monitoring of the permitting processes. • Facilitate communication, exchange of information and coordination on goals and methodologies between different centres of administration and between stakeholders within the same administration. • Re-evaluate the role of concessions. Assign concessions in a transparent and fair manner, ensuring maximum benefit both for the society and for the market • Improve the general "ease of doing business" environment by simplifying and digitalising administrative processes. • Coordinate and inform about planned projects to address possible transboundary concerns.		√	√	√	√	
	Same permitting procedures for small-scale projects	• Promote fast-track procedures for small-scale RE projects • Simplify permitting processes for small-scale RE projects.			√		√	
	Lack of comprehensive mapping of permits	• Concise guide describing the project development process	√		√		√	

	Barriers	Recommendations	AZ	KZ	GE	RS	UA	BA
	before initiation of the project							
Social acceptance risk	Social resistance	• Implement public outreach and awareness raising activities for RE • Enable participation of civil society organisations in strategic planning of the sector. • Enhance the social acceptance of RE through the establishment of net billing of distributed/small scale RES, effective public access to information and participation in decision-making for legislation procedures and for specific projects. • Examine retail prices and make sure they reflect the real cost of electricity. • Reinforce effective public access to information and public participation in decision-making procedures. • Actively promote awareness on benefits of energy transition for citizens, rural development, and the economy as a whole. • Enable participation of civil society organisations in strategic planning of the sector.			√	√		√
Resource and Technology Risk	Unavailability of data related to RE resources	• Investigate uses of RE in transport, heating and off-grid solutions for remote areas together with the energy efficiency and environmental impact nexus. • Produce RE potential assessment maps to quantify RE potentials in the region, taking also into account environmental limitations in spatial planning such as protected areas. • Explore the value chain of biomass and better understand inter-sectoral linkages • Deploy methodology to quantify biomass consumption in households and progress made towards the targets. • Establish a clear, transparent and verifiable methodology for long-term monitoring of biomass potential and data to improve quality, reliability, consistency and reporting of the statistics. • Establish inter-institutional coordination for the long-term monitoring of biomass potential, via the recently established biomass monitoring system, with the support of UNDP and GIZ. • Improve quality, reliability, consistency and reporting of energy-related statistics.			√	√	√	√
	Lack of local technical capacity	• Introduce education programs providing knowledge validation and certification. • Enhance technical capacity for RE project development through technical education programmes, courses and degrees, advanced learning activities for professionals.			√	√		√

	Barriers	Recommendations	AZ	KZ	GE	RS	UA	BA
Grid / Transmission Risk	Lack of an updated Grid Code	• Introduce an updated Grid Code with the support of donors. • Provide data on connection points and available capacities to interested parties. • Provide technical standards including the type of connection method for the integration of intermittent RE into the grid. • Connection points and available capacities should be readily available and publicly accessible. • Streamline Grid Code, and connection processes of renewables.	√	√	√	√		
	Network congestion – Lack of grid capacity	• Grid expansion should take place where renewable resources (e.g. wind) are available to allow integration of distributed generation from RE. • Invest in grid infrastructure in a transparent and fair way based on international standards. • Investigate and plan for the long term, the transmission system tolerance and ability to integrate RE, considering RE proliferation and regional interconnections. • Grid expansion costs should be allocated according to the “beneficiary pays” principle. • Adopt technical standards for RE integration. • Connection costs should be transparent and fair. • Enforce priority connection and dispatch rules for RE. • Address the grid/transmission issues identified. • Address the issue of grid losses, for example by incentivizing loss-reducing capacity deployment approaches and technologies. • Overcome power balancing issue due to introduction of intermittent RE. • Address and increase the limits related to the installed capacity allowance for interconnecting wind power plants at the transmission system. • Prioritise the unbundling of TSO/DSO. • The distribution network unbundling should follow EU legislation and best practices.	√		√		√	
Counterparty Risk	Not clear terms in connection agreement – counterparty risk	• Enhance regional trading through interconnections and address TSO/DSO (Distribution System Operators) unbundling concerns. • Implement credit enhancement measures (such as bilateral and multilateral agencies, partial risk insurance guarantee) to mitigate counterparty risk. • National Banks to take the leading role in overcoming the issue of counterparty risk. • Increase off-taker awareness and understanding of RE advantages. • Enhance reporting and monitoring by off-taker throughout its generation portfolio.		√				

	Barriers	Recommendations	AZ	KZ	GE	RS	UA	BA
Financial Sector Risk	High interest rates and high securities required from local Banks	• Consider global returns on investment. • Develop international cooperation with investors to attract foreign capital, manufacturers to participate in project development as equity holders and developmental banks to increase RE access to finance.		√		√	√	√
	Limited experience from local Banks with RE financing and project finance structures	• Capacity building for local banks to allow funding for RE projects. • Capacity building on appropriate lifecycle financial modelling for RE projects. • Banks should develop products to hedge against political risks and currency fluctuation. • Adjust financing terms for small-scale projects. • Improve project financing conditions and access to financing from the local banks. • Adopt alternative investment structures, such as communal energy initiatives, cooperatives. • Transition RE procurement from a subsidised to a market-based approach. • Support and help create “strong” local developers and project owners both financially and technically, to attract equity investment. • Facilitate access to capital to alternative investment structures, such as communal energy initiatives, cooperatives, citizens (for distributed generation), etc.		√		√	√	
Investment risks	PPA is not standardised according to International Standards	• Streamline PPA template according to international best practices accommodating specific requirements of different RE technologies (e.g. PPAs to be signed before construction of the plant, to provide guaranteed purchase of fixed annual amount, transparent procedures for tendered concessions, etc.) to enhance the bankability of the project. • PPA should include provisions for curtailment compensation and international arbitration in third countries.	√		√	√	√	
	Financial and legal risks due to uncertainty in the PPA terms	• Enhance participation of private developers in project development. • Establish the Green Tariff regime where terms are locked-in after securing the necessary permits but before the construction of the plant.	√	√		√		
	Strict PPA deadlines on securing permits and begin construction	• More realistic PPA template timeframes for beginning of construction, bank step-in rights, arbitration, compensation for early termination and take-or-pay rules, among others. • Streamline PPA bankable provisions according to international standards and facilitate access to the balancing markets.		√				

6. How can UNECE countries increase the market uptake of renewables?

6.1 Alignment of the policy framework and market regulation

Establishment of mid- and long- term renewable energy targets

The policy framework and market regulation governing the energy sector have an important effect on the investments of RE projects. The establishment of mid- and long- term RE targets is necessary to provide the necessary market signals for the capital intensive RE investments and to demonstrate the commitment of the Government to support deployment of RE technologies, respectively. Targets should also be deployed not only by sector (power, heating/cooling, transportation) but also by RE technology. Currently, only few countries have set targets in sectors other than electricity which are, however, less ambitious. Furthermore, the development of a strict monitoring process of the targets' achievement will play a key role in the mobilization of the market and the achievement of the SDG7. To this end, clarity needs to exist amongst local institutions and towards the EnC on the methodology to quantify consumption of RE (such as biomass consumption in households)[90].

Investors' confidence can be enhanced by the introduction of a comprehensive set of policies for attracting new investments[91]. Policies should also be established/enhanced in sectors other than electricity, namely the transportation and heating/cooling sectors, as well as in other sectors, such as distributed/small-scale generation net-metering, community/cooperative projects. Existing policies targeting across different sectors should be enhanced by increasing their ambition and number.

Deployment of Action plans and Roadmaps

Countries need to develop Action Plans (formally known as NREAP) outlining the targets per each technology and the measures for reaching them. Tangible mid-term goals must be addressed by the development of sector-specific roadmaps covering power generation, heating (including co-production of heat and power) and biofuels for transportation.

Roadmaps must focus on the:

- Assessment/development of future pathways/scenarios per sector and monitoring procedures.
- Prioritization of areas/projects.
- Assessment of economic and strategic implications per pathway.
- Identification of appropriate regulatory changes to implement pathways.
- Assessment of funding/investment opportunities for implementing projects.
- Identification and assignment of national & local roles and responsibilities per sector.
- Long-term RE targets.
- Introduction of policy schemes aligned with the context of the country.

Stable investment environment with transparent market rules

Policy measures must reflect the context of the country and provide necessary incentives to further attract international investors. To this end, it is of vital importance that the investment environment is stable, transparent, publicly available (including support measures, connection terms, etc.) as well as market rules to be uniformly applied across all interested parties. The participation of foreign investors to RE auctions can be facilitated by providing clear and transparent rules and prerequisites, as well as by making all required information available in the English language.

Once the RE targets are set and the corresponding policies are formulated, the country must guarantee the stable implementation of these policies and investors need to be reassured that there will be no retroactive adjustments to support mechanisms. For example, past experience (e.g. in Czech Republic and Spain) with retroactive changes in the FiT scheme (temporal pause of the tariffs' payment) and the partial suspension of Green Certificates, has severely damaged the investors' confidence.

Countries that formulate FiT schemes have to make sure that the implementation process is in line with the action plan priorities and adopt transparent and fair methodologies for RE electricity purchase price (tariff) calculations to facilitate project bankability and subsequent financing. The FiT needs to be able to change dynamically in order to better reflect market conditions (reduction of technology costs, number of pending applications, etc.). However, any changes must follow a pre-established and transparent methodology.

Removal of market distortions

Market distortions are related to the direct or indirect subsidies for conventional energy sources reduce the electricity prices and comprise an obstacle to the market entry of RE technologies. In some countries, electricity prices in the household bills are even lower than electricity production costs[92]. In this context, subsidies on fossil fuels must be minimised to support the deployment of RE to reflect the true cost of energy of the technologies. Introducing RE promotion schemes (e.g. FiT, FiP, auctions, Green Certificates) can help make RE more competitive by lifting the renewable electricity sales price above the electricity market price.

6.2 Improving the Institutional and Administration System

Establishment of Renewable Energy Regulations and Institutional Authorities

The establishment and implementation of a support scheme based on FiT/ FiP can help to unlock investments, however, in more developed RE markets, competitive capacity auction tenders (especially for large-scale projects) can promote the deployment of renewable electricity in a cost-efficient and transparent manner. A key strength of auctions is that they bring out the real price of the project, addressing the information asymmetry problem between the Regulator and the project developer[93]. Project-specific auctions on pre-selected projects could also be adopted, while FiTs scheme could be more effective for small-scale renewables and additional mechanisms for community energy initiative and self-consumption. Furthermore, laws must be adopted to promote RE in other sectors, such as district heating and heat energy systems.

The RE support scheme to be developed needs to consider international best practices adjusted to the national context of the country and examine the option of establishing an independent regulatory authority which will set tariffs and prices for RE generation technologies. The Independent Authority will also be responsible to periodically adapt the FiT, so that the mechanism does not involve having to go through amendment of the law (since it is a cumbersome process) every time but could be realized through executive decrees.

Streamlining and communication of permitting processes

A common barrier against the wider deployment of RE projects across the countries participating in the Hard Talks was reported to be the existence of lengthy and bureaucratic administration processes, as well as the fact that small-scale projects have to also go through the same long bureaucracy. Administrative procedures for permitting and licensing can be addressed by the introduction of "one-stop-shops" for RE developers, where all the permits and authorizations can take place. The

introduction of an electronic permitting process could further facilitate and save investors' time, while small-scale projects must bear simplified permitting processes. In general, permitting and licensing procedures need to be time-efficient, simplified, streamlined and rationalized. Permitting procedure could be done by an Independent Central Agency that oversees the permitting procedure, ensures transparency and impartiality and has the administrative obligation to reply within a few months. Furthermore, a project identification institution could be established as a matchmaker among project owners, financial institutions and investors.

International and local investors would also benefit from the publication of a state-sponsored clear, concise and practical "Manual for renewable energy Permitting", which will include all the required information regarding the licensing processes (steps, duration, etc.) that the project has to go through.

Improving and strengthening the inter-institutional coordination and monitoring of the permitting processes would also facilitate the pre-development stage of the RE project. Pre-development studies required for permits need to be improved, i.e. the implementation and enforcement of environmental assessment procedure for Strategic Environmental Assessment at the spatial planning and strategic planning levels, and for Environmental Impact Assessment (EIA) at project level.

6.3 Improving/facilitating resource potential assessment and technology adoption

In many countries, technical information about the RE potential and project pipeline is missing, limited or considered unreliable. Countries should undertake comprehensive assessment of their RE potential by region/city to create a RE Atlas which will provide investors a data driven basis for project development. The RE Atlas should accurately map, assess and quantify RE potentials for various types (wind, solar, biomass, etc.) in the region, taking also into account technical and economic potential as well as environmental limitations in spatial planning such as protected areas. Additionally to the mapping of the RE potential, a project development facility building on the results of RE atlas including inter alia additional local resource assessments where needed, feasibility studies, permitting process and training programs, will further inform future projects and provide support to investors.

There should be an inter-institutional coordination for the long-term biomass potential monitoring, with the support of United Nations Development Programme (UNDP) and GIZ, along with the adoption of a clear, transparent and verifiable methodology for biomass data for the future. Biomass potential needs to be studied across the value chain and inter-sectoral linkages need to be more fully understood and taken into consideration.

International Donors and international financial institutions (IFIs) could be instrumental in assisting in this highly technical field by providing technical assistance, building capacity and financing comprehensive mapping. The collaboration of the international community with the Ministry of Regional Development would be instrumental in moving this issue forward.

6.4 Development of grid and appropriate infrastructure towards wider integration of renewables

In targeting high levels of variable RE deployment and integration, policy makers should consider the enhancement of the grid, including the transmission and distribution system as well as investments in energy flexibility that enable RE to be integrated in the power system[94]. A key priority for policy makers should be to overcome the power balancing issue induced by the introduction of intermittent RE. To

this end, a holistic view on the planning of the system should be taken, considering the electricity demand growth profile, permitting, network charging and access rights, as well as the treatment of balancing and system services for harnessing flexibility, enabling a secure and affordable operation of a low-carbon system based on VRE generation.

Grid expansion should take place where renewable resources (e.g. wind) are available to allow integration of distributed generation from RE. Investments in grid infrastructure should be carried out in a transparent and fair way based on international standards. The transmission system tolerance and ability to integrate RE, considering RE proliferation and regional interconnections should be further investigated and planned for the long term. Costs of grid expansion should be allocated according to the "beneficiary pays" principle, while the integration of variable RE technologies should follow international technical standards. Grid losses can be addressed, for example by incentivizing loss-reducing capacity deployment approaches and technologies. Connection costs to the grid should be transparent and fair. Finally, UNECE countries should prioritise the unbundling of TSO/DSO according to the EU Directives[95] and enforce priority connection and dispatch rules for RE.

6.5 Addressing social opposition and lack of human capacity

As part of the NREAP, social awareness and public outreach activities could be carried out, as well as programs to develop human capacity (e.g. formal education and professional training schemes). The countries could raise the awareness of the people on the environmental, health and financial benefits of the energy transition for citizens, rural development, and the economy as a whole, by undertaking (locally focused) public awareness campaigns about tasks and targets of clean development and RE usage, including biomass use in households. Additional ways to enhance social acceptability is by carrying out transparent public debate on hydropower and other RE projects, exploring all aspects, promoting a constant dialogue between relevant national and local authorities and identifying pathways to ensure all concerns (e.g. safeguarding biodiversity, quality of water and low environmental impact).

As far as the lack of human capacity is concerned, training programs in new, efficient technologies (including for biomass) and technologies that integrate RE generation into other infrastructure (e.g. waste processing and wastewater treatment, or water conveyance) could be promoted at the state level, with emphasis on retraining of workers employed in fossil technologies (e.g. coal).

6.6 Improvement of bankability of the project

Access to financing

Depending on the situation of a country high interest rates and high security requirements from local banks can make local financing extremely difficult, as the risk perception of the banks is high rendering them reluctant to finance RE projects and when they do, increased risk is reflected in the high interest rates. To address this issue, countries could involve donors and international financial institutions to reduce risks and build capacity for local banks to provide funding for RE projects[96].

Counterparty risk can be mitigated through a number of credit enhancement forms, such as:

- Bilateral and Multilateral agencies to f
- acilitate Risk Mitigation e.g. Partial Risk Guarantee (WB) or Political Risk Insurance mechanisms (MIGA).
- ECAs for commercial and political insurance provision.
- Sovereign Guarantee, which can be provided as a credit enhancement to projects.

- Government-funded account.
- Replacement of offtake counterparty with other more creditworthy customers (e.g. International Corporation, etc.).

PPA terms

Issues with PPAs can be identified and a standard PPA template in line with international best practices on bankability has to be adopted. The PPA needs to accommodate the specific requirements of different technologies.

6.7 Promotion of new business models and enabling technologies

Innovative business models can create the business case for new services that further incentivize the integration of RE technologies. The deployment of distributed energy systems has promoted the active participation of energy prosumers who both consume and produce electricity. Aggregators have a key role in the active participation of small consumers in electricity markets, as consumers/prosumers cannot trade directly in the energy markets and require the services of an aggregator. Relevant business models include the peer-to-peer trading platforms and the energy-as-a-service model, enabled by smart meters and digitalization.

Off-grid RE supply have been further enabled by the emergence of innovative business models, such as the pay-as-you-go (PAYG) financing wherein consumers pay periodic instalments through mobile money[97]. This scheme has been particularly successful in stand-alone solar systems as the consumer can pre-pay the amount of energy they wish to consume, while the distributors and suppliers can reduce operational expenditures in physical collection of fees[98]. Recently, in 2018, a leading PAYG company called M-KOPA has launched a QR payment system with Mastercard in Uganda[99]. Impact investing and crowdfunding have also been used by private companies to raise capital. In fact, between 2015-2018 fundraising increased almost nine times from USD 3.4 million to USD 30.5 million[100]. The Energy-as-a-Service (EaaS) business model represents the shift from selling kWh to selling services, such as energy demand management services, smart home solutions, automatic control of energy load, etc. EaaS also includes shifting from customer-owned equipment to a scheme where the service provider keeps ownership while the customer pays for the services provided by the equipment[101]. Peer-to-peer (P2P) electricity trading is based on an online marketplace platform where consumers and suppliers of distributed energy can make transactions (otherwise called “Uber of energy”). The business model still has to handle regulatory issues before being able to provide benefits to customers, for example issues in relation to grid charges. Although the commercialisation of clean cooking systems coupled with off-grid solar systems has not yet been scaled, many companies have launched various alternative configurations including the sale of both the stove and the associated fuel (the “tool and fuel” business model). As such, recently, Inyenyeri (Rwanda) and Emerging Cooking Solutions (Zambia) companies have demonstrated clean cooking systems comprising ultra-clean gasifier stoves along with pellets produced from wood and agricultural feedstocks[102]. Other companies (such as KOKO Networks) have used ethanol as the fuel.

Enabling technologies for the deployment of renewables include smart metering technologies (the so called Internet-of-things), artificial intelligence models, big data management, and electric vehicles. Internet-of-things include the digitalization of assets and the connection of the devices such as residential PV on rooftops and other home appliances, enabling the collection of data and remote control of the system composed by the interconnected assets. Artificial intelligence and machine learning techniques are able to recognise patterns of data, draw inferences and make decisions. Such

systems have assisted the Condition and Structural Health Monitoring of RE technologies such as offshore wind assets, yielding considerable cost savings during the operation and maintenance phase of the investment.

7. Conclusions

Following the decreasing trend in RE capacity additions in 2018, it is foreseen that new additions will achieve a double-digit growth (by almost 12%) in 2019, driven by solar PV's strong performance.
The UNECE region has great potential to accommodate high shares of RE. However, most countries have not yet taken full advantage of this potential. Hard talks, organized by the GERE together with a number of key stakeholders originating from the private and public sector, are high-level, high-engagement and high-impact events run on a demand-basis. Hard Talks aim to deliver an exchange dialogue on the actions host countries need to take to tap into their RE potential by attracting more investments. The Renewable Energy Hard Talks are two-day events that combine an expert-level workshop on the first day with a high-level policy talk building on the workshop's findings during the second day. The barriers affecting the uptake of renewables are discussed during the first day, resulting in the development of a discussion paper, which is further elaborated during the following days to identify solutions and provide recommendations.
The Renewable Energy Hard Talks have led to the initiation of a number of RE specific policies across the focused countries. For example, in Kazakhstan, policies regarding the RE auction scheme, the integration of a national systems operator, secure PPA, tariff indexation to account for interest rate and currency fluctuation, and a land plot granting regime, have been introduced following the Hard Talks recommendations. Overall, these policies aimed at increasing transparency and enhancing RE regulation, while reducing investor risk to increase investment in the renewable sector. As a result of the Hard Talks in Georgia, the relevant national authorities renewed their commitment to ensure a clear roadmap and policy framework for deploying renewables on a larger scale and for a wider range of technologies (e.g. wind, solar, biomass). Similarly, in Ukraine, the national authorities renewed their commitment to ensure that further regulatory measures will be developed to support large-scale deployment of renewables for both power generation and heating (including CHPs) after the adoption of the law on the electricity market.

Key barriers identified and policy recommendations

- In most countries examined, the lack of adequate enabling policy, legislative and institutional frameworks to attract foreign and domestic investments to the power and energy sectors were reported as major bottlenecks. In fact, in Georgia, the lack of mid-term targets and a concrete Action Plan on how to achieve them, along with a long-term goal aiming for 2030 and beyond to provide the appropriate market signals to market actors remains a key barrier.
- Social resistance (NIMBY concerns), lack of technical local capacity and data on RE potential (reported in Georgia, Serbia and Ukraine) could be addressed through public outreach and awareness initiatives. Furthermore, raising activities for RE should be implemented as part of a RE development strategy, as well as capacity building activities (through technical education programs, courses and degrees and advanced learning activities for professionals).
- Transparency in terms of the available RE resources will increase confidence of domestic and foreign investors as it would allow more accurate feasibility studies to be conducted and

better-informed planning of the project. The assessment of the RE potential by region/city (RE Atlas) would provide data-driven basis for project development.

- The bankability of RE projects can be jeopardized by the relatively high counterparty risk. In Ukraine, Kazakhstan and Serbia low bankability of RE projects was connected to high interest rates and securities required from local banks to provide financing along with the limited experience of local banks with RE financing and project finance structures. The bankability of the RE project could be promoted by several measures, such as the establishment of a transparent calculation method of the FiT, the consideration of global returns on investment for similar projects and the protection against future retroactive regulatory changes.
- The form and content of the PPA issued (i.e. not having a standardized template, terms inducing legal and financial risks at the pre-development stage and lacking transparency) has also been regarded as a bottleneck against the bankability of the projects in Azerbaijan, Georgia, Serbia and Ukraine. In Kazakhstan, strict deadlines are applied in PPAs on securing permits and the initiation of construction of the project. The adoption of an Internationally standardized PPA template including several provisions (e.g. PPAs to be signed before construction of the plant, to provide guaranteed purchase of fixed annual amount, transparent procedures for tendered concessions, etc.) and a stable investment environment (support measures, clear connection terms, etc.) can also promote the bankability of the project.
- In Kazakhstan and Serbia, network congestion issues and lack of grid capacity infrastructure were also recognized as key barriers. RE connection access needs to be regulated so that the grid connection permit is included in the permitting process before project take-off. Technical standards for RE integration need to be defined and connection costs should be transparent and fair. The distribution network unbundling should also follow EU legislation and best practices.
- Countries should gradually shift from a subsidy-based to a market-based approach for RE procurement to ensure long-term financial sustainability of the support scheme.
- Policies on the use of renewables in sectors other than the power sectors (namely, the heating/cooling and the transport sectors) should be strengthened through the introduction of dedicated targets, financial incentives, technology mandates, generation-based incentives, carbon or energy taxes and removal of subsidies on fossil fuels.
- Business models and enabling technologies (such as batteries, smart energy systems, digitalization, and electric vehicles) could be employed to enable the integration of renewables and reduce their costs.

References

[1] OECD/IEA. Global Energy and CO2 Status Report. Available at: https://www.iea.org/geco/
[2] InfluenceMap (2019). Big Oil's Real Agenda on Climate Change. Available at: https://influencemap.org/report/How-Big-Oil-Continues-to-Oppose-the-Paris-Agreement-38212275958aa21196dae3b76220bddc
[3] UNECE (2019). Sustainable Energy For All In Eastern Europe, The Caucasus And Central Asia. Analysis of National Case Studies. Available at: https://www.unece.org/fileadmin/DAM/project-monitoring/unda/16_17X/A2.1_Implement_Natl_CS/SE4ALL_CSS_Analysis.pdf
[4] Statistics from the following sources: energy imports and use per capita from World Bank, op. cit. note 2; subsidies from IMF, "Counting the Cost of Energy Subsidies", IMF Survey, 17 July 2015, http://www.imf.org/external/ pubs/ft/survey/so/2015/new070215a.htm; electrification from Sustainable Energy for All (SEforALL), Global Tracking Framework 2017: Progress Toward Sustainable Energy (Washington, DC: April 2017), http://www.worldbank.org/en/topic/energy/publication/global-tracking-framework-2017.
[5] UNECE, REN21 (2017). UNECE Renewable Energy Status Report. Available at: https://www.unece.org/fileadmin/DAM/energy/se/pp/renew/Renewable_energy_report_2017_web.pdf
[6] IEA. (2019). World Energy Balances 2019.
[7] CEE Bankwatch Network. The Energy Sector in Bosnia and Herzegovina. Available at: https://bankwatch.org/beyond-coal/the-energy-sector-in-bosnia-and-herzegovina
[8] UNECE (2019). Sustainable Energy For All In Eastern Europe, The Caucasus And Central Asia. Analysis of National Case Studies. Available at: https://www.unece.org/fileadmin/DAM/project-monitoring/unda/16_17X/A2.1_Implement_Natl_CS/SE4ALL_CSS_Analysis.pdf
[9] International Energy Agency for EU4Energy. World Energy Statistics and Balances 2017.
[10] U.S. Department of Energy, Energy Information Administration (2019). Country Analysis Executive Summary: Kazakhstan. Available at: https://www.eia.gov/beta/international/analysis_includes/countries_long/Kazakhstan/pdf/kazakhstan_exe.pdf
[11] UNECE (2018). Implementation of Renewable Energy National Action Plans in Selected ECE Countries. Geneva: United Nations
[12] UNECE (2019). Sustainable Energy For All In Eastern Europe, The Caucasus And Central Asia. Analysis of National Case Studies. Available at: https://www.unece.org/fileadmin/DAM/project-monitoring/unda/16_17X/A2.1_Implement_Natl_CS/SE4ALL_CSS_Analysis.pdf
[13] IEA (2019). Data and statistics. Available at: https://www.iea.org/data-and-statistics
[14] *ibid*
[15] Gimon, E., Clack, C. T. M., & Mckee, S. (2019). The coal cost crossover: Economic viability of existing coal compared to new local wind and solar resources.
[16] IPCC (2018). Global warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty. In Press.
[17] IEA (2019). After stalling last year, renewable power capacity additions to hit double-digit growth in 2019. Available at: https://www.iea.org/newsroom/news/2019/september/after-stalling-last-year-renewable-power-capacity-additions-to-hit-double-digit-.html
[18] IEA(2019). After stalling last year, renewable power capacity additions to hit double-digit growth in 2019. Available at: https://www.iea.org/newsroom/news/2019/september/after-stalling-last-year-renewable-power-capacity-additions-to-hit-double-digit-.html

[19] REN21. (2019). Renewables 2019 Global Status Report (Paris: REN21 Secretariat). ISBN 978-3-9818911-7-1

[20]UNECE. Deployment of Renewable Energy: The Water-Energy-Food-Ecosystem Nexus Approach to Support the Sustainable Development Goals. Good practices and policies for intersectoral synergies to deploy renewable energy. Available at: https://www.unece.org/fileadmin/DAM/env/water/publications/WAT_NONE_7_Deployment/060617_v3_FINAL_Deployment_of_renewable_energy-_The_water-energy-food-ecosystems_nexus_approach_to_support_the_SDGs_complete_LR_map-manually-corrected.pdf

[21] UNECE (2018). Hard Talks in Bosnia Herzegovina. Available at: https://www.unece.org/fileadmin/DAM/energy/se/pdfs/gere/Hard_Talks/HT_Sarajevo_BiH_Dec_2018/Conclusions_HT_EP_BiH.PDF

[22] UNECE (2019). Committee on Sustainable Energy, Group of Experts on Renewable Energy. Hard Talks in ECE countries on how to increase renewable energy uptake. ECE/ENERGY/GE.7/2019/4

[23]IRENA (2019), Renewable Energy Statistics 2019, The International Renewable Energy Agency, Abu Dhabi.

[24] REN21 (2019). *Renewables 2019 Global Status Report* (Paris: REN21 Secretariat). ISBN 978-3-9818911-7-1

[25] *ibid*

[26] *ibid*

[27] Source Frankfurt School–UNEP Collaborating Centre for Climate and Sustainable Energy Finance and BNEF, Global Trends in Renewable Energy Investment 2018, https://www.greengrowthknowledge.org/sites/default/files/downloads/resource/Global_Trends_in_Renewable_Energy_Investment_Report_2018.pdf

[28] *ibid*

[29] *Ibid*

[30] France, Serbia sign documents on Belgrade waste project, Bašaid wind farm, geothermal energy. (2019, July 16). Retrieved August 18, 2019, from Balkan Green Energy News website: https://balkangreenenergynews.com/france-serbia-sign-documents-on-belgrade-waste-project-basaid-wind-farm-geothermal-energy/

[31] IRENA (2019), Renewable Power Generation Costs in 2018, International Renewable Energy Agency, Abu Dhabi.

[32] Wind Power Offshore REACTION: UK offshore CfD “breakthrough moment” for industry Available online: https://www.windpoweroffshore.com/article/1444212/reaction-uk-offshore-cfd-breakthrough-moment-industry

[33] IRENA (2019). Global weighted average total investment costs, capacity factors and LCOE 2010-2018. Available at: https://www.irena.org/Statistics/View-Data-by-Topic/Costs/Global-Trends

[34] IRENA (2019). Renewable Energy and Jobs – Annual Review 2019. Abu Dhabi. ISBN: 978-92-9260-134-8

[35] *ibid*

[36] UNECE (2018). Implementation of Renewable Energy National Action Plans in Selected ECE Countries. ECE/ENERGY/GE.7/2018/4

[37] IRENA, Joanneum Research and University of Ljubljana (2017). Cost-Competitive Renewable Power Generation: Potential across South East Europe. Abu Dhabi.

[38] Reuters Staff. (2018). Albania’s electricity imports soar in 2017 as domestic output falls. Available at: https://www.reuters.com/article/albania-electricity/albanias-electricity-imports-soar-in-2017-as-domestic-output-fallsidUSL5N1QP6AG

[39] IRENA, Joanneum Research and University of Ljubljana (2017). Cost-Competitive Renewable Power Generation: Potential across South East Europe. Abu Dhabi.

[40] *ibid*

[41] IRENA REsource (2019). Renewable Power Capacity and Generation. Available at: http://resourceirena.irena.org/gateway/countrySearch/?countryCode=SRB
[42] ECE (2018). Implementation of Renewable Energy National Action Plans in Selected ECE Countries.
[43] Ulviyye Aydin (2019). Energy insecurity and renewable energy sources: Prospects and challenges for Azerbaijan. ADBInstitute. Available at: https://www.adb.org/sites/default/files/publication/522891/adbi-wp992.pdf
[44] Alexandre Chachine (2019). Sustainable Energy for All in Eastern Europe, the Caucasus and Central Asia. Analysis of National Case Studies. UNECE. Available at: https://www.unece.org/fileadmin/DAM/project-monitoring/unda/16_17X/A2.1_Implement_Natl_CS/SE4ALL_CSS_Analysis.pdf
[45] UNECCC (2015). Intended Nationally Determined Contributions (INDCs). Available at: https://unfccc.int/files/adaptation/application/pdf/all__parties_indc.pdf
[46] *ibid*
[47] UNECE (2018). Kazakhstan puts focus on renewable energy. Available at: https://www.unece.org/info/media/news/sustainable-energy/2018/kazakhstan-puts-focus-on-renewable-energy/doc.html
[48] UNECE. (2019). Sustainable energy for all in Eastern Europe, the Caucasus and central Asia. Analysis of national case studies. Geneva
[49] IEA. Policies and Measures Databases. Available at: https://www.iea.org/policiesandmeasures/
[50] https://www.adb.org/sites/default/files/publication/522891/adbi-wp992.pdf
[51] *ibid*
[52] The State Statistical Committee of the Republic of Azerbaijan (2019). Plant capacity. Available at: https://www.stat.gov.az/source/balance_fuel/?lang=en (Last updated 27.11.2019)
[53]Alexandre CHACHINE, (2019). Sustainable Energy for All in Eastern Europe, the Caucasus and Central Asia. Analysis of National case studies. Available at: https://www.unece.org/fileadmin/DAM/project-monitoring/unda/16_17X/A2.1_Implement_Natl_CS/SE4ALL_CSS_Analysis.pdf
[54] IRENA. 'Renewable Electricity Capacity and Generation Statistics' query tool. Available at: http://www.irena.org/IRENADocuments/IRENA_RE_electricity_statistics_-_Query_tool.xlsm
[55] IRENA, IEA and REN21 (2018). Renewable Energy Policies in a Time of Transition.
[56] UNECE. (2018). Perspectives for renewable energy in the ECE region.
[57] *Ibid*
[58] *Ibid*
[59] IEA (2019). Renewables 2018. Market analysis and forecast from 2018 to 2023. Available at: https://www.iea.org/renewables2018/
[60] IEA (2018). Renewables 2018. Market analysis and forecast from 2018 to 2023. Transport. Available at: https://www.iea.org/renewables2018/transport/
[61] https://ec.europa.eu/energy/en/topics/renewable-energy/biofuels/overview
[62] European Commission (2019). Sustainability criteria. Available at: https://ec.europa.eu/energy/en/topics/renewable-energy/biofuels/sustainability-criteria
[63]IRENA (2017). Renewable Energy in district and cooling. A sector roadmap for remap. Available at: https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2017/Mar/IRENA_REmap_DHC_Report_2017.pdf
[64]European Commission. Renewable energy. Available at: https://ec.europa.eu/energy/en/topics/renewable-energy
[65]EC (2018). Energy: new target of 32% from renewables by 2030 agreed by MEPs and ministers. http://www.europarl.europa.eu/news/de/press-room/20180614IPR05810/energy-new-target-of-32-from-renewables-by-2030-agreed-by-meps-and-ministers
[66] Global Alliance for Buildings and Construction (2018). 2018 Global Status Report. Towards a zero-emission, efficient and resilient buildings and construction sector. Available at:

https://globalabc.org/uploads/media/default/0001/01/f64f6de67d55037cd9984cc29308f3609829797a.pdf

[67]EC (2019). Energy performance of buildings directive. Available at: https://ec.europa.eu/energy/en/topics/energy-efficiency/energy-performance-of-buildings/energy-performance-buildings-directive

[68] IRENA (2017). Renewable Energy in district and cooling. A sector roadmap for remap. Available at: https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2017/Mar/IRENA_REmap_DHC_Report_2017.pdf

[69]Alexandre CHACHINE, (2019). Sustainable Energy for All in Eastern Europe, the Caucasus and Central Asia. Analysis of National case studies. Available at: https://www.unece.org/fileadmin/DAM/project-monitoring/unda/16_17X/A2.1_Implement_Natl_CS/SE4ALL_CSS_Analysis.pdf

[70] Ulviyye Aydin (2019). Energy insecurity and renewable energy sources: Prospects and challenges for Azerbaijan. ADBInstitute. Available at: https://www.adb.org/sites/default/files/publication/522891/adbi-wp992.pdf

[71] UNECE (2018). Hard Talks in Azerbaijan. Available at: https://www.unece.org/energywelcome/areas-of-work/renewable-energy/unece-ren21-hard-talks.html

[72] Ibid

[73] IRENA, REN21, IEA. (2018). Renewable Energy Policies in a Time of Transition. International Renewable Energy Agency (IRENA), Abu Dhabi. ISBN 978-92-9260-061-7

[74] UNECE (2016). Hard Talks Conclusions: Top 15 Recommendations for unblocking private sector investments in sustainable energy.

[75] Jones, C.R., Eiser, J.R. (2009) Identifying predictors of attitudes towards local onshore wind development with reference to an English case study. Energy Policy 2009, 37, 4604–4614.

[76] González, Ana María, Harrison Sandoval, Pilar Acosta, & Felipe Henao (2016). On the Acceptance and Sustainability of Renewable Energy Projects – A Systems Thinking Perspective. Sustainability, Vol. 8, MDPI, p. 1171.

[77] Dena, UNECE. (2017). Status and perspectives for renewable energy development in the UNECE region. dena. Berlin, Germany.

[78] Sen, S., & Ganguly, S. (2017). Opportunities, barriers and issues with renewable energy development – A discussion. Renewable and Sustainable Energy Reviews, 69, 1170–1181. https://doi.org/10.1016/j.rser.2016.09.137

[79] ibid

[80] Barua, D. C., Urmee, T. P., Kumar, S. and Bhattacharya, S. C. (2001), A photovoltaic solar home system dissemination model. Prog. Photovolt: Res. Appl., 9: 313-322.

[81] Bindner, H. (1999). Power control for wind turbines in weak grids: Concepts development. Denmark. Forskningscenter Risoe. Risoe-R, No. 1118(EN)

[82] IRENA, REN21, IEA. (2018). Renewable Energy Policies in a Time of Transition. International Renewable Energy Agency (IRENA), Abu Dhabi. ISBN 978-92-9260-061-7

[83] ibid

[84]IRENA (2016). Unlocking renewable energy investment: The role of risk mitigation and structured finance. IRENA, Abu Dhabi. Available at: https://www.irena.org/documentdownloads/publications/irena_risk_mitigation_and_structured_finance_2016.pdf

[85]UNECE, REN21 (2016). New possibilities for developing Sustainable Energy in Ukraine. Hard Talks. Available at: https://www.unece.org/fileadmin/DAM/energy/images/GERE/REN21-UNECE_SR/Ukraine_Hard_Talk_Discussion_Paper_23_Dec_EN_CLEAN.pdf

[86] IRENA (2016). Unlocking Renewable Energy Investment: The Role of Risk Mitigation and Structured Finance. IRENA, Abu Dhabi. Available at: https://www.irena.org/documentdownloads/publications/irena_risk_mitigation_and_structured_finance_2016.pdf
[87] *ibid*
[88]BloombergNEF (2018). CLIMATESCOPE 2018. Ukraine Green Tariff. Available at: http://global-climatescope.org/policies/3214
[89] UNECE (2016). Hard Talks Ukraine. Available at: https://www.unece.org/fileadmin/DAM/energy/images/GERE/REN21-UNECE_SR/Ukraine_Hard_Talk_Discussion_Paper_23_Dec_EN_CLEAN.pdf
[90] UNECE (2018). New Possibilities for developing renewable energy sustainably in Bosnia and Hergovina.
[91] UNECE, dena (2017). Status and perspectives for renewable energy development in the UNECE region.
[92] *ibid*
[93] IRENA (2015). Renewable Energy Auctions: A Guide to Design. Available at: https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2015/Jun/IRENA_Renewable_Energy_Auctions_A_Guide_to_Design_2015.pdf
[94] IRENA (2019), Innovation landscape for a renewable-powered future: Solutions to integrate variable renewables. International Renewable Energy Agency, Abu Dhabi.
[95] CEER (2016). Status Review on the Implementation of Transmission System Operators' Unbundling Provisions of the 3rd Energy Package. Available at: https://www.ceer.eu/documents/104400/-/-/8f18879a-411e-2fd8-c367-1fa66e3739ed
[96] UNECE (2017). Outcome of the Hard Talk 2017 on "New Opportunities for Developing Renewable Energy in Azerbaijan". Recommendation Paper. Baku, Azerbaijan on 19-20 October 2017.
[97] IRENA (2019), Innovation landscape for a renewable-powered future: Solutions to integrate variable renewables. International Renewable Energy Agency, Abu Dhabi.
[98] IRENA (2017), REthinking Energy 2017: Accelerating the global energy transformation. International Renewable Energy Agency, Abu Dhabi. Available at: https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2017/IRENA_REthinking_Energy_2017.pdf
[99]IRENA (2019), Off-grid renewable energy solutions to expand electricity access: An opportunity not to be missed, International Renewable Energy Agency, Abu Dhabi. Available at: https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2019/Jan/IRENA_Off-grid_RE_Access_2019.pdf
[100] REN21 (2019). Renewables 2019. Global status report.
[101]American Council for an Energy-Efficient Economy (ACEEE) (2019). Emerging Opportunities Series. Available at: https://aceee.org/sites/default/files/eo-energy-as-service.pdf
[102] Clean Cooking Alliance (2019). Clean Cooking Industry Snapshot (The Hague, The Netherlands: April 2019). Available at: https://ww1.prweb.com/prfiles/2019/04/04/16223249/2019%20Clean%20Cooking%20Industry%20Snapshot.pdf