REN21 Renewable Energy Policy Network for the 21st Century

UNECE RENEWABLE ENERGY

STATUS REPORT

2015

PARTNER ORGANISATIONS

The United Nations Economic Commission for Europe (UNECE) was set up in 1947 by ECOSOC.

UNECE's major aim is to promote pan-European economic integration. To do so, it brings together 56 countries located in the European Union, non-EU Western and Eastern Europe, South East Europe and the Commonwealth of Independent States (CIS) and North America. All of these countries dialogue and cooperate under the aegis of UNECE on economic and sectoral issues. However, all interested United Nations member States may participate in the work of UNECE. Over 70 international professional organizations and other non-governmental organizations take part in UNECE activities.

REN21 is the global renewable energy policy multi-stakeholder network that connects a wide range of key actors. REN21's goal is to facilitate knowledge exchange, policy development and joint actions towards a rapid global transition to renewable energy.

REN21 brings together governments, non- governmental organisations, research and academic institutions, international organisations and industry to learn from one another and build on successes that advance renewable energy. To assist policy decision making, REN21 provides high-quality information, catalyses discussion and debate and supports the development of thematic networks.

SUPPORTED BY

The International Energy Agency (IEA) provided invaluable co-operation in verifying data and conducting analysis on countries' energy situations in this report.

The IEA is an autonomous organisation which works to ensure reliable, affordable and clean energy for its 29 member countries and beyond. The IEA has four main areas of focus: energy security, economic development, environmental awareness and engagement worldwide.

Bloomberg New Energy Finance (BNEF) drew from its global dataset to provide crucial data on renewable energy investment in the covered countries.

BNEF has 200 staff based in London, New York, Beijing, Cape Town, Hong Kong, Munich, New Delhi, San Francisco, São Paulo, Singapore, Sydney, Tokyo, Washington D.C. and Zurich and provides unique analysis, tools and data for decision makers driving change in the energy system.

EIR Global is a development consultancy which provides services to the public sector in the areas of energy, environment, climate change, and economic and social development. EIR Global facilitates the process of reform, change and development for the public sector, private sector and general public through development projects funded by international donor agencies and financial institutions. EIR Global has extensive experience in the energy sector in Eastern Europe, the Caucasus and Central Asia and is expanding to the Middle East and Asia.

On behalf of

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

of the Federal Republic of Germany

This project is part of the International Climate Initiative (IKI). The German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB) supports this initiative on the basis of a decision adopted by the German Bundestag.

This report has been compiled within the GIZ program "Capacity Development for Climate Policy in the Western Balkan, Central and Eastern Europe and Central Asia".

As a service provider with worldwide operations in the field of international cooperation for sustainable development, GIZ works together with its partners to develop effective solutions that offer people better prospects and sustainably improve their living conditions. GIZ is a public-benefit federal enterprise and supports the German Government as well as many public and private sector clients in a wide variety of areas, including economic development and employment, energy and the environment, and peace and security.

FOREWORD

Investments in renewable energy will be a key factor in reducing the carbon intensity of the energy sector in the UNECE region in the coming years. It is imperative that member States implement a range of policies and programmes to enable cost-effective deployment of renewable energy, and in order to do so, it is essential to understand the starting point and the challenges.

The UNECE Renewable Energy Status Report contributes to this understanding by improving the quality of data, by identifying the right indicators, and by preparing tracking systems to tackle the required changes.

The report represents a comprehensive overview of the renewable energy infrastructure, industry, policy, regulations, market development and potential growth rates in 17 selected countries of the UNECE region.

Key findings of this report show high shares of renewable energy in total final energy consumption in the 17 countries – e.g. 58% in Tajikistan, 46% in Montenegro, 38% in Albania, 28% in Georgia and 22% in Kyrgyzstan. However, over the past four years, the renewable energy investments have been decreasing in these countries. They still lag behind the considerable advances achieved globally, despite their high potential for deployment of any kind of renewable energy technology.

This report is very timely, coming two months after the adoption of the 2030 Agenda for Sustainable Development with its Goal 7 on ensuring access to affordable, reliable, sustainable, and modern energy for all. UNECE - through its Committee on Sustainable Energy and the Group of Experts on Renewable Energy - will continue to assist member States with specific activities to achieve the objectives of the 2030 Agenda and of the Sustainable Energy for All (SE4All) initiative of the UN Secretary-General.

UNECE is very grateful for the support provided by the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB) to this initiative which was led by the Renewable Energy Policy Network for the 21st Century (REN21) and finalized in close collaboration with the International Energy Agency (IEA). The preparation of this flagship report benefitted from the guidance and active role of the UNECE Group of Experts on Renewable Energy and its Bureau, particularly in the phases of gathering country data and information and of reviewing key messages. It is an important first step towards tracking renewable energy progress in the UNECE region.

Christian Friis Bach
Executive Secretary
United Nations Economic Commission for Europe (UNECE)

REN21 and the United Nations Economic Commission for Europe (UNECE) have joined forces to produce the *UNECE Renewable Energy Status Report*, which covers 17 selected UNECE member countries and forms part of a series of regional reports that REN21 has developed. The countries covered in the report – the Russian Federation as well as countries in South East and Eastern Europe, the Caucasus and Central Asia – face some common challenges as they advance in deploying renewable energy and improving energy efficiency. The *UNECE Renewable Energy Status Report* puts a spotlight on this highly promising region to foster further regional activity in renewable energy as well as in the energy efficiency sector.

Renewable energy continued to expand globally in 2014 against the backdrop of rising worldwide energy consumption – particularly in developing countries and emerging economies – as well as a dramatic decline in oil prices during the second half of the year. Global new investment in renewable power and fuels amounted to USD 270.2 billion.

Despite a total population of 300 million, the selected 17 UNECE countries represented only 0.5% – or USD 0.9 billion – of global renewable energy investment activity in 2014. Modern renewables are uniquely positioned to provide needed energy services in a sustainable manner, more rapidly and generally at lower cost than fossil fuels. Their potential in South East and Eastern Europe, the Caucasus, the Russian Federation and Central Asia is significant.

Global developments in 2014 also continued to demonstrate the important role of renewable energy in the energy mix. Despite rising energy use, global carbon dioxide (CO_2) emissions associated with energy consumption remained stable, illustrating a "decoupling" of economic growth and the rise in CO_2 emissions. This was due primarily to the increased use of renewables alongside energy efficiency measures.

REN21 is committed to tracking the development of renewables worldwide. In addition to its annual flagship publication, the *Renewables Global Status Report*, REN21 works with regional partners to shed further light on renewables development in different world regions. The *UNECE Renewable Energy Status Report* complements earlier regional status reports on China, India, and the ECOWAS, MENA and SADC regions.

Launched at the 2015 United Nations Climate Change Conference (COP 21) in Paris, this report will help raise awareness about the extraordinary mitigation potential of renewable energy and energy efficiency in the UNECE region. It also will be useful for subsequent activities of UNECE and its partners, serving as a baseline for renewable energy and energy efficiency in the region.

We would like to thank UNECE, the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety, the International Energy Agency and all partners involved for the excellent collaboration throughout the production of this report. We hope that you find the information contained in this report informative.

Christine Lins
Executive Secretary
Renewable Energy Policy Network for the 21st Century (REN21)

LAUNCHED AT THE 2015 UNITED NATIONS CLIMATE CHANGE CONFERENCE (COP 21) IN PARIS, THIS REPORT WILL HELP RAISE AWARENESS ABOUT THE EXTRAORDINARY MITIGATION POTENTIAL OF RENEWABLE ENERGY AND ENERGY EFFICIENCY IN THE UNECE REGION. IT ALSO WILL BE USEFUL FOR SUBSEQUENT ACTIVITIES OF UNECE AND ITS PARTNERS, SERVING AS A BASELINE FOR RENEWABLE ENERGY AND ENERGY EFFICIENCY IN THE REGION.

ACKNOWLEDGEMENTS

This report was commissioned by the United Nations Economic Commission for Europe. Its production was coordinated by REN21 in collaboration with a wide network of partner institutions and individuals. Financial support was provided by GIZ. Over 70 experts and reviewers from across South East and Eastern Europe, the Caucasus, Central Asia, the Russian Federation and elsewhere contributed to the report's content.

LEAD AUTHOR:
Katarina Uherova Hasbani (EIR Global)

SUPPLEMENTARY AUTHORSHIP AND PROJECT TEAM:
Zuzana Dobrotková (Consultant)
Martina Repíková (Consultant)
Ludmila Burlui (EIR Global)
Andriy Mitsay (Consultant)

REN21 PROJECT MANAGEMENT:
Martin Hullin
Dennis Akande
Shweta Koshy

UNECE PROJECT MANAGEMENT:
Gianluca Sambucini
David Townsend

CONTRIBUTORS AND REVIEWERS:
Albania: Besim Islami (local co-ordinating contributor), Lira Hakani (South East Europe Sustainable Energy Policy Programme – SEE SEP)

Armenia: Levon Vardanyan (local co-ordinating contributor), Donara Vardanyan (Ministry of Energy and Natural Resources of Armenia)

Azerbaijan: Jahangir Efendiev (local co-ordinating contributor), State Agency on Alternative and Renewable Energy Sources of Azerbaijan

Belarus: Andrei Malochka (local co-ordinating contributor)

Bosnia and Herzegovina: Elvis Hadzikadic (United Nations Development Programme – UNDP), Tanja Jokić and Irma Filipović-Karadža (SEE SEP), Radovan Nikčević (local co-ordinating contributor)

Georgia: Alexander Antonenko (local co-ordinating contributor), George Abulashvili and Liana Garibashvili (Energy Efficiency Centre Georgia), Ministry of Energy of Georgia

Kazakhstan: Lyubov Inyutina (local co-ordinating contributor), Aynur Sospanova, Ministry of Energy of Kazakhstan

Kyrgyzstan: Gulsara Kasymova (local co-ordinating contributor)

The former Yugoslav Republic of Macedonia: Radovan Nikčević (local co-ordinating contributor), Darko Janevski (Winrock International), Aleksandar Dedinec (Macedonian Academy of Sciences and Arts)

Moldova: Liudmila Burlui (local co-ordinating contributor)

Montenegro: Jasna Sekulović (Deutsche Gesellschaft für Internationale Zusammenarbeit – GIZ), Bozidar Pavlović (Ministry of Economy of Montenegro), Marija Vujadinović Kulinović (renewable energy expert), Sanja Orlandić (SEE SEP), Radovan Nikčević (local co-ordinating contributor)

Russian Federation: Yurii Sergeev (Bellona), Council for Organizing Efficient System of Trading at Wholesale and Retail Electricity and Capacity Market, Maria Volkova (Ministry of Energy of the Russian Federation), Alexey Zhikharev (International Finance Corporation – IFC), Natalia Guseva (local co-ordinating contributor)

Serbia: Maja Turković (Wind Power Co.), Renate Schindlbeck (GIZ), Vojislav Milijic (National Biomass Association SERBIO), Vukašin Vućević (Ministry of Mining and Energy of Serbia), Stefan Ćetković (Environmental Policy Research Centre, Free University of Berlin), Permanent Mission of the Republic of Serbia to the United Nations, Mr. Radovan Nikčević (local co-ordinating contributor)

Tajikistan: Timur Valamat-Zade (local co-ordinating contributor)

Turkmenistan: Jorge Servert (Solar Technology Advisors), Alexander Antonenko (local co-ordinating contributor)

Ukraine: Andriy Konechenkov (State Agency on Energy Efficiency and Energy Saving of Ukraine), Alexander Antonenko (local co-ordinating contributor)

Uzbekistan: Asad Yusupkhodjaev (local co-ordinating contributor), Larisa Tashodjaeva (local co-ordinating contributor), Rakhimzhan Babakhodzhayev and Nizomiddin Rakhmanov (State Technical University of Tashkent), Rano Baykhanova (UNDP)

Regional: Esa Rugova (Burg Capital), Branislava Jovicic (Balkan Green Energy News), Cindy Tiangco (Asian Development Bank – ADB)

EXPERT REVIEW BOARD:
Ulrich Benterbusch (German Federal Ministry of Economy and Energy)
Bilyana Chobanova (Energy Charter)
Gabriela Cretu (Energy Community)
Oliver Frank (German Energy Agency – DENA)
Paolo Frankl (International Energy Agency – IEA)
Željko Jurić (Croatia)
Marina Olshanskaya (UNDP)
Julian Popov (European Climate Foundation)
Olaf Pritzkow (GIZ)
Nazir Ramzanov (Azerbaijan)
Andrea Rossi (United Nations Food and Agriculture Organization)
Anca-Maria Simion (European Commission)
Ralph Sims (Massey University)
Aida Sitdikova (European Bank for Reconstruction and Development)

PRODUCTION:
REN21 Secretariat, Paris, France

EDITING, DESIGN AND LAYOUT:
Lisa Mastny, editor
Formas do Possível - Creative Studio (www.formasdopossivel.com)

TABLE OF CONTENTS

Foreword 02
Acknowledgements 05
Executive Summary 08

01
REGIONAL INTRODUCTION
Objective of This Report 15
Regional Overview 15
Regional Energy Challenges 21
Platforms for Regional Energy Co-operation 22

02
RENEWABLE ENERGY MARKET AND INDUSTRY OVERVIEW
Final Energy Consumption 25
Power Sector 26
Heating and Cooling Sector 31
Transport Sector 33

03
DISTRIBUTED RENEWABLE ENERGY AND ENERGY ACCESS
Power Sector 35
Distributed Renewable Energy Solutions for Energy Access 38

04
ENERGY EFFIENCY
Regional Overview 41
Electricity Supply 44
Buildings 45
Lighting, Appliances and Cooking 46
Other Sectors 47

05
POLICY AND TARGET LANDSCAPE
Renewable Energy Targets and Policies 50
Power Sector 51
Heating and Cooling Sector 54
Transport Sector 54
Fiscal Incentives and Public Financing 54
City and Local Government Policies 56
Energy Efficiency Targets and Policies 56
Building Sector 57
Lighting and Appliances Sector 58
Industry, Transport and Power Sectors 58

06
INVESTMENT FLOWS
Global Overview 61
Regional Financing Sources 62
Potential of Climate Finance 63

Conclusion 66
List of Abbreviations 67
Glossary 68
Endnotes 71
Annex: Sources for Energy Efficiency Policies 81

REPORT CITATION
REN21, 2015, UNECE Renewable Energy Status Report (Paris, REN21 Secretariat)
ISBN 978-3-9815934-8-8

FIGURES, TABLES AND SIDEBARS

FIGURE 1 Overview of regional collaboration involving energy issues 23
FIGURE 2 Share of renewable energy in total final energy consumption, 2012 25
FIGURE 3 Share of renewables in total final energy consumption in four UNECE countries, 1990-2012 26
FIGURE 4 Share of hydropower in total power production, 2012 27
FIGURE 5 Renewable power installed capacity, by country, 2014 28
FIGURE 6 Solar water heating installed capacity, 2013 31
FIGURE 7 Geothermal heat installed capacity, 2013-2014 33
FIGURE 8 Share of the population with access to electricity, 1990, 2000 and 2010 35
FIGURE 9 Primary energy intensity, 1990, 2010 and 2012 41
FIGURE 10 Change in energy intensity in selected countries, 1990-2010 42
FIGURE 11 Share of total final energy consumption by sector, 2012 43
FIGURE 12 Transmission and distribution losses as a share of electricity generation in selected countries, 2000, 2005 and 2010 44
FIGURE 13 Renewable energy investment in the region, 2004-2014 61
FIGURE 14 Renewable energy investment in selected countries, 2004-2014 62
FIGURE 15 Private participation in renewable energy projects in selected countries (projects with financial closure), 2007-2012 62
FIGURE 16 Financing of Climate Investment Fund-endorsed renewable energy projects, 2008-2014 64
FIGURE 17 Selected renewable energy investment with GEF support, as of July 2015 65

TABLE 1 General overview of the UNECE region, 2014 16
TABLE 2 Energy overview of the UNECE region 18
TABLE 3 Renewable energy share of total primary energy supply (TPES) in the UNECE region, 2012 19
TABLE 4 Energy access and energy poverty status 37
TABLE 5 Selected projects providing renewable energy solutions in remote areas 39
TABLE 6 Government share of commercial building floor space in South East and Eastern Europe 46
TABLE 7 Overview of renewable energy targets 50
TABLE 8 FIT rates in selected countries 51
TABLE 9 Overview of renewable energy policies 55
TABLE 10 Overview of energy efficiency policies 56
TABLE 11 Overview of mandatory labelling policies 57

SIDEBAR 1 Renewable energy deployment in Ukraine 28
SIDEBAR 2 Use of biomass to fuel district heating systems in Belarus 32
SIDEBAR 3 Communities without electricity access 36
SIDEBAR 4 Challenges of heating in Georgia 38
SIDEBAR 5 Innovative renewable solutions for energy access in Bosnia and Herzegovina 39
SIDEBAR 6 Renewable energy policies in Bosnia and Herzegovina 49
SIDEBAR 7 Renewable energy policy in South East Europe 49
SIDEBAR 8 Support schemes for renewable energy in the Russian Federation 53
SIDEBAR 9 Moldova's policy framework for energy efficiency 59
SIDEBAR 10 Burnoye Solar: showcasing a non-recourse project finance structure in Kazakhstan 64

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

The United Nations Economic Commission for Europe (UNECE) covers a large and diverse region comprising 56 member states. These countries have different energy situations and vary in their potential for and progress in renewable energy and energy efficiency. The present report covers 17 UNECE countries[i], with the aim of establishing a data baseline and providing a general overview of their renewable energy situations.

Over the past decade, the national governments of the selected countries have been working actively to leverage this renewable energy potential. Energy security and access to reliable, affordable, sustainable and modern energy are the key concerns driving renewable energy deployment. These countries require more substantial investment to fully realise its renewable potential and to bring innovative solutions to tackle their energy challenges, such as heating in urban and rural areas. A reliable data baseline is a pre-requisite and an enabler for more investment activity.

The UNECE has contributed actively to fulfilling the 17 countries' aspirations in renewable energy by providing them with a platform for collaboration among UNECE member states. In 2014, a UNECE Group of Experts on Renewable Energy was established to step up these efforts. Its mandate is to carry out action-oriented, practical activities to significantly increase the uptake of renewable energy, in line with the United Nations Secretary-General's Sustainable Energy for All (SE4All) initiative. This *UNECE Renewable Energy Status Report* strives to present analysis of up-to-date data and information on the status of renewable energy and energy efficiency in the selected countries of the UNECE region.

OVERVIEW

South East and Eastern Europe, the Caucasus, Central Asia and the Russian Federation are very diverse in terms of their population size and their economic, social and political characteristics. However, their energy systems were developed in a similar manner and still face some common challenges as they advance in deploying renewable energy and improving energy efficiency. Several countries covered by this report are rich in fossil energy resources, such as oil, gas and coal, and five countries (Azerbaijan, Kazakhstan, the Russian Federation, Turkmenistan and Uzbekistan) are net exporters of oil and gas. Most of the countries have sizable potential for hydropower and other renewable energy resources – including solar, wind and bioenergy – yet they are all at the early stages of deployment of non-hydro renewable energy and energy efficiency.

The 17 countries face several challenges that could become drivers for renewable energy and energy efficiency deployment. Energy security challenges are key, especially in countries that are net energy importers. Some countries face power outages on a seasonal basis. Electricity generation, transmission and distribution infrastructure is ageing, as is district heating infrastructure, resulting in great inefficiencies. Energy subsidies, prevalent in oil and gas exporting countries but also still present in importing countries, are detrimental to renewable energy and some energy efficiency deployment, as energy commodities are not priced at market prices, making renewables and efficiency comparatively very expensive.

Energy intensity remains high despite notable improvements over the past two decades related to structural changes in economies and to energy efficiency efforts, and further potential for energy efficiency remains to be exploited. The energy market structure is an issue in certain countries. Lack of liberalisation makes market entry for new players (in renewable energy and other areas) extremely difficult. Administrative red tape is also slowing project implementation across the selected countries.

Regional co-operation is driven through several initiatives, but co-ordination on renewable energy is limited to the Energy Community, with its legal obligations to implement the European Union (EU) Renewable Energy Directive and binding renewable energy targets in 2020. The South East European countries of Moldova and Ukraine are members of the Energy Community, while Georgia is a candidate and Armenia is an observer. Some countries in South East Europe have EU candidate status (Albania, the former Yugoslav Republic of Macedonia and Serbia) or have opened negotiations (Montenegro), advancing the pace of renewable policies. All countries have different levels of commitment to the Energy Charter. Countries in Eastern Europe, the Caucasus and Central Asia are co-operating with the EU through the INOGATE programme.

Regional co-operation also is driven through cross-regional power trade. Transmission investment is supportive and is a pre-requisite for increased integration of renewable power in the networks. The Central Asia South Asia Electricity Transmission and Trade project (CASA-1000) is a flagship project implemented jointly by Kyrgyzstan, Tajikistan, Afghanistan and Pakistan and co-financed by the World Bank and the European Bank for Reconstruction and Development (EBRD). Other frameworks of co-operation with the EU include the Association Agreement signed by the governments of Georgia, Moldova and Ukraine in June 2014. Armenia, Georgia, Moldova and Ukraine are members of the Eastern Europe Energy

i. Albania, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Montenegro, Russian Federation, Serbia, Tajikistan, the former Yugoslav Republic of Macedonia, Turkmenistan, Ukraine and Uzbekistan.

Efficiency and Environment Partnership (E5P), supported by the European Commission and other bilateral donors.

All of the 17 countries – with the exception of the Russian Federation, Turkmenistan and Uzbekistan – have at least one city or town participating as a signatory to the EU Covenant of Mayors. Overall, although several initiatives have one or more regional dimensions, common objectives or regional targets for renewables and energy efficiency have not yet been formulated at the regional level.

RENEWABLE MARKET AND INDUSTRY OVERVIEW

The 17 countries in the region differ widely in their share of renewable energy in total final energy consumption. In some countries, these shares are driven by the persisting traditional use of biomass heating, while other countries have high proportions of hydropower in their power sectors. Countries with high shares of renewable energy in total final energy consumption include Tajikistan (58%, hydropower), Montenegro (46%, traditional biomass uses and hydropower), Albania (38%, mostly hydropower but also some traditional biomass uses), Georgia (28%, mostly hydropower but also some traditional biomass uses) and Kyrgyzstan (22%, hydropower).

The share of renewable energy use in power generation differs widely among the 17 countries. Albania, Kyrgyzstan and Tajikistan run their power systems almost exclusively on hydropower, whereas in Georgia and Montenegro, hydro represents more than half of electricity produced in the country. Although the Russian Federation has the largest total hydropower production of the selected countries, hydro's share of total power generation in Russia is lower, due to the size of the country's power system.

Other renewable power technologies are nascent in the 17 countries, with significant deployment only in Ukraine (mostly solar photovoltaics (PV) and onshore wind). Smaller developments exist in Azerbaijan, Kazakhstan, the former Yugoslav Republic of Macedonia, Montenegro and Serbia (mostly onshore wind, solar PV and biogas/biomass installations). Although rural electrification is not a central issue for the countries, distributed renewable energy solutions such as solar PV, small-scale wind, biomass and micro-hydro can be practical solutions for remote electricity generation and in places with power outages or unstable power.

The 17 countries have potential to further develop their renewable energy sources beyond hydropower. Sizable solar PV potential exists in all countries, and insolation is particularly strong in South East Europe, the Caucasus, Central Asia and southern regions of the Russian Federation, improving the economics of potential solar PV generation in these countries. Onshore wind resources are present in all of the countries, with particularly large resources in Kazakhstan, the Russian Federation and Ukraine. South East Europe, Eastern Europe and the Russian Federation have large biomass resources, which are only partially exploited. Concentrating solar power (CSP) potential exists in the Central Asia region and in parts of the Russian Federation, and confirmed high-temperature geothermal resources suitable for power generation are present in a few sites in the Russian Federation. Other countries may have modest geothermal resources, but their suitability for power generation needs to be confirmed.

The penetration of modern renewable energy technologies for heating and cooling in the 17 countries is modest. Solar water heating installations exist in a few countries (Albania, Armenia, the former Yugoslav Republic of Macedonia, the Russian Federation and Ukraine) and could be economically developed in all of the countries. The potential for bioenergy-based renewable heat is great. In selected places with district heating networks, these could be converted to be fuelled by solid biomass or biogas (for example, the World Bank-financed Biomass District Heating Project for Belarus aims to scale up the efficient use of renewable biomass in heat and electricity generation in selected towns in Belarus).

Despite biofuels targets in several countries and ample bioenergy potential, capacities for production of liquid biofuels can be found only in Belarus (biodiesel), the former Yugoslav Republic of Macedonia (biodiesel) and Ukraine (ethanol).

DISTRIBUTED RENEWABLE ENERGY AND ENERGY ACCESS

Access to affordable, reliable and sustainable energy is a challenge for low-income and rural populations in the region, despite its endowment in energy sources. Some children still study in under-heated classrooms. Households burn low-quality fuel wood for heating and cooking in stoves that have conversion efficiencies of 20% or less. A few rural settlements in remote areas lack electricity access. Although electrification rates are very high comparing to the global electrification rate, several countries in the region report high use of polluting and health-damaging solid fuels for heating and cooking. To improve the quality of energy access, national governments and international donors are promoting emerging renewable energy solutions.

From a global perspective, the region has high electricity access. Although 1.2 billion people worldwide lack access to electricity networks, 15 out of 17 countries in the region had electrification rates of 100% of their population in 2010 (the exceptions being the former Yugoslav Republic of Macedonia and Moldova). In 2012, all 17 countries reported 100% electrification rates. Still, a discrepancy remains between reported rates and the situation on the ground, where a small number of remote settlements and rural communities continues to lack access to electricity. The reasons vary by country and include a history of conflict or changes in the sources of electricity supply.

Beyond electricity, the region faces a variety of energy access challenges. In some countries, populations that rely largely on solid fuels for heating and cooking still face issues related to low reliability (power outages), affordability (high rates of energy poverty), supply quality and health. Power outages continue to occur in several countries, especially in areas of the Caucasus and Central Asia that have poorly maintained and ageing energy infrastructure. Access to non-solid fuels is the greatest factor affecting energy access in the region. Almost 13 million people across the 17 countries still rely on polluting and health-damaging solid fuels to meet their cooking and heating needs.

A mix of ad hoc projects financed by international donors and government programmes has been adopted in the region to promote renewable energy solutions that improve the quality of the energy supply. Most of the projects documented in this report address heating for residential use using solar thermal systems. Only Montenegro has a government programme providing support for the conversion to modern biomass, which can be accessed by low-income households in remote areas as well. Uzbekistan has a national standard for biogas-based systems. Another potential solution in households with a more reliable electricity supply is geothermal heat pumps, provided that local economics allow it.

Financing the switch to renewable energy solutions is an issue for local populations. So far, such efforts have been covered through grants from international donors or contributions from government budgets. Innovative business solutions have yet to emerge to cover project roll-out at a large scale as well as investments in the renewable fuel supply chain (e.g., wood pellets). Electricity access is being addressed through fewer initiatives, given the limited scale of the issue. Only Tajikistan has a renewable energy target specifically for enabling electricity access in remote communities that are not connected to the national grid. In terms of non-hydro renewable options, solar PV is being used in several countries.

ENERGY EFFICIENCY

The selected UNECE countries have made significant progress in reducing their energy intensities since 1990, but energy intensity (which is not a substitute for energy efficiency indicators) is no longer decreasing. Most of the countries still face high losses in their electricity, natural gas or district heating transmission and distribution networks. Barriers to more-systematic market development for energy efficiency include the lack of (or inadequate) institutional frameworks. Another barrier to deployment of energy efficiency projects is the availability of sizable public or private funding. This is more relevant in Eastern Europe, the Caucasus and Central Asia than in South East Europe, where funding is available from international donors, although the absorption capacity at a local level is weak.

Countries of South East and Eastern Europe, the Caucasus and Central Asia continue to face challenges in improving the efficiency of their electricity supply, despite ongoing modernisation of their electricity infrastructure. Most countries in Eastern Europe, the Caucasus and Central Asia still had high electricity transmission and distribution losses in 2011 (the most recent year for which regional data are available), and some of them had losses more than three times the EU average of 6.2% of electricity output.

The building sector has considerable potential in the selected countries. In South East Europe, buildings represent around 50% of final energy consumption and a significant opportunity to achieve energy savings, in the range of 20-40%. Armenia's National Program on Energy Saving and Renewable Energy estimates an energy savings potential of 40% in the country's building sector, and in the Russian Federation, deep retrofits in residential buildings could result in 50% savings. International donors are actively supporting energy efficiency projects in buildings through adequate policies, reinforcing of institutional capacity and financing of retrofits. Given the importance of thermal use in buildings and the widespread use of poorly maintained and inefficient district heating systems in these countries, this area holds high energy-savings potential.

Efficient lighting, appliances and cooking could further contribute to improving energy efficiency in buildings, but their deployment in the market is a complex process driven by regulatory policies. For example, Ukraine provides partial reimbursement of loans for residential energy efficiency equipment under the State Target Economic Program on energy efficiency. Kyrgyzstan, meanwhile, has identified energy efficiency labelling as a priority, but no action has been carried out. Outside South East Europe, only Kazakhstan, the Russian Federation and Tajikistan have phased out inefficient incandescent light bulbs from their markets.

Initiatives to improve energy efficiency in the region's industry and transport sectors are less common, due in part to less-developed policy and regulatory instruments. Achieving better efficiency in industry faces multiple challenges, including high upfront costs, concerns about competitiveness and the existence of energy subsidies. Most of the countries host projects financed by international donors and development banks, which target improving energy efficiency in industry and include voluntary or mandatory energy audits and the introduction of energy management.

POLICY AND TARGET LANDSCAPE

Policies and targets are essential drivers for the deployment of secondary regulations and for attracting investment in renewable energy and energy efficiency projects. Some positive progress has been made in South East and Eastern Europe, the Caucasus and Central Asia, as well as in the Russian Federation. Yet there remains significant room for improvement of policies and regulations in these countries in order to fully unleash the available potential of renewable energy and energy efficiency.

All 17 countries, with the exception of Turkmenistan, have strategic documents outlining their priorities in at least one renewable energy technology. Part of this effort is the adoption of targets and regulatory policies for renewables deployment. All countries except for Georgia and Turkmenistan have renewable energy targets. Two countries – Turkmenistan and Uzbekistan – have no regulatory policies for renewable energy.

The most common support for renewable power generation is feed-in tariffs, which are used in 12 of the 17 countries (the exceptions are Moldova, the Russian Federation, Tajikistan, Turkmenistan and Uzbekistan). Tendering is used in Albania, Bosnia and Herzegovina, Montenegro and the Russian Federation. Tradable renewable energy certificates are used in Belarus and the Russian Federation. Electric utility quotas and obligations have been adopted in four countries (Albania, Belarus, Montenegro and the Russian Federation), and net metering also has been adopted in four countries (Armenia, Belarus, Montenegro and Ukraine).

The Russian Federation is using a mix of policies, including capacity-based support, which is unique in the global context. Renewable heating and cooling is supported through mandates only in Montenegro. Several countries have renewable energy targets for the transport sector, including Albania, the former Yugoslav Republic of Macedonia, Moldova, Montenegro, Serbia and Ukraine.

Various types of fiscal incentives and public financing are present in the selected countries, with the exception of three countries (the former Yugoslav Republic of Macedonia, Turkmenistan, and Uzbekistan). Several countries have approved city and local government policies promoting renewable energy.

With regard to energy efficiency targets and policies, all 17 countries are pursuing regulatory policies with the exception of Turkmenistan. All countries except for Armenia, Azerbaijan, Georgia, Kyrgyzstan and Turkmenistan have established targets. Four countries do not have any national energy efficiency awareness campaigns. Regulatory policies are most common in the building sector, followed by lighting and appliances, transport and industry. Building standards reflecting varying levels of energy performance requirements exist in all countries except Albania, Georgia and Turkmenistan. Mandatory labelling for buildings exists only in South East Europe, although not in Albania and Uzbekistan. Lighting standards exist in nine countries, and mandatory labelling for lighting exists in six countries. Mandatory labelling for appliances exists in nine countries. In the transport sector, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Montenegro and Ukraine have vehicle fuel economy and emission standards.

Albania, Belarus, Bosnia and Herzegovina, the former Yugoslav Republic of Macedonia, Montenegro and Serbia use energy efficiency targets for industry. Other instruments used in the 17 countries for industry are auditing and monitoring regulations. Energy efficiency in power generation is addressed in policies in 12 countries.

INVESTMENT

The 17 countries represented just 0.5% – or USD 0.9 billion – of the world's total investment in new renewable energy in 2014. Renewable energy investment in the region (outside large hydropower) developed erratically over the period 2004-2014, showing some positive signs during 2008-2011 (driven by growth in Eastern Europe) but then declining in 2013 and 2014. Based on selected countries where data are available, private sector investment is concentrated in large hydropower projects. The public sector plays a role in renewable energy investment in the region, with sources originating in national governments, international donors and multilateral development banks. Most of the governments provide fiscal incentives and public financing for renewables. Lending for renewable energy projects is available through national and international banks with the support of several international donors. Some investment is channelled through climate finance such as the Climate Investment Funds and the Global Environment Facility.

CONCLUSION

Over the past two decades, South East and Eastern Europe, the Caucasus, Central Asia and the Russian Federation have made strides in renewable energy and energy efficiency. Governments have developed various types of targets and policies to promote renewable energy sources across the region. From a global perspective, however, these developments remain marginal. Further project deployment and investment flows are needed to enable the region to catch up with global renewable energy market development.

In the near future, expected renewable energy developments differ by sub-region:

• Southern Europe is expected to be the most active in renewables, benefiting from its proximity to the EU and from the convergence of its industry, installers, and developers with the EU energy market. Developments are expected in solar PV, solar water heating, onshore wind and bioenergy technologies in particular. The gradual switch from traditional to modern uses of biomass would be beneficial for the region's environment and the health of its inhabitants.

• In Eastern Europe, the most active player to-date, Ukraine, is facing a complex geopolitical situation and a severe devaluation of its currency, posing major obstacles to further development of renewable energy, in particular solar PV and wind.

• In Central Asia, Kazakhstan is expected to be the biggest renewable energy player and has taken the first steps towards deployment of its substantial wind energy potential. Uzbekistan is expanding its solar capacity with support from the Asian Development Bank.

• In the Caucasus, renewable energy deployment could be driven by energy security concerns in Armenia and Georgia. Armenia is more advanced in renewables deployment but remains only in the preparatory stages, although the government recently developed a Renewable Energy Program Investment Plan.

• In the Russian Federation, due to its large size, some renewable energy development can be expected, but it will be far below the country's potential. Most of the power sector is still in the hands of the state, making entry for renewable energy actors difficult. The only pressure for new development could come from concerns about system adequacy over time, due to the ageing power infrastructure and the need to decommission significant capacity over the next decade. However, competition with new natural gas power plants will be fierce.

• In the near future, further development of energy efficiency, despite its large potential in the 17 countries, is expected to be hampered by slow policy development as well as enforcement complexities. The lack of detailed sectoral data is detrimental to the implementation of proper monitoring. In South East Europe, countries such as Albania, the former Yugoslav Republic of Macedonia and Montenegro have in place relatively

more-developed policy frameworks, which should enable increases in energy efficiency in the near future. The size of the energy efficiency market in South East Europe will be determined by the ability of market players to implement projects driven by newly introduced policy frameworks and to leverage available financing facilities.

• In Eastern Europe, the Caucasus and Central Asia, countries such as Belarus, Kazakhstan, Moldova, Tajikistan and Uzbekistan have in place the main pillars of an energy efficiency framework, which could yield benefits in the medium term provided that enforcement is adequately supported. Countries with above-average energy intensity for the region and with no or limited policies in place risk falling behind, as the competitiveness of their economies could be hampered by low energy efficiency. In Ukraine, in particular, the lack of efficiency measures in the industry sector could be of concern, combined with the challenging economic and geopolitical situation. Phasing out energy subsidies and introducing metering for district heating at the end-user level will be essential for future growth in energy efficiency markets in these countries.

• In the Russian Federation, a wide-ranging framework is being created to promote energy efficiency across several sectors. However, adequate regulatory conditions for investment projects to take place at the desired scale are not met, delaying further improvements in the efficiency of buildings and industries.

In conclusion, although governments are making initial efforts to build a basis or to advance policy and regulatory frameworks for renewable energy and energy efficiency, the unfavourable economics of energy supply and use, due to subsidies and the abundance of fossil fuels in some countries, continue to hamper the economics of projects. Market structure plays an important role in the deployment of renewable energy and energy efficiency, and market entry for new players remains challenging in countries that have not fully liberalised their energy markets. Upgrades of ageing energy infrastructure could be an opportunity to better integrate renewable energy and improve energy efficiency. Common regional objectives for renewable energy and energy efficiency could help to advance this agenda and to pull the 17 countries more intensively into ongoing international co-ordination.

OVER THE PAST TWO DECADES, SOUTH EAST AND EASTERN EUROPE, THE CAUCASUS, CENTRAL ASIA AND THE RUSSIAN FEDERATION HAVE MADE STRIDES IN RENEWABLE ENERGY AND ENERGY EFFICIENCY. GOVERNMENTS HAVE DEVELOPED VARIOUS TYPES OF TARGETS AND POLICIES TO PROMOTE RENEWABLE ENERGY SOURCES ACROSS THE REGION. FROM A GLOBAL PERSPECTIVE, HOWEVER, THESE DEVELOPMENTS REMAIN MARGINAL.

01

REGIONAL INTRODUCTION

01 REGIONAL INTRODUCTION

OBJECTIVE OF THIS REPORT

The United Nations Economic Commission for Europe (UNECE) covers a large and diverse region comprising 56 member states.[1] These countries have different energy situations and vary in their potential for and progress in renewable energy and energy efficiency. The present report covers 17 UNECE countries – grouped because of their specific needs to establish a data baseline – and provides a general overview of their renewable energy situations.[i]

The 17 countries and their sub-regions (South East and Eastern Europe, the Caucasus, Central Asia and the Russian Federation) cover a vast territory that is extremely rich in resources, including those suitable for almost any type of renewable energy technology. Over the past decade, the national governments of these countries have been working actively to leverage this renewable energy potential, often with the support of international donors and development banks. Energy security and access to reliable, affordable, sustainable and modern energy are the key concerns driving renewables deployment. The region requires substantial investment to fully realise its renewable energy potential and to bring innovative solutions to tackle its most pressing local challenges, such as heating in urban and rural areas. A reliable data baseline is a pre-requisite and an enabler for more investment activity, as confirmed through experience from other countries that have active renewable energy industries.

The UNECE has contributed actively to fulfilling the 17 countries' aspirations in renewable energy by providing them with a platform for collaborating with other UNECE member states. In 2014, a UNECE Group of Experts on Renewable Energy was established to step up these efforts. Its mandate is to carry out action-oriented, practical activities to greatly increase the uptake of renewable energy, in line with the United Nations Secretary-General's Sustainable Energy for All (SE4All) initiative. This *UNECE Renewable Energy Status Report* strives to present analysis of up-to-date data and information on the status of renewable energy and energy efficiency in the selected countries of the UNECE region.

DATA COLLECTION FOR THE *UNECE RENEWABLE ENERGY STATUS REPORT*

The data presented in this report were compiled from governments, international organisations and industry sources. The report builds on national progress in collecting energy statistics as well as on the established data collection process that REN21 utilises for its annual *Renewables Global Status Report*. Both formal and informal data sources haven been considered to obtain the most timely information available. Support from the INOGATE Secretariat in Eastern Europe, the Caucasus and Central Asia, and from the Energy Community Secretariat in South East Europe and Eastern Europe, has helped to improve national statistical systems and was leveraged in this report.

The data gathering was organised through a network of local co-ordinating contributors who interfaced with national governments. Most importantly, the International Energy Agency (IEA) provided invaluable co-operation in verifying data and conducting analysis on countries' energy situations. Bloomberg New Energy Finance drew from its global dataset to provide data on renewable energy investment. However, data gaps remain and will need to be addressed as the region strives to progress in deployment of renewable energy and energy efficiency.[2]

Although efforts were made to provide the most comprehensive overview of the selected countries, the scope and scale of the material presented in this report reflects some information gaps, including in the areas of off-grid renewable energy and consumption of biomass. The exclusion of any programmes, themes, sectors or technologies reflects a lack of information, not a judgment on their importance to the region. The report serves as a baseline to advance future collaboration efforts and data-gathering initiatives at a national or regional level, as well as to track future developments and progress in renewable energy uptake.

REGIONAL OVERVIEW

South East and Eastern Europe, the Caucasus, Central Asia and the Russian Federation are very diverse in terms of their population size and their economic, social and political characteristics (see

i. Albania, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Montenegro, Russian Federation, Serbia, Tajikistan, the former Yugoslav Republic of Macedonia, Turkmenistan, Ukraine and Uzbekistan.

table 1).[3] However, their energy systems were developed in a similar manner and face some common challenges as they advance in deploying renewable energy and improving energy efficiency.

The region's population is more than 300 million, with the Russian Federation representing nearly half of this, or more than 143 million inhabitants. The smallest country by population is Montenegro, with 620,000 inhabitants. The age structure in the region is more similar to that in the European Union (EU) than in Asia, with youth (below 15 years of age) averaging around 20% of the total population. The urban share of the population varies by country, from more than 70% in Bosnia and Herzegovina and the Russian Federation to only 27% in Tajikistan. Central Asian countries are, on average, less urbanised than countries in South East and Eastern Europe. Urbanisation across the region is stagnating or slowing, and there is a continuing need to address energy demand in rural areas.[4]

The countries also differ greatly in their territorial size and population density. Kazakhstan and the Russian Federation have the lowest population densities (6.4 and 8.8 persons per square kilometre, respectively), and Moldova has the highest (123.9 persons per square kilometre). Low population density is better suited for renewable energy technologies that have large land-use requirements, but renewable solutions, such as solar rooftop installations, also exist where population densities are high. Geographical and climatic conditions vary across the region and offer favourable environments for solar, wind and bioenergy technologies (see section 2). Three of the countries in the region – Kazakhstan, Kyrgyzstan and the Russian Federation – are among the world's coldest countries in terms of heating degree days, and the remaining countries have seasonal heating needs during the winter.[5] Renewable energy solutions have significant potential to address the region's heating requirements (see section 3).

TABLE 1 | General overview of the UNECE region, 2014

	Population	Population density (persons per km^2)	Share of urban population (%)	GDP per capita (current USD, PPP)
Albania	2,894,475	105.6	56.4%	10,428
Armenia	2,983,990	104.8	62.8%	8,078
Azerbaijan	9,537,823	115.4	54.4%	17,516
Belarus	9,470,000	46.7	76.3%	18,185
Bosnia and Herzegovina	3,824,746	75.0	39.6%	9,923
Georgia	4,504,100	78.8	53.5%	7,582
Kazakhstan	17,289,111	6.4	53.3%	24,205
Kyrgyzstan	5,834,200	30.4	35.6%	3,322
FYR of Macedonia	2,108,434	83.6	57.0%	13,142
Moldova	3,556,400	123.9	44.9%	4,983
Montenegro	621,800	46.2	63.8%	14,323
Russian Federation	143,819,569	8.8	73.9%	25,636
Serbia	7,129,428	81.5	55.5%	12,660
Tajikistan	8,408,947	60.1	26.7%	2,691
Turkmenistan	5,307,171	11.3	49.7%	15,474
Ukraine	45,362,900	78.3	69.5%	8,665
Uzbekistan	30,742,500	72.3	36.3%	5,576
Andorra	80,153	170.5	85.6%	N/A
Austria	8,534,492	103.6	65.9%	46,165
Belgium	11,225,207	370.7	97.8%	42,725
Bulgaria	7,226,291	66.6	73.6%	16,324
Canada	35,540,419	3.9	81.7%	44,089
Croatia	4,236,400	75.7	58.7%	21,252
Cyprus	1,153,058	124.8	67.0%	30,873
Czech Republic	10,510,566	136.1	73.0%	30,445
Denmark	5,639,565	132.9	87.5%	44,863
Estonia	1,313,645	31.0	67.6%	26,355
Finland	5,463,596	18.0	84.1%	39,754
France	66,201,365	120.9	79.3%	38,847
Germany	80,889,505	232.1	75.1%	45,616
Greece	10,957,740	85.0	77.7%	26,099
Hungary	9,861,673	108.9	70.8%	24,498
Iceland	327,589	3.3	94.0%	43,393

Ireland	4,612,719	67.0	63.0%	47,804
Israel	8,215,300	379.6	92.1%	33,072
Italy	61,336,387	208.5	68.8%	34,758
Latvia	1,990,351	32.0	67.4%	23,337
Liechtenstein	37,194	232.5	14.3%	N/A
Lithuania	2,929,323	46.7	66.5%	26,643
Luxembourg	556,074	214.7	89.9%	N/A
Malta	427,404	1,335.6	95.3%	N/A
Monaco	38,066	19,033.0	100.0%	N/A
Netherlands	16,854,183	499.8	89.9%	47,131
Norway	5,136,475	14.1	80.2%	64,893
Poland	37,995,529	124.1	60.6%	24,882
Portugal	10,397,393	113.5	62.9%	28,327
Romania	19,910,995	86.6	54,4%	19,401
San Marino	31,637	527.3	94.2%	N/A
Slovakia	5,418,506	112.7	53.8%	27,585
Slovenia	2,062,218	102.4	49.7%	29,917
Spain	46,404,602	93.0	79.4%	33,763
Sweden	9,689,555	23.8	85.7%	45,144
Switzerland	8,190,229	207.3	73.8%	N/A
Turkey	75,837,020	98.5	72.9%	19,226
United Kingdom	64,510,376	266.7	82.4%	39,137
United States of America	318,857,056	34.9	81.5%	54,629

Note: N/A indicates that the data were not available in the source used for this table.
Source: See endnote 3, section 1.

The region's economic history over the past two decades brought numerous challenges. The economic crisis of the 1990s resulted in the restructuring and downsizing of energy-intensive industries (steel, ferrous metals, etc.). In the Russian Federation, economic performance also was affected by the financial crisis of 1998. The beginning of the 2000s was marked by rapid economic growth, but the global economic and financial crisis of 2008 hit the region hard, with gross domestic product (GDP) contracting in several countries.[6] Seventy percent of households in Eastern Europe and Central Asia had to cut spending on basic foods and health care.[7] Currently, the region's economic growth is among the slowest in developing countries.[8] GDP per capita ranges from above USD 12,000 in the Russian Federation and Kazakhstan to below USD 1,300 in Kyrgyzstan and Tajikistan.[9] Economic factors have affected renewable energy markets in the region, both in terms of affordability for end-users (see section 3) and in terms of investment flows (see section 6).

The region's vast energy resources play a role in the global supply of fossil fuels. Five countries are net energy exporters (Azerbaijan, Kazakhstan, the Russian Federation, Turkmenistan and Uzbekistan; see table 2), all of them with sizable oil and gas reserves.[10] Bosnia and Herzegovina, Kazakhstan, Montenegro, the Russian Federation, Serbia and Ukraine have coal reserves. Belarus and the Russian Federation have peat deposits. The region's primary energy supply is geared heavily towards fossil fuels. Non-renewable sources represent 97% of the region's total primary energy supply (see table 3). Some countries have higher shares of renewable energy, namely Tajikistan (64% of its total primary energy supply), Albania (30%), Kyrgyzstan (30%), Montenegro (29%) and Georgia (25%). This is driven by either a high share of hydropower in power generation or the use of biomass in heating, or a combination of both (see section 3). Hydropower has a significant presence in some countries' power generation (see section 2), but the share of other renewable technologies is still modest (see section 2).

Energy intensity in the countries is high in the global context, despite notable improvements over the past two decades that have resulted from structural economic changes and efforts to improve energy efficiency (see section 4). For the residential sector, energy use per capita is widely used as an indicator, offering a view of the relative intensity of countries rather than a comparison of their efficiency. For this region, annual energy use per capita ranges between around 12.8 gigajoules (GJ) in Tajikistan to around 214.1 GJ in the Russian Federation (see table 2). It increased in most of the countries between 2001 and 2012, alongside rising GDP per capita, with the exception of Tajikistan, Ukraine and Uzbekistan.[11] The region's ageing electricity generation, transmission and distribution infrastructure results in significant inefficiencies, and some of the countries experience high losses in their networks. In terms of final energy consumption, the industry, residential and transport sectors are the main consumers, but important disparities exist among the countries.

TABLE 2 | Energy overview of the UNECE region

	Energy imports, net (% of energy use) 2011	Energy subsidies as share of GDP (% 2015)	Energy use per capita (MJ/capita, 2011)	Electrification rate (% of population) 2012
Albania	34%	1.9%	32,253	100%
Armenia	67%	4.3%	38,362	100%
Azerbaijan	-377%	6.3%	57,332	100%
Belarus	86%	7.0%	129,695	100%
Bosnia and Herzegovina	35%	37.0%	77,268	100%
Georgia	68%	5.2%	33,099	100%
Kazakhstan	-107%	11.0%	195,565	100%
Kyrgyzstan	51%	26.4%	25,133	100%
FYR of Macedonia	44%	18.7%	61,833	100%
Moldova	96%	5.6%	39,088	100%
Montenegro	36%	16.7%	76,013	100%
Russian Federation	-78%	16.0%	216,281	100%
Serbia	31%	34.7%	93,674	100%
Tajikistan	30%	7.1%	11,691	100%
Turkmenistan	-164%	23.2%	202,591	100%
Ukraine	32%	60.7%	115,929	100%
Uzbekistan	-21%	26.3%	67,389	100%
Andorra	-	-	-	100%
Austria	65%	0.9%	165,409	100%
Belgium	70%	1.9%	224,797	100%
Bulgaria	36%	33.9%	109,473	100%
Canada	-61%	2.5%	308,426	100%
Croatia	55%	3.7%	82,539	100%
Cyprus	96%	0.0%	88,800	100%
Czech Republic	25%	8.4%	171,775	100%
Denmark	-15%	1.6%	135,179	100%
Estonia	10%	0.5%	177,425	100%
Finland	51%	0.5%	270,634	100%
France	46%	1.0%	161,215	100%
Germany	60%	1.4%	159,145	100%
Greece	64%	2.6%	100,669	100%
Hungary	57%	3.9%	104,851	100%
Iceland	16%	0.5%	752,135	100%
Ireland	87%	0.5%	120,883	100%
Israel	80%	2.9%	124,876	100%
Italy	81%	0.6%	118,056	100%
Latvia	51%	1.3%	86,526	100%
Liechtenstein	N/A	N/A	N/A	100%
Lithuania	79%	4.4%	101,006	100%
Luxembourg	97%	3.2%	336,772	100%
Malta	100%	0.2%	83,956	100%
Monaco	N/A	N/A	N/A	100%
Netherlands	17%	1.1%	194,174	100%
Norway	-597%	0.9%	236,646	100%
Poland	32%	9.1%	111,300	100%

Portugal	77%	1.0%	90,550	100%
Romania	23%	6.5%	74,371	100%
San Marino	N/A	N/A	N/A	100%
Slovakia	63%	3.1%	134,562	100%
Slovenia	48%	2.4%	148,511	100%
Spain	75%	1.7%	112,494	100%
Sweden	33%	0.3%	220,839	100%
Switzerland	51%	0.2%	134,269	100%
Turkey	71%	4.5%	64,306	100%
United Kingdom	31%	1.4%	123,722	100%
United States of America	19%	3.8%	294,298	100%

Note: Electrification rates are as reported by the *Global Tracking Framework Report 2015*, but some countries still have communities without access to electricity (see section 3, sidebar 3). Energy subsidies are based on the International Monetary Fund's definition of "post-tax consumer subsidies", which arise when the price paid by consumers is below the supply cost of energy plus an appropriate "Pigouvian" (or "corrective") tax that reflects the environmental damage associated with energy consumption and an additional consumption tax that should be applied to all consumption goods for raising revenues. N/A indicates that the data were not available at the time of publication.
Source: See endnote 10, section 1.

The majority of the 17 countries have made noteworthy progress in advancing energy efficiency and renewable energy over the past decade by creating the necessary regulatory framework; adopting targets, policies and regulations; and deploying projects backed by fiscal and financial incentives. From a global perspective, however, the region is still in the early stages of renewable energy deployment (see table 3), although individual countries differ greatly due to varying drivers for renewables deployment.[12] Some are driven by energy security concerns, given their high dependence on imported energy or variability in hydropower generation. Others exploit more-affordable local energy sources, especially for heating.

TABLE 3 | Renewable energy share of total primary energy supply (TPES) in the UNECE region, 2012

	Total energy	Non-renewable energy	Renewable energy	Share of renewable energy
	(thousand tonnes of oil equivalent)			(%)
Albania	2,075	1,451	624	30%
Armenia	2,971	2,762	209	7%
Azerbaijan	13,692	13,437	255	2%
Belarus	30,499	28,882	1,617	5%
Bosnia and Herzegovina	6,670	6,128	542	8%
Georgia	3,706	2,767	939	25%
Kazakhstan	74,853	74,137	716	1%
Kyrgyzstan	4,132	2,909	1,223	30%
FYR of Macedonia	2,968	2,677	291	10%
Moldova	3,276	3,167	109	3%
Montenegro	1,062	754	308	29%
Russian Federation	756,593	734,483	22,110	3%
Serbia	14,462	12,635	1,827	13%
Tajikistan	2,267	814	1,453	64%
Turkmenistan	25,570	25,570	202,591	0%
Ukraine	122,661	120,012	2,649	2%
Uzbekistan	48,284	47,316	968	2%

Andorra	N/A	N/A	N/A	N/A
Austria	33,109	22,314	10,795	33%
Belgium	55,950	50,149	5,801	10%
Bulgaria	18,345	16,713	1,632	9%
Canada	251,124	204,995	46,129	18%
Croatia	7,917	6,924	993	13%
Cyprus	2,226	2,096	130	6%
Czech Republic	42,647	39,216	3,431	8%
Denmark	17,342	12,703	4,639	27%
Estonia	5,521	4,660	861	16%
Finland	33,304	23,181	10,123	30%
France	252,330	229,983	22,347	9%
Germany	312,525	275,434	37,091	12%
Greece	26,553	24,078	2,475	9%
Hungary	23,469	21,598	1,871	8%
Iceland	5,695	583	5,112	90%
Ireland	13,245	12,380	865	7%
Israel	24,277	23,105	1,172	5%
Italy	158,800	136,891	21,909	14%
Latvia	4,416	2,709	1,707	39%
Liechtenstein	N/A	N/A	N/A	N/A
Lithuania	7,376	6,216	1,160	16%
Luxembourg	N/A	N/A	N/A	N/A
Malta	671	662	9	1%
Monaco	N/A	N/A	N/A	N/A
Netherlands	78,578	74,394	4,184	5%
Norway	29,195	15,148	14,047	48%
Poland	97,855	88,627	9,228	9%
Portugal	21,394	16,764	4,630	22%
Romania	34,920	29,704	5,216	15%
San Marino	N/A	N/A	N/A	N/A
Slovakia	16,650	15,247	1,403	8%
Slovenia	6,996	5,924	1,072	15%
Spain	124,968	108,815	16,153	13%
Sweden	50,162	31,095	19,067	38%
Switzerland	25,613	19,521	6,092	24%
Turkey	116,897	104,710	12,187	10%
United Kingdom	192,231	183,082	9,149	5%
United States of America	2,140,618	2,004 733	135,885	6%

Note: N/A indicates that the data were not available at the time of publication.
Source: See endnote 12, section 1.

REGIONAL ENERGY CHALLENGES

The region faces a common challenge of securing a supply of energy that would be sustainable, reliable and affordable to fuel its future economic growth. National governments share a variety of energy challenges, which could become drivers for renewable energy deployment as the countries embrace more active renewable energy policies.

Energy security challenges dominate, especially in countries that are net energy importers (11 out of the 17). In four of the countries (Armenia, Belarus, Georgia and Moldova), net imports account for more than 60% of energy use, with Moldova's imports at 96% (see table 2). In the remaining energy-importing countries, imports exceed 30%, still constituting an energy security challenge. Heavy reliance on a single source for oil and gas imports is a security issue as well. Energy security can be a driver for renewable energy and energy efficiency as countries strive to decrease their share of energy imports and to leverage local energy sources. Renewable energy will have to compete in some countries with the available unconventional oil and gas resources, such as shale gas or coal-bed methane.

Energy subsidies are present throughout the region (see table 2), whether in oil and gas exporting or net energy importing countries. The percentage of energy subsidies in the region's GDP is one of the highest in the world, with individual shares ranging from less than 2% in Albania to more than 60% in Ukraine (the world's highest).[13] Bosnia and Herzegovina, Serbia, Kyrgyzstan, Uzbekistan and Turkmenistan are also in the world's top 10. Energy subsidies increase the vulnerability of countries to volatile international energy prices, reinforcing energy security concerns. Energy subsidies are also detrimental to renewable energy and energy efficiency deployment because energy commodities are not priced at market prices, making renewables and efficiency comparatively expensive. Subsidies discourage investment because energy tariffs remain below cost-recovery levels and do not provide investors with the opportunity to recoup their investment.[14]

Power outages are an issue in some of the countries (see section 3) and are exacerbated on a seasonal basis due to hydropower fluctuations and to the effects of harsh climatic conditions on ageing energy infrastructure. Countries with ongoing armed conflict, or a history of conflict, are exposed to outages as a consequence of physical damage to energy infrastructure. The quality of power and the frequency of outages can be a driver for distributed renewable energy solutions. Seasonal variations in hydropower could be a driver for using non-hydro renewable energy in countries with high shares of hydro-based power generation.

Electricity access is not a pressing issue in the region because this access is almost universal, except for in very remote areas in a few countries (see section 3). The bigger energy access issue relates to clean heating and cooking sources, which is problematic (especially in rural areas) despite the progress achieved since 1990.[15] However, this is not a significant driver for renewable energy and energy efficiency, particularly given the comparatively higher cost of modern renewable energy solutions (see section 3). District heating is spread across several countries in the region (Azerbaijan, Belarus, Bosnia and Herzegovina, Serbia, the former Yugoslav Republic of Macedonia, Kazakhstan, Moldova, the Russian Federation, Ukraine and, to a limited extent, Tajikistan).[16] The ageing infrastructure and high energy losses could be a driver for renewable energy deployment where local sources of renewables are available.

> **THE LACK OF LIBERALISATION OF ENERGY MARKETS AND THE PRESENCE OF INCUMBENTS MAKES MARKET ENTRY FOR NEW PLAYERS (IN RENEWABLE ENERGY OR OTHER AREAS) EXTREMELY DIFFICULT. SPLIT RESPONSIBILITIES AMONG INSTITUTIONS AND COMPLEX PROCEDURES (FOR EXAMPLE, FOR AWARDING LICENCES AND PERMITS) SLOW THE DEVELOPMENT OF RENEWABLE ENERGY PROJECTS IN SEVERAL COUNTRIES.**

Institutional and market structures for energy are an issue in some countries. The lack of liberalisation of energy markets and the presence of incumbents makes market entry for new players (in renewable energy or other areas) extremely difficult. Split responsibilities among institutions and complex procedures (for example, for awarding licences and permits) slow the development of renewable energy projects in several countries.[17]

Environmental and health concerns are a minor driver of renewable energy and energy efficiency deployment in the 17 countries, with the exception of solid fuel use for heating. However, compliance with international treaties and protocols (such as the Kyoto Protocol, the Energy Charter Protocol for Energy Efficiency and Environmental Aspects, and the Energy Community Treaty), which often are environmentally driven, is forcing countries to take steps towards adopting renewable energy and energy efficiency policies.

PLATFORMS FOR REGIONAL ENERGY CO-OPERATION

Regional energy co-operation is driven through several initiatives (see table 4), but co-ordination on renewable energy is limited to the Energy Community[ii], with its legal obligations to implement the EU Renewable Energy Directive and binding renewable energy targets in 2020.[18] The countries of South East Europe as well as Moldova and Ukraine are members of the Energy Community, whereas Georgia is a candidate and Armenia is an observer. Some South East European countries have EU candidate status (Albania, the former Yugoslav Republic of Macedonia and Serbia) or have opened negotiations (Montenegro), thereby advancing the pace of renewable energy policies.

The 17 countries have different levels of commitment to the Energy Charter. Thirteen countries have member status (Belarus is a member, but ratification of the treaty is pending). Serbia is an observer, and Russia applied the treaty only before 2009. The countries of Eastern Europe, the Caucasus and Central Asia co-operate with the EU though the INOGATE programme. Regional co-operation also is driven through cross-regional power trade. Transmission investment is supportive and is a pre-requisite for increased integration of renewable power in electricity networks. The Central Asia South Asia Electricity Transmission and Trade Project (CASA-1000) represents a flagship project implemented jointly by Kyrgyzstan, Tajikistan, Afghanistan and Pakistan and co-financed by the World Bank and the European Bank for Reconstruction and Development (EBRD).[19]

Other frameworks of co-operation with the EU include the Association Agreement signed by the governments of Georgia, Moldova and Ukraine in June 2014. Armenia, Georgia, Moldova and Ukraine also are members of the Eastern Europe Energy Efficiency and Environment Partnership (E5P), supported by the European Commission and other bilateral donors. Eight of the 17 countries are members of the Central European Initiative.

All of the countries – with the exception of the Russian Federation, Turkmenistan and Uzbekistan – have at least one city or town participating as a signatory in the EU Covenant of Mayors initiative. Signatories represent cities or towns, ranging in size from small villages to major metropolitan areas, that have committed in a voluntary manner to implement sustainable energy policies to meet (or exceed) the EU's target of reducing carbon dioxide (CO_2) emissions 20% by 2020. Signatories pledge to submit a Sustainable Energy Action Plan outlining how they will reach their targets, thereby improving citizens' quality of life and boosting local economic development. This includes a push for renewable energy and energy efficiency at the city level.

BUILDING ON THE UN MILLENNIUM DEVELOPMENT GOALS, ALL 17 COUNTRIES ARE CONTRIBUTING TO SHAPE THE NEW SUSTAINABLE DEVELOPMENT AGENDA, INCLUDING SUSTAINABLE DEVELOPMENT GOAL #7 TO "ENSURE ACCESS TO AFFORDABLE, RELIABLE, SUSTAINABLE AND MODERN ENERGY FOR ALL".

The Eurasian Economic Union, formed by Kazakhstan and Belarus with the Russian Federation in 2014, is another avenue for regional collaboration. Armenia and Kyrgyzstan joined in 2015.

With regard to global co-operation, six countries (Armenia, Kyrgyzstan, Moldova, Montenegro, the Russian Federation and Tajikistan) are partner countries of the SE4All Initiative (see table 4). Montenegro and Tajikistan are the only countries that have finalised rapid assessment and gap analysis, which lays the groundwork to scale up actions, undertake strategic reforms and attract new investments and financial support. Other countries could benefit from increased engagement in this context, based on the challenges across different dimensions of energy access (see section 3). Building on the UN Millennium Development Goals, all 17 countries are contributing to shape the new sustainable development agenda, including Sustainable Development Goal #7 to "Ensure access to affordable, reliable, sustainable and modern energy for all".[20]

ii. The Energy Community also includes Kosovo. This designation is without prejudice to positions on status and is in line with UN Security Council Resolution 1244 and the International Court of Justice Opinion on the Kosovo declaration of independence.

Figure 1 | Overview of regional collaboration involving energy issues

Notes: * Pending ratification; ** Applied the Treaty until 2009.
Source: See endnote 20, section 1.

02

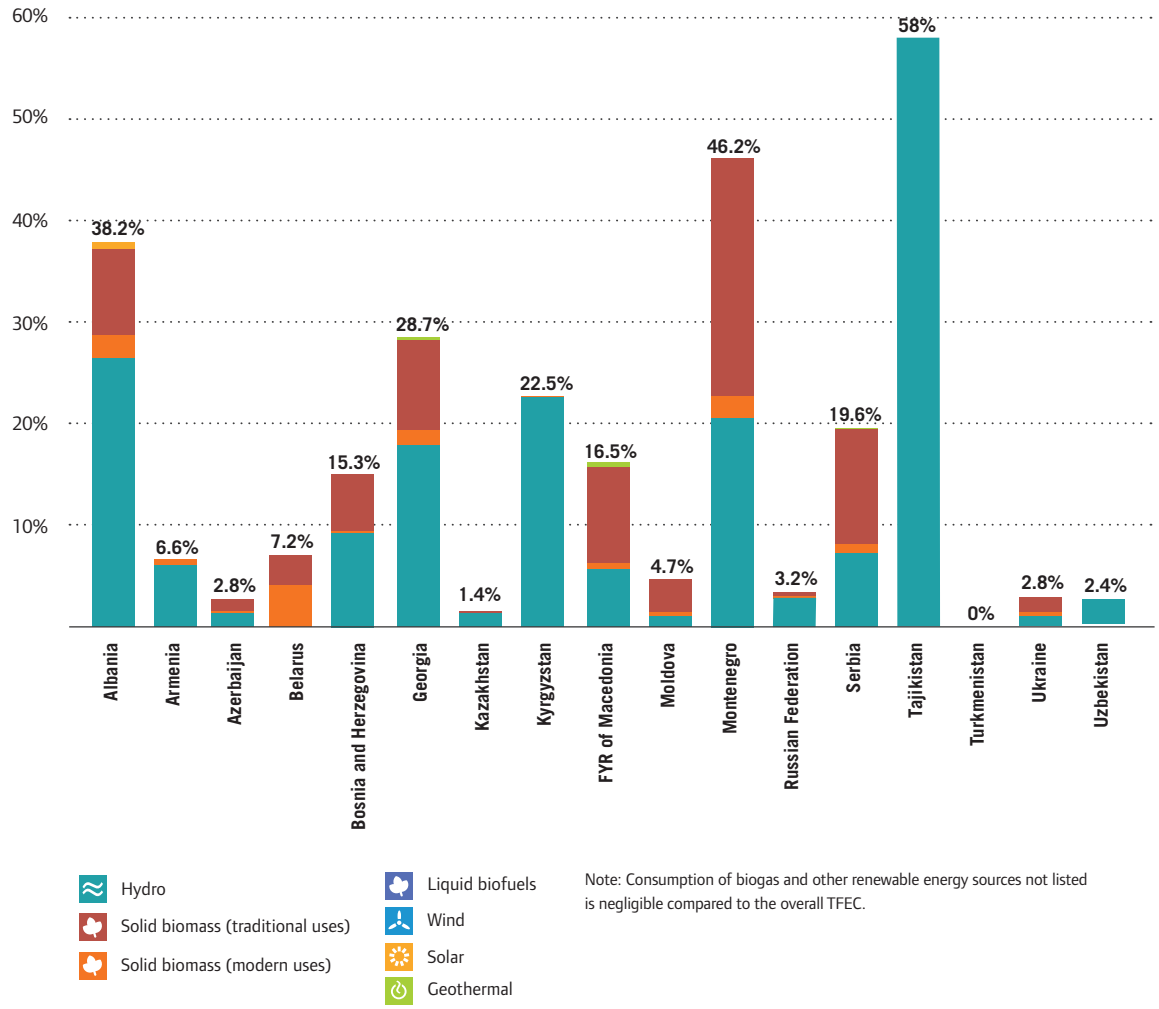
RENEWABLE ENERGY MARKET AND INDUSTRY OVERVIEW

Renewable energy solutions are arising in the power, heat and transport sectors to address the diverse energy challenges that the region is facing. Building on the region's sizable potentials, hydropower deployment continues (mostly in the form of small- to medium-scale plants), and a switch from traditional to modern uses of bioenergy is under way. Bioenergy options are replacing fossil fuels in the district heating sector, and modern biomass-based individual heating technologies are expanding in several countries. Solar photovoltaic (PV) and onshore wind technologies are also on the rise, with large-scale power plants under construction in several countries.

FINAL ENERGY CONSUMPTION

The share of renewable energy in total final energy consumption (TFEC) differs widely across the 17 countries. In countries with high shares of renewables – such as Albania, Georgia, Kyrgyzstan, Montenegro and Tajikistan – these levels are driven by either high shares of hydropower in power production, persisting traditional use of biomass for cooking and heating, or a combination of both (see figure 2).[1] Contributions of modern renewables such as solar PV, onshore wind, geothermal and liquid biofuels remain minor and represent less than 1% of TFEC in all countries.

Figure 2 | Share of renewable energy in total final energy consumption, 2012

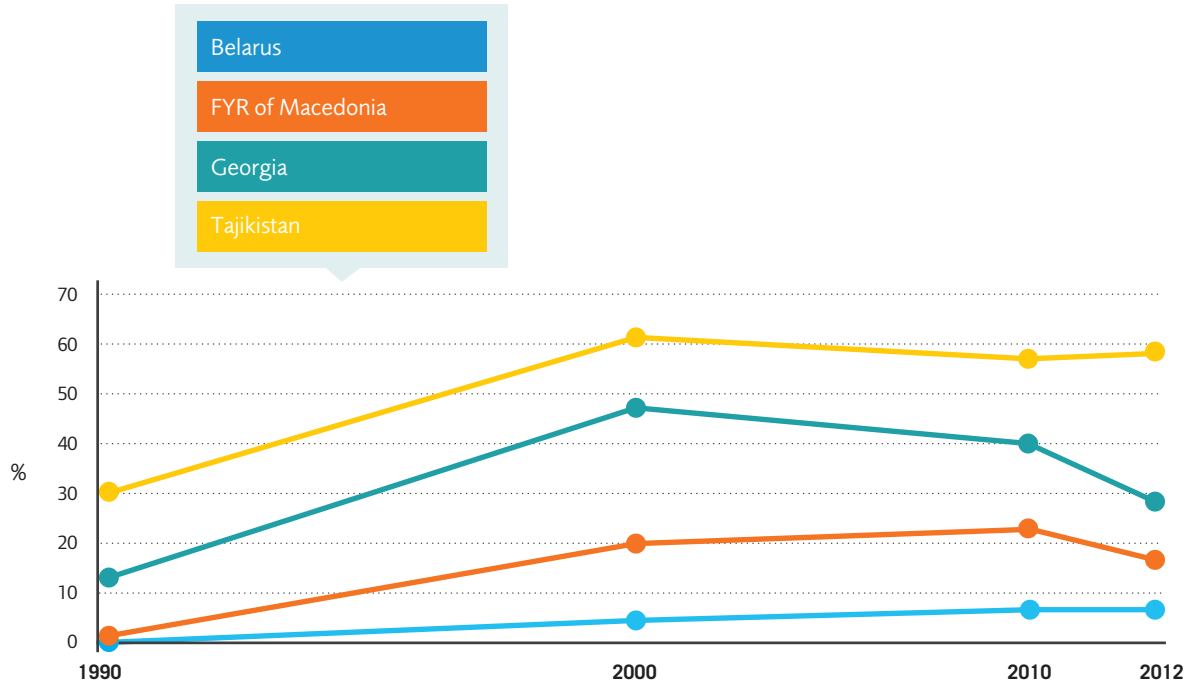


Note: Consumption of biogas and other renewable energy sources not listed is negligible compared to the overall TFEC.

Source: See endnote 1, section 2.

Over the years, shares of renewables in TFEC have changed across the region. Reasons include: significant decreases in the overall TFEC in many countries, driven by structural changes in economies or in regional energy markets; gradual reductions in traditional uses of biomass; increases as well as natural fluctuations in hydropower production; and improvements in biomass accounting, which greatly affected the energy balances of some countries. Additionally, since 2000, some countries increased their deployment of modern non-hydro renewable energy technologies – such as solar PV, wind and biomass- based district heating systems – although the impact of these uses on the overall picture remained limited. Figure 3 shows the evolution of the share of renewables in TFEC over time in four countries, representing various factors described above.[2]

FIGURE 3 | Share of renewables in total final energy consumption in four UNECE countries, 1990-2012



Source: See endnote 2, section 2.

In Tajikistan, changes in the regional energy market drove the changing share of renewables in TFEC. Hydropower production in the country has fluctuated very little since 1990; rather, declining gas imports from Turkmenistan and Uzbekistan resulted in a sharp drop in TFEC, which translated into a rapid increase in the renewables share.[3] Georgia also saw a rapid decrease in TFEC before 2000 (at roughly the same time that biomass use peaked) as the country gained independence and natural gas supplies were disrupted, and TFEC has since continued to decline. Hydropower production has fluctuated more in Georgia than in Tajikistan. The relatively erratic development of biomass use during 1990-2005 also can be explained by changes in accounting methodologies, due to the difficulties of such accounting.[4]

Statistical issues have influenced the renewables share in the former Yugoslav Republic of Macedonia as well. The country's energy balance of 1990 does not report biomass use, even though such use presumably existed, and estimates of biomass use were introduced only in the 1990s. At the same time, hydropower production in the country fluctuated widely, and TFEC has been increasing steadily, all affecting the share of renewables in TFEC over time. In Belarus, meanwhile, the use of biomass in heat and combined heat and power (CHP) plants, feeding district heating systems, ramped up significantly after 1990, driving the increase in that country's renewables share.

POWER SECTOR

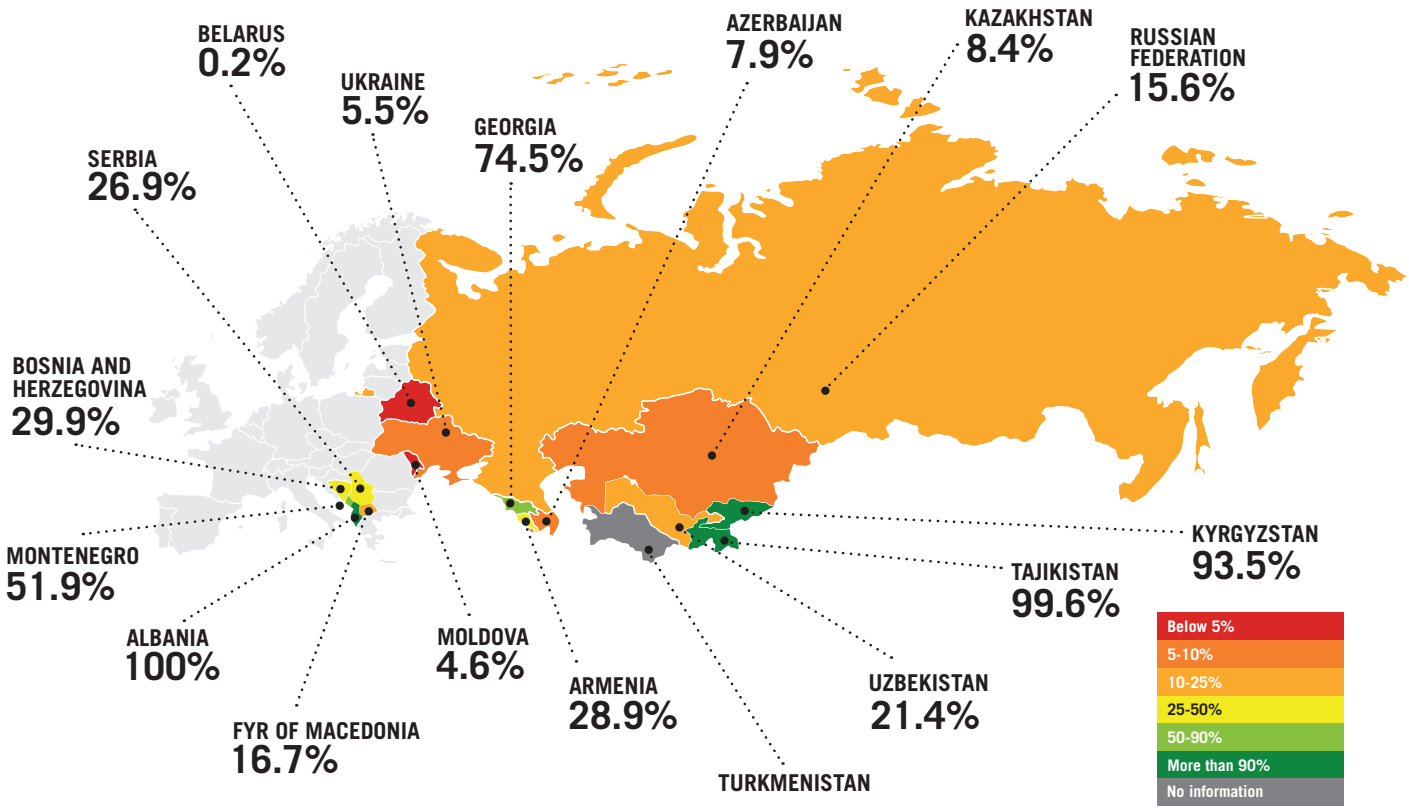
Deploying renewable energy in the power sector is a highly efficient way for the region to improve its energy security and reduce its CO_2 emissions. Hydropower has been developed to a great extent, but the potential is far from exhausted. Apart from the Russian Federation, Tajikistan has the region's largest hydro potential, but only 6% of the economic potential has been exploited to date, even though the country's power system is based almost entirely on hydropower.[5] If grid infrastructure were put into

place, existing power exports to Afghanistan could be increased further as well as expanded to other countries. The region also possesses sizable solar PV potential in all countries, and insolation is particularly strong in South East Europe, the Caucasus, Central Asia and southern regions of the Russian Federation, improving the economics of potential PV generation in these regions.[6]

Onshore wind resources are present in the whole region, with the largest resources in Ukraine, Kazakhstan and the Russian Federation.[7] South East Europe, Eastern Europe and the Russian Federation have large biomass resources, which are only partially exploited.[8] Woody biomass is used in South East Europe to produce wood chips or pellets for export, and it also fuels several CHP plants in Belarus, the Russian Federation and Ukraine.[9] Significant concentrating solar power (CSP) potential exists only in Central Asia and in parts of the Russian Federation, and confirmed high-temperature geothermal resources suitable for power generation are present only in a few sites in the Russian Federation.[10] Other countries may have modest geothermal resources, but the suitability of these resources for power generation needs to be confirmed.

Hydropower is the backbone of electricity systems in several of the 17 countries (see figure 4).[11] Albania and Kyrgyzstan, in addition to Tajikistan, run their power systems almost exclusively on hydropower. In Georgia and Montenegro, hydro represents more than half of electricity produced in the country. However, due to its vastly larger power system, the Russian Federation has the largest total hydropower production, reaching 153,300 gigawatt-hours (GWh) in 2014, significantly above the second-place Tajikistan at 17,071 GWh, followed by Serbia (11,109 GWh), Ukraine (8,639 GWh) and Georgia (8,334 GWh).

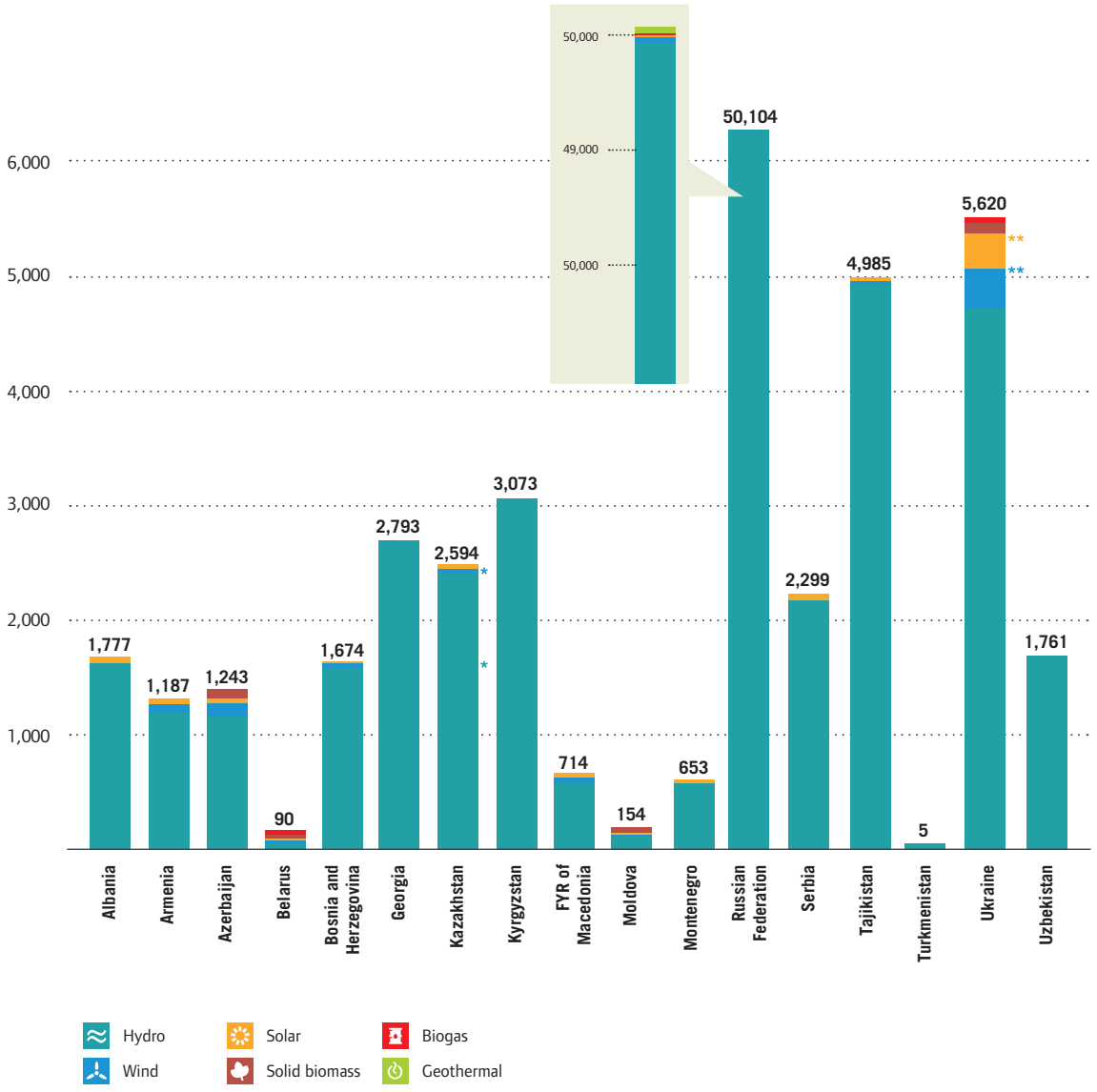
FIGURE 4 | Share of hydropower in total power production, 2012



Source: See endnote 11, section 2.

As shown in figure 5, non-hydropower renewable power technologies, such as solar PV and onshore wind, are nascent in the region, with significant deployment only in Ukraine, which is facing major challenges (see sidebar 1).[12] Smaller onshore wind and solar PV developments have occurred in several countries, including in South East Europe. Geothermal power is generated only in the Russian Federation, with most installations in Kamchatka, which has a suitable geothermal resource due to its volcanic environment. Bioenergy use for power generation is more developed than solar PV and wind, and solid biomass as well as biogas power plants exist in Armenia, Azerbaijan, Belarus, Moldova, the Russian Federation, Serbia and Ukraine.

Figure 5 | Renewable power installed capacity, by country, 2014



Note: * Data are for 2013; ** Excludes installations in Crimea, as these no longer are subject to power purchase by the Ukrainian sole electricity market operator, Energorynok.
Source: See endnote 12, section 2.

Sidebar 1. Renewable energy deployment in Ukraine

Renewable energy development is a priority of the Ukrainian government, which aims to reduce dependence on mostly imported natural gas and to improve the country's energy security situation. Since 2011, with the support of "green tariffs" (feed-in tariffs), Ukraine has developed the most diversified renewable energy portfolio in the Eastern Europe, Caucasus and Central Asia region, with sizable solar PV and onshore wind capacities (more than 750 MW and 500 MW, respectively) and several smaller bioenergy installations.

However, the energy security situation worsened in 2014 when the conflict in eastern regions of the country, particularly Crimea, severely disrupted industrial production (including coal mining and transport to power plants) and deteriorated trade relations with Russia, affecting imports of natural gas. Moreover, about half of Ukraine's solar PV installations and several dozen megawatts of onshore wind were situated in Crimea. Production from these installations is no longer purchased by the Ukrainian sole electricity market operator, Energorynok.

In October 2014, as part of its commitments to the Energy Community, Ukraine adopted a National Renewable Energy Action Plan, which sets a target for an 11% renewable energy share in the country's total final energy consumption by 2020. This translates into an 11% target in electricity consumption, a 12.4% target in heating and cooling and a 10% target in transport. The Plan should drive further uptake of renewable energy, supported by improved green tariffs and a large number of fiscal incentives, mostly tax exemptions.

Due to its size, Ukraine has large solar PV and onshore wind resources that could be further developed for power generation. The country also possesses abundant biomass resources, which, if exploited sustainably, could serve as an alternative energy source for power generation, for heating purposes (both in district heating and individual heating systems) as well as for production of liquid biofuels. The largest obstacle to further renewable energy scale-up today is the unstable geopolitical situation, which has resulted in a decrease in investors' trust and in severe depreciation of the Ukrainian currency, posing challenges to investments in both new renewable energy and conventional capacity.

However, with existing experience in installation and operation of distributed renewable energy plants, euro- linked green tariffs, and financing support provided by several international financing institutions, deployment of renewable energy in Ukraine is expected to continue, albeit at a slower pace, reaching 1.1 GW for onshore wind and 1.4 GW for solar PV in 2020.

Source: See endnote 12, section 2.

Further development of all renewable power technologies is under way in the region, and project pipelines exist in at least 10 of the 17 countries.[13] More than 7.5 GW of renewable power plants is reported to be in the planning or development stages, with the Russian Federation having the largest pipeline, including nearly 4 GW of wind, 1.5 GW of solar PV and some 0.5 GW of hydropower projects.[14] Belarus is further developing its solar PV, wind, hydro and bioenergy power production and has nearly 600 MW in the pipeline, of which biomass and biogas plants account for more than half of this capacity.[15]

Many of the region's renewable energy projects benefit from the support of international development banks, which are working with governments and helping to co-finance first-of-a-kind projects for technologies that have strong local potential. The financing typically is accompanied by capacity building and technical assistance to local institutions or utilities.

Large-scale solar developments are under way in Central Asia. Uzbekistan, with the support of the Asian Development Bank (ADB), is developing the largest solar PV plant in the region.[16] The 100 MW plant is to be situated in the Samarkand area, which has high insolation and currently suffers from power outages. In addition to construction of the power plant, the project includes capacity building and other support to Uzbekenergo, the state joint stock company, to ensure its ability to manage the plant and other potential solar facilities in the future. Capacity-building support also will be given to the country's International Solar Energy Institute, which aspires to become an internationally recognized provider of solar education, training and technology.

Uzbekistan's Samarkand plant is the first of six solar plants considered in the ADB's solar development roadmap, prepared as a technical assistance project to support solar development in the country.[17] The remaining five projects are three solar PV plants (100 MW each) and two CSP projects (one 10 MW plant and one 130 MW hybrid fossil-solar plant, an integrated solar combined-cycle (ISCC) plant with 30 MW of solar capacity).[18]

Kazakhstan has started solar development as well and is building a 35 MW plant in Otyrar district of Koksarai village in the country's south.[19] The installation is the first phase of a larger 75 MW power plant.[20] Additionally, the EBRD is financing a 50 MW solar PV plant that was commissioned in the Zhambyl region of southern Kazakhstan in July 2015.[21] The EBRD hopes that as one of the first large-scale plants in the region, the installation could become an example for replication.

In Turkmenistan, the Academy of Sciences was charged by presidential decree In 2014 to create a solar energy institute, which should identify locations for installing solar PV plants across the country. The institute also aims to investigate the potential for silicon production, since the country possesses vast reserves of monocrystalline and polycrystalline silicon that could be extracted cheaply using inexpensive domestic fossil fuels.[22]

Kazakhstan and Uzbekistan also have explored the possibility of local solar PV module production. In Kazakhstan, the company Astana Solar produces PV modules using local silicon.[23] The modules, which meet European quality norms and certification, are produced in a plant that is equipped with European automated equipment and that employs more than 200 professionals.[24] In 2013, the Chinese PV manufacturer Suntech signed a Memorandum of Understanding with Uzbekenergo for a future PV module factory joint venture in the Navoi Free Industrial and Economic Zone in Uzbekistan.[25] However, Suntech filed for bankruptcy later that year, and Uzbekenergo is exploring possible co-operation with several other manufacturers. A number of joint ventures were established recently in manufacturing technical silicon (total capacity of 17,000 tonnes per year) and solar water heating collectors (50,000 units per year).[26]

MANY OF THE REGION'S RENEWABLE ENERGY PROJECTS BENEFIT FROM THE SUPPORT OF INTERNATIONAL DEVELOPMENT BANKS, WHICH ARE WORKING WITH GOVERNMENTS AND HELPING TO CO-FINANCE FIRST-OF-A-KIND PROJECTS FOR TECHNOLOGIES THAT HAVE STRONG LOCAL POTENTIAL.THE FINANCING TYPICALLY IS ACCOMPANIED BY CAPACITY BUILDING AND TECHNICAL ASSISTANCE TO LOCAL INSTITUTIONS OR UTILITIES.

New onshore wind developments are planned in existing markets such as Azerbaijan, Belarus, the Russian Federation and Ukraine, but other countries are initiating projects as well. Kazakhstan is tapping into its vast wind potential with its first large-scale wind farm, a 45 MW facility being built in the town of Yereimentau in Akmola Region.[27] The project is financed by the Eurasian Development Bank and should help alleviate the region's expected electricity deficit.[28] Serbia is pursuing several large wind farm developments in Cibuk 1 Dolovo (158 MW), Krivaca (103 MW), Plandiste (102 MW), Kovacica (95 MW) and Alibunar (42 MW).[29] The environmental impact assessment for the Krivaca project has been prepared, and construction should start in 2016, with commissioning of the wind farm planned for November 2017.[30]

In Bosnia and Herzegovina, three wind farms with a total capacity of 138 MW were given permits for construction.[31] The 48 MW Podveležje project, to be built by a local utility and supported by Germany's state-owned development bank KfW, is planned for construction and commissioning in 2016.[32] The other two other wind farms, Debelo Brdo (54 MW) and Jelovača (36 MW), are to be built by local developers.[33] In Montenegro, two wind farms, Krnovo (72 MW) and Mozura (46 MW), are in progress.[34]

Offshore wind development has not yet started in the region. However, Azerbaijan has been interested in the technology since 2009 and developed plans for an offshore wind farm, using existing offshore oil platforms, as an integral part of the concept for a "carbon-neutral" Zira Island, located in the bay near the capital Baku.[36] Although these plans did not come to fruition, new interest in the idea of linking offshore wind and oil developments appeared in April 2015. The project, off the coast of Pirallahi Island, is expected to be the first wind farm to be built in an offshore oil production area. It would involve building two piers, at the expense of the State Oil Company of Azerbaijan Republic, as well as a platform between them to house the wind farm. The feasibility study will soon be completed, and investors from China, Germany and Saudi Arabia have expressed interest in the project.[36]

Further hydropower development in the region is under way in many countries, especially in the small hydro sector. Armenia is developing multiple small hydro projects, some of them under the Clean Development Mechanism.[37] The Georgian Energy Development Fund, set up by the Georgian government to facilitate investment in renewables and to identify potential development sites for hydropower, is developing several projects jointly funded with private investors.[38] Kyrgyzstan is developing small hydro projects with technical assistance from the Global Environment Facility (GEF) administered by the United Nations Development Programme (UNDP).[39] The project, Small Hydro Power Development, should result in about 20 MW of new capacity.[40]

In 2013, Montenegro tendered seven small hydro concessions, following previous concessions tendered in 2008.[41] In 2009, the government of Tajikistan launched a programme to build some 189 small hydro plants by 2020; however, due to the programme's success, some 300 plants were added by the end of 2013, when total small hydro capacity reached 132 MW.[42] The government envisages up to 3 GW of small hydro capacity to be added over time, especially in remote areas.[43]

In Turkmenistan, some 57 MW of small hydro capacity has been identified at multiple sites, but development has not progressed.[44] The potential for pumped hydropower storage across the region

should be explored, especially as shares of non-hydro renewable energy deployment increase, as these installations could play a crucial role in integrating variable renewable energy sources such as wind and solar PV into local grids.

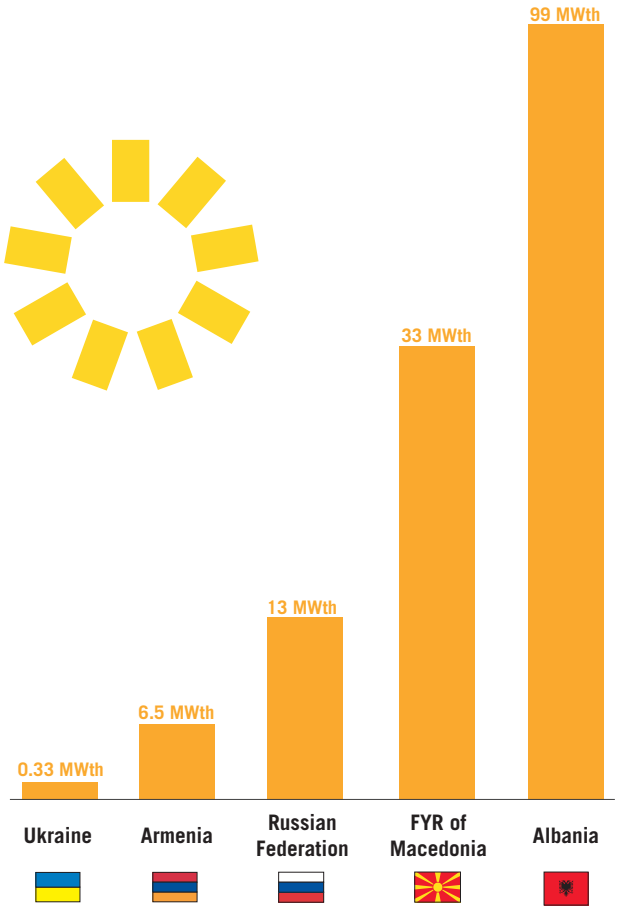
Future geothermal development in the region is uncertain. The only country with identified geothermal potential suitable for power generation is the Russian Federation. The country's total potential is estimated at 2 GW, but no major new developments are reported.[45]

Armenia is exploring its geothermal power possibilities with the help of a USD 8.55 million grant from the World Bank.[46] The project should confirm whether the geothermal resource at the Karkar field, in the Sjunik region, is suitable for power generation; if confirmed, the project will involve the private sector in developing a geothermal power plant. The project builds on the Armenia Geothermal Project, which covered the field investigations at the prospective sites, and was financed by the GEF. Preliminary analyses suggest that the site could support a 28 MW geothermal power plant.[47]

HEATING AND COOLING SECTOR

The region has good potential for using solar, geothermal or biomass for renewable heating and cooling, but the renewable heat sector is not yet well developed. Solar water heating (SWH) exists in a few countries (see figure 6) and could be developed economically throughout the region.[48]

FIGURE 6 | Solar water heating installed capacity, 2013



Source: See endnote 48, section 2.

In Albania, which has the most developed SWH in the region, use of this technology allows the country to save electricity and fuel wood that typically would be used to produce hot water. The government is working with UNDP and the GEF to support SWH technology, and, by 2020, the project should avoid an additional 300 MW of capacity that would be needed to power the electric boilers that are typically used for water heating.[49] The project aims to establish a sustainable market by securing an enabling policy framework, increased awareness and advocacy, a suitable financing mechanism and a supply of reliable technology (e.g., through labelling and quality control). Project efforts are focused on supporting Tirana Municipality to become a model for replication for other Albanian municipalities, by making SWH a standard solution for all new public buildings as well as those undergoing refurbishment. According to report contributors, there are three small producers of SWH systems in Albania.

With ample bioenergy resources in the region, the potential for bioenergy-based heat is large.[50] Belarus has the most developed sector, with 7 solid biomass-based and 16 biogas-based CHP plants feeding district heating networks, as well as more than 3,000 biomass-based boilers for heating public buildings and houses in rural areas.[51] Further developments in bioenergy for heat in the country are described in sidebar 2.[52] Belarus's example is replicable in countries that have existing and functioning district heating networks, as these can be converted to be fuelled by solid biomass or biogas where local supply is available. Individual heating systems also can take advantage of local biomass resources.

Sidebar 2. Use of biomass to fuel district heating systems in Belarus

Belarus is a net energy importer and spends around 22% of its GDP annually for energy imports. Most of the country's heat and power is produced from natural gas imported from Russia. District heating is an essential component of Belarus's energy system, providing heat to some 90% of the population and accounting for up to 40% of domestic gas consumption. Energy services, including district heating, traditionally have been heavily subsidised, implying fiscal costs for the government that amount to several percentage points of GDP. Due to the rising costs of subsidies and to rising import prices, the government is pursuing energy tariff reform to achieve cost-recovery levels. This tariff reform is adversely affecting energy consumers and increasing the share of energy poor in the country, contributing to the need to find low-cost alternatives to natural gas.

The use of local renewable energy sources, in particular abundant biomass sources, could help decrease the financial burden of gas imports as well as improve the energy security of Belarus. Forests cover 39% of the country. They are well-stocked and growing (both in volume and in area) and are efficiently and professionally managed; however, low-quality wood traditionally has been treated as waste. Using it as a feedstock for district heating systems would avoid gas imports, improve the country's CO_2 emissions and support development of the local wood-processing industry. The price differential between local biomass and imported gas, on an energy-equivalent basis, was in favour of biomass already in 2013, and has only widened since.

Building on its long-standing relationship with Belarus, the World Bank in 2014 approved a lending project to scale up the efficient use of woody biomass in heat and electricity generation in selected towns of Belarus. The total cost is expected to be USD 90 million, and the project should be implemented by 2019. In addition to investments in biomass boilers or small CHP plants based on biomass, the project includes energy efficiency improvements to district heating systems as well as technical assistance and capacity building for the companies that run these systems.

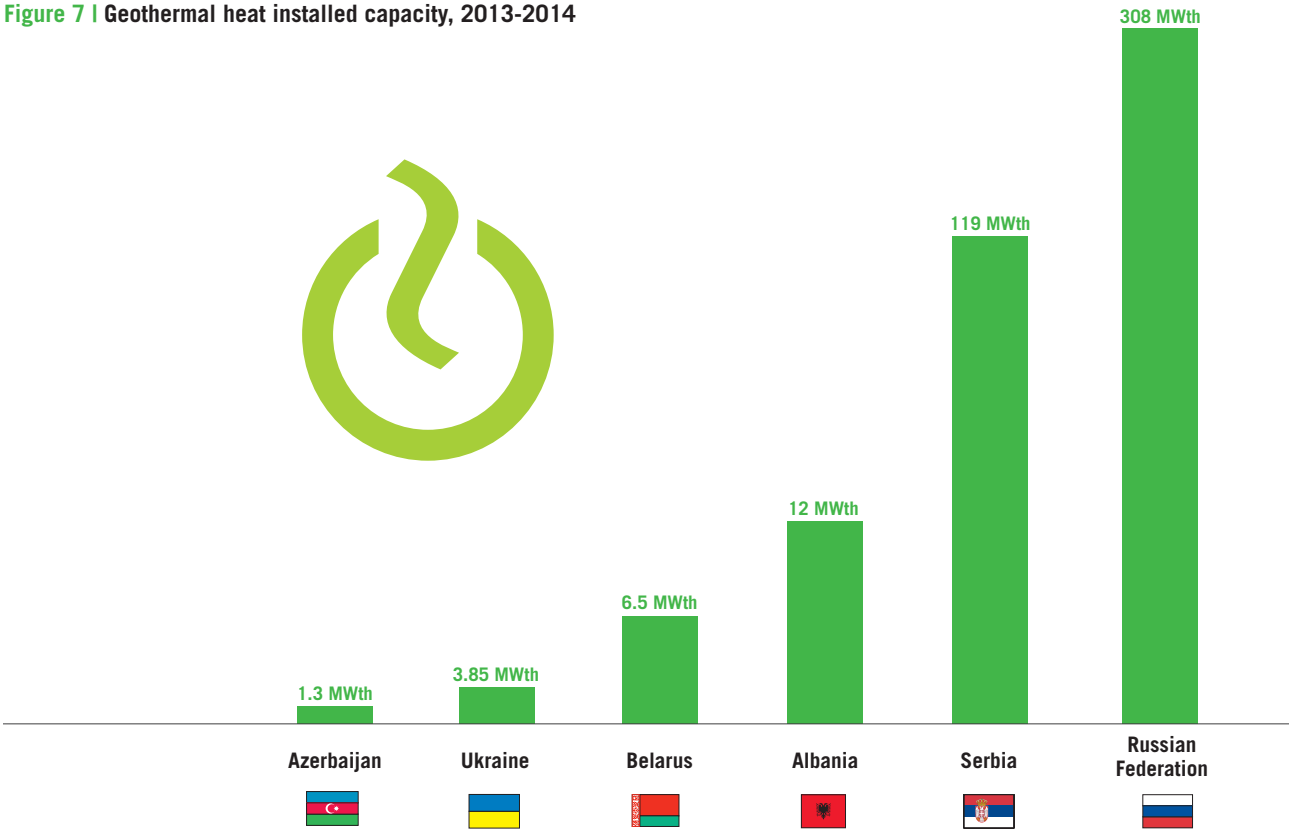
Source: See endnote 52, section 2.

Montenegro, with support from Luxembourg's Agency for Development Cooperation, is implementing the Energy Wood project, which provides citizens with soft loans for installing heating systems fuelled by modern biomass, such as wood pellets or briquettes.[53] Moldova, too, had a successful Energy and Biomass Project, supported by the European Commission and UNDP from 2011 to 2014. The project installed over 29 megawatts-thermal (MW_{th}) of total boiler capacity in public buildings in 126 villages across the country.[54] Another project in Moldova, between the government and the Japanese International Cooperation Agency, aimed to improve living conditions in rural communities by installing 25 biomass heating systems in schools and kindergartens.[55] The project included the installation of a biomass pellet plant that uses agricultural by-products and residuals (such as straw, sunflower and maize stalks) as well as orchard and vineyard residuals.[56]

The region also can take advantage of geothermal energy, either by using geothermal heat pumps or by directly exploiting low- to medium-temperature water sources to heat buildings, greenhouses, swimming pools and spas; to provide process heat for industry; and to use for drying in agriculture. Known geothermal heat capacities in the region are shown in figure 7.[57] These include mostly direct heat uses, although known heat pump capacities are reported for Serbia (22 MW_{th}), the Russian Federation (10 MW_{th}), Belarus (6.5 MW_{th}), Ukraine (3 MW_{th}) and Azerbaijan (1.3 MW_{th}).[58] In the Russian Federation, there are plans to further exploit direct geothermal heat in Krasnodar Krai and the regions of Kaliningrad and Kamchatka.[59]

DUE TO THE RISING COSTS OF SUBSIDIES AND TO RISING IMPORT PRICES, THE GOVERNMENT OF BELARUS IS PURSUING ENERGY TARIFF REFORM TO ACHIEVE COST-RECOVERY LEVELS. THIS TARIFF REFORM IS ADVERSELY AFFECTING ENERGY CONSUMERS AND INCREASING THE SHARE OF ENERGY POOR IN THE COUNTRY, CONTRIBUTING TO THE NEED TO FIND LOW-COST ALTERNATIVES TO NATURAL GAS.

Figure 7 | Geothermal heat installed capacity, 2013-2014



Source: See endnote 57, section 2.

TRANSPORT SECTOR

Several countries in the region have biofuel targets (see section 5 for details on biofuel policies). Liquid biofuel production capacities are reported in Belarus (50 million litres of biodiesel per year), the former Yugoslav Republic of Macedonia (30,000 tonnes of biodiesel per year) and Ukraine (500,000 tonnes of biodiesel and 131,000 tonnes of ethanol per year).[61] Biodiesel production in the former Yugoslav Republic of Macedonia started in 2007 and is based on rapeseed (canola).[62] The production is used for the sale of a B6 blend with diesel as well as for pure B100 biodiesel.[63] Two more biodiesel refineries have been announced for the country, one of which will use sunflower and soybeans as feedstock and is expected to produce 13,000 tonnes of biodiesel per year.[63]

03

DISTRIBUTED RENEWABLE ENERGY AND ENERGY ACCESS

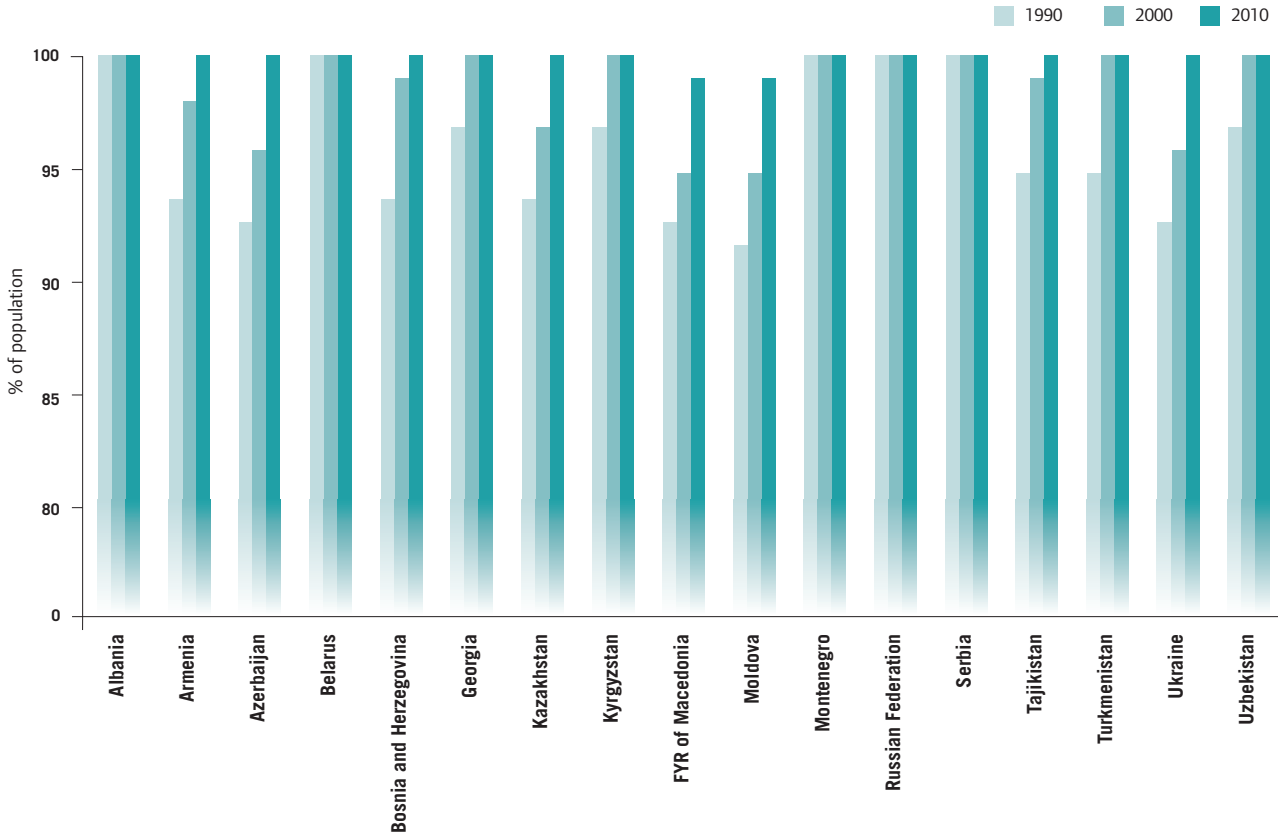
Access to affordable, reliable and sustainable energy is a challenge for low-income and rural populations in the region, despite its endowment in energy sources. Some children still study in under-heated classrooms.[1] Households use low-quality fuel wood for heating and cooking in stoves that have conversion efficiencies of 20% or less.[2] A few rural settlements in remote areas lack electricity access. Although electrification rates are very high in the global context, several countries in the region report high use of polluting and health-damaging solid fuels for heating and cooking[iii]. National governments and international donors are promoting renewable energy solutions to improve the quality of energy access.

POWER SECTOR

The latest advancements in reporting on the multi-dimensional character of energy access shed light on the situation across South East Europe, Eastern Europe, the Caucasus, Central Asia and the Russian Federation. Although the countries' overall performance on electricity access is above the global average, challenges emerge when applying a multi-tier approach to measuring energy access.[3] Multi- tier approaches measure energy access as a continuum of improvement, based on the performance of the energy supply.

From a global perspective, the region is over-performing in terms of electricity access. Whereas 1.2 billion people worldwide lack access to electricity networks, 15 out of the 17 countries in the region reported electrification rates of 100% of their population in 2010 (with the exceptions being the former Yugoslav Republic of Macedonia and Moldova; see figure 8).[4] In 2012, all countries reported 100% electrification rates (see table 2). This is a notable improvement over 1990, when 12 countries reported rates of between 90% and 100%.[5] Still, there is a discrepancy between reported rates and the situation on the ground, where a small number of remote settlements and rural communities continues to lack access to electricity (see sidebar 3).[6] The reasons vary by country and include a history of conflict or changes in the sources of electricity supply.

FIGURE 8 | Share of the population with access to electricity, 1990, 2000 and 2010



Source: See endnote 4, section 3.

iii. Solid fuels include traditional biomass (wood, charcoal, agricultural and forest residues, dung, and so on), processed biomass (such as pellets and briquettes) and other solid fuels (such as coal and lignite).

Sidebar 3. Communities without electricity access

According to the World Bank's World Development Indicators, access to electricity in the 17 countries covered in this report was equal to 100% of their population in 2012. However, other sources indicate that several communities across five countries still lack access to electricity.

In Bosnia and Herzegovina, villages lack access to electricity as a result of physical damages caused by the conflict in the 1990s. UNDP-implemented projects in the country brought electricity to over 400 families, with close to 100 kilometres of low- and high-voltage electricity grids rehabilitated in 17 municipalities. Renewable energy solutions are also encouraged, as illustrated by the renewable challenge competition (see sidebar 5).

In Georgia, electrification efforts are under way in eight remaining villages without access to electricity. Georgia launched a programme for rural electrification in 2012 to address the needs of 36 off-grid villages in the regions of Adjara, Imereti, Javakteti , Kakheti, Kvemo Kartli, Kvemo Svaneti, Mtkheta Mtianeti, Racha-lechkhumi, Samtskhe and Shida Kartli. The U.S. Agency for International Development (USAID) provided the initial financing for electrification works in 2012, and the government has been providing a budget allocation since 2013.

In Kyrgyzstan, about 20 settlements are not provided with electricity in Batken region on the border with Uzbekistan and Tajikistan. Electricity traditionally was supplied from a power plant located outside of Kyrgyzstan, but supplies were ceased in 2013. The Islamic Development Bank recently provided financing for a project that will improve the electricity supply situation in the region.

Uzbekistan has about 1,500 communities without connection to the centralised electricity supply. The issue is pressing in the Republic of Karakalpaksta, where UNDP provided 25 solar PV systems during 2002-2006.

Tajikistan's electricity company Barqi Tojik reports that the electricity grid covers 96% of the country, except for remote and sparsely populated mountainous regions. The issue is access to a reliable supply of electricity, as the country lacks sufficient generation capacity to satisfy demand. The situation is managed through scheduled outages. In the winter, 70% of the population living in rural areas has about three hours of electricity supply per day. Rural residents consume only 8.9% of the total volume of electricity in Tajikistan.

Source: See endnote 6, section 3.
The information in this sidebar is based on information gathering for the purpose of this report and may not be comprehensive.

Beyond electricity, the region is challenged on other dimensions of energy access. Populations across a number of countries are still exposed to issues of low reliability (power outages), affordability (high rates of energy poverty), supply quality and health as a consequence of reliance on solid fuels for heating and cooking (see table 4).[7] Power outages still occur in several countries, especially in the Caucasus and Central Asia, where the energy infrastructure is poorly maintained and ageing. Based on a World Bank enterprise survey, this is an issue not only for rural households, but also for businesses.[8] In Tajikistan, 4.4% of companies' sales are lost due to electrical power outages, in Kyrgyzstan 2.3% and in Uzbekistan 2.2%, compared to the OECD average of 0.1%. Power shortages in Tajikistan are estimated to total about a quarter of winter electricity demand (2,700 GWh), with related economic losses estimated at more than USD 200 million annually, or 3% of GDP.[9]

Affordability can be evaluated through the lens of energy poverty rates in the region. The energy poverty rate is defined as the share of households in a country that spend a significant portion of their budget (more than 10%) on energy.[10] The rate is higher than 40% in four countries in the region (see table 4). In Tajikistan, a high energy poverty rate (60%) coincides with a high occurrence of power outages, creating a situation of energy supply crisis.[11]

Access to non-solid fuels is the most significant factor affecting energy access in the region. Nearly 13 million people across the 17 countries still rely on polluting and health-damaging solid fuels to meet their cooking and heating needs (see table 4).[12] The energy impact is exacerbated by the fact that space and water heating are the most important components of a building's energy use. In at least 12 countries, more than 5% of the population used solid fuels in 2012.[13] In seven countries, the share is more than 30% (in Bosnia and Herzegovina, 58% of the population does not have access to non-solid fuels, in Georgia 46%, in Albania 38%, in Montenegro 38%, in the former Yugoslav Republic of Macedonia 33%, in Serbia 31% and in Tajikistan 31%).[14] The efficiency of the equipment

being used is also an issue: in South East Europe, heating stoves typically have a conversion efficiency of 20% or less.[15]

Multiple factors explain the high level of solid fuel use. Access to natural gas and district heating networks is limited in some parts of the countries, particularly in remote areas.[16] Gas and central heating networks are less available in South East Europe than in Eastern Europe, the Caucasus and Central Asia, with the exception of Tajikistan. Georgia has historical reasons for the spike in solid fuel consumption (see sidebar 4).[17] In countries that have district heating, this supply is present mainly in cities, and in Albania, the operation of district heating was ceased completely.[18]

TABLE 4 | Energy access and energy poverty status

	Access to non-solid fuels 2012	of which rural 2012	of which urban 2012	Energy poverty rate*" 2012	Share of sales lost due to electrical outages (%) 2013
Albania	62%	42%	84%	46%	2.6%
Armenia	93%	95%	100%	35%	0.1%
Azerbaijan	93%	82%	100%	21%	0.1%
Belarus	100%	97%	100%	6%	0.1%
Bosnia and Herzegovina	42%	24%	69%	29%	0.3%
Georgia	54%	16%	87%	39%	0.5%
Kazakhstan	90%	80%	97%	27%	0.4%
Kyrgyzstan	N/A	N/A	N/A	25%	2.3%
FYR of Macedonia	67%	43%	84%	N/A	1.2%
Moldova	91%	86%	100%	52%	0.2%
Montenegro	62%	47%	84%	35%	0.8%
Russian Federation	99%	91%	99%	29%	0.2%**
Serbia	69%	46%	87%	49%	0.3%
Tajikistan	69%	58%	95%	60%	4.4%
Turkmenistan	100%	100%	100%	N/A	N/A
Ukraine	96%	89%	99%	15%	0.2%
Uzbekistan	88%	79%	100%	N/A	2.2%

Note: Non-solid fuels include liquid fuels (for example, kerosene, ethanol, and other biofuels), gaseous fuels (for example, natural gas, liquefied petroleum gas, biogas) and electricity.
N/A indicates that the data were not available at the time of publication.
* The energy poverty rate is the share of households spending more than 10% of their budgets on energy;
** Data for the Russian Federation are from 2012.
Source: See endnote 7, section 3.

Reliance on electricity for heating needs varies across the countries and is intensive in Albania, the former Yugoslav Republic of Macedonia and Montenegro.[19] Some countries (Kyrgyzstan and Serbia) use electricity as a supplementary heat source in winter, resulting in demand peaks.[20] Other households, even if power supply is available, cannot afford the additional electricity expenditures and turn to other solutions. For example, fuel wood, obtained through social assistance programmes such as those in Georgia (see sidebar 4) or through illegal logging (as is occurring in South East Europe) is the heating fuel of choice for the rural poor.[21]

Sidebar 4. Challenges of heating in Georgia

Georgia has the lowest level of access to non-solid fuels among Caucasus countries, at 54% compared to 93% in Armenia and Azerbaijan. Its rural population is affected in particular, with only 16% having access to non-solid fuels. The current situation has its roots in the country's energy crisis of the 1990s, the consequences of which linger in patterns of energy sources for heating.

Georgia benefited from a well-designed and functioning district heating system until 1993. The system served the Tbilisi area (83% of the country's population) and consisted of 47 district thermal stations with a combined capacity of 4,295 MW. When the natural gas supply to Georgia was interrupted in 1993-1994, operation of the central heat supply system was ceased abruptly. As an immediate solution, people have relied on alternatives such as kerosene, propane and wood – a practice that has continued even as gas networks are progressively expanded.

An important reason for this is the cost of heating. The government offers vouchers to provide wood supply for households in rural areas at a very low rate. Based on a survey by the Caucasus Environmental NGO Network (CENN), between 75% and 96% of villages were depending on fuel wood for their heat supply. The report also discusses the widespread incidence of illegal logging, which has notable environmental implications. Some efforts are being made to propose renewable-based solutions, such as the use of solar thermal in schools and hospitals. Georgia's Energy Efficiency Centre is co-ordinating the projects on the government side.

Source: See endnote 21, section 3.

DISTRIBUTED RENEWABLE ENERGY SOLUTIONS FOR ENERGY ACCESS

A mix of ad hoc projects financed by international donors and government programmes has been adopted in the region to promote renewable energy solutions for improving the quality of the energy supply. The concerned countries have yet to benefit from their participation in the SE4All initiative (see section 1), which can bring them to the mainstream of innovation related to energy access. The main gaps are in communities without electricity access or with high use of solid fuels for heating.

Most of the projects documented here address heating for residential use using solar thermal systems. Albania and the former Yugoslav Republic of Macedonia have sizable installed capacities of solar thermal (see section 2). Albania boosted its installed capacity with UNDP/GEF financial support, and draft legislation introducing mandatory installation of solar water heaters is pending approval.[22] Kyrgyzstan and Tajikistan are pursuing projects at a smaller scale with the support of international donors (see table 5).[23] In Tajikistan, a guide to solar thermal installation for Tajik users was developed based on a project implemented in Croatia with the support of UNDP, offering an example of the transfer of know-how between two countries in transition.

Only Montenegro has a government programme providing support for conversions to modern biomass (see section 2), which also can be accessed by low-income households in remote areas. The programme offers retail loans for the installation of heating systems through commercial banks, with financing from the Luxembourg Agency for Development Cooperation and allocation via the Forestry Development Project in Montenegro.[24] In Uzbekistan, a biogas-based system was installed successfully to meet needs for space and water heating on a remote farm (see table 9), and UNDP later supported the development of the country's National Standard for Biogas Units.[25] The standard is registered with the Uzbek Standard Agency (reference number OzDSt 2798:2013) and includes mandatory requirements for the design, construction, operation and maintenance of biogas units. It is the first national standard related to renewable energy technologies in the region.

Another potential distributed renewable energy solution in the region is geothermal heat pumps in households that have a more reliable electricity supply, provided that local economics allow it.[26] In general, financing the costs of switching to renewable energy solutions is an issue for local populations. Costs so far have been covered primarily by grants from international donors or contributions from government budgets. Innovative business solutions have yet to emerge to cover project roll-out at a large scale as well as investments in the renewable fuel supply chain (e.g., wood pellets). In several countries, access to free solid fuels needs to be addressed as a barrier to further uptake of modern renewable energy solutions in the market (see sidebar 4).

Fewer initiatives focus on electricity access, given the limited scale of the issue (see figure 8). Tajikistan is the only country in the region that has a renewable energy target specifically for enabling electricity access in mountainous, off-grid communities where laying power lines is not economically feasible.[27] Georgia, Kyrgyzstan, Tajikistan and Turkmenistan all integrate electrification into their small hydropower development strategies (see section 2).

Several countries are using solar PV as a distributed energy solution. In 2011 and 2012, the government of Montenegro implemented the Solarni Katuni programme to subsidise the installation of PV systems on remote farms (see table 5). The programme offered 80% government support (from both the national and local governments) for the initial investment, combined with a 20% contribution from the end-user. Some 189 systems were installed during the two phases of the project. In Bosnia and Herzegovina, a

technology innovation challenge resulted in the installation of off-grid renewable power at costs rivalling connection to the national grid (see sidebar 5).[28]

Innovative models for financing improvements in access to electricity and heating are emerging at a local level. In the former Yugoslav Republic of Macedonia, the GEF's Small Grants Programme led to the creation of local EnviroFunds to generate seed money for environmental activities, using savings gained from the project as well as additional resources from local budgets.[29] In Kyrgyzstan, a mutual benefit revolving fund was created with support from the GEF programme to build and install solar collectors and water heaters in the community of Jamaat Bai-Tilek. The programme provides help with acquiring components as well as training in installation. Community members make monthly cash contributions to the fund, and after a certain sum has accumulated, the community buys the necessary parts and installs a solar water heater in a member's household, chosen by lottery.

TABLE 5 | Selected projects providing renewable energy solutions in remote areas

	PROJECT TITLE	DESCRIPTION
Kazakhstan	Renewable energy promotion in Kyzylorda oblast	Demonstration of the efficiency of solar PV systems as a power source for remote districts and settlements of Kyzylorda area, with the example of Moinak settlement and further replication by local communities and governmental authorities in other areas.
Kyrgyzstan	Home Comforts	Demonstration of the use of energy-efficient stoves, solar collectors for warm water and ECOSAN toilets in nine villages. The technologies are installed in public places, mainly buildings of the "Community Drinking Water Users Unions", so that villagers can see and test them. In Chyrak, energy-efficient stoves were installed in the post office, and in Toguz Balak, they were installed in the village medical ambulatory. Financed by the European Commission.
Montenegro	Solarni Katuni	Installation of solar PV power systems in households located on summer pastures. The state (national and local administrations) covers 80% of the system cost, and the end-user covers the remaining 20%. In two phases, 189 systems were installed in previously unelectrified households.
Tajikistan	Do-It-Yourself Solar Water Heating System	Development of a solar water heating manual under the SE4All initiative as a pilot model for "East2East" exchange on sustainable energy solutions. The project, based on the transfer of know-how between Croatia and Tajikistan, included a workshop for local Tajik women. Financed by UNDP.
	Wind pilot project	Wind installation on the isolated island of Gyzylsu in the Caspian Sea, providing power to a local village as well as a desalination system.
Turkmenistan	Solar pilot project	Installation of three solar PV power and pumping stations in national nature reserves by the end of 2015 in order to provide electricity and water to isolated shelters in desert areas. Implemented within the framework of the EU-funded Sustainable Development Policies (SDP) project and in co-operation with the Ministry of Nature Protection.
Uzbekistan	Biogas plant	Installation of a biogas plant on a remote farm for space and water heating and cooking purposes.

Source: See endnote 23, section 3.

Sidebar 5. Innovative renewable solutions for energy access in Bosnia and Herzegovina

Almost 3,000 households live without electricity in Bosnia and Herzegovina. The cost of electrification works is high. The village of Veliko Ocijevo, with some 20 households, needs EUR 350,000, or EUR 17,500 per household, to obtain a commercial electricity connection. Renewable energy is an alternative solution that can offer access to electricity at a lower cost.

In 2013, UNDP in Bosnia and Herzegovina issued a "Renewable Energy Challenge" seeking an affordable solution based on renewable energy for war-returnee families living in rural areas off the power grid. The successful proposal had to cover the energy needs of an average family and cost only EUR 5,000, more than three times less than a commercial electricity installation. The best of the 37 entries received by UNDP and Nesta were field tested for two months. The winning unit, designed by Telefon Inzenjering from Serbia, was a solar unit that provided more energy (2 kW) and longer battery storage capacity (4.65 days) than the challenge specified.

Since then, the UNDP-installed renewable energy kits have transformed the lives of 36 families and have helped them supplement their income. UNDP is negotiating with international donors and the government to extend the project to more beneficiaries. UNDP also plans to install more renewable energy kits in Veliko Ocijevo, which will become the first village in Bosnia and Herzegovina powered by renewable energy – including solar for electricity and domestic hot water, and biomass for heating.

Source: See endnote 28, section 3.

04

ENERGY EFFICIENCY

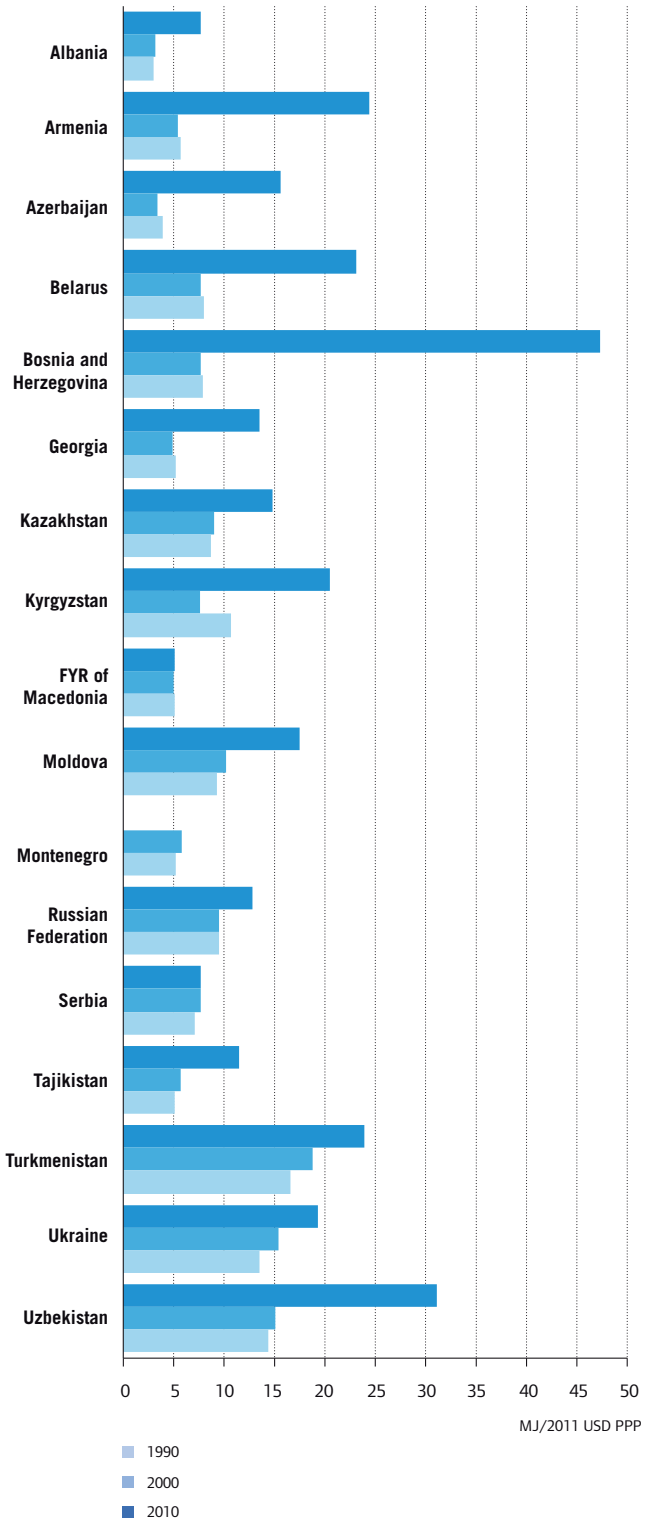
Energy efficiency is a way of managing the growth in energy consumption. Increasing energy efficiency means delivering more services for the same amount of energy consumed, or the same services for less energy. The 17 countries show moderate development in energy efficiency, pushed by energy security concerns and by support from international donors. Energy intensity in the region is high in the global context despite reductions driven by climatic and structural economic factors and the need to address inefficiency in energy conversion.[1] Most policies and projects target energy efficiency in buildings, but efforts in the industry and transport sectors also need to be scaled up, considering the potential for energy savings.

REGIONAL OVERVIEW

Energy intensity can be used to describe trends over time, bearing in mind that efficiency is only one driver of intensity.[2] Decomposition analysis is a helpful tool for quantifying the effect of different drivers and for isolating the actual intensity component.[3] In the past, countries in Eastern Europe, the Caucasus and Central Asia, as well as the Russian Federation, had very high levels of energy intensity compared to other regions of the world.[4] Between 1990 and 2010, primary energy intensity, or total energy consumption per unit of GDP, in the region decreased greatly (see figure 9).[5] However, some countries witnessed an increase between 2010 and 2012.

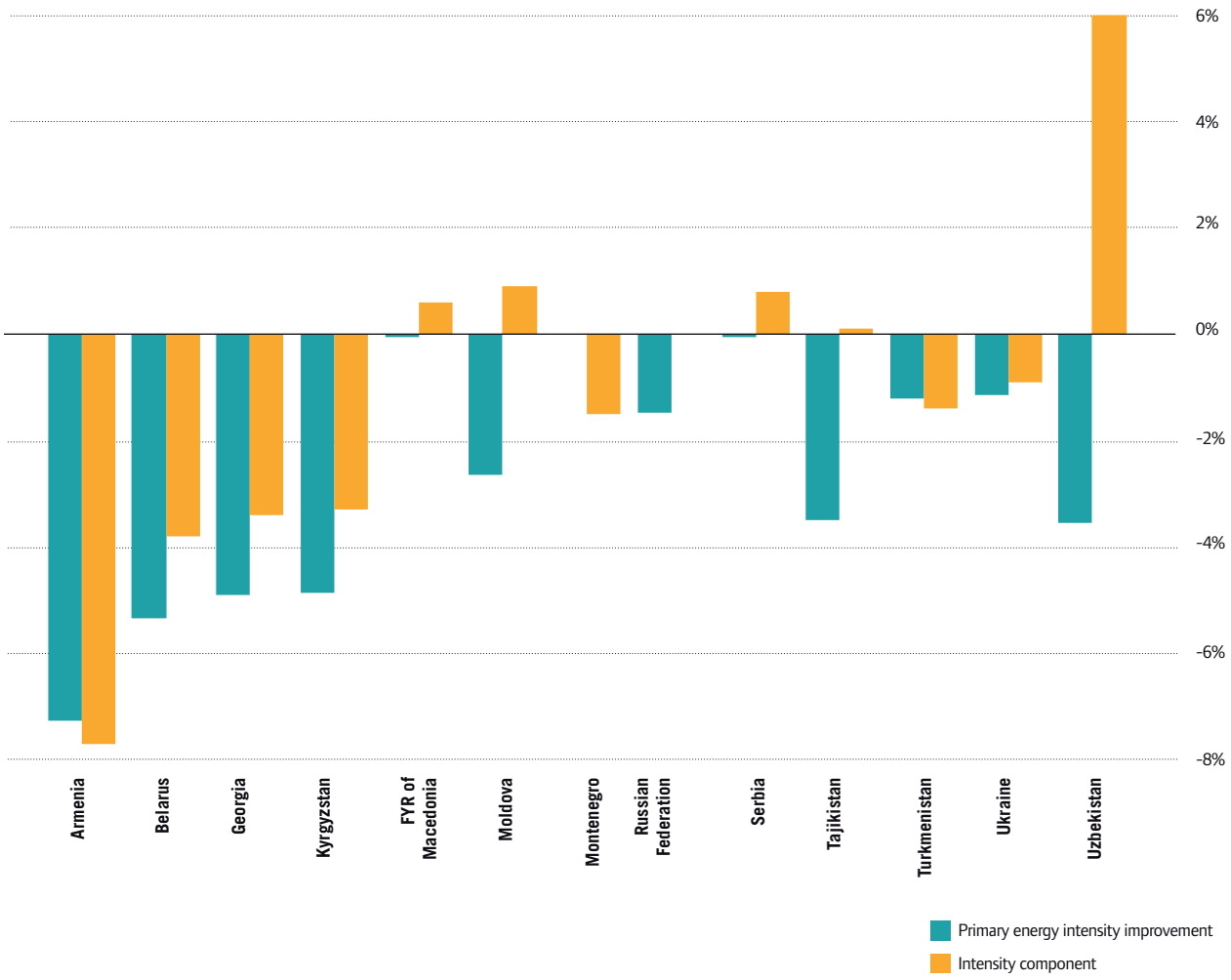
Decomposition analysis indicates that efficiency's role in reducing energy consumption was only one of the factors driving the reduction in energy intensity between 1990 and 2010. Structural changes in the economy during the 1990s towards less energy-intensive industries contributed to the decrease in primary energy consumption per unit of GDP.[6] The intensity component grew between 1990 and 2010 in several countries, including the former Yugoslav Republic of Macedonia, Moldova, Serbia and Uzbekistan (see figure 10).[7]

FIGURE 9 | Primary energy intensity, 1990, 2010 and 2012



Source: See endnote 5, section 4.

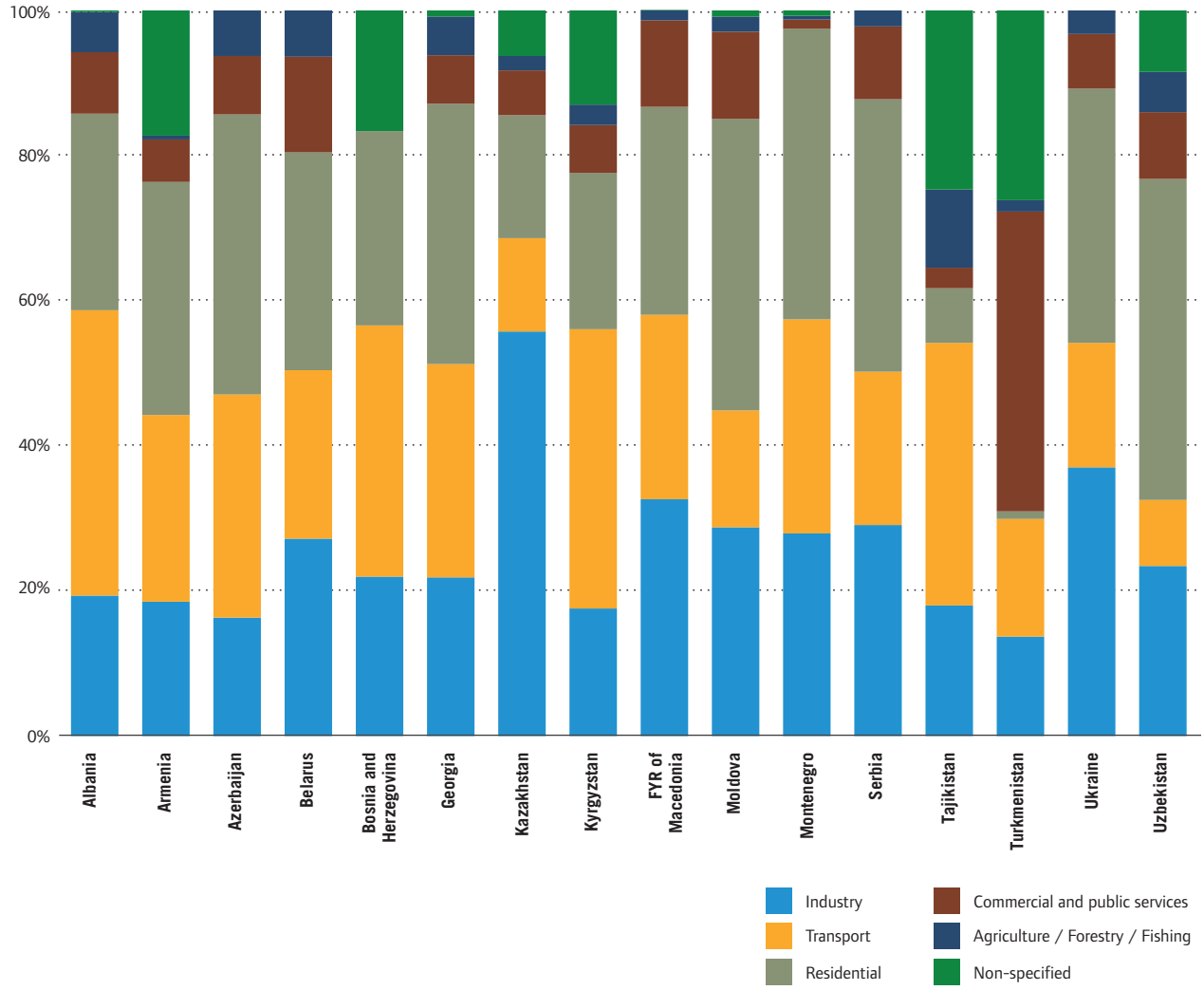
FIGURE 10 | Change in energy intensity in selected countries, 1990-2010



Note: Intensity component is based on decomposition analysis of global intensity trends undertaken by the SE4All Global Tracking Framework.
Source: See endnote 7, section 4.

The industry sector plays an important role in the region's energy use (accounting for at least 14% of TFEC in all 17 countries, and more than 40% in 4 countries), followed by the transport sector (more than 25% of TFEC in 8 countries) and the residential sector (more than 30% of TFEC in 7 countries) (see figure 11).[8] However, high shares of energy consumption do not necessarily indicate that these sectors are the most inefficient. For example, the industry sector's prominence over the residential sector in TFEC is due to the existence of energy-intensive industries, such as iron and steel, in several of the countries.[9] Although some advances have been made to promote energy efficiency in buildings, mostly in the residential and public sectors, efficiency policies for industry and transport are lagging (see section 5).

FIGURE 11 | Share of total final energy consumption by sector, 2012



Source: See endnote 8, section 4.

Energy efficiency markets in the region have been slow to develop despite significant potential opportunities. The barriers can be grouped into several categories: regulatory and institutional, financial and market-related, technological and infrastructural, and social and environmental.[10] Regulatory barriers include the existence of subsidies and metering at the customer level for selected sub-sectors. Energy subsidies are widespread, and price signals are not sufficient to drive the adoption of new, efficient and more costly technologies or upgrades.[11] Among the institutional barriers is the lack of dedicated agencies to co-ordinate policies from the government side (see section 5).

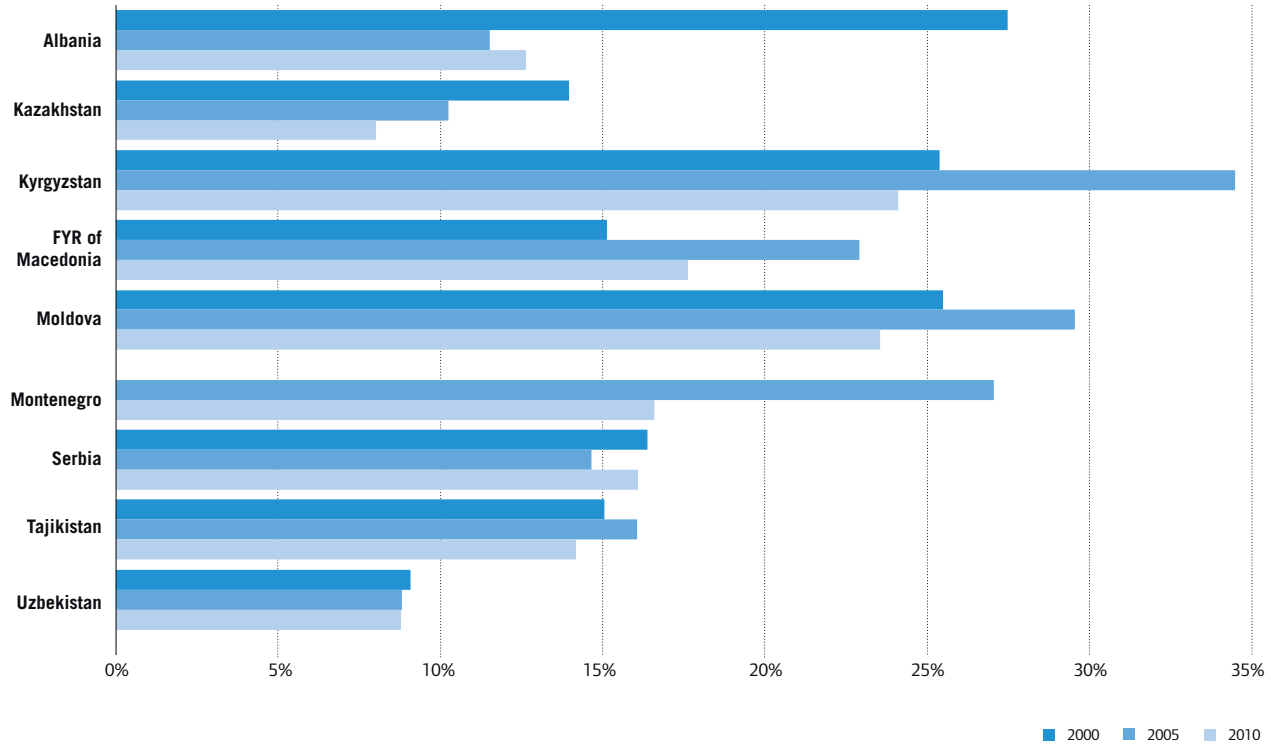
Another barrier to deployment of energy efficiency projects is the availability of sizable public or private funding. This is more relevant in Eastern Europe, the Caucasus and Central Asia than in South East Europe, where funding from international donors is available, but the absorption capacity at the local level is weak.[12] One of the main technical barriers is the availability of data at the user level. Tracking performance indicators for energy efficiency, such as kWh per floor area, is challenging, and metering in district heating is not available systematically at the end-user level.[13] Social barriers include low public awareness of energy efficiency and the lack of skilled labour, as technical and technology know-how is still being built in the local market.[14]

Given the above factors, energy efficiency is being promoted through government targets, regulatory policies and support mechanisms, although countries demonstrate varying levels of progress.

ELECTRICITY SUPPLY

Countries in South East and Eastern Europe, the Caucasus and Central Asia continue to face challenges in improving the efficiency of their electricity supply, despite ongoing modernisation of their electricity infrastructure. Most of these countries still had high levels of transmission and distribution losses in 2011 (the latest year for which data are available for the whole region), with some of the losses more than three times higher than the EU average of 6.2% of electricity output (see figure 12).[15] Only Kazakhstan and Uzbekistan reported losses of less than 10%. In South East Europe, high levels of losses was reported in Albania, the former Yugoslav Republic of Macedonia and Montenegro.

FIGURE 12 I Transmission and distribution losses as a share of electricity generation in selected countries, 2000, 2005 and 2010



Note: Data for 2000 for Montenegro are not available.
Source: See endnote 15, section 4.

Modernisation of the transmission and distribution network is on the government agenda in several countries. Tajikistan included an overall objective of securing the reliable operation of power grids and reducing electricity losses under its programme for the efficient use of hydropower resources and energy efficiency for 2012-16. At a regional level, the INOGATE programme has supported the countries of Eastern Europe, the Caucasus and Central Asia in addressing technical losses in their electricity and gas networks.[16] Among the outcomes achieved by 2014, Azerbaijan introduced secondary legislation on losses in the electricity sector as well as advanced metering infrastructure to reduce commercial losses in distribution.[17] Armenia amended its tariff methodology to create an incentive for large consumers to reduce technical losses in the distribution system.[18] Albania planned to invest more than USD 50 million in 2015 to improve its distribution network, improve the quality of supply and reduce technical losses.[19]

BUILDINGS

Globally, buildings account for 31% of final energy consumption and are the largest energy-consuming sector, with space and water heating accounting for the highest share of building energy consumption.[20] In the 17 countries of the region, residential energy use accounts for a sizable share of TFEC, between 17% and 42% (see figure 11). Energy efficiency in buildings is the most developed area for regulatory policies in the region (see section 5), and projects are ongoing in almost all countries, supported by international donors such as the World Bank, the German Agency for International Cooperation (GIZ), UNDP, the Swedish Development Agency, USAID and others.[21] However, improving energy use in buildings requires a more sustainable solution for supplying space and water heating, which is challenged by the use of traditional biomass and inefficient district heating systems.

Building stocks vary across the 17 countries, given differences in their climate and economies (see section 1). However, they also share some common features. In the residential sector, most buildings were constructed after World War II and comprise large, identical residential blocks with poor energy performance.[22] In rural areas of South East Europe, large numbers of houses are not completed and lack external insulation and window sealing.[23] For existing buildings, the potential for energy savings is estimated at 30-75%, with efficiency improvements targeting mainly external insulation and windows.[24]

In Armenia, the National Programme on Energy Saving and Renewable Energy estimates the potential for energy savings in the building sector at 40%.[25] In the Russian Federation, where buildings account for more than 35% of final energy consumption, the potential for savings from deep energy efficiency renovation in multi-story residential buildings is estimated at 50%.[26] In South East Europe, where buildings account for around half of final energy consumption, the energy savings potential is 20-40%.[27] The highest potential is estimated in the public sector (35-40%) and the residential sector (10-35%).[28]

International donors are supporting energy efficiency projects for buildings across the region through policy development, institutional capacity building and financing of retrofits. In Georgia, since 2009, USAID has run the New Applied Technology Efficiency and Lighting Initiative (NATELI), which supports energy auditing of common areas in residential buildings in Tbilisi.[29] In Azerbaijan, Norsk Energi supported the State Agency on Alternative and Renewable Energy Sources to develop capacity on sustainable buildings. In Kyrgyzstan, UNDP introduced a dedicated programme to promote energy efficiency and helped the Ministry of Construction create new building codes and regulations for the thermal performance of buildings.[30] In Ukraine, the EBRD has been driving energy efficiency projects in the public sector in collaboration with other donors.[31] In Uzbekistan, UNDP also helped revise building codes to address energy performance in buildings.[32]

PUBLIC BUILDINGS ACCOUNT FOR A LARGE SHARE OF COMMERCIAL BUILDINGS IN THE 17 COUNTRIES AND REPRESENT AN OPPORTUNITY FOR ENERGY SAVINGS. IN SOUTH EAST EUROPE, CENTRAL GOVERNMENT BUILDINGS REPRESENT 11-37% OF THE TOTAL FLOOR SPACE OF COMMERCIAL BUILDINGS.

Space and water heating is typically the largest component of residential energy use, although consumption patterns vary by country based on differences in climate and in the energy performance of buildings. In South East Europe, space and water heating accounts for 65% of residential energy use.[33] Heating solutions across the region rely primarily on solid fuels, such as fuel wood and coal (see section 3). District heating is important in several countries (Belarus, Kazakhstan, Kyrgyzstan, Moldova, Serbia, Ukraine, Uzbekistan, Tajikistan, Turkmenistan), and the Russian Federation is the largest user of district heating systems in the world.[34] In most of these countries, the systems remain inefficient and have continued to deteriorate since the 1990s, leading the IEA to identify district heating as an area of high savings potential.[35]

Public buildings account for a large share of commercial buildings in the 17 countries and represent an opportunity for energy savings. In South East Europe, central government buildings represent 11-37% of the total floor space of commercial buildings (see table 6).[36] International donor-supported projects in the region have focused on improving energy efficiency in public buildings, given the role of public institutions in leading by example and helping to create local markets.[37] The Western Balkans Investment Framework is helping to co-ordinate these donor activities.[38] Donor interest also extends to the residential sector, given its potential for energy savings in combination with energy efficiency policies (see section 5).[39]

Table 6 | Government share of commercial building floor space in South East and Eastern Europe

	Total commercial building floor space* m^2	Public building floor space as a share of commercial space %	Central government public buildings as a share of commercial space %
Albania	16,348,000	52%	13%
Bosnia and Herzegovina	15,890,000	47%	21%
FYR of Macedonia	8,483,400	27%	11%
Moldova	6,544,900	92%	30%
Montenegro	4,893,615	70%	37%
Serbia	53,152,000	49%	20%
Ukraine	115,725,700	94%	28%

* Total commercial buildings include all public and private non-residential building types.
Source: See endnote 36, section 4.

Energy service company (ESCO) schemes, which provide a full range of services, including design, implementation and financing for energy efficiency projects, are present in fewer countries, including Bosnia and Herzegovina, Moldova, Serbia and Montenegro (which is piloting an ESCO scheme).[40] The EBRD and the Energy Community Secretariat are supporting Bosnia and Herzegovina under the Regional Energy Efficiency Programme, targeting the development of ESCO-enabling regulations, among others.[41] In Moldova, a loan guarantee fund will be established for ESCOs within the UNDP/GEF ESCO-Moldova project, with the aim of targeting both public and residential buildings, but its results are yet to be seen.[42] The EBRD, along with the Swedish International Development Cooperation Agency and USAID, helped to develop the ESCO law in Ukraine.[43]

LIGHTING, APPLIANCES AND COOKING

Globally, lighting, appliances and cooking account for 45% of energy consumption in buildings.[44] Although significant improvement in energy efficiency is possible today based on the introduction of modern technologies, their deployment in the market is a complex process driven by regulatory policies. The situation across the 17 countries varies depending on their progress with development targets and regulatory policies (see section 5). For example, Ukraine provides partial reimbursement of loans for energy-efficient household appliances under the State Target Economic Programme on energy efficiency.[45] Kyrgyzstan, meanwhile, has identified energy efficiency labelling as a priority action, but the work has not been carried out.[46]

Lighting products represent 20% of global electricity consumption.[47] The recommended policy tool for improving lighting efficiency is the phase-out of inefficient technologies, such as incandescent light bulbs. Outside South East Europe, only Kazakhstan, the Russian Federation and Tajikistan have phased out incandescents from their markets. A key driver for lighting replacements is the availability of data on the efficiency potential. Several countries in South East Europe (Albania, the former Yugoslav Republic of Macedonia, Montenegro and Serbia) are involved in a project to design web-based solutions for gathering relevant data on energy efficiency, including street lighting.[48]

Because street lighting presents an opportunity for lighting replacement at a large scale, international donors have supported projects in several of the countries. Moldova is undertaking

street lighting retrofits under its Programme on Promotion of Social Infrastructure, in collaboration with Germany's KfW.[49] In Azerbaijan, the United Nations Environment Programme (UNEP) is supporting a project to replace public street lights with light-emitting diodes (LEDs), co-ordinated as part of the EU Covenant of Mayors initiative.[50] In Central Asia, UNDP is promoting energy efficiency in street lighting in Kazakhstan and elsewhere.[51]

The use of energy for cooking varies across the region, with several countries dominated by traditional biomass rather than electricity (see section 3). In some countries, such as Uzbekistan, the use of electricity for cooking has increased alongside growth in per capita GDP, opening room for increasing energy efficiency through the use of modern appliances.[52]

OTHER SECTORS

The industry and transport sectors play an important role in final energy consumption in most of the 17 countries. Industry is the largest energy-consuming sector in Eastern Europe, the Caucasus and Central Asia, as well as in the Russian Federation, where it accounts for more than 30% of TFEC.[53] In South East Europe, industry's share in TFEC is between 17% and 31%, and it is the third largest sector, with an estimated energy savings potential of 5-25%.[54] Achieving better efficiency in industry faces multiple challenges in the region, including high upfront costs, concerns about competitiveness and the existence of energy subsidies.[55]

In most countries in the region, international donors and development banks are financing projects targeting efficiency improvements in industry, including voluntary or mandatory energy audits and the introduction of energy management.[56] In Uzbekistan, the World Bank financed the establishment of the USD 100 million Energy Efficiency Facility for Industrial Enterprises Project (UZEEF).[57] In Belarus, UNDP funded energy efficiency upgrades in four state-owned enterprises.[58] In South East Europe, the EBRD has been supporting industrial energy efficiency through the Western Balkans Sustainable Energy Direct Financing Facility (WeBSEDFF), an investment facility endowed with up to EUR 100 million of loan funds, including some dedicated for energy efficiency.[59]

The transport sector represents a sizable share of the region's TFEC (see figure 11), with high annual growth rates in some countries.[60] Several countries lie on the transit route between Europe and Asia and have high road transport flows.[61] National vehicle markets in the region are dominated by second- hand imports, driving down their efficiency.[62] An exception is Uzbekistan, which has a car manufacturing facility that supplies both the domestic market and the broader regional market in Central Asia.[63]

THE INDUSTRY AND TRANSPORT SECTORS PLAY AN IMPORTANT ROLE IN FINAL ENERGY CONSUMPTION IN MOST OF THE 17 COUNTRIES. INDUSTRY IS THE LARGEST ENERGY-CONSUMING SECTOR IN EASTERN EUROPE, THE CAUCASUS AND CENTRAL ASIA, AS WELL AS IN THE RUSSIAN FEDERATION, WHERE IT ACCOUNTS FOR MORE THAN 30% OF TOTAL FINAL ENERGY CONSUMPTION.

SECTOR-SPECIFIC TARGETS
RENEWABLE ENERGY
05
POLICY AND TARGET LANDSCAPE
ENERGY EFFICIENCY
RENEWABLE ENERGY TARGETS IN THE TRANSPORT SECTOR
ENERGY EFFICIENCY IN BUILDINGS
FISCAL INCENTIVES AND PUBLIC FINANCING
SUSTAINABLE ENERGY ACCESS

Policies and targets are essential drivers for attracting investment in renewable energy and energy efficiency. The policy landscape in the region is still developing, with priority given to defining targets and regulatory policies.

All countries, with the exception of Turkmenistan, have strategic documents outlining their priorities for at least one renewable energy technology. Five countries (Kazakhstan, Montenegro, Moldova, Serbia and Ukraine) have renewable energy action plans at the national level, and national plans are pending approval in Albania and the former Yugoslav Republic of Macedonia. Bosnia and Herzegovina has action plans at the level of its two entities (see sidebar 6).[1] Armenia and Uzbekistan have roadmaps for the development of renewable energy, and Azerbaijan, Belarus, Georgia and Kyrgyzstan have state programmes dedicated to renewables development. In the Russian Federation, a government resolution prioritises the development of renewable energy within the country's energy strategy.

The adoption of secondary legislation – detailing legal, regulatory and financial mechanisms and technical rules – is happening at a slower pace in Eastern Europe, the Caucasus and Central Asia than in South East Europe, where countries are required to meet legal obligations under the Energy Community, in line with EU sustainability objectives (see sidebar 7).[2] Montenegro, for example, adopted nine different by-laws between 2011 and 2014 detailing the regulatory framework for renewable energy.[3]

Sidebar 6. Renewable energy policies in Bosnia and Herzegovina

In **Bosnia and Herzegovina**, there is no strategy or legislative framework for renewable energy at the national level. Regulatory policies have been addressed by the two entities, the Federation of Bosnia and Herzegovina and Republika Srpska. Both entities have their own laws regulating renewable energy, adopted by the two parliaments in 2013 (for Republika Srpska in May, and for the Federation of Bosnia and Herzegovina in August). Both entities adopted Renewable Energy Action Plans (REAPs) during 2014. The Ministry of Foreign Trade and Economic Relations is in the process of preparing the National Renewable Energy Action Plan, which covers the whole country and was expected to be adopted by the end of 2015.

Republika Srpska has adopted a Governmental Decree that sets an indicative target of a 36% renewable energy share by 2020, while its REAP sets an entity indicative target of 48% for 2020. The Federation of Bosnia and Herzegovina has set an entity indicative target of a 41% renewable energy share by 2020. Both entities have established systems of FITs and feed-in premiums for energy produced from renewables. Support is ensured for 12 years in the Federation of Bosnia and Herzegovina and for 15 years in Republika Srpska.

Source: See endnote 1, section 5.

Sidebar 7. Renewable energy policy in South East Europe

South East Europe hosts an important share of the continent's renewable energy potential. Albania, Bosnia and Herzegovina, the former Yugoslav Republic of Macedonia, Montenegro and Serbia all have feed-in tariffs in place to support their renewable energy targets (see table 7). In some countries, FITs were adopted already in the late 2000s, including in Albania, Bosnia and Herzegovina, Montenegro, the former Yugoslav Republic of Macedonia and Serbia. In Albania, FITs are limited to hydropower.

The absence of clear, enforceable secondary legislation – resulting in complicated permitting, licensing procedures and rules for grid connection – has hampered investment in South East Europe. In Serbia, the lack of a bankable power purchase agreement (PPA) for power plants above 50 MW has resulted in the deployment of small-size renewable energy projects (typically up to 1 MW for biogas, solar PV and small hydro, and up to 10 MW for wind power). Outside of hydropower (see section 2), the sub-region's installed renewable energy capacity remains modest, reaching less than 60 MW of installed capacity for power generation.

Changes are under way in South East Europe that affect regulatory policies for renewables. Each country has committed to binding renewable energy targets to 2020 and has a legal obligation to prepare and implement a National Renewable Energy Action Plan (NREAP) as a result of membership in the Energy Community and required compliance with EU Directive 2009/28/EC on the promotion of the use of renewable energy. NREAPs have been approved in Montenegro and Serbia and are pending approval in Albania and the former Yugoslav Republic of Macedonia. In Bosnia and Herzegovina, where the administrative situation is complex, renewable energy policies are driven at the entity level (see sidebar 6). NREAPs include detailed descriptions of the measures, policies and reforms that countries will implement to overcome the barriers to renewable energy development.

NREAPs are driving regulatory changes that aim to attract private sector investment. The former Yugoslav Republic of Macedonia has adopted a number of legislative amendments in recent years shortening deadlines, reducing the number of documents that need to be submitted and reducing the number of procedures that renewable energy investors must follow. Serbia streamlined PPAs for renewable energy in 2014. In Montenegro, the government concluded 21 concession contracts for the construction of 41 small hydro plants (6 of which are already in operation) and issued construction permits for two wind farms (Krnovo and Možura).

Still, other challenges remain, such as the existing balancing rules, which are not adequate for systems that integrate renewable energy. These will require revisions by transmission system operators and approval by regulators.

Source: See endnote 2, section 5.

RENEWABLE ENERGY TARGETS AND POLICIES

All countries in the region, with the exception of Turkmenistan, have targets or policies promoting renewable energy. Turkmenistan is showing initial progress by allocating resources to a solar institute and to pilot projects (see section 2).

Targets are used widely in the region, accompanied by regulatory policies dominated by feed-in tariffs (FITs). All of the countries have adopted renewable energy targets except for Georgia and Turkmenistan (see table 7).[4] Eight countries have sectoral targets for renewables. Only Bosnia and Herzegovina and Montenegro have mandatory renewable energy targets at the regional level. The target landscape is constantly developing as country targets are updated and enhanced via sectoral targets. In December 2014, Montenegro approved an overall binding target of a 33% renewables share in gross final energy consumption by 2020 (up from the reported share of 26.3% in 2009), along with sectoral targets for electricity, heating and cooling, and transport.[5]

However, targets need to be complemented by regulatory policies that actively enable the deployment of renewable energy projects. Such policies are absent in only two countries in the region: Turkmenistan and Uzbekistan (see table 9).[6] However, even these countries are taking preliminary steps towards policy development. Turkmenistan is undertaking research activities and pilot projects with support from the EU (see section 2), and Uzbekistan is embarking on a programme of solar energy development with support from the ADB.

POWER SECTOR

Renewable energy targets for the power sector have been adopted in 10 countries in the region: Armenia, Kazakhstan, Kyrgyzstan, the former Yugoslav Republic of Macedonia, Moldova, Montenegro, the Russian Federation, Serbia, Tajikistan and Ukraine (see table 7). The most common support for renewable power in the region is feed-in tariffs (FITs), which are present in all countries except for Moldova, the Russian Federation, Tajikistan, Turkmenistan and Uzbekistan (see table 8).[7] Some countries limit their FITs to a specific technology. For example, Georgia provides a FIT only for small-scale hydro plants (under 0.1 MW of installed capacity).[8] In Albania, FITs are applied to small hydro plants below 10 MW of installed capacity, and are based on concession agreements signed for 15 years for larger hydro plants (between 10 and 15 MW of installed capacity).[9] Ukraine amended its FIT legislation in June 2015, improving the conditions for bioenergy projects, removing the local content requirement for projects seeking to obtain FITs and introducing net metering.[10]

Table 7 | Overview of renewable energy targets

COUNTRY	SECTOR/TECHNOLOGY	TARGET
Albania	Energy	38% of gross final energy consumption (draft action plan)
	Biofuels	10% of transport fuel consumption by 2020
Armenia	Small hydro	397 MW by 2025
	Wind	100 MW by 2025
	Solar PV	80 MW by 2025
	Geothermal	100 MW by 2025
	Geothermal heat pumps	25 GW by 2025
	Solar thermal	20 GW by 2025
Azerbaijan	Energy	9.7% of total consumption by 2020
	Electricity	20% of consumption by 2020 2,000 MW of installed capacity by 2020
Belarus	Energy	30% of local content in 2015
Bosnia and Herzegovina	Energy	40% of gross final energy consumption by 2020
Georgia		None
Kazakhstan	Electricity	3% share (solar and wind) in generation capacity by 2020
	Hydropower	539 MW in 41 hydro-electric power stations by 2020
	Hydro	1,787 MW in 34 wind power stations by 2020
	Solar	713.5 MW in 28 solar electric plants by 2020
	Bioenergy	15.1 MW in 3 bioelectric stations by 2020
Kyrgyzstan	Electricity	1.5% by 2017
FYR of Macedonia	Energy	28% of gross final energy consumption in 2020
	Electricity	9% by 2020
	Heating and cooling	11% by 2020
	Transport	2% by 2020
Moldova	Energy	20% of the energy mix by 2020
	Electricity	10% of final gross consumption by 2020
	Heating and cooling	27% of gross final energy consumption by 2020
	Biofuels	10% of transport fuel consumption by 2020
Montenegro	Energy	33% of gross final consumption in 2020
	Electricity	51.4% by 2020
	Heating and cooling	38.2% by 2020
	Transport	10.2% by 2020
Russian Federation	Energy	4.5% of electricity production 5,871 GW of installed capacity commissioned by 2020
	Electricity	11,586 GWh by 2020
Serbia	Energy	27% of gross final energy consumption in 2020
	Electricity	37% of gross final energy consumption in 2020
	Heating and cooling	30% share of gross final energy consumption in 2020
	Transport	10% of gross final energy consumption in 2020
Tajikistan	Electricity	10% of the electricity balance
Turkmenistan		None
Ukraine	Energy	11% of the primary energy balance by 2020
	Electricity	11% of generation by 2020
	Heating and cooling	12.4% of gross final energy consumption for heating and cooling by 2020
	Transport	10% (including electricity in transport) by 2020
Uzbekistan	Electricity	16% of total generation by 2030; 19% by 2050

Note: Information for Albania is based on the Draft Renewable Energy Sources Action Plan, to be approved in 2015.
Source: See endnote 4, section 5.

Table 8 | FIT rates in selected countries

Albania	Hydro	Existing plants up to 10 MW: EUR 0.06 per kWh
		New plants up to 15 MW: EUR 0.07 per kWh
Armenia	Small hydro	Plants built on natural water streams: EUR 0.036 per kWh (VAT excluded)
		Plants built on irrigation systems: EUR 0.024 per kWh (VAT excluded)
		Plants built on natural drinking sources: EUR 0.016 per kWh (VAT excluded)
	Wind	EUR 0.065 per kWh (VAT excluded)
	Biomass	EUR 0.069 per kWh (VAT excluded)
Azerbaijan	Small hydro	EUR 0.025 per kWh
	Wind	EUR 0.045 per kWh
Belarus	Hydro	EUR 0.13 per kWh
	Wind	EUR 0.15 per kWh
	Solar PV	EUR 0.31 per kWh
	Biomass	EUR 0.15 per kWh
	Biogas	EUR 0.15 per kWh
	Geothermal	EUR 0.15 per kWh
Bosnia and Herzegovina – Federation of Bosnia and Herzegovina	Hydro	Micro: EUR 0.1484 per kWh
		Mini: EUR 0.093 per kWh
		Small: EUR 0.0703 per kWh
		Medium: EUR 0.0632 per kWh
	Wind	Micro: EUR 0.189 per kWh
		Mini: EUR 0.1131 per kWh
		Small: EUR 0.0967 per kWh
		Medium: EUR 0.0819 per kWh
		Large: EUR 0.0754 per kWh
	Solar	Micro: EUR 0.3160 per kWh
		Mini: EUR 0.2419 per kWh
		Small: EUR 0.2010 per kWh
	Biomass	Micro: EUR 0.1599 per kWh
		Mini: EUR 0.1277 per kWh
		Small: EUR 0.0123 per kWh
		Medium: EUR 0.0116 per kWh
	Biogas	Micro: EUR 0.4683 per kWh
		Mini: EUR 0.3406 per kWh
		Small: EUR 0.1425 per kWh
Bosnia and Herzegovina – Republika Srpska	Hydro	Up to 1 MW: EUR 0.0788 per kWh
		1-5 MW: EUR 0.0678 per kWh
		5-10 MW: EUR 0.0637 per kWh
	Wind	Up to 10 MW: EUR 0.0845 per kWh
	Solid biomass	Up to 1 MW: EUR 0.1234 per kWh
		1-10 MW: EUR 0.1156 per kWh
	Biogas	For agricultural biogas up to 1 MW: EUR 0.1228 per kWh
	Landfill gas	Up to 1 MW: EUR 0.0357 per kWh
		1-10 MW: EUR 0.0277 per kWh
	Solar (rooftop)	Up to 50 kW: EUR 0.1635 per kWh
		50-250 kW: EUR 0.1414 per kWh
		250 kW-1 MW: EUR 0.1128 per kWh
	Solar (ground-mounted)	Up to 250 kW: EUR 0.1312 per kWh
		250 kW-1 MW: EUR 0.1044 per kWh

FYR of Macedonia	Hydro	≤ 85,000 kWh of electricity delivered per block: EUR 0.12 per kWh
		> 85,000 and ≤ 170,000 kWh of electricity delivered per block: EUR 0.08 per kWh
		> 170,000 and ≤ 350,000 kWh of electricity delivered per block: EUR 0.06 per kWh
		> 350,000 and ≤ 700,000 kWh of electricity delivered per block: EUR 0.05 per kWh
		> 700,000 kWh of electricity delivered per block: EUR 0.045 per kWh
	Wind	EUR 0.089 per kWh (Art. 8 par. 2 FIT Decree)
	Solar PV	≤ 0.050 MW: EUR 0.16 per kWh
		> 0.050 MW: EUR 0.12 per kWh
Montenegro*	Hydro	≤ 3 GWh of produced electricity: EUR 0.1044 per kWh**
		> 3 and ≤ 15 GWh of produced electricity: EUR 0.0744 per kWh**
		> 15 GWh of produced electricity: EUR 0.0504 per kWh**
	Wind	EUR 0.0961 per kWh (Art. 4 Tariff System Decree)
	Solar	For power plants using solar energy on building and engineering constructions equally: EUR 0.15 per kWh (Art. 4 Tariff System Decree)
	Biomass	For power plants using biomass from forestry and agriculture: EUR 0.1371 per kWh
		For power plants using biomass from wood-processing industry: EUR 0.1231 per kWh
	Biogas	For power plants using waste gas: EUR 0.08 per kWh
		For power plants using biogas: EUR 0.15 per kWh (Art. 4 Tariff System Decree)
Serbia	Hydro	Up to 0.2 MW: EUR 0.1240 per kWh (Art. 13 § 3 Item No. 1.1 Incentive Measures Decree)
		0.2-0.5 MW: EUR 0.13727 per kWh -6.633xP*** per kWh (Art. 13 § 3 Item No. 1.2 Incentive Measures Decree)
		0.5-1 MW: EUR 0.1041 per kWh (Art. 13 § 3 Item No. 1.3 Incentive Measures Decree)
		1-10 MW: EUR 0.10747 per kWh -0.337x P per kWh (Art. 13 § 3 Item No. 1.4 Incentive Measures Decree)
		10-30 MW: EUR 0.0738 per kWh (Art. 13 § 3 Item No. 1.5 Incentive Measures Decree)
		If the hydro plant is using an existing infrastructure (see Art. 2 Nr. 2 Privileged Power Producer Decree): EUR 0.059 per kWh up to a capacity of 30 MW (Art. 13 § 3 Item No. 1.6 Incentive Measures Decree).
	Wind	EUR 0.0920 per kWh (Art. 13 § 3 Item No. 5 Incentive Measures Decree)
	Solar (rooftop)	Up to 0.03 MW: EUR 0.2066 per kWh (Art. 13 § 3 Item No. 6.1 Incentive Measures Decree)
		0.03-0.5 MW: EUR 0.20941 per kWh - 9.383xP*** per kWh (Art. 13 § 3 Item No. 6.2 Incentive Measures Decree)
	Solar (ground-mounted)	EUR 0.1625 per kWh (Art. 13 § 3 Item No. 6.3 Incentive Measures Decree)
	Biomass	Up to 1 MW: EUR 0.1326 per kWh (Art. 13 § 3 Item No. 2.1 Incentive Measures Decree)
		1-10 MW: 0.1382 EUR per kWh -0.56xP*** per kWh (Art. 13 § 3 Item No. 2.2 Incentive Measures Decree)
		Over 10 MW: EUR 0.0822 per kWh (Art. 13 § 3 Item No. 2.3 Incentive Measures Decree)
	Biogas	Up to 0.2 MW: EUR 0.1566 per kWh (Art. 13 § 3 Item No. 3.1 Incentive Measures Decree)
		0.2-1 MW: EUR 0.16498 - 4.188xP*** per kWh (Art. 13 § 3 Item No. 3.2 Incentive Measures Decree)
		Over 1 MW: EUR 0.1231 per kWh (Art. 13 § 3 Item No. 3.3 Incentive Measures Decree)
		For power plants fired by biogas from animal origin waste: EUR 0.1231 per kWh (Art. 13 § 3 Item No. 3.4 Incentive Measures Decree).
		For landfill and sewage gas power plants (see Art. 2 Nr 6 and 7 Privileged Power Producer Decree): EUR 0.0691 per kWh (Art. 13 § 3 Item No. 4 Incentive Measures Decree)
	Geothermal	Up to 1 MW: EUR 0.0967 per kWh (Art. 13 § 3 Item No. 7.1 Incentive Measures Decree)
		1-2 MW: EUR 0.10385 per kWh -0.688xP*** per kWh (Art. 13 § 3 Item No. 7.2 Incentive Measures Decree)
		Over 5 MW: 0.0692 per kWh (Art. 13 § 3 Item No. 7.3 Incentive Measures Decree)
Ukraine	Small hydro	EUR 0.105 to 0.175 per kWh until 2019
	Wind	EUR 0.102 per kWh for capacity of more than 2 MW
		Households with wind mills up to 30 kW: EUR 0.116 per kWh until 2019
	Solar****	EUR 0.17 per kWh (or capacity installed in 2016)
		EUR 0.15 per kWh (or capacity installed in 2016)
	Solar (rooftop)	Households up to 30kWh:
		EUR 0.2 per kWh (or capacity installed in 2015)
		EUR 0.19 per kWh (or capacity installed in 2016)
		EUR 0.18 per kWh (or capacity installed in 2017-2019)
	Biomass	EUR 0.124 per kWh until 2019
	Biogas	EUR 0.124 per kWh until 2019
	Geothermal	EUR 0.15 per kWh until 2019

Notes: * Small hydro plants, plants using biomass, biogas, solid waste or landfill gas and cogeneration plants are limited to a maximum capacity of 10 MW (MWe), while solar power plants are restricted to a maximum capacity of 1 MW limited only to rooftops or building structures. Only for wind power plants there is no prescribed maximum size.
** If the small hydro plant has been built on an existing pipeline or dam, the incentive price is reduced to 80% of the above-mentioned value (Art. 5 § 3 Tariff System Decree).
*** "P" stands for the value in MW of the installed power of the power plant.
**** Households are eligible for the FIT if the total power capacity of their installations using solar and/or wind energy does not exceed 30 kW.
Source: See endnote 7, section 5.

Four other regulatory policies are being used in the region (see table 9). Tendering is used in four countries (Albania, Bosnia and Herzegovina, Montenegro and the Russian Federation), and tradable renewable energy certificates are used in two (Belarus and the Russian Federation). Electric utility quotas and obligations have been adopted in four countries (Albania, Belarus, Montenegro and the Russian Federation), and net metering has been adopted in four countries (Armenia, Belarus, Montenegro and Ukraine). The Russian Federation uses a mix of policies, including capacity-based support, which is unique in the global context (see sidebar 8).[11]

Sidebar 8. Support schemes for renewable energy in the Russian Federation

The Russian Federation hosts significant renewable energy resources for solar, wind, biomass and geothermal (see section 2). In 2009, the government approved an overall target of a 4.5% share of electricity generation from renewable sources by 2020. The target is based on production and consumption of electricity from renewables, except for hydropower stations with a total capacity of more than 25 MW. The existing support schemes for renewable energy have been applicable at the level of the retail market for the regions since 2007, and at the level of the wholesale market for the entire federation since 2013.

In 2013, the government approved Decree No. 449, which established a capacity-based mechanism that supports renewable electricity deployment through the wholesale market. This approach is unique in the global context, because instead of promoting renewable energy based on output, it rewards installed capacity. The scheme is based on the "Agreement for the Supply of Capacity or Capacity Provision Contracts", through which selected (via a competitive selection process) renewable power projects receive capacity payments for a period of 15 years for maintaining readiness to generate electricity on demand. If power plants are not able to meet the agreed upon availability requirements, their capacity remuneration levels are reduced accordingly. The regulation sets the norms for the capacity factor for each technology (27% for wind power, 14% for solar power and 38% for small hydro), and if the project runs more than 25% below the applicable norm, its capacity payment will be reduced.

Renewable energy projects in the country therefore have two revenue streams: 1) the capacity payment and 2) the payment for electricity sold to the day-ahead market at the regular market price. Auctions are held by the trading system administrator (the non-profit partnership Council for Organizing Efficient System of Trading at Wholesale and Retail Electricity and Capacity Market) on an annual basis to award the capacity remuneration contracts. To be eligible to participate, proposed projects must equal or exceed 5 MW, and hydropower plants cannot be larger than 25 MW. Only wind, solar PV and small hydro plants are eligible for participation, and biomass and other technologies are excluded.

Contracts are awarded to projects with the lowest capital expenditure, but projects also must comply with high local content requirements, which increase between 2014 and 2020. The first auctioning round was held in 2013, with allocations for 2014, 2015, 2016 and 2017, and the second round was held in 2014, with allocations for 2015, 2016, 2017 and 2018. The limits of installed capacity additions from renewable energy sources are capped on an annual basis.

The support scheme for the retail market is applicable through Russian regions based on the Federal Energy Law of 2007. The legislation regulates tariffs of power purchases by regional distribution companies from qualified renewable energy generators. The purchases are mandatory for the purpose of compensation of network losses, and priority must be given to renewable energy. The maximum amount of losses to be compensated was capped at 5% in 2015. Tariffs are set by Regional Energy Commissions and reflect the capital and operational expenditure levels of individual projects.

According to Decree 47 of 2015, which specifies the support measures for renewable energy projects on retail markets (i.e., regional electricity markets represented by lower-capacity generators below 25 MW and local consumers), each region of county must organise a competitive selection of renewable energy projects. Selected projects will have the right to be included in the regional electricity sector master plan and, as a result, get the special tariff for a 15-year period. No regional competitive selections had been organised as of August 2015.

Source: See endnote 11, section 5.

HEATING AND COOLING SECTOR

Five countries in the region have sectoral targets for renewable energy in heating and cooling, which they have integrated into their NREAPs. Montenegro is the only country that supports renewable heating and cooling through a mandate (see table 9), which requires new buildings in certain climate zones to cover a quota of their energy needs for domestic hot water with renewable sources (solar thermal systems). The mandate also offers energy efficiency credit schemes (applicable to technologies such as solar thermal systems and biomass boilers) as well as support mechanisms at the local level, including subsidies in some municipalities for the installation of solar thermal systems in new buildings by reducing utility costs (fees for utility lands).[11] Belarus supports the increased use of peat and wood in heating through its "State programme for energy sources based on local fuel types in 2010-2015", with the objective of commissioning heat capacity of 1,025.7 MW_{th}.[13]

Other regulatory in-roads are opening in the region for increased use of renewable energy in heating. In July 2014, the Cabinet of Ministers of Ukraine adopted Decree No. 293, "On the promotion of substitution of natural gas in the heating sector", which opens the way for the use of renewables to substitute for natural gas for heating in public utilities. In Serbia, under the Energy Law of 2014, local self-governments are empowered and obliged to regulate the incentive measures and to establish a register of privileged heat producers. Also in 2014, Moldova adopted a law on heat and cogeneration promotion, which supports heat production based on renewable sources, without a specific mandate. Albania is planning a draft government decree on mandatory installation of solar water heater systems.

TRANSPORT SECTOR

Several countries have renewable energy targets for the transport sector, including Albania, the former Yugoslav Republic of Macedonia, Moldova, Montenegro, Serbia and Ukraine. Two countries, the former Yugoslav Republic of Macedonia and Montenegro, are working on by-laws that address further support for renewable energy in transport. In 2015, Ukraine ended the state's monopoly on ethanol production in order to meet its mandate of 7% biofuel share in the fuel blend by 2016.[14]

FISCAL INCENTIVES AND PUBLIC FINANCING

Various types of fiscal incentives and public financing for renewable energy are present in all countries except three (the former Yugoslav Republic of Macedonia, Turkmenistan and Uzbekistan; see table 12). In Kazakhstan, the government offers a grant of up to 50% of the capital cost on renewable energy installations of 5 kW or less, which is payable upon commissioning

THE RUSSIAN FEDERATION HOSTS SIGNIFICANT RENEWABLE ENERGY RESOURCES FOR SOLAR, WIND, BIOMASS AND GEOTHERMAL. IN 2009, THE GOVERNMENT APPROVED AN OVERALL TARGET OF A 4.5% SHARE OF ELECTRICITY GENERATION FROM RENEWABLE SOURCES BY 2020.

of the installation.[15] In Serbia, the Ministry of Energy and UNDP/GEF offer a 20% investment grant for eligible biomass projects.[16] Bosnia and Herzegovina and the Russian Federation use capital subsidies or rebates to support renewables. Energy production payments are used in Albania, Armenia, Belarus, the Russian Federation, and Ukraine. Kyrgyzstan, Tajikistan and Ukraine use investment or production tax credits. Public Investment, loans or grants are used in Armenia, Azerbaijan, Georgia, Kyrgyzstan, Moldova, Montenegro and Tajikistan. Reduction in sales, energy, CO_2, VAT or other taxes is used in Kyrgyzstan, Moldova and Ukraine. In Ukraine, the government provides import tax exemptions for renewable energy materials, equipment and installations, as well as a 25% reduction of the land tax (among other taxes) for owners of renewable energy projects.

Montenegro provides a subsidy for the installation of solar systems in new buildings in selected municipalities, which allows for a reduction in the utility fee (fee for utility land) of EUR 100-150 per square metre of installed solar panel.[17] The former Yugoslav Republic of Macedonia uses a combination of mechanisms to support renewable energy in heating and cooling, including a subsidy for household installation of solar thermal collectors (30% of the investments) and a reduction in VAT for the equipment. Moldova is using fiscal incentives to develop its biomass market, making available a wide range of biomass baling, milling, briquetting and pelleting equipment under advantageous conditions for a three-year period with 0% commission, 0% interest and zero-rate VAT.[18]

Table 9 | Overview of renewable energy policies

	Regulatory policies								Fiscal incentives and public financing				
	Biofuels obligation / mandate	Electric utility quotas obligation / RPS	Feed-in tariff / premium payments	Heat obligation / mandate	Net metering	Renewable energy targets	Tendering	Tradable REC	Capital subsidy / rebate	Energy production payment	Investment or production tax credits	Public investment, loans or grants	Reduction in sales, energy, CO_2, VAT or other taxes
Albania	X	X	X			X	X	X		X			
Armenia			X		X	X				X		X	
Azerbaijan			X			X				X		X	
Belarus	X	X	X		X	X		X		X			
Bosnia and Herzegovina	X		X			X	X		X				
Georgia			X									X	
Kazakhstan			X			X	X					X	
Kyrgyzstan			X			X		X		X	X	X	X
FYR of Macedonia			X			X							
Moldova						X						X	X
Montenegro		X	X	X	X	X	X			X		X	
Russian Federation		X				X	X	X	X	X			
Serbia			X			X						X	
Tajikistan						X		X		X	X	X	
Turkmenistan													
Ukraine	X		X		X	X				X	X		X
Uzbekistan						X							

Notes: The "X" indicates the presence of a policy or regulatory measure.
Source: See endnote 6, section 5.

CITY AND LOCAL GOVERNMENT POLICIES

A number of countries have approved city and local government policies promoting renewable energy. In Kazakhstan, the development of renewable energy sources is included in the development plans of the regions and cities of Astana and Almaty.[19] Montenegro's Law on Energy requires that local government authorities develop local energy plans.[20] In Serbia, the Nikola Tesla electro-technical institute prepares instructions for creating local development plans in the energy field, including renewable energy, which serve as guidelines for local self-governments.[21] Municipalities in Varvarin, Velika Plana, Žitište and Bečej have adopted local energy plans.

Municipalities in all of the countries – with the exception of the Russian Federation, Uzbekistan and Turkmenistan – are signatories of the EU Covenant of Mayors, which requires them to prepare sustainable energy action plans at the municipal level. In Ukraine, 92 cities have signed the agreement, and in Georgia, 13 cities have. In Bosnia and Herzegovina, the municipalities that are signatories represent 55% of the population.[22]

ENERGY EFFICIENCY TARGETS AND POLICIES[23]

Energy efficiency policies represent a complex body of instruments including regulations, standardisation and certification, and monitoring rules. Enforcement requires the allocation of resources, and the results of these measures (in terms of energy savings) take time to realise, creating a challenge for managing expectations.

All of the countries except for Armenia, Azerbaijan, Georgia, Kyrgyzstan and Turkmenistan have established energy efficiency targets (see table 10).[24] National energy efficiency regulations, standards or laws are absent in Georgia, Kyrgyzstan and Turkmenistan, and national energy efficiency awareness campaigns are absent in Albania, Armenia, Turkmenistan and Ukraine. Only Kyrgyzstan and Turkmenistan do not have mandated government institutions (dedicated agencies or appointed ministries) to formulate and implement energy efficient strategies and policies.

Table 10 | Overview of energy efficiency policies

	Energy efficiency target	National energy efficiency awareness campaigns	National energy efficiency regulations, standards or laws	Governmental institution(s) to formulate and implement energy efficiency strategies and policies
Albania	X		X	X
Armenia			X	X
Azerbaijan		X	X	X
Belarus	X	X	X	X
Bosnia and Herzegovina	X	X	X	X
Georgia		X		X
Kazakhstan	X	X	X	X
Kyrgyzstan		X		
FYR of Macedonia	X	X	X	X
Moldova	X	X	X	X
Montenegro	X	X	X	X
Russian Federation	X	X	X	
Serbia	X	X	X	X
Tajikistan	X	X	X	X
Turkmenistan				
Ukraine	X		X	X
Uzbekistan	X	X	X	X

Note: The "X" indicates the presence of a policy or regulatory measure.
Source: See endnote 24, section 5.

BUILDING SECTOR

Energy efficiency in buildings is addressed through a mix of instruments including mandatory building standards, minimum energy performance requirements, support mechanisms (such as energy audits, energy labels and certificates), awareness campaigns and trainings. Eight countries (Albania, Belarus, Bosnia and Herzegovina, Kazakhstan, the former Yugoslav Republic of Macedonia, Montenegro, Serbia and Uzbekistan) address efficiency in the building sector through long-term strategic plans and visions at the government level. Albania, Azerbaijan, Belarus, Bosnia and Herzegovina, the former Yugoslav Republic of Macedonia, Moldova, Montenegro and Serbia all have targets for energy efficiency in buildings. Building standards. reflecting varying level of energy performance requirements, exist in all countries except Albania, Georgia and Turkmenistan.[25] The regulatory landscape in this area is still under development, with technical assistance support from international donors (see section 3).

Belarus is working on updating more than 130 building energy norms and energy performance benchmarks under its Programme for the Development of Technical Norms, Standardisation and Verification of Compliance in the Field of Energy Saving for 2011-2015.[26] In Turkmenistan, UNDP worked on improving energy efficiency in residential buildings by introducing improved design measures and supporting pilot projects.[27] In Uzbekistan, a national database of energy-efficient materials and technologies was established in 2012 and is updated annually by the State Committee for Architecture and Construction (Gosarchitectstroy). As of 2014, the database covered more than 50 national enterprises specialising in energy-efficient materials and equipment.[28]

Mandatory building labelling has been adopted in The former Yugoslav Republic of Macedonia, Montenegro, Bosnia and Herzegovina, Serbia and Uzbekistan (see table 11).[29] Auditing regulations are in force in Bosnia and Herzegovina, Kazakhstan, the former Yugoslav Republic of Macedonia, Moldova, Montenegro, Serbia and Uzbekistan. Kazakhstan, Moldova and Ukraine have energy performance contracting to support building retrofit based on energy savings.[30] However, support for building retrofits is translated into financial, fiscal or economic instruments only in Albania, Kazakhstan, the former Yugoslav Republic of Macedonia, Moldova, Montenegro and Ukraine. For example, the former Yugoslav Republic of Macedonia and Moldova use grants, rebates and subsidies; Montenegro and Ukraine have preferential loans; and Kazakhstan provides state support for energy-saving equipment.[31] Other countries have opened dedicated credit lines with the support of international donors, such as the EBRD in Georgia and the World Bank in Kyrgyzstan.[32] Support mechanisms for energy efficiency in buildings have been adopted in Albania, Azerbaijan, Belarus, Kazakhstan, Kyrgyzstan, the former Yugoslav Republic of Macedonia, Montenegro and Ukraine.

Table 11 | Overview of mandatory labelling policies

	Buildings	Lightings	Appliances
Albania			
Armenia			
Azerbaijan			
Belarus		X	X
Bosnia and Herzegovina	X		X
Georgia			
Kazakhstan			
Kyrgyzstan			
FYR of Macedonia	X	X	X
Moldova			X
Montenegro	X	X	X
Russian Federation	X		X
Serbia	X	X	X
Tajikistan			
Turkmenistan			
Ukraine		X	X
Uzbekistan	X	X	X

Note: The "X" indicates the presence of a policy or regulatory measure.
Source: See endnote 29, section 5.

In Belarus, Kazakhstan, Kyrgyzstan, the former Yugoslav Republic of Macedonia and Montenegro, this translates into a mix of instruments including advice and aid service, educational campaigns and professional training programmes. In Kyrgyzstan, energy efficiency education and trainings are required under the Energy Conservation Programme for 2009-2013. Azerbaijan and Ukraine have the only professional training programmes. In Ukraine, the rules for obtaining permission to conduct energy audits were approved in 1997, and the State Agency on Energy Efficiency has certified eight universities to conduct trainings for audits.[33] Kazakhstan and Belarus also use a research, development and deployment (RD&D) approach. In Kazakhstan, state support is provided for scientific research on energy saving and energy efficiency, including design and development of the related methodological and normative legal norms.[34]

LIGHTING AND APPLIANCES[iv] SECTOR

Policies addressing lighting, appliances and cooking contribute further to improving energy efficiency in buildings and are being pursued to some extent in the region. Lighting standards exist in nine countries of South East and Eastern Europe, the Caucasus and Central Asia. Armenia, Azerbaijan, Georgia, Tajikistan and Turkmenistan do not currently have lighting standards. Two countries have introduced accompanying financial, fiscal or economic instruments: Belarus (subsidies, concessional loans, taxes and tax exemptions) and Kazakhstan (support for energy-saving equipment).[35] Kazakhstan, Kyrgyzstan and the former Yugoslav Republic of Macedonia use support mechanisms such as advice and aid services, international and educational campaigns (Kazakhstan and Kyrgyzstan), professional training programmes and RD&D (Belarus and Kazakhstan) and voluntary approaches (the former Yugoslav Republic of Macedonia).

Mandatory labelling for lighting has been adopted in Belarus, the former Yugoslav Republic of Macedonia, Montenegro, Serbia, Ukraine and Uzbekistan. Kazakhstan and Kyrgyzstan have public awareness campaigns on lighting efficiency. In 2015, Serbia adopted a regulation enabling procurement of energy efficiency in municipal services, including street lighting. Only Belarus, Montenegro, Serbia and Uzbekistan use a mix of support instruments[v] to create a comprehensive approach conducive to more-efficient lighting performance. Policy regarding incandescent lighting is lagging in the countries. Although the EU, the United States and some countries in the Middle East and Asia have introduced phase-outs of incandescent bulbs, in the region only Kazakhstan, Tajikistan, and the Russian Federation have introduced such measures. Kyrgyzstan has adopted a system of standardisation and energy certification for lighting products produced for household domestic use.

Appliances are another area where standards and labelling can contribute to improving energy efficiency in buildings. Albania, Montenegro, Serbia, Tajikistan and Ukraine all have long-term strategic plans and visions for appliances. Albania, Belarus, Montenegro and Serbia have energy efficiency targets for appliances. Nine countries have adopted mandatory labelling for appliances (Belarus, Bosnia and Herzegovina, the former Yugoslav Republic of Macedonia, Moldova, Montenegro[vi], the Russian Federation, Serbia, Ukraine and Uzbekistan). Kazakhstan and Uzbekistan have in place comprehensive policies on energy efficiency standards and labelling. In the countries of South East Europe, labelling regulations are based on transposition of the EU's Directive 2010/30/EU on labelling of energy-related products. Belarus has advice and aid services, international and educational campaigns, professional training programmes and RD&D on appliances. Kazakhstan has international and educational campaigns and professional training programmes, and Ukraine has professional training programmes.

INDUSTRY, TRANSPORT AND POWER SECTORS

Long-term strategic plans and visions for energy use in industry have been adopted in Albania, Bosnia and Herzegovina, Kazakhstan, Montenegro, Serbia and Uzbekistan. Albania, Belarus, Bosnia and Herzegovina, the former Yugoslav Republic of Macedonia, Montenegro and Serbia use energy efficiency targets for industry. Kazakhstan has set a target of reducing the energy intensity of its processing industry by at least 15% by 2019, based on its State Programme of industrial and innovation development for 2015-2019. Belarus, Kazakhstan, Serbia and Uzbekistan have auditing regulations. The Russian Federation has a system of mandatory audits covering public utilities and private and public companies, with the purpose of driving the market for energy efficiency.[36] Bosnia and Herzegovina, Montenegro and Serbia all have monitoring regulations.

Four countries use varying government financial, fiscal and economic instruments to influence energy use in the industry sector. Belarus uses grants, rebates and subsidies, tailored/preferential loans and tax relief. Kazakhstan has adopted energy performance contracting and procurement rules for industry, and Government Decree No. 1346 of October 2012 sets specific energy consumption norms for dozens of manufacturing processes and some industrial products.[37] The former Yugoslav Republic of Macedonia and Moldova use grants, rebates and subsidies.

Four countries use support mechanisms for the industry sector. Belarus has advice and aid services, international and educational campaigns, professional training programmes and RD&D. Kazakhstan uses a comprehensive set[vii] of support mechanisms across all categories. The former Yugoslav Republic of Macedonia uses advice and aid services and educational campaigns. Ukraine has professional training programmes addressing energy efficiency in the industry sector.

iv. Includes cooking equipment. Energy use in cooking is addressed in section 3.
v. The support mechanisms include advice and aid services, international and educational campaigns, professional training programmes, voluntary approaches and RD&D.
vi. Montenegro was still in the progress of adopting the legislation at the time of this report preparation.
vii. The support mechanisms include advice and aid services, international and educational campaigns, professional training programmes, voluntary approaches and RD&D.

Transport is the least-developed area of energy efficiency policy intervention in the region. Long-term strategic plans and visions exist in Albania, Bosnia and Herzegovina, Kazakhstan, Montenegro, Serbia and Uzbekistan. Albania, Belarus, Bosnia and Herzegovina, the former Yugoslav Republic of Macedonia, Montenegro and Serbia have energy efficiency targets for the transport sector. Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Montenegro and Ukraine have vehicle fuel economy and emission standards.[38] In Ukraine, the Euro-4 standard became mandatory on 1 January 2014, and the Euro-5 standard should be introduced from 1 January 2016.[39]

Three countries use support mechanisms to boost the implementation of regulatory policies in transport. Belarus uses grants, rebates and subsidies, tailored/preferential loans and taxes and tax relief, professional training programmes and RD&D as support instruments for promoting energy efficiency in transport. Kazakhstan has procurement rules, advice and aid services, international and educational campaigns, professional training programmes and RD&D. Montenegro has advice and aid services. Twelve countries address energy efficiency in power generation, with the exceptions being Armenia, Georgia, The former Yugoslav Republic of Macedonia, Moldova and Turkmenistan. Eight countries (Albania, Belarus, Bosnia and Herzegovina, Kazakhstan, Kyrgyzstan, Montenegro, Serbia and Uzbekistan) have long-term strategic plans and visions for the power sector. Only Belarus and Moldova have adopted energy efficiency targets. Moldova has a specific target to reduce losses in power transport and distribution networks to 11% by 2020 (see sidebar 9).[40]

Sidebar 9. Moldova's policy framework for energy efficiency

Moldova's policy on energy efficiency is driven by a combination of its energy challenges and its obligations stemming from membership in the Energy Community. Moldova depends on energy imports for 96% of its energy use. Although energy subsidies have been eliminated for electricity, the main source of Moldova's power generation – natural gas – continues to be subsidised. Energy efficiency is targeted as the least costly alternative to curb the country's energy demand. Moldova's comprehensive approach is formulated around energy efficiency strategies, legislative acts, regulations and national energy efficiency action plans.

The country's Energy Strategy 2030 provides a general overview on the development of the energy sector, with a focus on energy efficiency and the promotion of local renewable energy sources. The National Energy Efficiency Programme 2011-2020 outlines specific objectives for all sectors (energy conversion, buildings, transport, and the public and services sectors). It establishes specific targets and measures for each sector, with the aim of achieving 20% energy savings by 2020. Sectoral targets for 2020 include: a 20% reduction in primary energy consumption, a 10% reduction in energy intensity, a 39% reduction in natural gas losses in transport and distribution networks, a 5% reduction in heating losses in transport and distribution networks, and a 10% reduction in energy consumption in buildings. The targets also aim to reduce electricity losses in transport and distribution networks to 11%, to increase the share of renovated public buildings to 10% and to achieve energy savings of 533 kilotonnes of oil equivalent by 2020.

Moldova's first important act on energy efficiency – the law on energy efficiency (Law No. 142 of 2 July 2010) – establishes general objectives, creates capabilities in this area, describes the importance of local planning and appoints the state body responsible for implementation (the Agency for Energy Efficiency). The law on energy performance of buildings (Law No. 128 of 11 July 2014) contains provisions on implementing building energy performance certification, appointing the Ministry of Regional Development and Construction as the central authority in this area and the Energy Efficiency Agency as the body responsible for implementing the policy. The law on appliances and equipment labelling (Law No. 44 of 27 March 2014) establishes the regulatory framework in this area. The regulation on energy audits (Decree No. 884 of 27 November 2012) establishes the requirements on energy auditing, and the regulation on energy auditor certification (Decree No. 885 of 27 December 2012) establishes certification and authorisation procedures and related criteria. The methodology on energy audit cost calculation (Decree No. 924 of 12 December 2012) establishes the steps towards this cost calculation.

Moldova's energy efficiency regulatory policies receive financial support from several international donors, including the EBRD, the EU and UNDP. As an example, the EBRD's loan for on-lending to private companies undertaking energy-saving measures – granted to BC Mobiasbancă / Groupe Société Générale SA – was extended from an initial EUR 3 million by another EUR 7 million in 2013. Energy efficiency is also streamlined with renewable energy, especially in heating in buildings. Moldova's Energy and Biomass project is an example of synergies that can be generated through a combination of energy efficiency improvements and the introduction of modern biomass boilers in buildings.

Source: See endnote 40, section 5.

06

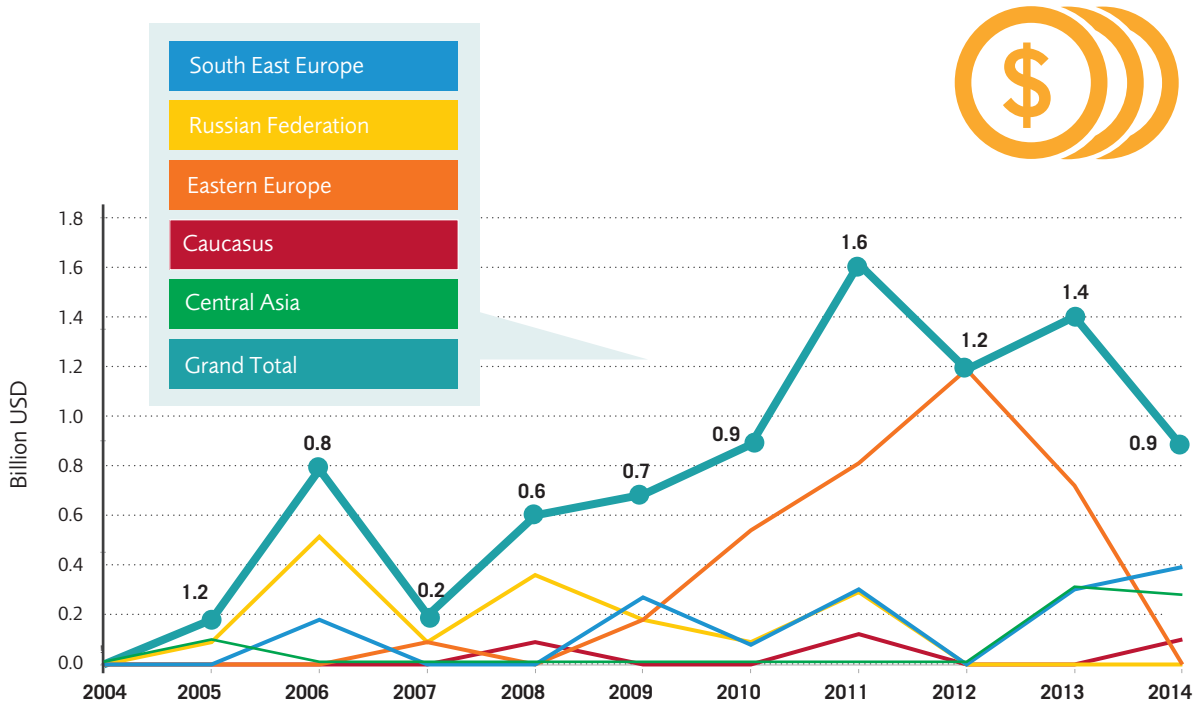
INVESTMENT FLOWS

GLOBAL OVERVIEW[1]

Global new investment in renewable power and fuels (not including hydropower above 50 MW) increased by 17% compared to 2013, amounting to USD 270.2 billion.[2] Renewables outpaced fossil fuels for the fifth year running in net investment in power capacity additions. Investment in developing countries continued to rise during 2014, reaching a total of USD 131.3 billion. Developing country investment came very close to the total for developed economies, which reached USD 138.9 billion in 2014. Investment in developing countries grew by 36% compared to 2013, whereas developed countries saw an increase of only 3% from 2013.

Solar and wind power were the leading technologies by far in renewable energy investment. Solar (mostly solar PV) accounted for more than 55% of new investment in renewable power and fuels (not including hydro above 50 MW), and wind's share was 36.8%. The 17 countries covered by this report represent only a fraction of new renewable energy investment – 0.5% of the world's total – with USD 0.9 billion in 2014 (see figure 13).[3]

FIGURE 13 | Renewable energy investment in the region, 2004-2014



Source: See endnote 3, section 6.

Renewable energy investment in the region (not including large hydropower) showed an erratic pattern of development during 2004-2014 (see figure 13). While total investment in the 17 countries exhibited positive signs during 2008-2011, driven by growth in Eastern Europe, the years 2013 and 2014 showed less investment activity than in 2011. The growth in investment in South East Europe (in 2014 only), the Caucasus and Central Asia did not make up for the downwards trend in investment activity in Eastern Europe and for the absence of investment in the Russian Federation since 2011. Overall, investment in the region declined by 44% between 2011 and 2014, and the region did not follow the pick-up in renewable energy investment between 2013 and 2014 that was seen at the global level.[4]

The distribution of investment in renewable energy was geared heavily towards Ukraine during 2004-2014. In this decade, the country captured around 40% (USD 3.3 billion) of the region's renewable energy investment (see figure 14).[5] The Russian Federation received around 20% (USD 1.7 billion), and the remaining 40% was divided relatively equally among 11 countries.

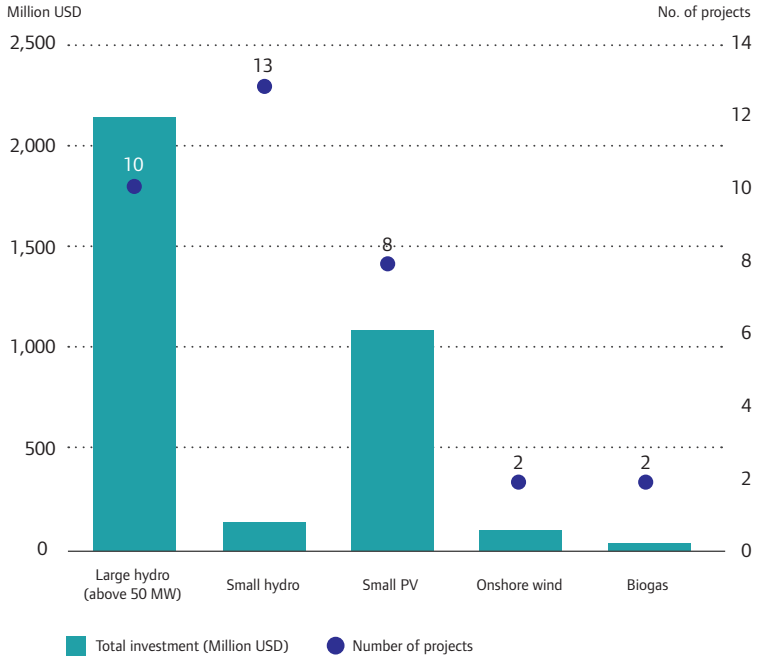
FIGURE 14 | Renewable energy investment in selected countries 2004-2014

Source: See endnote 5, section 6.

REGIONAL FINANCING SOURCES

At a global level, investment in renewable energy receives attention from both private and public sources. The data from the region do not allow for a consistent, detailed breakdown across all countries. Based on the countries where data are available, private sector investment is concentrated in large hydropower projects (see figure 15).[6] For six countries in the region (Albania, Georgia, the Russian Federation, Serbia, Tajikistan and Ukraine), 35 projects among those reported in the World Bank database with private sector participation reached financial closure between 2007 and 2012, amounting to USD 3.6 billion in total investment. All of these projects, with the exception of three, were 100% private, with a total installed capacity of 3.7 GW. Twenty-five projects involving covered technologies other than large hydro (biogas, small hydro below 50 MW, solar PV, onshore wind) amounted to USD 1.4 billion in total investment and 563 MW of installed capacity.[7]

FIGURE 15 | Private participation in renewable energy projects in selected countries (projects with financial closure), 2007-2012



Source: See endnote 6, section 6.

The public sector plays a role in renewable energy investment in the region, with sources originating in national governments, international donors and multilateral development banks. Most of the governments provide fiscal incentives and public financing for renewable energy (see section 5). Lending for renewable energy projects is available through national and international banks with the support of several international doors. Some investment is channelled through climate finance such as the Climate Investment Funds (CIF) and the GEF (see figures 16 and 17).

EBRD financing for renewable energy projects was noteworthy during 2006-2013. The bank financed EUR 436 million in Eastern Europe and the Caucasus, EUR 411 million in Russia and EUR 95 million in Central Asia.[8] The bank enters projects through debt and equity financing accompanied by technical support for renewable energy. For small and medium-sized projects, the bank established direct lending facilities, for example in Ukraine and countries in South East Europe.[9]

The World Bank and the ADB have a more modest footprint in the region's renewable energy investment but are working on new projects. The World Bank has commited to Armenia's geothermal and utility-scale solar projects under the Climate Investment Fund (see figure 16) and is financing a biogas generation pilot in Moldova under the GEF.[10] The ADB is actively supporting the government of Uzbekistan in launching its solar programme (see section 2). Agence Française de Developpement (AFD) has been authorised to work in Central Asia since 2012 and focuses its efforts on small hydropower, wind and solar farms in Kazakhstan.[11]

UNDP has a substantive contribution to financing renewable energy projects in the region. Its current portfolio includes 14 projects across 10 countries and covers biomass, small hydro, wind and solar water heating. The projects amount to USD 178 million and receive GEF support of USD 36 million.[12]

In South East European countries, the Western Balkans Investment Framework is channeling investment from several international donors and multilateral banks, including the European Commission Instrument for Pre-Accession, the Council of Europe Development Bank (CEB), the EBRD, the European Investment Bank, KfW and the World Bank. Support for renewable energy is directed through its Western Balkans Sustainable Energy Direct Financing Facility (WeBSEDFF), with the second phase launched in 2012. The EUR 50 million finance facility is supported by a EUR 21.5 million grant and technical assistance budget. It aims to provide direct financing for renewable energy and industrial energy efficiency projects.[13] WeBSEDFF has a portfolio of 15 renewable energy projects with a total installed capacity of 60 MW in biomass and small hydro technologies.[14]

POTENTIAL OF CLIMATE FINANCE

Climate finance consists of mitigation and adaptation funds. Renewable energy falls under mitigation funds, which can constitute an additional source for financing of projects in the region. Renewable energy also is increasingly recognised as playing a role in adaptation to climate change.[15] Albania, Armenia, Azerbaijan, Bosnia and Herzegovina, Georgia, Kazakhstan, Kyrgyzstan, the former Yugoslav Republic of Macedonia, Moldova, Montenegro, Serbia, Tajikistan, Turkmenistan and Uzbekistan are all non-Annex I Parties under the UNFCCC, and therefore are expected to be receivers of climate funds.

The Climate Investment Funds (CIF) is one source that can be leveraged for renewable energy investment in the region. The CIF was established in 2008 to trigger investments at scale to empower climate-smart growth and transformation in developing and middle-income countries. The CIF has USD 8.1 billion of pledged resources available that can be leveraged further through co-financing, both private and public.[16] The CIF covers both the construction of installed capacity as well as accompanying support, such as technical assistance and advisory services.

The CIF has a 14% allocation for Eastern Europe and Central Asia countries.[17] As of December 2014, the CIF had endorsed 13 renewable energy projects in Armenia, Kazakhstan (see sidebar 10) and Ukraine and had allocated USD 272 million, with an estimated co-financing of USD 974 million (see figure 16).[18] The projects fall under the CIF's Clean Technology Fund and, for projects in Armenia, under the Scaling- Up Renewable Energy Programme.

THE PUBLIC SECTOR PLAYS A ROLE IN RENEWABLE ENERGY INVESTMENT IN THE REGION, WITH SOURCES ORIGINATING IN NATIONAL GOVERNMENTS, INTERNATIONAL DONORS AND MULTILATERAL DEVELOPMENT BANKS. MOST OF THE GOVERNMENTS PROVIDE FISCAL INCENTIVES AND PUBLIC FINANCING FOR RENEWABLE ENERGY.

Sidebar 10. Burnoye Solar: showcasing a non-recourse project finance structure in Kazakhstan

A landmark solar project marks Kazakhstan's commitment to renewable energy and showcases opportunities for private investment pioneering the use of a non-recourse project finance structure. Kazakhstan prioritises the development of renewable energy based on its Strategy of Transition to a Green Economy, approved in 2013. Support for renewable energy is enabled through legislation adopted that same year.

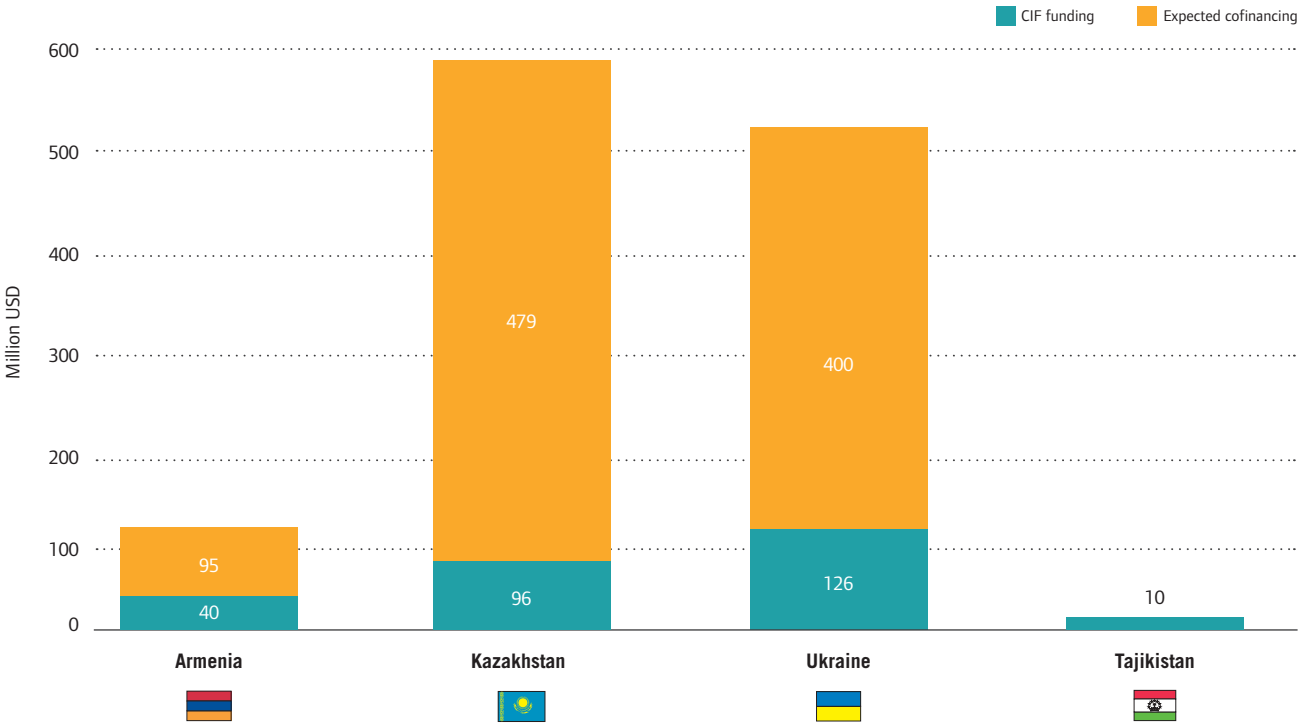
Burnoye Solar is a 50 MW solar PV power plant in Zhambyl Region in South Kazakhstan that was commissioned in July 2015. Burnoye Solar-1 LLP, the project company, was founded by a joint Kazakh-UK venture, Samruk-Kazyna United Green LLP. Burnoye Solar is the first commercial-scale solar park in Kazakhstan. The project is co-financed by the EBRD and the Clean Technology Fund (CTF), a funding window of the Climate Investment Funds. The EBRD will lend EUR 70 million, and the CTF will lend EUR 13.8 million.

Non-recourse financing means that project debt is issued on the basis of the project as a stand-alone activity. Repayment is entirely dependent on the future cash flow of the project and with limited or no recourse to the ultimate project owners. Non-recourse loans are common in European solar project finance. Non-recourse financing was used by EBRD to enable development of Ukraine's solar market to fund small and medium-sized renewable energy projects with domestic enterprises, including solar, wind, small hydro, biomass and biogas. More recently, non-recourse financing was applied for the Shuakhevi hydropower project in Georgia with joint financing from the World Bank, the ADB and the EBRD. However, this project is the first of its kind in Kazakhstan, with the intention of opening the door to additional private investment.

Source: See endnote 18, section 6.

In Armenia, a geothermal power plant with an estimated capacity of 28.5 MW and a utility-scale solar PV project of 40-50 MW are in the pipeline. In Kazakhstan, the Yermentau Large Wind Power Plant will add 50 MW of wind-based installed capacity. In Ukraine, an existing Novoazovsk Wind Project will be extended by 32.5 MW.[19] In Tajikistan, the EBRD and the Pilot Programme for Climate Resilience of the CIF co-financed a priority rehabilitation programme at the Qairokkum hydropower plant.[20]

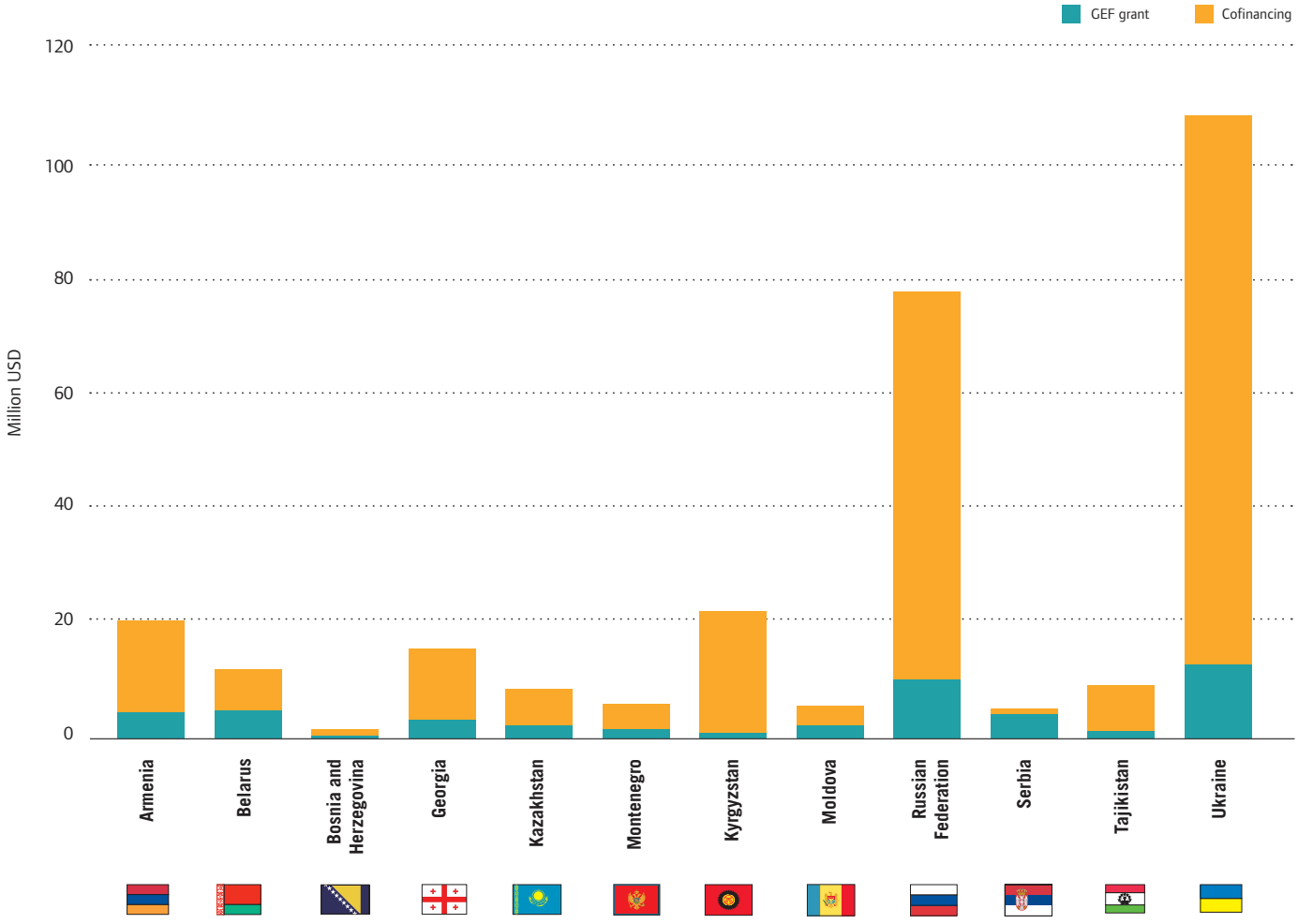
FIGURE 16 | Financing of Climate Investment Fund-endorsed renewable energy projects, 2008-2014



Source: See endnote 18, section 6.

The Global Environment Facility has been in operation since 1991 and can be tapped for renewable energy financing. The GEF channels investment from several international development partners, and multilateral development is leveraged through additional co-financing. Figure 17 provides a selection of 24 GEF-supported projects in the countries covered by this report, which were approved before July 2015 in the area of renewable energy with funding from the World Bank, UNDP, EBRD and the United Nations Industrial Development Organization (UNIDO).[21] The projects cover solar water heating, biomass, wind, small hydro and geothermal technologies. Six projects were completed with USD 15.5 million in grants from the GEF and co-financing of USD 38.8 million in Armenia, Belarus, Georgia, Kazakhstan and Montenegro. Seven projects are under implementation with USD 28.5 million in grants from the GEF and co-financing of USD 193.1 million in Bosnia and Herzegovina, Kyrgyzstan, Moldova, the Russian Federation, Tajikistan and Ukraine.

FIGURE 17 | Selected renewable energy investment with GEF support, as of July 2015



Source: See endnote 21, section 6.

CONCLUSION

Over the past two decades, South East and Eastern Europe, the Caucasus, Central Asia and the Russian Federation made strides into the realm of renewable energy and energy efficiency. Governments advanced in developing targets and policies to promote the diverse renewable energy sources that are abundant across the region. Viewed from a global perspective, however, these developments remain marginal. Greater project deployment and investment flows are needed to enable the region to catch up with global renewable energy market development.

The 17 countries covered in this report have an opportunity to leverage their respective energy challenges for the benefit of a more ambitious renewable energy and energy efficiency vision. Energy security concerns point in the direction of local renewable sources. Access to heating in the region can be improved with the support of renewable heating applications. Barriers remain, however. The presence of energy subsidies for fossil fuels results in unfavourable economics for renewable energy in local situations. Moreover, in countries that did not fully liberalise their energy markets, market entry remains challenging for renewable energy players.

Non-economic barriers further increase the cost of renewable energy development in the region. Legal, administrative and institutional complexities delay the implementation of projects. Licensing and permitting procedures in several countries are bureaucratic, lengthy and lacking in transparency. The region displays limited regional co-ordination and integration in global renewable energy promotion activities – in particular the Sustainable Energy for All initiative – preventing it from fully leveraging the available technical know-how.

The multi-tier approach to evaluating energy access highlights several challenges in the region pertaining to reliability, affordability and quality of energy supply. Although access to electricity is not an issue (except in remote communities), access to heating is a widespread concern. Almost 13 million people across the region do not have access to non-solid fuels, with damaging environmental and health implications. Roots of these issues vary across the countries, and renewable energy solutions also require differentiation. Solar thermal applications have been used most widely, although modern biomass solutions are getting traction. Biogas and heat pumps also could be considered where local potential allows. The costs of switching to renewables constitute a major barrier, given that low-income households are more exposed. Innovative financing solutions are emerging slowly but do not address large-scale roll-outs, except where support from international donors is available.

Energy intensity remains high in the region, representing strong potential for energy efficiency improvements. The building sector carries a legacy of inefficient construction standards. Improvements in energy efficiency are driven by improvements in public and residential buildings. Synergies are created with the increased use of biomass in heating, where a feedstock supply is available. Energy efficiency in industry and transport is more challenging to tackle because of complexities in the industry sector, and administrative co-ordination is required for the enforcement of standards. There is room for synergies between improving energy efficiency and introducing renewable energy sources, especially in heating.

Energy efficiency in the region is hampered by slow policy deployment and by the complexities of enforcing and monitoring the actions laid out in secondary legislation. The lack or incompleteness of statistical data on final energy uses impedes the implementation of more-precise monitoring measures. In South East Europe, the countries of Albania, the former Yugoslav Republic of Macedonia, Montenegro and Serbia have more-developed policy frameworks that will enable better efficiency improvements in the future. In the rest of the region (outside the Russian Federation), Belarus, Kazakhstan, Moldova, Tajikistan and Uzbekistan have in place the main pillars of an energy efficiency framework, which could yield benefit in the medium term, provided that enforcement is supported. Countries with above-average energy intensity for the region and no or limited efficiency policies risk falling behind, as the competitiveness of their economies will be hampered by low energy efficiency. Energy subsidies and a lack of metering at the end-user level are additional obstacles to be overcome, especially to make energy retrofits more commercially attractive.

A renewable energy market and industry is emerging gradually across the 17 countries. The existing activity builds on sizable hydropower and bioenergy potentials in the region. Deployment of hydropower continues, mostly in the form of small- to medium-scale plants, and, in the bioenergy sector, a switch from traditional to modern uses is under way. Bioenergy options also are replacing fossil fuels in the district heating sector, and modern biomass-based individual heating technologies are expanding in several countries. Solar PV and onshore wind technologies are on the rise, with large-scale power plants being built in several countries. Local PV manufacturing is being targeted successfully in Kazakhstan, while Uzbekistan is still in a planning phase. Turkmenistan, the only country in the region with no renewable energy targets and policies, is looking into pilot efforts and suitable technologies to be leveraged.

The renewable energy developments expected in the near future are relatively modest and differ by sub-region. South East Europe is expected to be the most active due to its proximity to the EU and to the need to meet accession requirements as the region's industry, installers and developers converge with the EU energy market. The focus is on solar PV, solar water heaters, wind technologies and biomass. Switching from traditional to modern uses of biomass would be beneficial for the environment and public health. In Eastern Europe, Ukraine is the most active player to date but is facing a complex geopolitical situation and a severe devaluation of its currency, posing major obstacles to further development of renewables, particularly PV and wind.

In Central Asia, Kazakhstan is expected to be the biggest renewable energy player, as the country has substantial wind potential and has made the first steps towards deployment. Uzbekistan is expanding its solar capacity with support from the ADB. In the Caucasus, energy security concerns in Armenia and Georgia could drive further renewable energy deployment. Armenia is the most advanced in renewables, and the government recently developed a renewable energy programme investment plan, but the country is still only in the preparatory stages of deployment. In the Russian Federation, due to its large size, some renewable energy development can be expected, but it will be far lower than the country's exploitable potential. Most of the power sector is still in the hands of the state, impeding the entry of private players. Energy security is not a driver, although future pressure to advance renewables could come from concerns about system adequacy over time.

Attracting investment remains an issue for renewable energy development in the region. Regional investment flows to renewables, excluding large hydropower projects, were less than 0.5% of the global total in 2014. Since 2012, the region has seen a downwards trend, with a slowdown in investment activity in Eastern Europe and the Russian Federation, and limited new investment in South East Europe, the Caucasus and Central Asia. Government action, in terms of providing stable and reliable investment frameworks for renewable energy deployment, is decisive in determining private investment in renewable energy, as is the support of international development banks.

LIST OF ABBREVIATIONS

BNEF	Bloomberg New Energy Finance
CDM	Clean Development Mechanism
CFL	Compact fluorescent lamp
CIF	Climate Investment Funds
CO_2	Carbon dioxide
CSP	Concentrating solar (thermal) power
EBRD	European Bank for Reconstruction and Development
ESCO	Energy service company
E5P	Eastern Europe Energy Efficiency and Environment Partnership
EUR	Euro
FIT	Feed-in tariff
GDP	Gross domestic product
GEF	Global Environment Facility
GW/GWh	Gigawatt/Gigawatt-hour
HVAC	Heating, ventilation and air conditioning
IEA	International Energy Agency
IFC	International Finance Corporation
IPCC	Intergovernmental Panel on Climate Change
IRENA	International Renewable Energy Agency
ISCC	Integrated solar combined-cycle
kW/kWh	Kilowatt/kilowatt-hour
LED	Light-emitting diode
LPG	Liquefied petroleum gas
MEPS	Minimum Energy Performance Standards
MJ	Megajoule
MW/MWh	Megawatt/Megawatt-hour
NEEA	National Energy Efficiency Action Plan
NREAP	National Renewable Energy Action Plan
NREP	National Renewable Energy Policy
PPP	Purchasing power parity
PV	Photovoltaics
REC	Renewable Energy Certificate
RPS	Renewable Portfolio Standard
SE4All	United Nations Sustainable Energy for All initiative
SHPP	Small hydro power plants
TFEC	Total final energy consumption
UA	Unit of Account
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNIDO	United Nations Industrial Development Organization
USAID	U.S. Agency for International Development
USD	United States dollar
VAT	Value-added tax

GLOSSARY

BIODIESEL. A fuel produced from oilseed crops such as soy, jatropha, rapeseed (canola) and palm oil, and from other oil sources such as waste cooking oil and animal fats. Biodiesel is used in diesel engines installed in cars, trucks, buses and other vehicles, as well as in stationary heat and power applications.

BIOENERGY. Energy derived from any form of biomass, including bio-heat, bio-power and biofuel. Bio-heat arises from the combustion of solid biomass (such as dry fuel wood) or other liquid or gaseous energy carriers. The heat can be used directly or used to produce bio-power by creating steam to drive engines or turbines that drive electricity generators. Alternatively, gaseous energy carriers such as biomethane, landfill gas, or synthesis gas (produced from the thermal gasification of biomass) can be used to fuel a gas engine. Biofuels for transport are sometimes also included under the term bioenergy (see Biofuels).

BIOFUELS. A wide range of liquid and gaseous fuels derived from biomass. Biofuels – including liquid fuel ethanol and biodiesel, as well as biogas – can be combusted in vehicle engines as transport fuels and in stationary engines for heat and electricity generation. They also can be used for domestic heating and cooking (for example, as ethanol gels). Advanced biofuels are made from sustainably produced non-food biomass sources using technologies that are still in the pilot, demonstration or early commercial stages. One exception is hydro-treated vegetable oil (HVO), which is now produced commercially in several plants.

BIOGAS/BIOMETHANE. Biogas is a gaseous mixture consisting mainly of methane and carbon dioxide produced by the anaerobic digestion of organic matter (broken down by micro-organisms in the absence of oxygen). Organic material and/or waste is converted into biogas in a digester. Suitable feedstocks include agricultural residues, animal wastes, food industry wastes, sewage sludge, purpose-grown green crops and the organic components of municipal solid wastes. Raw biogas can be combusted to produce heat and/or power; it can also be transformed into biomethane through a simple process known as scrubbing that removes impurities including carbon dioxide, siloxanes and hydrogen sulphides. Biomethane can be injected directly into natural gas networks and used as a substitute for natural gas in internal combustion engines without fear of corrosion.

BIOMASS. Any material of biological origin, excluding fossil fuels or peat, that contains a chemical store of energy (originally received from the sun) and that is available for conversion to a wide range of convenient energy carriers. These can take many forms, including liquid biofuels, biogas, biomethane, pyrolysis oil or solid biomass pellets.

BIOMASS PELLETS. Solid biomass fuel produced by compressing pulverised dry biomass, such as waste wood and agricultural residues. Torrefied pellets produced by heating the biomass pellets have higher energy content per kilogramme, as well as better grindability, water resistance and storability. Pellets are typically cylindrical in shape with a diameter of around 10 millimetres and a length of 30–50 millimetres. Pellets are easy to handle, store and transport and are used as fuel for heating and cooking applications, as well as for electricity generation and combined heat and power.

BRIQUETTES. Blocks of flammable matter made from solid biomass fuels, including cereal straw, that are compressed in a process similar to the production of wood pellets. They are physically much larger than pellets, with a diameter of 50–100 millimetres and a length of 60–150 millimetres. They are less easy to handle automatically but can be used as a substitute for fuelwood logs.

CAPACITY. The rated capacity of a heat or power generating plant refers to the potential instantaneous heat or electricity output, or the aggregate potential output of a collection of such units (such as a wind farm or set of solar panels). Installed capacity describes equipment that has been constructed, although it may or may not be operational (e.g., delivering electricity to the grid, providing useful heat or producing biofuels).

CAPITAL SUBSIDY. A subsidy that covers a share of the upfront capital cost of an asset (such as a solar water heater). These include, for example, consumer grants, rebates or one-time payments by a utility, government agency or government-owned bank.

CONCENTRATED SOLAR THERMAL POWER (CSP) (also called concentrated solar power or solar thermal electricity, STE). Technology that uses mirrors to focus sunlight into an intense solar beam that heats a working fluid in a solar receiver, which then drives a turbine or heat engine/generator to produce electricity. The mirrors can be arranged in a variety of ways, but they all deliver the solar beam to the receiver. There are four types of commercial CSP systems: parabolic troughs, linear Fresnel, power towers and dish/engines. The first two technologies are line-focus systems, capable of concentrating the sun's energy to produce temperatures of 400 °C, while the latter two are point-focus systems that can produce temperatures of 800 °C or higher. These high temperatures make thermal energy storage simple, efficient, and inexpensive. The addition of storage – using a fluid (most commonly molten salt) to store heat – usually gives CSP power plants the flexibility needed for reliable integration into a power grid.

DISTRIBUTED GENERATION. Generation of electricity from dispersed, generally small-scale systems that are close to the point of consumption.

ENERGY. The ability to do work, which comes in a number of forms including thermal, radiant, kinetic, chemical, potential and electrical. Primary energy is the energy embodied in (energy potential of) natural resources, such as coal, natural gas and renewable sources. Final energy is the energy delivered to end-use facilities (such as electricity to an electrical outlet), where it becomes usable energy and can provide services such as lighting, refrigeration, etc. When primary energy is converted into useful energy, there are always losses involved.

ETHANOL (FUEL). A liquid fuel made from biomass (typically corn,

sugar cane or small cereals/grains) that can replace gasoline in modest percentages for use in ordinary spark-ignition engines (stationary or in vehicles), or that can be used at higher blend levels (usually up to 85% ethanol, or 100% in Brazil) in slightly modified engines such as those provided in "flex-fuel vehicles". Note that some ethanol production is used for industrial, chemical and beverage applications and not for fuel.

FEED-IN TARIFF (FIT). The basic form of feed-in policies. A guaranteed minimum price (tariff) per unit (normally kWh or MWh) is guaranteed over a stated fixed-term period when electricity can be sold and fed into the electricity network, normally with priority or guaranteed grid access and dispatch.

FINAL ENERGY. The part of primary energy, after deduction of losses from conversion, transmission and distribution, that reaches the consumer and is available to provide heating, hot water, lighting and other services. Final energy forms include electricity, district heating, mechanical energy, liquid hydrocarbons such as kerosene or fuel oil, and various gaseous fuels such as natural gas, biogas and hydrogen. Final energy accounts only for the conversion losses that occur upstream of the end-user, such as losses at refineries and power plants.

FISCAL INCENTIVE. An economic incentive that provides individuals, households or companies with a reduction in their contribution to the public treasury via income or other taxes, or with direct payments from the public treasury in the form of rebates or grants.

GENERATION. The process of converting energy into electricity and/or useful heat from a primary energy source such as wind, solar radiation, natural gas, biomass, etc.

GEOTHERMAL ENERGY. Heat energy emitted from within the Earth's crust, usually in the form of hot water or steam. It can be used to generate electricity in a thermal power plant or to provide heat directly at various temperatures for buildings, industry and agriculture.

HYDROPOWER. Electricity derived from the potential energy of water captured when moving from higher to lower elevations. Categories of hydropower projects include run-of-river, reservoir based capacity and low-head in-stream technology (the least developed). Hydropower covers a continuum in project scale from large (usually defined as more than 10 MW of installed capacity, but the definition varies by country) to small, mini, micro and pico.

INVESTMENT. Purchase of an item of value with an expectation of favourable future returns. In this report, new investment in renewable energy refers to investment in: technology research and development, commercialisation, construction of manufacturing facilities and project development (including construction of wind farms and purchase and installation of solar PV systems). Total investment refers to new investment plus merger and acquisition (M&A) activity (the refinancing and sale of companies and projects).

INVESTMENT TAX CREDIT. A taxation measure that allows investments in renewable energy to be fully or partially deducted from the tax obligations or income of a project developer, industry, building owner, etc.

JOULE/KILOJOULE/MEGAJOULE/GIGAJOULE/TERAJOULE/PETAJOULE/EXAJOULE. A Joule (J) is a unit of work or energy equal to the energy expended to produce one Watt of power for one second. For example, one Joule is equal to the energy required to lift an apple straight up by one metre. The energy released as heat by a person at rest is about 60 J per second. A kilojoule (kJ) is a unit of energy equal to one thousand (103) Joules; a megajoule (MJ) is one million (106) Joules; and so on. The potential chemical energy stored in one barrel of oil and released when combusted is approximately 6 GJ; a tonne of oven dry wood contains around 20 GJ of energy.

MANDATE/OBLIGATION. A measure that requires designated parties (consumers, suppliers, generators) to meet a minimum, and often gradually increasing, target for renewable energy, such as a percentage of total supply or a stated amount of capacity. Costs are generally borne by consumers. Mandates can include renewable portfolio standards (RPS); building codes or obligations that require the installation of renewable heat or power technologies (often in combination with energy efficiency investments); renewable heat purchase requirements; and requirements for blending biofuels into transport fuel.

MODERN BIOMASS ENERGY. Energy derived from combustion of solid, liquid and gaseous biomass fuels in efficient small domestic appliances to large-scale industrial conversion plants for modern applications of space heating, electricity generation, combined heat and power, and transport (as opposed to traditional biomass energy).

NET METERING. A regulated arrangement in which utility customers who have installed their own generating systems pay only for the net electricity delivered from the utility (total consumption minus on-site self-generation). A variation that employs two meters with differing tariffs for purchasing electricity and exporting excess electricity off-site is called "net billing".

POWER. The rate at which energy is converted per unit of time, expressed in Watts (Joules/second).

PRIMARY ENERGY. The theoretically available energy content of a naturally occurring energy source (such as coal, oil, natural gas, uranium ore, geothermal and biomass energy, etc.) before it undergoes conversion to useful final energy delivered to the end-user. Conversion of primary energy into other forms of useful final energy (such as electricity and fuels) entails losses. Some primary energy is consumed at the end-user level as final energy without any prior conversion.

PUBLIC COMPETITIVE BIDDING (ALSO CALLED AUCTION OR TENDER). A procurement mechanism by which public authorities solicit bids for a given amount of renewable energy supply or capacity, generally based on price. Sellers offer the lowest price that they would be

willing to accept, but typically at prices above standard market levels.

REGULATORY POLICY. A rule to guide or control the conduct of those to whom it applies. In the renewable energy context, examples include mandates or quotas such as renewable portfolio standards, feed-in tariffs, biofuel blending mandates and renewable heat obligations.

RENEWABLE ENERGY TARGET. An official commitment, plan or goal set by a government (at the local, state, national or regional level) to achieve a certain amount of renewable energy by a future date. Some targets are legislated while others are set by regulatory agencies or ministries.

RENEWABLE PORTFOLIO STANDARD (RPS). An obligation placed by a government on a utility company, group of companies, or consumers to provide or use a predetermined minimum renewable share of installed capacity, or of electricity or heat generated or sold. A penalty may or may not exist for non-compliance. These policies are also known as "renewable electricity standards", "renewable obligations" and "mandated market shares", depending on the jurisdiction.

SOLAR HOME SYSTEM (SHS). A stand-alone system composed of a relatively small power photovoltaic module, battery and sometimes a charge controller, that can power small electric devices and provide modest amounts of electricity to homes for lighting and radios, usually in rural or remote regions that are not connected to the electricity grid.

SOLAR PHOTOVOLTAICS (PV). A technology used for converting solar radiation (light) into electricity. PV cells are constructed from semi-conducting materials that use sunlight to separate electrons from atoms to create an electric current. Modules are formed by interconnecting individual solar PV cells. Monocrystalline modules are more efficient but relatively more expensive than polycrystalline silicon modules.

SOLAR WATER HEATER (SWH). An entire system – consisting of a solar collector, storage tank, water pipes and other components – that converts the sun's energy into "useful" thermal (heat) energy for domestic water heating, space heating, process heat, etc. Depending on the characteristics of the "useful" energy demand (potable water, heating water, drying air, etc.) and the desired temperature level, a solar water heater is equipped with the appropriate solar collector. There are two types of solar water heaters: pumped solar water heaters use mechanical pumps to circulate a heat transfer fluid through the collector loop (active systems), whereas thermo-siphon solar water heaters make use of buoyancy forces caused by natural convection (passive systems).

SUBSIDIES. Government measures that artificially reduce the price that consumers pay for energy or reduce production costs.

TRADITIONAL BIOMASS. Solid biomass, including gathered fuel wood, charcoal, agricultural and forest residues, and animal dung, that is usually produced unsustainably and typically used in rural areas of developing countries by combustion in polluting and inefficient cookstoves, furnaces or open fires to provide heat for cooking, comfort and small-scale agricultural and industrial processing (as opposed to modern biomass energy).

WATT/KILOWATT/MEGAWATT/GIGAWATT/TERAWATT-HOUR. A Watt is a unit of power that measures the rate of energy conversion or transfer. A kilowatt is equal to one thousand (103) Watts; a megawatt to one million (106) Watts; and so on. A megawatt electrical (MW) is used to refer to electric power, whereas a megawatt-thermal (MWth) refers to thermal/heat energy produced.

ENDNOTES

1 REGIONAL INTRODUCTION

1 United Nations Economic Commission for Europe, "Member States and Member States Representatives", http://www.unece.org/oes/nutshell/member_States_representatives.html.

2 Ingrid Barnsley, Amanda Blank and Adam Brown, Enabling Renewable Energy and Energy Efficiency Technologies (Paris: OECD/International Energy Agency (IEA), 2015), p. 115, https://www.iea.org/publications/insights/insightpublications/EnablingRenewableEnergyandEnergyEfficiencyTechnologies.pdf.

3 Table 1 from World Bank, "World Development Indicators", http://data.worldbank.org/data-catalog/world-development-indicators, viewed 10 August 2015.

4 Wolfgang Lutz, *Emerging Population issues in Eastern Europe and Central Asia* (New York: United Nations Population Fund, 2010), p. 26, https://www.unfpa.org/sites/default/files/pub-pdf/bmsablon.pdf.

5 Tarek Atallah, Silvio Gualdi and Alessandro Lanza, *A Global Degree Days Database for Energy-related Applications* (Riyadh: King Abdullah Petroleum Studies and Research Center, 2015), p. 27, http://www.kapsarc.org/en/Publications/KS-1514-DP08A-A%20global%20degree%20days%20database%20for%20energy-related%20applications_for%20web.pdf.

6 Franklin Steves, ed., *Life in Transition: After the Crisis* (London: European Bank for Reconstruction and Development and World Bank, 2010), p. 116, http://www.ebrd.com/news/publications/special-reports/life-in-transition-survey-ii.html.

7 Ibid., p. 116.

8 International Monetary Fund (IMF), "World Economic Outlook (WEO) Update" (Washington, DC: 19 January 2015), p. 4, http://www.imf.org/external/pubs/ft/weo/2015/update/01/pdf/0115.pdf.

9 World Bank, "GDP per capita growth (annual %)", World Development Indicators, http://data.worldbank.org/indicator/NY.GDP.PCAP.KD.ZG, viewed 31 July 2015.

10 Table 2 from the following sources: energy imports and energy use per capita from World Bank, op. cit. note 3; energy subsidies from IMF, "Counting the Cost of Energy Subsidies", *IMF Survey*, 17 July 2015, http://www.imf.org/external/pubs/ft/survey/so/2015/new070215a.htm; electrification rate from Sustainable Energy for All (SE4All), *Progress Toward Sustainable Energy 2015: Global Tracking Framework Summary Report* (Washington, DC: 2015), p. 63, http://trackingenergy4all.worldbank.org/~/media/GIAWB/GTF/Documents/GTF-2015-Summary-Report.ashx.

11 World Bank, op. cit. note 3.

12 Table 3 from IEA, "Non-member Countries: Energy Balances", https://www.iea.org/countries/non-membercountries/, viewed 10 August 2015.

13 David Coady et al., *How Large Are Global Energy Subsidies?* (Washington, DC: IMF, May 2015), p. 41, https://www.imf.org/external/pubs/cat/longres.aspx?sk=42940.0.

14 IEA, *Eastern Europe, Caucasus and Central Asia: Energy Policies Beyond IEA Countries* (Paris: OECD/IEA, 2015), http://www.iea.org/bookshop/705-Eastern_Europe,_Caucasus_and_Central_Asia.

15 SE4All, op. cit. note 11.

16 Caterina Ruggeri Laderchi, Anne Olivier and Chris Trimble, *Balancing Act: Cutting Energy Subsidies While Protecting Affordability* (Washington, DC: World Bank, 2013), p. 165, https://openknowledge.worldbank.org/bitstream/handle/10986/12296/9780821397893.pdf?sequence=7.

17 Barnsley, Blank and Brown, op. cit. note 2, p. 24.

18 Table 4 from the following sources: Energy Community website, https://www.energy-community.org; Encharter website, http://www.encharter.org; INOGATE website, http://www.inogate.org; SE4All website, http://www.se4all.org.

19 World Bank, "Central Asia South Asia Electricity Transmission and Trade Project (CASA-1000)", http://www.worldbank.org/projects/P145054?lang=en, viewed 7 September 2015.

20 United Nations General Assembly, "Transforming Our World: The 2030 Agenda for Sustainable Development", Resolution adopted on 25 September 2015, http://www.un.org/ga/search/view_doc.asp?symbol=A/RES/70/1&Lang=E.

2 RENEWABLE ENERGY MARKET AND INDUSTRY OVERVIEW

1 Figure 2 from Sustainable Energy for All (SE4All), Progress Toward Sustainable Energy 2015: Global Tracking Framework Summary Report (Washington, DC: 2015), p. 63, http://trackingenergy4all.worldbank.org/~/media/GIAWB/GTF/Documents/GTF-2015-Summary-Report.ashx.

2 Figure 3 based on Ibid.

3 International Energy Agency (IEA), "Statistics", http://www.iea.org/statistics/statisticssearch/, viewed 25 July 2015.

4 SE4All, op. cit. note 1, p. 197.

5 World Energy Council (WEC), World Energy Resources: 2013 Survey (London: 2013), pp. 252, 255, https://www.

worldenergy.org/wp-content/uploads/2013/09/Complete_WER_2013_Survey.pdf.

6 International Renewable Energy Agency (IRENA), Renewable Energy Country Profiles for the European Union (Abu Dhabi: June 2013), http://www.irena.org/DocumentDownloads/Publications/_EU27Complete.pdf; IRENA, Renewable Energy Country Profiles: Eurasia, Non-EU Europe and North America (Abu Dhabi: December 2013).

7 Ibid.

8 Ibid.

9 Vojislav Milijić, "Biomass in the Western Balkans: Why Don't We Use Our Wood Biomass Potentials?" Balkan Green Energy News, 29 April 2015, http://balkangreenenergynews.com/biomass-in-the-western-balkans-why-dont-we-use-our-wood-biomass-potentials/; IEA, op. cit. note 3.

10 IEA, *Solar Energy Perspectives* (Paris: OECD/IEA, 2011), p. 58, http://www.iea.org/publications/freepublications/publication/Solar_Energy_Perspectives2011.pdf; WEC, op. cit. note 5, p. 402.

11 Figure 4 based on SE4All, op. cit. note 1.

12 Figure 5 based on information compiled from local co-ordinating contributors and on Olivier Lavagne d'Ortigue, Adrian Whiteman and Samah Elsay, *Renewable Energy Capacity Statistics 2015* (Abu Dhabi: IRENA, June 2015), p. 41, http://www.irena.org/DocumentDownloads/Publications/IRENA_RE_Capacity_Statistics_2015.pdf. Sidebar 1 from the following sources: IEA, *Eastern Europe, Caucasus and Central Asia: Energy Policies Beyond IEA Countries* (Paris: OECD/IEA, 2015), p. 371, http://www.iea.org/bookshop/705-Eastern_Europe,_Caucasus_and_Central_Asia; INEA Consulting, "Photovoltaic (Solar PV) Energy Market in CIS Countries 2015-2020. Growth continued in 2014 in the shadow of political turmoil in Ukraine", Renewable Market Watch, http://renewablemarketwatch.com/news-analysis/169-cis-countries-photovoltaic-solar-pv-power-market-2013-2018-growth-continued-in-2014-in-the-shadow-of-political-turmoil-in-ukraine, viewed 23 July 2015; IEA and IRENA, "Joint Policies and Measures Database – Global Renewable Energy", http://www.iea.org/policiesandmeasures/renewableenergy/?country=Ukraine, viewed 24 July 2015; IEA, *Medium-Term Renewable Energy Market Report 2014* (Paris: OECD/IEA, 2014), p. 117, https://www.iea.org/bookshop/480-Medium-Term_Renewable_Energy_Market_Report_2014.

13 Based on information compiled from local co-ordinating contributors (see list in Acknowledgements).

14 Ibid.

15 Ibid.

16 Asian Development Bank (ADB), "ADB to Help Uzbekistan Build Central Asia's First Solar Power Plant", press release (Manila: 22 November 2013), http://www.adb.org/news/adb-help-uzbekistan-build-central-asias-first-solar-power-plant

17 ADB, "Uzbekistan – Technical Assistance for Solar Energy Development", 19 December 2011, http://www.adb.org/news/briefs/uzbekistan-technical-assistance-solar-energy-development.

18 Cindy Tiangco, Energy Specialist, Energy Division, Central and West Asia Department, ADB, "Update on Solar Development in Uzbekistan", presentation at the 8th Meeting of the Asia Solar Energy Forum, Manila, Philippines, 15 June 2015, p. 14, http://d335hnnegk3szv.cloudfront.net/wp-content/uploads/sites/837/2015/06/ASEF-8th-Meeting-Presentation-UZB-Solar-Power-Development-CTiangco-1.pdf.

19 "Promondis Breaks Ground on 35 MW PV Plant in Kazakhstan", Photon News, 24 April 2015, http://www.photon.info/photon_news_detail_en.photon?id=92723.

20 Ibid.

21 European Bank for Reconstruction and Development (EBRD), "Burnoye Solar Power Plant", Project Summary Document (London: 13 March 2015), http://www.ebrd.com/work-with-us/projects/psd/burnoye-solar-power-plant.html; INEA Consulting, "First Large Scale Photovoltaic (Solar PV) Power Plants in Kazakhstan Are Under Construction", Renewable Market Watch, http://renewablemarketwatch.com/news-analysis/173-first-large-scale-photovoltaic-solar-pv-power-plants-in-kazakhstan-are-under-construction, viewed 27 July 2015; "Industrialization Day: 'Burnoye Solar-1' Solar Power Station Commissioned in Zhambyl Region", Kazinform, 2 July 2015, http://www.inform.kz/eng/article/2792955.

22 Ian Clover, "Turkmenistan Plans Solar Energy Institute", *PV Magazine*, 17 June 2014, http://www.pv-magazine.com/news/details/beitrag/turkmenistan-plans-solar-energy-institute-_100015441/#axzz3hCXMEgnw.

23 Astana Solar, "About Company", http://www.astanasolar.kz/en/about-us, viewed 26 July 2015.

24 Ibid.

25 Becky Beetz, "Suntech Plans PV Module Factory in Uzbekistan", *PV Magazine*, 5 February 2013, http://www.pv-magazine.com/news/details/beitragsuntech-plans-pv-module-factory-in-uzbekistan_100010091

26 "Альтернативная энергетика: нужна концепция", Gazeta Online, http://gazeta.norma.uz/publish/doc/text109779_alternativnaya_energetika_nujna_koncepciya viewed 2 October 2015; Embassy of the Republic of Uzbekistan in Austria, "Production of Technical Silicon to Start in SIZ 'Angren'", 14 July 2014, http://www.usbekistan.at/index.php?option=com_.

27 Eurasian Development Bank, "EDB Starts a Project to Launch the First Large Wind Power Plant in Kazakhstan", press release (Almaty: 17 October 2013), http://eabr.org/e/press_center/press-releases/?id_4=33357.

28 Ibid.

29 EBRD, "Dolovo Cibuk Wind Farm", http://www.ebrd.com/work-with-us/projects/esia/dolovo-cibuk-i-wind-farm.html, viewed 2 October 2015; Ivicom Energy, "Project Guidelines", http://ivicom-energy.com/web/?page_id=219, viewed

27 July 2015; "NIS Begins Construction of 102MW Plandiste Wind Farm in Serbia", Power-Technology.com, 20 September 2013, http://www.power-technology.com/news/news-nis-begins-construction-of-102mw-plandiste-wind-farm-in-serbia; EBRD, "Alibunar A Windfarm Project", http://www.ebrd.com/work-with-us/projects/esia/alibunar-a-windfarm-project.html, viewed 2 October 2015; Kovacica Vetropark, "Project Development", http://www.vpkovacica.rs/EN/Projekat/RazvojProjekta.html, viewed 2 October 2015.

30 Ibid.

31 Maja Zuvela and David Goodman, "Bosnian Region Approves First Wind Farm Projects", *Reuters*, 18 March 2015, http://www.reuters.com/article/2015/03/18/bosnia-windfarm-idUSL6N0WK35J20150318.

32 Akta, "EPBIH: Construction and Commissioning of Podveležje Wind Farm End 2016", 7 January 2015, http://www.akta.ba/en/Vijest/investments/epbih-construction-and-commissioning-of-podvelezje-wind-farm-end-2016/47579.

33 Zuvela and Goodman, op. cit. note 31.

34 Akuo Energy, "Krnovo - 72 MW - Montenegro", http://www.akuoenergy.com/en/what-we-do/wind/krnovo.html, viewed 29 September 2015; United Nations Framework Convention on Climate Change (UNFCCC), "Project 9241: Mozura Wind Farm", https://cdm.unfccc.int/Projects/DB/RINA1356551429.6/view, viewed 29 September 2015.

35 Bridgette Meinhold, "Azerbaijan's Carbon Neutral Zira Island", Inhabitat, 2 February 2009, http://inhabitat.com/zira-island-by-big-architects/.

36 "Azerbaijan Plans to Construct Wind Farm in Area of Offshore Oil Production for AZN 450 Million", ABC.AZ, 16 April 2015), http://abc.az/eng/news/87802.html.

37 UNFCCC, "Cascade Credit Small-scale Hydro Bundled Project in Armenia", http://cdm.unfccc.int/Projects/Validation/DB/4P61F8C5GBVORDJ5XVPS12B6KK9HDJ/view.html, viewed 2 September 2015.

38 IEA, *Eastern Europe, Caucasus and Central Asia*, op. cit. note 12.

39 Global Environment Facility (GEF), "Detail of GEF Project #3931", https://www.thegef.org/gef/project_detail?projID=3931, viewed 27 July 2015.

40 IEA, *Eastern Europe, Caucasus and Central Asia*, op. cit. note 12, p. 229.

41 United Nations Development Programme (UNDP), "Renewable Energy Snapshot: Montenegro", http://www.scribd.com/doc/224004948/Renewable-Energy-Snapshot-Montenegro, viewed 2 September 2015.

42 IEA, *Eastern Europe, Caucasus and Central Asia*, op. cit. note 12, p. 295.

43 Ibid.

44 United Nations Industrial Development Organization and International Center on Small Hydro Power, *World Small Hydropower Development Report: Turkmenistan* (Vienna and Hangzhou: 2013), p. 1, http://www.smallhydroworld.org/fileadmin/user_upload/pdf/Asia_Central/WSHPDR_2013_Turkmenistan.pdf.

45 WEC, op. cit. note 5, p. 403.

46 World Bank, "World Bank Supports Exploration of Geothermal Resources in Armenia", press release (Washington, DC: 8 June 2015), http://www.worldbank.org/en/news/press-release/2015/06/08/world-bank-supports-exploration-of-geothermal-resources-in-armenia.

47 Ibid.

48 Figure 6 based on information compiled from local co-ordinating contributors and from Franz Mauthner, Werner Weiss and Monika Spörk-Dür, *Solar Heat Worldwide: Markets and Contribution to the Energy Supply 2013* (Gleisdorf, Austria: IEA Solar Heating & Cooling Programme, June 2015), p. 30, http://www.iea-shc.org/data/sites/1/publications/Solar-Heat-Worldwide-2015.pdf.

49 United Nations Development Programme (UNDP) Albania, "The Country Program of Albania under the Global Solar Water Heating Market Transformation and Strengthening Initiative", http://www.al.undp.org/content/albania/en/home/operations/projects/environment_and_energy/the-country-program-of-albania-under-the-global-solar-water-heat.html, viewed 27 July 2015.

50 Based on IRENA, op. cit. note 6, and on Milijić, op. cit. note 9.

51 "Беларусь Агенцтва па статыстыцы, Дэпартамент энергаэфектыўнасці, Развитие важнейших отраслей национальной экономии неразрывно связано с энергосбережением", http://energoeffekt.gov.by/news/22-news/1903-2015-02-19-06-26-58.html, viewed 25 July 2015.

52 Sidebar 2 from the following sources: Fan Zhang, "Project Information Document (Appraisal Stage) - Belarus Biomass District Heating Project - P146194" (Washington, DC: World Bank, 27 January 2014), p. 7, http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/ECA/2014/01/27/090224b08221f767/1_0/Rendered/PDF/Project0Inform0ng0Project000P146194.pdf; World Bank, "Belarus - Biomass District Heating Project". (Washington, DC: 5 March 2014), p. 68, http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2014/03/14/000442464_20140314095506/Rendered/PDF/PAD7280P146194010Box382166B00OUO090.pdf.

53 Energetska Efikasnost u Crnoj Gori, "Energy Wood", http://www.energetska-efikasnost.me/ee.php?id=24&l=en, viewed 27 July 2015.

54 IEA, *Eastern Europe, Caucasus and Central Asia*, op. cit. note 12, p. 260.

55 Project Implementation Unit for Increase of Food Production, "Biomass Project", http://www.2kr.md/index.php/introduction-to-biomass, viewed 27 July 2015.

56 Ibid.

57 Figure 7 from Ibid.; Albania data based on WEC, op. cit. note 5, p. 372.

58 Azerbaijan from State Agency on Alternative and Renewable Energy Sources of the Republic of Azerbaijan, personal communication with REN21, 24 June 2015; Belarus from Vladimir Zui, "Main Geothermal Installations in Belarus", in *Proceedings World Geothermal Congress 2015* (Melbourne,

Australia, 19-25 April 2015), p. 6, https://pangea.stanford.edu/ERE/db/WGC/papers/WGC/2015/06004.pdf; Russia and Serbia from WEC, op. cit. note 5, pp. 402, 404; Ukraine from State Agency on Energy Efficiency and Energy Saving of Ukraine, "Generation of Thermal Energy from Renewable Sources", http://saee.gov.ua/en/activity/vidnovlyuvana-enerhetyka/suchasny-stan, viewed 28 July 2015.

59 Ibid.

60 Based on information compiled from local co-ordinating contributors and on IRENA, *REmap 2030: Renewable Energy Prospects for Ukraine* (Abu Dhabi: April 2015), p. 11, http://www.irena.org/remap/IRENA_REmap_Ukraine_paper_2015.pdf.

61 Energy Agency of the Republic of Macedonia, "Renewable Energy", http://www.ea.gov.mk/index.php?option=com_content&view=article&id=53&Itemid=&lang=en, viewed 29 July 2015.

62 Makpetrol, "Biodiesel B100", https://www.makpetrol.com.mk/biodizelb100_en.asp, viewed 29 July 2015.

63 Energy Agency of the Republic of Macedonia, op. cit. note 61.

3 DISTRIBUTED RENEWABLE ENERGY AND ENERGY ACCESS

1 Ani Balabanyan et al., *Keeping Warm: Urban Heating Options in Tajikistan*, Summary Report (Washington, DC: World Bank, March 2015), p. 93, http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2015/06/19/090224b082f5d1cd/2_0/Rendered/PDF/Keeping0warm000tan000summary0report.pdf.

2 World Bank, *Status of Energy Efficiency in the Western Balkans. A Stocktaking Report* (Washington, DC: 15 June 2010), p. 83, http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2010/10/26/000334955_20101026030914/Rendered/PDF/AAA490ESW0p11010Box353763B01PUBLIC1.pdf.

3 Nicolina Angelou, *A New Multi-Tier Approach to Measuring Energy Access* (Washington, DC: World Bank Energy Sector Management Assistance Program (ESMAP), 19 February 2014), p. 33, http://www.esmap.org/sites/esmap.org/files/DocumentLibrary/Multi-tier%20BBL_Feb19_Final_no%20annex.pdf.

4 Figure 8 from Sustainable Energy for All (SE4All), *Progress Toward Sustainable Energy 2015: Global Tracking Framework Summary Report* (Washington, DC: 2015), p. 63, http://trackingenergy4all.worldbank.org/~/media/GIAWB/GTF/Documents/GTF-2015-Summary-Report.ashx.

5 Ibid.

6 Sidebar 3 from the following sources: United Nations Development Programme (UNDP) Bosnia and Herzegovina, "About UNDP in Bosnia and Herzegovina", http://www.ba.undp.org/content/bosnia_and_herzegovina/en/home/operations/about_undp.html, viewed 5 August 2015; Ministry of Energy of Georgia, personal communication with REN21, 26 June 2015; Almaz Stamaliev, Head of Department of Electricity, Ministry of Energy and Industry, Kyrgyzstan, personal communication with REN21, 4 August 2015; Islamic Development Bank, "Request for Expressions of Interest (Consulting Services), Kyrgyz Republic, 'The Improvement of Electricity Supply in the Arka Area of Batken Region' Project", 10 December 2014, http://www.isdb.org/irj/servlet/prt/portal/prtroot/tenderuser.TenderEndUser?Title=REQUEST%20FOR%20EXPRESSION%20OF%20_CONSULTING%20SERVICES_; UNDP Uzbekistan, "Chapter 5. The Technological Outlook for Developing Renewable Energy in Uzbekistan", in *The Outlook for Development of Renewable Energy in Uzbekistan* (Tashkent: 2007), pp. 56-62, http://www.undp.uz/en/publications/publication.php?id=79; Barqi Tojik website, Tajikistan, http://www.barqitojik.tj/, viewed 24 June 2015; SE4All, *Tajikistan Rapid Assessment and Gap Analysis*, (Tashkent: undated), p. 31, http://www.tj.undp.org/content/dam/tajikistan/docs/library/UNDP_TJK_SE4ALL_Rapid_Assessment_and_gap_analysis_Eng.pdf.

7 Table 4 from the following sources: SE4All, op. cit. note 4, p. 38; Caterina Ruggeri Laderchi, Anne Olivier and Chris Trimble, *Balancing Act: Cutting Energy Subsidies While Protecting Affordability* (Washington, DC: World Bank, 2013), p. 62, https://openknowledge.worldbank.org/bitstream/handle/10986/12296/9780821397893.pdf?sequence=7; World Bank, "Value lost due to power outages", World Development Indicators, http://data.worldbank.org/data-catalog/world-development-indicators, viewed 10 August 2015.

8 International Energy Agency (IEA), *Eastern Europe, Caucasus and Central Asia: Energy Policies Beyond IEA Countries* (Paris: OECD/IEA, 2015), http://www.iea.org/bookshop/705-Eastern_Europe,_Caucasus_and_Central_Asia; World Bank, "World Development Indicators", http://data.worldbank.org/indicator, viewed 3 August 2015.

9 Daryl Fields et al., *Tajikistan's Winter Energy Crisis: Electricity Supply and Demand Alternatives* (Washington, DC: World Bank, November 2012), p. 73, http://siteresources.worldbank.org/ECAEXT/Resources/TAJ_winter_energy_27112012_Eng.pdf; Slavica Robića et al., "Understanding Energy Poverty – Case Study: Tajikistan", undated, p. 18, www.indiaenergycongress.in/montreal/library/pdf/339.pdf.

10 Ruggeri Laderchi, Olivier and Trimble, op. cit. note 7, p. 164.

11 Robića et al., op. cit. note 9, p. 18.

12 Figure of 13 million is calculated based on SE4All, op. cit. note 4, p. 63, and on World Bank, "Population, total", World Development Indicators, http://data.worldbank.org/indicator/SP.POP.TOTL, viewed 2 August 2015.

13 Ibid.

14 Ibid.

15 World Bank, op. cit. note 2, p. 83.

16 Ruggeri Laderchi, Olivier and Trimble, op. cit. note 7, p. 165.

17 Sidebar 4 from the following sources: George Abulashvili, Energy Efficiency Centre Georgia, "District Heating System in Georgia", presentation, 2010, http://erranet.org/index.php?name=OE-eLibrary&file=download&id=7334&keret=N&showheader=N; SE4All, op. cit. note 4; Norberto Pignatti,

Irakli Galdava and Giorgi Kelbakian, "Expanding Access to Modern Energy Services in Transition Countries: The Republic of Georgia," International Association for Energy Economics newsletter, Second Quarter 2014, pp. 21-22, www.iaee.org/en/publications/newsletterdl.aspx?id=229; Nani Mchedlishvili, National Forestry Agency of Georgia, personal communication with REN21, 7 August 2015; Molly Corso, "Georgia: Need for Firewood Raises Threat for Christmas-Tree Trade", Eurasianet.org, 20 December 2013, http://www.eurasianet.org/node/67891; Liana Garibashvili, Head of Informational-Analytical Department, Energy Efficiency Centre Georgia, personal communication with REN21, 31 July 2015.

18 IEA, *Energy in the Western Balkans* (Paris: OECD/IEA, 2008), p. 412, www.iea.org/publications/freepublications/publication/balkans2008.pdf.

19 Ruggeri Laderchi, Olivier and Trimble, op. cit. note 7, p. 165.

20 World Bank, *Heating Assessment for the Urban Building Sector of the Kyrgyz Republic* (Bishkek: February 2015), p. 36, http://www.worldbank.org/content/dam/Worldbank/Feature%20Story/ECA/Central%20Asia/KG-Urban-Heating-Study-Summary-en.pdf; Serbia from IEA, op. cit. note 18, p. 412.

21 "Energy Poverty Takes Toll on Balkan Forests", EurActiv.com, 14 December 2012, http://www.euractiv.com/climate-environment/energy-poverty-takes-toll-balkan-news-513402.

22 UNDP Albania, "The Country Program of Albania under the Global Solar Water Heating Market Transformation and Strengthening Initiative", http://www.al.undp.org/content/albania/en/home/operations/projects/environment_and_energy/the-country-program-of-albania-under-the-global-solar-water-heat.html, viewed 4 August 2015.

23 Table 5 from the following sources: Energetska Efikasnost u Cnroj Gori, "Solarni Katuni", http://www.energetska-efikasnost.me/ee.php?id=24&l=en, viewed 27 July 2015; Global Environment Facility (GEF) Small Grants Programme, "Promotion of Renewable Energy Sources in Distant Non-electrified Settlements of Kyzylorda Oblast on the Example of Moynak Village", https://sgp.undp.org/index.php?option=com_sgpprojects&view=projectdetail&id=17744&Itemid=205, viewed 4 August 2015; Women in Europe for a Common Future, "Kyrgyzstan: Home Comforts – Creating Local Capacity for Improved Rural Living Standards via Sustainable Energy and Sanitation", 15 February 2011, http://www.wecf.eu/english/about-wecf/issues-projects/projects/kyrgyzstan_improving_livingstandards.php; Marko Capek et al., *Do It Yourself Solar Water Heating System* (Zagreb: UNDP Croatia, 2014), p. 48, http://www.eurasia.undp.org/content/dam/rbec/docs/UNDP-HR-DIY%20Guide%20for%20Solar%20Water%20Heating%20System-2015.pdf; Sophie Yeo, "Tajikistan's Women Take Solar Power into Their Own Hands", Climate Change News, 20 February 2015, http://www.rtcc.org/2015/02/20/tajikistans-women-take-solar-power-into-their-own-hands/#sthash.mhC9JfY2.dpuf; UNDP Croatia, "From Tajikistan with Love: The 'Handywomen' diaries", 3 March 2015, http://www.hr.undp.org/content/croatia/en/home/blog/2015/3/3/From-Tajikistan-with-love-The-handywomen-diaries.html; United Nations Economic Commission for Europe, *Assessment on Clean Energy Infrastructure in Turkmenistan* (Geneva: October 2013), p. 72, http://www.unece.org/fileadmin/DAM/ceci/documents/UNDA_project/PPP_Assessment_Turkmenistan.pdf; Jean-Jacques Dautet, Team Leader SDP project, Turkmenistan, personal communication with REN21, 6 August 2015; GEF Small Grants Programme, "Nadejdas Farm Gives Hope for More Biogas in Uzbekistan", 12 April 2012, https://sgp.undp.org/index.php?option=com_content&view=article&id=267:nadejdas-farm-gives-hope-for-more-biogas-in-uzbekistan&catid=36:our-stories&Itemid=186#.Vb3M-vnzrIU.

24 Energetska Efikasnost u Cnroj Gori, "Energy Wood", http://www.energetska-efikasnost.me/ee.php?id=24&l=en, viewed 27 July 2015.

25 Ekaterina Biryukova, "Yippee! Biogas Standard Registered!", Akvorsr, 13 December 2013, http://rsr.akvo.org/fr/project/528/update/4341/.

26 UNDP, *The Heat Is On: Practical Proposals for Rural Heating in Eastern Europe and Central Asia*, 2013, unpublished, p. 117, http://econos.eu/index_htm_files/The%20Heat%20Is%20On.pdf.

27 Barqi Tojik website, http://www.barqitojik.tj/, viewed 24 June 2015.

28 UNDP Bosnia and Herzegovina, "UNDP/Nesta Renewable Energy Challenge: Can You Help People Affected by War?" 25 May 2013, http://www.ba.undp.org/content/bosnia_and_herzegovina/en/home/presscenter/articles/2013/05/25/undp-nesta-renewable-energy-challenge-can-you-help-people-affected-by-war-.html.

29 GEF Small Grants Programme, *20 Years: Community Action for the Global Community* (New York: UNDP, June 2012), p. 114, https://sgp.undp.org/index.php?option=com_docman&task=doc_download&gid=281&Itemid=222.

4 ENERGY EFFICIENCY

1 Ingrid Barnsley, Amanda Blank and Adam Brown, *Enabling Renewable Energy and Energy Efficiency Technologies* (Paris: OECD/International Energy Agency (IEA), 2015), p. 14, https://www.iea.org/publications/insights/insightpublications/EnablingRenewableEnergyandEnergyEfficiencyTechnologies.pdf.

2 Ibid.

3 This report uses decomposition analysis, available in Sustainable Energy for All (SE4All), *Progress Toward Sustainable Energy 2015: Global Tracking Framework Summary Report* (Washington, DC: June 2015), http://trackingenergy4all.worldbank.org/~/media/GIAWB/GTF/Documents/GTF-2015-Summary-Report.pdf.

4 Caterina Ruggeri Laderchi, Anne Olivier and Chris Trimble, *Balancing Act: Cutting Energy Subsidies While Protecting Affordability* (Washington, DC: World Bank, 2013), p. 165, https://openknowledge.worldbank.org/bitstream/handle/10986/12296/9780821397893.pdf?sequence=7; IEA, *Eastern Europe, Caucasus and Central Asia*: *Energy Policies Beyond IEA Countries* (Paris: OECD/IEA, 2015), http://www.iea.org/bookshop/705-Eastern_Europe,_Caucasus_and_Central_Asia.

5 Figure 9 from SE4All, op. cit. note 3, p. 63.

6 The intensity reduction is attributable mainly to structural changes in their economies and to decreasing economic outputs, especially in the late 1990s, from IEA, op. cit. note 4.

7 Figure 10 from Ibid.

8 Figure 11 from IEA, "Non-member Countries: World Energy Balance", https://www.iea.org/countries/non-membercountries/, viewed 10 August 2015.

9 Barnsley, Blank and Brown, op. cit. note 1, p. 115.

10 Ibid., p. 115.

11 David Coady et al., *How Large Are Global Energy Subsidies?* (Washington, DC: International Monetary Fund, May 2015, p. 41, https://www.imf.org/external/pubs/ft/wp/2015/wp15105.pdf.

12 Energy Community, *Energy Community – Tapping On Its Energy Efficiency Potential* (Vienna: 1 June 2015), p. 48, https://www.energy-community.org/portal/page/portal/ENC_HOME/DOCS/3750146/EnC_EE_Publication.pdf.

13 IEA, op. cit. note 4.

14 Barnsley, Blank and Brown, op. cit. note 1, p. 115; ENPI Regional East Action Programme, *Energy Saving Initiative in the Building Sector in Eastern Europe and the Central Asian Countries: Completion Report* (Brussels: October 2014), p. 13, http://www.inogate.org/documents/ESIB_Final_Completion_Report_with_country_reports.pdf.

15 Figure 12 from World Bank, "World Development Indicators", http://data.worldbank.org/data-catalog/world-development-indicators viewed 10 August 2015.

16 INOGATE, *Multi-Annual Report 2012-2014* (Brussels: June 2015), p. 26, www.inogate.org/documents/IMAR_2015_ver_WEB.pdf.

17 Ibid.

18 Ibid.

19 "Albania's Energy Distribution Plans to Invest over 50 Million US Dollars This Year to Improve Its Distribution Network", Balkans.com, 15 January 2015, http://www.balkans.com/open-news.php?uniquenumber=200396.

20 D. Ürge-Vorsatz et al., "Heating and Cooling Energy Trends and Drivers in Buildings," *Renewable and Sustainable Energy Reviews*, vol. 41 (January 2015), pp. 85-98.

21 Several publications provide an overview of ongoing donor activity in the area of energy efficiency. The main sources include: Energy Community, op. cit. note 12, pp. 24-48; Komila Nabiyeva, *Renewable Energy and Energy Efficiency in Central Asia: Prospects for German Engagement* (Istanbul: Michael Succow Foundation for the Protection of Nature, May 2015), pp. 12, 15, 16, http://www.iea.org/media/workshops/2015/platformistanbul2015/First_Steps_towards_Energy_Transition_in_Central_Asia__Opportunities_for_German_and_EU_Engagement.pdf; Copenhagen Centre on Energy Efficiency, *Energy Efficiency Orbits for Transition Economies: Final Report* (Copenhagen: 2015), p. 227, http://www.cenef.ru/file/Final%20Report_C2E2_CENEf_June2_2015.pdf.

22 Uwe Deichmann and Fan Zhang, *Growing Green: The Economic Benefits of Climate Action* (Washington, DC: World Bank, 2013), p. 385, https://openknowledge.worldbank.org/handle/10986/13194.

23 Energy Community, op. cit. note 12, p. 48.

24 ENPI Regional East Action Programme, op. cit. note 14, p. 13.

25 UNDP Armenia, *Energy Efficient Public Buildings and Housing in Armenia*, NAMA Project Document (Yerevan: 10 June 2014), p. 50, http://www.nama-database.org/images/5/5c/NAMA_public_buildings_and_housing_Armenia_project_document_15.10.2014.pdf.

26 IEA, *Russia 2014: Energy Policies Beyond IEA Countries* (Paris: OECD/IEA, 2014), https://www.iea.org/bookshop/474-Russia_2014.

27 Energy Community, op. cit. note 12, p. 48.

28 Ibid.

29 Copenhagen Centre on Energy Efficiency, op. cit. note 21, p. 101.

30 Ibid., pp. 140,143.

31 Volker Ahlemeyer, "EBRD Paves the Way for Increased Energy Savings in Ukraine", European Bank for Reconstruction and Development, 7 September 2015, http://www.ebrd.com/news/2015/ebrd-paves-the-way-for-increased-energy-savings-in-ukraine.html.

32 Copenhagen Centre on Energy Efficiency, op. cit. note 21, p. 209.

33 World Bank, *Status of Energy Efficiency in the Western Balkans. A Stocktaking Report* (Washington, DC: 2010), p. 83, http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2010/10/26/000334955_20101026030914/Rendered/PDF/AAA490ESW0p11010Box353763B01PUBLIC1.pdf.

34 In Uzbekistan, district heating reaches approximately 80% of households; in Kyrgyzstan, four cities have district heating: Bishkek (85% of households), Osh (35-40%), Kyzyl-Kiya (60%) and Karakol (26%); in Tajikistan, only Dushanbe does, per IEA, op. cit. note 4; Russia from IEA, op. cit. note 26.

35 Marina Olshanskaya, "Overheated: Two Decades of Energy Transition in the Former Soviet Union", *UNDP/LSE Development and Transition Newsletter*, No. 14 (2009), p. 7, http://europeandcis.undp.org/uploads/public1/files/vulnerability/Senior%20Economist%20Web%20site/Readings/Olshanskaya.pdf; Barnsley, Blank and Brown, op. cit. note 1, p. 115.

36 Table 6 from Energy Community, *Energy Community 2012: Impact Assessment of the Energy Efficiency Directive (2012/27/EU) for the Energy Community* (Vienna: July 2014), p. 108, https://www.energy-community.org/portal/page/portal/0633975ADB617B9CE053C92FA8C06338.

37 Claire Chrétien and Jelena Djukic, *Financing Energy Efficiency Investments in the Western Balkans* (Brussels: Western Balkans Investment Framework, May 2013), p. 31, https://www.energy-community.org/pls/portal/docs/2144178.PDF.

38 Ibid., p. 31.

39 Bernd Kalkum, *Scaling Up Energy Efficiency in Buildings in the Western Balkans, Financing Energy Efficiency Measures for Residential Building Stock* (Washington, DC: World Bank, May 2014), p. 28, https://openknowledge.worldbank.org/bitstream/handle/10986/20044/ 893240WP0P133200000 2014006016018.42.pdf?sequence=1.

40 Ministry of Economy of Montenegro, Directorate for Energy Efficiency, "Project for Establishing the Framework for ESCO Concept Started", http://www.energetska-efikasnost.me/ee.php?v=187&l=en.

41 Regional Energy Efficiency Programme (REEP) for the Western Balkans website, http://www.wb-reep.org, viewed 14 July 2015.

42 Moldovan Residential Energy Efficiency Financing Facility (MOREEFF) website, http://moreeff.info/en/, viewed 23 June 2015.

43 Ahlemeyer, op. cit. note 31.

44 IEA, *Transition to Sustainable Buildings* (Paris: OECD/IEA, 2013), p. 284, https://www.iea.org/publications/freepublications/publication/Building2013_free.pdf.

45 Resolution of the Cabinet of Ministers of Ukraine of 08.04.2015 № 231, "On Amendments to the Decree of the Cabinet of Ministers of Ukraine from 01.03.2010 № 243 and from 17.10.2011 № 1056", http://zakon4.rada.gov.ua/laws/show/231-2015-%D0%BF/paran9#n9.

46 Barnsley, Blank and Brown, op. cit. note 1, p. 115.

47 IEA, *25 Energy Efficiency Policy Recommendations – 2011 Update* (Paris: OECD/IEA, 2011), p. 12, https://www.iea.org/publications/freepublications/publication/25recom_2011.pdf.

48 Energy Community, "Energy Efficiency Monitoring and Reporting Tool Developed for the Energy Community to Be Exported to the EU", 20 November 2014, https://www.energy-community.org/portal/page/portal/ENC_HOME/NEWS/News_Details?p_new_id=9981.

49 KfW, *Project Information: Social Infrastructure and Energy Efficiency – Moldova* (Frankfurt am Main and Chisinau: June 2015), https://www.kfw-entwicklungsbank.de/PDF/Entwicklungsfinanzierung/L%C3%A4nder-und-Programme/Europa/Projekt-Moldau-2014-MSIF-engl.pdf.

50 United Nations Environment Programme (UNEP), "Azerbaijan Installs LED Street Lights in Its Capital Historical District", 30 June 2015, http://www.unep.org/Documents.Multilingual/Default.asp?DocumentID=26827&ArticleID=35219&l=en.

51 UNDP Kazakhstan website, tenders section, www.kz.undp.org, viewed 5 September 2015.

52 ENPI Regional East Action Programme, op. cit. note 14, p. 13.

53 Barnsley, Blank and Brown, op. cit. note 1, p. 115; IEA, "Russian Federation: Balances for 2012", Energy Statistics, http://www.iea.org/statistics/statisticssearch/report/?country=RUSSIA&product=balances&year=2012, viewed 9 August 2015.

54 Industry share from Energy Community, *Annual Implementation Report 2013-14* (Vienna: 1 August 2014), p. 207, https://www.energy-community.org/pls/portal/docs/3356393.PDF; savings from World Bank, op. cit. note 33, p. 83.

55 Barnsley, Blank and Brown, op. cit. note 1, p. 115.

56 Copenhagen Centre on Energy Efficiency, op. cit. note 21, p. 227.

57 World Bank, "World Bank Continues Helping Industrial Enterprises in Uzbekistan Become More Energy Efficient", press release (Washington, DC: 26 April 2013), http://www.worldbank.org/en/news/press-release/2013/04/26/world-bank-continues-helping-industrial-enterprises-in-uzbekistan-become-more-energy-efficient.

58 Energy Charter, *In-Depth Review of the Energy Efficiency Policy of the Republic of Belarus* (Brussels: 2013), p. 139, http://belgium.mfa.gov.by/docs/belarus_ee_2013_eng.pdf.

59 Western Balkans Sustainable Energy Direct Financing Facility, "About WeBSEDFF", http://www.websedff.com/index.php?id=25&PHPSESSID=b76a2390a3b995beca361ec40320b7ba, viewed 2 October 2015.

60 Regional Environmental Center for Central Asia (CAREC), *Vehicle Emissions, Fuel Quality Standards and Fuel Economy Policies in Kazakhstan* (Almaty: 2013), p. 25, http://www.unep.org/Transport/new/PCFV/pdf/cleanfue_transport_UNEP-CARECreport.pdf.

61 Ibid.

62 Barnsley, Blank and Brown, op. cit. note 1, p. 115.

63 IEA, op. cit. note 4.

5 POLICY AND TARGET LANDSCAPE

1 Energy Community, "Bosnia and Herzegovina Renewable Energy", https://www.energy-community.org/portal/page/portal/ENC_HOME/AREAS_OF_WORK/Implementation/Bosnia_Herzegovina/Renewable_Energy, viewed 25 July 2015; Energy Community, "Annex 18: Decision on the Implementation of Directive 2009/28/EC and Amending Article 20 of the Energy Community Treaty", web presentation, Meetings of the 10th Ministerial Council, 9 July 2012, https://www.energy-community.org/portal/page/portal/ENC_HOME/DOCS/1766219/Decision_on_the_implementation_of_Directive_2009-28-EC__signed_18-10-2012.pdf.

2 International Energy Agency (IEA), *Eastern Europe, Caucasus and Central Asia: Energy Policies Beyond IEA Countries* (Paris: OECD/IEA, 2015), p. 27, http://www.iea.org/bookshop/705-Eastern_Europe,_Caucasus_and_Central_Asia; Energy Community, *Annual Implementation Report 2013-14* (Vienna: 1 August 2014), p. 207, https://www.energy-community.org/pls/portal/docs/3356393.PDF. Sidebar 7 from the following sources: Energy Community, op. cit. note 1, p. 207; MOREEF website, http://moreeff.info/en, viewed 23 June 2015; , "Renewables Alter Market Game: Interview with Janez Kopač, Director of Energy Community Secretariat",

Balkan Green Energy News, 1 April 2015, http://balkangreenenergynews.com/interview/; International Renewable Energy Agency (IRENA), *IRENA Executive Strategy Workshop on Renewable Energy in South East Europe Background Paper Topic A: Renewable Energy Action Plans and Regulations to Harmonise with EU Directives* (Abu Dhabi: 2013), http://www.irena.org/DocumentDownloads/events/2013/December/Background_Paper-A.pdf; Misha Savic, "Serbia Seeks to Boost Renewable Energy", *Bloomberg*, 29 December 2014, http://www.bloomberg.com/news/articles/2014-12-29/serbia-seeks-to-boost-renewable-energy-investment-with-new-law.

3 The following are the relevant by-laws: "Rulebook on types and classification of the power plants for electricity generation from renewable sources of energy and high efficiency cogeneration plants" (Official Gazette of Montenegro 28/11); "Decree on acquiring the status and accomplishing entitlements of the privileged producers of electricity" (Official Gazette of Montenegro 37/11, 28/14); "Decree on means of issuance, transfer and cancelation of guarantees of origin for energy generated from renewable energy sources and high efficient cogeneration" (Official Gazette of Montenegro 37/11); "Decree on the tariff system for determining the incentive prices for electricity produced from renewable energy sources and high efficiency cogeneration" (Official Gazette of Montenegro 52/11, 28/14); "Rulebook on criteria for issuance of energy licence, content of a request and registry of energy licences" (Official Gazette of Montenegro 49/10, 38/13); "Rulebook on detailed criteria legal entity should meet in order to perform measurement and survey potential of renewable energy sources" (Official Gazette of Montenegro 28/11); "Decree on incentive fees to encourage production of electricity from renewable energy sources and cogeneration" (Official Gazette of Montenegro 08/14); "Rulebook on the amount of incentive fees to encourage production of electricity from renewable energy sources and cogeneration in 2014" (Official Gazette of Montenegro 18/14); "Rulebook on the amount of incentive fees to encourage production of electricity from renewable energy sources and cogeneration in 2015" (Official Gazette of Montenegro 04/15). Based on Ministry of Economy of the Government of Montenegro, *National Renewable Energy Action Plan to 2020* (Podgorica: 11 December 2014), http://www.oie-res.me/uploads/Dokumenta%202015/EBRD_Montenegro%20Draft%20NREAP%2016%2012%202014.pdf.

4 Table 7 from the data gathering undertaken for this report by local co-ordinating contributors (see list in Acknowledgements). Uzbekistan from United Nations Development Programme (UNDP) Uzbekistan, "Targets To Reduce Energy Consumption and Greenhouse Gas Emissions in Key Sectors of the Economy of Uzbekistan", prepared under the UNDP project "The Ministry of Economy – The Republic of Uzbekistan: Supporting Uzbekistan's in transition to low-carbon path development of the national economy", http://www.uz.undp.org/content/uzbekistan/en/home/operations/projects/environment_and_energy/supporting-uzbekistan-in-transition-to-a-low-emission-development-path.html, viewed 26 October 2015.

5 Ministry of Economy of the Government of Montenegro, op. cit. note 3.

6 Table 9 from the data gathering undertaken for this report by local co-ordinating contributors (see list in Acknowledgements).

7 Table 8 from the following sources: Armenia from Armenia Renewable Resources and Energy Efficiency Fund, "Tariffs", http://r2e2.am/en/2011/06/tariffs/; Azerbaijan from Tariff (Price) Council of the Azerbaijan Republic, "About Regulation of the Electricity Tariffs Within the Republic" (Baku City: 6 January 2007), http://tariff.gov.az/?/en/resolution/view/5/; Belarus from Ministry of Energy of the Republic of Belarus, "Resolution of the Ministry of Economy on Tariffs for Electricity Produced from Renewable Energy Sources, and Repeal of Certain Decisions of the Ministry of Economy of the Republic of Belarus, http://minenergo.gov.by/dfiles/000441_995925_100.pdf, viewed 5 July 2015, from Ministry of Energy of the Republic of Belarus, "Current Tariffs for Electricity for Legal Entities and Individual Entrepreneurs in Belarus in Accordance", http://minenergo.gov.by/dfiles/000710_41120__jur_litsa_prajs.pdf, viewed 5 July 2015, and from Ministry of Economy of the Republic of Belarus, "Resolution of the Ministry of Economy dated April 8, 2014 No. 29 on Amendments to the Decree of the Ministry Economy of the Republic of Belarus of June 30, 2011 number 100", http://www.pravo.by/main.aspx?guid=3871&p0=W21428632&p1=1, viewed 5 July 2015; Bosnia and Herzegovina – Republika Srbska from Energy Regulatory Commission, Republika Srbska, http://www.reers.ba/sites/default/files/Odluka_visina_garantovanih_otkupnih_cijena_okt2014.pdf, viewed 26 October 2015; Ukraine from "Electricity Law, Document 575/97-VR, Current Version - Version of 07/16/2015", http://zakon4.rada.gov.ua/laws/show/575/97-%D0%B2%D1%80/paran447#n447, viewed 26 June 2015; remaining countries from Legal Sources on Renewable Energy, http://www.res-legal.eu/search-by-country/.

8 United Nations Industrial Development Organization and International Center on Small Hydro Power, *World Small Hydropower Development Report 2013: Georgia* (Vienna and Hangzhou: 2013), p. 7, http://www.smallhydroworld.org/fileadmin/user_upload/pdf/Asia_Western/WSHPDR_2013_Georgia.pdf.

9 Albania, "Law on Concessions", 18 December 2006, http://faolex.fao.org/docs/pdf/alb85809E.pdf.

10 Verhovna Rada, https://www.linkedin.com/grp/post/2304935-6002063922037866496, website of Verhovna Rada (Parliament), http://w1.c1.rada.gov.ua/pls/zweb2/webproc4_1?pf3511=55219, viewed 6 June 2015.

11 Sidebar 8 from International Finance Corporation (IFC), *Russia's New Capacity-based Renewable Energy Support Scheme* (Moscow: 2013), p. 20, http://www.ifc.org/wps/wcm/connect/f818b00042a762138b17af0dc33b630b/Energy-Suppor-Scheme-Eng.pdf?MOD=AJPERES, and from IEA, *Russia 2014: Energy Policies Beyond IEA Countries* (Paris: 2014), https://www.iea.org/bookshop/474-Russia_2014.

12 Ministry of Economy of the Government of Montenegro, op. cit. note 3.

13 Andrei Minenkov, Head of Division for Scientific-Technical Policy and Foreign Economic Relations, Energy Efficiency Department of the State Standardization Committee of the Republic of Belarus, "Policy and Legislation for Facilitation of Energy Efficiency Enhancement and Renewable Energy Resources Use in the Republic of Belarus", presentation at the Fourth International Forum: Energy for Sustainable Development, Tbilisi, Georgia, 17-19 September 2013, p. 14,

http://www.unece.org/fileadmin/DAM/energy/se/pp/eneff/IEEForum_Tbilisi_Sept13/Day_2/ws1/Minenkov_e.pdf.

14 Ukraine, "The Law on Alternative Energy Sources", http://zakon4.rada.gov.ua/laws/show/1391-14, viewed 26 June 2015.

15 Alma Zhukenova, Deputy Director, Renewable Energy Division, Ministry of Energy of the Republic of Kazakhstan, "System for Promoting RES in Kazakhstan", presentation at the First Session of the Group of Experts on Renewable Energy (GERE), UNECE Energy Week – Energy for Sustainable Development: Trends and Milestones, Palais des Nations, Geneva, 17-21 November 2014, p. 9, http://www.unece.org/fileadmin/DAM/energy/se/pp/gere/1st_session_GERE_November_14/6._Ms._Alma_Zhukenova.pdf.

16 UNDP Serbia, "Public Call for the Award of Grants for Construction of Biomass / Biogas Combined Heat and Power Generation Plants", 8 May 2015, http://www.rs.undp.org/content/serbia/en/home/presscenter/articles/2015/05/08/public-call-for-the-award-of-grants-for-construction-of-biomass-biogas-combined-combined-heat-and-power-generationa-plants.html.

17 Ministry of Economy of the Government of Montenegro, *Energy Efficiency Action Plan of Montenegro for 2013-2015* (Podgorica: November 2013), p. 86, http://energetska-efikasnost.me/uploads/file/Dokumenta/Energy%20Efficiency%20Action%20Plan%20for%20the%20period%202013-2015_final.pdf.

18 UNDP Moldova, "Green Energy Creates New Opportunities for Women", http://www.md.undp.org/content/moldova/en/home/ourwork/environmentandenergy/successstories/Sample_Success_Story_1.html, viewed 8 August 2015.

19 Sospanova, "System of RES Support in Kazakhstan", presentation, 2014, http://www.slideshare.net/Green_Academy/sospanova-assistemapodderzhkivie.

20 Ministry of Economy of the Government of Montenegro, "Law on Energy, the Parliament of Montenegro", April 2010, Official Gazette of Montenegro 28/10, 06/13, 10/15.

21 Ministry of Energy, Development and Environmental Protection of the Republic of Serbia, "Development and Environmental Protection, Instructions for preparation of local development plans in the energy field" (Belgrade: 2013), p. 83, http://www.mre.gov.rs/doc/efikasnost-izvori/05%20Uputstvo%20za%20izradu%20lokalnih%20planova%20razvoja%20u%20oblasti%20energetike.pdf.

22 EU Covenant of Mayors, "Signatories", http://www.covenantofmayors.eu/about/signatories_en.html, viewed 14 July 2015.

23 Sources for this section for each country are based on data gathering by local co-ordinating contributors (see separate annex).

24 Table 10 from Ibid.

25 Albania from Energy Community, op. cit. note 1, pp. 42-43; Georgia from idem, p. 101.

26 Department of Energy, Belarus, http://energoeffekt.gov.by/programs basicdocuments/191--20112015-24122010-1882.html, viewed 3 August 2015.

27 UNDP Turkmenistan, "Improving Energy Efficiency in the Residential Building Sector of Turkmenistan", http://www.tm.undp.org/content/turkmenistan/en/home/operations/projects/environment_and_energy/improving-energy-efficiency-in-the-residential-building-sector-o.html, viewed 12 September 2015.

28 State Committee of the Republic of Uzbekistan for Architecture and Construction, http://www.davarx.uz/uz/, viewed 6 October 2015.

29 UNDP Uzbekistan, Global Environment Facility (GEF), and State Committee of the Republic of Uzbekistan for Architecture and Construction, *Results, Lessons Learned and Strategy for Transition and Sustainability Upon Completion of the UNDP/GEF Full-Sized Project* (Tashkent: 2015), p. 32, http://uz.beeca.net/userfiles/files/Final%20report%20EEPB%20Uz%20Chao%20incl%20LL%20transition%20and%20sustainability_ENG.pdf. Table 11 from the data gathering undertaken for this report by local co-ordinating contributors (see list in Acknowledgements).

30 Kazakhstan from Government of the Kazakh Republic, 15.06.2015, Law of Kazakhstan of January 13, 2012 Ð 541-IV "On energy saving and energy efficiency", the official publication of Adilet, http://online.zakon.kz/Document/?doc_id=31112351, viewed 19 June 2015; Moldova from Copenhagen Centre on Energy Efficiency, *Energy Efficiency Orbits for Transition Economies: Final Report* (Copenhagen: 2015), p. 118, http://www.cenef.ru/file/Final%20Report_C2E2_CENEf_June2_2015.pdf; Ukraine from "Асоціація енергоаудиторів, "Підписано закони щодо діяльності енергосервісних компаній в Україні", http://aea.org.ua/2015/05/pidpisano-zakoni-shhodo-diyal-nosti-energoservisnih-kompanij-v-ukrayini/, viewed 26 June 2015.

31 Government of the Kazakh Republic, op. cit. note 30.

32 Copenhagen Centre on Energy Efficiency, op. cit. note 30, pp. 98 and 140.

33 "Держенергоефективності України", http://saee.gov.ua/uk/business/energetichny-audit-ta-manadzhment, viewed 14 June 2015.

34 Government of the Kazakh Republic, op. cit. note 30.

35 Ibid.

36 Decree of the Government of the Russian Federation as of 25.01.2011, No. 19 "On approval of Provision on requirements imposed to collection, processing, systematization, analysis and use of data of energy performance certificates issued based on the results of mandatory and voluntary energy inspections".

37 Copenhagen Centre on Energy Efficiency, op. cit. note 30, p. 118.

38 Armenia and Azerbaijan from Ingrid Barnsley, Amanda Blank and Adam Brown, *Enabling Renewable Energy and Energy Efficiency Technologies* (Paris: OECD /IEA, 2015), p. 115, https://www.iea.org/publications/insights/insightpublications/

EnablingRenewableEnergyandEnergyEfficiencyTechnologies.pdf; Ukraine from Auto Consulting, "Украинский авторынок перешел на Евро-4", http://www.autoconsulting.com.ua/article.php?sid=29462, viewed 13 June 2015.

39 Auto Consulting, op. cit. note 38.

40 Sidebar 9 from the following sources: Olga Rosca, "EBRD Expands Support for Energy Efficiency in Moldova", European Bank for Reconstruction and Development, 30 December 2013,http://www.ebrd.com/news/2013/ebrd-expands-support-for-energy-efficiency-in-moldova.html; Moldova, *National Energy Efficiency Action Plan for 2013-2015* (Chisinau: 7 February 2013), p. 67, https://www.energy-community.org/pls/portal/docs/1938189.PDF; Energy Charter, *In-Depth Review of the Energy Efficiency Policy of Moldova* (Brussels: 12 June 2015), p. 29, http://international.energycharter.org/fileadmin/DocumentsMedia/News/20150615-PEEREA-Moldova.pdf; Moldova Energy and Biomass Project, "Project Background", http://www.biomasa.aee.md/project-background-en, viewed 8 August 2015.

6 INVESTMENT FLOWS

1 This section is derived from Bloomberg New Energy Finance (BNEF) Clean Energy Investment Trends and Asset Finance Records. Figures are based on the output of the desktop databases of BNEF unless otherwise noted. Only renewable energy power generation projects greater than 1 MW are included. Programmes for grid access and/or residential PV schemes or solar water heating are not within the scope of the BNEF database and therefore are excluded here. Large hydropower projects with installed capacity above 50 MW also are excluded.

2 REN21, *Renewables 2015 Global Status Report* (Paris: 2015), p. 31, http://www.ren21.net/status-of-renewables/global-status-report/ and based on data from BNEF.

3 Figure 13 data from BNEF Clean Energy Investment Trends and Asset Finance Records. Large hydropower projects with installed capacity above 50 MW are excluded. See endnote 1 for this section.

4 Ibid.

5 Figure 14 data from BNEF Clean Energy Investment Trends and Asset Finance Records. Large hydropower projects with installed capacity above 50 MW are excluded. See endnote 1 for this section.

6 Figure 15 from World Bank, "Private Sector Investment in Renewable Energy Database", http://ppi-re.worldbank.org, viewed 8 August 2015.

7 Ibid.

8 European Bank for Reconstruction and Development (EBRD), *Sustainable Energy: Coming of Age* (London: 2014), p. 9, http://www.ebrd.com/downloads/sector/eecc/sei-renew.pdf.

9 Ibid.

10 Global Environment Facility (GEF), "GEF Projects", https://www.thegef.org/gef/gef_projects_funding, viewed 6 August 2015.

11 European Commission, "Sustainable Energy in Central Asia: Business Opportunities and Technology Transfer", 6 November 2014, https://ec.europa.eu/energy/en/events/sustainable-energy-central-asia-business-opportunities-and-technology-transfer.

12 Marina Olshanskaya, Regional Technical Advisor, Energy, Infrastructure, Technology and Transport, United Nations Development Programme (UNDP), personal communication with REN21, 3 September 2015.

13 Western Balkans Investment Framework, *Annual Report 2014* (Brussels: 2015), https://www.wbif.eu:9443/alfresco/service/api/node/workspace/SpacesStore/01c29c64-9c8c-45ac-b4e9-be97d6eaf259/content?alfticket=TICKET_5476d3092d8724b19b791c809eb2f850657842fb.

14 Western Balkans Sustainable Energy Direct Financing Facility website, http://www.websedff.com, viewed 8 August 2015.

15 REN21, op. cit. note 2, p. 31.

16 Climate Investment Funds, "Countries Map View", https://www-cif.climateinvestmentfunds.org/countries-map, viewed 7 August 2015.

17 Ibid.

18 Ibid. Sidebar 10 from the following sources: Svitlana Pyrkalo, "First Large-scale Solar Plant in Kazakhstan Receives EBRD Backing", EBRD, 3 June 2015, http://www.ebrd.com/news/2015/first-largescale-solar-plant-in-kazakhstan-receives-ebrd-backing.html; EBRD, Environmental Impact Assessment, "Burnoye Photovoltaic Solar Power Plant: Phase 1 Non-technical Summary" (London: undated), p. 5, http://www.ebrd.com/cs/Satellite?c=Content&cid=1395244431290&d=&pagename=EBRD%2FContent%2FDownloadDocument; International Finance Corporation Georgia, "IFC, ADB, EBRD, Tata Power, and Clean Energy Help Georgia Achieve Energy Self-sufficiency", press release (Tbilisi: 19 March 2015), http://ifcext.ifc.org/IFCExt/pressroom/IFCPressRoom.nsf/0/D95421C2DF3F67D285257E0D004D3466?OpenDocument; EBRD, *Case Study: USELF – Ukraine Sustainable Energy Lending Facility* (London: undated), p. 11, www.ebrd.com/downloads/sector/sei/uself.pdf; Qendresa Rugova, "Challenges to Financing Renewable Energy Projects in the Balkans", Balkan Green Energy News, 29 April 2015, http://balkangreenenergynews.com/challenges-to-financing-renewables-projects-in-the-balkans. Figure 16 from Climate Investment Funds, *Delivering at Scale, Empowering Transformation. Annual Report 2014* (Washington, DC: World Bank, 31 December 2014), p. 63, https://www.climateinvestmentfunds.org/cif/content/delivering-scale-empowering-transformation.

19 Climate Investment Funds, op. cit. note 18, p. 63.

20 Craig Davies and Sandy Ferguson, "Climate Resilience and Hydropower in Tajikistan", EBRD, 26 September 2014, http://www.ebrd.com/news/2014/climate-resilience-and-hydropower-in-tajikistan.html.

21 Figure 17 based on GEF, "GEF Projects", https://www.thegef.org/gef/gef_projects_funding, viewed August 2015.

ANNEX

SOURCES FOR ENERGY EFFICIENCY POLICIES

ALBANIA

Law No. 8937, "On Conservation of Thermal Heat in Buildings", dated 12 September 2002.

Law No. 9290, "On Construction Products", dated 7 October 2004.

Law No. 9482, "On the Legalization, Urbanization and Integration of Illegal Buildings", dated 3 April 2006.

ARMENIA

Law "On energy saving and renewable energy" of the Republic of Armenia.

AST ISO 13789-2014 "Тепловые характеристики зданий. Коэффициенты теплопроводности и теплопередачи вентиляции. Метод расчета".

AST ISO 14683-2014 "Тепловые мосты строительных конструкций. Линейная теплопроходность. Упрощенные методы и стандартные значения".

AST ISO 9251-2014 "Теплоизоляция, условия теплопередачи и свойства материалов. Словарь".

AST ISO 10211-2014 "Тепловые мосты в строительных конструкциях. Тепловые потоки и температура поверхности. Подробные расчетыvv".

AST ISO 13790-2014 "Энергетические характеристики зданий. Расчет расхода энергии на отопление и охлаждение".

AZERBAIJAN

Decision #73 of Cabinet of Ministers of Azerbaijan Republic.

Decision #71 of Cabinet of Ministers of Azerbaijan Republic.

Construction rules of Azerbajan Republic, AzDTN 2.6 – 1, State Urban Planning Rules and Regulations.

BELARUS

Законодательство в Республике Беларусь, „Правовые основы", http://ee.energybel.by/industry/legislation/.

Energy Charter, *In-Depth Review of Energy Efficiency Policy of Belarus* (Brussels: 2013), http://www.energycharter.org/what-we-do/energy-efficiency/energy-efficiency-country-reviews/in-depth-review-of-energy-efficiency-policies-and-programmes/in-depth-energy-efficiency-review-of-belarus-2013/.

BOSNIA AND HERZEGOVINA

Ministry of Industry, Energy and Mining, "The Energy Efficiency Action Plan", Government of Republika Srpska, December 2013, http://ekofondrs.org/sadrzaj/dokumenti/ee/ap_ee_rs_do_2018.pdf

Ministry of Industry, Energy and Mining, "The Law on Energy Efficiency", Government of Republika Srpska, May 2013, http://www.vladars.net/eng/vlada/ministriesMIEM/Documents/RS%20Law%20on%20Energy%20Efficiency_410834436_389051602.pdf

Ministry of Industry, Energy and Mining, "The Rulebook on Energy Class of Products", Government of Republika Srpska, August 2014, http://www.vladars.net/eng/vlada/ministries/MIEM/eef/Pages/default.aspx.
Ministry of Industry, Energy and Mining, "The Rulebook on Methodology of Costs Estimate for Energy Service Supply", Government of Republika Srpska, http://www.vladars.net/eng/vlada/ministries/MIEM/eef/Pages/default.aspx.

Ministry of Spatial Planning, Civil Engineering and Ecology, Government of Republika Srpska, May 2013, http://ekofondrs.org/sadrzaj/dokumenti/ee/zakon_o_uredjenju_prostora_i_gradjenju.pdf.

Federal Ministry of Physical Planning, "The Law on Physical Planning and Land Utilization", Government of Federation of Bosnia and Herzegovina, 2010, http://www.fbihvlada.gov.ba/bosanski/zakoni/2006/zakoni/5bos.htm.

Pravilnici, http://www.fmpu.gov.ba/content/view/53/45/lang,hr/.

Pravilnik, "O Uslovima za lica koja vrše energetsko certificiranje objekata", http://www.ee-infos.ba/Content/docs/Pravilnik.pdf.

Pravilnik, "O tehničkim svojstvima sistema ventilacije, djelimične klimatizacije I klimatizacije u gradevinama", http://www.ee-infos.ba/Content/docs/pravilnik_sistemi_ventilacije.pdf.

"Regulation on the technical requirements for heating and cooling of buildings", http://www.ee-infos.ba/dokumenti.

"Fond za zaštitu okoliša", Federation of Bosnia and Herzegovina, http://www.fzofbih.org.ba/v2/index.php.

Environmental Protection and Energy Efficiency Fund, Republika Srpska, http://ekofondrs.org.

GEORGIA

Tamara Rukhadze, Ministry of Economy and Sustainable Development of Georgia Head of Department of Spatial Planning and Construction Policy, "Energy Efficiency in Buildings: Policy and Practice in Georgia", presentation at the Third International Forum: Energy for Sustainable Development – Capacity building for energy efficiency and access to cleaner energy in Central Asia and neighboring regions, Bishkek, September 2012, http://www.unece.org/fileadmin/DAM/energy/se/pp/eneff/IEEForum_Issyk_Kul_Lake_Sept.2012/day_2/workshop_4/3_Tamar_Rukhadze_Georgia__discussions.pdf.

U.S. Agency for International Development, *Energy Efficient Potential in Georgia and Policy Options for Its Utilization* (Tbilisi: 2008), http://weg.ge/wp-content/uploads/2012/12/energy_efficiency1.pdf.

Energy Efficiency Centre Georgia, "Useful Links", http://www.eecgeo.org/en/links.htm, viewed 6 October 2015.

KAZAKHSTAN

Vladimir Shkolnik, "Energy-saving technologies will receive in Kazakh Republic a broad application with the support from the state", 24 April 2015, http://www.primeminister.kz/news/show/24/energosberegajuschie-tehnologii-poluchat-v-rk-shirokoe-primenenie-pri-podderzhke-gosudarstva-vshkolnik-/24-04-2015.

EBRD in Kazakhstan website, http://www.ebrd.com/kazakhstan.html, viewed 19 June 2015.

Kamila Mazgieva, "Twenty years of Kazakhstan's participation in the framework programs of the European Union in the field of Science, Technology and Innovation: Lessons from the Past and Future Perspectives", Delegation of the European Union in the Republic of Kazakhstan Operations Division, 2013.astanaforum.org, http://www.kazee.kz/wp-content/uploads/2012/05/%D0%9F%D1%80%D0%BE%D0%B3%D1%80%D0%B0%D0%BC%D0%BC%D1%8B-%D0%95%D0%A1-%D0%BF%D0%BE-%D0%BF%D0%BE%D0%B4%D0%B4%D0%B5%D1%80%D0%B6%D0%BA%D0%B5-%D1%8D%D0%BD%D0%B5%D1%80%D0%B3%D0%BE%D1%81%D0%B1%D0%B5%D1%80%D0%B5%D0%B6%D0%B5%D0%BD%D0%B8%D1%8F.pdf, viewed 19 June 2015.

UNDP, GEF projects in the period 2012 and beyond, www.undp.kz/, viewed 19 June 2015.

Changes to the Law of Kazakhstan of April 16, 1997, "On Housing Relations", Bulletin of the Parliament of Kazakhstan, of 1997 in connection with the amendments and additions to some legislative acts of Kazakhstan on the issues of energy conservation and energy efficiency (the Law).

Vladimir Shkolnik, Minister of Energy of the Kazakh Republic, "By the 'green' way to the growth of production", *Kazpravda*, 20 May 2015, http://www.kazpravda.kz/interviews/view/zelenim-kursom-k-rostu-proizvodstva/.

Закон Республики Казахстан, "Об энергосбережении и повышении энергоэффективности" (с изменениями и дополнениями по состоянию на 15.06.2015 г.), http://online.zakon.kz/Document/?doc_id=31112351.

Government of the Kazakh Republic, 15.06.2015, Law of Kazakhstan of January 13, 2012 № 541-IV "On energy saving and energy efficiency", with amendments and additions as of 15.06.2015, the official publication of Adilet, http://online.zakon.kz/Document/?doc_id=31112351.

UNDP, GEF, preliminary programme of the International Conference, "Improving energy efficiency in municipal heat supply as a contribution to 'green' the economy", 19 April 2013, www.eep.kz/upload/files/agenda_rus.doc.

Carec, 23 ноября 2012 года, Первая национальная встреча по проекту «Соглашение Мэров – Восток» в Республике Казахстан, г. Астана, Казахстан, Астана, http://www.carecnet.org/programs_and_projects/mezhprogrammnaya-deyatelnost/soglashenie-merov-vostok/pervaya-nacionalnaya-vstrecha-po-proektu-soglashenie-merov-vostok/.

Gennady Doroshin, "Green Bridge – 2013", presentation at the International Conference, Astana, 30 September 2013, http://gbpp.org/wp-content/uploads/2013/10/%D0%AD%D0%BD%D0%B5%D1%80%D0%B3%D0%BE%D1%8D%D1%84%D0%B5%D0%BA%D1%82%D0%B8%D0%B2%D0%BD%D1%81%D1%82%D1%8C-%D0%B8-%D0%92%D0%98%D0%AD-%D0%B2-%D0%9A%D0%B0%D0%B7%D0%B0%D1%85%D1%81%D1%82%D0%B0%D0%BD%D0%B5-%D1%84%D0%B8%D0%BD%D0%B0%D0%BB%D1%8C%D0%BD%D1%8B%D0%B9-%D0%B2%D0%B0%D1%80%D0%B8%D0-%B0%D0%BD%D1%82-.pdf.

Copenhagen Centre on Energy Efficiency, *Energy Efficiency Orbits for Transition Economies: Final Report* (Copenhagen: 2015), http://www.cenef.ru/file/Final%20Report_C2E2_CENEfJune2_2015.pdf.

"Правительство РК, 15.06.2015, Закон Республики Казахстан от 13 января 2012 года № 541-IV «Об энергосбережении и повышении энергоэффективности" (с изменениями и дополнениями по состоянию на 15.06.2015, официальная публикация Адилет, http://online.zakon.kz/Document/?doc_id=31112351.

Правительство РК, 31 августа 2012, Постановление, официальная публикация Adilet, http://adilet.zan.kz/rus/docs/P1200001117.

Правительство РК, 11 сентября 2012, Постановление, официальная публикация Adilet, http://adilet.zan.kz/rus/docs/P1200001181.

Министр ИР РК, 31.03.2015, Приказ "Об установлении требований по энергоэффективности транспорта", МИР РК, http://online.zakon.kz/Document/?doc_id=39393353#sub_id=100.

"Внесены изменения и дополнения в некоторые законодательные акты РК по вопросам энергосбережения и повышения энергоэффективности", http://pravo.zakon.kz/4469885-vneseny-izmenenija-i-dopolnenija-v.html, viewed 19 June 2015.

KYRGYZTAN

Law of Kyrgyz Republic "On the energy efficiency of buildings", 26 July 2011, http://cis-legislation.com/document.fwx?rgn=46118.

Azamat Omorov, Chief Specialist, Renewable Energy Sources and Energy Efficiency Department, "The main prospects for the development of energy saving and energy efficiency in the Kyrgyz Republic", presentation, Geneva, April 2012, http://www.unece.org/fileadmin/DAM/energy/se/pp/gee21/3_ge_April12/13_Omorov_e.pdf.

THE FORMER YUGOSLAV REPUBLIC OF MACEDONIA

Ministry of Economy, "The First Energy Efficiency Action Plan", 2011, http://www.ea.gov.mk/projects/unece/docs/legislation/First_EEAP_Macedonia_EN.pdf.

Ministry of Economy, "The Strategy for Increasing Energy Efficiency in the Republic of Macedonia Until 2020", Government of the FYR Macedonia, October 2010, http://www.slvesnik.com.mk/Issues/561BC1D7F500534F92277E9AD55DA794.pdf.

Ministry of Economy, "Draft Second Energy Efficiency Action Plan" April 2014, https://www.energy-community.org/portal/page/

portal/ENC_HOME/DOCS/3354154/Draft_second_EEAP.pdf.

Ministry of Economy, "The Rulebook on Energy Performances of Buildings", July 2013, http://www.slvesnik.com.mk/Issues/13f04c29ba10487fba87b473c0d7626e.pdf.

Ministry of Economy, "The Rulebook on Energy Audit", July 2013, http://www.slvesnik.com.mk/Issues/13f04c29ba10487fba87b473c0d7626e.pdf.

Ministry of Economy, "The Rulebook on eco labelling of energy related products", November 2013, http://www.slvesnik.com.mk/Issues/134C9AD59F06D944BA92C4468F0097FC.pdf.

Ministry of Economy, "The Decree on eco-design of energy related products", Government of the FYR Macedonia, July 2011, http://www.slvesnik.com.mk/Issues/47D56301AAB3324281A085DAAC0AEF98.pdf.

Energy Community, web presentation, https://www.energy-community.org/portal/page/portal/ENC_HOME/AREAS_OF_WORK/Implementation/FYR_Macedonia/Renewable_Energy, viewed 14 July 2015.

U.S. Agency for International Development, "Industrial management project", https://www.usaid.gov/news-information/fact-sheets/industrial-management-project, viewed 14 July 2015.

Habitat for Humanity, "Residential Energy Efficiency Investor Forum held in Skopje", http://www.habitat.org.mk/eng/n_investorforum.html, viewed 14 July 2015.

World Bank, Sustainable Energy GEF Project, http://www.worldbank.org/projects/P089656/sustainable-energy-gef-project?lang=en, viewed 14 July 2015.

Energy efficiency promotional campaign, http://energetskaazbuka.mk/, viewed 14 July 2015.

MOLDOVA

ПОстановление Nr. 102 , от 05.02.2013, „об Энергетической стратегии Республики Молдова до 2030 года", Республика Молдова, http://lex.justice.md/viewdoc.php?action=view&view=doc&id=346670&lang=2.

Парламент, Закон Nr. 142 от 02.07.2010, „об энергоэффективности", Республика Молдова, http://lex.justice.md/viewdoc.php?action=view&view=doc&id=335818&lang=2.

Парламент, Закон Nr. 128 от 11.07.2014, "об энергетической эффективности зданий", Республика Молдова, http://lex.justice.md/viewdoc.php?action=view&view=doc&id=354929&lang=2.

Правительство, Постановление Nr. 833 от 10.11.2011, "о Национальной программе энергоэффективности на 2011-2020 годы", Республика Молдова, http://lex.justice.md/viewdoc.php?action=view&view=doc&id=340940&lang=2.

Правительство, Постановление Nr. 113 от 07.02.2013, "об утверждении Национального плана действий в области энергоэффективности на 2013-2015 годы", Республика Молдова, http://lex.justice.md/viewdoc.php?action=view&view=doc&id=346722&lang=2.

Парламент, Закон Nr. 44 от 27.03.2014, "о маркировке энергопотребляющих изделий", Республика Молдова, http://lex.justice.md/viewdoc.php?action=view&view=doc&id=352631&lang=2.

Moldovan Residential Energy Efficiency Financing Facility (MoREEFF), http://moreeff.info.

Moldovan Sustainable Energy Financing Facility (MoSEFF), http://www.moseff.org.

BERD (European Bank for Reconstruction and Development), http://www.infoeuropa.md/berd.

MONTENEGRO

Ministry of Economy, "Energy Policy of Montenegro Until 2030", Government of Montenegro, February 2011, http://www.energetska-efikasnost.me/uploads/file/Dokumenta/Energy%20Policy%20of%20Montenegro%20until%202030.pdf.
Ministry of Economy, "Energy Development Strategy of Montenegro by 2030", Government of Montenegro, May 2014, http://www.oie-res.me/uploads/Dokumenta%202015/4%20Bijela_Knjiga_konacna_13_06_2014%20%282%29.pdf.

Ministry of Economy, "Energy Efficiency Action Plan of Montenegro for 2013-2015" (the Second NEEAP), Government of Montenegro, November 2013, http://energetska-efikasnost.me/uploads/file/Dokumenta/Energy%20Efficiency%20Action%20Plan%20for%20the%20period%202013-2015_final.pdf.

Ministry of Economy, "Law on Efficient Use of Energy", Parliament of Montenegro, December 2014, http://www.energetska-efikasnost.me/uploads/file/Dokumenta/Zakon%20o%20efikasnom%20koriscenju%20energije.pdf.

Ministry of Economy, "Decision on determining indicative energy saving target", April 2011, http://energetska-efikasnost.me/uploads/file/Dokumenta/Regulativa/Decision%20on%20determining%20indicative%20energy%20savings%20target.pdf.

Ministry of Economy, "Rulebooks on Energy Efficiency in Buildings", April/May 2013, http://energetska-efikasnost.me/index.php?l=en.

Ministry of Economy, "Regulation on determining limit for energy consumption to define big consumer", February 2012, http://energetska-efikasnost.me/uploads/file/Dokumenta/Regulativa/PRAVILNIK_VELIKI%20POTROSAC.pdf.

Ministry of Economy, Energy Efficiency website, 2014, http://www.energetska-efikasnost.me/index.php?l=en.

Ministry of Economy, Energy Efficiency website, 2014, http://www.energetska-efikasnost.me/ee.php?id=24&l=en.

Ministry of Economy, Energy Efficiency website, 2014, http://www.energetska-efikasnost.me/ee.php?id=2&l=en.

Ministry of Economy, Energy Efficiency website, 2014, http://www.energetska-efikasnost.me/ee.php?v=226&l=en.

RUSSIAN FEDERATION

Federal law as of 23.11.2009, No.261-ФЗ (rev. 29.12.2014), "On energy saving and energy efficiency increase and on introduction

of changes to some legislative acts of the Russian Federation". Government programme "Energy efficiency and development of energetics" as of 15 April 2014, No. 321.

Federal law, No. 261-ФЗ "On energy saving and increase energy efficiency and On introduction of changes to some legislative acts of the Russian Federation", 23 November 2009.

Order of the Government of the Russian Federation, No. 1715-p "On energy strategy of Russia for the period of up to 2030", 13 November 2009.

Decree of Gosstroy of the Russian Federation, No. 113, 26 June 2003.

Decree of Gosstroy of the Russian Federation, No. 109 "On approval and enactment of Construction Norms & Regulations, Residential multiple-dwelling buildings", 23 June 2003.

Decree of Gosstroy of the Russian Federation, No. 115, 26 June 2003.

Order of the Government of the Russian Federation, No. 1973-Ð "On approval of action plan ensuring the limitation of circulation of filament lamps in the Russian Federation and providing the system of actions aimed at stimulating the demand on energy-efficient sources of light", 28 October 2013.

Order of Rosstandart, No. 208-ст "On enactment of Interstate standard", 20 March 2014.

Order of the Government of the Russian Federation, No. 391 "On the procedure of creation of the state informational system in the area of energy saving and energy efficiency increase and conditions for its operation", 1 June 2010.

Decree of the Government of the Russian Federation, No. 19 "On approval of Provision on requirements imposed to collection, processing, systematization, analysis and use of data of energy performance certificates issued based on the results of mandatory and voluntary energy inspections", 25 January 2011.

Order of the Ministry of Energy of Russia, No. 400 "On approval of requirements to carry on energy inspection and its results and regulations on sending of copies of energy performance certificate issued based on the results of mandatory energy inspection", 30 June 2014.

Decree of the Government of the Russian Federation, No. 18 "On approval of the Regulations to fix requirements of energy efficiency for buildings, structures, facilities and requirements to the rules on determination of energy efficiency class of apartment blocks", 25 January 2011.

Decree of the Government of the Russian Federation, No. 1222 "On types and characteristics of goods, information about the class of energy efficiency of which shall be specified in technical documents attached to these goods, in their marking and labels and principles of regulations on determination of class of energy efficiency of goods by manufacturers, importers", 31 December 2009.

Order of Ministry of Industry and Trade of the Russian Federation, No. 768 "On approval of the Rules of inclusion of information about the class of energy efficiency of goods to technical documents attached to the goods, to their marking and indication of such information on their labels", 7 September 2010.

Order of Ministry of Industry and Trade of the Russian Federation, No. 357 "On approval of Rules of determination of the class of energy efficiency of goods by manufacturers and importers and other information about their energy efficiency", 29 April 2010.

Order of Ministry of Regional Development of the Russian Federation, No.161 "On approval of the Rules of determination of energy efficiency classes of apartment blocks and requirements to the indicator of energy efficiency class of apartment block fixed on front of such building", 8 April 2011.
Order of the Ministry of Economics of the Russian Federation, No. 229 "On requirements of energy efficiency of goods used for creation of structural parts of buildings, structures, facilities including engineering systems of resources supply having impact on energy efficiency of buildings, structures and facilities", 4 June 2010.

Decree of the Government of the Russian Federation, No. 1221 "On approval of the Rules of determination of requirements of energy efficiency of goods, works, services when making purchases to provide governmental and municipal needs", 31 December 2009.

Order of Rosstandard, No. 568-ст "On approval of National standard GOST R ISO 50001-2012", 26 October 2012.

SERBIA

Ministry of Mining and Energy, "The Law on Efficient Use of Energy, the Serbian Parliament", March 2013, http://www.mre.gov.rs/doc/efikasnost-izvori/efikasnost/A_01_Zakon_o_efikasnom_koriscenju_energije.pdf.

Ministry of Energy, Development and Environmental Protection, the First NEEAP, Government of the Republic of Serbia, June 2010, http://www.mre.gov.rs/doc/efikasnost-izvori/Prvi_akcioni_plan_za_energetsku_efikasnost.pdf?uri=CELEX:32009L0028.

Ministry of Energy, Development and Environmental Protection, the Second NEEAP, "Службени гласник РС", бр. 98/2013, Government of the Republic of Serbia, October 2013, http://www.mre.gov.rs/doc/efikasnost-izvori/efikasnost/B_01_Drugi_akcioni_plan_za_energetsku_efikasnost_za_Republiku_Srbiju_za_period_od_2013_do_2015_godine.pdf?uri=CELEX:32009L0028.

Ministry of Mining and Energy, "The Rulebook on manner and the deadlines for submission of data necessary for monitoring of the implementation of the NEEAP", Government of the Republic of Serbia, May 2015, http://www.mre.gov.rs/doc/efikasnost-izvori/Prav%20o%20nacinu%20i%20rokovima%20dost%20pod%20neop%20za%20prac%20sprov%20APEE%20-%20SlglRS%2037-15.pdf?uri=CELEX:32009L0028.

Ministry of Mining and Energy, "The Rulebook on implementation and content of training program for energy managers, amount and payment of training fees and procedure of taking exams for energy managers", February 2015, http://www.mre.gov.rs/doc/efikasnost-izvori/Pravilnik%20o%20nacinu%20sprovodjenja%20obuke.pdf?uri=CELEX:32009L0028.

Ministry of Mining and Energy, "The Rulebook on the authorization of organization for performing of training for examination for energy manager or energy advisors",

February 2015, http://www.mre.gov.rs/doc/efikasnost-izvori/Pravilnik%20o%20uslovima%20u%20pogledu%20kadrova.pdf?uri=CELEX:32009L0028.

Ministry of Mining and Energy, "The Rulebook on conditions for the distribution and use of the Budgetary Fund", January 2014, http://www.mre.gov.rs/doc/efikasnost-izvori/efikasnost/C_02_Pravilnik_o_uslovima_za_raspodelu_i_koriscenje_sredstava_Budzetskog_fonda_za_unapredenje_energetske_efikasnosti.pdf.

Ministry of Mining and Energy, "The Decree on Labelling of Energy-Related Products", Government of the Republic of Serbia, October 2013, http://www.mre.gov.rs/doc/efikasnost-izvori/efikasnost/D_01_Uredba_o_vrstama_proizvoda_koji_uticu_na_potrosnju_energije_za_koje_je_neophodno_oznacavanje_potrosnje_energije_i_drugih_resursa.pdf.

Ministry of Mining and Energy, "The Rulebook on Labelling of household refrigerating appliances", February 2014, http://www.mre.gov.rs/doc/efikasnost-izvori/efikasnost/D_06_Pravilnik_o_ozacavanju_energetske_efikasnosti_rashladnih_uredjaja_za_domacinstvo.pdf.

Ministry of Mining and Energy, "The Rulebook on Labelling of household Washing Machines", March 2014, http://www.mre.gov.rs/doc/efikasnost-izvori/efikasnost/D_02_Pravilnik_o_ozacavanju_energetske_efikasnosti_masina_za_pranje_vesa_u_domacinstvu.pdf.

Ministry of Mining and Energy, "The Rulebook on Labelling of Household Dishwashers", March 2014, http://www.mre.gov.rs/doc/efikasnost-izvori/efikasnost/D_03_Pravilnik_o_ozacavanju_energetske_efikasnosti_masina_za_pranje_sudova_u_domacinstvu.pdf.

Ministry of Mining and Energy, "The Rulebook on Labelling of Electrical Ovens", March 2014, http://www.mre.gov.rs/doc/efikasnost-izvori/efikasnost/D_04_Pravilnik_o_ozacavanju_energetske_efikasnosti_elektricnih_pecnica.pdf.

Ministry of Mining and Energy, "The Rulebook on Labelling of Luminaries", March 2014, http://www.mre.gov.rs/doc/efikasnost-izvori/efikasnost/D_05_Pravilnik_o_ozacavanju_energetske_efikasnosti_elektricnih%20sijalica_i_svetiljki.pdf

Ministry of Mining and Energy, "The Rulebook on Labelling of Televisions", March 2014, http://www.mre.gov.rs/doc/efikasnost-izvori/efikasnost/D_07_Pravilnik_o_ozacavanju_energetske_efikasnosti_televizora.pdf.

Ministry of Mining and Energy, "The Rulebook on Labelling of Air-conditioning systems", March 2014, http://www.mre.gov.rs/doc/efikasnost-izvori/efikasnost/D_08_Pravilnik_o_ozacavanju_energetske_efikasnosti_uredjaja_za_klimatizaciju.pdf.

Ministry of Construction, Transport and Infrastructure, "The Law on Construction and Planning", Serbian Parliament, September 2009, http://www.mgsi.gov.rs/sites/default/files/ZAKON%20O%20PLANIRANJU%20I%20IZGRADNJI%20PRECTEKST%202015.pdf

Ministry of Construction, Transport and Infrastructure, "The Rulebook on Energy Efficiency in Buildings", August 2009, http://www.mgsi.gov.rs/sites/default/files/PRAVILNIK%2O%20ENERGETSKOJ%20EFIKASNOSTI%20ZGRADA.pdf.

Ministry of Construction, Transport and Infrastructure, "The Rulebook on criteria, content and issuance of the Energy Performance certificate for buildings", September 2009, http://www.mgsi.gov.rs/sites/default/files/PRAVILNIK%20O%20USLOVIMA%20SADR%C5%BDINI%20I%20NA%C4%8CINU%20IZDAVANJA%20SERTIFIKATA%20O%20ENERGETSKIM%20SVOJSTVIMA%20ZGRADA.pdf.

Ministry of Mining and Energy, "The Decree on the Programme of financing of activities and measures for improvement of efficient use of energy in 2014", Serbian Government, January 2014, http://www.mre.gov.rs/doc/efikasnost-izvori/efikasnost/C_01_Uredba_o_utvrdjivanju_programa_finansiranja_aktivnosti_i_mera_unapredjenja_efikasnog_koriscenja_energije_u_2014_godini.pdf.

TAJIKISTAN

Committee for Construction and Architecture under the Government of Tajikistan.

UNDP Tajikistan, "Normative and legal acts and national standards for renewable energy, operating in the Republic of Tatarstan", Government of Tajikistan (Dushanbe, 2011), pp. 108-122.

UNDP Tajikistan, "Normative and legal acts and national standards for renewable energy, operating in the Republic of Tatarstan", Government of Tajikistan (Dushanbe, 2011), pp. 129-135.

Правительство РТ. Стр. 123 – 124, Душанбе 2011, "Нормативные и правовые акты и национальные стандарты по ВИЭ,действующие в РТ. ПРООН в Таджикистане".

UNDP Tajikistan, "Normative and legal acts and national standards for renewable energy, operating in the Republic of Tatarstan", Government of Tajikistan (Dushanbe, 2011), pp. 125-128.

UNDP Tajikistan, "Normative and legal acts and national standards for renewable energy, operating in the Republic of Tatarstan", Government of Tajikistan (Dushanbe, 2011), pp. 210-212.

UNDP Tajikistan, "Normative and legal acts and national standards for renewable energy, operating in the Republic of Tatarstan", Government of Tajikistan (Dushanbe, 2011), pp. 230-276.

UNDP Tajikistan, "Normative and legal acts and national standards for renewable energy, operating in the Republic of Tatarstan" Government of Tajikistan (Dushanbe, 2011), p. 42.

UNDP Tajikistan, "Normative and legal acts and national standards for renewable energy, operating in the Republic of Tatarstan", Government of Tajikistan (Dushanbe, 2011), p. 43.

TURKMENISTAN

International Energy Agency, *Eastern Europe, Caucasus and Central Asia: Energy Policies Beyond IEA Countries* (Paris: OECD/IEA, 2015), http://www.iea.org/bookshop/705-Eastern_Europe,_Caucasus_and_Central_Asia.

UKRAINE

Sustainable Development Strategy "Ukraine-2020", Presidential Decree of 12.01.2015 № 5/2015, http://energefficiency.in.ua/page-404.html.

„Як оцінити енергетичну ефективність будинку". http://energefficiency.in.ua/stati/energoeffektivnost-i-energosberezhenie/12-yak-otsiniti-energetichnu-efektivnist-budinku.html, viewed 8 July 2015.

„Украинский авторынок перешел на Евро-4" http://www.autoconsulting.com.ua/article.php?sid=29462,%20viewed%20on%2013/06/2015, viewed 8 July 2015.

„Уряд схвалив плани імплементації актів законодавства ЄС у сфері енергетичного маркування" http://www.kmu.gov.ua/control/uk/publish/article?art_id=248172964&cat_id=244274160, viewed 8 July 2015.

Resolution of the Cabinet of Ministers "On the approval of technical requirement of energy labelling", No. 702, 7 August 2013.

Resolution of the Cabinet of Ministers "On the approval of technical requirement of light bulbs and electrical lamps", No. 340, 25 May 2015, http://zakon4.rada.gov.ua/laws/show/702-2013-%D0%BF.

Order of the Ministry of Economic Development, No. 1111, 16 September 2014, http://www.csm.kiev.ua/index.php?option=com_content&view=article&id=2817:----16092014--1111---&catid=105:2013-02-08-07-48-.

Resolution of the Cabinet of Ministers of Ukraine of 08.04.2015 № 231 "On Amendments to the Decree of the Cabinet of Ministers of Ukraine from 01.03.2010 Ð 243 and from 17.10.2011 № 1056", http://zakon4.rada.gov.ua/laws/show/231-2015-%D0%BF/paran9#n9.

„Підписано закони щодо діяльності енергосервісних компаній в Україні", http://aea.org.ua/2015/05/pidpisano-zakoni-shhodo-diyal-nosti-energoservisnih-kompanij-v-ukrayini/, viewed 8 July 2015.

Alexander Antonenko, Expert, INOGATE programme, ToR for the AHEF assignment, "Development of the concept of mandatory energy audits of state industrial enterprises which are planned to be fully or partially privatised/sold in 2015-2016", communication dated 25 June 2015.

„Енергетичний аудит та менеджмент", http://saee.gov.ua/uk/business/energetichny-audit-ta-manadzhment, viewed 8 July 2015.

UZBEKISTAN

State Committee for Architecture and Construction of Uzbekistan, "Results, Lessons Learned and Strategy for Transition and Sustainability Upon Completion of the UNDP/GEF Full-Sized Project" (Tashkent: 2015 p. 32, http://uz.beeca.net/userfiles/files/Final%20report%20EEPB%20Uz%20Chao%20incl%20LL%20transition%20and%20sustainability_ENG.pdf.

Sirojjidin Akhmendov, Chief Specialist, Department for Energy Efficiency and Renewable Energy Development, Ministry of Economy, Uzbekistan, "Energy Efficiency Policy in Uzbekistan", presentation, 2015, http://d335hnnegk3szv.cloudfront.net/wp-content/uploads/sites/837/2015/06/5.-KEMCO-DDWPresentation_Session-III-Sirojiddin-Akhmedov.pdf.

REN21 IS COMMITTED TO TRACKING THE DEVELOPMENT OF RENEWABLES WORLDWIDE. IN ADDITION TO ITS ANNUAL FLAGSHIP PUBLICATION, THE *RENEWABLES GLOBAL STATUS REPORT*, REN21 WORKS WITH REGIONAL PARTNERS TO SHED FURTHER LIGHT ON RENEWABLES DEVELOPMENT IN DIFFERENT WORLD REGIONS. THE *UNECE RENEWABLE ENERGY STATUS REPORT* COMPLEMENTS EARLIER REGIONAL STATUS REPORTS ON CHINA, INDIA, AND THE MENA, ECOWAS AND SADC REGIONS.

UNECE RENEWABLE ENERGY

STATUS REPORT 2015

ISBN 978-3-9815934-8-8

REN21 Renewable Energy Policy Network for the 21st Century

REN21
c/o UNEP DTIE
1 rue Miollis
Building VII
75015 Paris
France
www.ren21.net