STUDY

Phasing in Renewables

Towards a prosperous and sustainable energy future in Kosovo: challenges and possible solutions

Photo: Shutterstock/bht2000

GERMANWATCH

Balkan Green Foundation

Summary

This study focuses on the challenges that need to be faced in order to phase in renewables and phase out lignite (often referred to as brown coal). It provides evidence and inspiration from other countries that have tackled such challenges already. The study analyses three types of challenges: (1) the technology challenge of installing renewable electricity generation, alongside the system integration measures needed to balance fluctuations of wind and solar power; (2) the economic challenge of financing these technical solutions and organising the electricity market; and (3) the legal challenge of providing the necessary legal certainty for investments. Finally, the study investigates the potential role of the Kosovar diaspora in realising a prosperous and sustainable energy future. The solutions proposed in this study are intended to serve as a basis for discussion and inspiration on how these manifold challenges can be faced. Ultimately, the government of Kosovo has to decide on how to continue towards a low-carbon energy system, a journey it began by signing the Energy Community treaty.

Imprint

Authors:
Matthias Buck, Kathrin Goldammer, Raphael Heffron, Philip Hiersemenzel, Martin Kittel, Christian Redl, Eva Schmid, Andreas von Schoenberg, Jurica Volarevic, Gerard Wynn

Editing:
Andrew Johnston

Design:
Dietmar Putscher

Publisher:
Germanwatch e.V.

Office Bonn:
Kaiserstr. 201
D-53113 Bonn
Phone +49 (0)228 / 60 492-0, Fax -19

Office Berlin:
Stresemannstr. 72
D-10963 Berlin
Phone +49 (0)30 / 28 88 356-0, Fax -1

Internet: www.germanwatch.org
E-Mail: info@germanwatch.org

July 2018

Purchase Order Number: 18-3-02e

This publication can be downloaded at:
www.germanwatch.org/en/15497

This publication is financially supported by the German Federal Ministry for Economic Cooperation and Development (BMZ). Germanwatch is responsible for the content of this publication.

With funding from the

Federal Ministry for Economic Cooperation and Development

german cooperation
DEUTSCHE ZUSAMMENARBEIT

Supported by

ENGAGEMENT GLOBAL
Service for Development Initiatives

Contents

Abbreviations

AC	alternating current
APPK	Employment Promotion Agency Kosovo
BTM	behind the meter
CHP	combined heat and power
CO_2	Carbon Dioxide
COP	Conference of the Parties (UNFCCC)
CCS	carbon capture and storage
CRF	Cost-Reduction Facility (RES-CRF)
DC	direct current
EBITDA	earnings before interest, tax, depreciation and amortisation
EU	European Union
FTM	in front of the meter
GDP	gross domestic product
GIZ	German Society for International Cooperation
GVA	gross value added
GW	gigawatt
HPP	hydro power plant
IEA	International Energy Agency
IEEFA	Institute for Energy Economics and Financial Analysis
IMF	International Monetary Fund
IRENA	International Renewable Energy Agency
kW	kilowatt
kWh	kilowatt hour
KOSID	Kosovo Civil Society Consortium for Sustainable Development
LCOE	levelised cost of energy
MLSW	Kosovo Ministry of Labour and Social Welfare
MW	megawatt
MWh	megawatt hour
NaS	sodium-sulphur
O&M	operations and maintenance
OECD	Organization for Economic Co-Operation and Development
PLEF	Pentalateral Energy Forum
PPA	power purchase agreement
PV	photovoltaics
RES	renewable energy sources
RES-CRF	European Renewable Energy Cost Reduction Facility
RF	redox-flow
R&D	research and development
SEERMAP	South East Europe Electricity Roadmap
SAA	Stabilisation and Association Agreement
SDGs	Sustainable Development Goals
SEE	South East Europe
T&D	transmission and distribution grids
UNDP	United Nations Development Programme
UKERC	United Kingdom Energy Research Centre
UN	United Nations
UNFCCC	United Nations Framework Convention on Climate Change
WB6	Western Balkan 6

1 Motivation and Outline

In May 2018, the participants of the European Union (EU) Western Balkan Summit concluded in the "Sofia Declaration"[1] their ambition to intensify regional cooperation for a peaceful future. A core means to this end is to enhance connectivity of all kinds: transport, energy, digital, economic and human. The Western Balkans partners strive to move towards digital economies and climate-friendly societies in line with the Paris Agreement[2], under which 195 countries and territories pledged to keep the average global temperature rise this century to well below 2˚C.

An important institutional advocate for a sustainable energy transition in the Western Balkan is the Energy Community, an international organisation established by the European Union and nine contracting parties: the Western Balkan 6, or WB6 (Albania, Bosnia and Herzegovina, Kosovo[3], Macedonia, Montenegro and Serbia) as well as Georgia, Moldova and Ukraine. The key objective of the Energy Community is to extend the rules and principles of the EU internal energy market – in particular market liberalisation – to the contracting countries on the basis of a legally binding framework. Prospectively, the institutional basis may be strengthened by an enlargement of the Energy Union.

Progress in attaining the Energy Community targets is slow, though. Kosovo has implemented only 22% of measures aimed at improving the governance of energy efficiency, the sustainability of energy systems, climate action and the transparency of sustainable energy markets.[4] Kosovo is still a highly fossil-fuel based country. Two lignite power plants supply 95% of Kosovo's electricity.[5] Kosovo A, which has five units built between 1960 and 1975, was meant to be decommissioned in 2014/15.[6] Kosovo B was built between 1977and 1984. Together they constitute the largest point source of particulate matter in Europe.[7] The adverse public health impacts of particulate matter and other pollutants released by the plants include lower respiratory symptoms, restricted activity and working days lost, respiratory medication use, hospital admissions, bronchitis and asthma, as well as premature deaths. The total health costs incurred by Kosovo A and B are estimated at 144-352 million € per year.[8] The supply of electricity in Kosovo is instable and experiences frequent outages, mainly due to obsolete and low-capacity power plants, as well as large distributional losses.[9] In 2016, interruptions in electricity supply reached a total of 62 hours, with an average of 35 interruptions per customer.[10]

Kosovo has implemented a Renewable Energy Action Plan that sets a target of 25% renewable energy by 2020. The government is in danger of missing the target, however, because investment remains minimal despite the existence of a legal framework for renewable support schemes. Connection and access to the transmission and distribution grids remain the main barriers for renewables, as grid operators are not able to deal with intermittent electricity production from variable renewable sources such as wind and solar power.[11]

1 EU Western Balkans Summit 17 May 2018, Sofia Declaration. http://www.consilium.europa.eu/de/press/press-releases/2018/05/17/sofia-declaration-of-the-eu-western-balkans-summit/ [accessed 18.05.2018].

2 United Nations Framework Convention on Climate Change (UNFCCC) https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement [accessed 23.03.2018].

3 The Republic of Kosovo is an independent state that is recognized by 110 of the 193 member states of the United Nations (UN).

4 Energy Comunity (2018) Secretariat's Monitoring Reports on WB6 Sustainable Charter. https://www.energy-community.org/regionalinitiatives/WB6/Monitoring_SUS.html [accessed 23.03.2018].

5 Quelle: KOSTT (2016) http://ero-ks.org/2017/Sektoret/161212_KOSTT_Bilanci%20Afatgjate%20i%20Energjise%20Elektrike%20 2017%20-%202026_ver.%200.3.pdf [accessed 23.03.2018].

6 Evonik Consortium (2009) Study for Decommissioning of Kosovo-A Power Plant. http://eeas.europa.eu/archives/delegations/kosovo/documents/press_corner/decommissioning_study_kosovo_a_power_plant_en.pdf [accessed 23.03.2018].

7 HEAL (2016) The unpaid health bill. http://env-health.org/IMG/pdf/factsheet_kosovo_en_lr-2.pdf [accessed 23.03.2018].

8 Ibid.

9 IMF (2018) Public Infrastructure in the Western Balkans : Opportunities and Challenges. Departmental Paper No. 18/02. http://www.imf.org/en/Publications/Departmental-Papers-Policy-Papers/Issues/2018/02/07/Public-Infrastructure-in-the-Western-Balkans-Opportunities-and-Challenges-45547 [accessed 23.03.2018].

10 Ibid.

11 Energy Comunity (2018) Renewable Energy. https://www.energy-community.org/implementation/Kosovo/RE.html [accessed 23.03.2018].

Yet, continuing on the road towards a prosperous and sustainable energy future in Kosovo – one without lignite combustion – would contribute directly to three of the United Nations' Sustainable Development Goals (SDGs): good health and well-being (goal 3), affordable and clean energy (goal 7) and climate action (goal 13). If policy implementation is pursued adequately, phasing in renewables could accelerate progress towards five further SDGs: ending poverty (goal 1), decent work and economic growth (goal 8), sustainable cities and communities (goal 11), life on land/biodiversity (goal 15), as well as peace, justice and strong institutions (goal 16).

Converting energy systems from fossil to low-carbon, low-risk renewables provides a global benefit by avoiding the dangerous impacts of unabated climate change. This study shows that it also offers several benefits at national and local levels. Policies that encourage energy efficiency and a transition from coal to renewables encourage technical innovation and new business start-ups. There are also significant employment benefits, even in the absence of original equipment manufacturers of solar panels, wind turbines or other renewable energy equipment. Kosovo's economy would benefit from gross value added through non-manufacturing investment in construction, installation, grid connection and planning. Operation and maintenance (O&M) of renewable power generation assets would contribute to economic value added. The resulting jobs and economic activity would stabilise communities and avoid rural depopulation. In this context, there is substantial potential for circular migration through engaging the international Kosovar diaspora to a domestic energy transition. In particular due to the increased regional connectivity by means of high-voltage power lines, an interconnected energy transition in the Western Balkan would also generate peace-building opportunities.

However, for the past decade the centre of energy policy efforts from the national government has been to replace the lignite power plant Kosovo A with a new one known as 'Kosova e Re'.[12] The World Bank has offered to support the construction financially with a partial risk guarantee, but this support has been contested internationally. The finalisation of the (by now single-bidder) tendering procedure has been postponed several times. There is still a possibility to re-evaluate the current path and avoid locking Kosovo into a lignite future, with all the ensuing consequences. Also, the rising international pressure against coal combustion through climate negotiations is likely to prevent 'Kosova e Re' to run full load over the entire investment period. If carbon pricing comes into play, the power plant may be even driven out of the market. Upgrading the plant with the carbon capture and sequestration (CCS) technology is expensive and the technology has not yet reached commercial maturity.

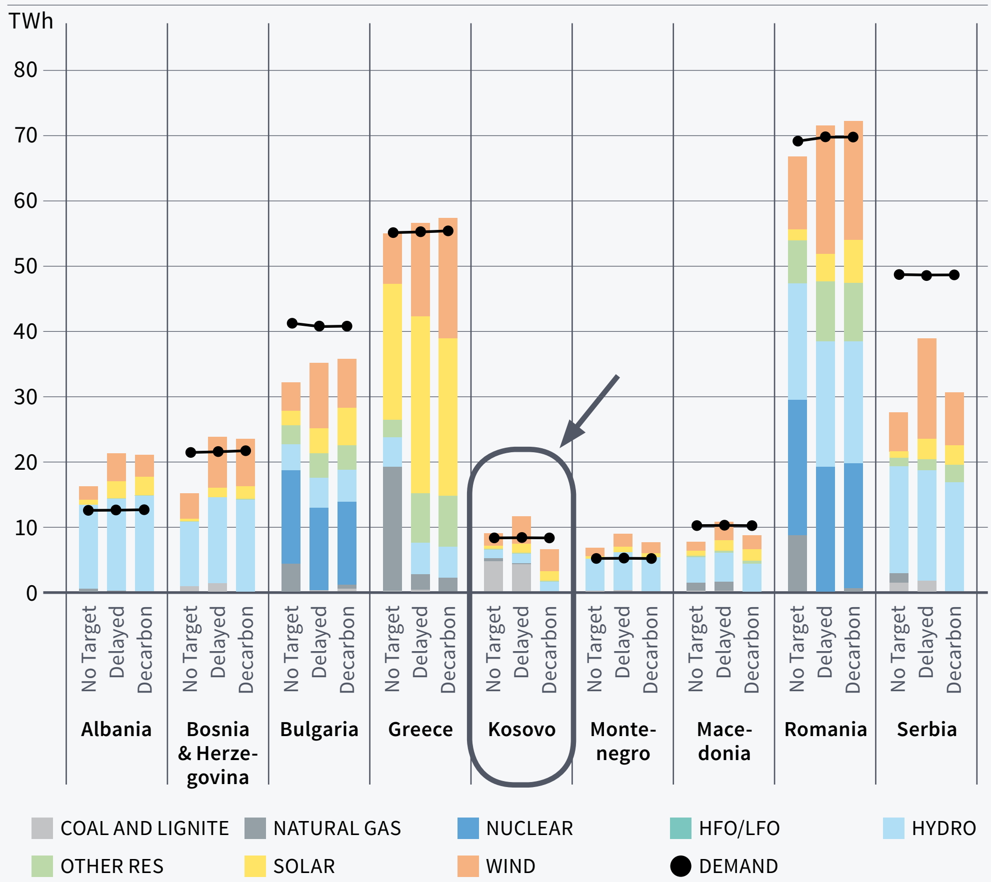
12 KOSID (2017) A short history of a big failure of energy policies in Kosovo. http://kosid.org/file/repository/KOSID_Chronology_English.pdf [accessed 23.03.2018].

Decarbonizing the Western Balkan: technically and economically feasible

Scientific studies have shown the technical feasibility of decarbonising the energy system of Kosovo and, more generally, of South East Europe[13],[14] based on renewables. The most notable and rigorous analysis, by the South-East Europe Electricity Roadmap (SEERMAP) project consortium, proposed three scenarios that analyze the energy market, the electricity market, the transmission grid and the larger economic system.[15] The three scenarios have different levels of ambition and timing in meeting climate mitigation targets (Figures 1 and 2). In the "no target" scenario, currently implemented energy policy continues and there is no CO_2 target in the EU and South East Europe for 2050. The "decarbonisation" scenario is consistent with the 2015 Paris Agreement. The "decarbonisation" scenario reflects a continuous effort to reach CO_2 emission reduction in line with the long-term EU emissions reduction goal of 93-99% for the electricity sector by 2050 (SEERMAP). The "delayed" scenario is a mix of the "no target" scenario in the coming decades and the "decarbonisation" scenario thereafter. It foresees current investment plans until 2035, followed by an increase in policy ambition that results in the realisation of the same emissions reduction target in 2050 as the "decarbonisation" scenario.

Figure 1: Three scenarios that lead to a renewables-based electricity system in South East Europe

Electricity demand and generation by primary energy in 2050



Source: Own illustration based on Figure 6 in SEERMAP[15]

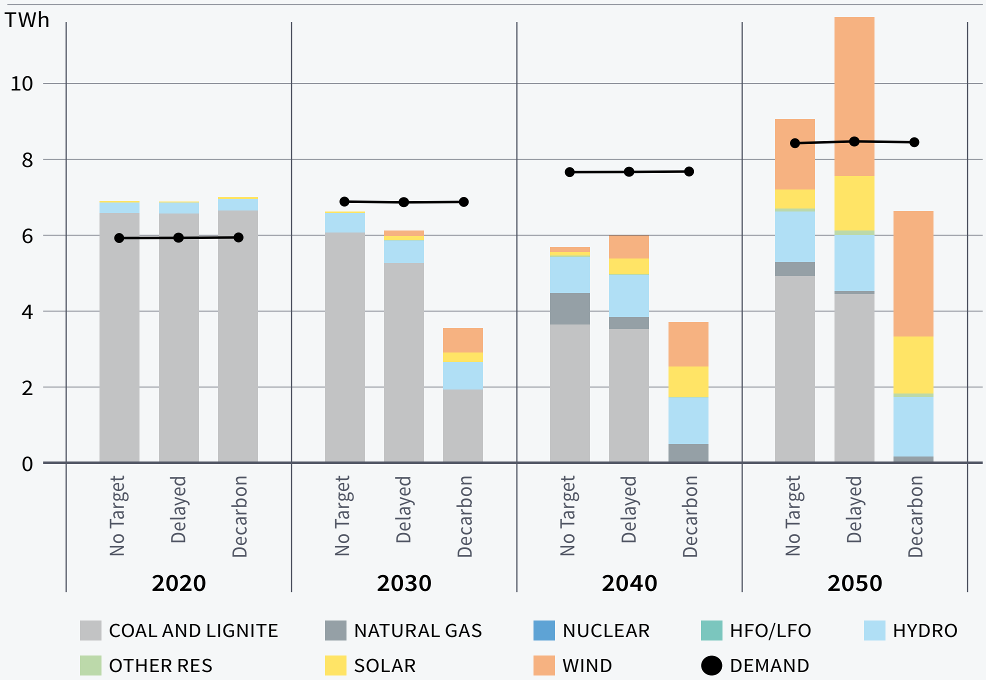
13 Kittner, N. et al. (2016) An analytic framework to assess future electricity options in Kosovo. Environmental Research Letters, 11(10).

14 NEK Umwelttechnik AG (2010) Kosovo Wind Resource Assessment Final Report. http://www.repic.ch/files/9413/7544/1755/SB_NEK_KosovoI_web.pdf [accessed 23.03.2018].

15 SEERMAP (2017) Regional Report. South East Europe. South East Europe Electrixity Roadmap. https://rekk.hu/downloads/projects/SEERMAP_RR_SEE_A4_ONLINE.pdf [accessed 23.03.2018].

Figure 2: Three scenarios that lead to a renewables-based electricity system in Kosovo

Electricity demand and generation by primary energy in 2020, 2030, 2040 and 2050



Note: In the delayed action scenario, coal and lignite plants operate with carbon capture and storage after 2035.

Source: Own illustration based on Figure 4 in SEERMAP[16]

A key result of the SEERMAP project is that renewables are a no-regret investment: even without decarbonisation targets, more than two-thirds of electricity generation in the region in 2050 will stem from the renewable energy sources hydro, wind and solar. Active decarbonisation policies could lift the share of renewable electricity generation to 83%. As Figure 1 shows, Albania, Bosnia and Herzegovina, Macedonia, Montenegro and Serbia will have electricity generation mixes dominated by hydro and complemented by some solar PV and wind. In Bulgaria and Romania, around half of generation will be nuclear, with the other half divided between biomass, solar PV, wind and hydro. Greece is the only country in which solar PV will dominate the mix, making up more than half of generation in 2050, followed by wind, biomass, hydro and some natural gas.

Kosovo is an outlier in two ways. It is the only country in which the decarbonisation scenario raises wind's share of generation to around 50%, with the other half split between solar PV and hydro. It is also the only country in which the delayed action scenario envisages a significant share of coal generation, operating with carbon capture and storage (CCS). In this scenario, Kosovo is a net exporter. In the decarbonisation scenario, electricity generation from renewables is similar in 2050, but Kosovo is a net importer of electricity from 2030 onwards. The share of renewables reaches around 25% by 2030, 45% by 2040 and 75% by 2050 (Figure 2).

The main policy conclusion of the SEERMAP study for Kosovo[16] is that to optimise the energy system, renewable generation capacities will expand significantly from current low levels. Planned long-

16 SEERMAP (2017) Country Report Kosovo. South East Europe Electricity Roadmap. https://rekk.hu/downloads/projects/SEERMAP_CR_KOSOVO_A4_ONLINE.pdf [accessed 23.03.2018].

term action to strive for a renewable generation mix is more advantageous than delaying action by investing in lignite generation first and then having to deal with stranded assets – in this case, power plants that are retired before the end of their economic life, incurring a loss that needs to be financed by Kosovar society. Natural gas does not play a role in any of the scenarios, implying that gas infrastructure investments are not needed. Overall, the study concludes that a focus on enabling the integration of renewables is a robust, no-regret option for energy policy in Kosovo. The centre of attention should be expanding the power grid by investing in transmission and distribution networks, enabling demand-side management – modifying consumer demand through methods such as financial incentives and behavioural change – and promoting investment in different types of storage. To keep costs to a minimum, de-risking policies to lower the costs of capital should also be prioritized.

Outline

This study focuses on the challenges that need to be faced in order to phase in renewables and phase out lignite in Kosovo. It provides evidence and inspiration from countries that have tackled such challenges already. Chapter 2 outlines the benefits of an energy transition. Chapter 3 examines the technological challenges to phasing in renewables and phasing out lignite, and suggests solutions. Chapter 4 explores the economic perspective and ways of keeping the costs of the transition as low as possible. Chapter 5 investigates the role of law and the challenge of providing legal certainty. Chapter 6 assesses the potential role of the diaspora and circular migration movements in realising an energy transition in Kosovo.

This study concentrates on phasing in renewables and phasing out lignite. A third strategy, improving energy efficiency, is also pivotal in achieving a prosperous and sustainable energy transition in Kosovo. Several easy wins in energy efficiency have considerable potential to reduce electricity demand and growth in electricity demand. The domestic heating sector is a particular target. About two-thirds of residential homes lack insulation and many of those are heated with electricity.[17] Tackling this issue would help to reduce energy poverty as well as the significant increase in electricity demand during the heating season.

This study was developed as part as of "A multi-stakeholder partnership for the energy transition in Kosovo", a joint project of Germanwatch and Balkan Green Foundation (BGF). The project started in late 2017 and will run until the end of 2020. It is financed by the German Federal Ministry for Economic Cooperation and Development. This study is intended to serve as an input for a constructive dialogue on how Kosovo can transform its energy system. The solutions suggested are offered not as prescriptions but as inspiration for facing the challenges, based on experience from other countries. Ultimately, the government of Kosovo has to decide on how to continue towards a low-carbon energy system, a journey it began by signing the Energy Community treaty.

17 Ahmetaj, G. et al., (2015) Funding Energy Efficiency in Kosovo: benefits and barriers. http://kosid.org/file/repository/1064_INDEP_Energy_Efficiency_Fund_Kosovo_Policy_Paper.pdf [accessed 23.03.2018].

2 Energy transition offers many benefits for Kosovo

The following sections examine prospective benefits of an energy transition in Kosovo, using examples from Germany or other countries where appropriate.

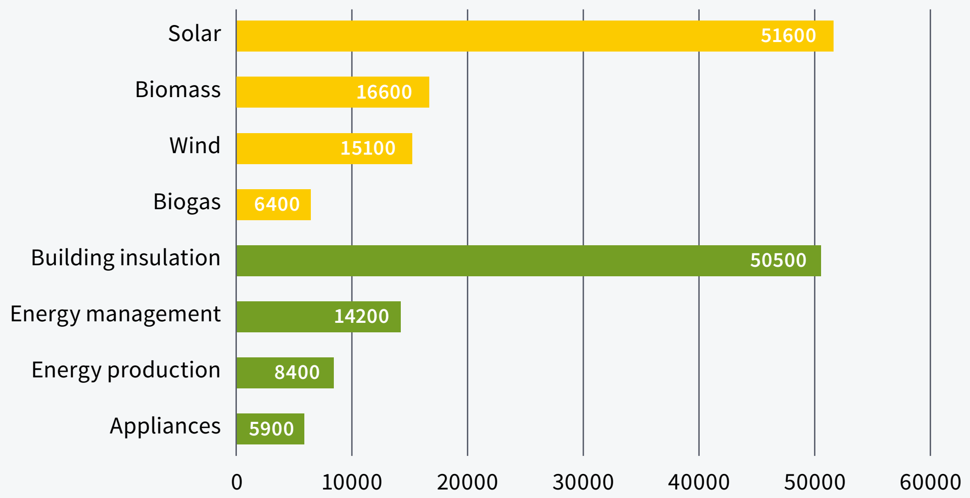
Business start-ups and technical innovation would increase

Financial encouragements for energy transitions – such as feed-in tariffs, tax incentives, energy efficiency grants, and funding for research and development (R&D) – have accelerated start-up activity in many countries. In Germany, 170,000 new businesses were founded in the renewable and energy efficiency sectors between 2006 and 2013 (Figure 3). Solar power and energy efficiency in buildings, in particular, promote development at an early stage of any energy transition.

Energy transitions have also resulted in numerous technical innovations. Solar and wind patents registered annually by German companies increased almost fourfold from 2004 to a peak of more than 600 in 2011.[18] Start-ups and innovations are both engines for job growth.

Figure 3. Energy transitions favour the creation of new companies

Renewable energy and energy efficiency start-ups in Germany, 2006-2013



Source: Own illustration based on data in Borderstep[19]

Many jobs would be created in Kosovo

The renewable energy sector, including hydropower, employs almost 10 million people worldwide[20], about twice the number who work in the coal industry. Many millions more are employed in energy efficiency activities, for example in the construction and electrical appliance sectors.

18 Schoenberg, A. v. (2016) The German 'Energiewende' and its Contribution to the Global Energy Transition, Lecture at the University of North Carolina at Chapel Hill, USA, Andreas von Schoenberg Consulting, Berlin.

19 Borderstep (2015) Green Economy Gründungsmonitor 2014. Grüne Wirtschaft als Gründungs- und Beschäftigungsmotor in Deutschland. https://start-green.net/static/files/green_economy_gruendungsmonitor_2014.pdf [accessed 23.03.2018].

20 IRENA (2017) Renewable Energy and Jobs. Annual Review 2017. https://www.irena.org/DocumentDownloads/Publications/IRENA_RE_Jobs_Annual_Review_2017.pdf [accessed 23.03.2018].

In the European Union, 1.2 million people already work in renewables, including 334,000 in Germany, 162,000 in France, 110,000 in the United Kingdom and 76,000 in Spain.[21] Most jobs in renewables have been created over the last 15 years as a result of supportive energy policies and falling costs for renewables, especially for solar photovoltaics and onshore wind. The cost reductions have been achieved by innovation and economies of scale, making renewables competitive with conventional power generation in many parts of the world.[22]

Jobs have been created along the entire renewable energy value chain, including R&D, manufacturing, engineering, installation, operations and service, as well as ancillary areas such as consulting and financial services. Not enough information is available to determine the number of jobs created in every section of the value chain, but research in Germany has shown that around 63,500 skilled people were employed in operating and maintaining 82 GW of renewable energy assets in 2013.[23] As renewable energy's share of power generation increases, additional products and services are being developed, such as energy storage, demand-side management, smart grids and electricity trading, that create jobs for skilled workers.

Overall policy consistency will be essential to ensure that job creation in renewable energy development is sustainable in the long term. To make sure that jobs are created in all of Kosovo's regions, it will also be important to encourage the right mix of project sizes, ranging from small-scale solar and wind for private households to medium-sized agricultural, community and municipal projects, to large and utility-scale projects for industrial and urban applications.

As energy transitions are implemented throughout the world, some sectoral employment reallocation from high- to low-emission power generation and manufacturing becomes inevitable. This will need to be managed carefully in Kosovo so that workers are provided with opportunities to obtain new skills and jobs in other sectors.

Technical training involving genuine knowledge transfer to Kosovo will be essential to create long-term jobs and value locally. As at the beginning of any period of renewable energy adoption, skills shortages will need to be overcome to avoid faulty installations, project delays and cost overruns. Once plants are operating, skilled workers need to be available for operate, maintain and repair them. The depth and breadth of existing technical skills and projected future requirements should be assessed so that the necessary courses can be designed at the University of Pristina and vocational schools. Training people for renewable energy jobs in Kosovo can also help avoid the brain drain of ambitious, educated individuals seeking employment abroad.[24]

Gross value added would increase

Analyses of the wind industry in 2012 in the German state of Brandenburg (2.46 million inhabitants) offer insights into the value that adopting renewables could add to the economy of Kosovo (1.8 million inhabitants). In Brandenburg, which had an installed capacity of 4,810 MW, gross value added (GVA) from renewables in 2012 amounted to €955 million. This includes the impact of investments in new turbines (€212 m) and of operating total existing assets (€743 m). The figures are based on direct, indirect and secondary effects to reflect the total impact of the wind industry on the state's economy. Direct effects include wages and salaries earned by employees in the wind industry as

21 Ibid.

22 Fraunhofer Institute for Solar Energy Systems (2017) Photovoltaics Report. https://www.ise.fraunhofer.de/content/dam/ise/de/documents/publications/studies/Photovoltaics-Report.pdf [accessed 23.03.2018].

23 Lehr, U. et al. (2015) Beschäftigung durch erneuerbare Energien in Deutschland: Ausbau und Betrieb, heute und morgen, http://www.bmwi.de/Redaktion/DE/Publikationen/Studien/beschaeftigung-durch-erneuerbare-energien-in-deutschland.pdf?__blob=publicationFile&v=6 [accessed 23.03.2018].

24 IRENA (2014) The Socio-economic Benefits of Solar and Wind Energy. http://www.irena.org/-/media/Files/IRENA/Agency/Publication/2016/Socioeconomic_benefits_solar_wind.pdf?la=en&hash=FCFA4C1C1CDA1E2E2B8BE7E71D8BDB55113DE81A [accessed 23.03.2018].

well as profits generated by the operation of wind turbines. Indirect effects reflect the value added by the purchase of goods and services from suppliers, for example in the steel industry. Secondary or multiplier effects are the impacts of the income generated on the local economy, for example, in the form of increased consumption.

For Kosovo, as for other states without domestic turbine manufacturers, the primary boost to GVA comes from operation of turbines, as well as from the non-manufacturing investments in foundations, installation, grid connection and project development, which typically are around 300,000-400,000 €/MW.[25]

On a more international scale, the OECD has found that adopting renewables – far from harming economies, as some have claimed – provides a long-term boost to economic growth.[26] If the G20 countries adopted high-investment, high-innovation and low-carbon policies designed to achieve a 50% probability of limiting global warming to 2°C, long-run GDP would increase by 2.8% relative to a continuation of current practices. If the benefits of avoiding climate change are also factored into this assessment, the net impact on GDP to 2050 increases to almost 5%.

Stabilisation of rural communities

Renewables enable a diversified ownership of energy assets that is in stark contrast to the oligopolistic control of large conventional power plants. Wind, solar and biomass plants are owned and operated by private households, farmers, factory and warehouse owners, cooperatives, municipalities, financial investors and utilities. In Germany, for example, 42% of all renewable energy assets are owned by private individuals and farmers.[27] In rural areas, the decentralised nature of renewables allows villagers to form energy cooperatives to produce clean power at prices that are stable for 20 years or more. In parallel, municipalities may invest in renewables to benefit from energy independence and stable long-term prices. Widespread asset ownership also increases acceptance of the development of new energy infrastructure.

Peace building dimension

The energy transition also provides opportunities for peace building. Section 3 shows that expanding the interconnection capacities to neighbouring countries is essential for an energy transition in Kosovo and Western Balkan. This increased connectedness can constitute a constructive basis for mutual peace building.

25 DIW (2014) Die ökonomische Bedeutung der Windenergiebranche, Windenergie an Land in Brandenburg, https://diw-econ.de/wp-content/uploads/2014/09/DIW-Econ_%C3%96konomische-Bedeutung-Windenergie_BB_v2.0_Homepage.pdf [accessed 23.03.2018].

26 OECD (2017) Investing in Climate, Investing in Growth. P. 127 ff, http://www.oecd.org/env/investing-in-climate-investing-in-growth-9789264273528-en.htm [accessed 23.03.2018].

27 trend:research (2017) Eigentümerstruktur: Erneuerbare Energien, http://www.trendresearch.de/studien/20-01174.pdf?53aa70023041eed705bd1235a41fbaa4 [accessed 23.03.2018].

3 Solving the technology challenges

To understand the main challenges in Kosovo's energy transition, as with any such transition, it is essential to understand the underlying principles of electricity systems.

Energy systems are made up of "all components related to the production, conversion, delivery, and use of energy".[28] The components that produce and consume energy are connected by the electricity grid, a network of wires that carry the electric current. Each wire has a certain capacity for electricity transmission, also called power transmission.

For the electricity system to function, the flow of electric current needs to remain stable within the grid. This means that the amount of power consumed, measured in Watts (W), needs to be met by an equal amount of power generated, every millisecond. Too much power is just as problematic as too little. Failure to equalise generation and consumption changes frequency and voltage, the two most important factors for grid stability. The frequency of the European electricity grid is 50 Hertz. The voltage varies from the household to the transmission-line level. If grid frequency is impaired or voltage unstable, electricity system failures and black-outs can result.

3.1 Electricity generation in coal-fired power plants

Coal-fired electricity generation is the dominant energy generation method used in Kosovo. Its effects on the electricity system are similar to those of the other fossil or "conventional" energy sources.

How conventional power generation works

In coal-fired power plants, the thermal energy that results from burning coal is used to convert water to steam. The steam drives a turbine connected to a generator, which in turn transforms the energy into electricity. Burning coal emits several by-products: not only CO_2 but also pollutants such as particulate matter, sulphur, mercury, nitrogen oxides and soot. The air pollution from old power plants in Southeast Europe is particularly strong.[29]

The most important components of a coal-fired power plant are the burning chamber, heat exchanger, water, steam, turbine and generator. The steam produced can power the generator at a stable speed, resulting in alternating current (AC) with a stable electric frequency. The overall energy conversion efficiency of a coal-fired power plant is typically in the range of 30% to 40%, which means that at least 60% of the energy in one unit of coal is lost during the process.

Before the actual electricity generating process, many supporting mechanisms are necessary, such as conveyor belts, crushers, pulverizers and burners to process the fuel. These processes are referred to as internal loads because they consume a small amount of the generated electricity.

28 Allwood, J. M. et al. (2014) Annex I: Glossary, acronyms and chemical symbols. In: IPCC. Climate change 2014: mitigation of climate change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. (2014) Cambridge/United Kingdom/New York, Cambridge University Press. p. 1261.

29 HEAL (2017) Boosting health by improving air quality in the balkans. http://env-health.org/IMG/pdf/13.12.2017_-boosting_health_by_improving_air_quality_in_the_balkans_ied_briefing.pdf [accessed 23.03.2018].

Coal-fired power plants are typically located near sources of coal, whether mines or coal transport hubs, and near running water: they require a lot of water, for cooling and for steam production. They are usually connected to the highest grid level, the transmission level, through a local substation, where the produced power is fed into the grid.

A coal-fired power plant may take several hours to vary its output to a significant degree, and turning coal-fired power plants off and on comes with significant loss of efficiency. They are therefore ideally kept at a stable operating point. This makes them suitable for providing a base-load within an energy system – that is, meeting minimum demand – at a steady generation capacity.

Coal-fired power plants typically have a power generation capacity between 100 megawatts (MW) and one gigawatt (GW), making them large players among the many generation units within an energy system.[30] To power a city of 50,000 households, capacity of 20-30 MW is enough.

Ancillary services – a key function of coal-fired power plants

As well as generating the bulk of power for an energy system, coal-fired power plants fulfil other electricity and network functions that are important to keep an energy system running, referred to as ancillary services. Their large size and complete controllability enables them to set the pace within an energy system and thus foster stability and security of supply.

- **Guaranteeing a stable frequency within the energy system:** The large synchronous generators found in coal-fired power plants have high rotational inertia and are thus very resistant to changes in frequency and voltage. Such power plants can therefore form a stable electricity grid. This is sometimes referred to as "rotating mass".

- **Compensating reactive power transfer within the grid:** Reactive power, which is produced as a by-product of impedances in the energy system, can be increased or decreased and has an influence on the voltage. The large synchronous generator used in coal-fired power plants helps to stabilise the grid by controlling voltage, which may be disturbed by other components such as loads, motors and other generators within the grid.

- **"Black start" ability:** Because they do not need to reply on an external network, coal-fired power plants can restore parts of an electric grid to operation after a blackout. Large coal-fired power plants usually keep stand-by diesel generators on the premises that can provide power to the auxiliary mechanisms needed to start the power plant.

- **Operating reserve:** Coal-fired power plants can provide operating reserve – power that is used to equalize fluctuations within the grid – although their ability to do so is limited due to thermal inertia and their low flexibility.

3.2 Electricity generation from renewable energy sources

Several renewable energy generation methods exist, with very different technical properties. They generally fall into two categories: dispatchable and intermittent. Dispatchable renewables, which can be controlled to a certain degree, include hydropower, biomass, biogas and geothermal energy.

30 Umweltbundesamt (2018) Database "Kraftwerke in Deutschland (ab 100 Megawatt elektrischer Leistung)". https://www.umweltbundesamt.de/dokument/datenbank-kraftwerke-in-deutschland [accessed 23.03.2018].

Hydropower generates electricity by transforming the kinetic energy of running or falling water via a turbine and generator. This generation method is stable, and the output of electricity can be controlled by regulating the amount of water conveyed through the turbine. Hydropower produces alternating current, which is the kind needed in an energy system designed for coal-fired power plants. Hydropower also offers mid- and long-term electricity storage, as electricity can be used to pump water into a reservoir and which can then be released to produce more electricity.

Biomass and biogas can be burned instead of fossil fuels to generate electricity, using the same technical principle as thermal power plants. Although biomass and biogas are renewable resources, their use can run counter to sustainability aims if their production harms biodiversity and their combustion releases non-CO_2 greenhouse gases.

Geothermal energy is used to generate electricity by conveying liquids through a natural underground heat reservoir and using the resulting steam to power a turbine connected to a generator. This generation method is very stable and is also based on the technical principle of a thermal power plant.

"Intermittent" renewable energy sources fluctuate and cannot be fully controlled. This group includes solar photovoltaic (PV) and wind power.

Solar photovoltaics generate power by transforming sunlight (radiation) into electricity via the photovoltaic effect in silicon solar cells. In contrast to thermal power generation, electricity from PV is produced directly, without any further conversion steps. However, the resulting power is direct current (DC), which needs to be converted to be suitable for AC energy systems. Also, PV does not deliver electricity steadily, because sunlight levels vary. However, it is fairly predictable on a day-to-day basis.

Wind power harvests the kinetic energy of wind via spinning rotor blades in a turbine that powers a generator. The resulting power has a different frequency from that used in energy systems designed for fossil fuel power plants, so it needs to be transformed to 50 Hertz. Like solar power, wind power fluctuates, making it an unstable power generation method, but it is also fairly predictable.

Apart from hydropower, renewable energy sources are much smaller and have less nominal output than coal-fired power plants. This means that they are typically connected to the grid on a low voltage level. It also means that energy systems in which renewables are the main source of power will be characterized by distributed generation, with a large number of generation units installed.

Renewables-based generation methods generally do not emit greenhouse gases while operating and rely on free and unlimited resources. Generation from biomass and biogas does emit greenhouse gases, but biomass and biogas come with a "negative carbon footprint" due to their growth process, so their net carbon footprint is close to zero.

Renewable energy can provide some ancillary services

Renewables can provide to some extent the ancillary services that coal-fired plants supply to electricity grids, especially when supported by specially designed battery storage systems (see section 3.6). Wind turbines can provide frequency control by a process called simulating inertia. This technique is being researched but its capacity is probably limited.[31] Inverter-based renewable sources such as PV and wind can also help regulate reactive power in the power system, but again only to a limited extent. It depends on their active power, which in turn depends on the variability of the

31 Lidström, E; Wall, D. (2016) Frequency Support by Synthetic Inertia from Variable Speed Wind Turbines. In: CIRED Workshop Helsinki (2016).

sun or the wind. To provide reactive power control, PV and wind can be equipped with an inverter. Renewables can provide some operating reserve, especially if combined with storage technologies.

Black start ability can be achieved by a power generation unit if it can generate electricity independently and pick up its internal load without support from any external electricity source. Black start units are normally small and their power is used to pick up the starting and auxiliary loads of larger power plants to restart the grid. These requirements can be met by any dispatchable renewable energy source, such as hydropower or biogas, or by large battery systems equipped with specialized inverters.

3.3 Replacing coal with renewables: the effects on energy systems

Coal-fired power plants need to be phased out gradually because of their size and limited flexibility, and because they become less efficient as their output is reduced. Phasing out coal-fired plants requires not only replacing their generating capacity, but also compensating for the loss of their ancillary functions they provide. The extent of compensation required depends on the design of each energy system.

Several problems may arise when coal-fired electricity production is phased out. For each there exists a technical solution (see section 3.4).

A general lack of generation capacity on the supply side may mean that not all electrical loads can be powered and may limit electricity consumption. Reduced electrical generation capacity at the transmission grid voltage level may disturb grid voltage and frequency. Existing grids in Europe are designed to accommodate large-scale thermal (or controllable) power plants at the highest voltage level – that of the transmission grid – and electrical loads (consumption) at lower voltage levels. Taking coal-fired power plants off the transmission grid level disturbs this grid scheme. Large amounts of energy no longer have to be transported over long distances, causing weak frequency coupling between grid areas and raising the risk that even small disturbances could cause nationwide black-outs. An energy system can become more prone to frequency instabilities when large synchronous rotating masses that set the system's pace – such as those in coal-fired power plants – are reduced. In addition, the black start ability of the system decreases.

Introducing higher shares of renewables has two main effects on an energy system. Overvoltages and overloading can occur when decentralised, lower-voltage power plants are connected, as existing electricity grids are designed for large-scale power plants operating at high voltage. The predictability of the energy system can decrease when fluctuating sources of energy are connected. This can lead to systemic instabilities, such as frequency stability problems.

From a system point of view, the main difference between coal-fired and renewable energy generation is their flexibility. Coal-fired power plants are controllable, while most renewable energy sources fluctuate and therefore require the energy system to be very flexible to meet electricity demand.[32]

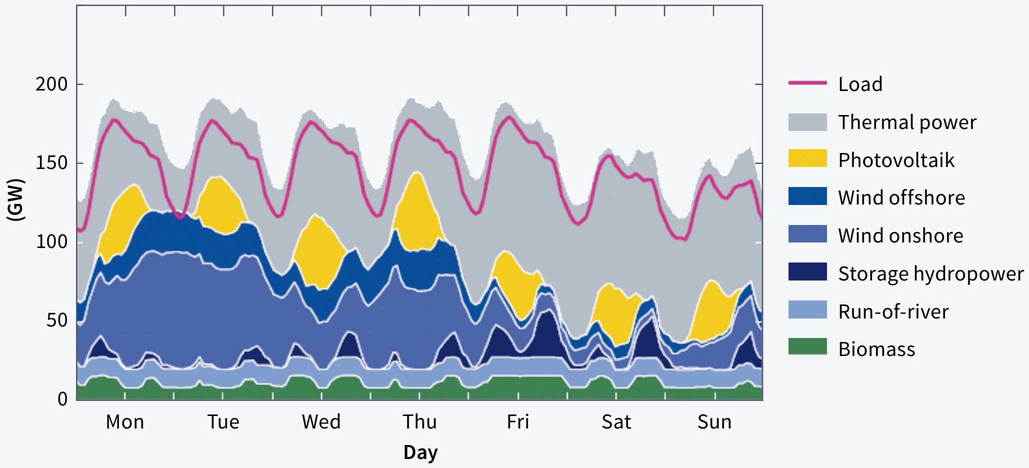
This need for flexibility, also known as the "flexibility challenge", can be illustrated by a hypothetical case in which the wind dies down in tandem with a drop in the generation of solar power (Figure 4). As a result, controllable power plants have to cover a major portion of the demand within a few hours. In a worst-case scenario, demand might increase at the same time – for example, if a

32 Henning, H. M. et. al. (2014) A comprehensive model for the German electricity and heat sector in a future energy system with a dominant contribution from renewable energy technologies —Part I: Methodology. https://www.sciencedirect.com/science/article/pii/S1364032113006710?via%3Dihub [accessed 23.03.2018].

large part of the population comes home at sunset and turns on electrical appliances, televisions and lights. In such a case, conventional power plants and imported energy would have to cover almost the entire load, irrespective of the amount of installed wind and PV capacities – and even though wind and PV might have been covering almost all of power demand in the preceding hours.

Figure 4. Meeting the flexibility challenge

Electricity generation and consumption in the Central Western European region in a week in late summer 2030 (calendar week 32)



Note: The modelling is based on 2011 weather and load data.

Source: Figure 22 in Fraunhofer IWES[33]

3.4 Solutions: next generation energy systems

Coal-based energy systems can add only a limited share of energy from renewable sources because they are not designed to meet the requirements that renewables impose. In general, however, there are technical solutions to all the problems that arise when phasing out coal and phasing in renewables, even if more research and testing is needed to upgrade these solutions.

Generation capacity can be replaced by all other types of generation units, including not only renewable energy sources but also conventional power plants such as gas turbines.

The grid forming function of large power plants can be replaced by several smaller synchronous generators. These generators can either form part of smaller thermal power plants or use grid-forming inverters, a new technology that converts DC to AC in renewable energy units, in combination with battery storage.

To protect against overvoltage and overloads, the grid can be redesigned, reinforced or expanded. For example, smart meter networks, in which smart meters are attached to all important grid nodes, can support wide-area monitoring and control for immediate regulation. Several products are already available for this purpose.

33 Fraunhofer IWES (2015): The European Power System in 2030: Flexibility Challenges and Integration Benefits. Study on behalf of Agora Energiewende. https://www.agora-energiewende.de/index.php?id=157&tx_agorathemen_themenliste%5Bprodukt%5D=969&L=1 [accessed 23.03.2018].

Coal-fired power plants generate power at different voltages flexibly, whereas renewable, inverter-based energy cannot. To compensate for this, on-load tap-changing transformers are used to control voltage.

Special inverters designed for fluctuating renewable sources can help to control reactive power, though only to a limited extent. However, a lot of technology development in this direction is expected.

The flexibility that is required for rising shares of intermittent renewables can be provided by several so-called integration options. These include flexible power plants, improving network infrastructure, implementing demand-side measures, increasing energy storage and improving operational and planning methods.[34]

Best practice examples

No country has yet completely replaced coal-based power generation with renewable energy. However, more than 20 countries are in the process of phasing out coal phase-out. In 2017 they formed the Powering Past Coal Alliance, led by Canada and the United Kingdom, at the COP23 global climate talks. In addition, there are numerous examples worldwide of using next-generation energy system components to meet the challenges of introducing fluctuating energy sources and replacing ancillary services.

- **Reactive power control:** In Frankendorf, Switzerland, a housing estate was equipped with PV panels and modern inverters. Grid extension and large-scale storage, which would normally be required in such as case, was avoided by using the reactive power control of the PV inverters.[35]
- **Grid frequency stabilisation:** The Smart Power Flow research project installed a prototype redox-flow stationary battery equipped with a smart frequency control unit in the distribution grid of LEW Verteilnetz GmbH in Bavaria, Germany. The goal was to stabilise grid frequency and prevent overloads if the share of PV increased.[36] A second approach, "synthetic inertia", emulates the behaviour of synchronous generators with software running on wind power inverters. This technology is subject to intensive research by Vattenfall and other.[37]
- **Operating reserve:** The German energy provider STEAG has installed six battery systems with an output of 15 MW each in North Rhine-Westphalia. These can provide primary operating reserve within seconds and form one of the largest battery storage projects worldwide.[38]
- **Black start ability:** Black starts are technically feasible from a battery system equipped with an appropriate inverter. Lafferte et. al have simulated and analysed such a system with real-life data from a German distribution grid operator.[39]
- **Off-grid-solution**: The German company Younicos has installed the world's first megawatt-scale grid-forming renewable energy system on the Portuguese island of Graciosa. It relies completely on fluctuating renewables, with no rotating mass components. This has been achieved by using intelligent power controls in combination with a large battery storage system, a wind park and a PV power plant.[40]

34 Sims, R. et al. (2011) Integration of Renewable Energy into Present and Future Energy Systems. In: IPCC Special Report on Renewable Energy Sources and Climate Change Mitigation. Cambridge University Press, Cambridge/United Kingdom/ New York, NY, USA.

35 HK-Gebäudetechnik (2013) PV-Anlagen: Kabeltausch vermeiden mit dynamischer Blindleistungs-Regelung. pp. 46-48. https://www.solvatec.ch/assets/uploads/Medienspiegel_Dynamische%20Blindleistungs-Regelung.pdf [accessed 23.03.2018].

36 Schachler et. al. (2017) Technisch-wirtschaftliche Optimierung der Teilnahme einer netzdienlichen Großbatterie am Primärregelleistungsmarkt. Conference Paper "Zukünftige Stromnetze für Erneuerbare Energien". https://reiner-lemoine-institut.de/technisch-wirtschaftliche-optimierung-der-teilnahme-einer-netzdienlichen-grossbatterie-am-primaerregelleistungsmarkt-schachler-et-al-2017/ [accessed 23.03.2018].

37 Lidström, E. (2016). Frequency Support by Synthetic Inertia from Variable Speed Wind Turbines. In: CIRED Workshop Helsinki (2016).

38 pv magazine group GmbH & Co. KG (2016) Steag nimmt ersten 15-Megawatt-Großspeicher in Lünen in Betrieb, https://www.pv-magazine.de/2016/07/07/steag-nimmt-ersten-15-megawatt-grospeicher-in-lnen-in-betrieb/[accessed 23.03.2018].

39 Lafferte et al. (2017)Black start and island operation of distribution grids with significant penetration of renewable resources.

40 Younicos Inc. (2018) Graciosa. Adios Diesel. Ahoy storage. https://www.younicos.com/case-studies/graciosa/ [accessed 23.03.2018].

- **System integration:** The development of the Danish energy system is also worth noting: Denmark's energy mix includes about 40 percent wind power, one of the highest proportions in the world[41] The country aims to power all of its transportation, heating and electricity with renewables by 2050. Part of the flexibility that is needed for such a high share of renewables is provided by Denmark's high-capacity electrical connections to neighbouring countries. Another factor is the strong interconnection of different energy sectors within the county, such as electricity, heating, and transport.[42] This is referred to as sector coupling.

Using existing technology to expand renewables

The Institute for Energy Economics and Financial Analysis (IEEFA), recently showed how nine countries and regions used existing, proven integration technologies and policy measures to adapt to high shares of wind and solar power and hence improve the diversity of their domestic generation, without compromising reliability or supply.[43] The nine case studies were among the top 15 countries or markets worldwide by wind and solar market share, which ranged from 14% to 53% of total net electricity generation in 2017, compared with a global average of 5%: Denmark (53%); South Australia (48%); Uruguay (32%); Germany (26%); Ireland (25%); Spain (23%); Texas (18%); California (15%); and the state of Tamil Nadu, India (14%).

World Bank data for blackouts in major cities indicated that these are among the world's most robust electric grids, performing better than peers by national income. The IEEFA report found that operators could assure security of supply at levels of wind and solar power of 50% or more of total generation. Grid operators and energy regulators have used practical changes to market rules and resources to boost system flexibility, invest in transmission grids and cross-border interconnection, and ensure strong price signals.

Few of the top markets used capacity markets, which attempt to assure security of supply through "availability payments" paid to conventional generation such as coal, gas and nuclear power, to make sure they could step in when wind and solar generation were unavailable. Kosovo recently included availability payments in its power purchase agreement for a new lignite power plant. Given that the country has very little wind and solar power, it is difficult to see a rationale for these payments, except to boost the economics of the lignite project, and perhaps to reduce the rate of return on equity.

The IEEFA report found nine actions that system operators used to ease the integration process and assure supply security and grid reliability. Of these nine measures, three are especially applicable to Kosovo.

- **Timely investment in the transmission grid:** Without transmission network investment to connect wind farms with cities, wind farms can generate too much power for the grid to assimilate, leading to forced reduction of output, called curtailment. In 2005, the Texas legislature directed the utilities commission to develop renewable energy zones. Transmission projects were then selected to transmit 18,500 MW of wind power from these zones to the eastern, more populated area of the state. As a result, curtailment of wind power fell from 17% in 2009 to just 0.5% in 2014.
- **Boosting interconnections with neighbouring countries and power markets:** Denmark has the lowest wind power curtailment among IEEFA's case studies, at near-zero, partly because of exceptional interconnection to its neighbours. The country's interconnection

41 Danish Energy Agency (2017) Danes used more energy and renewables in 2016. http://en-press.ens.dk/pressreleases/danes-used-more-energy-and-renewables-in-2016-2314839 [accessed 23.03.2018].

42 Pinson P. (2017) Towards Fully Renewable Energy Systems: Experience and Trends in Denmark. In: CSEE Journal of Power and Energy Systems. Volume 3. (2017).

43 Institute for Energy Economics and Financial Analysis - IEEFA (2018) Power-Industry. Transition, Here and Now. Wind and Solar Won't Break the Grid: Nine Case Studies. http://ieefa.org/wp-content/uploads/2018/02/Power-Industry-Transition-Here-and-Now_February-2018.pdf [accessed 23.03.2018].

capacity accounts for 51% of installed generating capacity, and is expected to rise to 59% by 2020. This enables Denmark to exploit the diversity of generation of its bigger neighbours, especially hydropower in Scandinavia and thermal and renewable generation in Germany. In the same spirit, Denmark's transmission system operator, Energinet.dk, is expanding its export capacity in response to anticipated growth in renewable generation. Like the rest of the Western Balkans, Kosovo already has a basis for widespread interconnection. Kosovo recently completed additional interconnection to Albania, a country almost 100% dependent on hydropower, an ideal complement to variable renewables. To allow full commissioning of this interconnection capacity, it is urgent to resolve existing political difficulties.

- **Exploiting existing domestic flexible generation:** In Uruguay, wind power is balanced by hydropower when wind is short, and by exports to Brazil and Argentina when wind power is in surplus. The combination of hydropower and interconnection and has allowed wind generation to grow to 32% of generation in 2017, from 1% in 2013. This growth has allowed Uruguay to achieve energy independence and become a net electricity exporter. Kosovo has access to flexible resources, including unexploited domestic resources. Kosovo has licensed, but still not developed, 250 MW of proposed hydropower and 10 MW of biomass power for feed-in tariffs.

- **Market reform to boost flexible back-up**: Ireland is introducing real-time balancing and intraday markets to provide price signals to investors in flexible generation, demand-side response and storage, aiding the development of a more flexible grid to respond better to increased wind power market share. Other markets in Europe have introduced negative pricing, allowing prices to turn negative when there is surplus generation, for example on very windy days, to provide further incentives for fast-response demand and supply. Kosovo is in the process of liberalising power markets. It could benefit from the experience of Ireland in developing electricity markets (day-ahead and intraday markets) to provide incentives for flexible generation.

- **Supporting demand-side flexibility**: Several European countries have reformed markets to allow demand-side response (DSR), in which consumers are paid to reduce demand at times of peak prices or system stress. DSR can shift demand to periods when variable renewables are available.

- **Better wind and solar forecasting:** Another way to reduce the need for back-up of variable wind and solar, and so cut curtailment and other balancing costs, is to reduce forecast errors. Spain's wind power forecasting system, Sipreolico, provides hourly wind forecasts for up to 10 days ahead. According to the system operator, REE, wind power forecast error 24 hours ahead halved from 18% in 2008 to 9% in 2015.

- **Enhancing the responsiveness of the distribution grid:** Denmark, Germany and South Australia are all examples of power markets with high levels of distributed renewables generation, with prosumers who both produce their own electricity and consume power from the grid. With high solar radiation and very high residential electricity tariffs, South Australia is a world leader in distributed residential rooftop solar with storage system installations. The state uses time-of-use pricing structures to encourage solar users to shift time of production.

- **Making renewables more responsible for grid balancing:** Countries are now requiring variable renewables to provide reliability services as a condition of grid connection, and to participate in regular balancing markets. For example, after blackouts caused by severe storms in South Australia, the regulator stated that renewables would have to contribute more to frequency control. This boosted interest in adding battery storage to wind and solar farms. South Australia has five completed or announced battery storage plans, including Tesla's 100 MW lithium-ion battery – the world's biggest – completed in 2017 alongside a 315 MW wind farm.

- **National leadership:** India's ambition to increase its variable renewables five-fold over the next decade has spurred projects such as the Interstate Green Power Corridor, an initiative to transport power from zones rich in renewables to demand centres and areas with less renewable potential. The development will favour states such as Tamil Nadu, which leads India in variable renewables' market share, at 14%. Work on a 1.7 billion € upgrade of this Green Power corridor should be operational by May 2019, prompting additional investment in renewables in Tamil Nadu.

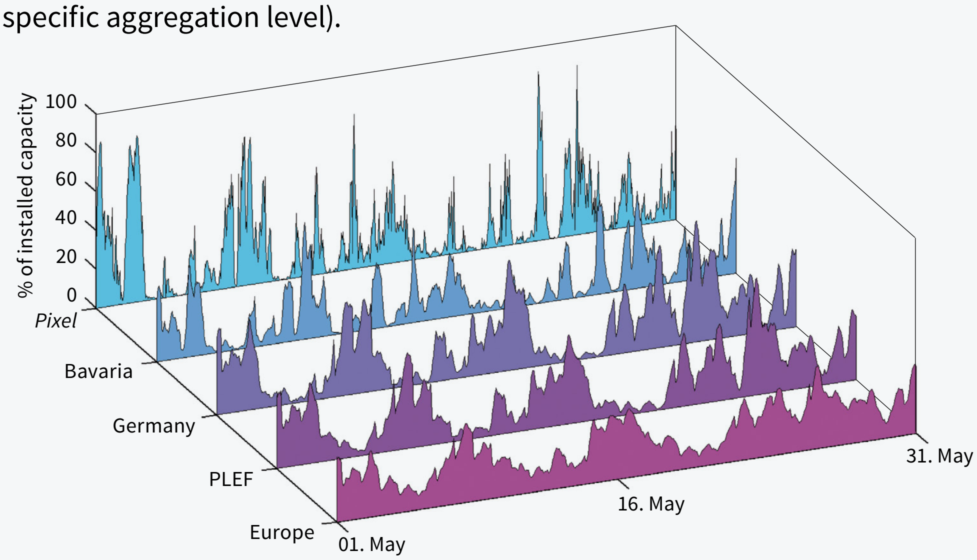
3.5 Cross-border integration boosts renewables by providing geographical flexibility

Transmission interconnection is a key way of providing flexibility in an energy system with high shares of intermittent solar and wind power, given that sunlight and wind vary from place to place and from country to country. When working in combination, the sum of individual generation profiles provides more stable generation, easing the incorporation of solar and wind power. To benefit from this "smoothing" effect, however, strong national power grids and integration of national power markets and interconnection capacities are crucial.

At the European level, instantaneous total wind power output is generally much less volatile than in any one place or country, and lacks extremely high and low values (Figure 5). For onshore wind, Europe-wide aggregation yields hourly output changes exceeding 5% of installed capacity for only 23 hours of the year. The single largest hourly change is minus 10% of installed capacity.

Figure 5. Wind power changes even out over a wide area, enabling stable generation

Time series of onshore wind power generation in a simulation for May 2030 at different levels of aggregation (as a percentage of the installed capacity at the specific aggregation level).



Note: One pixel is equivalent to an area of 2.8 x 2.8 km

Source: Figure 7 in Fraunhofer IWES[44]

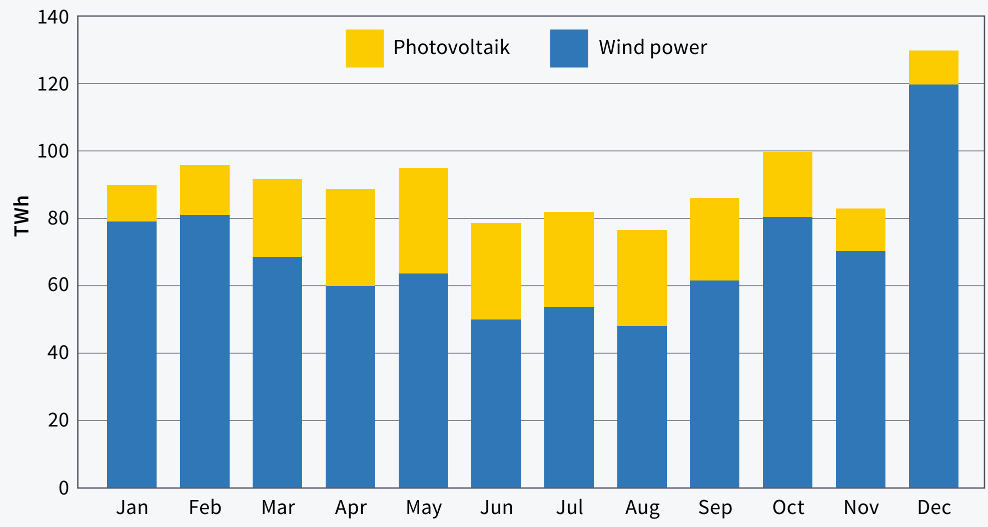
44 Fraunhofer IWES (2015): The European Power System in 2030: Flexibility Challenges and Integration Benefits. Study on behalf of Agora Energiewende. https://www.agora-energiewende.de/index.php?id=157&tx_agorathemen_themenliste%5Bprodukt%5D=969&L=1 [accessed 23.03.2018].

Seasonal weather variation produces a similar pattern of monthly wind power and PV generation, which also yields a more stable total output of variable renewables. While solar radiation is strongest in summer and most sunshine occurs in the middle of the day, the wind can blow at any time and usually blows more strongly in the winter in Europe (Figure 6).

Geographical smoothing also applies to load. Electricity demand varies from place to place and country to country, due to cultural differences and slight shifts in daylight hours. Each region has its annual peak load at different times of the day and year, but the peak load of the entire Central Western European region in 2011 was 2% to 3% smaller than the sum of individual country peak loads.

Figure 6. Seasonal weather variance gives a stable pattern over a wide area

Monthly wind power and PV generation in Europe in 2030



Source: Figure 5 in Fraunhofer IWES[45]

Flexibility lowers total system costs for the conventional power plant park

Deployment of variable renewables means that the remainder of the overall power generation portfolio (the "residual power plant park") has to be more flexible to respond quickly to changes in variable generation and in load. Reducing the generation of conventional power plants changes the structure and composition of the power plant park. Base load capacities will decrease, while peak load and mid-merit capacities will increase.[46]

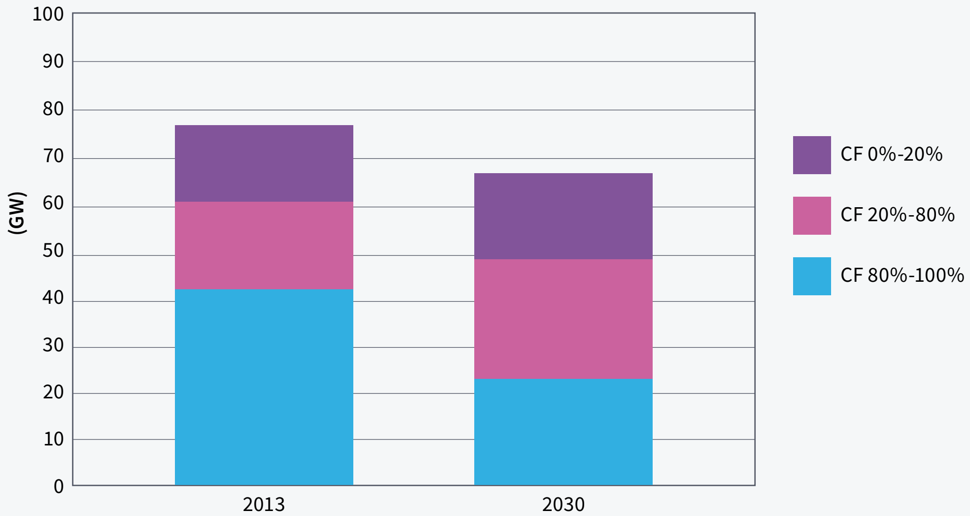
In Germany, for example, while 43 GW of capacity ran for more than 80% of the time in 2013, in 2030 only 23 GW of capacity is expected to operate more than 80% of the time. Fossil power plants will need to become very responsive: they will have to ramp up and down more frequently, operate often at partial loads, and be turned on and off with greater regularity. Unless policy-makers ensure that an increase in the share of variable renewable power is accompanied by a system shift to a qualitatively different, more flexible capacity mix, society will be economically worse off.

45 Ibid.

46 Baseload plants are defined here with more than 7,000 hours of operation per year (and a capacity factor of 80%); mid-merit, with 1,750 to 7,000 hours of operation per year (and a capacity factor between 20 and 70% and peak load, with less than 1,750 hours of operation a year (and a capacity factor smaller than 20%).

Figure 7. Deploying variable renewables will reduce base-load capacities

Structure of the residual power plant park in Germany in 2013 and 2030



Note: The structure is derived from assumed capacity factor (CF) values: Plants with a capacity factor of 80% or larger (>7000 full load hours), a capacity factor between 20% and 80% (1750-7000 full load hours) and a capacity factor smaller than 20% (<1750 full load hours) are shown.

Source: Figure 32 in Fraunhofer IWES[47]

As mentioned in section 3.4, in addition to flexible fossil power plants, several other flexibility options exist to incorporate variable energy sources in the power system. These include demand-side management, the expansion of smart grid infrastructure, bioenergy power plants, temporary curtailment of wind and solar PV energy, new storage technologies and new electricity demands from other sectors such as power-to-heat and electric cars.

3.6 Storage boosts renewables by enabling flexibility over time

Kosovo is for both physical and political reasons a partial "electric island", because of its limited interconnection with Europe's power grid. For such de facto or real electric islands, even limited amounts of short-term storage (ranging from a few minutes to a few hours) can boost the shares of renewable energy that can be integrated significantly. Most early adopters of renewables in Western Europe, especially Germany and Denmark, are physically part of a much larger grid that was able to absorb their temporally high shares of intermittent wind and solar power. By contrast, the Ireland and the United Kingdom have been exemplary in transforming their system by adding comparatively more storage and flexibility, precisely because of their physical interconnection constraints. As a result, Britain is now able to use its own intermittent renewable resources cost-effectively.

However, it is important to keep in mind that increasing interconnection and adding more domestic flexibility and storage capacities are complementary strategies for phasing in renewables. Intelligent, grid-forming batteries can balance the system more quickly, more precisely and often also more cheaply than thermal generators. If such batteries are employed in parallel with a build-up of wind

47 Ibid.

and solar generation capacity, the resulting share of renewable penetration is still dependent on several factors. The average daily load pattern and how well it matches renewable generation, the impact of seasonal patterns (on Greek islands, for example, both wind and solar production is highest in the summer months when there is also peak load), and how well wind and solar balance each other out (winds tend to be strong when solar generation is low, and vice-versa). The latter factor is dependent on the size of the interconnected region: the larger the region, the more geographical smoothing effects occur.

Storage technologies are usually categorized in three different kinds, depending on the time they are able store energy economically. Generally speaking, as shares of renewables rise in an energy system, it requires more and different kinds of storages.

- **Short-term storage:** Storage ranging from milliseconds to minutes or hours can keep the grid stable by automatically balancing any discrepancies between power supply and demand. By providing so-called "virtual inertia", such systems enable all "must-run" thermal capacity to be switched off when intermittent renewable energy is available, thus allowing the share of renewables to rise. "Virtual" or "digital" inertia can even be superior to rotating mass.[48,49]
- **Medium-term storage:** Storage ranging from hours to days, or sector-coupling, can move energy from the peaks of renewable energy "waves" to periods of cloudy and low-wind weather and can decarbonise other energy sectors, e.g. heat, transport or industrial processes.
- **Long-term storage:** Storage ranging from days to weeks, can bridge "dark doldrums" – periods of little solar or wind power – and allow the share of renewables to increase up to 100%. Not all of this this storage may be needed, however, especially if the heating and transport sectors are integrated/coupled with the electricity sector. Energy can also be stored as heat and in the batteries of electric cars if they are connected to the grid.

Technologies prices, trends, drivers

The global energy storage market is growing exponentially as new technologies enter the market and costs continue to decline spectacularly. From 0.34 GW installed in 2012 and 2013, it has grown to 6 GW in 2017 and is expected to reach more than 40 GW by 2022.[50]

Lithium-ion batteries dominate the energy storage industry and have all but replaced the previously dominant technology, lead-acid, which was and is typically used as a "starter battery" in internal combustion cars. Lithium-ion batteries are technically superior and are declining drastically in cost thanks to the massive build-up of production capacity for electric vehicles. The most viable alternatives to lithium-ion, sodium-sulphur (NaS) and redox-flow (RF), are being driven out of the (mass) market by lithium, which is now often already cheaper on a kilowatthour (kWh) basis.

Independent of price, all batteries are ideally suited for providing critical system stability and thus replacing rotating mass, with response times in the millisecond range. Such systems also enable thermal units to run more smoothly and cost-efficiently, as back-up or even as base-load. That is because such systems smooth out short-term fluctuations and thus allow thermal units to run at their most fuel-efficient point.

48 Kubik, M. (2017) 'Digital inertia": Energy storage can stabilise grid with 1/10 the capacity of thermal gerneration, https://www.energy-storage.news/blogs/digital-inertia-energy-storage-can-stabilise-grid-with-1-10-the-capacity-of [ac-cessed 23.03.2018].

49 Everoze (2017) Batteries beyond the spin. The dawning era of digital inertia on the Island of Ireland. http://s2.q4cdn.com/601666628/files/doc_presentations/2017/Everoze-Batteries-Beyond-the-Spin.pdf [accessed 23.03.2018]

50 Energy Storage Association (2018) Facts & Figures. http://energystorage.org/energy-storage/facts-figures (14.05.18); original information in IHS (2018) Grid-Connected Energy Storage Market Tracker - H2 2017 https://technology.ihs.com/589829/grid-connected-energy-storage-market-tracker-h2-2017 [accessed 23.03.2018].

Thermal storage technologies exist based on concrete, molten salt and steel. Of these, molten salt is the most proven, but also the most expensive, while concrete and steel are still in early stages of development. Thermal storage is not nearly as fast or as versatile as batteries but a lifetime average cost of 0.023 €/kWh or less is possible.[51] However, that is only the cost of the storage of energy – parts of which can be reconverted into electricity using a combined-heat-and-power (CHP) generator. Depending on the precise layout, this process yields about one-third electricity and two-thirds low-temperature heat (80-120°C), which can be used in industry or in district heating or cooling.

Table: Overview of storage technologies

Name	Type	Primary Application	Characteristics
Lithium-ion	Battery	Short-term-grid stability, moving towards 65% renewables.	Driven by electric vehicle expansion, price declining by 20% per year. Current price around 500 €/kW h capacity, about 10 euro cents per used kWh. Expected to drop to 100-200 €/kWh by 2020-2025.
Redox-flow	Battery	Short-term-grid stability, high energy applications, 6-10 hours.	Very robust in principle, but still facing reliability problems. Expensive electrolyte and power components make this only attractive with large tanks (which have low charge rates). Struggling to scale, likely to remain niche.
Sodium-sulphur (NaS)	Battery	Short-term-grid stability, high energy applications, 6-10 hours.	High-temperature, reliable and proven, but requiring good care and management. Struggling to scale, currently offered at 1,800 € for a 1 MW/6 MWh system, but there is little demand for such long duration. Likely to remain niche.
Molten salt	Thermal	High energy applications 6-10 hours. Sector coupling moving beyond electricity.	Large-scale solution usually only deployed or economic with concentrating solar power (CSP). Price for salts driven by global fertiliser market (their primary application). Yields both power and heat (only electricity: 30-40% efficiency).
Concrete	Thermal	High energy applications 6-10 hours. Sector coupling moving beyond electricity.	New. Potentially scalable and cheap, but durability in doubt.
Steel	Thermal	High energy applications 6-10 hours. Sector coupling moving beyond electricity.	New. Potentially scalable and cheap (0.02 € and less per “stored” kWh).
Hot water	Thermal	Sectorcoupling, but only one-way.	Low temperatures prevent re-electrification.
Supercapacitors, fly-wheels	Other	Very short durations – milliseconds to seconds.	
Hydro	Mechanical	Bulk storage.	Strongly dependent on local conditions.

51 This example is based of the authors intimate knowledge of steel-based sector-coupling storage. Other technologies sometimes give even lower figures, but the author cannot assess these claims in the scope of this study.

Selected milestone projects

With storage markets growing fast, so is the number of impressive energy storage projects. The most-talked about project is a 100 MW/127 MWh system by Tesla (which sells storage and solar systems as well as cars) in South Australia, which went online in late 2017. Shortly after its inception the battery saved the grid from a blackout caused by a malfunction of a coal-fired power plant. The project, known as Hornsdale Power Reserve, was a key driver for Australian frequency control ancillary service market costs to be 57% lower in Q1 2018 than in Q4 2017.[52]

There is a rapidly expanding reference list of battery storage projects globally, with the biggest markets being Germany, Italy, Japan, South Korea, the United Kingdom and the United States (mostly California and Texas). At the utility/transmission grid-scale (this is referred to as "in front of the meter" or FTM), notable highlights are:

- The UK FTM battery market currently has 131.5 MW in operation with 826.5 MW announced or under construction.[53]
- Europe's first commercial battery power plant (15 MW/15 MWh) was built by the battery systems integrator Younicos for the northern German municipal utility Wemag in 2014. Since its inception, the battery has performed better than expected economically, and thereby helped kick-start the FTM battery market in Germany, where 173.26 MW is installed and another 388.5 MW has been announced. This battery has also been successfully tested to restart a grid.
- The leading NaS manufacturer NGK has installed systems totalling over 530 MW/3,700 MWh for load levelling, renewable energy stabilisation, transmission and distribution network management, in microgrids and for ancillary services in 190 locations in Europe, Japan, the Middle East and North America. Abu Dhabi's main utility uses 108 MW for grid-scale demand management to operate thermal generation efficiently. In Italy, 35 MW of NaS facilities store wind energy generated in the south before it is transmitted to the large power users in the north. In Japan, a 50 MW/300 MWh system absorbs excess solar PV generation.[54]

Grid-scale vs. home storage

In addition to the FTM market, there is an equally rapidly growing "behind the meter" (BTM) market for private home storage (mostly for solar home systems) and for commercial and industrial battery systems. The primary motivation for installing such systems is saving electricity cost by increasing use of (solar) self-generation to avoid network charges – and only to a much lesser degree, if at all, earning money by providing system services.

Home storage can stress rather than relieve the grid if not managed properly. If a PV system with storage is designed only to optimise itself, it may increase grid problems if it suddenly releases its full PV production capacity into the grid as soon as the storage system is full. It is therefore important to make sure that such systems "talk" with the grid. Fortunately, modern communications protocols make this easy. Several projects are under way that bundle home storage systems to help relieve the grid.

52 AEMO (2018) Quarterly Energy Dynamics Q1 2018 https://www.aemo.com.au/-/media/Files/Media_Centre/2018/QED-Q1-2018.pdf

53 Everoze (2018) What?!£7/MW/hr for EFR storage? Explain! http://everoze.com/what-7mwhr-for-efr-storage-explain/ [accessed 23.03.2018].

54 Colthorpe, A. (2017) NGK's NAS sodium sulfur grid-scale batteries in depth. https://www.energy-storage.news/blogs/sponsored-ngks-nas-grid-scale-batteries-in-depth [accessed 23.03.2018].

4 Solving the economic challenges

The cost of generating electricity from solar and wind has fallen dramatically over the past decade, making renewables increasingly a low-cost option competitive with fossil fuels such as coal and gas.

There are two main measures for the cost of renewables. The first is levelised cost of electricity (LCOE), a commonly referenced theoretical measure. The second is the revealed cost, supplied by the results of recent competitive tenders for wind and solar power purchase agreements (PPAs). A policy shift towards auctions for long-term PPAs is part of a global trend, away from fixed price support, for example via feed-in tariffs.

4.1 Global levelised cost of electricity (LCOE) estimates and ranges

Levelised cost of electricity (LCOE) is a popular measure of the cost of electricity generation because it is easy to calculate and provides a benchmark for comparing the costs of power generation by a range of different technologies. Its main drawback is that its focus is exclusively on generation cost, ignoring wider system costs and benefits such as flexibility of generation or contribution to carbon emissions. In addition, care must be taken comparing estimates, given the impact of variables such as financing costs and capacity factors.

LCOE is obtained by dividing the estimated, discounted capital and operating costs over the lifetime of an energy asset by expected total generation, to derive a cost per unit of electricity. Key inputs are capital costs, operation and maintenance costs (O&M); financing costs; fuel costs; and an assumed utilisation rate. In the case of solar PV, utilisation rate is based on solar irradiance, and in the case of wind power, the local wind resource.

Established industry sources for unsubsidised LCOE include the International Energy Agency (IEA), the International Renewable Energy Agency (IRENA) and Lazard.

The IEA's latest global average reference LCOEs for new projects completed in 2016 and 2022:[55]

- Onshore wind: 0.07 €/kWh in 2016, falling to 0.06 €/kWh in 2022
- Utility-scale solar: 0.09 €/kWh in 2016, falling to 0.08 €/kWh in 2022

IRENA's global average weighted LCOEs for new projects completed in 2017:[56]

- Hydropower: 0.04 €/kWh
- Onshore wind: 0.05 €/kWh
- Bioenergy and geothermal: 0.06 €/kWh
- Utility-scale solar: 0.09 €/kWh

55 IEA (2017) Renewables 2017. http://www.iea.org/publications/renewables2017/ [accessed 23.03.2018].

56 IRENA (2018) Renewable Power Generation Costs in 2017, http://www.irena.org/publications/2018/Jan/Renewable-power-generation-costs-in-2017 [accessed 23.03.2018].

Lazard's global average estimates for renewable projects built in 2017:[57]

- Onshore wind: 0.026-0.05 €/kWh
- Utility-scale solar: 0.04 €/kWh

Lazard also published comparative ranges for conventional technologies:

- Combined cycle gas turbine: 0.03-0.07 €/kWh
- Coal: 0.05-0.12 €/kWh
- Nuclear: 0.09-0.15 €/kWh

Four broad conclusions are evident from these studies. First, wind power is already competitive with new gas, coal and nuclear. Second, solar power is already competitive with new coal and nuclear, and with gas in areas of higher solar irradiance. Third, both wind and solar are highly competitive with the cost of new lignite power in Kosovo, as revealed by the proposed PPA of 80 €/MWh, or 0.08 €/kWh. Fourth, the costs of both wind and solar are projected to continue to fall.

4.2 Estimating wind and solar LCOE for Kosovo

Our LCOE calculations are based on five key variables:

- **Return of cash to investors:** This is based on a straight-line 25-year depreciation of the upfront capital expenditure. The numbers are based on global average wind and solar installed costs quoted by the International Energy Agency (IEA).[58] We take into account the IEA's projected reductions in installed costs from 2016-2022.

- **Operating and maintenance (O & M) costs:** For wind power, we take the mid-point of Deloitte's review of O & M costs, at 21% of revenues (ie, a margin of EBITDA – earnings before interest, tax, depreciation and amortisation – of 79%), a review based on dozens of operating wind farms and market studies worldwide.[59] For solar power, we take published data from a highly geographically diversified solar farm operator, Scatec Solar, and its actual or expected EBITDA margin of 90% across 400 MW of assets in operation and under construction.[60]

- **Equity costs:** We assume a 70:30 debt to equity split, based on the same ratio used in the recently agreed PPA for a proposed new lignite power plant in Kosovo.[61] For equity returns, we assume a very costly 18.5% for wind power, which is taken from the same proposed lignite PPA. For solar, we assume a 12% equity return, reflecting the fact that solar farms are fast and easy to construct, with therefore minimal development and construction risks. We note that both these wind and solar equity costs are more than double expected equity returns of 5%-6% in developed European markets.[62] We use these far higher costs for Kosovo to reflect the risks associated with first-time projects, as well as a higher level of political risk.

57 LAZARD (2017) Levelized Cost of Energy 2017. Lazard's lower cost for utility-scale solar reflects a high capacity factor, using high solar irradiance equivalent to the Southwest United States. https://www.lazard.com/perspective/levelized-cost-of-energy-2017/ [accessed 23.03.2018].

58 IEA (2017) Renewables 2017. https://www.iea.org/publications/renewables2017/ [accessed 23.03.2018].

59 Deloitte (2014) Establishing the investment case. Wind power. https://www2.deloitte.com/content/dam/Deloitte/global/Documents/Energy-and-Resources/gx-er-deloitte-establishing-the-wind-investment-case-2014.pdf [accessed 23.03.2018].

60 Scatec Solar (2018) Investor. http://www.scatecsolar.com/Investor [accessed 23.03.2018].

61 Power Purchase Agreement between Republic of Kosovo acting through the Ministry of Economic Development (as NKEC) and ContourGlobal Terra 6 S.à r.l. (as GenCo). http://mzhe-ks.net/repository/docs/1._Power_Purchase_Agreement_(Execution_Version).pdf [accessed 23.03.2018].

62 Green Finance Initiative (2017) The renewable energy infrastructure investment opportunity for UK pension funds. http://greenfinanceinitiative.org/renewable-energy-infrastructure/ [accessed 23.03.2018].

- **Debt costs:** We assume a 7.2% lending rate for Kosovo, as published by the World Bank.[63] We factor in Kosovo's 10% corporation tax rate. And we assume that the project is refinanced at a lower 5% rate after year 10. The 7.2% is a rather optimistic estimate and, depending on the lender and the specific conditions, may actually be higher. Sections 4.4 and 4.5 focus on the issue in more depth.

- **Electricity generation:** We assume that these first renewables projects in Kosovo take advantage of the best possible resources. This is an advantage of siting the first projects, offset by the disadvantage of higher costs of capital as discussed. We used World Bank wind and solar resource atlases to derive the relevant generation data.[64,65] For wind, we assume a 6.5 metre/second annual average wind speed, as found in NE Kosovo, implying a load factor of 33.9%. We applied the specifications of a 2 MW Vestas turbine adapted for lower wind conditions, to an industry formula for calculating electricity output.[66] For solar, we assumed a 15.6% load factor, as achieved in the best locations in West Kosovo, to calculate relevant annual generation.

To calculate our LCOEs, we used the formulae below. We discounted all values according to our weighted average cost of capital (WACC). For wind power, we used a WACC of 10.1%, and a slightly lower 8.1% for solar power, reflecting a lower cost of equity, as described above.

Wind power: LCOE = Discounted lifetime totals for (B+C+E+G)/ K = 62 €/MWh

A.	Installed system cost	1.15mln €/MW
B.	Annual return of cash to investors (over 25 years)	46k €/MW
C.	Annual operating and maintenance costs (@ 21% of revenues)	35.2k €/MW
D.	Debt ratio, % of total finance	70%
E.	Annual equity cost (@18.5%)	63.8k €/MW
F.	Debt cost year 1 (@7.2%)	58.0k €/MW
G.	Debt cost year 1, after corporation tax (@10%)	52.2k €/MW
H.	Annual average wind speed in NE Kosovo, @100m tower	6.5 m/s
I.	Annual electricity generation, for a 2MW turbine, MWh	5,947 MWh
J.	Load factor	33.9%
K.	Annual electricity generation, MWh per MW installed	2,974 MWh

Solar power: LCOE = Discounted lifetime totals for (B+C+E+G)/ J = 85 €/MWh

A.	Installed system cost	1mln €/MW
B.	Annual depreciation (over 20 years)	40k €/MW
C.	Annual operating and maintenance costs (@ 10% of revenues)	10.7k €/MW
D.	Debt ratio, % of total finance	70%
E.	Annual equity cost (@12%)	36k €/MW
F.	Debt cost year 1 (@7.2%)	50.4k €/MW
G.	Debt cost year 1, after corporation tax (@10%)	45.4k €/MW
H.	Best solar resource in W Kosovo, direct normal irradiance (DNI)	1,416 kWh/m2/yr
I.	Load factor	15.6%
J.	Annual electricity generation, MWh per MW installed	1,367 MWh

63 The World Bank (2018) Lending interest rate (%). https://data.worldbank.org/indicator/FR.INR.LEND?view=chart

64 Global Wind Atlas (2018) https://globalwindatlas.info [accessed 23.03.2018].

65 Global Solar Atlas (2018) https://globalsolaratlas.info [accessed 23.03.2018].

66 Vestas (2018) Technical Specifications. https://www.vestas.com/en/products/turbines/v90-2_0_mw#!technical-specifications. REUK – Renewable Energy UK (2018) Calculate KWh Generated By Wind Turbine. http://www.reuk.co.uk/wordpress/wind/calculate-kwh-generated-by-wind-turbine/ [accessed 23.03.2018].

Wind and solar projects will only be financed in Kosovo if developers are offered long-term power purchase agreements, as recently offered to the UK-based developer ContourGlobal to build a lignite power plant.

Our wind and solar LCOE estimates for Kosovo are in the range of estimates as calculated by IEA, IRENA and Lazard, quoted above. They are far above the actual revealed cost of wind and solar power, as indicated by recent PPA auctions (see next section). Our LCOE calculations suggest that both wind (62 €/MWh) and solar power (85 €/MWh) are competitive with lignite in Kosovo, noting the indicative price for the prospective power purchase agreement with ContourGlobal for a new lignite power plant at 80 €/MWh.

4.3 Revealed cost of renewables

Renewable energy policy has undergone a major global shift in recent years from fixed feed-in tariffs towards competitive tenders for long-term PPAs. This shift has contributed to a rapid drop in prices for renewable power. The International Energy Agency tracks PPA auctions globally (Figure 5).[67] Global average prices have fallen from 137 €/MWh for solar PV projects completed in 2014, to below 26 €/MWh for projects bidding now, to be completed in 2020/2021. For onshore wind, over the same timeframe, average auction prices have dropped from 60 €/MWh to below 43 €/MWh.

Individual auction results show that prices have fallen particularly quickly in the past two years. Onshore wind PPA prices fell as low as 26 €/MWh in Mexico in 2016, and lower again, to 15 €/MWh bid in Mexico the following year.[68],[69] Regarding solar PV, bids fell to 43 €/MWh in Latin America in the spring of 2016, and further to around 26 €/MWh in Dubai, Chile and Abu Dhabi, later that year.[70] During 2017, prices fell to around 17 €/MWh in Mexico and Chile, and to 15/MWh in Saudi Arabia in late 2017.[71]

These revealed bids are far lower than LCOE, showing that theoretical measures of wind and solar costs have failed to keep pace with real-world reductions in the cost of equipment and capital. Auctions have driven down costs of capital by tendering for government-guaranteed, long-term PPAs. Meanwhile, competitive pricing pressure has forced developers to make the lowest possible bids. These bids are in most cases still only bids: it is still to be seen whether developers can complete their projects at revenues below 17 €/MWh. However, they face strong economic incentives not to fail.[72]

Wind and solar costs of as low as 15 €/MWh as revealed by PPA auctions are highly competitive with the proposed new lignite power plant in Kosovo, at a fraction of the proposed Kosovo PPA price of 84 €/MWh. Costs for solar PPA have fallen rapidly in recent years because of advances in technology; economies of scale in manufacturing and installation; investors becoming increasing-ly comfortable with the technologies; and delivery switching from fixed feed-in tariffs to competi-tive tenders,

67 IEA (2017) Renewables 2017, http://www.iea.org/publications/renewables2017/ [accessed 23.03.2018].

68 GEWC (2018) New low wind energy costs: Morocco tender averages $US30/MWh. http://gwec.net/new-low-for-wind-energy-costs-morocco-tender-averages-us30mwh/. [accessed 23.03.2018].

69 Fitzgerald Weaver, J. (2017) Updated: Cheapest electricity on the planet is Mexican (actually) wind power at 1.77¢/kWh. https://electrek.co/2017/11/16/cheapest-electricity-on-the-planet-mexican-solar-power/ [accessed 23.03.2018].

70 Hirtenstein, A. (2016) New Record Set for World's Cheapest Solar, Now Undercutting Coal. https://www.bloomberg.com/news/ articles/2016-05-03/solar-developers-undercut-coal-with- another-record-set-in-dubai [accessed 23.03.2018].

71 Graves, L. (2017). World's cheapest prices submitted for Saudi Arabia's first solar project. https://www.thenational.ae/business/energy/world-s-cheapest-prices-submitted-for-saudi-arabia-s-first-solar-project-1.663842 [accessed 23.03.2018].

72 Kåberger, T. (2018) Progress of renewable electricity replacing fossil fuels. https://research.chalmers.se/publication/500693/file/500693_Fulltext.pdf [accessed 23.03.2018].

driving more competitive pricing and more cost-effective uptake. In addition, very low costs of solar generation have been achieved in India (0.04 €/kWh) through the use of “plug and play” solar parks, which have an installed grid connection, and government-guaranteed offtake contracts.

These global trends provide some clear lessons for Kosovo on how to minimise the cost of a low-carbon transition. First, Kosovo can benefit from the global policy trend towards competitive tenders. However, such competitive tenders have reduced costs by reducing the cost of capital, which is closely associated with project risk. The prospect of 15-year, government-backed PPAs is attractive to investors, including pension funds and insurance companies, which may view such regular income streams as highly desirable, especially in a low-interest rate world of record-low yields on fixed income investments. However, such investors only view infrastructure revenues in this way because the cash flows are government-guaranteed, in the same way as a government bond. Second, the Indian example of solar parks highlights the benefit of reducing execution risks for investors, by providing in advance the required permitting, land leases and grid infrastructure.

In Kosovo, neither of these critical conditions is in place. First, the renewables PPAs proposed by the Kosovo government are not government-backed. For example, they lack “termination clauses”, so if the government terminated the PPA for any reason, the investor would have no recourse to lost revenues. Investors are unlikely to view such PPAs as bankable, and if they did take the risk, would expect a higher return, which would increase the cost of the project. Given that investors may already be wary of political risk in Kosovo, government backing for PPAs is all the more important. Second, some solar developers in Kosovo are still awaiting construction and grid connection permits several years after they were awarded feed-in tariff licences. This is a striking contrast with the experience in India.

4.4 The political mindset challenge

In most countries that are moving towards an energy transition, societal debates were needed to change the political mindset before seminal policy decisions, and continue doing so throughout the transition. For example, in Germany, the timing and organization of the coal phase-out is subject to an ongoing discussion.[73] In Kosovo, renewables appear to be competitive with a new lignite power plant, even before considering non-market factors such as air pollution. However, there seems to be a “political mindset” bias in Kosovo that favours a new coal plant over alternatives, including renewables. This political bias is evident in comparing the terms of a recent PPA to build a new lignite power plant with comparable support schemes offered to developers of wind and solar power.

A new contract for a lignite-fired power plant

The government of Kosovo announced in December 2017 that it had signed a no-bid contract with the US developer ContourGlobal to build a 450 MW coal power project, burning low-grade domestic lignite.[74] To its credit, the government published details of the contract on its website.[75] Nevertheless, specific terms of the deal remained unclear, particularly the cost to consumers.

The 269-page PPA proposed a “target” consumer cost for the power plant’s electricity of 80 €/MWh over the 20-year period of the agreement. It was unclear what cost this figure related to. However, it

73 Clean Energy Wire (2018) Germany gears up for official talks on coal phase-out. https://www.cleanenergywire.org/news/germany-gears-official-talks-coal-phase-out [accessed 23.05.2018].

74 Ministry of Economic Development, Republic of Kosovo (2017) Parties reach an agreement on the development of Thermal Power Plant “Kosova e Re”. http://mzhe-ks.net/en/news/parties-reach-an-agreement-on-the-development-of-thermal-power-plant-kosova-e-re-#.WpPfXjWcYW8 [accessed 23.03.2018].

75 Ministry of Economic Development, Republic of Kosovo (2018) Commercial Contracts of TC “Kosova e Re” Project. http://mzhe-ks.net/en/commercial-contracts-of-tc--kosova-e-re--project#.WpPfRjWcYW8 [accessed 23.03.2018].

seems most likely to refer to the cost of the power plant's energy output, excluding various additional payments. Under the terms of the PPA, ContourGlobal would receive three types of payments: an energy payment, an availability payment, and an additional payment. The energy payments would cover the power plant's operating costs, including fuel and other variable costs. The availability payments would cover fixed costs, including ContourGlobal's 18.5% equity return and debt interest payments, and appeared to be a non-competitive version of what is more commonly known as a capacity payment. The additional payments would cover the cost of ancillary services to balance the grid.

The PPA is a government-guaranteed contract. The contract terms make clear that any dispute resolution would take place in international courts, rather than domestic courts in Kosovo, giving maximum protection to the investor.

Existing proposed feed-in tariffs for renewable power

The Kosovo government has a feed-in tariff regime for renewables, which it is re-designing. In 2016, Kosovo described the feed-in tariffs as 12-year contracts for wind power (85 €/MWh) and solar PV (136 €/MWh).[76] Individual projects were capped at 3 MW for solar PV and 35 MW for wind power.

While these terms appear generous enough, no projects have yet been completed under the regime, even though preliminary authorisation of the wind feed-in tariffs took place in 2013, and of the solar tariffs in 2015. Unattributed conversations with prospective developers and investors indicate a lack of political commitment.

Investors state that the proposed renewable energy contracts would be seen unfavourably by banks because of a lack of clarity over what happens if the support regime were cancelled, for whatever reason. Developers, meanwhile, say progress has become bogged down politically. For example, the energy regulator has been unable to sign off support for renewables feed-in tariffs because of an incomplete board of directors, in turn due to political turmoil following last year's general election. One developer was awaiting a grid connection permit, something that depended on a functioning energy regulator.

Key differences between the proposed lignite and renewables PPAs

Three key differences between the proposed support regimes for lignite and for renewables demonstrate a bias in favour of lignite:

- The support measures for renewables fall under Kosovo law, and have become bogged down by proposed regime reforms. That has injected uncertainty over the rules and levels of support. What is more, the dissolution of the energy regulator board and subsequent failure to recruit fresh members has halted issuance of grid connection permits. In contrast, support for lignite is underpinned by a cast-iron bilateral deal with a foreign sponsor that has secured for itself highly advantageous terms for dispute resolution and fair treatment in international courts.
- Support for renewables is capped at 3MW for solar and 35MW for wind, compared with 450MW for lignite.
- Support for renewables is delivered through an energy payment, capped at 136 €/MWh for solar and 85 €/MWh for wind. Support for lignite, by contrast, is uncapped, and calculated instead according to detailed formulae to cover all fixed and variable costs incurred by the developer,

76 Republic of Kosovo Energy Regulatory Office (2016) http://www.ero-ks.org/w/index.php/en/authorization-tendering/feed-in-tariff [accessed 23.03.2018].

including an annual 18.5% return on equity. The developer would receive capacity and ancillary services payments, as well as an energy payment.

Overcoming political bias: IEEFA market research

It is difficult to understand the basis for political bias against renewables. Possible explanations include bias in favour of larger projects, which are perceived as a bigger political coup, or bias in favour of foreign investors, especially investors based in countries that were instrumental in Kosovo's achievement of independence, such as the United States.

One way to overcome such bias might be to demonstrate the achievability of wind and solar projects. To this end, IEEFA conducted market research into the presence of willing, experienced solar power developers among neighbouring countries. IEEFA considered that developers in the Balkan region would be experienced in the types of difficulties facing Kosovo. Those developers with a successful track record would also have a lower execution risk than smaller, inexperienced developers in Kosovo.

Accordingly, IEEFA investigated 12 developers in Bulgaria, 27 in Greece, 11 in Croatia and 4 in Kosovo. IEEFA reduced these to a target list of seven developers, based on desk-top and phone market research, prioritising track record and an interest in working in Kosovo. This target list comprised two independent developers holding feed-in tariff licences in Kosovo; one established developer based in Croatia with a new, Kosovo subsidiary; two developers in Greece with large operational pipelines and clear execution ability; and two successful and interested developers based in Bulgaria. These developers could form the basis for a solar supply chain in Kosovo.

4.5 The capital cost challenge for renewables

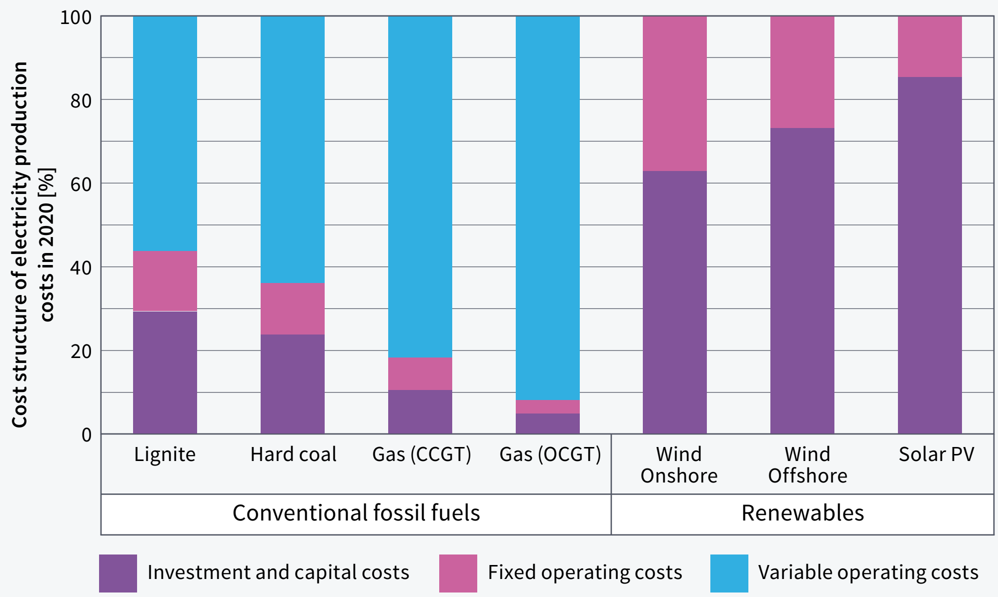
There is a unique opportunity to advance low-carbon energy transitions in the Western Balkan countries. First, there is a political commitment by governments in South East Europe to implement the Paris Agreement on climate change. Second, the European Union is pushing for an integrative, economy-wide approach to climate and energy policy-making. Finally, the Western Balkan countries have close geographical and political ties with the Central and East European and South East European member states of the European Union, which can help to overcome the EU/non-EU divide.

In addition, the costs of renewable energy technologies have fallen markedly in recent years, making them competitive with fossil fuels. To reap the benefits of these cost reductions and develop low-cost projects, however, it is necessary to overcome significant barriers in the regulatory, policy and market frameworks for renewable investments in the region. These barriers are keeping the costs of capital for renewable projects in South East Europe significantly above the EU average.

An enabling policy environment lowers risk for investors and thus helps to keep project costs as low as possible. Lower risk translates into lower rates of return needed to make an investment profitable. Low risk projects also need less or even no help in closing possible revenue gaps and are thus cheaper for consumers and taxpayers.

Figure 8. Renewable energy sources are highly capital-intensive

Comparative cost structure of key power generating technologies



Note: Variable operating costs include fuel costs and CO_2-pollution abatement costs (e.g. EU ETS certificates). Fixed operating costs include operation & maintenance as well as personnel.

Source: Figure 1 in Agora Energiewende (2018)[77]

Policy risks, cost of capital and implications for project costs

Investments in renewable energies are highly capital-intensive, so the cost of capital is a major determinant of the LCOE. Furthermore, due to their capital intensity, the cost competitiveness of renewable investments is more sensitive to variations in the cost of capital than less capital-intensive fossil-fuel alternatives.

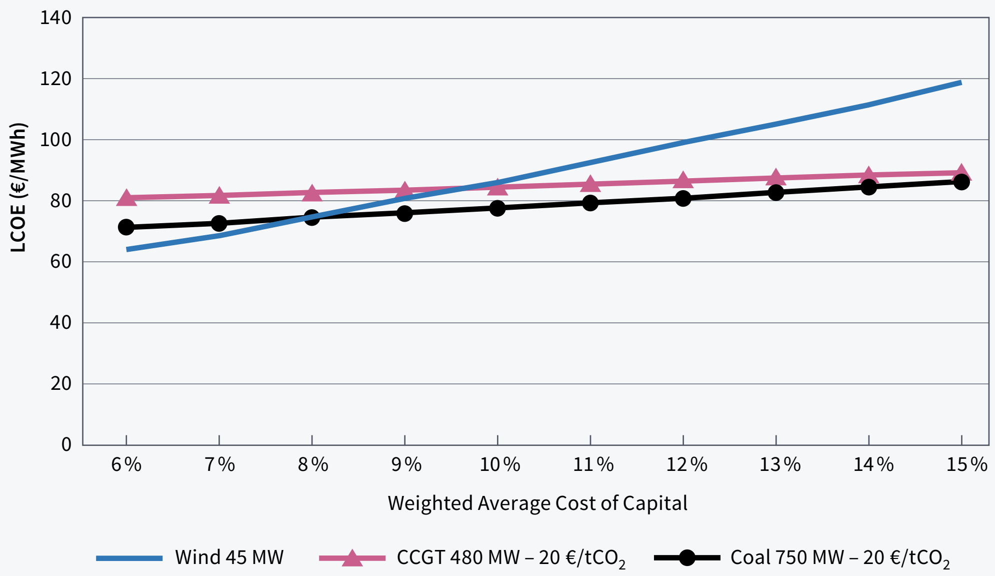
The high cost of capital for an investment in wind power, for example, has a marked impact on the cost of energy as compared with investment in combined cycle gas turbines or coal.[78] A 9 percentage point increase in the cost of capital leads to a near doubling in the LCOE for wind power, yet to only a 10 percent increase in the LCOE for gas and coal. The economics of solar PV plants also have a high sensitivity to the cost of capital.

77 Agora Energiewende (2018): Reducing the cost of financing renewables in Europe. Report of a multi-stakeholder dialogue on the proposed EU Renewable Energy Cost Reduction Facility. https://www.agora-energiewende.de/fileadmin2/Projekte/2016/De-Risking/Agora_RES_CRF-Dialogue_WEB.pdf [accessed 23.03.2018].

78 The main economic assumptions underlying the comparison are: For wind power investment cost of 1600 EUR/kW and 2,250 full load hours, for CCGT plants investment cost of 800 EUR/kW and 8,000 full load hours, for coal plants investment cost of 1,400 EUR/kW and 8,000 full load hours. A CO_2 price of 10 EUR/t CO_2 is applied. For further details see Climate Strategies (2015): What does the European power sector need to decarbonize?

Figure 9. Economics of renewables are highly sensitive to the cost of capital

LCOE in relation to divergent cost of capital for different energy technologies



Source: Figure 1 in Temperton (2016)[79]

The cost of capital of renewable investments directly reflects how investors perceive risks. These risks translate into country-specific premiums on the costs for renewable energy investments that have nothing to do with technology risks or weather conditions. The DIA-CORE project[80] approached 80 equity providers, project developers and bankers to identify and evaluate project risks related to wind power investments in 24 EU member states (Figure 10). The risks identified related to policy design, market design and regulatory issues, sudden changes in policies and financing aspects. Administrative risks, grid access risks, social acceptance risks and technical and management risks were also rated by the interviewees.

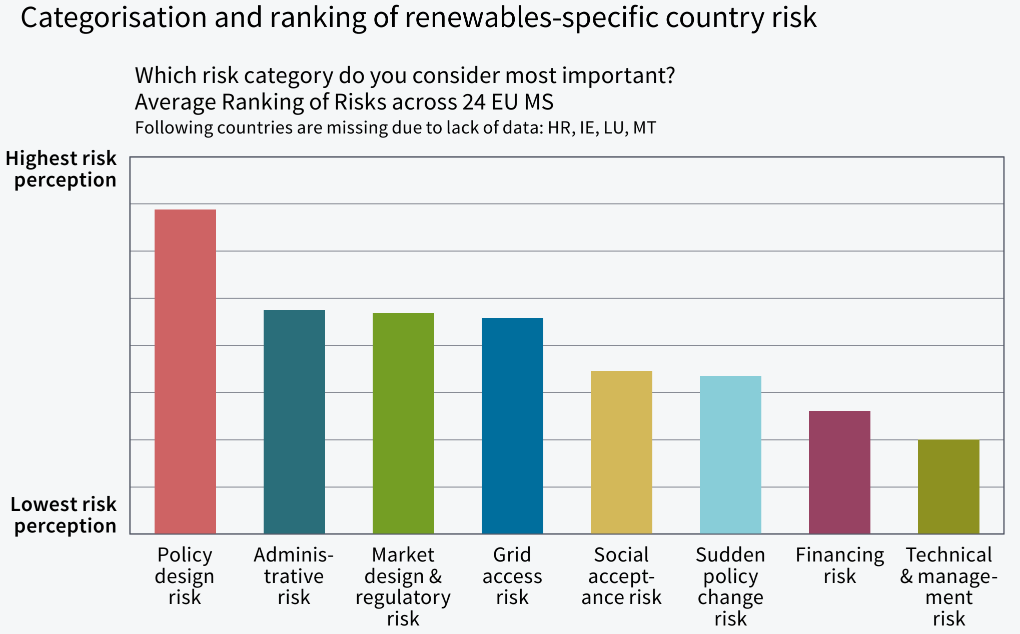
The results show how sensitive renewable investments are to political and regulatory risks. Some EU member states have changed support payments after investments have been made, for example. Given the highly capital intensive and inflexible nature of renewable investments, it is impossible for renewable energy investors to adapt their projects to compensate for such changes.

The renewables-specific country risks have a significant impact on the cost of capital. In the European Union, the cost of capital varies from 3.5% -4.5% in Germany to 12% in Greece and Croatia. In consequence, a wind farm built in Croatia in 2014 would have cost twice as much as one Germany with the same equipment cost and wind resource. In Germany, the wind farm would constitute a competitive investment, based on LCOE, compared with investments in coal-fired power plants or combined cycle gas turbine plants, whereas the wind farm in Croatia would not.

79 Temperton, I. (2016) Reducing the cost of financing renewables in Europe. A proposal for an EU Renewable Energy Cost Reduction Facility ("RES-CRF"). Study on behalf of Agora Energiewende. https://www.agora-energiewende.de/fileadmin/Projekte/2016/De-Risking/Agora_RES-Derisking.pdf [accessed 23.03.2018].

80 https://ec.europa.eu/energy/intelligent/projects/en/projects/dia-core [accessed 23.03.2018].

Figure 10. Political and regulatory risks weigh on investments in renewables



Source: Own illustration based on Figure 3 in Temperton (2016)[81]

Options for lowering the financing cost of renewables

Governments want to invest in clean energy at the lowest possible cost, so it is vital to remove costly barriers to renewables and promote instruments that lower the financing cost of renewable energy projects.

One proposal for reducing the financing cost that is gaining support is the European Renewable Energy Cost Reduction Facility (RES-CRF).[82,83] RES-CRF would lower the financing costs for renewables in countries with high cost of capital by reducing the ex-ante risk profile of specific renewable projects. The revision of the EU Renewable Energy Directive[84] that is currently being negotiated between the European Council and the European Parliament would oblige the European Commission to support member states with high ambitions for renewables through an enabling framework, with a focus on reducing the cost of capital for renewable energy projects.[85]

RES-CRF would underpin specific renewable energy projects with a guarantee from the CRF. This would be a simple guarantee of payment of the country tariff. The terms of the tariff and the non-tariff performance would be set out in a contract between the country and the CRF. In the contract, the country would also undertake to repay any guarantee payments made by the CRF. This arrangement would move responsibility for recourse in case of non-payment of a tariff from the project or investor to the CRF.

81 Temperton, I. (2016) Reducing the cost of financing renewables in Europe. A proposal for an EU Renewable Energy Cost Reduction Facility ("RES-CRF"). Study on behalf of Agora Energiewende. https://www.agora-energiewende.de/fileadmin/Projekte/2016/De-Risking/Agora_RES-Derisking.pdf [accessed 23.03.2018].

82 Ibid.

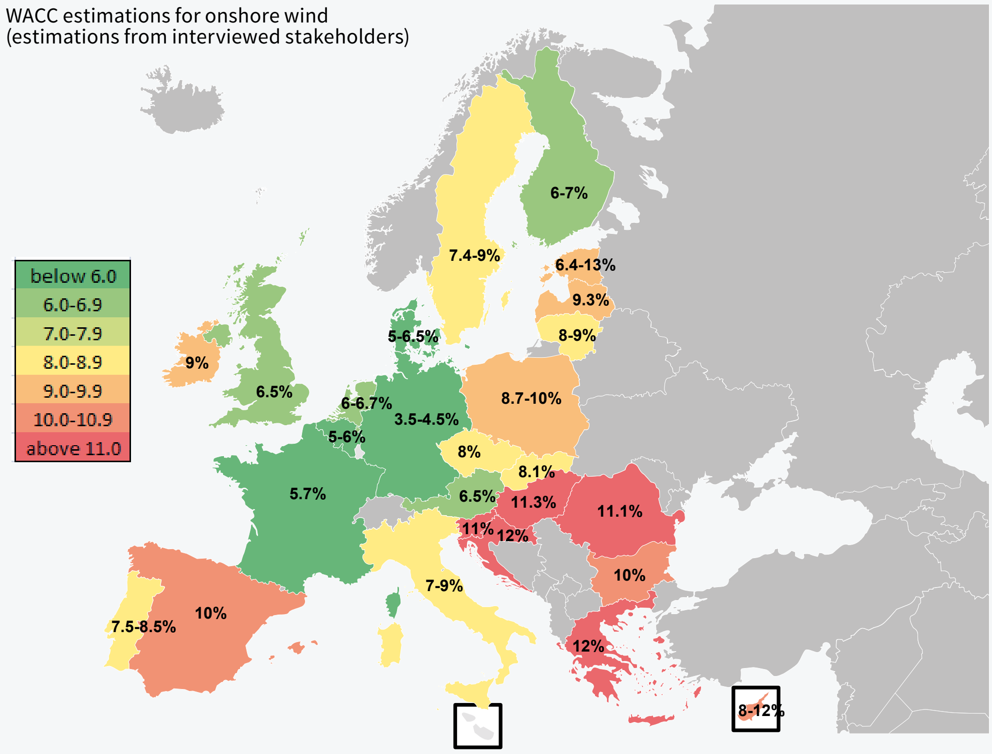
83 Agora Energiewende (2018): Reducing the cost of financing renewables in Europe. Report of a multi-stakeholder dialogue on the proposed EU Renewable Energy Cost Reduction Facility. https://www.agora-energiewende.de/fileadmin2/Projekte/2016/De-Risking/Agora_RES_CRF-Dialogue_WEB.pdf [accessed 23.03.2018].

84 COM(2016) 767 final of 30.11.2016. https://ec.europa.eu/transparency/regdoc/rep/1/2016/EN/COM-2016-767-F2-EN-MAIN-PART-1.PDF [accessed 23.03.2018].

85 Ibid, Article 3.4.

Figure 11. Risk determines whether renewables are competitive

Cost of capital estimations for onshore wind projects in Europe in 2014



Own illustration based on Figure 2 in Temperton (2016)[86]

To be able to access the CRF, countries would commit to implementing some best practice standards on renewable energy support frameworks. To share some of the risk and avoid moral hazard, countries would also commit to unconditionally recompense the CRF for any tariff commitment eventually invoked and provide some of their own funds as collateral for the guarantee facility.

Investors would know that should there be a problem with the performance of the country, there would be immediate recourse to a creditworthy institution backed by EU legislation. Investors could therefore be expected to reduce the interest rates they need for financing a project to the absolute minimum. The renewables-specific country risks related to sudden changes in policies and financing would no longer apply.

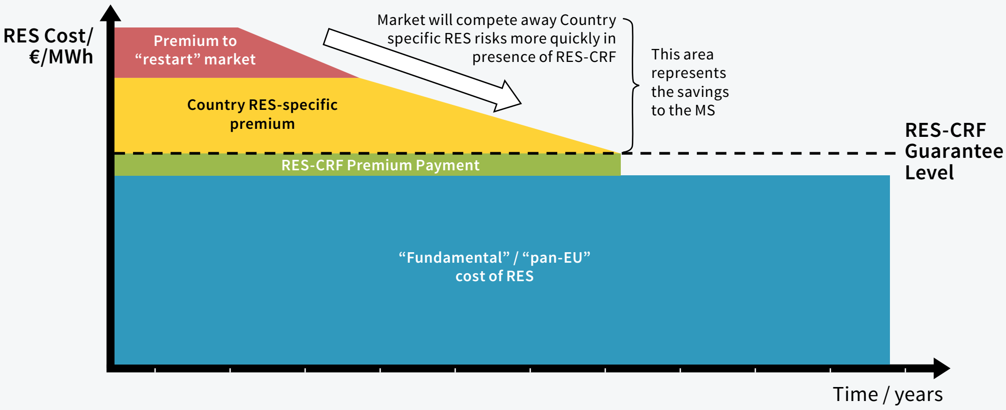
For high cost-of-capital countries in Central and South-Eastern Europe, the expected economic benefits of the RES-CRF will be significant (Figure 10). The RES-CRF will make investment in renewables cost-competitive with investment into any other generation technology.

While the RES-CRF has been developed within the 2030 EU framework for climate and energy, similar logic could be applied outside the European Union, for example in countries that are members of the Energy Community, such as Kosovo. The European Investment Bank could play a role, as could the European Bank for Reconstruction and Development. There could also be bilateral arrangements between, for example, the German development bank KfW and a country from the Western Balkans.

86 Temperton, I. (2016) Reducing the cost of financing renewables in Europe. A proposal for an EU Renewable Energy Cost Reduction Facility ("RES-CRF"). Study on behalf of Agora Energiewende. https://www.agora-energiewende.de/fileadmin/Projekte/2016/De-Risking/Agora_RES-Derisking.pdf [accessed 23.03.2018].

Figure 12. Europe's Cost Reduction Facility can help make renewables competitive

Economic effects of the Cost Reduction Facility (CRF) on the level of renewable energy tariff commitments of a country with high cost of capital



Note: MS stands for member state.

Source: Own illustration based on Agora Energiewende(2018) 82

4.6 System integration costs

As discussed in Section 3, the flexibility of the electricity and energy system needs to be increased for integrating intermittent, or variable, renewables. This can be achieved by investing in the transmission network, including cross-border interconnection, upgrading the flexibility of conventional generation, energy storages, reforming the market to reward more flexible demand and supply; improving wind and solar power forecasting; and making renewables themselves more responsible for meeting demand.[87] The costs of integrating intermittent renewable electricity can be estimated in three ways: theoretical grid system modelling; case studies of leaders in variable renewable power; and auction prices for wind and solar power plus storage.

Grid system modelling:
11.30 €/MWh to integrate variables renewables

Modelling by the UK Energy Research Centre (UKERC) concluded that the costs of integrating variable renewables can vary dramatically, but are usually modest, with higher costs the result of inflexible or sub-optimal systems.[88] The study stressed that a "whole-system" approach that used measures in combination would limit costs. The authors warned that conventional technologies also have grid integration costs. Historically, such system costs were not usually attributed to individual technologies, even though these all have characteristics to be optimized, whether the inflexibility of nuclear power, the seasonality of hydropower or the slow warm-up of coal power plants.

87 Institute for Energy Economics and Financial Analysis - IEEFA (2018) Power-Industry. Transition, Here and Now. Wind and Solar Won't Break the Grid: Nine Case Studies. http://ieefa.org/wp-content/uploads/2018/02/Power-Industry-Transition-Here-and-Now_February-2018.pdf [accessed 23.03.2018].

88 Wright, L. (2017) Government must act urgently on power system flexibility to avoid costs escalating. http://www.ukerc.ac.uk/news/government-must-act-urgently-on-power-system-flexibility-to-avoid-costs-escalating.html [accessed 23.03.2018].

The UKERC study found that integrating variable renewables has six kinds of impact:

- First, they require some flexible reserve to balance short-term variability. This cost would usually be below 5.7 €/MWh, except in systems with very high wind and/ or solar power, above 30% of total generation, plus very inflexible grids.
- Second, variable renewables require back-up to meet peak demand, given that wind and solar power are not available all the time. This cost is generally 4.5-7.9 €/MWh.
- Third, they incur curtailment costs, though these are usually very low. Curtailment refers to the cost of forcing wind and/ or solar farms not to generate power, even when they are available. Curtailment may be due to grid congestion or voltage limits.
- Fourth, there are transmission costs, for example to connect remote variable renewables to urban areas, and to balance their variability, estimated at 5.7-22.6 €/MWh). Greater transmission confers greater grid benefits, beyond integrating renewable power.
- Fifth, greater ramping up and down of conventional power plants, to respond to the vari-ability of renewable power, might inflict some wear and tear, but this cost was found to be very small.
- Finally, higher levels of variable renewables would require alternative sources of system inertia to maintain grid frequency, but this was not found to inflict grid integration costs.

The authors concluded that combined system integration costs for variable renewables at around 30% share of generation would be about 11.3 €/MWh.[89]

Denmark's example: 1-2 €/MWh to integrate variable renewables

Denmark is a great example of a flexible grid, which helps explain why the country is the world leader in wind power market share, at 53% of total net generation in 2017. First, Denmark has deep interconnections with Germany, Sweden and Norway, equivalent to more than half its own generation capacity, and consequently near-zero wind power curtailment. Second, Denmark's electricity and heating systems are closely integrated via small combined heat and power (CHP) plants, which provide half the country's electricity and two-thirds of its heat. CHP plants act as a storage system, generating heat when there is excess wind power and electricity when wind is unavailable. Third, Denmark has invested in thermal generation to make these assets more flexible. For example, its coal power plants can ramp up and down faster than those of Denmark's peers, and can run at lower minimum loads. Thanks to this system flexibility, Denmark's Energy Agency calculates that it has very low system costs for renewables integration, at 1-2 €/MWh, despite such high levels of wind power.[90]

Auction prices for storage point to integration costs

As has been discussed in Section 3.5, battery storage is an important emerging tool to counter short-term variability. Increasingly, wind and solar power are bidding for PPAs alongside battery storage. These bids give an alternative insight into the cost of integrating wind and solar into the grid.

In late 2017, the Minnesota-based utility Xcel Energy released the results of a tender for wind, solar, natural gas and battery storage projects, to come on line in 2023.[91] The tender was a response to the planned closure of 660 MW of coal generation capacity. Bids were sought for wind power, solar power, wind plus battery storage and solar plus battery storage. The median bid for solar plus stor-

89 Evans, S. (2017) In-depth: The whole system costs of renewables. https://www.carbonbrief.org/in-depth-whole-system-costs-renewables [accessed 23.03.2018].

90 Danish Energy Agency (2018) The Danish Energy Model. Innovative, efficient and sustainable. https://ens.dk/sites/ens.dk/files/Globalcooperation/the_danish_energy_model.pdf [accessed 23.03.2018].

91 Xcel Energy (2017) 2016 Electric Resource Plan. 2017 All Source Solicitation 30-Day Report (Public Version). https://assets.documentcloud.org/documents/4340162/Xcel-Solicitation-Report.pdf [accessed 23.03.2018].

age was 31 €/MWh, only just above the median bid for solar-only, at 25 €/MWh. The median bid for wind plus storage was 18 €/MWh, only slightly above the median for wind-only at 16 €/MWh. These bids include the effect of US federal tax credits and would be higher if unsubsidised. Nevertheless, the low incremental cost of battery storage, at just 3-5 €/MWh, raises the prospect that battery storage will soon overcome concerns about the cost of integrating variable renewables.

Wind and solar are clearly competitive with lignite in Kosovo

The combination of grid modelling, Denmark's example with deep interconnections, CHP and flexible plants, as well as recent battery storage tenders suggests that system integration costs are small, ranging from around 1 €/MWh to around 15 €/MWh, even at a very high market share of around 30% wind and solar. Given our LCOE estimates for Kosovo of 62 €/MWh for wind and 85 €/MWh for solar, this implies that even at dramatically higher levels of renewables, wind and solar remain competitive with lignite.

It is important to realise that lignite also has grid integration costs, notably a slow start-up time, high minimum loads and poor ramping rates. This inflexibility implies a need for alternative sources of peaking generation to cater for daily demand peaks. Given that costs rise according to the inflexibility of the grid, another key factor that would limit integration costs is Kosovo's access to flexible resources, including hydropower and interconnection, as well as potential biomass generation. The development of a power system with flexibility at its core requires an enabling political, regulatory and market design framework. The power market, in particular, has to be designed to provide the right incentives for flexibility.

An advanced energy-only market should be at the heart of any power market design as strong wholesale price signals, reflecting the real-time value of electricity, are required to manage the flexibility challenge efficiently. The spot price should serve as a central and undistorted dispatch signal for all market parties. To achieve this, making the short-term energy markets faster (by using shorter trading products like quarterly products, reducing gate closure times) and larger (by coupling markets across balancing areas) is crucial.

Coupling markets gives access to a larger set of balancing options, facilitating the more efficient supply of flexibility. Faster markets allow trading closer to real-time, enabling market participants to react swiftly to new information. This reduces short-term uncertainties and the need for operating reserves. Adjusting the design of balancing markets (by shortening contracting periods and adjusting technical prequalification criteria) will allow new market actors (demand-side response, storage, renewables) to offer balancing services and minimise fossil must-run capacities.

In addition, the structure of grid tariffs and other surcharges has to be adjusted to give market actors incentives to behave in a "system-friendly" way. At a regional level, cross-border system operation, cooperation among grid operators and an enabling regional governance structure are vital elements that require more political attention.

5 Solving legal challenges

The Paris Agreement on climate change has focused the attention of the legal research and practice community on energy law, as there is now a tangible international document on which to build legal discussion and arguments.[92] Lawyers have little visible role in the energy transition, however. For example, few members of the international Energy Transitions Commission have a legal background.[93] Whether lawyers are not proactive in engaging with energy law or have received little invitation from other scholars to participate is not clear.

The literature that does exist emphasises two major points, both of which are important for Kosovo to consider: energy law will play an increasingly important role, and it is at national level that law can be instrumental in driving the energy transition. To achieve the 2030 climate and energy targets in the Paris Agreement, the necessary laws need to be formulated, passed and implemented as soon as possible. This is not only because energy infrastructure takes time to plan, finance and build, but also there are significant planning and environmental hurdles to overcome. It is up to national governments to set a policy agenda and ensure law provides the structures, incentives and pathways that are necessary to overcome these hurdles and enable the energy transition.

The legal challenges that exist

Energy law can be defined as "the regulation of energy-related rights and duties of various stakeholders over energy resources over the energy life-cycle" .[94] The energy life-cycle referred to consists of five major stages (Figure 13[95]).

In many countries there are serious gaps in energy law. Waste management – including management of CO_2 emissions – has received little attention from lawyers and policy-makers, for example. However, the situation is improving, and there is now a realisation that energy companies need to be accountable for their waste and to pay for it. Law has been introduced to achieve change in coal-fired power generation in the United Kingdom, for example, which plans to phase out the use of coal by 2025.[96] Law can be used to ensure problematic energy infrastructure that has a limited focus on waste management – CO_2 emissions, impact on public health, impact of decommissioning – is no longer an option. In this way a country can move towards a low-carbon economic future.

Formulating energy law for the transition

Each country has its own energy resources, geographies, culture and socio-economic characteristics. Nevertheless, there are now accepted guiding principles to follow for developing and applying energy law. Such principles can be a force for change. These principles of energy law can "act as a guide to policymakers, academics, lawyers, judges and arbitrators when adjudicating, enforcing, making or formulating documentation, laws, regulations, judgments, etc on energy law".[97]

92 UNFCCC (2017) Paris Agreement – Status of Ratification. http://unfccc.int/paris_agreement/items/9444.php [accessed 23.03.2018].

93 Energy Transitions Commission (2018) Who we are. http://www.energy-transitions.org/who-we-are [accessed 23.03.2018].

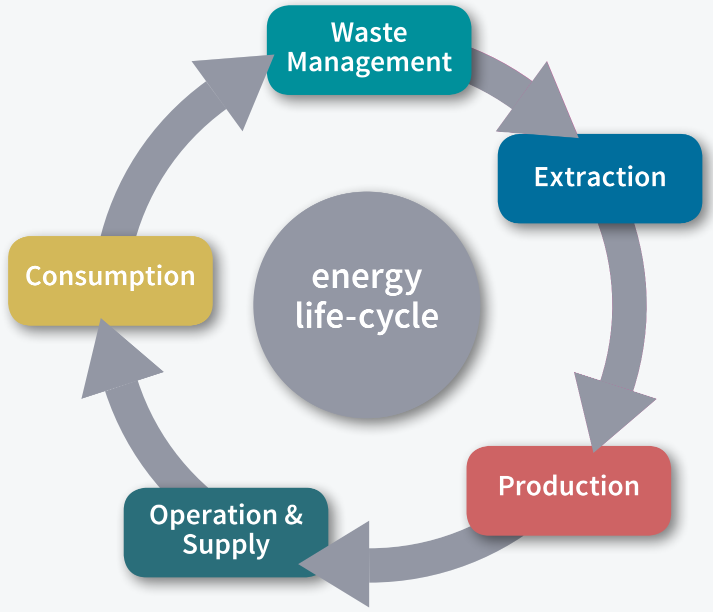
94 Heffron, R. J.; Talus. K. (2016) The Evolution of Energy Law and Energy Jurisprudence: Insights for Energy Analysts and Researchers. Energy Research and Social Science, 19, 1-10. p.5. https://doi.org/10.1016/j.erss.2016.05.004

95 US EPA, Climate Change and the Life Cycle of Stuff, available at https://19january2017snapshot.epa.gov/climatechange/climate-change-and-life-cycle-stuff_.html [accessed 23.03.2018].

96 To read more on the UK Governments plans to phase out coal by 2025 please see: UK Government (2016) Coal generation in Great Britain: The pathway to a low-carbon future. https://www.gov.uk/government/consultations/coal-generation-in-great-britain-the-pathway-to-a-low-carbon-future [accessed 23.03.2018].

97 Heffron, R. J. et al.(2018) A Treatise for Energy Law. Journal of World Energy Law & Business, 11 (1), 34-48. p. 48. https://doi.org/10.1093/jwelb/jwx039

Figure 13: The energy life-cycle



Source: Own illustration based on US EPA 94

Seven guiding principles have been proposed for energy law:[98]

- **The principle of natural resource sovereignty:** A state has the right to use its natural resources in its own national interest.
- **The principle of access to modern energy services:** Access to energy should be available to all citizens of a nation.
- **The principle of energy justice:** Human rights apply across the energy system.
- **The principle of prudent, rational and sustainable use of natural resources:** The use of natural resources should achieve a balance between economic development and environmental concerns.
- **The principle of the protection of the environment, human health and combatting climate change:** The use of energy and natural resources should protect the environment and public health and climate change mitigation.
- **The energy security and reliability principle:** There should be a secure supply of energy that should also be reliable.
- **The principle of resilience:** The different energy activities in the energy system should be resilient so they can adapt to adverse events.

In terms of the energy transition in Kosovo, these principles highlight that decisions need to have a long-term perspective and should be integrated. While the use of coal may provide benefits in the short-term, such as cost, energy access and energy security, it meets few of the other objectives of the energy law principles.

98 Ibid, p. 40.

A more thorough analysis of the cost of using coal needs to be completed, taking into account the cost to the public health system, the cost of full decommissioning and pollution costs (such as effects on water supply). Renewable energy provides a more practical solution than coal, even in the short-term, and can supply both urban and rural communities in Kosovo. It is more sustainable, protects the environment and human health, and increases energy security and access.

Ensuring long-term change through legal certainty

If the energy law principles above are adopted they can provide legal certainty for long-term ambition in the energy sector. This can lower the risk profiles of energy infrastructure projects and thus reduce capital costs.

If the renewable energy sector in Kosovo is provided with legal certainty, it will be able to develop, grow and mature. Consequently, investment will flow and the cost of financing this investment will reduce over time. Denmark's successful transition to renewables from its near 100 per cent reliance on fossil fuels shows that an affordable and successful energy transition is achievable in small nations and highlights the role that effective law can play.[99]

Kosovo also needs to ensure that the transformation of its energy sector is a "just" transition.[100] Decision-making has to be transparent and politicians accountable, and the public need to see justice in the processes and outcomes of these decisions. New expertise needs to be developed to strengthen the environmental and energy regulators. The existing energy labour force needs to have access to retraining and educational opportunities so it can adjust and be part of the energy transition. Public participation in the transition is essential and ensures more socially acceptable outcomes.

The formulation and application of revised or new energy law can help set Kosovo on a course to achieve its energy transition by 2030in a way that has far more benefits and is more just than retaining the status quo.

99 Heffron, R. J.; McCauley, D. (2014) Achieving Sustainable Supply Chains through Energy Justice, Applied Energy, 123, 435-437. https://doi.org/10.1016/j.apenergy.2013.12.034

100 Heffron R. J.; McCauley, D. (2018) What is the 'Just Transition'? Geoforum, 88, 74-77. https://doi.org/ 10.1016/j.geoforum.2017.11.016

6 Circular migration: the potential role of the diaspora

Migration has moved to the centre stage of development policy agendas. The potentially positive role of migration has been recognized in policy circles – in particular the contribution of migrants through remittances, transfers of know-how and transnational diaspora networks. For the development of a country, migration can be a challenge and – if well managed – an opportunity. This section first gives a brief general introduction into the topic, followed by an overview of migration and development in Kosovo, as well as an analysis of the Kosovar diaspora in Germany. It then goes on to outline migration policies in Kosovo and the concept of global skills partnership. The section closes with recommendations on how circular migration can support a prosperous and sustainable energy transition in Kosovo.

Migration and development at international level

The connections between migration and development drew increasing attention in 2003 when the then United Nations (UN) Secretary-General, Kofi Annan, appointed the Global Commission on International Migration, putting migration on the global agenda. The commission's report shifted the focus from the downside of migration for development ("brain drain") to the potential benefits. During the first High-Level Dialogue on Migration in 2006, the member states agreed to initiate the informal, non-binding and government-led annual Global Forum on Migration and Development.

The Sustainable Development Goals (SDGs) recognize the integral role of migration in and its immense contribution to sustainable development. The SDGs acknowledge international migration as a multi-dimensional reality of major relevance for the development of countries of origin, transit and destination. They require countries to cooperate to ensure safe, orderly and regular migration, with full respect for human rights and the humane treatment of migrants, regardless of migration status of refugees and of displaced persons.

The Global Approach to Migration and Mobility is the European Union's first comprehensive approach to migration and development. It is a framework for dialogue and cooperation between the EU member states and the most important partner countries of Eastern Europe and the Mediterranean through mobility partnerships.

The cooperation on migration issues between the European Union and the Western Balkan states is being negotiated under Stabilisation and Association Agreements (SAA) on a bilateral basis. The abolition of visa requirements for Kosovo citizens, thereby enabling visa-free short stays for Kosovars in the Schengen area, are part of the SAA, which also covers asylum issues, combating irregular migration and readmission.

Diaspora and development

While agreeing that development agendas should aim to abolish root causes for migration pressure, the international community is seeking more and more to recognise and leverage the positive impact migration may have on development.

Regarding the transfer of knowledge and skills, for example, a massive "brain drain" can be very problematic for developing countries. But countries of origin may also benefit from "brain gain"

– when migrants acquire new skills abroad and bring these back home when returning temporarily, permanently or virtually. If migrants are working in jobs below their qualifications – at home or abroad – the result can be “brain waste”.

Crucially, migrants and diaspora communities also contribute to the development of their countries of origin through remittances. These can either be social transfers (such as ideas, innovations, attitudes or values) or financial transfers (such as direct contributions to household income, or investments). Usually, remittances are direct transfers to migrants’ families and friends back home, yet they can also be funds that are invested, deposited or donated to public projects in the country of origin.

According to the World Bank[101], worldwide remittances accounted for around 492 billion € in 2016, of which 368 billion € was sent to developing countries. Although there are large informal and unreported flows, this amount is already three times the total value of global foreign aid.

Circular and triple-win migration

The emphasis on the reciprocal links between migration and development has made the term “circular migration” fashionable in policy circles. Although there is no generally agreed definition, it is taken to mean “repeated migration experiences involving more than one emigration and return”.[102] Circular migration has frequently been characterised as a “triple win” scenario and is strongly associated with labour migration.

In times of severe unemployment, an outflow of migrants can be a key strategy in countries of origin to relieve a labour surplus or to ease unemployment or social tensions. It enables destination countries with ageing societies and severe skill shortages to meet labour needs in a flexible and timely way, and increase productivity.

Migration can provide migrants and their families with a framework to gain qualifications and access to income opportunities, and improve their material situation. The reasons why an individual chooses to migrate are often many and complex. Personal relationships, family circumstances, family or friends abroad, persecution, poverty and vulnerability of various kinds are among the factors behind people’s decisions to migrate.

Migration is often analysed in terms of the “push-pull model”, which looks at the push factors that drive people to leave their country (such as economic, social or political problems) and the pull factors attracting them to the country of destination (such as job opportunities, improved living conditions, education, and political or religious freedom). The combination of both factors influences the extent and direction of migration movements.

6.1 Migration and development in Kosovo

The shift to circular migration in general has come through “a rather sudden realisation that remittances have become a major economic resource”.[103] By sending money home, migrants improve the incomes of family members still in the country of origin – money that can be invested in education, health and infrastructure, and in businesses that create jobs and hence provide incomes. In

101 Worldbank (2017): Republic of Kosovo. Systematic Country Diagnostic. https://openknowledge.worldbank.org/bitstream/handle/10986/26573/Kosovo-SCD-FINAL-May-5-C-05052017.pdf?sequence=1&isAllowed=y [accessed 23.03.2018].

102 Wickramasekara, P. (2011) Circular Migration.A Triple Win or a Dead End? Global Union Research Network. Working Paper no. 15. p.9. http://www.migration4development.org/sites/m4d.emakina-eu.net/files/no15-mar11-circular-migration-a-triple-win-or-a-dead-end.pdf [accessed 23.03.2018].

103 Vertovec, S. (2007) Circular Migration. The way forward in global policy? International Migration Institute, Working Paper No. 4. https://www.imi.ox.ac.uk/publications/wp-04-07 [accessed 23.03.2018].

2015, remittances from the Kosovo diaspora amounted to a record of 745 million €, representing the largest source of external financing for Kosovo and ranking the country regularly among the top 20 recipients in the world relative to the size of the domestic economy (ranging from 13% and 17% of GDP in recent years, according to the World Bank). The actual total of remittances is likely to be significantly higher, as considerable amounts of cash are not transferred via the banking system.

According to the United Nations Development Programme (UNDP)[104], migrant remittances in Kosovo represent a stable source of income, act as a safety net for many households and help relieve pressure on the government budget by replacing social benefits. Approximately 25% of households in Kosovo have access to international remittances in the form of money or goods. There are more beneficiaries of remittances in rural areas than in urban areas. The annual amount received varies from less than 500€ (20%) to more than 5,000€ (15%) per household. Most of the international transfers came from Germany (38%) and Switzerland (22%) in 2016 (Central Bank Data). Diaspora spending during annual visits to Kosovo has considerable macro-economic effects.

Migrants and the diaspora also contribute to Kosovo's economic development by setting up enterprises themselves or helping families and relatives to do so through beneficial transfer of know-how and skills. It is estimated that 25% of all businesses in Kosovo were set up with partial or complete funds generated from work abroad. Switzerland and Germany are the main countries where Kosovars worked before starting up businesses in Kosovo.

Socio-economic context, migration motives and trends

Even though Kosovo has enjoyed a steady economic recovery since the Kosovo War, it remains the poorest country in the region, with around 30% of the population living in poverty and 10% in extreme poverty. Many families could hardly survive without the remittances they receive.

In contrast to the general trend of shrinking and ageing populations in Europe, Kosovo's population is the youngest in Europe, with an average age of about 30. Although this is presented as one of Kosovo's comparative advantages, it is also a major challenge. At current growth rates, the economy cannot absorb the estimated 36,000 young people who enter the labour market every year.

Furthermore, one in every three young Kosovars is neither in education, employment nor in training (so-called NEET). In 2016 Kosovo earned a spot at the bottom end of the 72-country ranking (with only Algeria and the Dominican Republic worse off), after having participated for the first time in the Programme for International Student Assessment (PISA), run by the Organisation for Economic Co-operation and Development. This shows the dramatic challenges facing the education system, especially the transition from education to the labour market.

The lack of well-qualified and educated young Kosovars at all skill levels remains one of the biggest obstacles to Kosovo's development, especially for the Kosovo economy. Vocational education and training is not always of sufficient quality to ensure the employability of the workforce the qualifications obtained do not always match those needed by employers. Moreover, weak links to the labour market mean there are few opportunities for students to obtain relevant work experience in internships. The paradoxical outcome is that despite youth unemployment of around 60%, vacancies cannot be filled by Kosovar workers, especially in engineering but also in craft professions.[105]

Consequently, about half those aged 18 to 36 plan to leave the country, opinion surveys have revealed, with the main reason being the unfavourable economic situation.[106] This age group accounts

104 UNDP (2015): Kosovo Human Development Report 2014. Migration as a Force for Development. http://hdr.undp.org/sites/default/files/khdr2014english.pdf [accessed 23.03.2018].

105 Sauer, M. (2018) Kosovo Mobilitiy Platform. Ein holistischer und potentialorientierter Ansatz zu zirkulärer Migration. In: Clewing, C.; Dzihic, V. Das neue Kosovo. Eigenstaatlichkeit, Demokratie und „Europa" im jüngsten Staat des Kontinents.

106 UNDP (2015): Kosovo Human Development Report 2014. Migration as a Force for Development. http://hdr.undp.org/sites/default/files/khdr2014english.pdf [accessed 23.03.2018].

for the biggest number of migrants. The average migrant is 20 to 34, has no training, is unemployed, disillusioned and poor.

Lacking substantial official circular or seasonal labour programmes, some opt for illegal migration or seek asylum in the European Union. Between January and October 2015, around 32,000 Kosovar nationals initially applied for asylum only in Germany.[107]

6.2 The Kosovo diaspora in Germany

Many Kosovar Albanians fled from Yugoslavia to Turkey due to repressive policies during the early 1960s. A second phase of migration was caused by a low level of industrial development and a high unemployment rate during the late 1960s, when the wave of "gastarbeiter" (guest workers) moved mostly to Germany (75%), Austria (9%) and Switzerland (6%).[108] A further wave of emigration in the 1980s was prompted by a political crackdown after the death of Tito, Yugoslavia's leader, and persistent underdevelopment of the country. During the early 1990s, better-educated, skilled and better-off Kosovar Albanians of the nationalist elite from urban areas, including young men seeking to avoid military service in the Yugoslav Army during the Balkan wars, migrated to Europe, especially to Switzerland and Germany, with their already established Albanian diaspora.

The civil wars within the different republics of the former Yugoslavia and the outbreak of the war in Kosovo in 1998 led to a phase of mass emigration – more than 800,000, according to UNDP.[109] Most refugees remained in the region, including 442,000 in Albania and 250,000 in Macedonia, but many European countries, Germany and Switzerland in particular, granted Kosovo Albanians temporary or permanent asylum status. As political stability returned after 1999, many chose to return or were repatriated to Kosovo.

Organisation and characteristics of the diaspora

There is still no reliable census data on migration in Kosovo, so it remains difficult to obtain accurate information about the Kosovar diaspora. The biggest established communities, together comprising up to 60% of migrants, are in Germany with 323,000[110] and Switzerland with 175,000 Kosovar Albanians[111]. Both figures include naturalized members of the Kosovo diaspora.

Most Kosovar Albanians who migrated to Germany and Switzerland in the 1970s were initially seasonal workers. They arrived as unqualified labour and had limited financial resources to send back to Kosovo. Many still work in construction, catering and other services. The main concern of the members of this first generation within the Kosovar diaspora seems to be educating their children, improving their living standards and integrating into the host society.[112]

Members of German Albanian-speaking associations often come from different Albanian-speaking areas of Southeastern Europe. Although most are connected to Kosovo, the German Albanian-speaking

107 Bundesamt für Migration und Flüchtlinge (BAMF) (2015) Länderreport Kosovo. https://www.ecoi.net/en/file/local/1195248/4543_1432796577_kosovo-laenderreport-2015-05.pdf [accessed 23.03.2018].

108 Baucic, I.; Groß, B. (1987) Die Auswirkungen der Arbeitskräftewanderungen in Jugoslawien. In: Lohmann, R.; Manfrass, K. Aus Länderbeschäftigung und internationale Politik.

109 UNDP (2015): Kosovo Human Development Report 2014. Migration as a Force for Development. http://hdr.undp.org/sites/default/files/khdr2014english.pdf [accessed 23.03.2018].

110 Statistisches Bundesamt (2016): Bevölkerung und Erwerbstätigkeit. Bevölkerung mit Migrationshintergrund. Ergebnisse des Mikrozensus 2015. https://www.destatis.de/DE/Publikationen/Thematisch/Bevoelkerung/MigrationIntegration/Migrationshintergrund2010220157004.pdf?__blob=publicationFile [accessed 23.03.2018].

111 Gashi, A.; Haxhikadrija, A. (2012) Social Impact of Emigration and Rural-Urban Migration in Central and Eastern Europe Final Country Report. www.ec.europa.eu/social/BlobServlet?docId=8859&langId=en [accessed 23.03.2018].

112 Novinscak Kölker, K. (2016) Migrationsnetzwerke zwischen Deutschland und den Herkunftsstaaten Republika Albanien und Republik Kosovo. Studie im Auftrag der Deutschen Gesellschaft für Internationale Zusammenarbeit. http://uni-regensburg.academia.edu/KarolinaNovinscakK%C3%B6lker [accessed 23.03.2018].

associations are not clearly grouped according to countries of origin. As part of a non-representative study, 204 German Albanian-speaking and registered associations with Albanian and Kosovo connections have been identified.[113]

The largest organized associations in Germany are Albanian-language or cultural associations whose activities often cover education or sporting activities. Homeland activities and joint project work include fundraising for those in need or providing housing for homeless families in Kosovo.

Second-generation diaspora and student associations

The second and third generations of the Albanian diaspora in Europe have acquired better education and more white-collar jobs. They are a confident group that is interested in fostering development in their country of origin through know-how and technology transfer, business start-ups and short stays in Kosovo for internships or academic visits.

These generations are much less interested in sentimental or patriotic reasons for sending remittances and getting involved in Kosovo, looking instead for opportunities and challenges. Several young entrepreneurs have used savings and know-how acquired abroad to start successful businesses in the promising sector of IT and services (including call centres) in Pristina. Having dual citizenship makes travelling, living and working in two worlds easier for most of the younger members of the Albanian diaspora. Another relevant and active group, which is critically following the developments in Kosovo and urging for more transparency and political participation, are the German Albanian-speaking student, alumni and academic associations.

Diaspora business unions in Germany

A few registered Albanian-speaking organisations in Germany are active in the field of private sector development and involve mostly Kosovar Albanian entrepreneurs who live and work in Germany.

The German Albanian-speaking business associations unite a wide range of entrepreneurs, ranging from construction companies and craft enterprises to catering businesses, law firms and other small businesses. According to the association Union Business, there are more than 3,000 companies with more than 10 employees throughout Germany that are led by Albanian-born entrepreneurs, most of them in the construction industry.

6.3 Migration and diaspora policies in Kosovo

Although the potential contribution of migrants and the diaspora to Kosovo's development has been acknowledged, little has been done to develop appropriate and consistent policies that could make use of that potential.

Like other countries that have begun pursuing policies that attempt to engage with their diaspora populations, the Kosovo government has finalised a Diaspora Law and several strategies on diaspora and migration. These deal with many issues, from preserving cultural and linguistic identity to facilitating investments and institutionalising the diaspora's political participation. The relevant ministries lack substantial financial and human resources, however, so the impact of their activities – for example, to stimulate diaspora investments by founding Unions of Diaspora Entrepreneurs across Australia, Europe, Turkey and the United States – has been limited so far.

113 Ibid.

Little surprise, then, that the potential of the diaspora to invest in Kosovo remains underutilized. Most members of the diaspora do not see investing in Kosovo as a priority and view the business culture in Kosovo as an obstacle. They complain about corruption, lack of basic infrastructure and lack of reliability. Most potential migrant investors also remain hesitant to invest in Kosovo because of a pervading perception of abandonment by their "homeland" after having contributed for decades to its political development.

In addition, German-Albanian companies in Germany are struggling with a severe shortage of junior staff and apprentices, which the domestic labour market in Germany cannot sufficiently cover.

But recruiting potential employees from Kosovo is difficult because of the approval procedures of the Federal Employment Agency and the limited visa processing capacity at the German Embassy in Pristina, where applicants wait up to eight months to get an appointment.

National migration strategy

The national migration strategy 2013-20, which was developed and published by the Kosovar Ministry of the Interior, is in line with all international and legal obligations, especially regarding Kosovo's hoped-for accession to the European Union. Its core focus is managing migration efficiently and promoting migration-related development potential. The political reorientation of the Kosovar migration policy was fostered by the general socioeconomic conditions and the experience of thousands of Kosovar asylum seekers in late 2014 and early 2015, when the government and its European partners decided to focus more on labour migration in order to prevent illegal migration and open up new legal pathways for migrant workers.

Kosovo's government welcomed the announcement of the German Ministry of Labour and Social Welfare on improved employment opportunities for Kosovo nationals in 2015. The new regulation for Western Balkan citizens was the German response to the sharp rise in asylum migration from the region and highlighted the main political and economic objectives regarding migration of all stakeholders involved.

Since the end of 2015, citizens from the Western Balkans have been able to come to Germany as labour migrants, regardless of their qualifications, if they have a job offer and consent to employment from the German Agency for Employment. At the same time, the number of asylum applications submitted by nationals from Western Balkan countries, which have been declared safe countries of origin, has fallen sharply. Asylum seekers must now return to their countries of origin before applying if they do not want to lose the chance of legal labour migration.

Between January 2016 and September 2017, the German Agency for Employment granted 100,500 consents to take up employment under the Western Balkans regulation. Kosovo nationals accounted for 38%, the largest share. This total indicates a high level of interest among nationals of these countries as well as in the private sector. However, in 2016 and the first nine months of 2017, only 38,000 visas were issued by the relevant diplomatic missions abroad, 8,600 of which were for Kosovars. Capacity bottlenecks and long waiting times at foreign missions are hampering the implementation of the Western Balkans regulation.[114]

114 Brücker, H.; Burkert, C. (2017) Westbalkanregelung: Arbeit statt Asyl? https://www.iab-forum.de/westbalkanregelung-arbeit-statt-asyl/?pdf=6011 [accessed 23.03.2018].

Facilitating circular labour migration

Despite the impediments mentioned above, liberalising the visa regime presents a huge improvement for many Kosovars after many years with few legal ways to travel to the European Union. Moreover, the new Western Balkans regulation is a fundamental achievement for the Kosovo government and the Ministry of Labour and Social Welfare (MLSW). They have reached one of their main strategic goals: to promote legal labour migration by facilitating travel to the EU and helping citizens benefit from circular migration. The other strategic objective is reducing labour market pressure and unemployment, by increasing skill development and improving the functioning of the labour market. This objective incorporates the increase in the MLSW's institutional capacities to lead and manage labour migration development and the reform and modernisation of the Public Employment Service (PES).

The German government is helping the Kosovar stakeholders to address these goals, to provide quality vocational training that corresponds to labour market needs and to cooperate with the private sector. The established cooperation between the Kosovo Employment Agency and the German Agency for Employment is focusing on the reintegration, employment and training of returnees and repatriated Kosovars, helping them to obtain the skills and training they need to re-enter the local labour market.

Piloting best practice examples

To reap the potential benefits of migration, the migration process needs to be managed efficiently. That is why the Kosovo Ministry of Labour and Social Affairs (MLSW) is using its established links with the German Agency for Employment to develop a consistent labour migration policy approach. In close cooperation with German employers and with institutional support from the German Society for International Cooperation (GIZ), the ministry is piloting circular migration schemes in strategically relevant sectors.

The crafts sector: The Chamber of Crafts (Handwerkskammer) of Dortmund has been working for several years to improve the training and education of young people in Kosovo in cooperation with local vocational schools, the Kosovo Chamber of Commerce (Oda Ekonomike e Kosoves) and GIZ. This commitment is a best practice example of how transnational know-how transfer can succeed. Since 2013, the projects have been enabling young Kosovars who are interested in practical training to gain professional knowledge in various craft sectors through a qualification scheme that is based on the German dual training system.

At the moment, two training projects are being implemented: a dual vocational training of young Kosovars in Germany and a training programme for practice-oriented further education in the automotive sector and metalworking in Kosovo. Between 2013 and 2017, 20 young apprentices from Kosovo completed their training at German companies in Dortmund and the surrounding area. Subsequent demand from German companies for these well-educated and highly motivated young workers was high.

Most participants preferred to postpone their planned return to Kosovo and stay in Germany to gain more work experience and qualifications. Many are striving to obtain a permanent residence permit, which is granted after several years of work in Germany and could enhance their options and further mobility between Kosovo and Germany.

German stakeholders stopped bringing more young people from Kosovo to Germany for training after thousands of asylum seekers migrated in 2014 and 2015. Instead, a training programme has been set up in Kosovo that uses local vocational schools to improve income and employment opportunities.

The health care sector: Despite the global shortage in skilled labour in the health care sector, Kosovo has up to 12,000 unemployed professionals in this field. In November 2015, representatives of Diakonie Württemberg (the social welfare service of the Protestant churches in Württemberg), the Kosovo non-governmental organization Employment Promotion Agency Kosovo (APPK), GIZ and the MLSW signed an agreement on a joint project for the placement of young Kosovars in geriatric care education in Germany. Fifty-four young Kosovars began their three-year vocational training in autumn 2016.

Bilateral public private partnerships

APPK, which is also supported by an expert financed by the GIZ in its efforts to develop innovative measures for active labour market policies, plays a crucial role in Kosovo. APPK is regarded as a market leader in implementing placement projects in the health sector. It is contributing its expertise to both pilot schemes mentioned above, including helping to select and prepare candidates, and handle formalities.

The pilot projects represent a unique public-private partnership, bringing together the state (MLSW), the private sector (Chamber of Commerce and Industry), as well as a charitable organisation (Diakonie Württemberg), civil society actors of the diaspora (Albanian Academics) and donor organisations (GIZ, German Agency for Employment). Both pilot projects, which aim to bring back to Kosovo skilled workers trained in Germany, show the relevance and the opportunities of circular labour migration schemes at the state level. And both are being used by the MLSW as a blueprint to learn from the practical experiences gained, representing an excellent basis for developing and implementing future programmes, for example in the renewable energy sector.

6.4 Global skills partnerships

For migration to become an effective tool for development, it is necessary to design the right complementary policies and programmes, including those relating to social protection in the countries of origin. A lot can go wrong with labour migration: migrants can indebt themselves to pay exorbitant sums to dubious recruiters, be exploited in their workplaces, work under precarious conditions, or work below their qualifications due to non-recognition of skills. Countries of origin can face brain drain, with the departure of highly qualified people whose education was subsidised by the state and whose knowledge and skills would have been useful in the development of their own country. Moreover, much of the responsibility for managing the de facto problem that brain drain entails for certain countries of origin is put on these countries themselves, while remittances cannot offset their loss in education costs, productivity and innovation power.

Global skills partnerships have therefore been proposed in which countries of origin and destination agree ex ante on how to share the costs and benefits of creating skills for both countries' needs, while preserving workers' freedom of mobility.[115] The proposed bilateral agreements can be established in any technical field that is in global demand. In two-track technical training schools, participants can opt for an "away" or a "home" track. An "away" track that prepares students to work abroad in a developed country – permanently or temporarily – could be financed either by destination country employers or governments, or by the graduate's future earnings. A "home" track would train students to work in related jobs on the local job market and could be partly subsidised from financial gains generated through the "away" track. Innovative partnerships like these are better

115 Clemens, M. A. (2014) Global Skill Partnerships. A Proposal for Technical Training in a Mobile World. Center for Global Development CGD, Policy Paper 40. https://www.files.ethz.ch/isn/179555/clemens%20global%20skill%20partnerships%20cgd%20web.pdf [accessed 23.03.2018].

instruments to address concerns about labour migration than alternative policies such as enforcing limits on migration.

Skill mobility and skill creation in Kosovo

Existing labour migration programmes in Kosovo have mostly followed ad hoc decisions and tend to be isolated activities. In contrast, an example in the construction sector, based on the experiences gained from the piloted labour migration schemes in the health care and crafts sectors, takes into account the concept of skills partnerships and provides an advanced focus on fostering circularity.

The Ministry of Labour and Social Welfare (MLSW) of the Republic of Kosovo, the Employment Agency of the Republic of Kosovo, the Bavarian Construction Association (Landesverband Bayerischer Bauinnungen) and GIZ concluded an agreement at the beginning of 2017 aiming to improve the strategic development of the construction sector and vocational education and training in this field in Kosovo, by offering young Kosovars a two-year dual training course (Ausbildung) in Germany.

The construction industry, which is also relevant to the fields of renewable energy and energy efficiency, was identified as a sector in which development potential can be realized at all levels and for all parties involved. Applying the idea of circular migration, the project is aiming to tap diverse development potential, in particular through capacity and skill development (brain gain) and through the transfer of technology and innovation provided by the German partners.

The young Kosovars and the participating companies have been prepared accordingly, through language courses and assistance with the necessary administrative processes. The training is closely monitored by the project partners through a buddy program and peer-group activities in both countries.

A core objective of the cooperation is to provide concrete incentives for a return to Kosovo at the end of the migration cycle. Potential returnees trained in Germany will be given firm job offers (e.g. as a multiplier in a vocational schools) and granted support to start up their own businesses upon their return. This might include technical and financial assistance from GIZ in form of know-how and salary top ups.

6.5 Recommendations for circular migration to support a prosperous and sustainable energy transition

The European Union plays a crucial role for Kosovo. As the main political actor and largest donor, it sets the agenda through its existing legal frameworks and obligations, including the EU accession process, ecological standards, the EU West Balkan Strategy, the Berlin Process and the EU Energy Union. These policy processes, as well as the related documents and treaties, should be systematically reviewed regarding policy coherence, contents and objectives concerning renewable energies, economic development, education, job creation and circular labour migration, to develop concerted and concrete strategic action.

Further recommendations address the Kosovar government:

Strategically promote the energy transition, renewable energy and energy efficiency as a central and priority state goal in Kosovo. Such action as a way to advance the image of Kosovo within the

Kosovar diaspora goes hand in hand with state investments in infrastructure, the creation of the necessary legal frameworks and job creation.

Promote the reform of the education system as a core investment to secure Kosovo's short-term and long-term economic development. Education needs to become a responsive, needs based and practice-oriented national instrument for combating unemployment and training skilled labour for the innovative and promising field of renewable energy.

Foster circular labour migration policies, based on the circular migration programmes that have already been piloted. Develop existing programmes into full skill partnerships in relevant areas and design new approaches in the renewable energy sector, based on the experiences gained and the innovative multi-stakeholder public-private partnerships established.

Make use of international best practice experiences to improve the relevance and adaptability of the Kosovo-German pilot programme in the construction sector, with a view to replicating it in the renewable energy sector.

Use the potential of German-Kosovar-Albanian diaspora entrepreneurs and young well-educated second- and third-generation Kosovars to boost know-how transfer and contribute to circular migration and education programmes in the field of renewable energy.

Develop a national remittance investment scheme and create legal and economic in-centives to steer remittances towards sectors relevant to renewable energy or energy efficiency. Use incentives to foster know-how transfer and business start-ups in the sector in general, especially from the diaspora.

Use Kosovo's renewable energy targets to market the country as an attractive business location for foreign direct investments and as an innovative society that is addressing its socio-economic challenges with state of the art approaches, making it a best practice example in the region.

7 Conclusion

This study examines hurdles that will need to be overcome to phase in renewable energy sources and phase out lignite in Kosovo. It provides evidence and inspiration from other countries that have tackled some of these challenges already.

After detailing the benefits for Kosovo of the transition to renewables, the report addresses the challenges from the perspectives of technology, economy and law: (1) The technological challenge of installing renewable electricity generation capacities and adequate system integration measures to balance the fluctuations of wind and solar power; (2) the economic challenge of financing these technical solutions and organising the electricity market; and (3) the legal challenge of providing the necessary certainty for investments.

Finally, the study investigated the potential role of the Kosovar diaspora for realising a prosperous and sustainable energy future. Key messages are:

In addition to the global benefit of reducing the greenhouse gas emissions that cause global warming, the **main benefits of an energy transition** based on sound policies in Kosovo are:

- an increase in business start-ups and technical innovation
- improved gross economic value added
- job creation
- new opportunities for parts of the Kosovar diaspora to return to their homeland
- stabilisation of rural communities
- peace-building.

Main challenges **fom a technological perspective** are to provide the flexibility needed to accommodate solar and wind power in an energy system, and to provide ancillary services (which keep the electricity system stable) without recourse to conventional coal-fired power plants. The main solutions, which have been deployed in many countries worldwide, are:

- timely investment in the transmission grid to enable spatial smoothing across countries
- next-generation electricity systems with intelligent control functions
- domestic sources of flexibility (demand side management and hydropower)
- storage to alleviate constraints of the transmission and distribution grids
- a more liberalised power market that provides incentives for flexible generation.

From an economic perspective, the main challenges are the significant barriers in the regulatory, policy and market frameworks for renewable investments in the region. The costs of renewable energy technologies have fallen markedly in recent years, making them competitive with fossil fuels. To reap the benefits of these cost reductions and develop low-cost projects, however, it is necessary to reduce regulatory, policy design and market design risks. Solutions include:

- government backing for power purchase agreements
- increased government capacity to expedite the granting of construction and grid connection permits
- a Europe-wide cost reduction facility that could lower financing costs by reducing the ex-ante risk profile of specific renewable projects.

From a legal perspective, the main challenge is to ensure energy law is in place that adequately supports an energy transition and long-term ambition in the energy sector. Adopting the accepted principles of energy law can provide the necessary legal certainty, lowering the risk profiles of energy infrastructure projects and thus reducing capital costs.

Circular migration offers many opportunities to promote and support Kosovo's energy transition. The emigration and return, sometimes cyclical, of Kosovo's citizens can play a crucial role in building up the skilled workforce needed by the renewables industry and mobilising investment in sectors related to renewables. Measures necessary to tap the potential of circular migration include:

- fostering circular labour migration policies
- promoting the energy transition as a central and priority state goal as a way to advance the image of Kosovo within the Kosovar diaspora
- promoting reform of the education system, including training skilled labour for the renewables industry
- replicating the Kosovo-German construction sector pilot labour migration programme in the renewable energy sector
- developing a national remittance investment scheme and creating legal and economic incentives to steer remittances towards sectors relevant to renewable energy
- creating incentives to foster business start-ups in the renewables sector, especially through using the potential of German-Kosovar-Albanian diaspora entrepreneurs and young well-educated second- and third-generation Kosovars.

8 About the authors

Matthias Buck

Matthias Buck specialises in EU electricity market integration, EU state aid rules, the 2030 climate and energy framework, the Energy Union and EU energy governance. Before joining Agora Energiewende in September 2015, Matthias worked for more than 10 years with the European Commission: in the Commission's Directorate-General for Energy; as a Commission expert seconded to the German government advising on EU aspects of the German energy transition; as a member of the cabinet of Janez Potonik, former EU Commissioner for the environment; and as EU negotiator for multilateral and regional environmental and free trade agreements. Matthias studied law, political science, economics and sociology in Germany, Spain, the United States, and the United Kingdom. He is co-author or editor of several books and has written numerous papers and book chapters. He is also co-editor of the Journal for European Environmental & Planning Law.

Dr. Kathrin Goldammer

Dr. Kathrin Goldammer has been the managing director of Reiner Lemoine Institute since 2016. She is an energy market expert focusing on energy policy, stakeholder involvement in politics, and transdisciplinary approaches to knowledge generation. Former positions include the German Academy of Science and Engineering (acatech) where she was in charge of the Energiewende Research Forum, the multi-stakeholder dialogue platform of the German Federal Ministry of Education and Research, and the Institute for Advanced Sustainability Studies IASS in Potsdam, a think tank for sustainability research, where she established the Transdisciplinary Panel on Energy Change. She also worked in the energy industry for several years. Kathrin studied electrical engineering at the Technical University of Berlin and received her PhD in Physics in 2007 after research periods in Switzerland, the United States and Japan.

Prof. Raphael Heffron

Raphael Heffron is Professor for Global Energy Law and Sustainability at the Centre for Energy, Petroleum and Mineral Law and Policy at the University of Dundee. He also holds a Jean Monnet Chair in Energy and Natural Resources Law (awarded by the European Commission). His work is international and combines a mix of energy law, policy and economics – including interdisciplinary energy research, EU and US energy law and policy. He has published over 100 publications of different types. Raphael's research has involved funding from UK national research councils (the ESRC, and the EPSRC), the European Union (in a Horizon 2020 project) and currently through the European Commission (Jean Monnet Chair). He has acted as a consultant for the World Bank and London think tanks. His research has been cited over 300 times in the last two years. Raphael is on the Editorial Board of the International Energy Law Review and is also Consulting Editor of the Halsbury's Laws of England volumes on Energy Law. Raphael read for his PhD at Trinity Hall, University of Cambridge. He is also a trained barrister-at-law and was called to the Bar in July 2007 in the Republic of Ireland. He holds degrees from the University of Cambridge (MPhil, PhD), the Uni-versity of St. Andrews (MLitt), and Trinity College Dublin (BA, MA).

Philip Hiersemenzel

Philip Alexander Hiersemenzel, B.Sc.Econ, MAIA, is a renewable energy system consultant and author with a particular focus on analysing and explaining the complex technical issues around the transition to clean energy in easy-to-understand terms. He has spent almost a decade explaining fossil fuel phase-out, 100% renewable energy systems and storage technology to a wide variety of audiences, ranging from technical experts to politicians, regulators, journalists and the public at large. He has served as advisor to, and spokesperson of, trailblazing renewable energy companies such as storage pioneers Younicos, Lumenion Energy and off-grid clean energy supplier GRIPS. Before that Philip spend 10 years working as a TV and online journalist and two as an investment banker. Philip holds degrees in economics and international relations from the London School of Economics (LSE) and Johns Hopkins University SAIS. In 2016-17 he served as an Associate Expert at the think tank "stiftung neue verantwortung" and co-authored "Network Strategy for an Energy Transition Foreign Policy", a study commissioned by the German Foreign Office.

Martin Kittel

Martin Kittel was Policy Advisor for Energy Transition Cooperation Southeastern Europe at Germanwatch at the time of contributing to this study. He now works at the Technical University of Berlin as research associate and at the German Institute for Economic Research as guest researcher. In his PhD project he specializes on the topic of transforming European electricity markets, notably in terms of infrastructure expansion planning and the optimal mix of flexibility options for the large-scale integration of renewable energy sources into the inter-sectoral energy system. Before joining Germanwatch, Martin worked with a European utility in the area of electricity market data analysis. Martin holds degrees in Business Management (M.Sc.) and Business Administration and Economics (B.Sc.) from Technical University Dresden after studying in Germany and the United Kingdom.

Dr. Christian Redl

Christian Redl is part of the European Energy Cooperation team of Agora Energiewende, where he focuses on power market design and options for cross-border cooperation in the field of energy policy. In his work, he focuses on the Southeast European and Central West European regions. From 2012 to 2013, he worked for an international energy consulting firm in the Netherlands focusing on electricity market design, power system planning and renewables integration. Before that, he worked as a research associate at Vienna University of Technology from 2005 to 2011 where he was dealing with energy scenarios and decarbonisation roadmaps. Christian studied at Vienna University of Technology and holds a PhD in energy economics.

Dr. Eva Schmid

Eva Schmid is Senior Policy Advisor for Power Grids and Low-Carbon Policy at Germanwatch. From 2012 to 2017, she worked as Post-Doctoral Researcher at the Potsdam-Institute for Climate Impact Research. Her research focus was on the development and analysis of consistent transformation strategies for the German and European electricity system that are on the one hand based on formal energy system modelling and on the other hand embrace the perspectives of actors, institutions and technologies so as to address the question of how to implement the transition towards a low-carbon economy. Between 2009 and 2012, Eva Schmid completed her PhD thesis at the Technical University Berlin and the Potsdam-Institute for Climate Impact Research in which she developed an energy system model for Germany (REMIND-D) that was applied to develop participatory energy transition scenarios for Germany. She holds a MSc in Econometrics and a BSc in International Business from Maastricht University.

Andreas von Schoenberg

Andreas von Schoenberg has a successful 30-year track record in the waste management and renewable energy industries (solar, wind and biogas) in Germany and abroad. In the 1980s Andreas was responsible for international sales and marketing at a medium-sized environmental technology company specialised in anaerobic digestion plants and waste compactors. Moving into waste management and recycling services, he established the Cleanaway brand in Germany for Australian parent company Brambles in the 1990s. Subsequently he was responsible for Cleanaway's strategic planning in Asia, Australia and Europe. After the merger with the SULO Group in 2006 and the acquisition by the international environmental services group Veolia Environnement in the following year, he managed the Business Development, M&A, Communications and Marketing departments. In 2010-12 he developed the UK business of Colexon Energy, a German solar EPC and wholesaler. In 2013 he set up Andreas von Schoenberg Consulting in Berlin, which specialises in advising public and private sector clients on energy transition and resource efficiency issues. He has an MA degree in modern languages from Oxford University.

Jurica Volarevic

Jurica Volarevic is an expert in migration and development and international development cooperation, focusing on circular labour migration, migration policy advice and the contribution of migrants and their diasporas to development. Former positions include the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) and the International Placement Service (ZAV) at the German Federal Employment Agency, where he was in charge of designing and implementing different programs fostering the global mobility and know how transfer of skilled migrants and their organisations for the benefit of destination countries, countries of origin and migrants themselves. In this regard he worked in Africa, Eastern Europe, Central Asia and the Western Balkans. Jurica studied Political Sciences at the University of Heidelberg and the Freie Universität Berlin.

Gerard Wynn

Gerard Wynn, an IEEFA energy finance consultant, is a UK.-based 10-year veteran of energy and economics reporting at the Thomson Reuters News Agency. He has authored numerous research papers on the energy industry, from solar power development in the United Kingdom to coal power in the Netherlands, Germany, China and India, and issues around renewable energy policy and grid integration globally. With IEEFA, Wynn focuses on analysing key decisions by electric utilities in Europe and the economics of proposed and existing coal-fired power plants. He has a PhD in environmental economics from the University of Aberdeen, a master's in agricultural economics from Imperial College at Wye, and a bachelor's from the University of Cambridge.

All currency conversions pursued in this study were based on the exchange rate
1 $ = 0.857 € and 1 £ = 1.13 €.

Germanwatch

Following the motto "Observing, Analysing, Acting", Germanwatch has been actively promoting global equity and the preservation of livelihoods since 1991. In doing so, we focus on the politics and economics of the North and their worldwide consequences. The situation of marginalised people in the South is the starting point of our work. Together with our members and supporters as well as with other actors in civil society, we intend to represent a strong lobby for sustainable development. We attempt to approach our goals by advocating for the prevention of dangerous climate change, for food secu-rity, and compliance of companies with human rights.

Germanwatch is funded by membership fees, donations, grants from the "Stiftung Zukunftsfähigkeit" (Foundation for Sustainability) as well as grants from various other public and private donors.

You can also help achieve the goals of Germanwatch by becoming a member or by donating to:

Bank für Sozialwirtschaft AG
IBAN: DE33 1002 0500 0003 2123 00
BIC/Swift: BFSWDE33BER

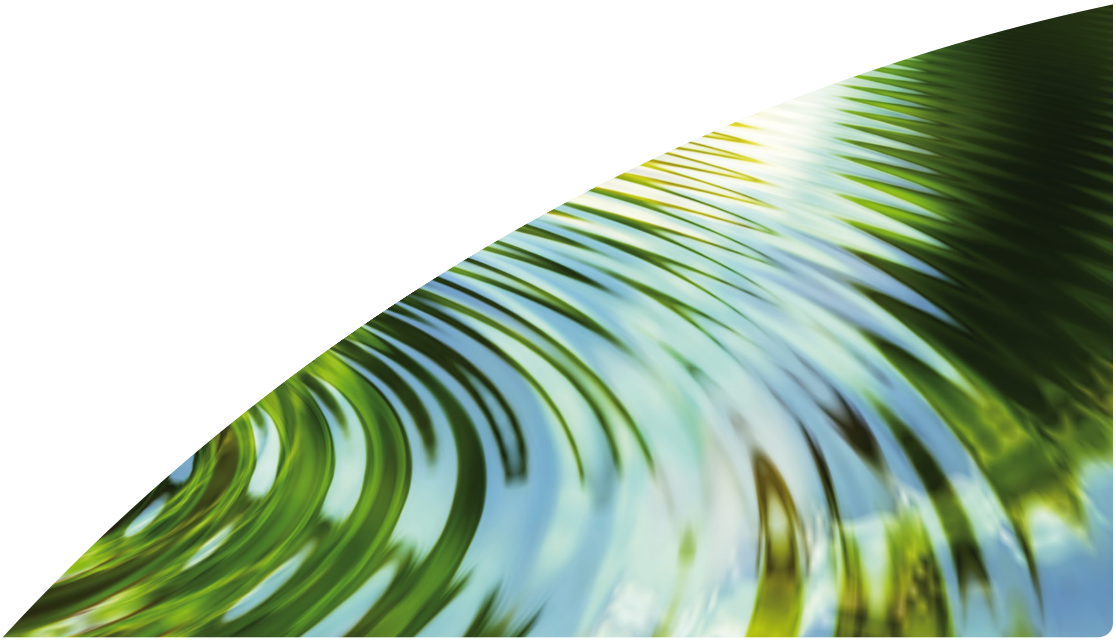
For further information, please contact one of our offices

Germanwatch – Bonn Office
Kaiserstrasse 201
D-53113 Bonn, Germany
Phone: +49 (0)228 / 60492-0
Fax: +49 (0)228 / 60492-19

Germanwatch – Berlin Office
Stresemannstr. 72
D-10963 Berlin, Germany
Phone: +49 (0)30 / 2888 356-0
Fax: +49 (0)30 / 2888 356 -1

E-mail: info@germanwatch.org

or visit our website:
www.germanwatch.org



GERMANWATCH

Observing. Analysing. Acting.
For Global Equity and the Preservation of Livelihoods.