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Status of development of renewable energy in the United Nations Economic Commission for Europe region

Status of Renewable Energy in the ECE region¹

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I. Introduction

In line with the “Sustainable Energy for All” Initiative for the United Nations Secretary General, the Group of Experts on Renewable Energy focuses on activities that help significantly increase the uptake of Renewable Energy (RE) in the region and that help achieve the objective of access to energy for all in the United Nations Economic Commission for Europe (ECE) region.

During its first session (Geneva, 18-19 November 2014), the Group of Experts will consider the state of development of renewable energy sources in view of establishing a baseline for further activities in the ECE region. This document is primarily based on a research made by consultants from the German Agency for International Cooperation (GIZ) supported by the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety. The consultants used data on energy balances in OECD and non-OECD countries from the International Energy Agency (IEA) and selected reference reports and information available on websites of the International Renewable Energy Agency (IRENA) and the Renewable Energy Policy Network for the 21st Century (REN21).

The Sustainable Energy for All Initiative embodies three objectives to be achieved by 2030: access to modern energy services for all, doubling the share of renewable energy uptake, and doubling the rate of improvement in energy efficiency. In order to measure progress to the objectives, it is necessary to have a view of the starting point. The goal of this report is to provide an overview regarding where the ECE region stands in RE uptake and implementation of RE policy frameworks and to discuss possible RE best practice guidelines, taking into account global technical and structural barriers. An extract from the Final Report prepared by the GIZ consultants is available as an Annex to this discussion paper.

II. Main Observations²

The ECE has 56 member States which constitute the main aggregation in this report. The ECE region includes countries with a wide range of economic circumstances, from those with up to triple the global average per capita GDP to those with one tenth the global average. Such considerable differences in economic situations require careful consideration when crafting national action plans for sustainable energy. Affordability and the willingness of energy consumers to accept higher tariffs for electricity produced from renewable energy sources and possibly also for heat and biofuels in transport on one hand and the ability of local governments to support renewable energy programmes on the other hand are important considerations. Each country will have to develop sustainable energy policies designed for its own particular situation. Best practices from one socio-economic environment may have limited applicability elsewhere and cannot be transferred automatically.

The lowest per capita-income ECE countries have primary energy supply intensities that are four to six times higher than those of the highest per capita-income ECE countries. The other countries in the region fall in between. One can conclude that: (i) economic well-being provides better conditions for the promotion of energy efficiency measures, (ii) energy is used in a wasteful manner in lower-income countries, and (iii) low-income countries do not add sufficient economic value per unit of consumed energy. Such unfavourable circumstances represent important potential for introduction and implementation of energy efficiency programmes on a large-scale.

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Harnessing renewable energy sources is possible only in cases where there is favourable potential. Introducing renewable energy may face technical limitations beyond the economic or financial ones that apply in most countries. At risk of technical challenges in particular are small countries with limited power generation and transmission systems that cannot cope with the intermittent character of certain renewables. The state of the power distribution system is also an important consideration.

A vast majority of ECE countries demonstrate a potential for increased use of electricity per capita in the future, driven by aspirations for improved quality of life. Capacity additions seem reasonable and justified in nations with per capita installed power generation capacities that are below the global average. This growth potential is an opportunity for renewables-based electric power provided that such projects are competitive locally with traditional technology.

There were 2,596 GW of total power generation capacity installed in the ECE region, which represented 48.7% of global power generation capacity in 2011 (5,331 GW). Renewable electric generating capacity in the region amounted to 652.7 GW, or 47.9% of global renewable capacity (1,364 GW). Global renewable energy capacities have increased from 1,364 GW at end-2011 to 1,561 GW at end-2013 (a net addition of 197 GW, an increase 14.4% cumulatively or 7.0% per year).

Individual Renewable Energy Sources:

1. **Wind power:** At end-2013, 8 ECE member States were among the top 10 countries in the world in terms of installed wind energy capacity: United States (61.1 GW), Germany (34.7 GW), Spain (23 GW), United Kingdom (10.5 GW), Italy (8.6 GW), France (8.3 GW), Canada (7.8 GW) and Denmark (4.8 GW), which contributed 158.8 GW in total that represented 49.9% of global capacities (318 GW).

2. **Solar photovoltaics:** At end-2013, 7 ECE member States were among the top 10 countries of the world in terms of solar photovoltaic capacity: Germany (35.9 GW), Italy (17.6 GW), United States (12.1 GW), Spain (5.6 GW), France (4.6 GW), United Kingdom (3.3 GW) and Belgium (3.0 GW). In aggregate these countries had 82.1 GW of installed solar photovoltaic capacity, representing 59.1% of global capacity (139 GW).

3. **Concentrated solar thermal power (CSP):** At end-2013, 2 ECE member States were among the top 10 countries of the world: Spain (2,300 MW) and United States (882 MW), which together contributed 3,182 MW, or 93% of global capacity (3,425 MW).

4. **Hydropower:** At end-2013, 3 ECE member States were among the top 6 countries of the world: United States (78 GW), Canada (76 GW) and Russia (47 GW), which contributed 201 GW in total that represented 20.1% of global capacities (1,000 GW).

5. **Geothermal power:** At end-2013, 2 ECE member States were among the top 6 countries of the world: United States (3.4 GW) and Italy (0.9 GW), which contributed 4.3 GW, or 35.8% of global capacity (12.0 GW).

6. **Solar water heating collectors:** At end 2012, 7 ECE member States were among the top 12 countries of the world: United States (16.2 GWth), Germany (11.8 GWth), Turkey (10.8 GWth), Austria (3.4 GWth), Israel (2.9 GWth), Greece (2.9 GWth) and Italy (2.4 GWth), which together contributed 50.4 GWth, or 17.9% of global capacity (282 GWth).

7. **Biofuels production:** At end-2013, 8 ECE member States were among the top 16 countries of the world: United States (55.4 billion litres/yr (bl/y)), Germany (3.9 bl/y), France (3.0 bl/y), The Netherlands (2.5 bl/y), Canada (2.0 bill. litres/yr), Poland (1.2 bl/y), Belgium (0.8 bl/y) and Spain (0.7 bl/y), which together contributed 69.5 bl/y, or 59.6% of global capacity (116.6 bl/y).

The EU and the Energy Community countries have introduced minimal targets of 10% for the share of renewable energy in transport by 2020. The target is mandatory for every country. Most of the target will be met by biofuels (bioethanol and biodiesel).

1. Renewable Energy Potential

The ECE region as a whole can be regarded as a highly promising region for nearly any kind of renewable energy technology. The RE-potential is usually observed as **renewable energy resource (RER) potential** – as assessment of the content, conditions and terms under which energy from renewable sources found in nature can be exploited. The approach to the RER potential differs, depending on the type of RES: wind, solar, hydro, biomass, geothermal and ocean. Endowment with renewable energy sources (RES) of a country is natural wealth, and depends on specific geomorphologic, geographical, climate and weather conditions typical for a country, which is beyond our control. The maximum ability to benefit from RE-sources is determined as **theoretical potential**.

Theoretical potential has very limited practical value, as numerous limitations apply, from spatial planning (e.g. protected zones – national parks, other infrastructure, water supply and agricultural areas, living habitats and recreation areas etc.), technical, environmental, economic and market. Consequently, theoretical potential is gradually downsized to the reality – actual potential. More often used terms are **technical, economical and exploitable / sustainable / market potentials**, for which the above spatial planning constraints as well as other development planning related requirements have been considered. Thus, technical potential particularly assumes the application of a portfolio of presently available mature technologies. When assessing technical potential, both supply and demand options are to be analysed. For example, should RE-sources be used for power generation, heating/cooling, in transport or be an option for off-grid electrification of remote areas? Economic potential is then that part of technical potential, which is economically feasible and financially viable in the prevailing present and foreseeable future conditions. Finally, for the assessment of market potential, one should also consider locally specific market conditions, possibly within the competitive environment, and various impediments related to “making business” in a country. In many cases, the assessments of RE potentials do not explicitly mention the pertaining conditions and assumptions behind. Therefore, the assessments remain vague and speculative.

In the ECE region as a whole, the **RE-potential** is assessed as High in the following number of countries: hydro -: 39 (75%), wind - 38 (73%), biomass 29 (56%), solar - 22 (42%), geothermal - 21 (40%) and ocean - 11 (21%). The RE-potentials for biomass and solar are assessed as Medium at the most in 15-18 (32%) countries. Low potentials in ocean, geothermal and hydro are attributed to not more than 8 (15%) countries. Most unexplored potentials, where the RE-potential are Unknown, are for ocean (22 countries) and geothermal (14 countries). The RE-potential is not applicable only in countries without access to sea (12) and without natural conditions to develop hydro (1). Based on this information, the ECE region shall be regarded as a highly promising region on the Earth to deploy nearly any kind of RE technologies. However, further research and field surveys (biomass), measurements (hydro, wind) and exploratory drilling (geothermal) is required to permanently improve the renewable energy resource assessment. In addition, feasibility studies are required, based on the application of state-of-art RE technologies and updated data on costs in order to refresh the assessment of technical and economic potentials in all RE countries and applications (power generation, heating/cooling, transport, provision of electricity and heat to areas with no access to modern energies etc.).

2. Renewable Energy Policy & Regulation

The ECE region is fairly well developed in terms of development and adoption of **strategic planning documents** in the area of renewable energy. Long-term energy sector development strategies have been prepared recently in many member States and national renewable energy action plans (NREAPs) exist in 75% of member States. The proactive policies of promoting energy from renewable sources in EU (20% of renewable energy in gross final energy consumption and 10% in transport in 2020) have motivated EU member States and the Energy Community countries to prepare and adopt adequate strategies and the associated action plans, some even with concrete investment programmes or plans.

Considerable improvements of the **legal and regulatory framework** are still awaited in member States that are least developed in terms of renewable energy uptake. In the Energy Community countries, for example, after transposition of Directive 2009/28/EC into primary legislation (delayed in several countries), an adequate regulatory regime is still needed before the effective implementation can start. International technical assistance is demanded to achieve this goal.

Discussions on **strategy targets** represent a vivid topic in public debate and political arena, and a lot of misinterpretations are evident, including manipulation of the general public. However, targets as clear commitments of the state are necessary, but as few as possible and as clear as possible. Also, overlapping or duplications of targets should be avoided. Targets have to be set on realistic grounds and implications have to be thoroughly studied prior to governmental decisions. The public should be involved in consultations. Finally, all countries shall improve clarity and transparency on this subject in communications with media.

The discrepancies between the various datasets that nominally aim to deliver the same information, speak volumes on how difficult it is to establish and maintain a reliable source of internationally comparable information on the effective measures within the legal frameworks in force. Not even similar services by a single organisation are immune to these adversities, as the REN21's Global Status Report (GSR) and Renewables Interactive Map (MAP) show: out of almost 300 policies being referred to as applicable in the individual ECE member States, 82% of the references are consistent between the two, MAP exclusively refers to the applicability of 33 policies and GSR provides the remaining 5 exclusive references. Taking into account the incomplete set of countries within IEA/IRENA (12 ECE member States missing) and only four policies being cross-referenced, evaluated reliability of positive reference within a single REN21 report falls from 82% down to a mere 30%.

Nonetheless, The **TOP-4 renewables policy measures** in the ECE region exceeding 45% share in implementations are:

1. **Feed-in tariffs / Premium payments** with implementations in at least 61% and maybe up to 82% of ECE member States. The recent developments, however, show a decline in their applicability, due to either suspension of the schemes (e.g. Czech Republic) or even their ex-post revocation (e.g. Spain).
2. **Biofuels obligation or mandate** implemented in 54% to 59% of ECE member States.
3. **Reductions in sales energy, VAT or other taxes** with an implementation share between 48% - 61% in the region.

4. **Capital subsidy, grant, or rebate** implemented in between 45% and 71% of member States.

An additional potential member of the 45% group is the Public investment, loans, or financing, that could be implemented in as much as 77% of the ECE member States, but due to IEA/IRENA not backing most of the positive references within the REN21 sources, it landed at a minimum share of only 23%.

3. Challenges in Baseline Assessment

The main challenge in assessing the baseline situation for renewable energy in the ECE region is the **availability of the right information**. Inadequate state of legal and regulatory framework in a country is typically ranked highest on the list of possible challenges for RE investment, before e.g. availability of financing schemes, political risk and similar.

The RE-potentials described in this document are based on analysis done by IRENA, Country Profiles. IRENA Country Profiles provide presumably up-to-date information, however with less transparency on used sources for individual information. Although, various reports and information sources have been consulted for each country, such documents often contain discrepancies due to key methodological differences in assessment, variant data collection techniques within a country and publication date. Therefore, determining the qualitative level of the country assessment with high confidence can be arbitrary.

The REN21 Renewables Interactive Map, also provides a comprehensive set of information collected from numerous sources, e.g. IRENA, national RE agencies, IFIs etc. Although REN21 Renewables Interactive Map includes both recent as well as archived information, it is still difficult to capture a complete picture without field research in the respective country and data discrepancies with IRENA Country Profiles in several countries are prevalent.

Although helpful, official data sources may lack thoroughness in provision of information. Preliminary research has identified the following data inconsistencies and gaps in the ECE region:

Inconsistencies found:

- By comparing the information provided within the two publications by REN21 on the 56 ECE member States, namely the Renewables Global Status Report (GSR) and the Renewables Interactive Map (MAP), inconsistencies have been identified. Of nearly 300 policies implementations stated within the two sources, only 82% are coherently referred to in both of them, while 33 are referred to by the MAP exclusively and 5 by the GSR only.
- Cross-referencing information provided by REN21 (GSR and MAP) and IEA/IRENA Global Renewable Energy Policies and Measures Database on the 4 categories that appear to be perfectly overlapping (according to the documentation provided with the data services), and within the common country coverage (REN21 collects information on all 56 ECE member States while IEA/IRENA does so for 44 only), substantial discrepancies appear: of 140 statements by either of the REN21 services 47 are disputed and 10 more identified as missing by the information provided within IEA/IRENA database. This means that either IEA/IRENA or REN21 or both are incomplete and/or partially wrong.

Data gaps identified:

- The most pressing issue is lack of complete geographical coverage. In terms of the ECE region, the various approaches of individual information sources leads to limited comparability of information as granularity varies. For example, the IEA World Energy Balances accounts for 49 ECE member States individually, data on 4 member States is provided on pair-by-pair basis, data on 1 member State is combined with partial data on another one (with the other part of information not being available), and there is no information on 1 member State. On the other hand, REN21 claims to collect information on all the ECE member States, but fails to deliver at least on one of them (San Marino, as our own research has proved). Furthermore, IEA/IRENA database deals with only 44 ECE member States, missing out, among others, on the whole of the Central Asia sub-region.
- It appears that nobody collects information on validity of non-existence of the reference. That being said, collection of information on the validity of sources of information (meta-data) is dealt with to a limited extent of referencing the source of information (e.g. REN21 MAP and IEA/IRENA database), where such information is included in the report/database, but there is no information on the information not being there (whether such status is being claimed or just not known³). In fact, the user of the information tends to rely on the reference not being there regardless of the source of information not providing any claim in that regard but its implicit message. For example, no information within REN21 on Turkmenistan appears to be right, while the same (no) information on San Marino proved to be wrong.

It is evident that every investor will check in his own capacity the currently valid legal and regulatory regimes in a country of his potential RE-investment. This is another reason that one should not strive for perfect information because this is hardly possible and would demand substantial financial resources for the research of 56 countries of the ECE region. Inadequate state of legal and regulatory framework in a country is typically ranked highest on the list of possible barriers for RE investment, before e.g. availability of financing schemes, political risk and similar. Nonetheless, gaps in critical technical data and policy information, the quality of the data, and the relevance of the questions posed in the data gathering process demonstrate significant opportunities for improvement. Member States' active engagement in the provision of data would serve long-term interests in understanding the regional and sub-regional situation for RE potential and policy landscape.

³ In the field of databases the difference between the values »none« and »not known« is commonly dealt with by two explicit values of the relevant attributes: »0« or »null«. The interpretation of 0 vs. »null« might differ substantially: 0 means that the value is zero, while "null" means the value has not been entered and is not known.

III. Annex: Extract from the final Report

Report title

Baseline Conditions on Renewable Energies in the ECE Region

EXTRACT FROM THE FINAL REPORT

October 2014



Project Team

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LIST OF ACRONYMS AND ABBREVIATIONS

Symbol	Meaning
a.g.l.	Above ground level
BNEF	Bloomberg New Energy Finance
BMUB	Federal Ministry for the Environment, Nature Conservation, Construction and Nuclear Safety (<i>Bundesministerium für Umwelt, Naturschutz, Bau und Reaktorsicherheit</i>)
CHP	Combined heat and power
CO2	Carbon dioxide
CP	Contracting Party (to ECT)
CSP	Concentrating solar thermal power
EC	European Commission
ECE	United Nations Economic Commission for Europe
ECE-CA	Energy Commission for Europe / Central Asia
ECE-EP	Energy Commission for Europe / Eastern Partnership
ECE-EU.EF.3	Energy Commission for Europe / European Free Trade Association (incl. Iceland, Norway, and Switzerland)
ECE-NA	Energy Commission for Europe / Northern America (incl. Canada and United States of America)
ECE-I.R.T	Energy Commission for Europe incl. Israel, Russian Federation and Turkey
ECE-WB	Energy Commission for Europe /Western Balkan
ECLAC	Economic Commission for Latin America and the Caribbean
ECT	Energy Community Treaty
EFTA	European Free Trade Association
EnC	Energy Community
EU	European Union
FIT	Feed-in tariff

Symbol	Meaning
G	Giga (10^9)
GDP	Gross Domestic Product
GFEC	Gross Final Energy Consumption
GHG	Greenhouse gases
GIZ	<i>Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH</i>
GSR	Global Status Report (REN21, 2014)
GTF	Global Tracking Framework
IEA	International Energy Agency
IFI	International financial institution
IRENA	International Renewable Energy Agency
k	Kilo (10^3)
M	Mega (10^6)
MAP	Renewable Interactive Map
MS	Member State
NGO	Non-governmental organization
NREAP	National Renewable Action Plan
OECD	Organization for Economic Co-operation and Development
P	Peta (10^{15})
PES	Primary Energy Supply
PV	Photovoltaic
RE	Renewable energy
REC	Renewable Energy Certificate
REN21	Renewable Energy Policy Network for the 21 st Century
RES	Renewable energy source
RES-E	Renewable energy source-for-electricity
RES-H	Renewable energy source-for-heat
RES-H/C	Renewable energy source-for-heating and cooling
SESA	Strategic Environmental and Social Assessment
SE4All	Sustainable Energy for All
T	Terra (10^{12})
TH	Thermal
UN	United Nations
USA	United States of America
W	Watt

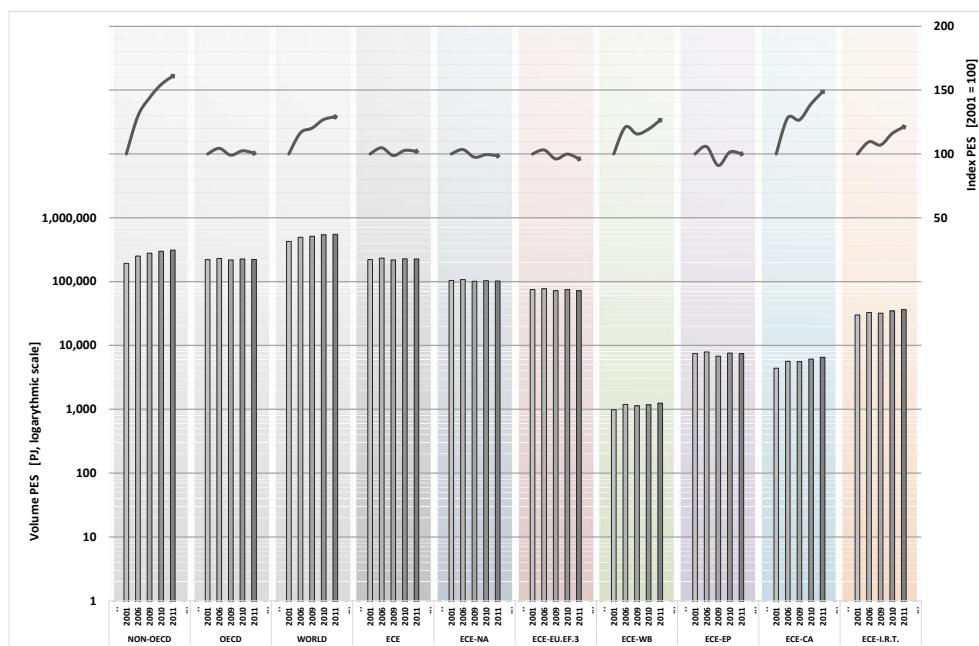
I. Renewable Energy in ECE countries vs. OECD/Non-OECD and the world in the last decade (2001-2011)

Section 1.1 is focused entirely on baseline conditions with renewable energy sources (RES) in the ECE region, by its sub-region and in comparative terms with OECD, non-OECD and the world as a whole. In order to give proper appreciation of the Base Year of 2011 (the last year for which energy statistics at IEA is available for all 56 ECE member States at the moment), the previous 10-year period of 2001-2011 was also observed. In particular, 2001, 2006 and the last three years of the period (2009, 2010, 2011) were chosen. The role of RES is shown from various perspectives in the following Sections 1.1.1-1.1.11.

An identical presentation in all pertaining Figures 1-34 was followed, which includes: (i) column charts with volumes (sometimes also as part of another broader data category) for the 5 selected years, (ii) line charts for trend analysis above that, (iii) separate pie charts with shares of sub-regions within the ECE region as well as data for the ECE region vs the world; and (iv) column charts with specific shares by sub-region, the ECE region and the world – the last two charts are for the year of 2011.

1. Primary Energy Supply (PES) [unit: PJ]

Figure 1: Volumes of Primary Energy Supply (PES) by sub-region (2001, 2006, 2009-2011)



2. Volume and share of renewable energy sources (RES) in PES [PJ and %]

Figure 2: Volume and share of Renewable Energy Sources (RES) in PES by sub-region (2001, 2006, 2009-2011)

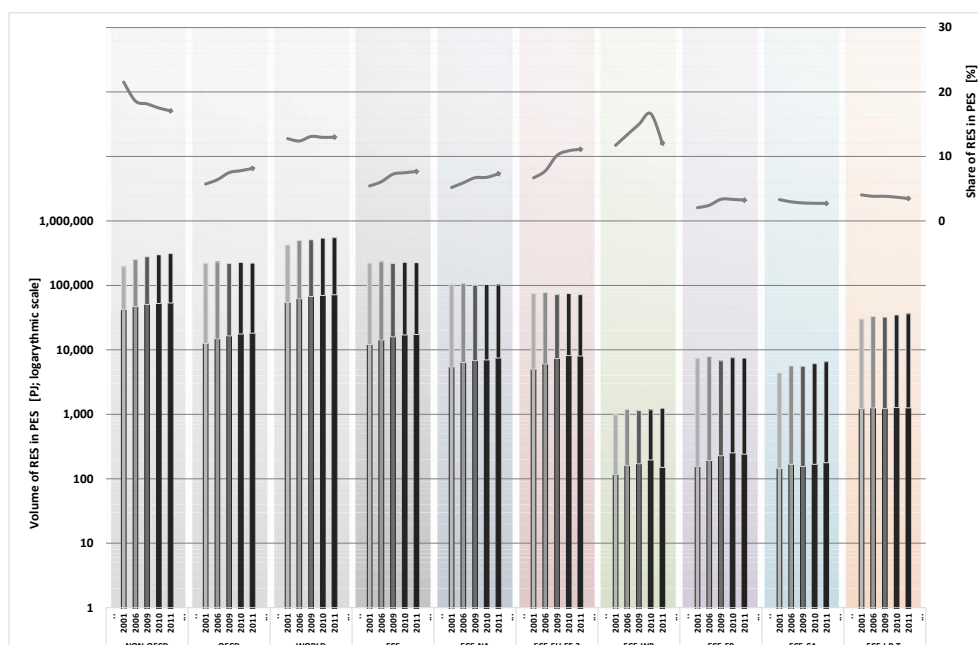
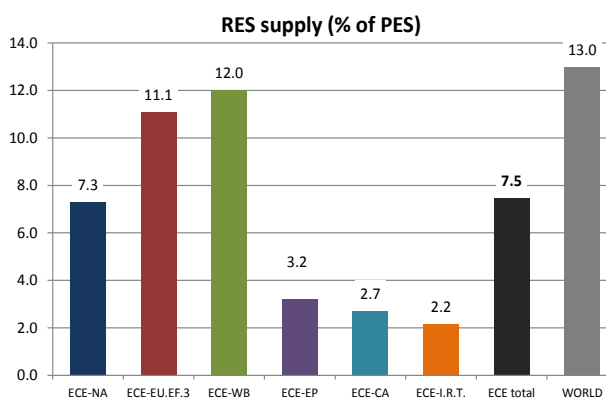
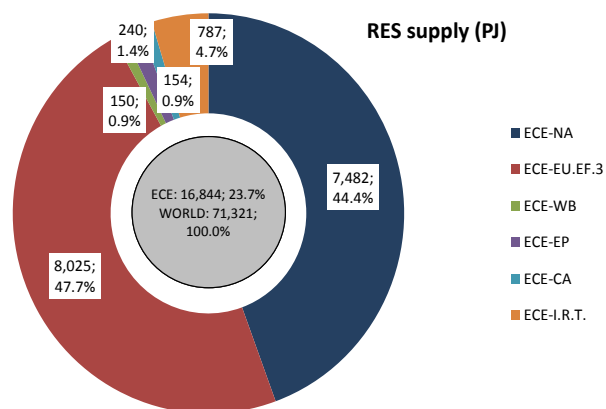


Figure 3: Supply of RE-sources by ECE sub-region in 2011



3. Volume and share of RE sub-sectors (wind, solar, hydro, biomass, biogas, geothermal, ocean) in total PES [PJ and %]

Figure 4: Volumes and shares of Wind in RES (PES) by sub-region (2001, 2006, 2009-2011)

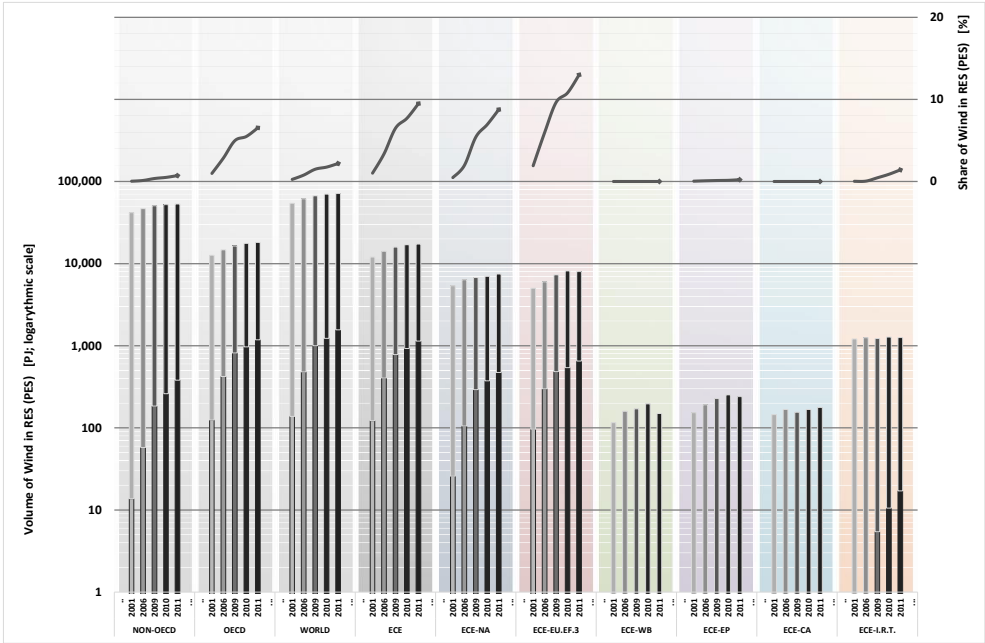
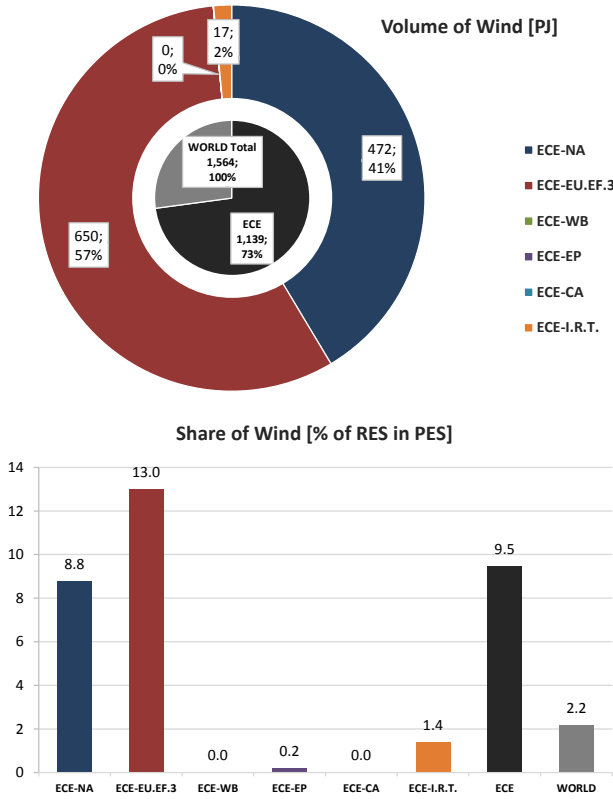


Figure 5: Wind within PES by ECE sub-region in 2011



Wind for power generation, either onshore or offshore, is being rapidly deployed in the ECE region by rates of roughly 20% more wind power produced year-on-year in 2010 and 2011, resulting in an index value of 146 in 2011 on 2009. The I.R.T. and the EP sub-regions show the highest growth in wind energy production with indexes in 2011 on 2009 values of 314 and 186 respectively, while the largest wind power producing sub-regions, NA and EU.EF.3 maintained their respective paces at 162 and 134, jointly contributing more than 30 times to the additional generation in the two-year period than the higher growth regions combined. The CA and the WB sub-regions had no wind power production by the end of 2011. (Figures 4-5)

Figure 6: Volumes and shares of Solar PV in RES (PES) by sub-region (2001, 2006, 2009-2011)

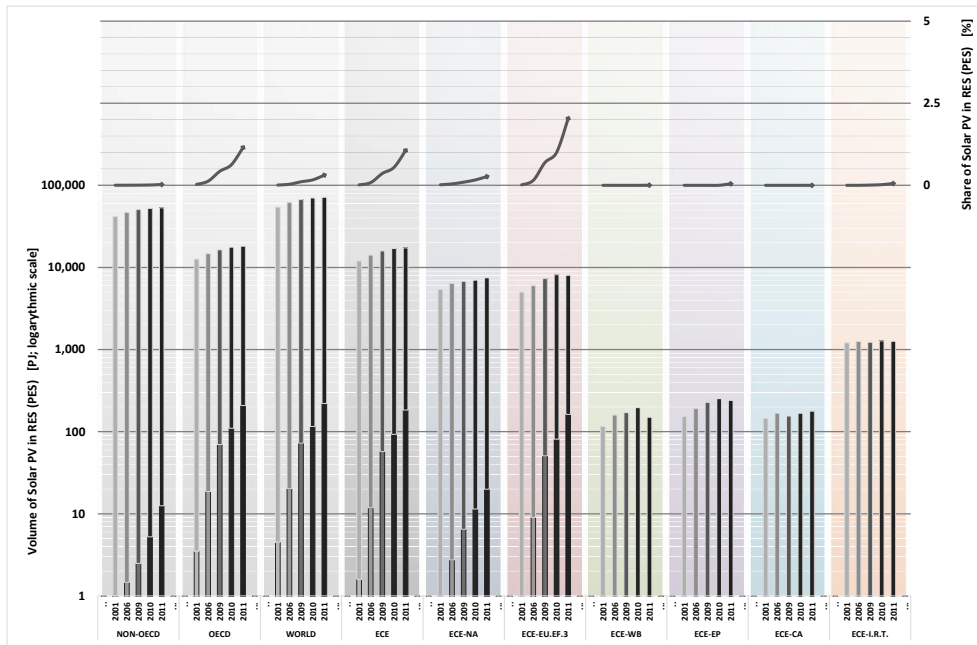
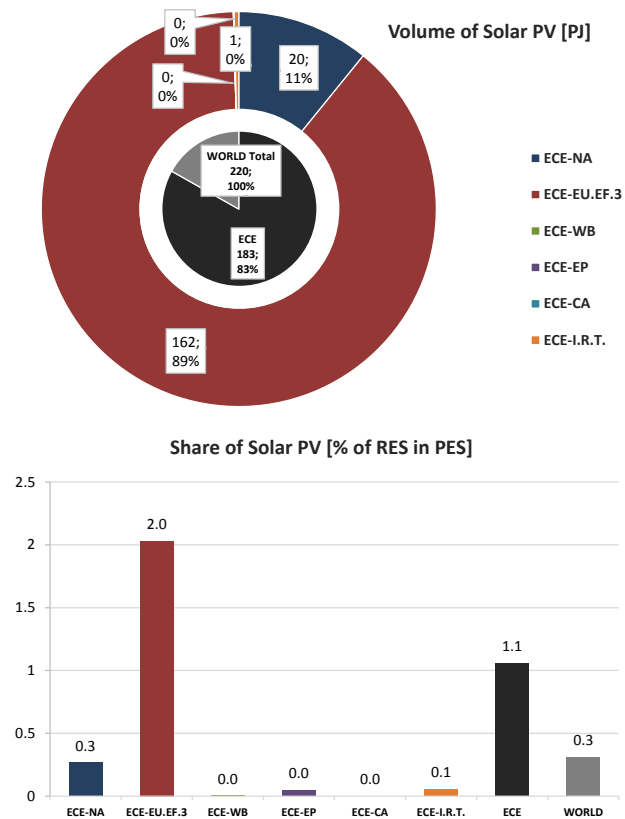


Figure 7: Solar PV within PES by ECE sub-region in 2011



Power generation from Solar PV is the most rapidly growing power generation sector. In terms of shares, the EU.EF.3 sub-region is a global champion, accounting for more than 70% of production volume in the year 2011 and more than 80% of additionally generated volumes in 2011 over both 2009 and 2010 global values. (Figures 6-7)

Even though its share in PES is relatively low, the natural “midday-peak-consumption shaving” potential has made life easier for certain actors and dented the traditional business model of some of the on-demand peak-load generation capacity operators. For the purposes of energy access, this is the technology that is ready to be deployed in the non-connected areas today and may benefit by effective power storage solutions in the future.

Figure 8: Volumes and shares of Solar thermal (TH) in RES (PES) by sub-region (2001, 2006, 2009-2011)

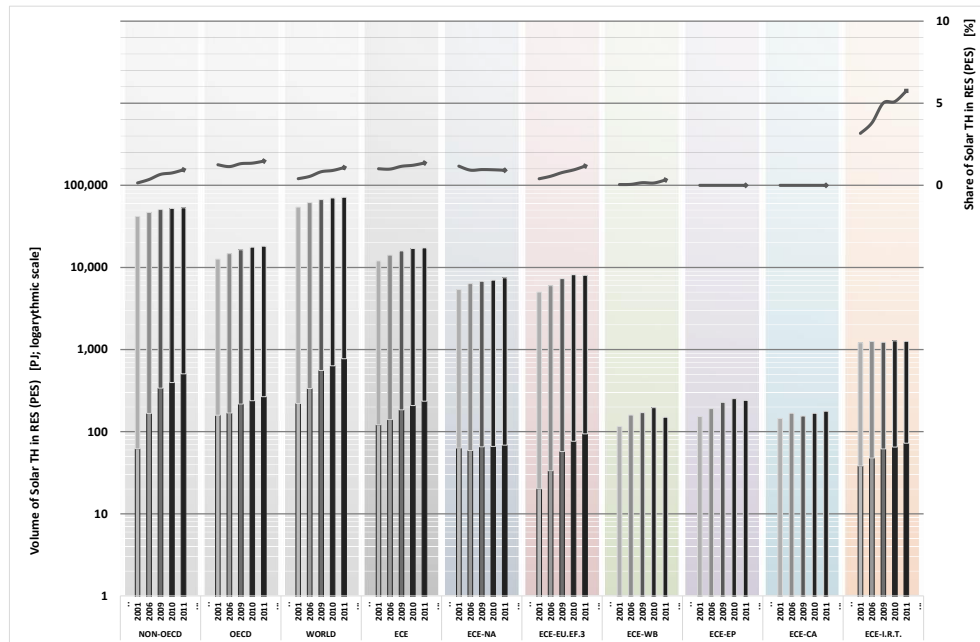
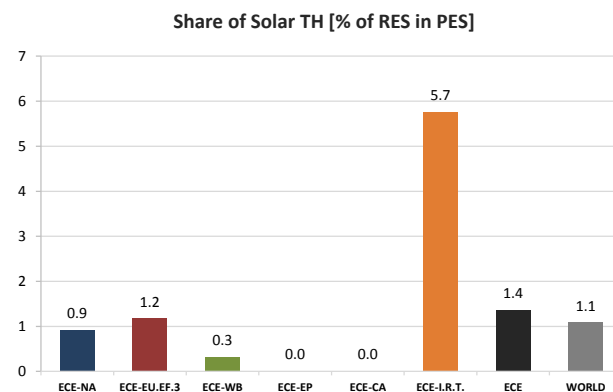
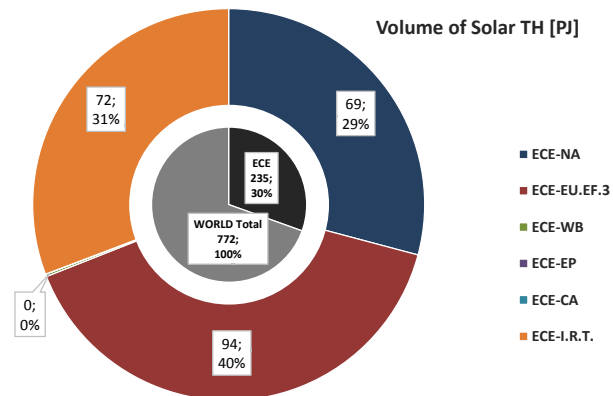


Figure 9: Solar TH within PES by ECE sub-region in 2011



Solar TH (solar thermal as solar-to-heat transformation technology) does not include CSP (concentrating solar power as solar-to-thermal-to-power transformations technology) and has a longer tradition than solar PV. Its share among RE-sources is relatively stable in the ECE region, with the exceptions of EU.EF.3 and I.R.T. sub-regions, whose respective indexes in 2011 on 2009 were 164 and 118. The latter sub-region (ECE-I.R.T.) has a significant share of solar TH in its RE-sources volume so the high index of heat generation is of relatively greater importance. (Figures 8-9)

Figure 10: Volumes and shares of Hydro in RES (PES) by sub-region (2001, 2006, 2009-2011)

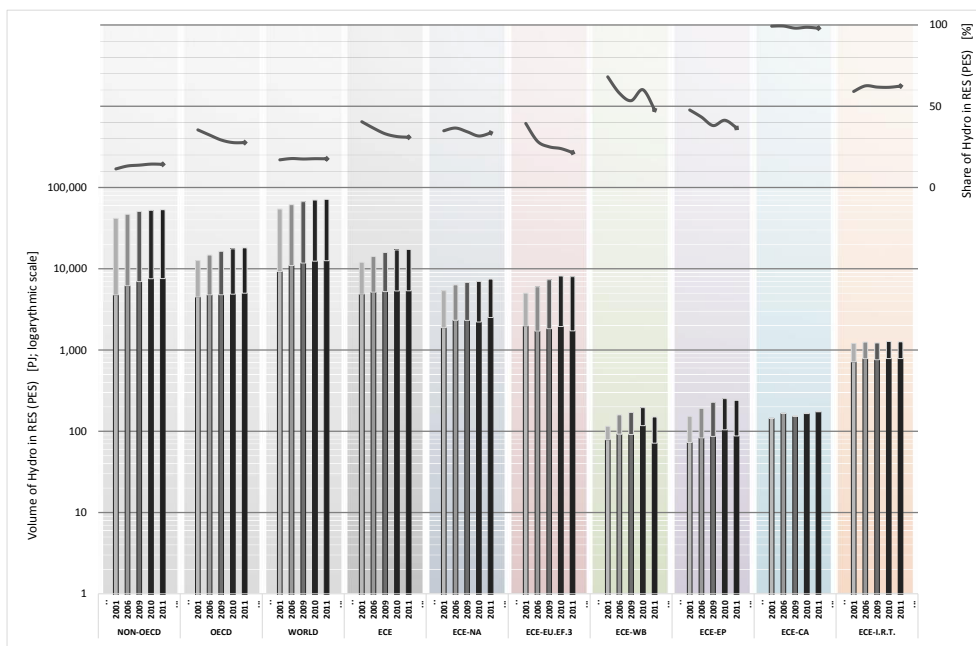
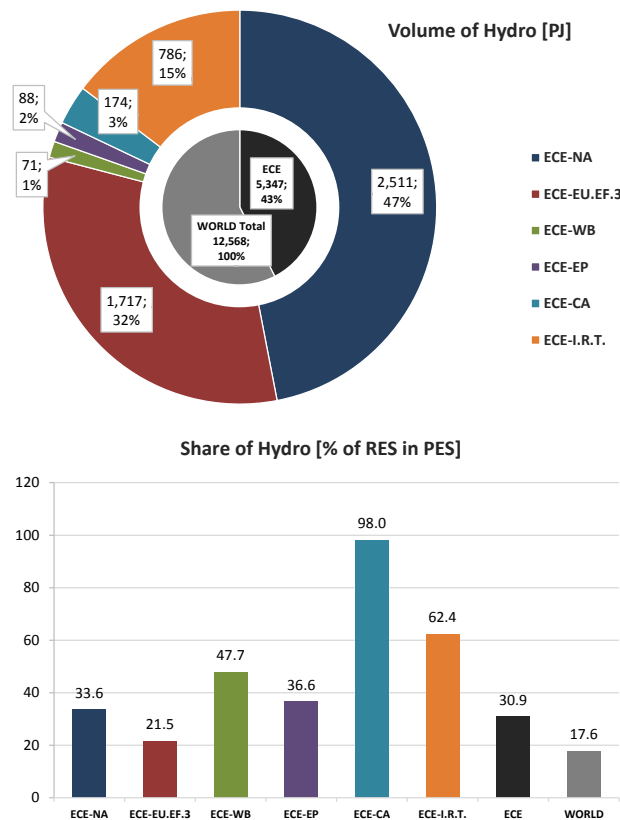


Figure 11: Hydro within PES by ECE sub-region in 2011



Hydropower generation is a power generation sector with a long standing tradition worldwide. RE-sources in CA sub-region almost exclusively (98% in 2011) derives from hydropower generation and it generates almost 3% of electricity above its own needs.

It can also be a very volatile business to be in as it depends greatly on the hydrological circumstances, as the example of the WB sub-region shows: in 2010, there has been an exceptional year with 29% yearly production growth (resulting in 110% self-sufficiency in power generation) that was followed by a disastrous one of -39%, pushing the sub-region more than 20% short even on 2009 production, making it importer of electricity for more than 7% of its consumption. EU.EF.3 sub-region was hit quite a bit softer (-6% in 2011 on 2009) levelling out the effect due to its geographic size. (Figures 10-11)

Figure 12: Volumes and shares of Solid Biomass in RES (PES) by sub-region (2001, 2006, 2009-2011)

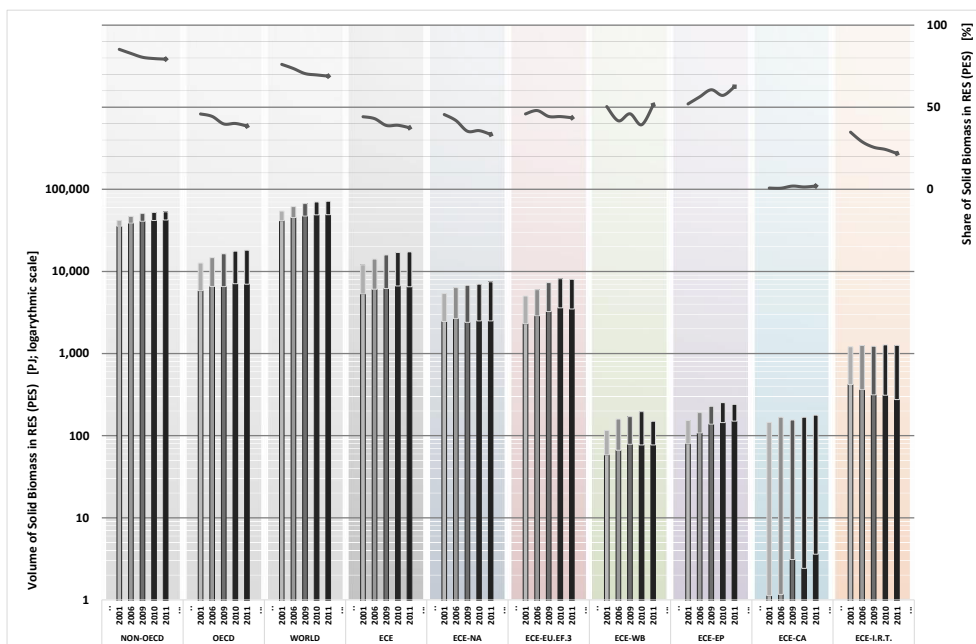
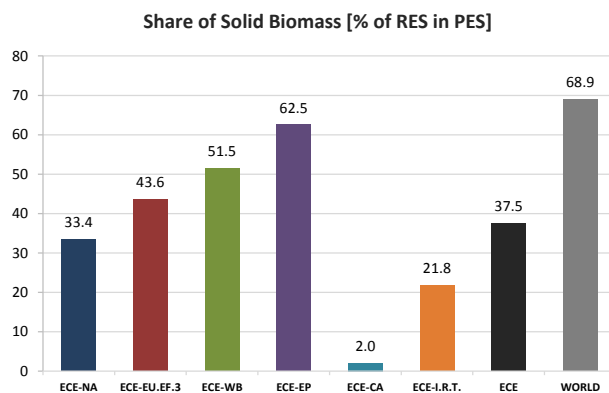
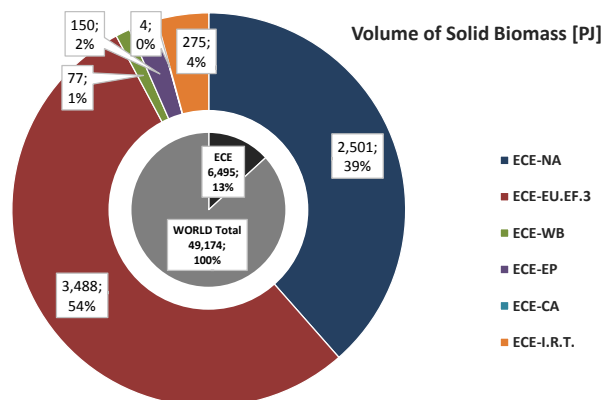


Figure 13: Solid Biomass within PES by ECE sub-region in 2011



Solid biomass is often taken for a proxy of traditional renewable energy sources as it constitutes the major part of it and as there is at least some data (of varying quality) on it. Even though it presents itself with a significant 2/3 share in RE-sources worldwide, it should be noted that the data available is not to be relied on. Several organisations (also within ECE) are trying to improve the means and principles of data collection and evaluation. (Figures 12-13)

Ready available data on solid biomass (in this case both wood biomass and charcoal are summed-up) points to the contrast between its sky-high share in RE-sources (80%) outside OECD and only 40% within OECD.

Figure 14: Volumes and shares of Biogas in RES (PES) by sub-region (2001, 2006, 2009-2011)

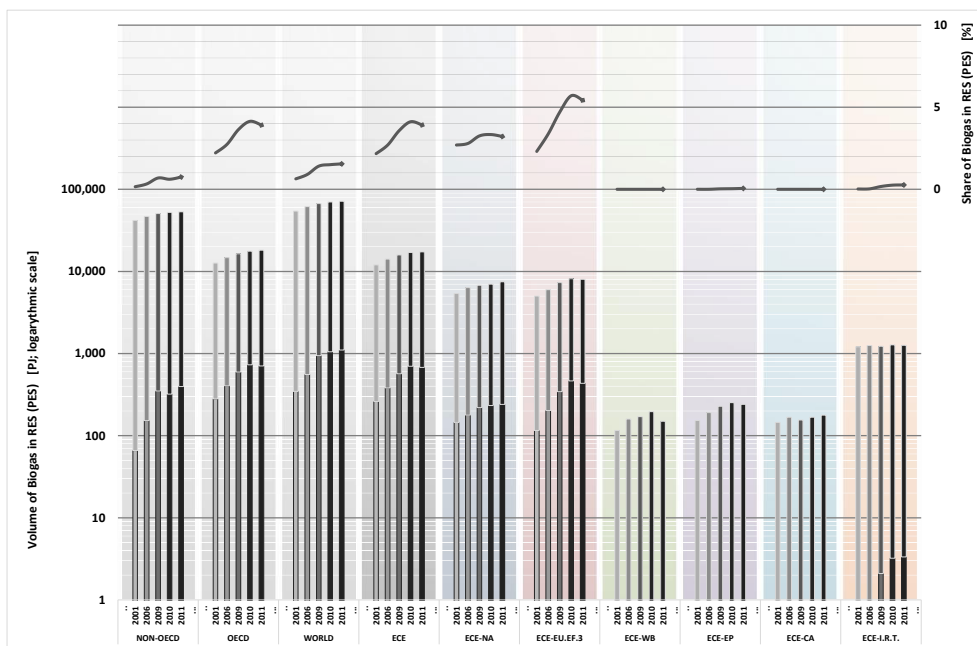
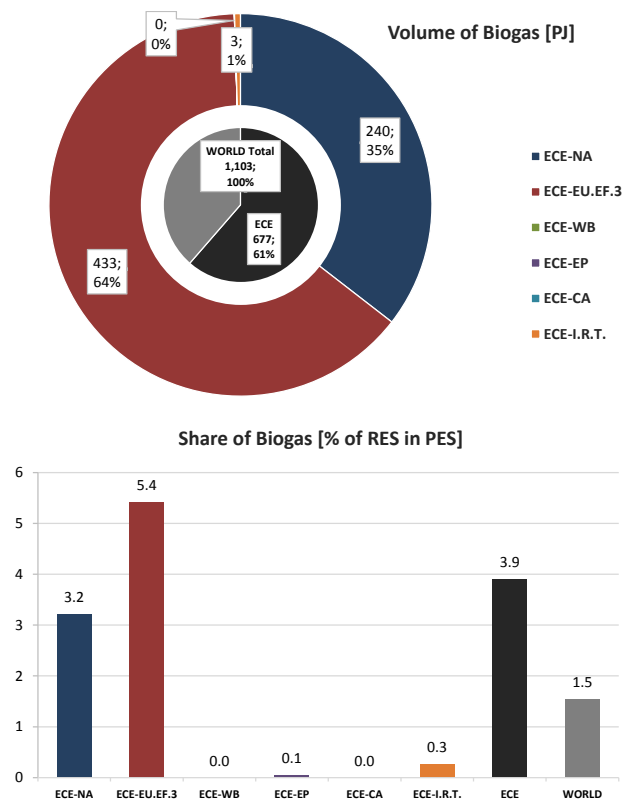


Figure 15: Biogas within PES by ECE sub-region in 2011



Biogas appears to be significantly more popular in the developed world (OECD used as a proxy), where its share in RE-sources is around 4%, an important contrast to less than 1% outside OECD (even if we triple the latter to account for the significantly lesser remaining part of RE-sources due to high share of solid biomass). Among the ECE sub-regions the contrasts are even starker: practically negligible shares in three of them are faced with a huge share of more than 5% in the EU.EF.3 sub-region. (Figures 14-15)

Figure 16: Volumes and shares of Bioliquids in RES (PES) by sub-region (2001, 2006, 2009-2011)

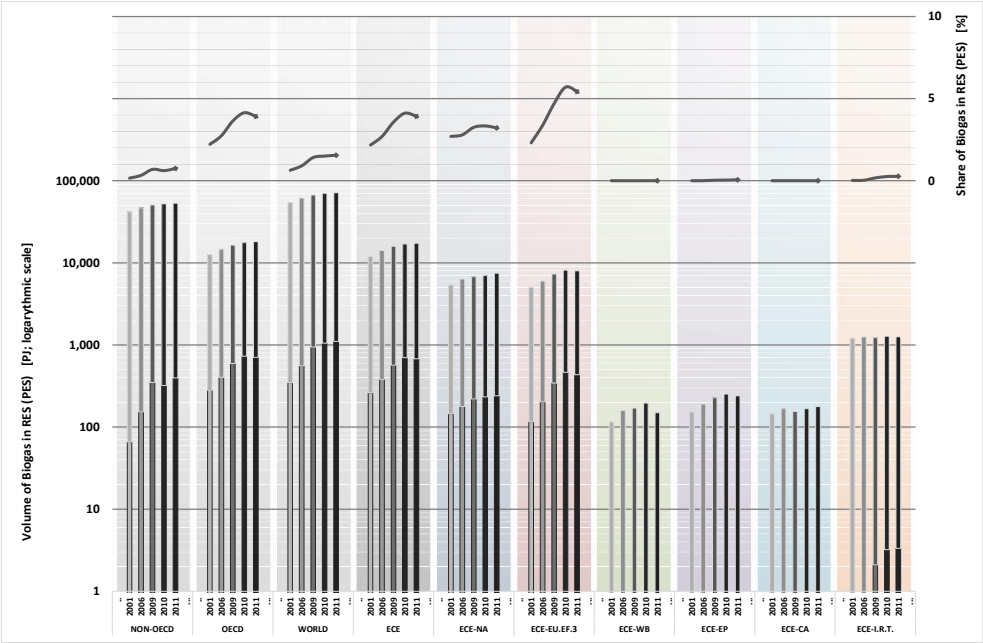
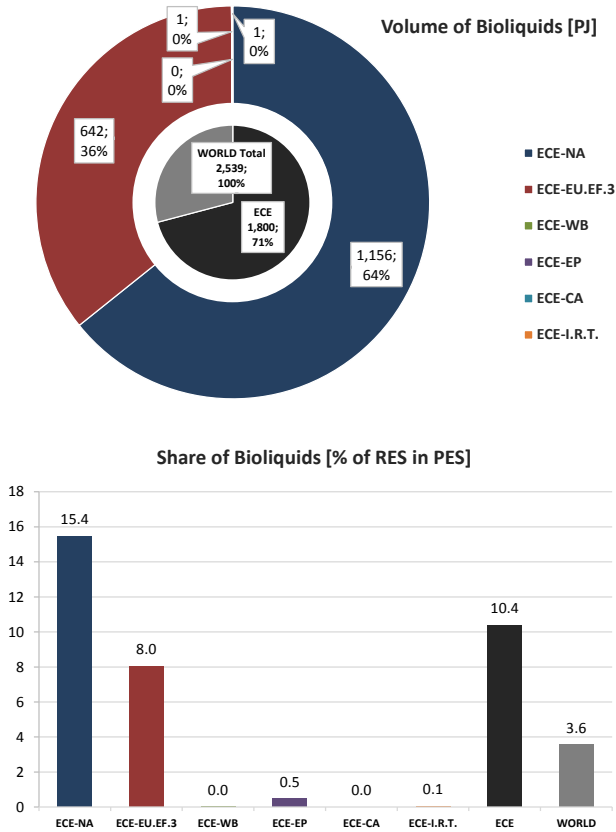


Figure 17: Bioliquids within PES by ECE sub-region in 2011



Almost all of the **bioliquids** (biodiesel, biogasoline and other bioliquids) are used in the transport sector: more than 98% both globally and in the ECE region. In the ECE region it has an important share in excess of 10% within the RES, resulting from the consumption in the NA and EU.EF.3 sub-regions. (Figures 16-17)

The second generation biofuels (advanced biofuels) brings about great promises of increased affordability and non-competition with the food industry chain on both the crops and arable land, paving the way towards greater acceptability and wider eventual uptake.

Figure 18: Volumes and shares of Geothermal in RES (PES) by sub-region (2001, 2006, 2009-2011)

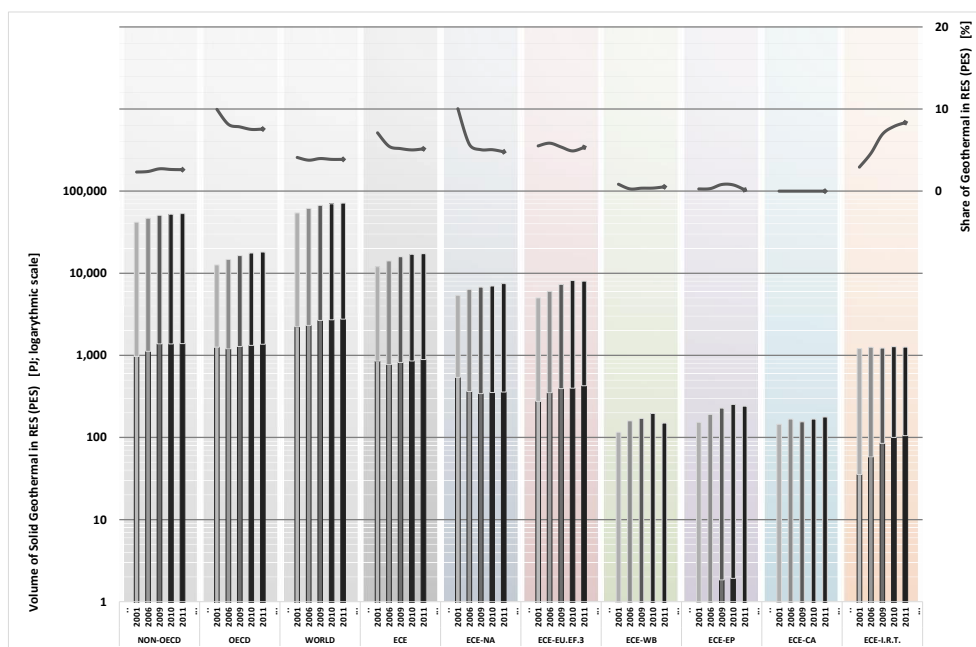
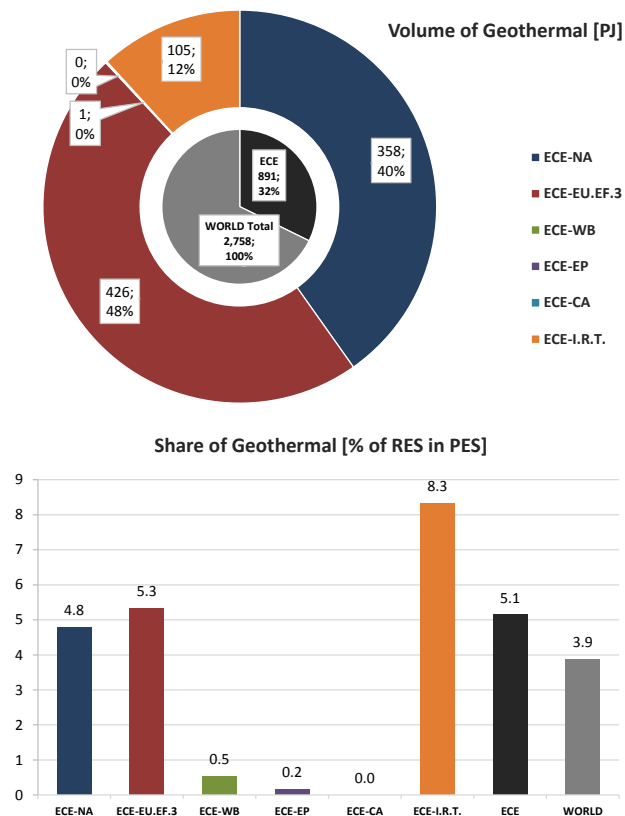


Figure 19: Geothermal within PES by ECE sub-region in 2011



Majority of **geothermal energy** in the ECE region is employed in electricity and heat generation (83% in 2011). In the I.R.T. and the WB sub-regions, both featuring the highest growth recently (index in excess of 120 in 2011 on 2009), the situation is radically different with almost 60% share of residential use in I.R.T. (all of it in Turkey, where its share is above 70%) and 90% agriculture/forestry use in the WB region. (Figures 18-19)

In the NA sub-region the decline in geothermal energy use between 2001 and 2006 appears to be caused by stopping a third of generation (only 2 GW out of 3 GW installed capacity is reported to be actually running lately).

Figure 20: Volumes and shares of Ocean in RES (PES) by sub-region (2001, 2006, 2009-2011)

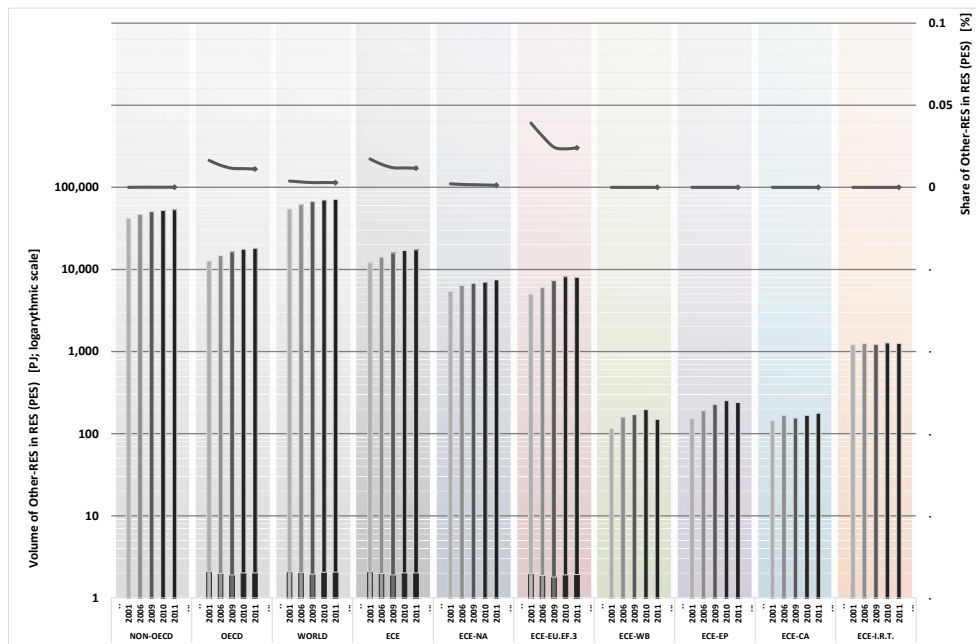
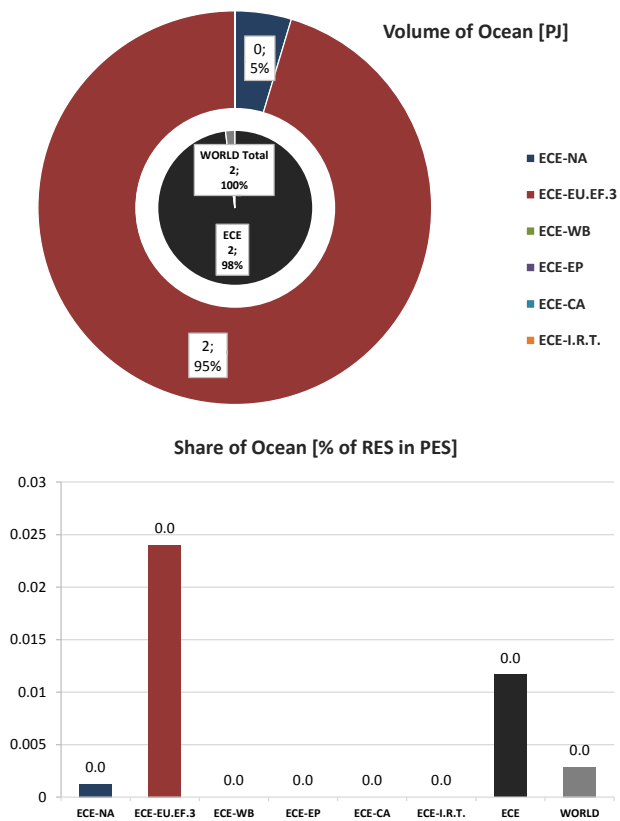


Figure 21: Ocean within PES by ECE sub-region in 2011



All of the **ocean energy** industry (comprising ocean energy-to-power harnessing technologies that include tide and wave) in the ECE region is placed in the EU.EF.3 (France) and NA (Canada) sub-regions, with relatively stable production quantities at least for the last two decades. (Figures 20-21)

The production volumes remain marginal for the time being, but the technologies appear promising, even though the installations announced are confined to the R&D purposes.

Figure 22: Volumes and shares of Other RES (Renewable waste and Non-specified renewable sources) in RES (PES) by sub-region (2001, 2006, 2009-2011)

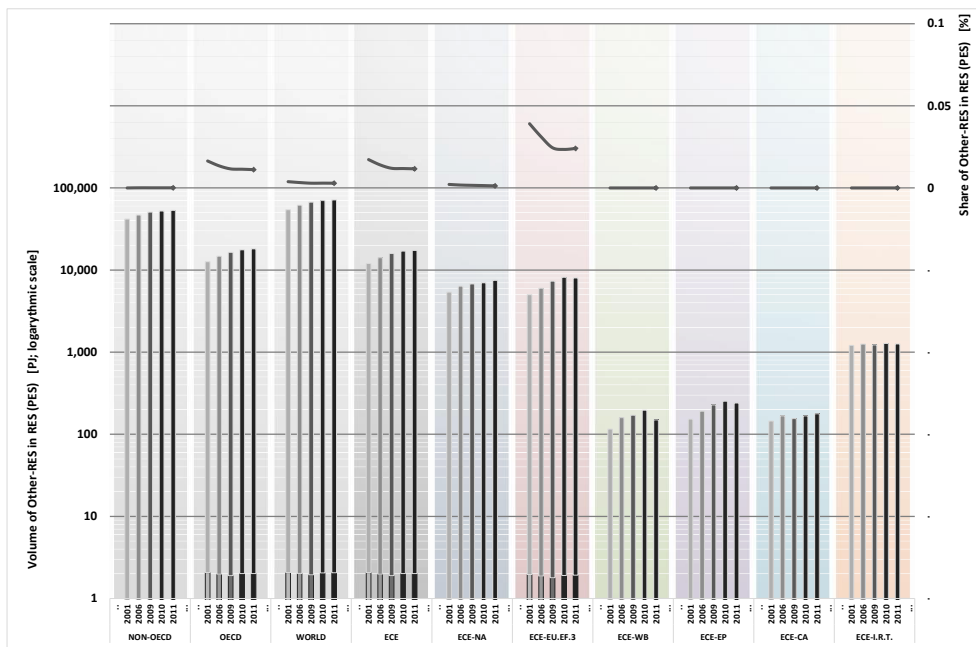
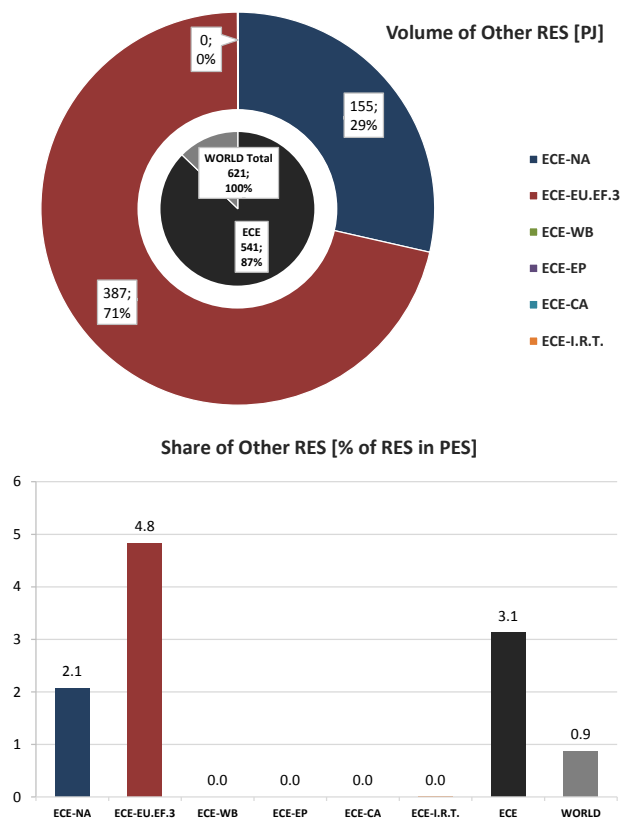


Figure 23: Other RES within PES by ECE sub-region in 2011



The two sub-regions actively using **other RE-sources** (comprising renewable municipal waste and non-specified renewable sources, but the latter are not reported within the ECE region) are facing entirely different trends since 2006: growth in volume and share within RE-sources for EU.EF.3 on one hand and decline in both categories for NA on the other. It should be noted that renewable municipal waste has become a very important RE-source within the EU.EF.3 sub-region with almost 5% share in RES. (Figures 22-23)

4. Volume and share of RE in total Gross Final Energy Consumption (GFEC) [PJ and %]

**Figure 24: Volumes and shares of RES in GFEC by sub-region
(2001, 2006, 2009-2011)**

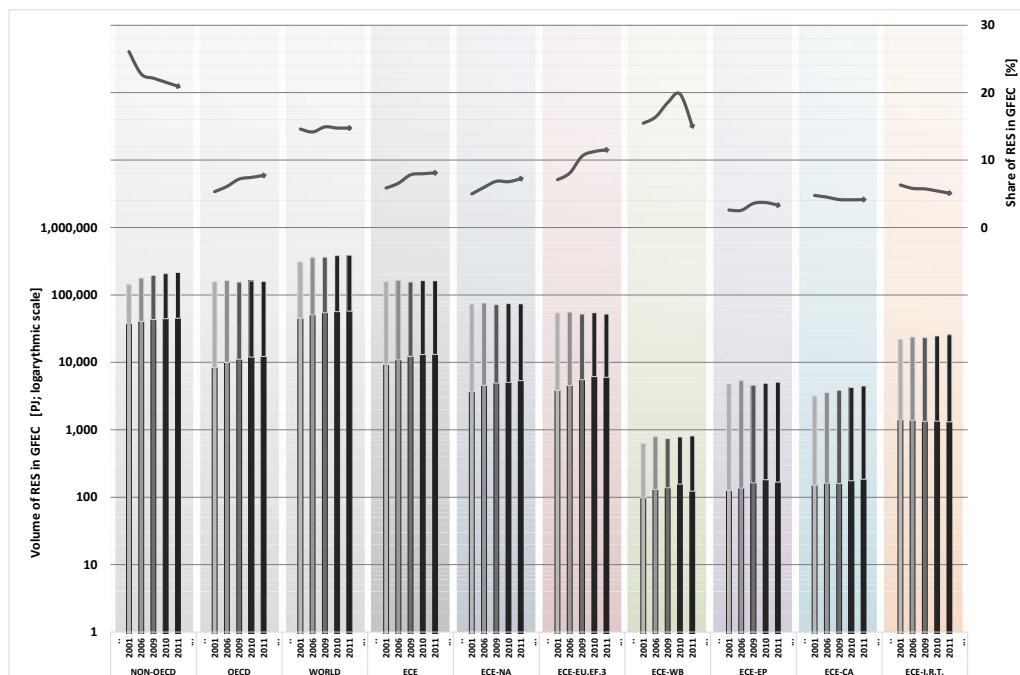
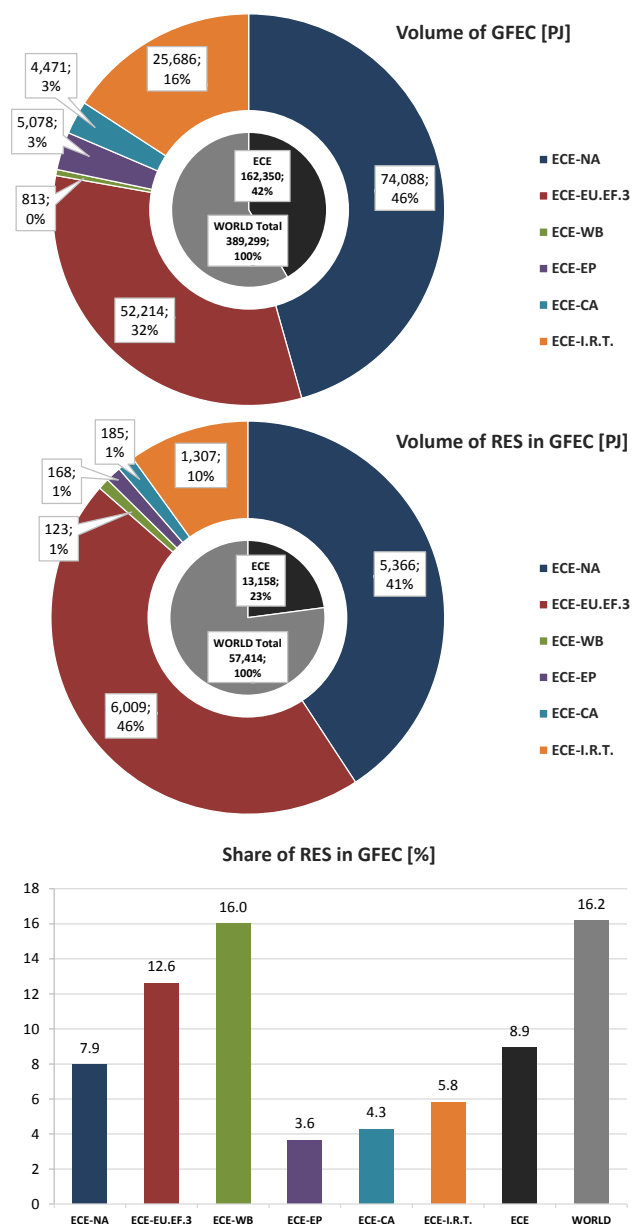


Figure 25: Volumes and shares of GFEC and RES in GFEC by ECE sub-region in 2011



The trends of the **share of RE-sources in Gross Final Energy Consumption (GFEC)** are very much similar to the trends of the share of RE-sources in PES, while the ratio depends on the country-specific ratios between PES and GFEC (in terms of GFEC/PES that can never fall below 1). The latter vary greatly in the ECE region (average value is around 1.4), ranging from below 1.1 in Tajikistan to more than 2.0 in Malta. (Figures 24-25)

Since accounting of the primary energy values of RE-sources tends not to deal with actual efficiency values of transformations (while it does so for most traditional technologies), its share in the GFEC is substantially higher than within PES - the ECE region's shares of RE-sources in PES and GFEC for 2011 are 7.5% and 8.1% respectively. For example, the accounted volume of PES of solar radiation needed for 10 MWh (36 GJ) of electricity delivered to the network from a solar PV installation is 36 GJ, even though the actual transformation efficiency of researched cell technologies appears not to exceed 50%, while the efficiency of

contemporary production installations in terms of the electricity on the network most probably does not exceed 5%.

5. Volume of electricity produced from RE (RES-E) and share in total electricity generation [TWh and %]

Figure 26: Volumes and shares of RES-E in Electricity Generation by sub-region (2001, 2006, 2009-2011)

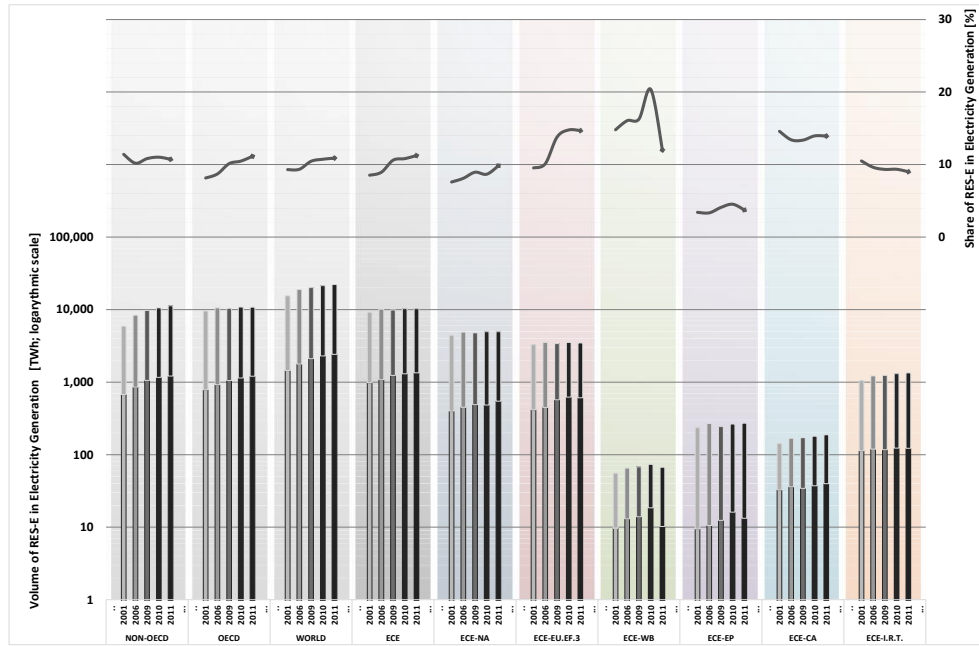
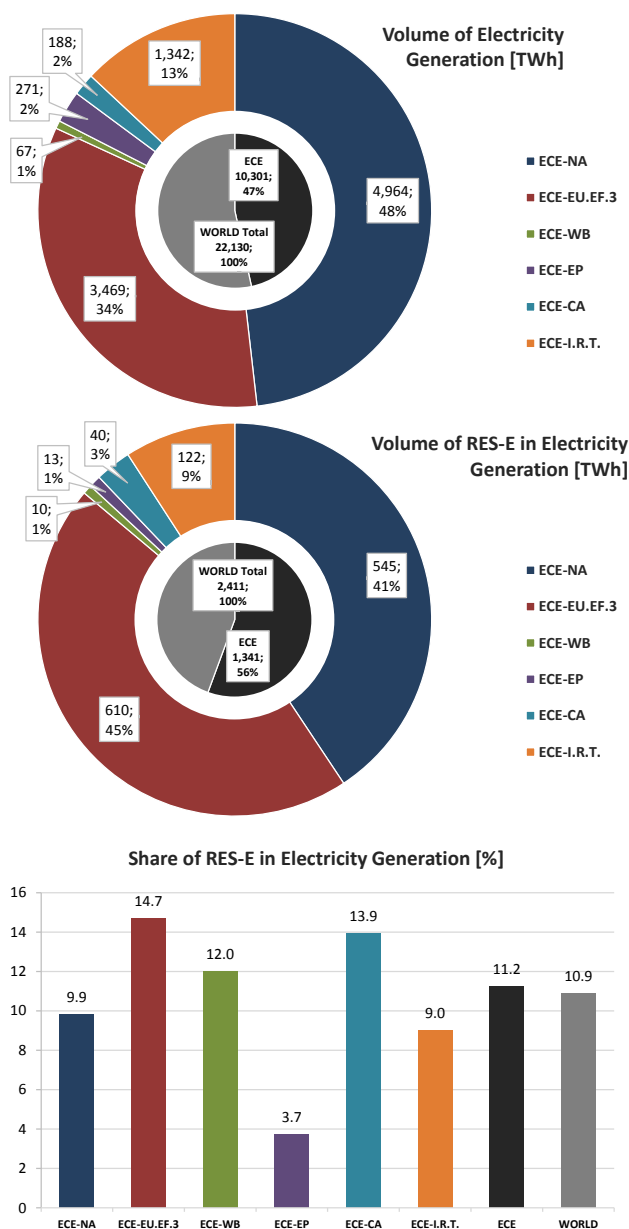


Figure 27: Electricity generation – total and from RES by sub-region in 2011

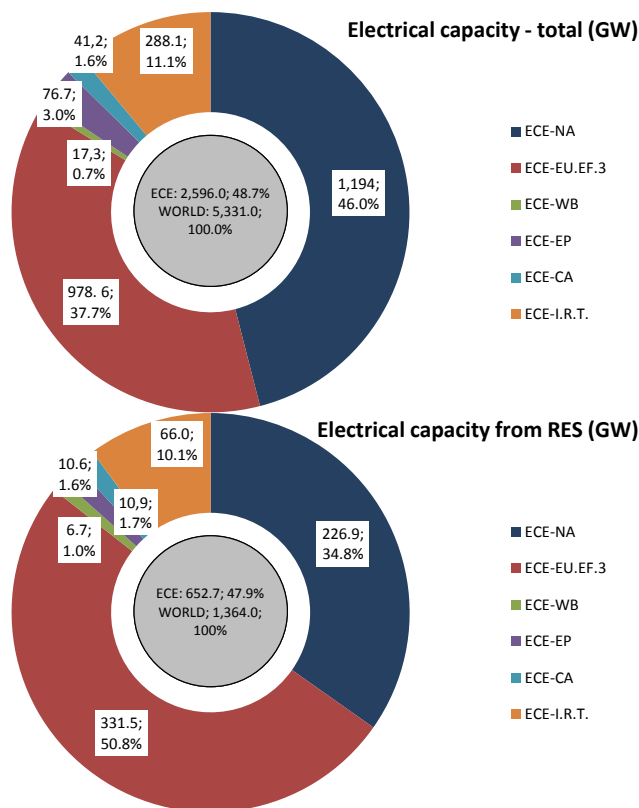


As for the **share of RE-sources in PES**, the correlation between electricity consumption growth and ability to maintain the levels of share of RE-sources appears to be reversed. (Figures 26-27)

The notable decreases in the respective shares of RE-sources electricity production in the WB and EP sub-regions is mainly the consequence of specific hydrological circumstances in the years 2010 (very good year) and 2011 (extremely dry year).

6. Installed RE-E capacities and its share in total electrical capacity [MW and %]

Figure 28: Installed electrical capacities – total and from RES in 2011



In 2010, there was 2,596 GW of total power generation capacity installed in the ECE region, which represented 48.7% of global power generation capacities - 5,331 GW. The respective shares of RES-E in these figures were nearly the same - 25%. The RES-E capacity amounted to 652.7 GW or 47.9% of global capacities (1,364 GW). As regards conditions within the ECE region, half of RES-E capacities were installed in EU.EF.3 (331.5 GW), followed by NA (226.9 GW, 34.8%), I.R.T. (66.0 GW, 20.1%), while the other 3 sub-regions contributed with 28.2 GW (4.3%).

Global RES-E capacities have increased from 1,364 GW at end-2011 to 1,561 GW at end-2013 (net addition of 197 GW - increase by 14.4% or 7.0%/yr of average growth rate). In absolute terms, wind contributed with major capacity addition of 80 GW, followed by solar PV (practically doubled from 70.0 GW to 139.0 GW), hydropower - 30 GW, bio-power (16 GW) etc. Concentrated solar thermal power (CPS) still represents a minor share in total RES-E (0.2% in 2013), however, it remains a promising technology with great potential for further large-scale deployment in specific geographical parts of the world. Visible growth can be noticed in bio-power technologies (10.6%/a). Geothermal power has somehow stagnated while no visible progress has been obviously achieved in ocean power.

In heating/hot water production area, capacity addition were less remarkable compared to RES-E, from 580 GWth to 645 GWth in total (net addition of 65 GWth - increase by 11.2% or 5.5%/yr of average growth rate). Also, capacities for transport biofuels (bioethanol and

biodiesel) production were developing rather slowly, from 108 billion litres/year to 116 billion litres/yr capacity (net addition of 8 billion litres/yr - 7.4% or 3.6% of average growth rate)

1. **Wind power:** At end-2013, there were 8 ECE member States among the top 10 countries of the world: United States (61.1 GW), Germany (34.7 GW), Spain (23 GW), United Kingdom (10.5 GW), Italy (8.6 GW), France (8.3 GW), Canada (7.8 GW) and Denmark (4.8 GW), which contributed 158.8 GW in total that represented 49.9% of global capacities (318 GW).
2. **Solar PV:** At end-2013, there were 7 ECE member States among the top 10 countries of the world: Germany (35.9 GW), Italy (17.6 GW), United States (12.1 GW), Spain (5.6 GW), France (4.6 GW), United Kingdom (3.3 GW) and Belgium (3.0 GW), which contributed 82.1 GW in total that represented 59.1% of global capacities (139 GW).
3. **Concentrated solar thermal power (CSP):** At end-2013, there were 2 ECE member States among the top 10 countries of the world: Spain (2,300 MW) and United States (882 MW), which contributed 3,182 MW in total that represented 93.0% of global capacities (3,425 MW).
4. **Hydropower:** At end-2013, there were 3 ECE member States among the top 6 countries of the world: United States (78 GW), Canada (76 GW) and Russia (47 GW), which contributed 201 GW in total that represented 20.1% of global capacities (1,000 GW).
5. **Geothermal power:** At end-2013, there were 2 ECE member States among the top 6 countries of the world: United States (3.4 GW) and Italy (0.9 GW), which contributed 4.3 GW in total that represented 35.8% of global capacities (12.0 GW).
6. **Solar water heating collectors:** At end 2012, there were 7 ECE member States among the top 12 countries of the world: United States (16.2 GWth), Germany (11.8 GWth), Turkey (10.8 GWth), Austria (3.4 GWth), Israel (2.9 GWth), Greece (2.9 GWth) and Italy (2.4 GWth), which contributed 50.4 GWth in total that represented 17.9% of global capacities (282 GWth).
7. **Biofuels production:** At end-2013, there were 8 ECE member States among the top 16 countries of the world: United States (55.4 bill. litres/yr), Germany (3.9 bill. litres/yr), France (3.0 bill. litres/yr), The Netherlands (2.5 bill. litres/yr), Canada (2.0 bill. litres/yr), Poland (1.2 bill. litres/yr), Belgium (0.8 bill. litres/yr) and Spain (0.7 bill. litres/yr), which contributed 69.5 bill. litres/yr in total that represented or 59.6% of global capacities (116.6 bill. litres)

7. Volume and share of RE for heating/cooling [PJ and %]

Figure 29: Volumes and shares of RE for Heat (RES-H) in heat generation by sub-region (2001, 2006, 2009-2011)

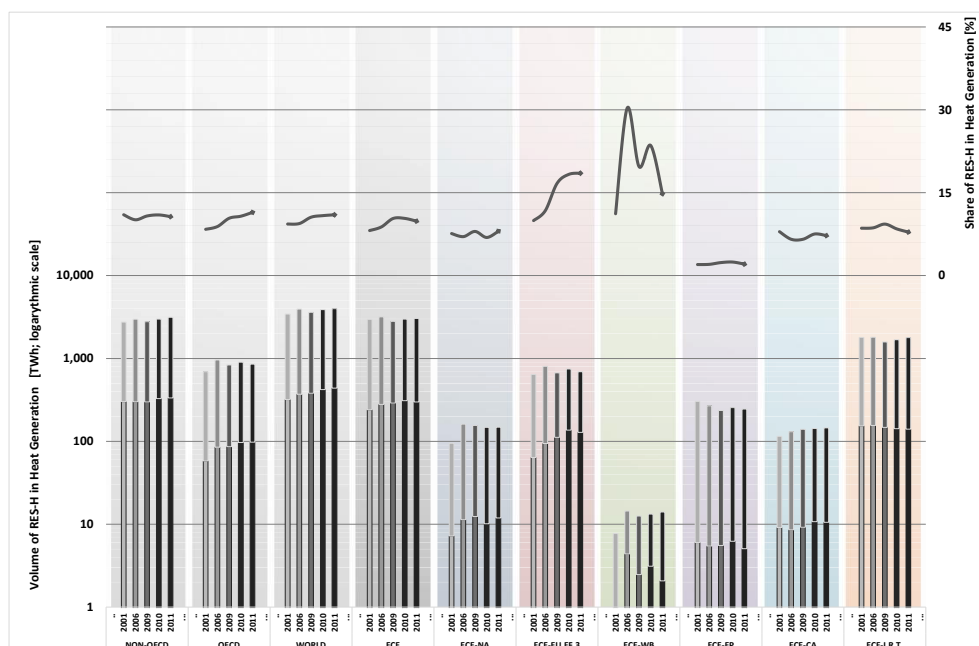
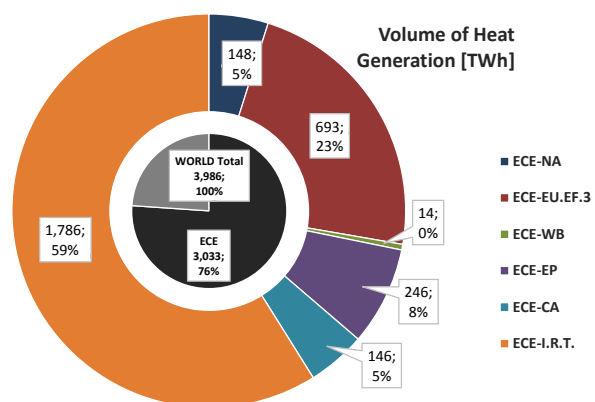
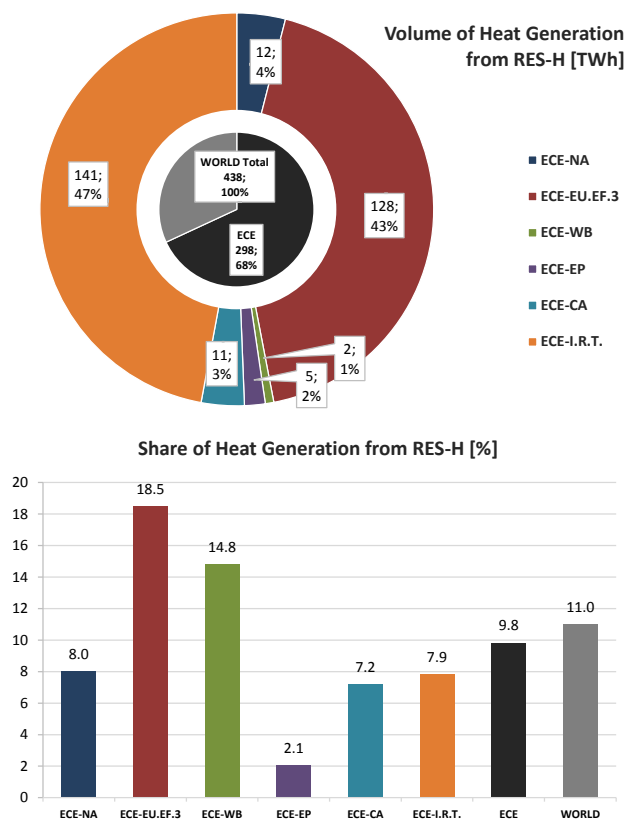


Figure 30: Heat generation – total and from RES by sub-region in 2011





Heat production (comprising uses for heating and cooling) in its larger part generally follows the residential needs caused by the weather, but the correlation of RES' and other sources' volumes appears to be very weak; only vaguely and not even consistently following the trend over preceding year. (Figures 1.29-1.30)

8. Volume and share of RE (biodiesel and bioethanol) in transport [PJ and %]

Figure 31: Volumes and shares of Biodiesel and Biogasoline in Total Transport Consumption by sub-region (2001, 2006, 2009-2011)

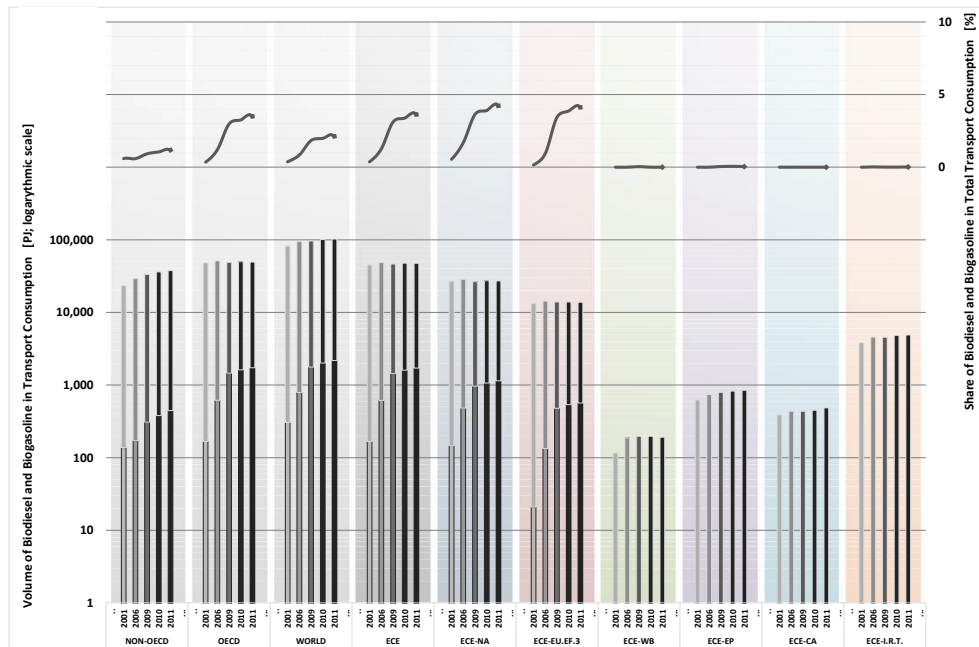
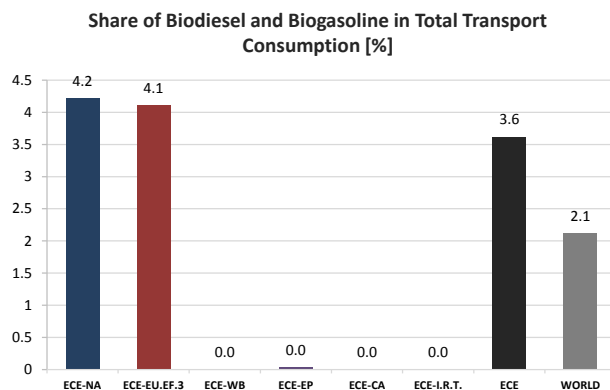
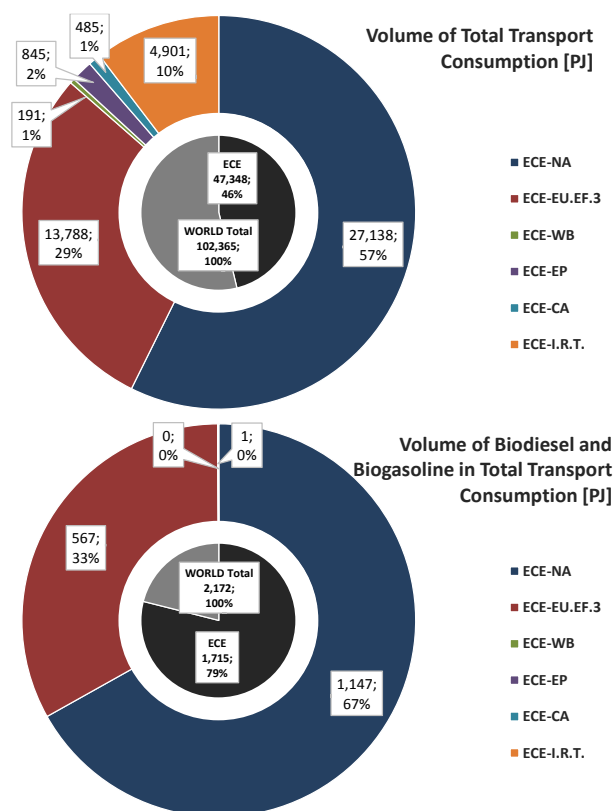


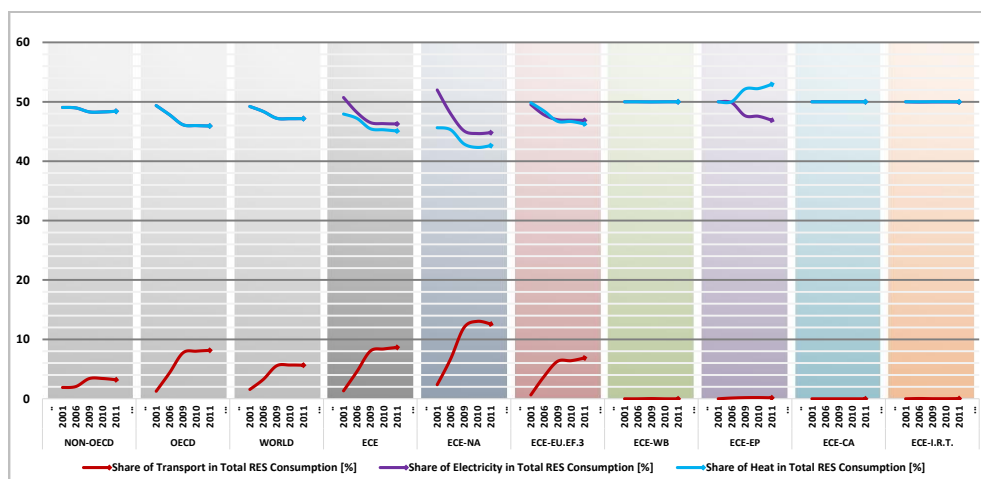
Figure 32: Total Transport Consumption and share of Biodiesel and Biogasoline by sub-region in 2011



EU and CPs to ECT (Energy Community countries) have introduced minimal target shares of 10% RE-sources in transport by 2020, which is mandatory for every country and most of it shall come from biofuels (bioethanol and biodiesel). Besides the EU.EF.3 region these targets will, through respective Energy Community countries influence also the WB and the EP sub-regions in the future. (Figures 31-32)

9. Utilisation of RE by purpose (power generation, heating/cooling and transport) [PJ and %]

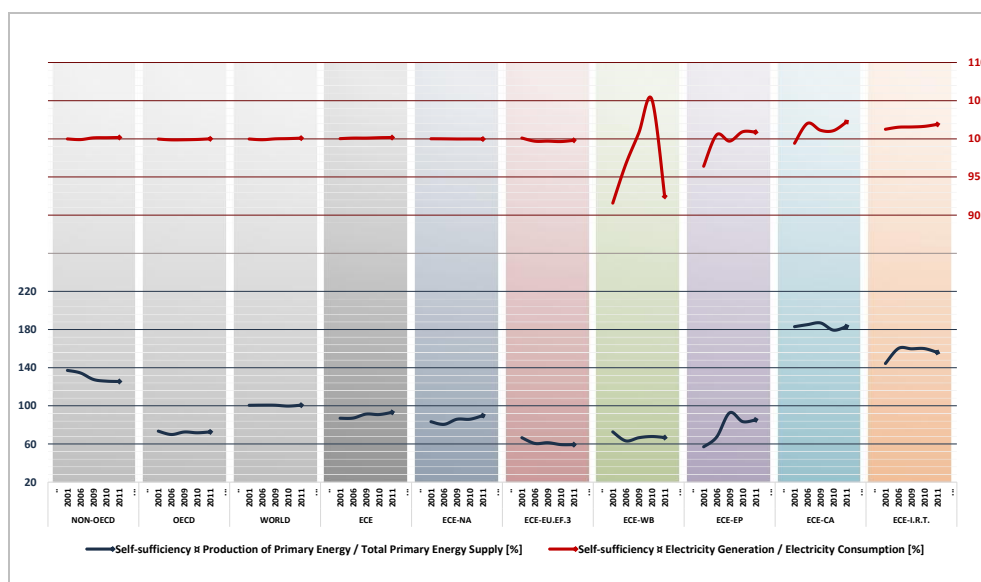
**Figure 33: Shares of Transport, Electricity and Heat in Total RES Consumption by sub-region
(2001, 2006, 2009-2011)**



There appears to be a very strong link between the RE-sources consumption for electricity and heat (note the perfectly overlapping trends of the two sectors for WORLD, OECD, NON-OECD regions and the WB, CA and I.R.T. sub-regions in the above figure), except in the EP sub-region, where they diverged from 2006 onwards. (Figure 3)

10. Percentage of overall energy and electricity self-sufficiency [%]

**Figure 34: Self-sufficiency in Primary Energy Supply and Electricity Generation by sub-region
(2001, 2006, 2009-2011)**



The ECE region as a whole is very well balanced in terms of electricity production and a bit less in terms of PES, but the trend in the latter is an optimistic one and also substantially better than the one for OECD. (Figure 34)

The situation in individual sub-regions varies greatly with the most notable oscillations in electricity self-sufficiency in WB that has primarily been caused by the hydrological circumstances in the years of 2010 and 2011. The CA and the I.R.T. sub-regions are huge exporters of PES and also of electricity, while the EU.EF.3 sub-region reaches only 60% self-sufficiency in PES, the lowest within the ECE region.

II. Renewable energy potentials

1. Used definitions and their practical meanings

The word “potential” in connection with renewable energy is subject of vivid and often disputed debates, depending on the motives the parties promote their assessment. It can vary considerably, therefore, the definitions, applied methodologies and assumptions should be explained by those that assess it.

The RE-potential is usually observed as **renewable energy resource (RER) potential** – as assessment of the content, conditions and terms under which energy from renewable sources found in nature can be exploited.

The approach to the RER potential differs, depending on the type of RES: wind, solar, hydro, biomass, geothermal and ocean. Endowment with renewable energy sources (RES) of a country is natural wealth, and depends on specific geomorphologic, geographical, climate and weather conditions typical for a country, which is beyond our control. The maximum ability to benefit from RE-sources is determined as **theoretical potential**. Depending on locally specific conditions over the year expressed in terms of average wind speed at a reference height of e.g. 50 m a.g.l. (m/s), solar radiation on a horizontal surface (kWh/m²,y) and hydrological conditions in terms of water flows (m³/s), the actually available RE-capacity vary considerably over time. There are periods of no energy yield, of limited and intermittent energy production (wind, hydro, solar) and very short periods with maximum rated energy output. Therefore, the capacity factors are often quite low (solar PV 0.15-0.20 and wind 0.25-0.3) as compared to traditional fossil-fuelled power plants (approx. 0.75). Knowledge of the above specific conditions is necessary for selection of the best sites and design of RE installations. However, from the annual energy supply perspective, the planned annual energy output (kWh/year) is a standard main input for assessing the profitability of a RE project.

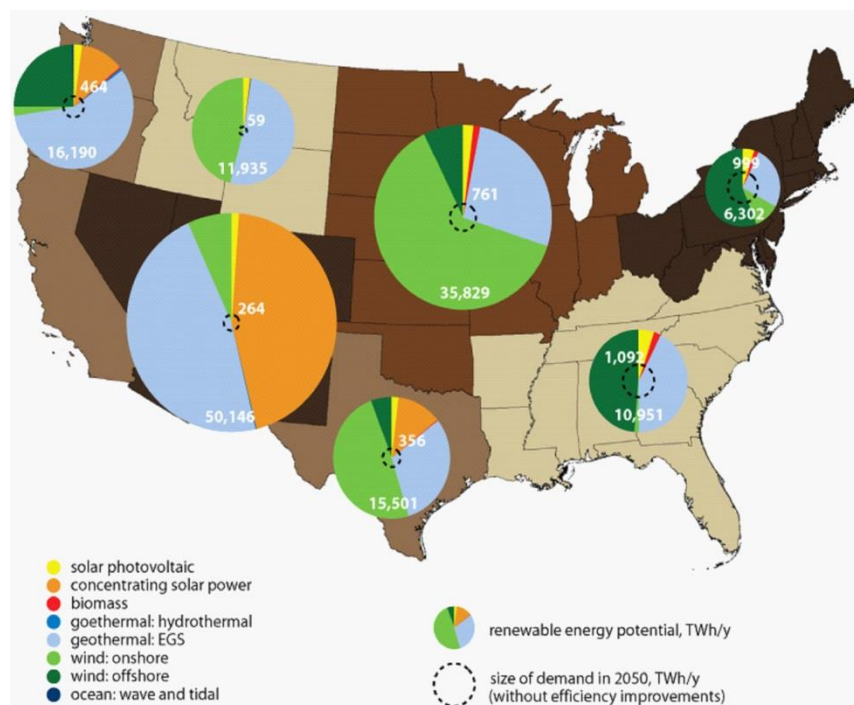
Theoretical potential has very limited practical value, as numerous limitations apply, from spatial planning (e.g. protected zones – national parks, other infrastructure, water supply and agricultural areas, living habitats and recreation areas etc.), technical, environmental, economic and market. Consequently, theoretical potential is gradually downsized to the reality – actual potential. More often used terms are **technical, economical and exploitable / sustainable / market potentials**, for which establishment the above spatial planning constraints as well as others development planning related requirements have been considered. Thus, technical potential particularly assumes the application of a portfolio of presently available mature technologies. When assessing technical potential, both supply and demand options are to be analysed, for example, should RE-sources be used for power generation, heating/cooling, in transport or be an option for off-grid electrification of remote areas. Economic potential is then that part of technical potential, which is economically feasible and financially viable in the prevailing present and foreseeable future conditions. Finally, for assessment of market potential, one should consider also locally specific market conditions, possibly within the competitive environment and various impediments related with “making business” in a country. In many cases, assessments of RE potentials do not explicitly mention the pertaining conditions and assumptions behind. Therefore, the assessments remain vague and speculative.

The assessment of renewable energy potentials entail thorough analytical work, international cooperation and high level of transparency in used assumptions and input data. For comparative reasons, it is essential that reference and comparable methodologies are used. The Global Atlas of Solar and Wind, a joint on-going project of IRENA and UNEP, working closely with other

international institutions, is planned to provide a reference tool for effective deployment of RE technologies in this area. However, this would be still just the starting point for more reliable determination of the most promising locations, while further country specific analysis will be required to assess the actual potential for wind and solar in individual ECE member States.

In illustration and as an example the renewable energy potential of the USA is shown in Figure 35.

Figure 35: Example of renewable energy potential of the USA



2. Indicative RE-sources potentials by RE sub-sector and ECE Member State

RES potentials, described in a qualitative rather than quantitative manner have been obtained from IRENA, Renewable Energy Country Profiles (www.irena.org). The results by country are summarized in Table 1 in the following. The RE-potential is indicated as High, Medium, Low, Unknown or Not applicable for each RE sub-sector and ECE Member State.

As reported, the RE-potentials are based on analysis done by IRENA, without further details. It is to believe that various reports and information sources have been consulted for each country. However, such documents often contain certain discrepancies because they based on different methodologies, assumptions and date of production. To determine the qualitative level of the country thus eventually remain rather arbitrary. Differences between the country approaches are also probable.

Therefore, the ranges of classified potentials in Table 1 should be treated as indicative and for orientation purposes only. Nevertheless, they do provide certain magnitude regarding which RE sub-sector is promising and which not or to a lesser extent in a respective ECE Member State. The results are statistically reported and shown in Table 2 and Figure 36, respectively, which provides the distribution of RE-potential by sub-region and RE sub-sector. It is done by indicating the number of countries per sub-region with a certain level of RE potential in a RE sub-sector.

In the ECE region as a whole, the **RE-potential** is assessed as High in the following number of countries: hydro -: 39 (75%), wind - 38 (73%), biomass 29 (56%), solar - 22 (42%), geothermal - 21 (40%) and ocean - 11 (21%). In maximum 15-18 (32%) countries, the RE-potentials for biomass and solar are assessed as Medium. Low potentials are attributed to not more than 8 (15%) countries, in ocean, geothermal and hydro. Most unexplored potentials, where the RE-potential are Unknown, are for ocean (22 countries) and geothermal (14 countries). The RE-potential is not applicable only in countries with no access to sea (12) and no natural conditions to develop hydro (1). Based on that, the ECE region shall be regarded as highly promising region on the Earth to deploy nearly any kind of RE technologies. However, further research and field surveys (biomass), measurements (hydro, wind) and exploratory drilling (geothermal) is required to permanently improve the renewable energy resource assessment. In addition, feasibility studies are required, based on application of the state-of-art RE technologies and updated data on costs in order to refresh the assessment of technical and economic potentials in all RE sub-sectors and applications (power generation, heating/cooling, transport, provision of electricity and heat to areas with no access to modern energies etc.).

Table 1: Indicative qualitative assessment of renewable energy potential by RE type and ECE Member State

	Country	RES Potential					
		Wind	Solar	Hydro	Biomass	Geothermal	Ocean
	Northern America						
1	Canada						
2	United States of America						
	European Union						
1	Austria						n.a.
2	Belgium						
3	Bulgaria						
4	Croatia						
5	Cyprus						
6	Czech Republic						n.a.
7	Denmark						
8	Estonia						
9	Finland						
10	France						
11	Germany						
12	Greece						
13	Hungary						n.a.
14	Ireland						
15	Italy						
16	Latvia						
17	Lithuania						
18	Luxembourg						
19	Malta			n.a.			
20	Netherlands						
21	Poland						
22	Portugal						
23	Romania						
24	Slovak Republic						n.a.
25	Slovenia						
26	Spain						
27	Sweden						
28	United Kingdom						
	European Free Trade Association						
1	Iceland						
2	Lichtenstein						
3	Norway						
4	Switzerland						n.a.
	Western Balkans						
1	Albania						
2	Bosnia and Herzegovina						
3	Montenegro						
4	Serbia						n.a.
5	FYR of Macedonia						n.a.
	Eastern Partnership						
1	Armenia						n.a.
2	Azerbaijan						
3	Belarus						n.a.
4	Georgia						
5	Republic of Moldova						n.a.
6	Ukraine						
	Central Asia						
1	Kazakhstan						
2	Kyrgyzstan						n.a.
3	Tajikistan						n.a.
4	Turkmenistan						
5	Uzbekistan						
	Others						
1	Andorra						
2	Israel						
3	Monaco						
4	Russian Federation						
5	San Marino						
6	Turkey						

Source: IRENA Renewable Energy Country Profiles (www.irena.org, July 2014).

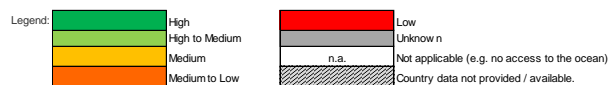
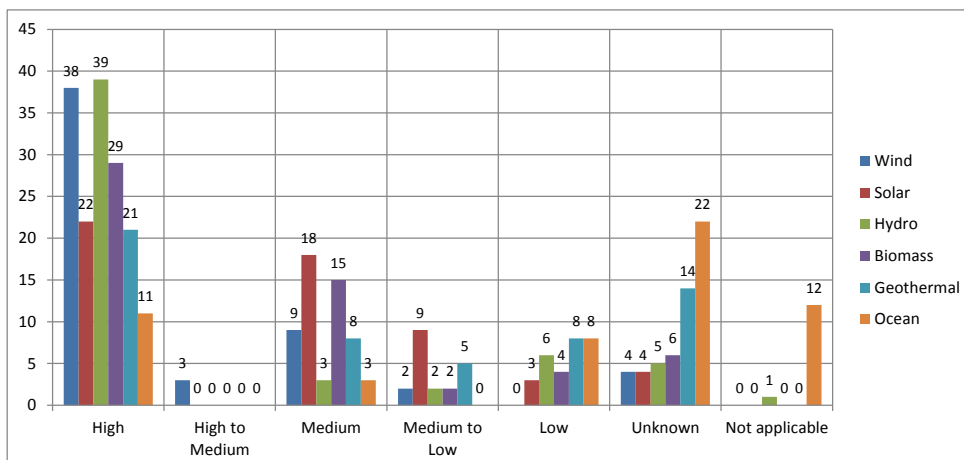


Table 2: Statistics on indicative assessment of renewable energy potential by RE type and sub-region

Sub-region	High	High to Medium	Medium	Medium to Low	Low	Unknown	Not applicable
WIND							
ECE-NA	2						
ECE-EU.EF.3	22	2	5	2		1	
ECE-WB	4		1				
ECE-EP	3	1	2				
ECE-CA	4		1				
ECE-I.R.T.	3					3	
ECE-region	38	3	9	2		4	
SOLAR							
ECE-NA	1		1				
ECE-EU.EF.3	11		8	9	3	1	
ECE-WB	3		2				
ECE-EP	1		5				
ECE-CA	4		1				
ECE-I.R.T.	2		1			3	
ECE-region	22		18	9	3	4	
HYDRO							
ECE-NA	2						
ECE-EU.EF.3	20		2	2	6	1	1
ECE-WB	4						
ECE-EP	5		1				
ECE-CA	5						
ECE-I.R.T.	2					4	
ECE-region	39		3	2	6	5	1
BIOMASS							
ECE-NA	2						
ECE-EU.EF.3	18		8	2	2	2	
ECE-WB	2		3				
ECE-EP	2		2		1	1	
ECE-CA	3		1		1		
ECE-I.R.T.	2		1			3	
ECE-region	29		15	2	4	6	
GEO THERMAL							
ECE-NA	2						
ECE-EU.EF.3	14		5	2	5	6	
ECE-WB	1		1	1	1	1	
ECE-EP	1		2	1	2		
ECE-CA	1					4	
ECE-I.R.T.	2			1		3	
ECE-region	21		8	5	8	14	
OCEAN							
ECE-NA	2						
ECE-EU.EF.3	9		3		6	9	5
ECE-WB					1	2	2
ECE-EP						3	3
ECE-CA						3	2
ECE-I.R.T.					1	5	
ECE-region	11		3	0	8	22	12

Note: Data for 4 ECE member States (Andorra, Lichtenstein, Monaco, San Marino are not available.

Figure 36: Number of ECE member States by certain qualitative level of renewable energy potential



III. Strategic planning and implementation of renewable energy policies

For successful implementation of development plans of a country in the renewable energy (RE) field, there are certain best practices with respect to the “process from energy system planning phase to the implementation”, which can be depicted in a simplified manner by the (6) stages as outlined in the following.

1) **Political commitment:** Denotes the starting or departure point when a responsible Government becomes aware of a need and priority to promote renewable energy and announces its commitment to achieve progress and indicated goals in foreseeable future (e.g. by 2020) publicly. The line ministry responsible for energy/RE (“the Ministry”) is charged with the preparation of RE strategies & policies and implementation frameworks. Promotion of renewable energy needs strong support and direct government involvement because of a need for strategic cooperation between the public and the private sector.

2) **Analytical work:** Necessary background studies are launched by the responsible Ministry with a purpose to ascertain the current situation and development opportunities, establish energy demand/supply scenarios, set possible strategic targets, objectives and goals, all covering a long-term planning time horizon.

For the purpose of preparing this report, we have not checked and analysed the individual country’s political commitment and analytical work undertaken but rather reviewed the results thereof in the next stage.

3) **Preparation and adoption of strategic planning documents:** Based on results of the analytical work, the Ministry, in close collaboration with other stakeholders in a country and in close consultation with the broader public, coordinates a process that so-called strategic planning documents of adequate scope and quality are prepared. This task is undertaken through several steps, from preparation of e.g. so-called “Green Book” (discussion paper) to “White Paper” (policy paper). Strategic assessment of possible environmental and social impacts (SESA) is part of this process. The strategy documents typically cover at least a 10-15 year planning period (i.e. by 2025-2030 at present). Several rounds of public consultations represent a standard communication/coordination mechanism between the involved parties. Depending on the legal framework of the country, the final documents are approved either by

Government (executive branch⁴) or even by Parliament (legislative branch) because energy economy has cross-sectoral implications on national economy, environment, mitigation of climate change, spatial planning, social welfare of population etc. As a follow-up to the adopted White Paper, the Ministry coordinates the preparation of the Action Plan for the implementation thereof. The Action Plan determines further details relating to the implementation frameworks required (e.g. institutional & organisational, legal & regulatory, economic- & social etc., as well as specific implementation policies), split responsibilities between the participating institutions including deadlines, determine indicators for regular monitoring and verification of progress, and define the likely programmes and projects including costs by (sub)sector). The Action Plans are typically adopted by Government as its operational tool for implementation thereafter. In summary, formal strategic planning documents thus include policy and strategy documents, and the associated action or implementation plans (e.g. NREAPs).

4) **Institutional & organisation framework:** As abovementioned, an adequate framework of this type is required for successful implementation of any renewable energy strategy. Typical elements of such framework are (i) policy making authorities (usually Ministry or its specialised Department responsible for RE, supported by specialised state agencies in some countries), other relevant ministries (e.g. in charge of transport, construction, spatial planning, environment and climate change); (ii) national regulatory authority (NRA), (iii) renewable energy funds of various type, (iv) relevant energy market operators, and finally (v) electricity, heat, oil and gas industry undertakings that buy and resell electricity, heat and biofuels/bioliquids/biogas produced from RE.

Due to rapidly changing environment in this area, assessment of adequacy and capacities of institutional & organisational frameworks in place in individual ECE member States is not addressed in this report.

5) **Legal & regulatory framework:** According to general practices, allocation of institutional responsibilities, tasks, and activities with “material consequences” that requires careful budgeting and regular raising of funds has to be determined in primary legislation (adopted by Parliament), while implementation methodologies, procedures and rules in secondary legislation (adopted by Government or responsible ministries).

The area of renewable energy can be either part of separate sectoral legislation relating solely to renewable energy or as an integral part of much broader horizontal-type laws like law on energy or similar. Practices in the ECE member States differ considerably. Numerous implementation policies (e.g. establishment of regulatory measures, support / subsidy / financing / FIT / REC / specific RE-fund and many others) are determined in secondary legislation.

Technical rules like e.g. market rules, grid codes, standards and norms, power purchase agreements or tender documents and similar, have a similar status. Depending on the nature of documents, they are typically adopted in direct close collaboration between the industry undertakings and the NRA, based on the set jurisdiction of the involved parties.

The state of accomplishment of legal & regulatory framework in a country is of prime importance for investors striving for gaining confidence in the country’s RE-investment framework.

⁴ The executive branch is the part of government that has sole authority and responsibility for the daily administration of the state. The executive branch executes or enforces the law. The division of power into separate branches of government is central to the idea of the separation of powers. The separation of powers system is designed to distribute authority among several branches — an attempt to preserve individual liberty in response to tyrannical leadership throughout history. The executive officer is not supposed to make laws (the role of the legislative branch, e.g. Parliament) or interpret them (the role of the judicial branch – e.g. Court). The role of the executive is to enforce the law as written by the legislative branch and interpreted by the judicial system.

Finally, it is worth stressing that strategic planning documents under the aforementioned pt. 3 are not part of the legal & regulatory framework as it is often interpreted.

6) **Regulatory measures and support schemes for implementation of renewable energy policies:** These are the elements that are decisively necessary for successful uptake of RE-projects, by which RE investment projects can be implemented, new capacities eventually recorded, energy from renewable energy produced and policy targets from the pt. 3 accomplished. Its set-up and detailed terms and conditions represent major concerns to all RE investors. Because energy from renewable sources is in most cases more expensive than energy produced from fossil fuels, a typical private investor expects favourable conditions that would make his project economically viable and financially sufficiently attractive. On the other hand, the RE-sector of today is intensively integrated into daily public debates, political ambitions of individual countries and export oriented RE-industry.

International investors thoroughly assess the trade-offs between the investment risks and the available regulatory measures and support schemes in a country. For this type of information it is very important to be: comprehensive, reliable, sufficiently detailed and up-to-date. None of the investors is interested in historic developments but in likely or preferably guaranteed conditions in the next 10-15 years.

Based on above, the report provides information on Baseline Conditions with respect to:

- Strategic planning documents in Section 1.4.1;
- Legal & regulatory framework in Section 1.4.2;
- RE-related concrete targets in Section 1.4.3; and
- Regulatory measures and support schemes in Section 1.4.4.

To the extent possible, overviews of the existing situation (as per available information in August 2014) and relevant observations are included in the main part of the report, while all country specific details, extracted from the mentioned sources used, are provided in Annexes 3-6.

1. Strategic planning documents

As per prevailing general legal practice at least in the EU MSs, it is up to the MSs to decide what strategic planning documents are needed to suit best the governance of the energy sector. There are countries, where an obligation for preparation and regular update of the national energy strategy is stipulated in primary legislation, somewhere in secondary legislation, and there are countries with no legal obligations of this kind. As a consequence, there are countries with very sophisticated set up of strategic planning documents and those with practically no formally adopted strategies. Also, the scope, level of detail and general coverage of documents vary considerably, from quite general ones to those with quantified details. Often, there is quite vague split between the strategy documents and the action plans, even considerable overlapping is often evident. Most countries have strategies for the development of the energy sector as a whole with renewable energy being an integral part, and only a few have specific RE-sector strategies as separate standalone documents.

Our report lists most important strategic planning documents of the above type adopted by individual ECE Member State. Table 3 shows statistics about the type of strategic planning documents by country and sub-region since the Rio Conference (1992). The exact content and the adoption year of respective documents are shown in further detail in Table A5.1 in Annex 5.

Documents have been grouped in several categories. The results based on available data for 52 countries (the ECE region without Andorra, Lichtenstein, Monaco and San Marino) reveal the following summary conclusions:

- 1) **National energy strategies**; 32 countries (62%) have adopted long-term national “strategies” for the energy sector as a whole. Some countries call such documents “programmes” or “policies” as there are no international definitions in place. As a consequence, strategic planning documents exist in 35 countries (67%) altogether. Long-term energy strategies have been passed in all countries of the WB sub-region and in most AP and CA countries, while not more than 18 countries (56%) out of 32 EU.EF.3 countries have adopted strategies.
- 2) Preparation of **separate documents on RE strategies** is not widely practiced. Not more than 7 countries (13%), notably; Azerbaijan, France, FYR of Macedonia, Hungary, Montenegro, Slovak Republic and Spain have adopted such documents in the past.
- 3) **Strategic plans for RE sub-sectors** (e.g. wind, solar, hydro etc.); 16 countries (31%) have adopted sub-sectoral plans.
- 4) **Specific RE sub-sector programmes and investment plans** are present in 22 countries (42%).
- 5) **National Renewable Energy Action Plans (NREAP)** are the major documents that determine the long-term outlook for RE development, in most cases, by 2020. In EU MSs, NREAPs have been prepared and adopted in 2010 in line with provisions of the last RES Directive 2998/92/EC. They are mandatory to all EU MSs (28) and since 2012 also to the Contracting Parties to Energy Community Treaty (8). Till now, available data indicate that as many as 39 countries (75%) have NREAPs or similar. Apart from the mentioned countries, also Norway, Switzerland (both EU.EF.3) and Armenia (ECE-EA) have NREAPs. The European model of NREAPs is still missing in NA, CA, I.R.T, and non-EnC countries of the EP sub-region.
- 6) According to available information, **without sound RE-policy framework** in place remains Israel, Kazakhstan and Turkmenistan.

The ECE region is fairly well developed in terms of development and adoption of **strategic planning documents** in the area of renewable energy. Long-term energy sector development strategies have been prepared recently in most WB and EP countries, and NREAPs exist in 75% of ECE member States. The proactive policies of promoting energy from renewable sources in EU (20% of RE-sources in GFEC and 10% in transport in 2020) have motivated EU MS and CPS to the ECT to prepare and adopt adequate strategies and the associated action plans, some of them even concrete investment programmes or plans. However, similar approaches and demand for development of concrete RE-development goals at the national level should be promoted particularly in EP and CA. Considerable capacity building and support in establishment of organisational & institutional framework is required, too.

Table 3: Statistics on the type of strategic planning documents adopted in ECE member States

	Country	Overall energy sector strategy or policy	Separate renewable energy strategy	Strategic plans and initiatives in RE-subsectors	National RE action plans (NREAP)	RE standards / technologies and R&D	Specific RE-subsector programmes and investment plans	Other
	Northern America							
1	Canada							
2	United States of America							
	European Union							
1	Austria							
2	Belgium							
3	Bulgaria							
4	Croatia							
5	Cyprus							
6	Czech Republic							
7	Denmark							
8	Estonia							
9	Finland							
10	France							
11	Germany							
12	Greece							
13	Hungary							
14	Ireland							
15	Italy							
16	Latvia							
17	Lithuania							
18	Luxembourg							
19	Malta							
20	Netherlands							
21	Poland							
22	Portugal							
23	Romania							
24	Slovak Republic							
25	Slovenia							
26	Spain							
27	Sweden							
28	United Kingdom							
	European Free Trade Association							
1	Iceland							
2	Liechtenstein							
3	Norway							
4	Switzerland							
	Western Balkans							
1	Albania							
2	Bosnia and Herzegovina							
3	Montenegro							
4	Serbia							
5	FYR of Macedonia							
	Eastern Partnership							
1	Armenia							
2	Azerbaijan							
3	Belarus							
4	Georgia							
5	Republic of Moldova							
6	Ukraine							
	Central Asia							
1	Kazakhstan							
2	Kyrgyzstan							
3	Tajikistan							
4	Turkmenistan							
5	Uzbekistan							
	Others							
1	Andorra							
2	Israel							
3	Monaco							
4	Russian Federation							
5	San Marino							
6	Turkey							
	No. of countries	32	7	16	39	7	22	5
	Percentage of UNECE MSs	62%	13%	31%	75%	13%	42%	10%

Main sources: IRENA Renewable Energy Country Profiles, IEA/IRENA Policies and Measures Database, EU and EFTA member countries legislation related to RE.

2. Legal and regulatory framework

The report lists most important items of primary and secondary legislation by ECE Member State based on various sources (REN21, IRENA and others). However, due to rapidly developing and changing environment in this area, information provided may not always be comprehensive, reliable and up-to-date. Therefore, they should be regarded as indicative.

Table 4 shows statistics on the type of adopted legal and regulatory acts by ECE Member State that have been adopted since the Rio Conference (1992). The authors made their best endeavours to depict those that should be still valid as of today. For further country details, see Table A6.1 in Annex 6. Knowing the typical nature of permanently changing legal and regulatory framework, one has to conclude that information and data in this area cannot be reliable “by definition”. Therefore, they should be taken as indicative.

One source, REN21 Renewables Interactive Map, contains a comprehensive set of detailed information collected from numerous sources, e.g. IRENA, national RE agencies, IFIs etc. These include recent as well as probably some outdated information, as nobody can establish a clearly updated picture without his own research in the respective country, preferably directly in the field. Based on experience working in several EnC CPs, the authors experienced cases when there were disputes even between responsible institutions in its own country. Another source, IRENA Country Profiles, provides presumably up-to-date information, however with less transparency on used sources for individual information. And discrepancies with REN21 in some countries are obvious. In addition, own knowledge of the authors about the situation particularly in the EnC CPs was used by the authors when compiling Table 1.5.

Table 4 offers the following rough observations:

- 1) **Horizontal energy laws (or for a specific sector, e.g. electricity, gas, heat or climate protection) are recognisable in 34 countries (34%). Most energy laws have experienced regular updating in the observed period since 1992;**
- 2) **Separate laws on renewable energy at the national level exist in 21 countries (40%);**
- 3) **RE-framework regulations have been passed in 28 countries (54%). Presumably, information are most incomplete in this area as adoption of numerous regulations may not have been reported internationally;**
- 4) **Information that 34 countries (65%) have adopted feed-in tariffs / premium related regulations seems more reliable;**
- 5) **There are numerous decisions and regulations on various support schemes (grants, incentives, subsidies) that are adopted but many also amended / revised / suspended / terminated at short notices – another grave area in information collection;**
- 6) **Regulations on tradable Renewable Energy Certificates (REC) or Guarantees of origin are present in 14 countries (27%) but this information seems more reliable;**
- 7) **Fiscal measures (tax credits or EKO taxes) have been used in many countries (32 or 62%) as one of the most popular measures supporting RE;**
- 8) **Regulations on biofuels exist in 31 countries (60%), and;**
- 9) **Regulations on dedicated funds (RE, energy efficiency or EKO) in 13 countries (25%). Again, this information may not be reliable as some funds exist as integral part of ministries and only some have been established as separate legal entities based on government regulations or even separate law on fund establishment.**

Finally, it is evident that every investor will check in his own capacity the currently valid legal and regulatory regimes in a country of his potential RE-investment. This is another reason that one should not strive for perfect information because this is hardly possible and would demand substantial financial resources for the research of 56 countries of the ECE region. Inadequate state of legal and regulatory framework in a country is typically ranked highest on the list of

possible barriers for RE investment, before e.g. availability of financing schemes, political risk and similar.

Countries of the WB, EP and CA are least developed sub-regions where considerable improvements of the **legal and regulatory framework** are still awaited. In EnC CPs, for example, after transposition of Directive 2009/28/EC in primary legislation (delayed in several CPs), an adequate regulatory regime is still needed before the effective implementation could start. International technical assistance is demanded to achieve this goal.

Table 4: Statistics on the type of RE-relevant legal and regulatory documents adopted in ECE member States

	Country	Energy, electricity, heat, climate laws	Separate RE laws	RE-framework regulations	Regulations on feed-in tariffs / premiums	State support schemes (grants, incentives, subsidies)	Tradable REC / Guarantees of Origin	Fiscal measures (tax credits or EKO taxes)	Regulations on biofuels	Regulation on Funds (RE, EE or EKO)	Others
	Northern America										
1	Canada										
2	United States of America										
	European Union										
1	Austria										
2	Belgium										
3	Bulgaria										
4	Croatia										
5	Cyprus										
6	Czech Republic										
7	Denmark										
8	Estonia										
9	Finland										
10	France										
11	Germany										
12	Greece										
13	Hungary										
14	Ireland										
15	Italy										
16	Latvia										
17	Lithuania										
18	Luxembourg										
19	Malta										
20	Netherlands										
21	Poland										
22	Portugal										
23	Romania										
24	Slovak Republic										
25	Slovenia										
26	Spain										
27	Sweden										
28	United Kingdom										
	European Free Trade Association										
1	Iceland										
2	Liechtenstein										
3	Norway										
4	Switzerland										
	Western Balkans										
1	Albania										
2	Bosnia and Herzegovina										
3	Montenegro										
4	Serbia										
5	FYR of Macedonia										
	Eastern Partnership										
1	Armenia										
2	Azerbaijan										
3	Belarus										
4	Georgia										
5	Republic of Moldova										
6	Ukraine										
	Central Asia										
1	Kazakhstan										
2	Kyrgyzstan										
3	Tajikistan										
4	Turkmenistan										
5	Uzbekistan										
	Others										
1	Andorra										
2	Israel										
3	Monaco										
4	Russian Federation										
5	San Marino										
6	Turkey										
	No. of countries	34	21	28	34	26	14	32	31	13	12
	Percentage of UNECE MSs	65%	40%	54%	65%	50%	27%	62%	60%	25%	23%

Main sources: IRENA Renewable Energy Country Profiles, IEA/IRENA Policies and Measures Database, EU and EFTA member countries legislation related to RE.

3. RE-related targets

Targets are specific objectives and goals of a strategy, usually expressed in concrete quantitative terms, with a clear deadline for the achievement thereof. They can be formally adopted as binding governmental decision (“mandatory” targets) or they may just represent indicators contained in a wide range of legally non-binding strategic planning documents (“voluntary” targets). From the status of targets depends the real commitment for achievement thereof.

The main purpose of introducing targets is at least twofold: (i) demonstrate clear development policy commitment, and (ii) help establishing a system for monitoring and verification of progress towards fulfilment of the set objectives/goals. In order to accomplish that, one should first establish the starting point conditions in the base year, in by following a certain methodology, determine the appropriate targets in another year in the future as well as the development trajectories towards these goals. Targets should be chosen in a transparent and unambiguous way and have to be verifiable based on official and objective data. Targets shall be chosen in categories that are most sensitive for achieving visible progress in a given area. If necessary, targets should be subject of revision, should actual progress considerably deviate from the initial trajectories. Therefore, targets are typically introduced by government-type document of secondary legislation rather than introduced via primary legislation, which denotes flexibility.

The above approach of setting targets is within the spirit of the RES Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources. The EU MS had to transpose the directive in national legislation by 5 December 2010 while the EnC CPs (i.e. all WB countries and Moldova and Ukraine from EP) were supposed to bring into force the laws, regulations and administrative provisions necessary to comply with slightly amended terms of the directive by 1 January 2014. The directive contains two mandatory targets expressed in terms of shares of renewable energy:

- Minimal overall 20% **share of energy from renewable sources in gross final consumption of energy** (GFEC) in 2020 by the EU (however allowing individual MSs to have higher or lower targets depending on their baseline condition in 2005); and
- Minimal sectoral 10% **share of energy from renewable sources in energy consumption in transport** in 2020 by all EU Member States.

Apart from highly regulated EU MS and EnC CPs in terms of renewable energy and the associated targets, the situation and practices in individual ECE member States vary considerably. It is obvious that the applied targets are in line with three major areas of renewable energy utilisation: (i) power generation, (ii) heating / cooling) and (iii) transport). As a consequence, apart from the abovementioned two most typically applied targets in the ECE region, the other types of targets expressed in terms of shares include:

- **Share of renewable energy in Final Energy Consumption (FEC);**
- **Share of renewable energy in total Primary Energy Supply (PES);**
- **Share of electricity generated from RE-sources (RES-E) in total electricity generated** in a country;
- **Share of renewable energy in energy for heating and cooling.**

In addition, many countries have introduced targets related to **additional power and heat production capacities by RE sub-sector** (e.g. hydro, wind, solar, geothermal, ocean capacities etc.) and **produced energy volume** related targets for the same. In terms of timeframe, most

targets envisage 2020 as the target year, while only a few targets indicate explicitly the previous trajectory years or go beyond, even by 2050 (e.g. some Scandinavian countries).

Table 5 shows statistics on the type of targets introduced in ECE member States, while more comprehensive Table A7.1 in Annex 7 provides further details in quantitative terms for each target. Research has been based on information from REN21 (Renewable Interactive Map) and IRENA (Renewable Energy Country Profiles) as major data sources. However, the exact status of targets, whether mandatory or voluntary, often remains ambiguous.

Table 5: Statistics on the type of RE-related targets adopted in ECE member States

	Country	Primary energy supply	(Gross) final energy consumption	Generation or consumption (electricity)	Capacities (power generation)	Capacities or production (heating / cooling)	Transport
	Northern America						
1	Canada						
2	United States of America						
	European Union						
1	Austria						
2	Belgium						
3	Bulgaria						
4	Croatia						
5	Cyprus						
6	Czech Republic						
7	Denmark						
8	Estonia						
9	Finland						
10	France						
11	Germany						
12	Greece						
13	Hungary						
14	Ireland						
15	Italy						
16	Latvia						
17	Lithuania						
18	Luxembourg						
19	Malta						
20	Netherlands						
21	Poland						
22	Portugal						
23	Romania						
24	Slovak Republic						
25	Slovenia						
26	Spain						
27	Sweden						
28	United Kingdom						
	European Free Trade Association						
1	Iceland						
2	Liechtenstein						
3	Norway						
4	Switzerland						
	Western Balkans						
1	Albania						
2	Bosnia and Herzegovina						
3	Montenegro						
4	Serbia						
5	FYR of Macedonia						
	Eastern Partnership						
1	Armenia						
2	Azerbaijan						
3	Belarus						
4	Georgia						
5	Republic of Moldova						
6	Ukraine						
	Central Asia						
1	Kazakhstan						
2	Kyrgyzstan						
3	Tajikistan						
4	Turkmenistan						
5	Uzbekistan						
	Others						
1	Andorra						
2	Israel						
3	Monaco						
4	Russian Federation						
5	San Marino						
6	Turkey						
	No. of countries	12	36	29	24	18	35
	Percentage of UNECE MSs	23%	69%	56%	46%	35%	67%

Main sources: IRENA Renewable Energy Country Profiles, REN21 Renewable Interactive Map.

Based on Table 5, some suggested conclusions include:

- Horizontal cross-sectoral **(gross) final energy consumption related targets** are most popular targets that have been introduced in 36 countries (69%), followed by:
- Consumption-related **sectoral targets for renewable energy in transport** are in 35 countries (67%);

- Production-related **sectoral targets for the power sector**, either in terms of installed power generation capacities (24 countries – 46%) or electricity generation or consumption (29 countries – 56%);
- Production-related **sectoral targets for heating/cooling**, either in terms of capacity or energy, are present in 18 countries (35%);
- Horizontal cross-sectoral **primary energy related targets** have not been introduced in more than 12 countries (23%).

Based on experience from WB and EP, discussion on **strategy targets** represents a vivid topic in public debate and political arena, and a lot of misinterpretations are evident, including manipulation of the general public. However, targets as clear commitments of the state are necessary, but as few as possible and as clear as possible. Also, overlapping or duplications of targets should be avoided. Targets have to be set on realistic grounds and implications have to be thoroughly studied prior to governmental decisions. The public should be involved in consultations. Finally, all countries shall improve clarity and transparency on this subject in communications with media.

4. Regulatory measures and support schemes for implementation

For the analysis the datasets of REN21, IRENA and IEA/IRENA have been used⁵. REN21 database accounts for all, while IRENA and IEA/IRENA do so for more than 75% of the ECE Member States.

4.1 Support schemes and policy measures by REN21

REN21 publishes two major publications that have served as the primary source for the analysis in this section:

- **Renewables Global Status Report (GSR)**⁶, published annually, being the most referenced source of renewables policy information worldwide;
- **Renewables Interactive Map (MAP)**⁷, published continuously online.

Abovementioned primary sources have been extensively checked for inconsistencies one against the other and also against other sources, namely several types of information has been verified through IEA/IRENA Global Renewable Energy Policies and Measures Database and certain unclear information also against other sources. Cross-referencing the datasets with the IEA/IRENA on the 4 policies (“Feed-in tariff / Premium payment”, “Capital subsidy, grant, or rebate”, “Public investment, loans, or financing”, and “Tradable renewable energy certificate (REC)”) that can be perfectly aligned with IEA/IRENA (categories 121, 123, 123, and 132) following the strict criteria of applicability (if there is a reference in IEA/IRENA, REN21

⁵ Another relevant source of renewables policy and measures is the RES-legal website, but has been omitted in this analysis due to its limited focus, accounting for 33 countries altogether, of which 28 are EU Member States, 4 are EFTA members and Turkey. On the other hand, these are all ECE Member States as well, but the limitations were deemed too severe for a reasonable inclusion in our study that aims to present a balanced worldwide view of the ECE region.

⁶ REN21. 2014. Renewables 2014 Global Status Report (Paris: REN21 Secretariat), page 89; accessible on http://www.ren21.net/portals/0/documents/resources/gsr/2014/gsr2014_full%20report_low%20res.pdf

⁷ Accessible on <http://map.ren21.net>. On the subject of its background, the site itself states also the following: “Information presented in the Map is compiled from a variety of reports, databases, news announcements, and specific enquiries with official authorities. The Map is also populated with data collected over the course of the yearly formulation of the Renewables Global Status Report (GSR), the most referenced renewable energy report in the world. These sources are used to provide the most accurate and current information on renewable energy policies, targets, shares, installed capacity, and production.”

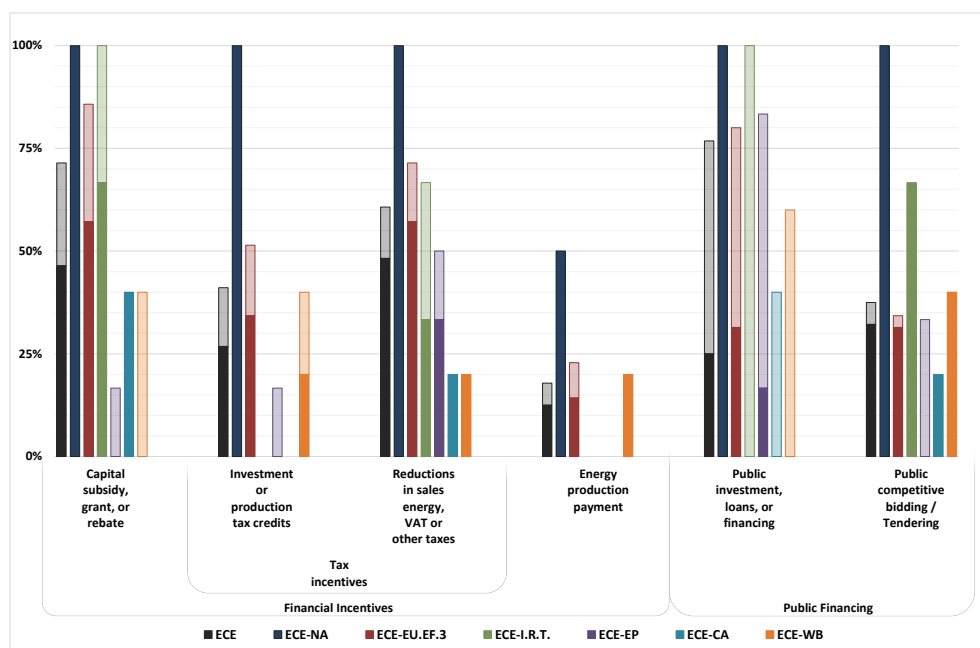
should have one as well; if no reference is made in the IEA/IRENA, REN21 should not refer to it as well) disputed 47 of the REN21 references and pointed at 10 of them missing.

This statistics is presented only to point out the huge gaps within and between the various sources of information. It is to serve as a reiteration of the need to treat the results within this report only as an indicative reference.

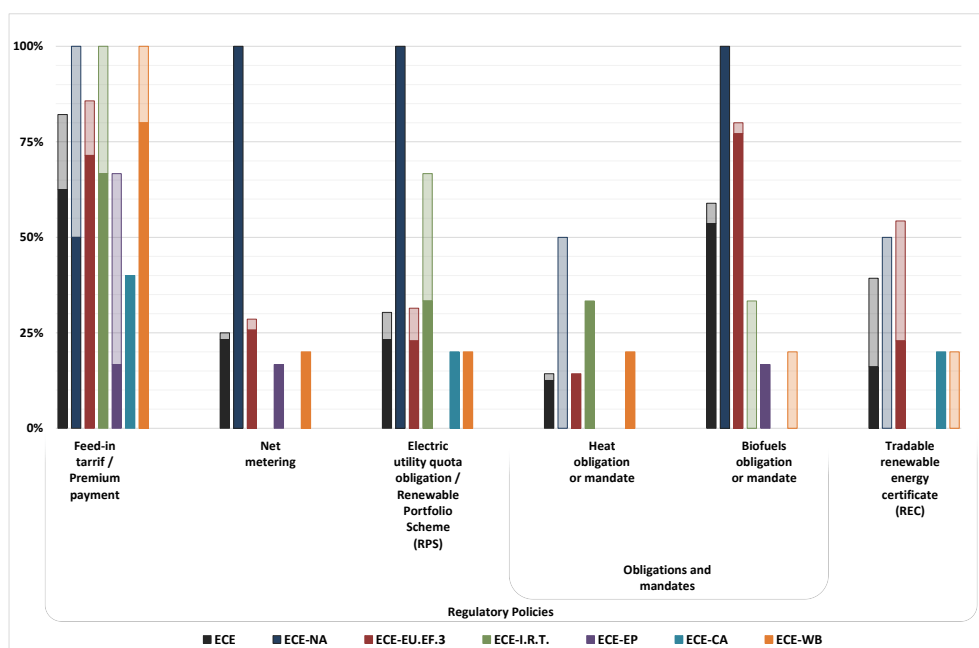
The discrepancies between the various datasets that nominally aim to deliver the same information, speak volumes on how difficult it is to establish and maintain a reliable source of internationally comparable information on the effective measures within the legal frameworks in force. Not even similar services by a single organisation are immune to these adversities, as the REN21's GSR and MAP show: out of almost 300 policies being referred to as applicable in the individual ECE Member States, 82% of the references are consistent between the two, MAP exclusively refers to applicability of 33 policies and GSR provides for the remaining 5 exclusive references. Taking into account the not-complete set of countries within IEA/IRENA (12 ECE Member States missing) and only four policies being cross-referenced, evaluated reliability of positive reference within a single REN21 report falls from 82% down to mere 30%.

The following two Figures 37-38 present the shares of countries in the ECE region and groups of countries with individual policy measures implemented; the first one presents them grouped by policy measures and the second one grouped by region/groups. Two policy measures ("Feed-in tariff / Premium payment" and "Reductions in sales energy, VAT or other taxes") are implemented in all 7 groups, with another one ("Public investment, loans, or financing") potentially joining them should the disputed references be cleared beneficially.

Figure 37: Renewable energy policy support measures in force (by share of countries in the ECE region and sub regions)



*Note: Lighter colour-fill part of the column denotes contradictions between the sources.
Main source: REN21 (Renewables 2014 Global Status Report and Renewables Interactive Map).*



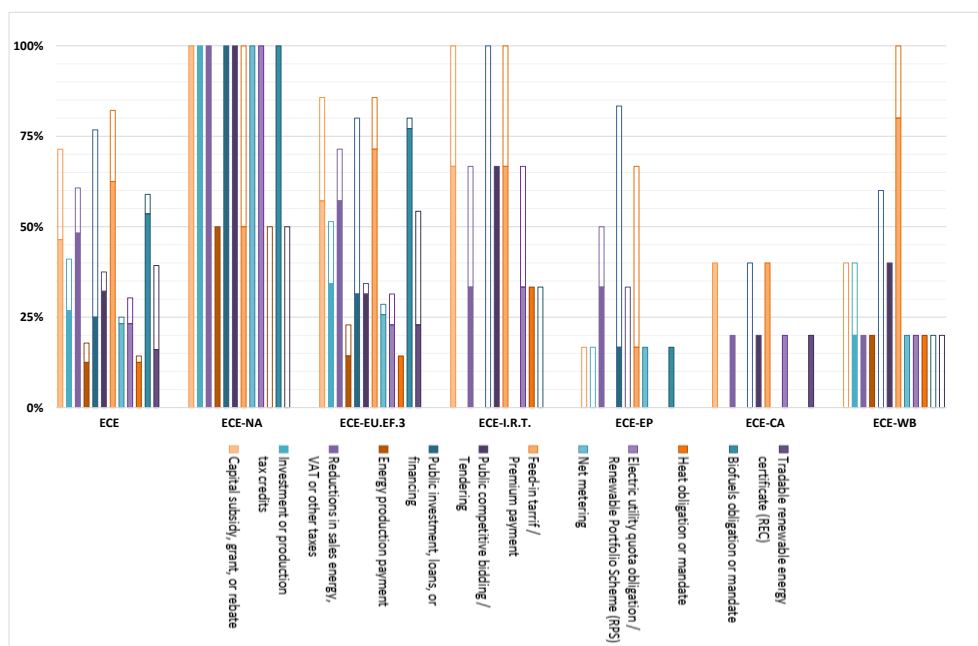
Note: Lighter colour-fill part of the column denotes contradictions between the sources.
Main source: REN21 (Renewables 2014 Global Status Report and Renewables Interactive Map).

The **TOP-4 renewables policy measures** in the ECE region exceeding 45% share in implementations are:

1. **Feed-in tariffs / Premium payments** with implementations in at least 61% and maybe up to 82% of ECE Member States. The recent developments, however, show a decline in their applicability, due to either suspension of the schemes (e.g. Czech Republic) or even their ex-post revocation (e.g. Spain).
2. **Biofuels obligation or mandate** implemented in 54% to 59% of ECE Member States.
3. **Reductions in sales energy, VAT or other taxes** with an implementation share between 48% - 61% in the region.
4. **Capital subsidy, grant, or rebate** implemented in between 45% and 71% of Member States.

An additional potential member of the 45% group is the Public investment, loans, or financing, that could be implemented in as much as 77% of the ECE Member States, but due to IEA/IRENA not backing most of the positive references within the REN21 sources, it landed at a minimum share of only 23%.

Figure 38: Renewable energy policy support measures in force (by share of countries in the ECE region and sub regions)



Note: Lighter empty-fill (upper) part of the column denotes disputed values among the sources. Main source: REN21 (Renewables 2014 Global Status Report and Renewables Interactive Map).

The sub-regions differ quite significantly in terms of renewable policies implementation (Table 6). If we take the average (disputed accounted at 50% probability) chart area coverage as the criteria (value for the ECE region as a whole is 4.7), the following ranking appears:

1. **Highly engaged sub-regions (above average)**
 - **ECE-NA (9.7)**
 - **ECE-EU.EF.3 (5.5)**
2. **Moderately engaged sub-regions (slightly below average)**
 - **ECE-I.R.T. (4.3)**
 - **ECE-WB (3.0)**
3. **Under-engaged sub-regions (well below average)**
 - **ECE-EP (2.0)**
 - **ECE-CA (1.8)**

Being aware of the indicative nature of the information available within the report, the criteria above might serve as a rough guidance for ECE to focus its efforts in the field of renewables. Evaluation of individual countries appears not to be the best approach as, for example, Iceland and Turkmenistan both have not got a single policy measure implemented, while their respective shares of RE-sources in total primary energy supply are the very extremes in the ECE region: Iceland's share is above 80% and Turkmenistan's practically 0%.

Nevertheless, excluding the two upper two sub-groups from the focus of discussion on what might be the best approach for ECE in the renewables policy support field, seems to serve well both in general state of development and in geographical terms.

Table 6: Renewable energy policy support measures in force (as structured by REN21 and by individual ECE member States)

	Count of Policy Measures	Financial Incentives				Public Financing		Regulatory Policies					
		Capital subsidy, grant, or rebate	Tax incentives		Energy production payment	Public investment, loans, or financing	Public competitive bidding / Tendering	Feed-in tariff / Premium payment	Net metering	Electric utility quota obligation / Renewable Portfolio Scheme (RPS)	Obligations and mandates		Tradable renewable energy certificate (REC)
			Investment or production tax credits	Reductions in sales energy, VAT or other taxes							Heat obligation or mandate	Biofuels obligation or mandate	
ECE (SUM of all entries as if valid)	311	40	23	34	10	43	21	46	14	17	8	33	22
ECE (SUM only undisputed values)	210	25	14	27	7	13	18	34	13	13	7	30	9
ECE (AVG of all entries as if valid)	5.6	71%	41%	61%	18%	77%	38%	82%	25%	30%	14%	59%	39%
ECE (AVG only undisputed values)	3.8	45%	25%	48%	13%	23%	32%	61%	23%	23%	13%	54%	16%
Albania	10		•	•	•	• -(1)	•	• -(1)	•	•	•		• -(1)
Andorra	1							m					
Armenia	1							• -(1)					
Austria	8	•	• -(1)	m -(1)	m	• -(1)		•				•	• -(1)
Azerbaijan	1					• -(1)							
Belarus	3			•		• -(1)		m					
Belgium	10	•	•	•		m -(1)	•	+(1)	•	•		•	•
Bosnia and Herzegovina	3	• -(1)					•	•					
Bulgaria	5		m -(1)	m -(1)		• -(1)		•				•	
Canada	9	•	•	•		•	•	•	•	•		•	
Croatia	4	m				m		•				•	
Cyprus	5	•					•	•	•			•	
Czech Republic	8	m	•	•	m	+(1)		m +(1) +(2)				•	• -(1)
Denmark	9	•	•	•		•	•	•	•			•	• -(1)
Estonia	7	m -(1)	m		•	• -(1)		•				•	m -(1)
Finland	7	•		•	•	m		•				•	• -(1)
France	8	•	•	•		•	•	•				•	m -(1)
Georgia	2					m	m						
Germany	8	•	•	•		•		•	m		•	•	
Greece	7	•	•	•		• -(1)		•	•			•	
Hungary	7	•		•		•		•		m		•	+(1)
Iceland	0												
Ireland	8	+(1)	m			m -(1)	•	•			•	•	• -(1)
Israel	7	+(1)		•		• -(1)	•	•		•	•		
Italy	12	•	•	•	m	• -(1)	•	•	•	•	•	•	•
Kazakhstan	3	•						•					•
Kyrgyzstan	4	•		•		m				•			
Latvia	6			•		m -(1)	•	•	•			•	
Liechtenstein	2	m						•					

Main source: REN21 (Renewables 2014 Global Status Report and Renewables Interactive Map)

Table 6: Renewable energy policy support measures in force (as structured by REN21 and by individual ECE member States)

	Count of Policy Measures	Financial Incentives				Public Financing		Regulatory Policies					
		Capital subsidy, grant, or rebate	Tax incentives		Energy production payment	Public investment, loans, or financing	Public competitive bidding / Tendering	Feed-in tariff / Premium payment	Net metering	Electric utility quota obligation / Renewable Portfolio Scheme (RPS)	Obligations and mandates		Tradable renewable energy certificate (REC)
		Investment or production tax credits	Reductions in sales energy, VAT or other taxes								Heat obligation or mandate	Biofuels obligation or mandate	
Lithuania	6	+(1)		m		•		•		•		•	
Luxembourg	4	•		m				•				•	
Malta	4	•		•				•	•				
Monaco	1	m -(1)											
Montenegro	2					m -(1)		•					
Netherlands	10	•	•	•	•	•		•	•	m		•	•
Norway	7	•		•		• -(1)	•			•		•	•
Poland	7	m		•		•	•			•		•	• -(1)
Portugal	9	m	m	•		m -(1)	•	•		•	•	•	
Republic of Moldova	4			m		•	+(3)	• -(3)					
Romania	5			m		• -(1)				m		•	•
Russian Federation	5	•		g		+(1)	•	+(1)					
San Marino	4	+(4)	+(4)			+(4)		+(4)					
Serbia	4	• -(1)	m			• -(1)		•					
Slovak Republic	6	•		•		m		•				•	• -(1)
Slovenia	8	• -(1) +(2)	•	•		•	•	•				m	• -(1)
Spain	8	•	•		•	m -(1)		+(1)	•			•	•
Sweden	8	•	•	•		•		m -(1)		•		•	•
Switzerland	5	•	g	•		m -(1)		•					
Tajikistan	1							•					
The F. Y. R. of Macedonia	2							•				m	
Turkey	5	•				• -(1)		•		g		g	
Turkmenistan	0												
Ukraine	7	• -(1)	m	•		• -(1)		•	•			•	
United Kingdom of G. B. and N. I.	10	•		•	•	•	m	•		•	•	•	•
United States of America	12	•	•	•	•	•	•	• -(1)	•	•	g	•	• -(1)
Uzbekistan	2					m	•						

Legend:

- applicable according to both REN21 services, Renewable Global Status Report (GSR) and Renewables Interactive Map (MAP)
- g applicable according to GSR only
- m applicable according to MAP only
- + applicable according to a source outside REN21
- not applicable according to a source outside REN21
- (1) source: IEA/IRENA Global Renewable Energy Policies and Measures Database
- (2) source: RES-Legal Database
- (3) source: Energy Community Secretariat
- (4) source: Sportello per l'Energia, Dipartimento Territorio e Ambiente, San Marino

Main source: REN21 (Renewables 2014 Global Status Report and Renewables Interactive Map).

4.2 The IEA/IRENA Global Renewable Energy Policies and Measures Database

The IEA/IRENA Global Renewable Energy Policies and Measures Database provides information on the legal sources in 44 ECE Member States (79%), with none of the Central Asia group included. References to more than 1000 legal documents (in force, planned or historical) containing short descriptions and categorisations are collected.

The scope of database is very broad as it aims to touch most of the relevant aspects of renewables support as it appears in the legislative / regulatory documents; in relation to the REN21's approach, IEA/IRENA collects information on a similarly grained level but with a distinctively broader view at the issue. The 34 policy types are organised within 6 categories defined⁸ in the glossary⁹:

1. **Economic instruments:** Policies and measures that stimulate certain activities, behaviours or investments using financial supports and price signals to influence the market. These include fiscal and financial policy instruments such as taxes, tax relief, grants or subsidies, feed-in tariffs for renewable energy, and loans for the purchase or installation of certain goods and services. They also include direct public funding and procurement rules, and market mechanisms such as tradable permits.
2. **Information and education:** Policies and measures designed to increase knowledge, awareness and training among relevant stakeholders or the general public. This can include general information campaigns, targeted training programmes for professionals and labelling schemes that provide the purchaser with information on a product's energy usage or emissions performance.
3. **Policy support (Policy development and reform):** Refers to steps in the ongoing process of developing, supporting and implementing policies. This includes strategic plans that guide policy development and the creation of specific bodies to support policy.
4. **Regulatory instruments:** Covers a wide range of instruments with which a government imposes targets, obligations and standards on actors requiring them to undertake specific measures and/or report on specific information. Examples include energy performance standards for appliances, equipment, and buildings; requirement for companies to manage energy consumption, produce or purchase a certain amount of renewable energy or deliver energy efficiency to customers; mandatory energy audits of industrial facilities; requirements to monitor and report on greenhouse gas emissions or energy use.
5. **Research, Development &Deployment (RD&D):** Policies and measures aimed at supporting technological advancement, through direct government investment, or facilitation of investment, in technology research, development, demonstration and deployment activities.
6. **Voluntary approaches:** Refers to measures that are undertaken voluntarily either by public agencies or by the private sector unilaterally, or by the two in a negotiated agreement. Unilateral commitments are when entities set themselves environmental targets and communicate successful compliance to their stakeholders. Public voluntary schemes invite companies to meet specified environmental targets established by public authorities. Negotiated agreements set environmental targets agreed between a government and a private sector entity, and may require reporting information on energy use to the government, being subject to audits, and undertaking measures to reduce energy use.

⁸ Besides those of categories also some other definitions are provided by the authors (the numbers indicate the term's position within the taxonomy):

123 - Loans: may include green loans, preferential rate loans, dedicated credit-lines and loan guarantees provided by government and revolving loan funds.

13 - Market based instruments (Tradable permits): Refers to three kinds of systems:

131 - Greenhouse gas (GHG) emissions permits: In GHG trading schemes, industries must hold permits to cover their GHG emissions; if they emit more than the amount of permits they hold, they must purchase permits to make up the shortfall. If they emit less, they may sell these.

132 - Green certificates: These systems are based on obligations to produce or purchase renewable energy-sourced power (generally electricity). Green certificates refer to renewable energy certificates which represent the certified generation of one unit of renewable energy, generally one megawatt-hour (MWh). Certificates can be traded and used to meet renewable energy obligations among consumers and/or producers.

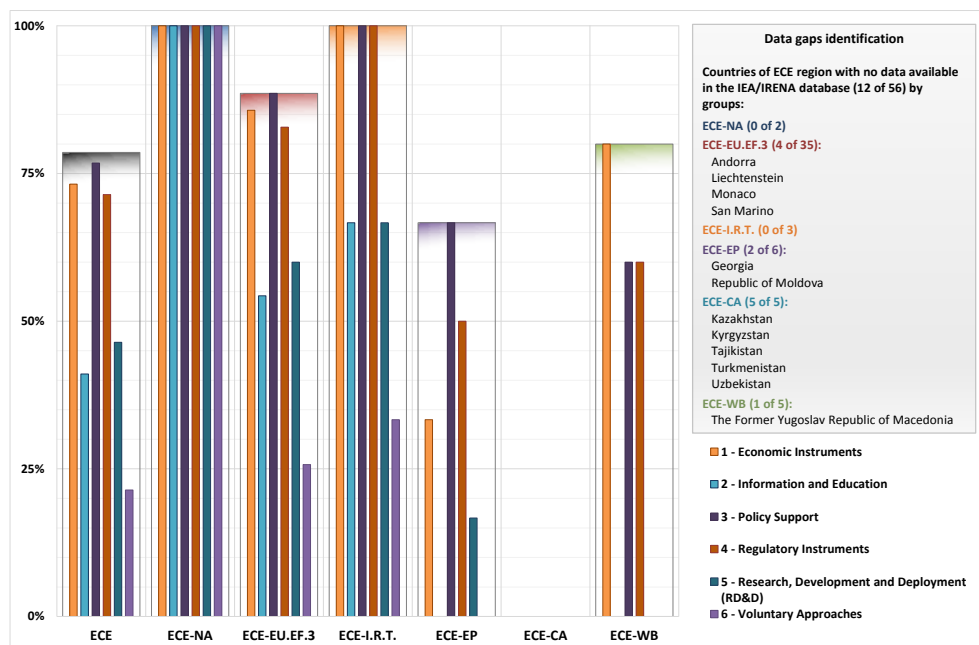
133 - White certificates: These systems stem from energy efficiency or energy savings obligations; White certificate schemes create certificates for a certain quantity of energy saved, for example a MWh; regulated entities must submit enough certificates to show they have met energy saving obligations. Again, if they are short, this must be made-up through measures that reduce energy use, or through purchase of certificates.

44 - Obligations schemes: This broad term may include energy efficiency obligations on energy suppliers requiring them to deliver certain energy savings, as well as energy mix quotas requiring energy suppliers to include a certain amount of renewable energy in their generation capacity.

⁹ Accessible on <http://www.iea.org/policiesandmeasures/search-options/>.

In the following Figure 39 the focus is set primarily on the data gaps within the IEA/IRENA dataset. The most important omissions are the Central Asian group (with no representative at all) and the three missing countries from the Eastern Partnership and Western Balkans groups, while the 4 European microstates are quite usually missing and due to their general state of development and fairly low significance in terms of energy consumption and generation this presents no great obstacle in our endeavours to establish the present state of affairs in the ECE region.

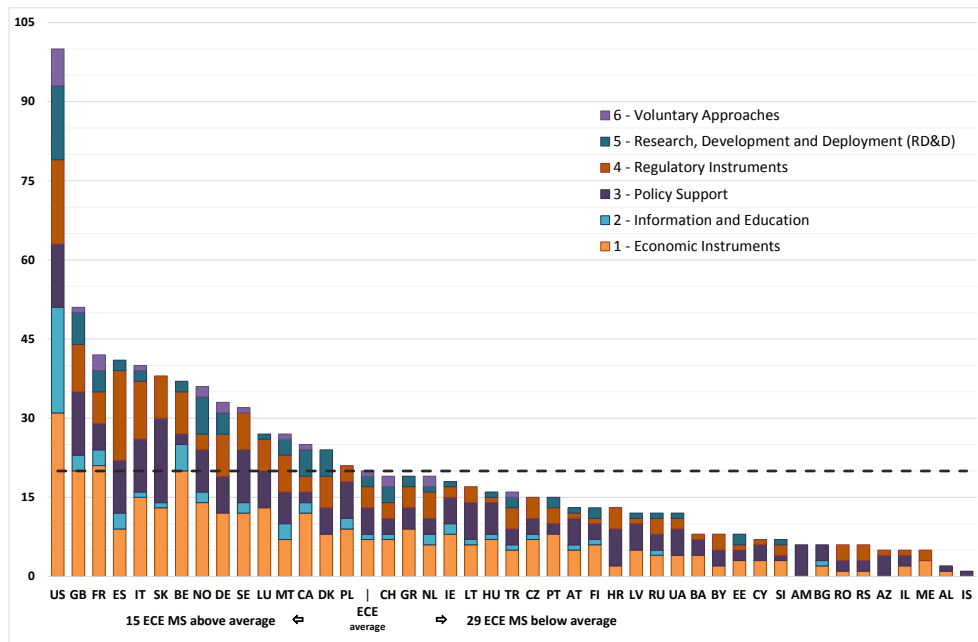
Figure 39: Renewable energy policy support measures in force (as structured by REN21 and by individual ECE member States)



Source: IEA/IRENA Global Renewable Energy Policies and Measures Database

The next Figure 40 presents the actual number of references to an individual policy category within the IEA/IRENA database. It serves to show the extensive nature of this database's approach and as a guide to understanding the Table 7 further below.

Figure 40: Number of legal sources in force in 44 ECE member States addressing individual groups of renewable policies and measures (by category)



Source: IEA/IRENA Global Renewable Energy Policies and Measures Database

Nevertheless, it seems that the snapshot of the currently enforced legal sources in the countries included is not complete. In a number of tests by samples performed, it was found that many documents are not accounted for and/or are incompletely tagged for the actual substance. IEA/IRENA database has a great approach but unfortunately it does not really deliver on completeness, yet.

The IEA/IRENA database deals with information of tremendous value to both policy and industry decision-makers. The approach of multiple tagging of the legal sources against elaborated taxonomies, together with descriptions and links to the integral texts is superb. By design, it aims to deliver internationally comparable state of affairs in terms of legislation and regulative set-up for every single country included and once the processes of managing its promptness and completeness are set up and followed through by both the IEA/IRENA and the reporting parties, it is going to be an extremely valuable dataset.

It seems that reliance on the official sources, as mentioned on the database's website, lacks thoroughness in provision of the information on the legal sources that actually do influence any of the aspects included in the applied taxonomies. ECE's effort in getting its Member States actively engaged in provision of the information to the database might serve its long-term interests in data on its region compilation efforts.

The two-page Table 7 is the numerical representation of how many documentary references to a single policy measure the database contains regarding the 44 ECE Member States. Even though the scope of the database in terms of the taxonomy is quite broad, the level of detail is very good for the purposes of international policy comparisons and initial investor guidance.

Table 7: Legal framework sources in force in the ECE member States addressing individual renewable policies and measures (according to the IEA/IRENA database)

			SUMMARY			1 - Economic Instruments														
			Renewable policies and measures addressed	Categories (level 1; MAX=6) Types (lowest level; MAX=34)	Number of addresses of renewable policies and measures in force	11 - Direct investment					12 - Fiscal/financial incentives						13 - Market-based instruments			
						111 - Funds to sub-national governments	112 - Infrastructure investments	113 - Procurement rules	114 - RD&D funding	121 - Feed-in tariffs/premiums	122 - Grants and subsidies	123 - Loans	124 - Tax relief	125 - Taxes	126 - User charges	131 - GHG emissions allowances	132 - Green certificates	133 - White certificates		
ECE	(44/36)	ECE	6	34	857	12	7	9	1	86	124	30	59	36	3	8	15	2		
ECE-NA	(2/2)	ECE-Northern America	6	21	147	6	1	4		2	21	4	8	2		1				
ECE-EU.EF.3	(11/35)	ECE-EU, EFTA, 3EM	6	34	639	6	6	5	1	71	97	25	45	32	3	7	15	2		
ECE-I.R.T.	(1/1)	ECE-Israel, Russia, Turkey	5	11	28					4	6	1								
ECE-EP	(4/6)	ECE-Eastern Partnership	2	4	22					2			3							
ECE-CA	(NO DATA)	ECE-Central Asia																		
ECE-WB	(4/5)	ECE-Western Balkans	3	5	21					7			3	2						
AL		Albania	2	2	2								1							
AM		Andorra	1	2	7															
AT		Austria	4	10	15	1				1	2				1					
AZ		Azerbaijan	1	2	4															
BY		Belarus	2	3	5					1			1							
BE		Belgium	5	14	36	1		1		1	12		4				3			
BA		Bosnia and Herzegovina	3	5	12					4			2	2						
BG		Bulgaria	2	3	4					2										
CA		Canada	5	11	25	2				2	6	2	2							
HR		Croatia	3	7	11					1	1	1		1						
CY		Cyprus	2	5	5					1	1				1					
CZ		Czech Republic	4	11	12					1	1	1	2	1						
DK		Denmark	4	8	22					4	3	2		3						
EE		Estonia	3	5	6	1	1			1										
FI		Finland	5	9	13					1	4	1	1	1						
FR		France	6	15	44					9	5	4	4	1						
DE		Germany	5	16	37	1		1		4	5	5	1	2						
GR		Greece	4	10	21		1			5	4		1	3						
HU		Hungary	4	11	18	1	1			1	4	1	1				2			
IS		Iceland	1	1	1															
IE		Ireland	4	9	18					1	6		1							
IL		Israel	2	3	3					1	1									
IT		Italy	6	18	40				1	5	2		3	1		2	2	2		
LV		Latvia	2	4	9					2			2	2						
LT		Lithuania	4	11	18					3	1	2	1	1		1				
LU		Luxembourg	4	10	26					3	5		3	5	1					
MT		Malta	5	8	16					1	6									
ME		Montenegro	2	2	3					2										
NL		Netherlands	6	15	20		1	1		1	2	1	1				2			
NO		Norway	5	14	28		1			2			2	4		1	1			
PL		Poland	4	13	24			1		4	2	2	2			1				
PT		Portugal	4	9	16					4	1		3							
RO		Romania	3	6	7												1			
RU		Russian Federation	4	7	9					1	1	1								
RS		Serbia	3	3	4					1										
SK		Slovak Republic	4	10	34					7	8	2	3	1						
SI		Slovenia	4	6	7					1		1	1							
ES		Spain	5	16	37		1	1		4	4		1	1			1			
SE		Sweden	4	12	23					3	4	1	3	2			1			
CH		Switzerland	6	11	18	1				3	3		1							
TR		Turkey	6	11	18					2	4									
UA		Ukraine	2	3	6					1			2							
GB		United Kingdom of G. B. and N. I.	6	18	52					4	7	1	4	1		2	2			
US		United States of America	6	20	128	4	1	4			15	2	6	2		1				
NO DATA			Andorra, Georgia, Kazakhstan, Kyrgyzstan, Liechtenstein, Monaco, Republic of Moldova, San Marino, Tajikistan, The F. Y. R. of Macedonia, Turkmenistan, and Uzbekistan.																	

Source: IEA/IRENA Global Renewable Energy Policies and Measures Database

Table 7 (Cont.): Legal framework sources in force in the ECE member States addressing individual renewable policies and measures (according to the IEA/IRENA database)

	2 - Information and Education					3 - Policy Support		4 - Regulatory Instruments							5 - Research, Development and Deployment (RD&D)			6 - Voluntary Approaches					
	21 - Advice/aid in implementation	22 - Information provision	23 - Performance Label		24 - Professional training and qualification	31 - Institutional creation	32 - Strategic planning	41 - Auditing	42 - Building codes and standards	42 - Product standards	42 - Sectoral standards	42 - Vehicle fuel-economy and emissions standards	43 - Monitoring	44 - Obligation schemes	45 - Other mandatory requirements	51 - Demonstration project	52 - Research programme	52 - Technology deployment and diffusion	52 - Technology development	61 - Negotiated Agreements (Public-private sector)	62 - Public Voluntary Schemes	63 - Unilateral Commitments (Private sector)	
ECE	(44/56)	31	40	3	3	4	38	137	5	3	6	1	1	17	29	47	25	30	26	14	4	1	
ECE-NA	(2/2)	17	18				2	9						1	8	11	9	8	6	1			
ECE-EU.EF.3	(31/35)	12	21	3	3	4	33	101	5	3	6	1	1	15	18	31	16	21	18	8	3	1	
ECE-I.R.T.	(3/3)	2	1				1	6						1	3	2		1					
ECE-EP	(4/6)						2	15															
ECE-CA	(NO DATA)																						
ECE-WB	(4/5)							6								3							
AL								1															
AM							1	6															
AT		1	1				1	5									1	1					
AZ							1	3															
BY								3															
BE		4	2					2	2					1			1		1				
BA								3									1						
BG							1	1															
CA			2												2	3	2	1		1			
HR								5				1					1						
CY							1	1															
CZ		1	1			1		1			1						1						
DK								5									1		1	3			
EE								2									1						
FI			1					2									1	1					
FR		2	2					2	1					1			3	3	2	3	2		
DE							1	4			1		1	3	2	3			1		2		
GR							2	1									1	2					
HU			1					4						1		1							
IS								1											1				
IE		2	1	1			1	4											1				
IL								1															
IT			1		1		1	7			1					2	4		2	2	1		
LV								3															
LT			1				2	4		1							1						
LU							1	5		1	1						1						
MT					2		2	2									1		1				
ME																	1						
NL			2	1				2									1						
NO							2	4						1		1	2	1	1	2			
PL			1				2	4	1		1				1	2							
PT								3						1	1			1	1	1			
RO								2	1	1				1	1								
RU		1						2								1	2						
RS								2								1							
SK					1		5	4								2	1						
SI								1											1				
ES			3				2	5						3	4	3	2	1	1				
SE		1	1	1			1	5								2							
CH			1				1	3			1								1	2			
TR		1	1				1	3						1	2				1	1	1		
UA								3															
GB		1	1		2		7	7						2	3		2	3	2	1			
US		17	16				2	9						1	6	8	7	9	9	7	2		
NO DATA	Andorra, Georgia, Kazakhstan, Kyrgyzstan, Liechtenstein, Monaco, Republic of Moldova, San Marino, Tajikistan, The F.Y.R. of Macedonia, Turkmenistan, and Uzbekistan.																						

Source: IEA/IRENA Global Renewable Energy Policies and Measures Database

IV. Announced additional capacities by RE sub-sector and ECE Member States (BNEF database)

The report on Baseline Conditions should not be future oriented by definition as it rather provides the starting point for future plans only. However, for indicative purposes, the reader may benefit from obtaining information on “what is the current assessment of so-called announced capacity additions by RE sub-sector and sub-regions of the ECE region”. Data have been obtained from IRENA Renewable Energy Country Profiles, however, originally IRENA has taken them from Bloomberg New Energy Finance (BNEF). The results are shown in Table 8 and Figure 41.

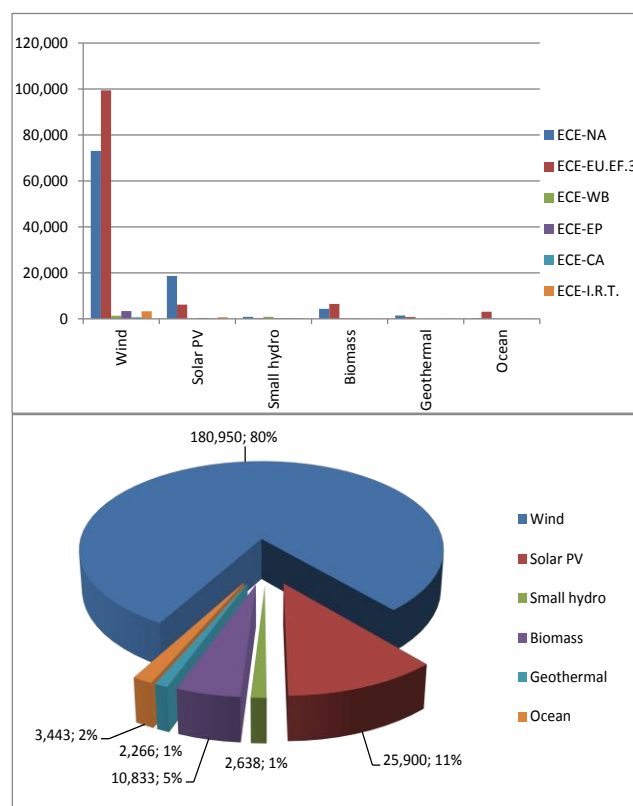
Table 8: Announced additional capacities (MW and no. of projects) by RE sub-sector and sub-region (BNEF database)

	Sub-region	Wind		Solar			Small hydro		Biomass and biofuels						Geothermal			Ocean			
		(MW)	No. 1)	PV (MW)	No.	Thermal (MWh)	No.	(MW)	No.	(MWe) 2)	(MWh) 2)	No.	Biodiesel 3) (mill.)	No.	Bioethanol 3) (mill. litre/a)	No.	(MWe)	(MWh)	No.	(MW)	No.
1	ECE-NA	73,000	420	18,650	480	5,000	22	850	42	4,300	86	163	4,770	57	10,580	57	1,416	0	48	259	24
2	ECE-EU.EF.3	99,468	576	6,114	273	975	26	243	44	6,429	2,037	293	1,771	15	1,283	9	745	235	21	3,088	37
3	ECE-WB	1,296	14	10	0	0	0	847	37	27	27	4	48	1	0	0	0	0	0	0	0
4	ECE-EP	3,355	19	360	19	0	0	225	11	41	8	5	310	6	38	1	0	0	0	0	0
5	ECE-CA	601	3	102	2	0	0	213	9	0	0	0	0	0	0	0	0	0	0	0	0
6	ECE-I.R.T.	3,230	38	664	23	420	3	260	10	36	7	20	738	5	1,425	6	105	50	3	96	4
	Total ECE region	180,950	1,070	25,900	797	6,395	51	2,638	153	10,833	2,165	485	7,637	84	13,326	73	2,266	285	72	3,443	65

Notes: 1) Number of projects, 2) Includes (i) waste-to-energy and (ii) biogas installation, 3) Million litre per year of biofuel production capacity.

Source: IRENA Renewable Energy Country Profiles (www.irena.org, July 2014,) based on BNEF database.

Figure 41: Announced capacity additions by renewable energy sub-sector and sub-region



Source: Original source Bloomberg New Energy Finance (BNEF).

According to BNEF data, wind technology seems by far most promising. In term of planned electrical capacities, as much as 181 GW (80%) in 1,070 projects is the announced capacity addition. This is followed by solar PV (25.9 GW – 11% in 797 projects), biomass - mostly in CHP mode (10.8 GW in 485 projects), ocean (1.4 GW in 65 projects), small hydro (2.6 GW in 153 projects) and geothermal (2.3 GW in 286 projects).

Regarding sub-regional distribution of announced projects, the NA and the EU.EF.3 sub-region continue to demonstrate considerably higher investors' confidence compared to any other sub-region. The great majority of wind projects shall be implemented there; this is equally valid for solar PV, biomass and ocean projects. Wind shall be also the prevailing technology in RE-projects in all other sub-regions.

Identification and preparation of projects to come to the level of being announced need special attention in all less developed sub-regions like WB, EP and CA. Lack of investors' confidence is an obvious sign of lacking RE-implementation frameworks in the mentioned sub-regions. ECE/GERE may consider increasing contribution to this issue by promoting political debate, international development cooperation and assistance of IFIs both at a higher technical as well as financial assistance level than has been done so far.

V. Other issues related to renewable energy in the ECE region

1. Decentralised power generation and supply

Energy systems are considered to be distributed if (1) the systems of production are relatively small and dispersed (such as small-scale solar PV on rooftops), rather than relatively large and centralised; (2) generation and distribution occur independently from a centralised network; or (3) both. It provides energy services for electrification, cooking, heating, and cooling that are generated and distributed independent of any centralised system, in urban and rural areas. (Global Status Report 2014).

Decentralised electricity systems include mini-grids and isolated systems that are entirely distributed in nature. Mini-grids vary in size and usually service a cluster of households and businesses through an independent distribution network, and most commonly in remote areas. Isolated systems are employed in individual homes or businesses, with all energy being consumed at the site of generation.

Distributed power generation facilities are (i) often used to reinforce power systems, thereby increasing technical stability of the grid and security of electricity supply, but also (ii) provide access to electricity, which would otherwise not be supplied through the central power system.

Mini-grids operating in an island mode (i.e. not being connected and synchronised to the central power system) offer a viable solution in densely populated areas provided the large number of households and businesses provide a load sufficient enough to justify the cost of mini-grid development. Isolated home electricity systems are often the most viable options for rural households having very limited demand, that occurs only occasionally (e.g. cottages) or in the remote locations where grid electrification is financially not viable. In case of solar PV choice, electricity is used primarily for lighting, charging of communication and IT equipment and minimal low-demand medical services.

Based on research, statistical data on the scope and exact geographical location of mini-grids and isolated systems in the ECE region are not available in international databases (IRENA, REN21, IEA). However, such data necessary for mapping are surely available within the ECE countries at respective local ministries (e.g. responsible for energy, spatial planning, regional development etc.) and power distribution operators as well as local administration authorities.

Population with no access to electrical network according to SE4All in the ECE region

The SE4All Global Tracking Framework (GTF) determines energy access based on the results of household surveys that clarify the percentage of the population with connection to electrical network and thus access to non-solid fuels. The GTF defines solid fuels as traditional biomass (wood, charcoal, agriculture and forest residues, dung, etc.), processed biomass (pellets and briquettes) and others such as coal and lignite.

The GTF statistical concept and methodology for calculating access to electricity as applied by GTF

“Data for access to electricity are collected from different sources: mostly data from nationally representative household surveys (including national censuses) were used. Survey sources include Demographic and Health Surveys (DHS) and Living Standards Measurement Surveys (LSMS), Multi-Indicator Cluster Surveys (MICS), the world Health Survey (WHS), other nationally developed and implemented surveys, and various government agencies (for example, ministries of energy and utilities). Given the low frequency and the regional distribution of some surveys, a number of countries have gaps in available data. To develop the historical evolution and starting point of electrification rates, a simple modelling approach was adopted to fill in the missing data points - around 1990, around 2000, and around 2010. Therefore, a country can have a continuum of zero to three data points. There are 42 countries with zero data point and the weighted regional average was used as an estimate for electrification in each of the data periods. 170 countries have between one and three data points and missing data are

estimated by using a model with region, country, and time variables. The model keeps the original observation if data is available for any of the time periods. This modelling approach allowed the estimation of electrification rates for 212 countries over these three time periods (Indicated as "Estimate"). Notation "Assumption" refers to the assumption of universal access in countries classified as developed by the United Nations." (source: Global Tracking Framework, SE4All Database)

The 9 ECE Member States, where population has less than 100% access to electrical network as determined by the above-described methodology, are shown in Table 9. Shares of such population are shown as percentage of (i) total population, (ii) urban population, and (iii) rural population.

Table 9: ECE countries with less than 100% access of population to electrical network (GTF 2010)

ECE member State	Total population in 2011 (mill.)	Percentage of total population (%)	Population with no access in 2011	Average electricity consumption per capita in 2011 (kWh/cap)	Assessment of electricity consumption in 2011 (MWh)	Percentage of urban population with access (%)	Percentage of rural population with access (%)
Armenia	3.0	99.8	5,900	1,755	10,404	99.9	99.7
Azerbaijan	9.2	99.4	55,000	1,705	93,840	99.7	99.7
Bosnia and Herzegovina	3.8	99.7	11,500	3,189	36,728		97.7
The former Yugoslav Republic of Macedonia	2.1	99.0	21,000	3,881	81,656	99.7	98.0
Moldova	3.6	98.6	49,800	1,470	73,265	99.3	98.0
Ukraine	45.7	99.8	91,400	3,662	334,751	99.9	99.6
Kazakhstan	16.6			5,306			97.5
Tajikistan	7.8			2,089			99.0
Turkmenistan	5.1			2,873			99.6
TOTALS							
Sub-total (1-9)	96.8		234,800		630,643	or 2.27 PJ	
Total for ECE region	1,245.3		1,245,277.0	7,736	9,633,270,147		
Percentage of ECE (%)			0.019		0.007		

*) Assuming that all population with no access to electrical networks would consume the national average amount of electricity per capita (kWh/cap).

Source: WB, Global Tracking Mechanism (2010).

In order to ascertain the actual scope of the issue, the authors assessed the actual number of impacted people - some 235,000 people in total that represents mere 0.19 % of total population (1,245.3 billion) in the ECE region. Assuming that these people would consume the average amount of electricity per capita as used in respective countries, their electricity consumption would amount to 630.6 GWh (or 2.27 PJ), which would represent additional 0.07% of the ECE electricity consumption (9,633,270.1 GWh). Even if all this electricity is provided by decentralized mini or isolated RE-based systems (e.g. solar PV), the share of energy supply

from renewable energy sources in these countries would grow by 9.0% but in the ECE region as a whole, by mere 0.1%.

Major reasons for not using “modern” energies can encompass:

- **Lack of physical access to electrical grid,**
- **No economic access due to low affordability of the consumer, despite grid electrification would be possible,**
- **Lack of access in practice – e.g. access technically exists, however, it is badly maintained and therefore practically not possible for the consumer,**
- **Lack of consumer’s interest to switch to modern energies from traditional supply.**

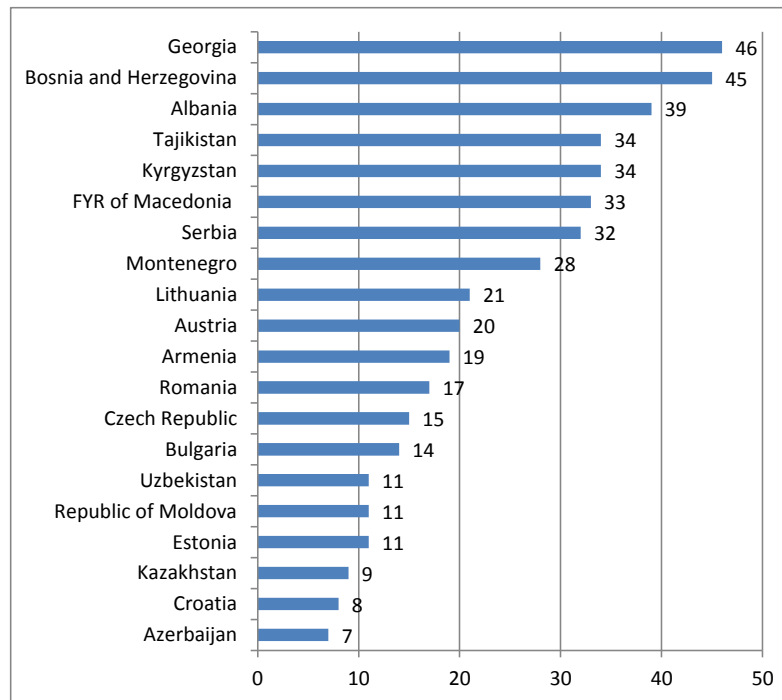
The issue is much locally specific; there may be various reasons that the prospective energy consumers may or may not have decided to switch to modern energies nor may such systems be economically viable and financially feasible. Availability of favourable and affordable financing schemes for energy consumers is a prerequisite for implementation of otherwise technically feasible options.

Grid electrification of currently non-grid connected communities in the ECE region can definitively contribute to social and regional development in rural and remote areas in the spirit of the SE4All initiative. However, energy consumers may have various preferences. In general, the solution to this issue in presently identified countries with such problems cannot be regarded as a noticeable uptake of renewable energy at the level of the ECE region.

2. Traditional biomass for heating purposes in the ECE region

The IRENA Renewable Energy Country Profiles database provides a rough assessment of population by ECE Member State that use solid fuels as the only or primary source of energy for heating purposes in 2010. Figure 42 shows 20 countries where this percentage was higher than 5%. The group is a combination of prevailing medium-income countries of the WB, EP and CA sub-regions and a few EU MSs of the Balkan Peninsula, the Baltic States, Eastern Europe plus Austria. The reasons can be attributed to socio-economic conditions in rural areas of these countries, but also to systematic promotion of modern biomass-fired boilers and applications in this segment of RE utilisation (e.g. Austria, Moldova).

Figure 42: Share of population using solid fuels for heating in 2010 (%) *)



*Note: *) Only ECE member States with more than 5% are shown.*

Source: IRENA Renewable Energy Country Profiles (based on data of World Health Organisation).

ANNEX 1: LIST OF MAJOR STAKEHOLDERS

R&D organizations, science and academia and global networks

1. Emergent Energy
2. Bloomberg New Energy Finance
3. Chatham House / The Royal Institute of International Affairs
4. Institute for Sustainable Energy Policy (ISEP)
5. International Institute for Applied Systems Analysis (IIASA)
6. International Solar Energy Society (ISES)
7. Massey University
8. Renewable Energy Policy Network for the 21st Century (REN21)
9. Sunna Research
10. World Watch Institute

Industry associations

1. American Council on Renewable Energy (ACORE)
2. Alliance for Rural Electrification (ARE)
3. Clean Energy Council (CEC)
4. European Biomass Industry Association (EUBIA)
5. European Photovoltaic Industry Association (EPIA)
6. European Renewable Energies Federation (EREF)
7. European Renewable Energy Council (EREC)
8. European Small Hydro Association (ESHA)
9. European Wind Energy Association (EWEA)
10. Global Wind Energy Council (GWEC)
11. International Geothermal Association (IGA)
12. International Hydropower Association (IHA)
13. World Bioenergy Association (WBA)
14. World Wind Energy Association (WWEA)

International and UN-based organizations

1. Asian Development Bank (ADB)
2. Council of Europe Development Bank (CEB)
3. European Commission (EC)
4. Economic and Social Commission for Asia and the Pacific (ESCAP)
5. European Bank for Reconstruction and Development (EBRD)
6. European Investment Bank (EIB)
7. Food and Agricultural Organization (FAO)
8. Global Environmental Facility (GEF)
9. International Energy Agency (IEA)
10. International Fund for Agricultural Development (IFAD)
11. International Renewable Energy Agency (IRENA)
12. United Nations Conference on Trade and Development (UNCTAD)
13. United Nations Educational, Scientific and Cultural Organization (UNESCO)
14. United Nations Framework Convention on Climate Change (UNFCCC)
15. United Nations Department for Economic and Social Affairs (UN DESA)

16. United Nations Development programme (UNDP)
17. United Nations Economic Commission for Europe (ECE)
18. United nations Environmental programme (UNEP)
19. United Nations Human Settlements Programme (UN-Habitat)
20. United Nations Industrial Development Organization (UNIDO)
21. World Bank (WB) Group (IBRD, IDA, IFC, MIGA, ICSID)
22. World Health Organization (WHO)
23. World Meteorological Organization (WHO)

National governments of (via development cooperation agencies)

1. AUSTRIA- Austrian Development Cooperation
2. CANADA - Canadian International Development Agency
3. DENMARK - DANIDA OpenAid (Danish Development Agency)
4. FINLAND- Finnish Department for International Development Cooperation
5. FRANCE - French Development Agency
6. GERMANY - Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH
7. GERMANY – The Kreditanstalt für Wiederaufbau Group (IPEX-Bank, DEG, Development Bank)
8. JAPAN - Japan International Cooperation Agency
9. NETHERLANDS - Netherlands Development Cooperation
10. NORWAY - Norwegian Agency for Development Cooperation
11. SWEDEN - Swedish International Development Cooperation Agency
12. UNITED STATES OF AMERICA - U.S. Agency for International Development

Annex 2: ECE Classification

Table A2. 1: Classification of the ECE Member States

SN	Northern America (2)	SN	European Union and European Free Trade Association (32)	SN	Western Balkans (5)
1	Canada		<i>European Union (28)</i>	1	Albania (#1)
2	United States of America	1	Austria	2	Bosnia and Herzegovina (#1)
		2	Belgium	3	Montenegro (#1)
		3	Bulgaria	4	Serbia (#1)
		4	Croatia	5	The FYR of Macedonia (#1)
		5	Cyprus	(#1) Contracting Parties to Energy Community Treaty	
		6	Czech Republic		
		7	Denmark		
		8	Estonia		
		9	Finland		
		10	France (#2)	(#2) Includes data for Monaco	
		11	Germany		
		12	Greece		
		13	Hungary		
		14	Ireland		
		15	Italy (#3)	(#3) Includes data for San Marino	
		16	Latvia		
		17	Lithuania		
		18	Luxembourg		
		19	Malta		
		20	Netherlands	(#4) Includes data for Andorra	
		21	Poland		
		22	Portugal		
		23	Romania		
		24	Slovak Republic		
		25	Slovenia	(#5) Oil data included under Switzerland, no other data available.	
		26	Spain (#4)		
		27	Sweden		
		28	United Kingdom of Great Britain and Northern Ireland		
			<i>European Free Trade Association (4)</i>		
		29	Iceland		
		30	Liechtenstein (#5)		
		31	Norway		
		32	Switzerland		
SN	Eastern Partnership (6)	SN	Central Asia (5)	SN	Other ECE member States (6)
1	Armenia	1	Kazakhstan	1	Andorra (#6)

2	Azerbaijan	2	Kyrgyzstan	2	Israel
3	Belarus	3	Tajikistan	3	Monaco (#7)
4	Georgia	4	Turkmenistan	4	Russian Federation
5	Republic of Moldova (#1)	5	Uzbekistan	5	San Marino (#7)
6	Ukraine (#1)			6	Turkey
				(#6) No data available	
				(#7) Data included in other EU Member States as above	
Total: 56 ECE member States					

DENOTATION OF GEOPOLITICAL CLASSIFICATION¹⁰

Central Asia (ECE-CA)

The Central Asia is the core region of the Asian continent and stretches from the Caspian Sea in the west to China in the east and from Afghanistan in the south to Russia in the north. It is also sometimes referred to as Middle Asia. In modern contexts, all definitions of Central Asia include the five republics of the former Soviet Union: Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan, Afghanistan is also sometimes included.

Eastern Partnership (ECE-EP)

The Eastern Partnership is an initiative of the European Union governing its relationship with the post-Soviet states of Armenia, Azerbaijan, Belarus, Georgia, Moldova, and Ukraine, intended to provide a venue for discussions of trade, economic strategy, travel agreements, and other issues between the EU and its eastern neighbours. The Eastern Partnership was inaugurated by the European Union in Prague on 7 May 2009.

European Free Trade Association (EFTA)

The EFTA is a free trade organization between four European countries that operates in parallel with – and is linked to – the European Union (EU), notably, Iceland, Liechtenstein, Norway and Switzerland. The EFTA was established on 3 May 1960 as a trade bloc-alternative for European states who were either unable or unwilling to join the then-European Economic Community (EEC) which has now become the EU. EFTA states have jointly concluded free trade agreements with a number of other countries. The EFTA countries are part of the European Union's internal market; Iceland, Liechtenstein and Norway through the Agreement on a European Economic Area (EEA) and Switzerland through a set of bilateral agreements.

Energy Community (EnC)

The EnC a community established between the European Union (EU) and a number of third countries to extend the EU internal energy market to Southeast Europe and beyond. With their signatures, the Contracting Parties commit themselves to implement the relevant EU *acquis communautaire*, to develop an adequate regulatory framework and to liberalise their energy markets in line with the *acquis* under the Treaty. The Treaty establishing the Energy Community was signed in Athens, Greece, on 25 October 2005, and entered into force on 1 July 2006. As per status of July 2014, the CPs to the Treaty are Albania, Bosnia and

¹⁰ Source: based on Wikipedia Free Encyclopedia.

Herzegovina, FYR of Macedonia, Kosovo, Montenegro, Republic of Moldova, Serbia and Ukraine, with Georgia being a candidate country.

European Union (EU)

The EU is a politico-economic union of 28 member states that are primarily located in Europe. The EU operates through a system of supranational independent institutions and intergovernmental negotiated decisions by the member states. Institutions of the EU include the European Commission (EC), the Council of the European Union, the European Council, the Court of Justice of the European Union, the European Central Bank, the Court of Auditors, and the European Parliament.

Northern America

The Northern America A is the northernmost region of the Americas, and is part of the North American continent. It lies directly north of the region of Middle America; the land border between the two regions coincides with the border between the United States and Mexico. Geopolitically, according to the scheme of geographic regions and sub-regions used by the United Nations, Northern America consists of: Bermuda, Canada, Greenland, Saint-Pierre and Miquelon, and the United States of America. For the purpose of this report, the NA includes Canada and United States

Organization for Economic Co-operation and Development (OECD)

The OECD is an international economic organization of 34 countries founded in 1961 to stimulate economic progress and world trade. It is a forum of countries committed to democracy and the market economy, providing a platform to compare policy experiences, seek answers to common problems, identify good practices and coordinate domestic and international policies of its members.

Western Balkans

European Union institutions and member states defined the Western Balkan as the Southeast European area that includes countries that are not members of the European Union (Bosnia and Herzegovina, Montenegro, Kosovo¹¹, FYR of Macedonia, Serbia and Albania — or Albania plus the former Socialistic Federal Republic of Yugoslavia, minus Slovenia and Croatia (EU Member States). Today, the Western Balkans is more of a political than a geographic designation for the region of Southeast Europe that is not in the European Union. Each country has as its aim to join the EU. For the purpose of this report, the WB excludes Kosovo (ECE-WB).

¹¹ This designation is without prejudice to positions on status, and is in line with UNSCR 1244 and the ICJ Opinion on the Kosovo declaration of independence.

ANNEX 3: SELECTED SOCIO-ECONOMIC, ENERGY AND CO2 EMISSIONS RELATED INDICATORS BY ECE MEMBER STATE

Figure A3. 1: GDP per capita by ECE Member State, 2011 (current US\$/cap)

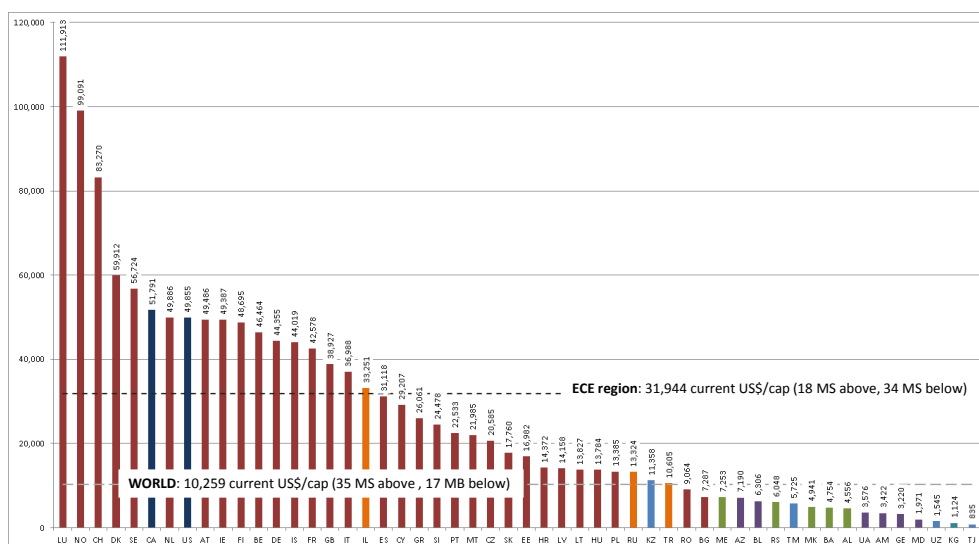


Figure A3. 2: Total Primary Energy Supply (PES) intensity by ECE Member State, 2011 (PJ/current US\$)

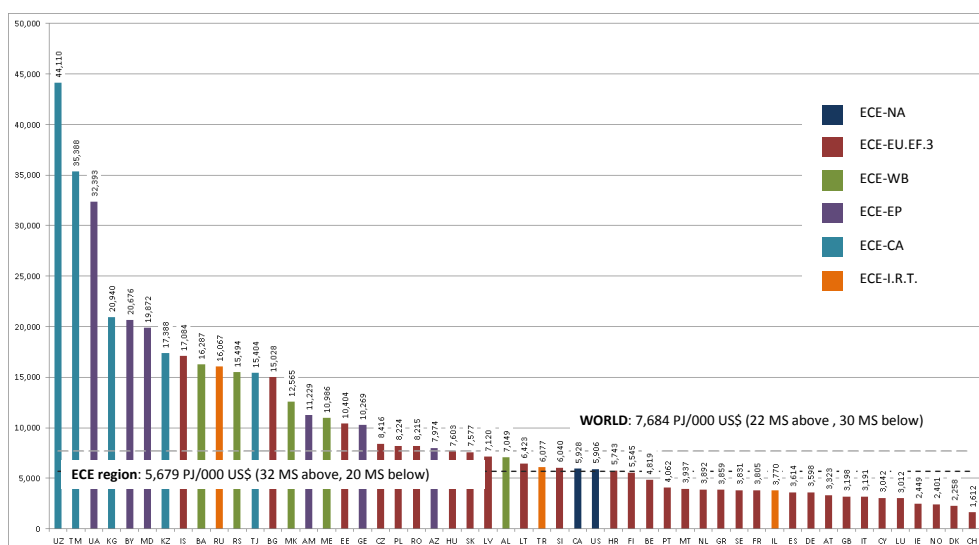


Figure A3. 3: Energy self-sufficiency by ECE Member State, 2011 (%)

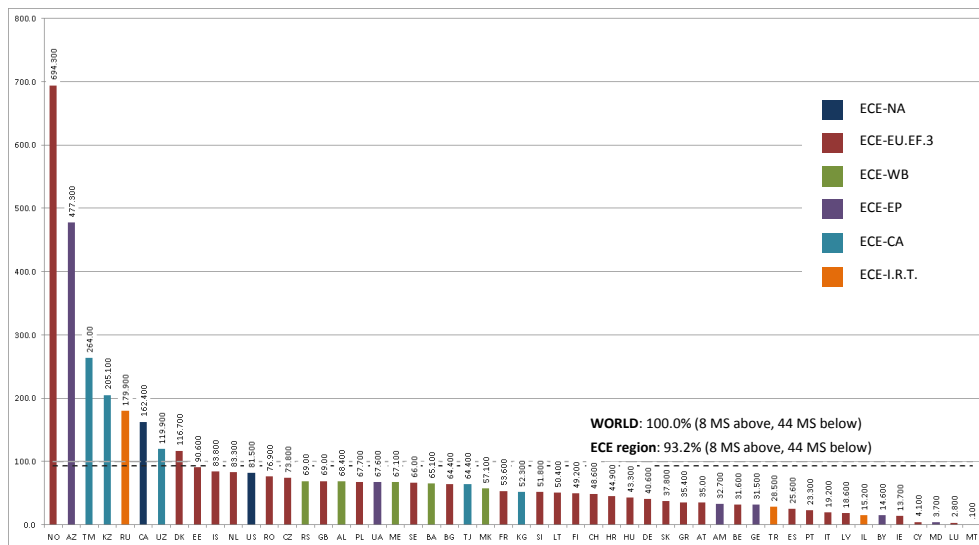


Figure A3. 4: Cost of fuel import by ECE Member State, 2011 (mill. US\$)

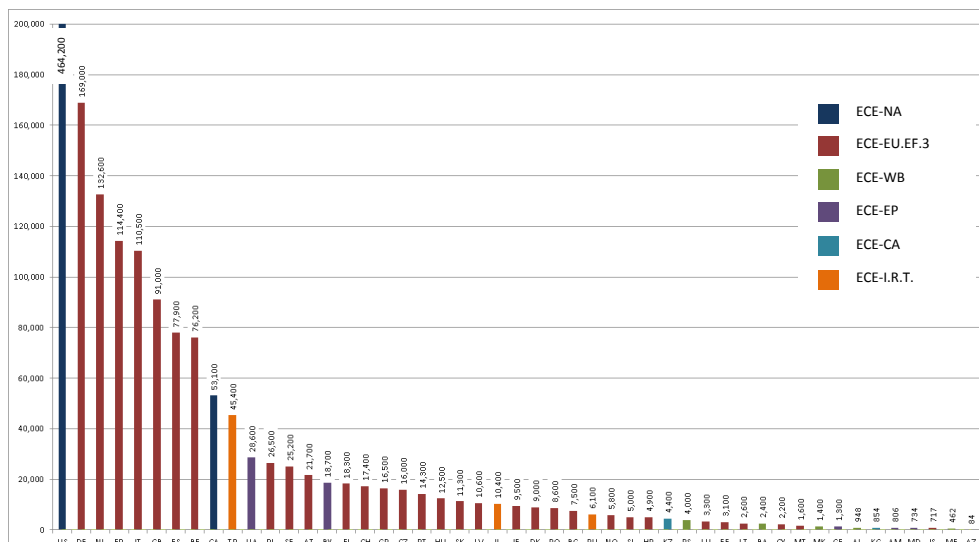


Figure A3. 5: Cost of fuel import as percentage of GDP by ECE Member State, 2011 (%)

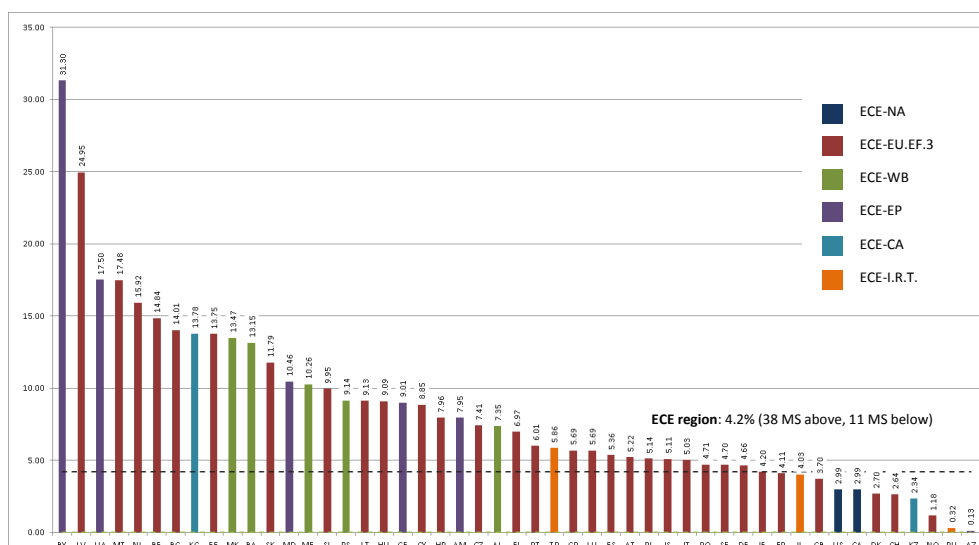


Figure A3. 6: Electricity consumption per capita by ECE Member State, 2011 (kWh/cap)

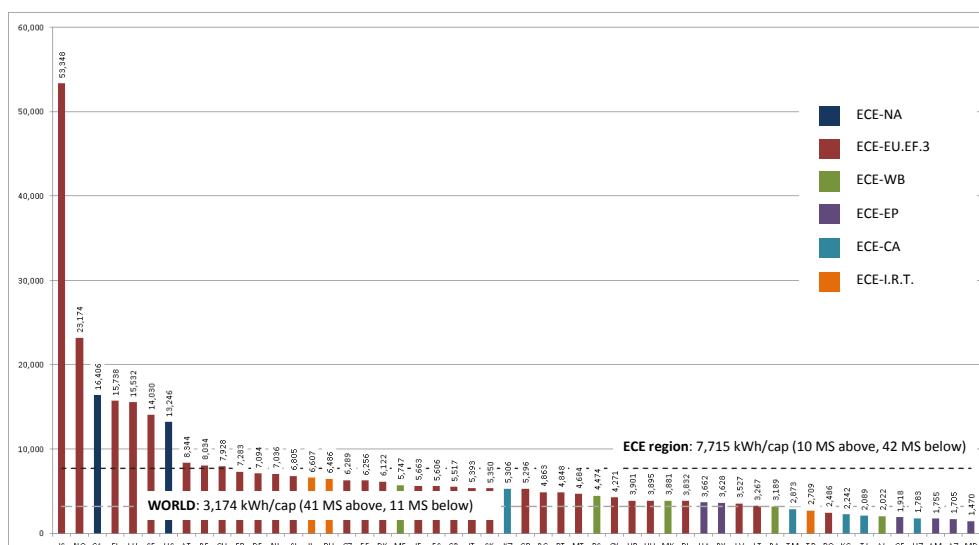


Figure A3. 7: Installed electrical capacity per capita by ECE Member State, 2011 (W/cap)

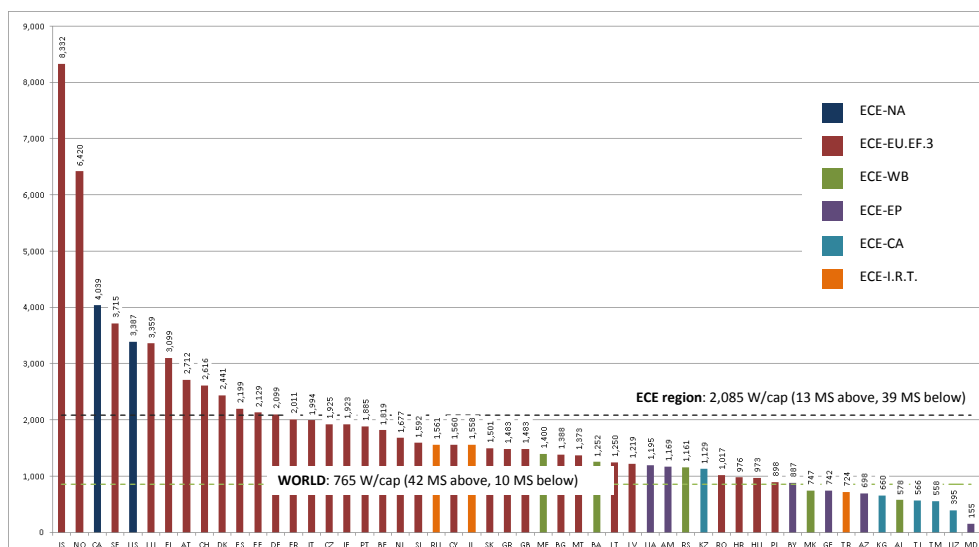


Figure A3. 8: Share of ECE member States in total global emission of CO₂, 2011 (%)

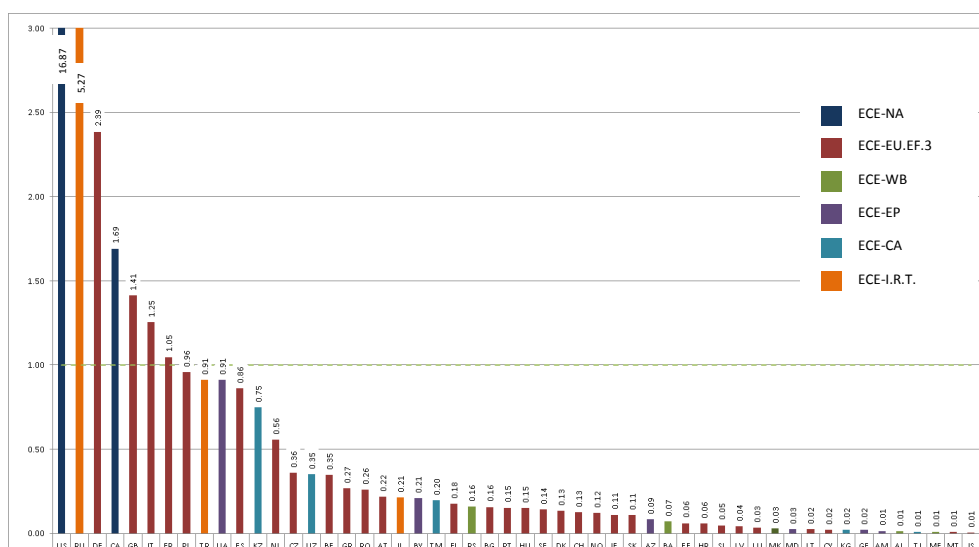


Figure A3. 9: CO₂ emission per capita by ECE Member State, 2011 (t CO₂/cap)

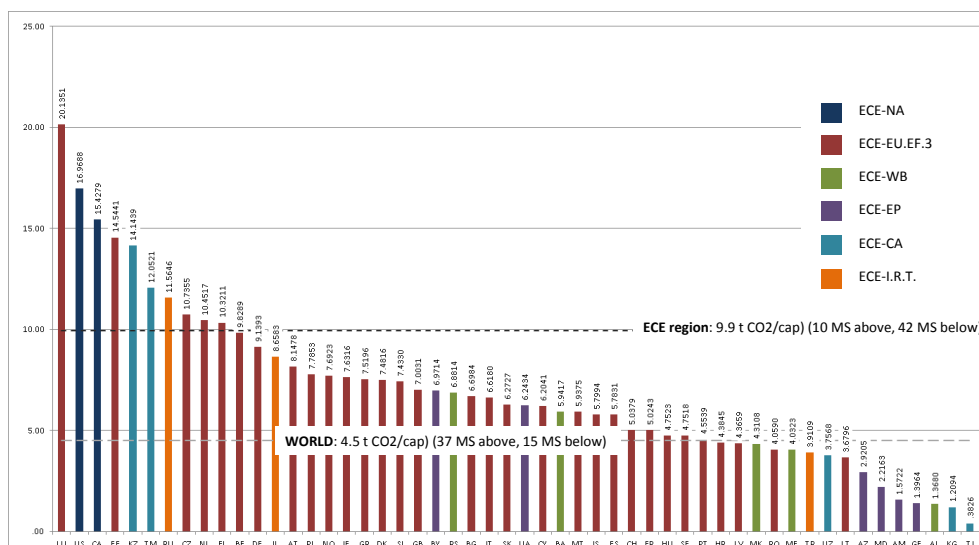


Figure A3. 10: CO2 emission per GDP by ECE Member State, 2011 (kg CO2/current US\$)

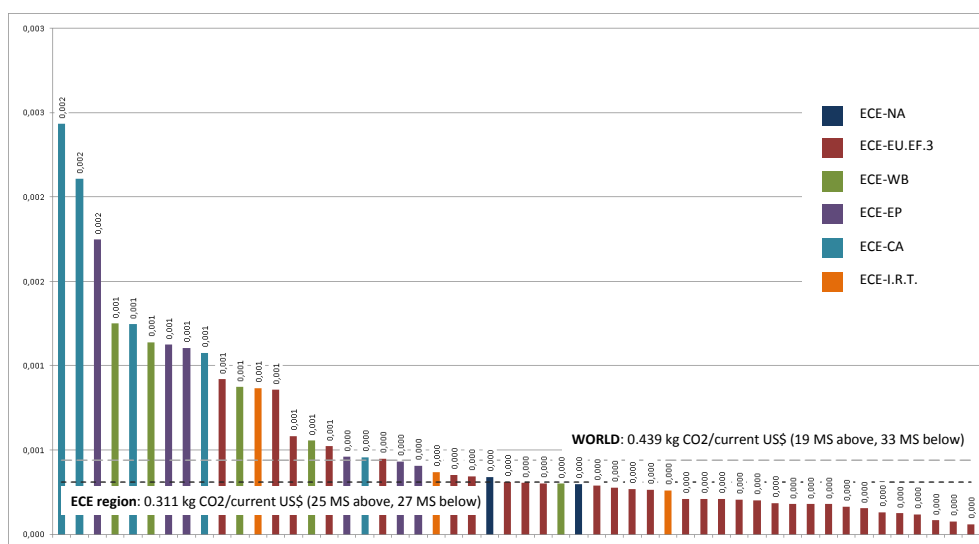
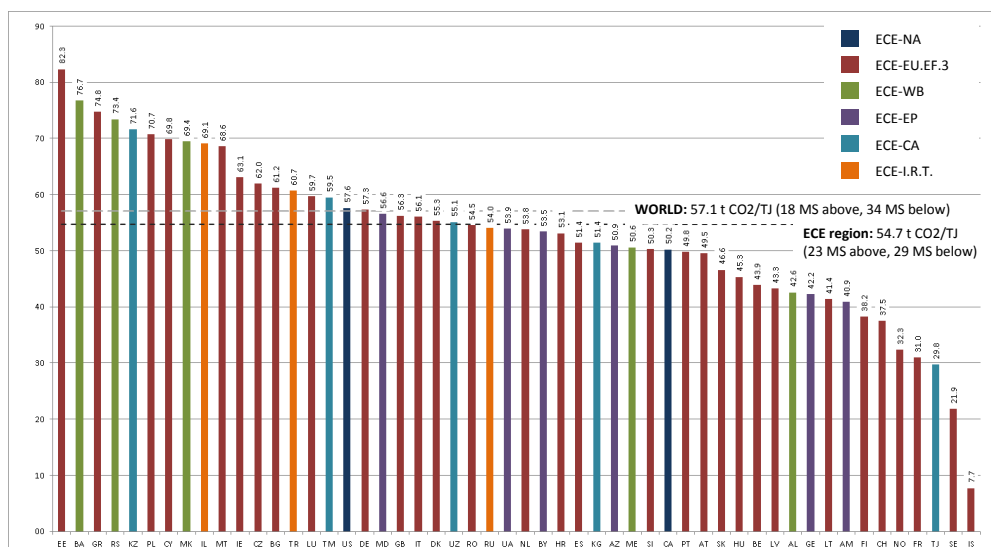


Figure A3. 11: CO2 emission per total PES by ECE Member State, 2011 (t CO2/TJ)



ANNEX4: SELECTED BASIC ENERGY VALUES BY ECE MEMBER STATE

Figure A4. 1: Total primary energy supply (PES) by ECE Member State, 2011 (PJ)

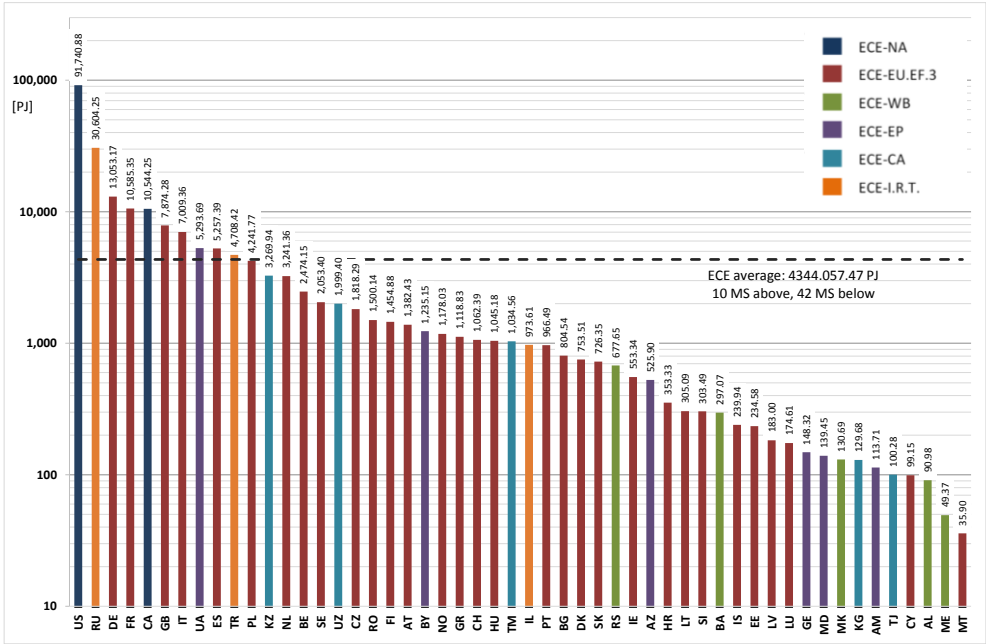


Figure A4. 2: Renewable energy sources in PES by ECE Member State, 2011 (PJ)

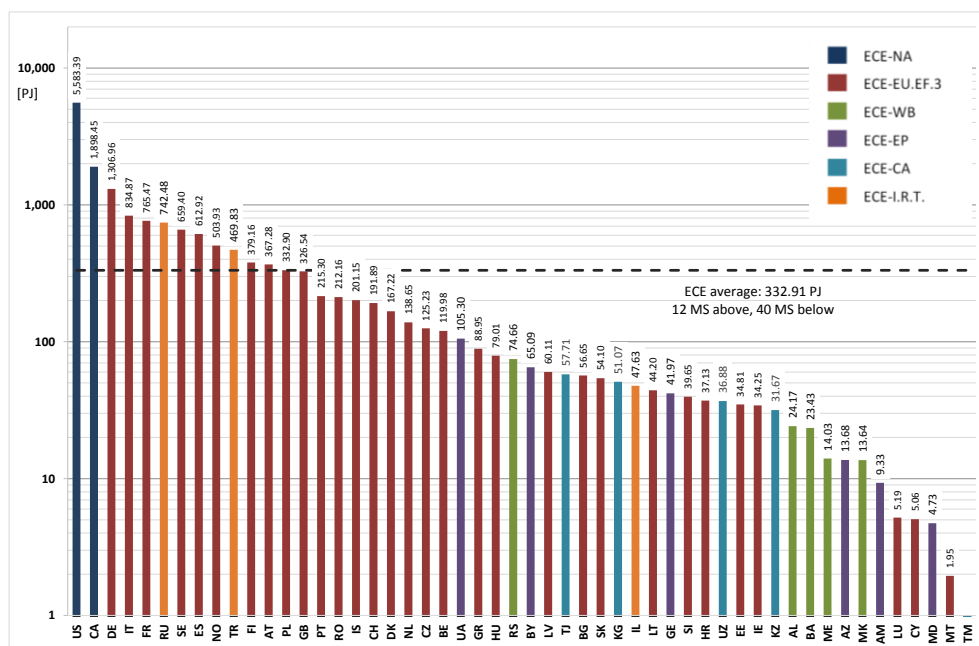


Figure A4. 3: Gross final energy consumption (GFEC) by ECE Member State, 2011 (PJ)

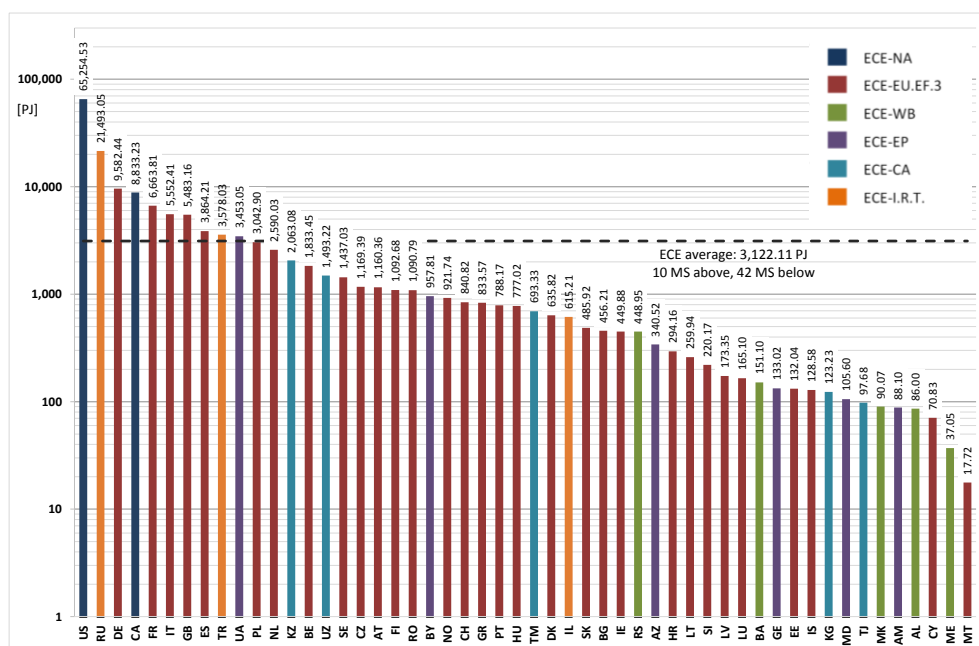


Figure A4. 4: Renewable energy sources in GFEC by ECE Member State, 2011 (PJ)

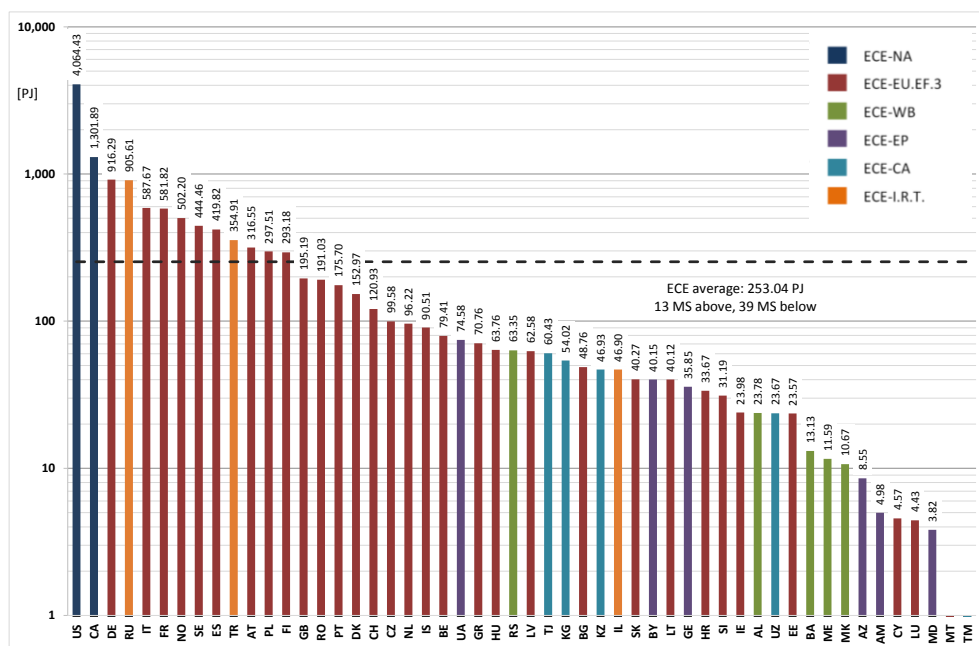


Figure A4. 5: Gross electricity generation by ECE Member State, 2011 (PJ)

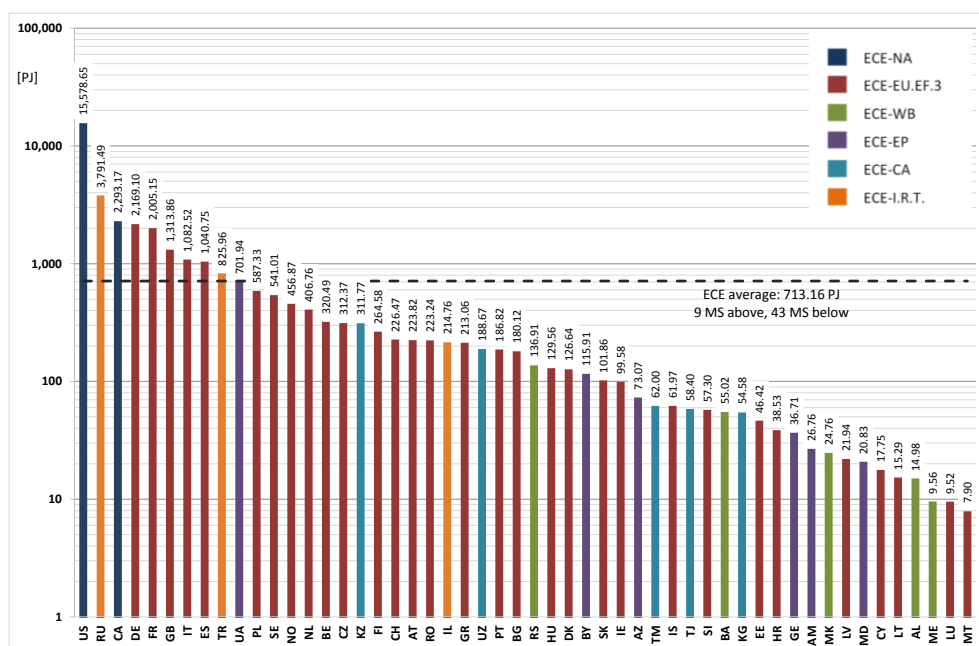


Figure A4. 6: Renewable energy sources in gross electricity generation by ECE Member State, 2011 (PJ)

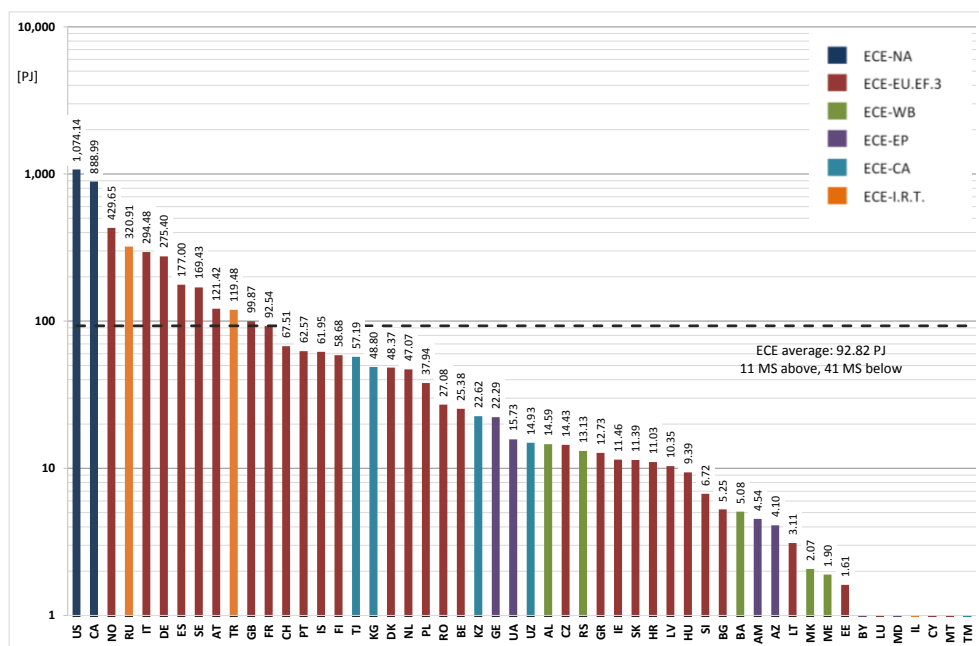


Figure A4. 7: Total heat generation by ECE Member State, 2011 (PJ)

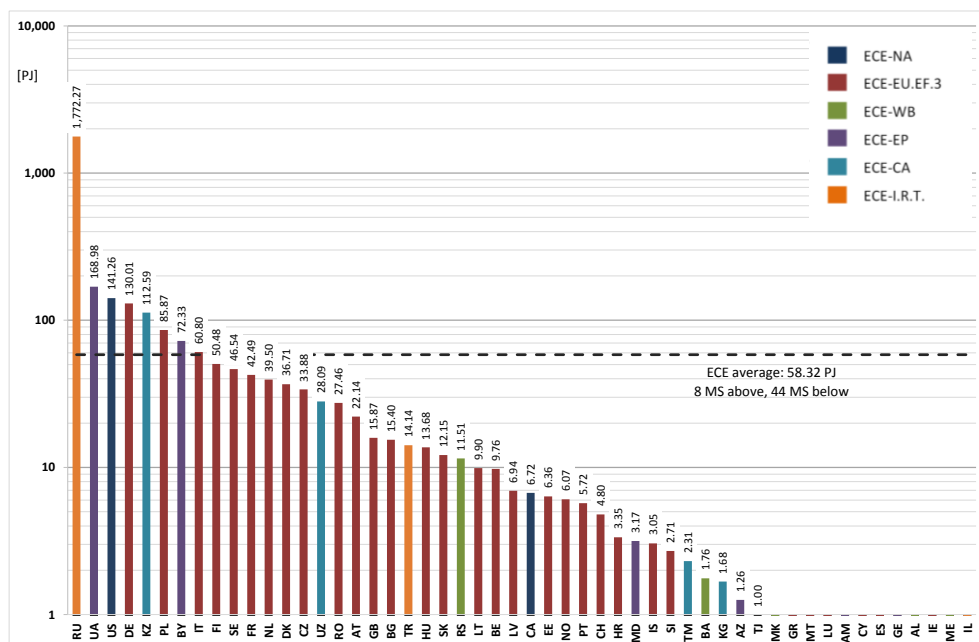


Figure A4. 8: RES in heat generation by ECE Member State, 2011 (PJ)

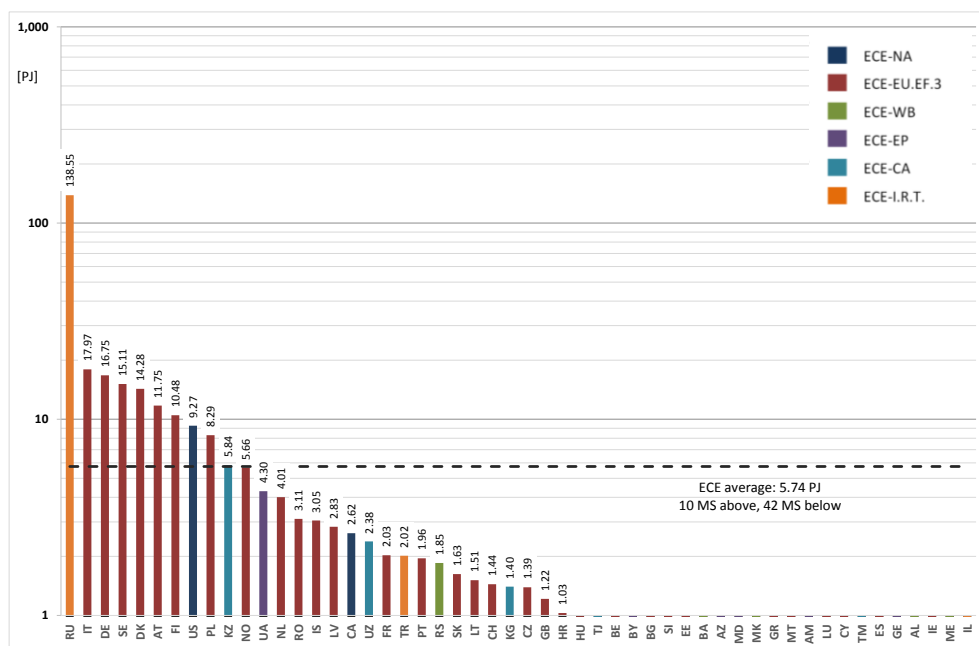


Figure A4. 9: Total transport consumption by ECE Member State, 2011 (PJ)

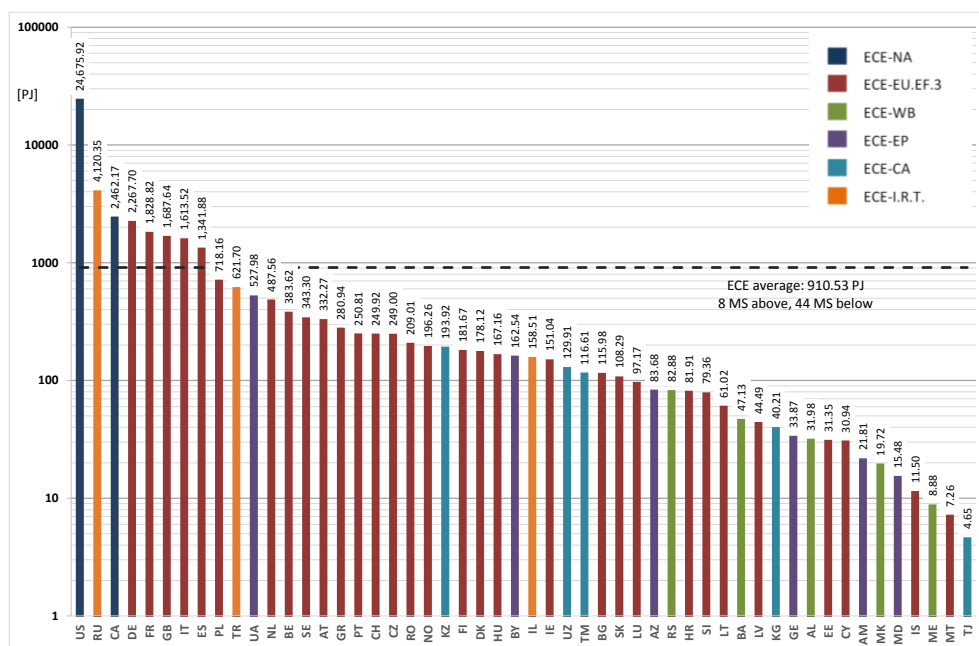
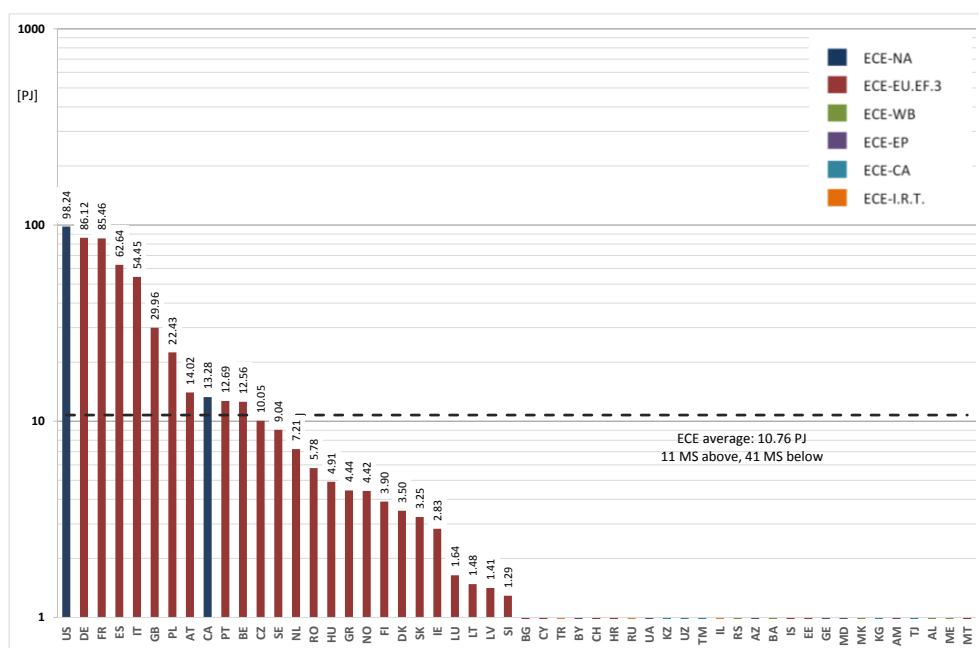


Figure A4. 10: Biodiesel and biogasoline in transport consumption by ECE Member State, 2011 (PJ)



ANNEX 5: STRATEGIC PLANNING DOCUMENTS

Table A5. 1: Strategic planning documents adopted by individual ECE member States since the Rio Conference (1992)

	Country	Strategic planning documents
	Northern America	
1	Canada	Nova Scotia Renewable Portfolio Standard (2007, revised in 2010) - RPS also in place Ontario and British Columbia; ecoENERGY programmes (2007); ecoAgriculture Biofuels Capital Initiative (2007); Prince Edward Island Renewable Portfolio Standard (2006); Sustainable Technology Development Canada (2001); Future Fuels Initiative (2001); Renewable Energy Deployment Initiative (1997-2007) (1997)
2	United States of America	Department of Energy (DOE) Loan Guarantee Programme (2007); Renewable Fuel Standard (RFS) Programme (2007); Minnesota Renewable Portfolio Standards (1994); Energy Policy Act (1992, updated in 2005)
	European Union	
1	Austria	Green Electricity Act (2012); Strategy of Austria (2010); NREAP (2010); Combined Heat and Power Law (2009); Austrian Climate Change Strategy (2007); "Klima: Aktiv" Programme (2004); National Climate Strategy 2000-08/12 (2000)
2	Belgium	NREAP (2010)
3	Bulgaria	NREAP (2010)

	Country	Strategic planning documents
4	Croatia	NREAP (2013), National Energy Strategy 2009-2020 (2009)
5	Cyprus	NREAP (2010); Action Plan for the Promotion of Renewable Energy Sources (2002)
6	Czech Republic	NREAP (2010); State Energy Policy (2004); National Programme for Economical Energy Management and Use of Renewable and Secondary Energy Resources (2002)
7	Denmark	Danish Energy Agreement for 2012-2020 (2012); Energy Strategy 2050 (2011); NREAP (2010); Green Growth Agreement (2009); Energy Strategy 2025 (2005); National R&D Strategies for Renewable Technologies (2003); Electricity Reform Agreement (2000); Biomass Agreement (1993)
8	Estonia	NREAP (2010); National Development Plan of the Energy Sector until 2020 (2009); National Energy Technology Development Plan (2008); Long-term development plan for the fuel and energy sector to 2015 (2004)
9	Finland	NREAP (2010); Long-term Climate and Energy Strategy (2008); BioRefine Technology Programme for New Biomass Products (2007); Development Programme for Second Generation of Transport Biofuels (2007); Wood Energy Technology Programme (1999); Action Plan for Renewable Energy Sources (1999); Finnish Energy Strategy (1997); Bioenergy Promotion Programme (1994); Wind Power Programme (1993); Bioenergy R&D Programme (1993)
10	France	New solar plan and second offshore wind tender (2013); Debate on energy transition (2013); NREAP (2010); Green innovation funding: the French programme of investments for the future (2010); Hydropower Revival Plan (2009); Pluriannual plan of investment (2009); National Strategy for R&D in the field of Energy (2007); Solar Water Heaters Plan (2000); Wood Energy Programme (1999); Wind Energy Programme (1996)
11	Germany	"Energiewende" (2011); KfW Programme Offshore Wind Energy (2011); NREAP(2010); Energy Concept 2010 (2010); KfW Renewable Energies Programme (2009); Integrated Climate Change and Energy Programme (2007); KfW Programme Producing Solar Power (2005); 100,000 Roofs Solar Power Programme (1999); Green Power (1996); 100 Million DM Programme (1995)
12	Greece	NREAP (2010), National Operational Programme for Competitiveness II (2010)
13	Hungary	NREAP (2011); National Energy Strategy 2030 (2011); National Energy Conservation Programme 2008 (2008); Hungary Strategy on Renewable Energy Sources 2007-2020 (2007); New Hungary Development Plan (NHDP) (2006); Szechenyi Plan (2000); Hungarian Energy Policy Principles and Business Model of the Energy Sector (1999); Energy Saving Action Plan (1996)
14	Ireland	NREAP (2010); Best Practice Guidelines for the Irish Wind Industry (2008); Micro-generation Support Programme (2008); Sustainable Energy Component of the National Development Plan 2007-2013 (2007); Renewable Heat Deployment Programme (REHeat) (2007); Pilot Programme for Mineral Oil Tax Relief on Biofuels (2005)
15	Italy	National Energy Strategy (2013); NREAP(2010); National Plan for Biofuels and Biomass (2000); 10,000 PV Roofs Programme (2000); Inter-ministerial Price Committee Provision (1992)
16	Latvia	NREAP (2010); Energy Development Guidelines for 2007-2016 (2006); Programme "Biofuel Production and Use in Latvia (2003-2010)" (2003)
17	Lithuania	National Energy Independence Strategy (2013); NREAP (2010)
18	Luxembourg	National plan for "near zero" energy buildings (2013); NREAP (2010), CO2 Reduction Action Plan (2006), National Strategy to Reduce GHG Emissions

	Country	Strategic planning documents
		(2000), National Plan on Sustainable Development (1999)
19	Malta	National Energy Policy (2012); Guidelines for micro wind turbine installations (2011); NREAP (2010)
20	Netherlands	Offshore wind energy Green deal (2011); NREAP (2010); International Energy Programme (2010)
21	Poland	Elimination of low efficient sources through support of energy efficiency and development of dispersed renewable energy sources (Pilot programme KAWKA) (2013); Biofuels targets 2013-2018(2013); NREAP (2010); Directions of Development for Agricultural Biogas Plants in Poland in 2010-2020 (2010); Polish Energy Policy until 2030 (2009); National Environmental Policy for 2009-2012 and its 2016 Outlook (2009); Programme for Renewable Energy and High Efficiency Cogeneration Projects (2009); Long-Term Programme for Promotion of Biofuels or Other Renewable Fuels (2008)
22	Portugal	National Energy Strategy (2005); Energy Efficiency and Endogenous Energies (E4) Programme (2001); ENERGIA Programme (1994)
23	Romania	NREAP (2010); National Strategy for Sustainable Development - Horizons 2013-2020-2030 (2008)
24	Slovak Republic	Concept of development of electricity generation from small renewable energy sources in Slovakia (2013); NREAP (2010); Programme for Higher Biomass and Solar Energy Use (2009); Long-term Strategy for the Use of Agricultural and Non-Agricultural Crops for Industrial Purposes (2009); Biomass Action Plan (2008-2013); Strategy for greater use of renewable energy sources (2007); Slovak Republic New Energy Policy (2006)
25	Slovenia	NREAP (2010); Resolution on the National Energy Programme (2004)
26	Spain	Indicative Renewable Energy Plan 2011-2020 (2011); NREAP (2010); Control Centre of Renewable Energies established (2006); Renewable Energy Promotion Plan 2000-2010 (1999, modified in 2005)
27	Sweden	NREAP (2010); A vehicle fleet independent of fossil fuel by 2030 (2009); Renewable Energy Investment Support Programme (1997); Energy Policy Programme (1997)
28	United Kingdom	Energy White Paper (2011); NREAP (2010); Renewable Energy Strategy 2009 (2009)
European Free Trade Association		
1	Iceland	NREAP (2014); Climate Change Strategy (2002, amended in 2007)
2	Liechtenstein	
3	Norway	Research Council of Norway, ENERGIX program (2012); NREAP (2012); Act on Offshore Renewable Energy Production (2010); National Strategy for research, Development, Demonstration and Commercialisation of New Energy Technology (Energie21) (2008); White Paper on National Climate Policy (2007); Clean Energy for the Future (RENERGI) Programme (2004); White Paper on Energy Supply (2003); Strategy for Small-Scale Hydropower (2003); White Paper on Energy Policy (1999)
4	Switzerland	Action plan for coordinated energy research (2013); The Government presents the first package of measures of the Energy Strategy 2050 to Parliament (2013); Government and Parliament decide to phase out nuclear power (2011); Building Renovation Programme (2010); Stabilisation Programme: Energy Measures (2009); Action Plan on Renewable Energy and Energy Efficiency (2008); SwissEnergy Programme (2001)
Western Balkans		

	Country	Strategic planning documents
1	Albania	Adoption of NREAP delayed; National Energy Strategy (2003, amended in 2005)
2	Bosnia and Herzegovina	Adoption of NREAP(s) delayed, Policy and strategy documents adopted at the entity level only (i.e. Republic of Srpska - RS: Energy Strategy of Republic of Srpska up to 2030 (2012) and Federation of BiH: Strategic Plan and Energy Sector Development Program of FBiH (2009))
3	Montenegro	Adoption of NREAP delayed; Energy Development Strategy of Montenegro by 2025 (2007) currently under revision by 2030 - new expected in 2014; Energy Policy of Montenegro by 2030 (2011); Renewable Energy Strategy (2007)
4	Serbia	NREAP (2013), Energy Sector Development Strategy until 2015 (2005)
5	FYR of Macedonia	Adoption of NREAP delayed; Strategy for utilising the renewable sources of energy till 2020 (2010); Strategy for Energy Development until 2030 (2010); Energy Efficiency Strategy until 2020 (2004)
Eastern Partnership		
1	Armenia	Strategic Development Programme of Hydro Energy Sector (2011); Action Plan aimed at the implementation of the National Programme on Energy Saving and Renewable Energy (2010); National Programme on Energy Saving and Renewable Energy (2007); Action Plan stipulated by the provisions of the National Security Strategies (2007); Energy Sector Development Strategy in the Context of Economic Development (2005)
2	Azerbaijan	Order of the President on preparation of National Strategy on the Use of alternative and RES for 2010-2020 (2011); State Programme on Use of Alternative and RES (2004, amended in 2009)
3	Belarus	National Programme of Local and RES Development (2011); Energy Standardisation Programme (2007); National Energy Saving Programme (2006)
4	Georgia	Renewable Energy State Programme (2008); Main Directions of the State Policy in the Energy Sector (2006)
5	Republic of Moldova	NREAP (2014); Energy Strategy by 2030 (2012)
6	Ukraine	Adoption of NREAP delayed; Energy Strategy to 2030 (2006, updated in 2013); Programme to develop biodiesel production (2005, updated 2006)
Central Asia		
1	Kazakhstan	n.a.
2	Kyrgyzstan	Programme for Development of Small and Medium Energy (2008)
3	Tajikistan	Complex Program of Wise Use of Alternative Energy 2007-2015 (2007); National Economic Development Strategy (2004)
4	Turkmenistan	n.a.
5	Uzbekistan	Energy sector development program by 2010 (1999); Main Directions of Energy Strategy up to 2010 (1995)
Others		
1	Andorra	
2	Israel	Renewable energy targets and promotion policy (2009)
3	Monaco	

	Country	Strategic planning documents
4	Russian Federation	Energy Strategy to 2030 (2009)
5	San Marino	
6	Turkey	National Climate Change Action Plan 2011-2023 (2011); National Climate Change Strategy 2010-2020 (2010); Energy Strategy Paper (2009)

Main sources: IRENA Renewable Energy Country Profiles, IEA/IRENA Policies and Measures Database, EC and EFTA member countries legislation related to RE

Annex 6: LEGAL AND REGULATORY FRAMEWORK

Table A6. 1: Type of legal and regulatory documents adopted by individual ECE member States since the Rio Conference (1992)

	Country	Legal & Regulatory Framework
Northern America		
1	Canada	Clean Energy Fund (2009); Ontario FIT Programme (2009); ecoENERGY for Biofuels Bill (2008); Accelerated Capital Cost Allowance (2007); NextGen Biofuels Fund (2007); Green Municipal Fund (2001); Canadian Renewable Conservation Expenses (1996)
2	United States of America	Appropriations for Clean Energy under the American Recovery and Reinvestment Act (2009); Cellulosic Biofuel Producer Tax Credit (2009); Grants for Production of Advanced Biofuels (2008); Energy Independence and Security Act (2008); Food, Conservation and Energy Act (2008); Residential Renewable Energy Tax Credit (2006, amended in 2008 and 2009); Farm Security and Rural Investment Act (2002); Federal Renewable Electricity Production Tax Credit (1992, last updated in 2013); Federal Business Investment Tax Credit (1992, last updated in 2009)
European Union		
1	Austria	Energy "Ökostromverordnung" (feed-in tariffs) (2012); "Klimaschutzgesetzes KSG" (law on climate protection) (2011); Combined Heat and Power Law (2009); Climate and Energy Fund (2007, amended in 2009); Amendment to the Mineral Oil Tax and the Fuel Ordinance (2004); Green Electricity Act (2002, amended in 2009, 2010 and 2012); Federal Environment Fund (2001); Eco-Plants FIT (2001); Renewable Energy Targets (2000)
2	Belgium	Federal level: Law on obligation for the incorporation of biofuels in fossil fuels (2009); Excise Tax Reduction for Biofuels (2006); Offshore Domanial Concessions for Wind and Ocean Energy Production (2004); Green Certificate Scheme (2003); Tax deductions for investments in energy efficiency and renewable energy (2003); Royal Decree on the Introduction of Mechanisms Promoting Renewable Electricity Generation (2002); National Green Certificate Scheme (2001); Access to the Grid (Renewables and CHP) (2000); RUE/Electricity Generation Fund (1996); Tax Deduction for investments in energy efficiency & renewable energy by enterprises (1992); Provincial level (Flanders, Wallonia, Brussels region etc.): grants for solar PV and solar thermal, ecological investment subsidies, RE in tertiary sector buildings, grants for small-scale heat production, RE investment subsidies, Green Certificate Schemes, demonstration projects, technology subsidies) (1990-2014)
3	Bulgaria	Energy Act (2013); Energy from Renewable Sources Act (2012); FIT for electricity from renewable sources (2011); Renewable and Alternative Energy Sources and Biofuels Act (2007); Energy Act (2003)

	Country	Legal & Regulatory Framework
4	Croatia	Energy Act (2012); Tariff system for the production of electricity from renewables and cogeneration (2012), Ordinance on the Use of Renewable Energy Sources and Cogeneration (2007); Environmental protection Act (2007); Regulation on the Minimum Share of Electricity Produced from RES and Cogeneration whose Production is Incentivised (2007); Electricity Market Act (2004); Environmental Protection and Energy Efficiency Fund (2003); Regulation on incentive fees to promote electricity production from renewables and cogeneration (2001, amended in 2011)
5	Cyprus	Law for the Promotion of Renewable Energy and Energy Efficiency in Public Consumption (2012); Support scheme for renewable electricity generation and energy savings (2009); Tax exemptions for biofuels (2005); New Grant Scheme (2004, amended in 2006); Law regulating the electricity market (2003); Law no. 33 on the Promotion of Renewable Energy and Energy Efficiency (2003)
6	Czech Republic	Green Investment Scheme (2009); Biofuels Blending Requirements (2007); Act on the Promotion of the Use of Renewables Energy Sources (2005, amended in 2006 and 2011); Tax exemption for renewable energy use (2005); Promotion of crops for energy use (2004); Excise tax exemptions for biofuels (2004); Bill on Promotion of Power and Heat Generation from Renewable Energy Sources (2003); Energy Management Act (2001, amended in 2006 and 2010); New Energy Act (2001); Subsidies for biodiesel production (1999)
7	Denmark	Regulation on Net-Metering for the Producers of Electricity for Own Needs (2012); Promotion of Renewable Energy Act (2009), Feed-in premium tariffs for renewable power (2009); Subsidies for Renewable Electricity Generation (2004), New Rules for Payment of Green Electricity (2001), Net Metering for Small-Scale PV (1998), Carbon Tax / Green Tax System (1999), Wind Energy Co-operative Tax Incentive (1997)
8	Estonia	Support to investments in wind energy (2010); Electricity Market Act (2003, amended in 2007); Green Certificates System (2001); Energy Act (1998)
9	Finland	FIT for electricity from wind, biogas and wood chips (2010); Decree on Notification of the Origin of Electricity (2005); Energy Grants for Residential Buildings (2003); Energy Aid Scheme (1999); VAT Reduction (1999); Tax subsidies for renewable electricity (1997, modified in 2007)
10	France	Offshore wind tendering mechanism (2011); Renewable Energy FIT: Biomass (2009); Flexible depreciation scheme (2003); New Energy Technologies Demonstration Fund (2008); Renewable Energy FIT: Hydropower IV (2007); Renewable Energy FIT IIII (2006); Tax Credit for Energy Saving and RE Equipment (2005); Renewable Energy FIT II (2002); Electricity Law 2000 (2000); Tax Credit for Renewable Energy in New Buildings (2000); Reduced VAT for Residential Renewable Energy Equipment (1999); Renewable Energy Purchasing Conditions (1999)
11	Germany	Energy Industry Act (2005, amended in 2012); CHP Agreements with Industry (2012); Law on Energy and Climate Fund (2011); Biofuels Quota Act (2010); Combined Heat and Power Law (2002, amended in 2008, 2011 and 2012); Renewable Energy Sources Act (2000, amended in 2004, 2009, 2010 and 2012); Eco-Tax Reform (1999); Renewable Energies Heat Act (2009); Federal Building Codes for Renewable Energy Production (1997); Incentives for solar PV installations (1993)
12	Greece	Renewable Energy Law 3851 (2010); FIT for Solar PV (included in the 3851RE Law) (2010); Generation of Electricity using Renewable Energy Sources (2006, amended in 2009); Introduction of biofuels and other renewable fuels (2005); Development incentives for renewable energy sources (2004); New Law on the Exploration of Geothermal Potential (2003); FIT (1999); Tax exemptions for renewable equipment (1995); Operational Programme for Energy: Fiscal Incentives for Renewables and Energy Conservation (1994)

	Country	Legal & Regulatory Framework
13	Hungary	Green Investment System (2009); Green Investment System (2009); Electricity Act 2007 and Green Certificates Scheme (2008); Excise tax exemption for biofuels (2007); Electricity Act (2005); Government resolution on the use of biofuels (2004); FIT (2003)
14	Ireland	Statutory Instrument 147 (2011); Biofuels Origination Scheme (2010); Renewable Energy FIT (2005); Greener Homes Scheme (2005, updated in 2007); Sustainable Energy Act (2002); Tax relief for renewable energy investments (1998)
15	Italy	Biomethane subsidies (2014); New support scheme for renewable heat from small installations (2013); New Support Scheme for Non-PV Renewable Power (2013), 5th Revision of "Conto Energia" Support Scheme for PV (2012); "All inclusive" FIT for Small Renewable Power Plants (2008); Biodiesel aid scheme quotas (2008); "55%" fiscal support scheme for small renewable heat installations (2007); Kyoto Rotation Fund (2006); "Conto Energia" feed-in premium for photovoltaic systems (2005); Introduction of the White Certificates System for renewable heat and energy efficiency installations (2001); Introduction of the Green Certificates System (1999); Carbon Tax (1999)
16	Latvia	Regulation on the Production of Renewable Electricity and the Procedures to Determine the Prices (2010); Regulations Regarding Electricity Production and Price Determination upon Production of Electricity in Cogeneration (2009); Climate Change Financial Instrument (2009); Biofuel Quota (2009); Electricity Tax Exemption (2007); Reduction of excise duty for biodiesel (2007); Guidelines for Use of Renewable Energy 2006-2013 (2006); Mandatory admixture of biofuel (2005); Financial support quotas for biofuel (2005); Electricity Market Law (2005); Law on Energy (1998)
17	Lithuania	FIT for Electricity Produced from RES (2013); Resolution of the FIT for Electricity produced from RES (2013); The promotion rules for energy production from RES (2012); Law on Energy from Renewable Sources (2011); Law on Financial Instruments for Climate Change Management (2009); Law on the Heat Sector (2003); Pollution Tax (2002); Law on Energy (2002); Tax exemptions for biofuels (2001); Law on Electricity (2000, amended in 2013); Law on biofuel, biofuels in transport and bio-oils (2000, amended in 2009)
18	Luxembourg	Financial aid programme for energy savings and renewable energy in housing 2013 (2013); Act on production, remuneration and commercialisation of biogas introducing FIT (2011); Compensation mechanism for renewable electricity (2010); Biofuels Quota (2009); Investment Grants for SMEs and non-industrial enterprises (2004); Incentives for Renewable Energy in Buildings (2001, amended in 2006, 2009 and 2012); Incentives for Renewable Electricity Production (2001); Differentiated Tax on Fuels (2000); Energy Tax (1999); FIT for renewable energy and cogeneration (1994, amended in 2005 and 2008); Fund for the Protection of the Environment (1999); Framework Law (1993)
19	Malta	Biofuel substitution obligation (2011); Capital grants for solar and wind (2006, amended in 2009); Biomass content of biodiesel exempted from excise tax (2005); FIT for solar energy (2004, amended in 2010); Use of Biofuels for Transport Regulations (2004, amended in 2012); Malta Resources Authority Act (2000)
20	Netherlands	Support Scheme for Solar Panels (2011); Guarantee Scheme for Geothermal Energy (2009); Transport Biofuels Act (2007); Energy Tax Regime (2005); FIT (2003, amended in 2008 and 2011); Energy Premium (EPR) and Energy Performance Advice (EPA) (2001); Renewables for Government Buildings (2001); Green Certificate Trading (2001); Regulatory Energy Tax (1996); Green Funds (1995)

	Country	Legal & Regulatory Framework
21	Poland	Regulation on funding of activities related to the production of bio-components, liquid biofuels or other renewable fuels and their usage in transport (2013); Order on the Quota Obligation (2012); Green Investment Scheme (2009); Bio-Components and Liquid Biofuels Act (2006); Obligation for Power Purchase from Renewable Sources (2005, amended in 2008 and 2012); Tax exemptions for renewable electricity (2002); Energy Law (2007, amended in 2002, 2005, 2007 and 2010)
22	Portugal	Feed-in tariffs for micro and mini generation for 2014 (2014); Micro-generation Law (2010, amended in 2011); Solar Thermal Incentive Scheme (2009); Wave Energy Pilot Zone (2008); Biodiesel Blending Requirement (2009); Biodiesel tax exemption (2009); Biofuels Law (2006, amended in 2008); New FIT for Renewables (2001, amended in 2005, 2007 and 2013); Promotion of hydro and wind projects (Decree-Law no. 69/2000) (2000); Tax Reduction for Renewable Energy Equipment (1999)
23	Romania	Biofuel Quota (2011); Decree 22/2008 promoting the final consumption of renewable energy sources (2008); Law establishing a system for the promotion of renewable electricity (2008, amended in 2011 and 2012); Energy performance of buildings Law (2007); Electricity Law (2003, amended in 2007 and 2012); Law on the Environmental Fund (2000)
24	Slovak Republic	Act on Energy and amendments to certain acts (No. 251/2012) (2013); Act 136/2011 on the promotion of the renewable energy and highly efficient cogeneration (2011); Act 309/2009 on Support of Renewable Energy Sources and High Efficiency CHP (2009, amended in 2010 and 2011); Excise Tax Exemption for Renewable Electricity (2008); Minimum biofuel requirements (2007); FIT for renewable energy (2005, updated yearly); Act 656/2005 on Energy and Amendments (2005); Excise tax exemption for biofuels (2004, amended in 2007); Act on Regulation in Network Industries (2001, amended in 2007)
25	Slovenia	Decree on Green Public Procurement (RS 102/2011) (2011); Energy Act (2010, amended in 2013); Decree on the support for Electricity Generated from Renewable Energy Sources (2009); Promotion of the Use of Biofuels and Other Renewable Fuels for the Propulsion of Motor Vehicles (2007); Tax exemptions for liquid biofuels (2004); FIT and Premiums (2002); Eco-Fund (2000); Energy Act (1999)
26	Spain	Law 15/2012 on tax policy aimed at energy sustainability (2013); Royal Decree Law 1/2012 revocation of public financial support for new electricity plants from renewable energy sources, waste and CHP (2012); Sustainable Economy Law (2011); Mandatory Biofuel Content in transportation fuels (Royal Decree 459/2011) (2011); Regulation on small power plants connection to the electricity grid (Royal Decree 1699/2011) (2011); New Regulatory Framework for Administrative Procedures for RE Facilities (Royal Decree Law 6/2009) (2009); Royal Decree 1578/2008 on PV Electricity Price (2008); Law 12/2007 and Mandatory Biofuel Requirement (2007-2008, amended in 2011); Royal Decree 661/2007 (2007); Royal Decree 314/2006 on technical Building Code (2006); Royal Decree 436/2004 (2004); Royal Decree 2818/1998); Law 54/1997 on the Electricity Sector (1997); Royal Decree 2366/1994 on FIT (1994, amended in 1998, 2000, 2004, 2007, 2009, 2010 and 2012)
27	Sweden	Sweden-Norway Green Certificates Scheme (2012); Electricity Certificates Act (2011); Act on Sustainability Criteria for Biofuels and Bioliquids (2010); Support for the development and implementation of biogas technologies (2009); Support for the installation of solar panels (2009); Grants for Residential Heating Conversion (1006); Green Certificate Scheme (2003); Support for Small Scale Electricity Production (2000); Guaranteed Power Purchase Contracts (1997); Environmental Bonus for Wind Power (1994, regularly amended); Tax exemptions for renewable electricity (1994)

	Country	Legal & Regulatory Framework
28	United Kingdom	Renewable Heat Incentive (2011); Energy Act (2010); FIT for Renewable Electricity (2010); Renewable Transport Fuels Obligation (2008); Energy Act (2008, amended in 2010); Climate Change Act (2008); Environmental Transformation Fund (2007); Climate Change and Sustainable Energy Act (2006); Scottish Biomass Support Scheme (2006); Marine Research Development Fund (2005); Renewable Energy Guarantees of Origin (2003); Renewables Obligation (2002, last amended in 2009); Preferential Tax Regimes for Biofuels (2002, last amended in 2008); Bio-Energy Capital Grants Scheme (2002); Offshore Wind Capital Grants Scheme (2002); Bio-energy capital Grants Scheme (2002); Climate Change Levy (2001)
European Free Trade Association		
1	Iceland	Act on the Guarantee of Origin of Renewable Electricity (2008, amended in 2010); Electricity Act (2003); Regulation on the National Energy Fund (2003); Act on the National Energy Authority (2003)
2	Liechtenstein	
3	Norway	Enova investment aids (2013); Renewable Heat Production (2013); Norway-Sweden Green Certificates Scheme (2012); Enova and Energy Fund established (2002); Offshore Energy Act (2010); Energy taxes and CO ₂ -tax (1999)
4	Switzerland	FIT for RES (2009); Risk Guarantee Scheme for Geothermal Power Projects (2008); Mineral Oil Tax Exemption for Biofuels fulfilling sustainability criteria (2008); Electricity Supply Act (2007); Nature Made Labelling Scheme (2000); Federal Law on the Reduction of CO ₂ (1999); Energy Act (1999)
Western Balkans		
1	Albania	Renewable Energy Law (2013); Law on Power Sector (2003, amended in 2009); New tariff methodology for small hydro plants (2007); Law on Heat Savings in Buildings (2002)
2	Bosnia and Herzegovina	Law on Renewable Energy and Efficient Cogeneration (2013, amended in 2014); Law on Electricity in the Federation (FBiH) 2013); Rulebook on incentives for generation of electricity from renewables and efficient co-generation (RS) (2012); FIT for electricity from renewables and cogeneration (RS) (2012); Decree on generation and consumption of electricity from renewables and cogeneration (RS) (2011); Regulation on the use of renewables and cogeneration (RS) (2010); Energy Law (RS) (2009); Electricity Law (RS) (2008, amended in 2009 and 2011); Connection rules (2008)
3	Montenegro	Energy Law (2010); Comprehensive regulatory framework for RE established (2011); FIT (2011) - all documents currently under revision
4	Serbia	FIT for renewable energy sources and CHP generation (2009, amended in 2013); Decree on the Requirements for obtaining the Status of Privileged Power Producer (2009, amended in 2013); Energy Law (2004, amended in 2011 and 2012)
5	FYR of Macedonia	Energy Law (2006, amended in 2008, 2011, 2013, new amendments in progress); FIT (2007, amended in 2008 and 2010)
Eastern Partnership		
1	Armenia	Energy Saving and Renewable Energy Law (2004); Energy Law (2001)
2	Azerbaijan	RES targets adopted (2013); Rules of issuing Special Permission to Activity Concerning Alternative and RES (2010); State Agency on Alternative and RES established (2009)
3	Belarus	Law on Renewable Energy Sources (2011); Decree on biofuel product norms (2011); Tax relief for renewable energy investors (2009); FIT for RES-E (1994, revised in 2011)

	Country	Legal & Regulatory Framework
4	Georgia	n.a.
5	Republic of Moldova	Draft Law on Promotion of Energy from Renewable Sources in Parliament discussion (2014); Law on Electricity (2009, amended in 2014); Law on Natural gas (2010, amended in 2014); Heat Law (2014)
6	Ukraine	Law on Promotion of Biological Fuels Production and Use (2009); FIT (2009, amended in 2013); VAT and customs duties exemptions for renewable energy equipment (2008); Law on Combined Heat and Power (Cogeneration) and Waste Energy Potential (2005); Presidential Decree on the production of fuels from biomaterials (2003); Law on Alternative Energy Sources (2003); Law on Alternative Liquids and Gaseous Fuels (2000, revised in 2009 and 2012)
	Central Asia	
1	Kazakhstan	Law 166-IV amending existing laws to support renewables (2009); Law on the Use of Renewable Energy Sources (2009); Decree on the transition to sustainable energy development (2006)
2	Kyrgyzstan	Regulation on small hydro power plants (2009); Law on Renewable Energy (2008)
3	Tajikistan	Law on the use of renewable energy (2010); Law on Power Engineering (2000, amended in 2005); Order no. 267 on Development of Small Power Engineering (1997); Tax exemptions for small hydro plants (1992)
4	Turkmenistan	n.a.
5	Uzbekistan	Law on Rational Energy Utilisation amended (2003); Decree 476 on the development of hydro energy (1995)
	Others	
1	Andorra	
2	Israel	FIT for solar PV and wind electricity (2009, amended in 2011); State subsidy for electricity generation from wind and solar PV (2004); Incentives for renewable electricity generation (2002)
3	Monaco	
4	Russian Federation	Decree 449 (2013); Resolution 850 (2010); Federal Law Introducing the Capacity-Based Scheme (2010); Renewable Energy Target (2009); Decree 426 on Qualifying a Renewable Electricity Generating Facility (2008); Law on Electricity Industry amended to introduce the Electricity Premium Scheme (2007)
5	San Marino	
6	Turkey	Regulation on the Promotion of Renewables and the Certification of their Origin updated (2011); Renewable Energy Law 2010 (2011); FIT (2008); Law 5686 on Geothermal Resources (2007); Renewable Electricity Law (No. 5346) 2005; Electricity Market Licensing Regulation (2001)

Main sources: IRENA Renewable Energy Country Profiles, IEA/IRENA Policies and Measures Database, EC and EFTA member countries legislation related to RE.

Annex 7: RENEWABLE ENERGY RELATED TARGETS

Table A7. 1: Renewable energy related targets in ECE member States

	Country	Percentage (%) of RE in GFEC in 2005 (EU MSs) and in 2009 (CPs to ECT)	National Overall targets (% of RE in GFEC in 2020)	Various other targets for RE by 2020 (unless another deadline is mentioned)
	Northern America			
1	Canada	Several targets established in terms of installed RE-E capacity, RE-E sales, RE-E generation by X year (Manitoba, New Brunswick, Nova Scotia, Ontario, Prince Edward Island, Quebec); 14.3% share of RE in electricity generation		
2	United States of America	Several targets referring to retail electricity sales by X year established (Hawaii, California, Colorado, New York etc.) www.dsireusa.org		
	European Union			
1	Austria	23.3	34 and 45 in Final Energy from RES	At least 10% in transport; additional 2 GW of wind, 1.2 GW of solar PV, 1 GW of hydro and 0.2 GW of bioenergy /solid and biogas capacity
2	Belgium	2.2	13	At least 10.14% in transport; 20.9% in electricity generation; 3.8 TWh of total wind generation; 11.9% in heating and cooling
3	Bulgaria	9.4	16	At least 10% in transport; 23.8% in heating & cooling
4	Croatia	12.6	20	10% in transport; 400 MW wind power installed by 2030; 35% of RE in electricity generation;
5	Cyprus	2.9	13	At least 10% in transport
6	Czech Republic	6.1	13.5	10.8% in transport; 16.9% share of RE in electricity generation by 2030; 15% in GFEC in 2030

	Country	Percentage (%) of RE in GFEC in 2005 (EU MSs) and in 2009 (CPs to ECT)	National Overall targets (% of RE in GFEC in 2020)	Various other targets for RE by 2020 (unless another deadline is mentioned)
7	Denmark	17	30	10% in transport by 2020 (100% by 2050); 35% in GFEC in 2020; 50% of wind power in electricity generation; 1.2 GW of additional offshore wind capacity; 1.8 GW of additional onshore wind capacity; 39.8% share of RE in heating/cooling by 2020 and 100% by 2050; individual oil boilers and coal used in power plants to be phased out by 2030; heat and electricity supply to be based on RES by 2035; 100% of total energy consumption covered from RES by 2050
8	Estonia	18	25	18% of electricity generation from RE by 2015; at least 10% in transport
9	Finland	28.5	38	10% in transport by 2020 (revised to 20% in 2013); 9 GW of installed wind capacity by 2020; 6 TWh electricity generation from on-grid wind by 2020 and 9.0 TWh by 2025; 25 TWh biomass output
10	France	10.3	23	27% of electricity generation from RES; 10.5% in transport; specific targets for RES-E and RES-H by RE sub-sector (hydropower, ocean, solar PV, CSP, wind, geothermal, solid biomass, biogas) in 2020
11	Germany	5.8	18	18% of RE in GFEC by 2020 (30% by 2030, 45% by 2040 and 60% by 2050); 35% of electricity generation from RE by 2020 (50% by 2030, 65% by 2040 and 80% by 2050); at least 10% in transport; 14% of total heat supply from RE; 50% share of RE in primary energy supply in 2050
12	Greece	6.9	18	40% of electricity generation from RES; at least 10% in transport; 2.2 GW of solar PV by 2030 and 10 GW by 2050; 20% share of RE in GFEC in 2020; 20% in heating and cooling by 2020
13	Hungary	4.3	13	At least 10% in transport; 14.65% share of RE in GFEC (revised from previous 13%); 10.9% share of RE in electricity consumption; 18.9% share of RE in heat consumption
14	Ireland	3.1	16	40% of electricity generation from RES; at least 10% in transport; 15% in heating from RES
15	Italy	5.2	17 / 19-20	19-20% of RE in GFEC by 2020; 10% in transport; 35-38% of electricity generation from RES by 2020, corresponding to 120-130 TWh of electricity generation from RES; 20% in heating from RES; targeted total installed power (RES-E) and heat (RES-H) generation capacities by RE sub-sector by 2020
16	Latvia	32.6	40	At least 10% in transport; 60% share of RE in electricity consumption; 8% share of CHP in electricity generation

	Country	Percentage (%) of RE in GFEC in 2005 (EU MSs) and in 2009 (CPs to ECT)	National Overall targets (% of RE in GFEC in 2020)	Various other targets for RE by 2020 (unless another deadline is mentioned)
17	Lithuania	15	23	At least 10% in transport; 500 MW installed wind power capacity; 10 MW installed solar PV capacity; 141 MW installed hydropower capacity; 355 MW installed biomass capacity; 21% share of RE in electricity generation; 1 GW installed RES-E generation capacity; 1.9 TWh RES-E generation; 39% share in heating/cooling; 10% share of RE in primary energy supply
18	Luxembourg	0.9	11	At least 10% in transport
19	Malta	0	10	At least 10% in transport
20	Netherlands	2.4	14	At least 10% in transport; 16% share of RE in electricity generation; 24% share of RE in GFEC in 2023; 24 PJ of total biogas production
21	Poland	7.2	15	At least 10% in transport (11.7% in NREAP); 1 GW of offshore wind capacity; 19.1% share of RE in electricity generation; 17.1% share of RE in heating/cooling; 14% share of RE in total PES
22	Portugal	20.5	31	At least 10% in transport; 55-60% of electricity generation from RES; specific targets are set for RES-E capacity and pertaining electricity generation by RES type, RES-H capacities and generation by RES type and biofuels capacity in 2020
23	Romania	17.8	24	10% in transport; 22% in heating and cooling from RES; 4 GW total installed wind capacity, 43% share of RE in electricity generation
24	Slovak Republic	6.7	14	At least 10% in transport; 356 GWh solar thermal heat production
25	Slovenia	16	25	At least 10% in transport; 340 MW installed wind capacity by 2015; 1.25 GW of additional installed hydropower capacity by 2030; 30.8% share of RES-H in final heating/cooling
26	Spain	8.7	20	20.8% in primary energy supply, of which: 6.3% wind, 5.8% biomass/wastes, 3% solar, 2.9% hydro, 2.7% liquid biofuels and 0.1% other RES; 40% of electricity generation from RES; 11.3% in transport; 18.9% in heating/cooling from RES; 72.5 GW of RE capacity, of which: 35 GW offshore wind, 13.9 GW hydro and 7.3 GW solar PV
27	Sweden	39.8	49 / 50	At least 10% in transport; 25 TWh more RE-E by 2020 than in 2002; a vehicle stock becomes independent from fossil fuels by 2030
28	United Kingdom	1.3	15	5% in transport by 2014 and at least 10% by 2020; 12% of renewable-based heat; Scotland: 15% of electricity generation from RES by 2020; 100% share of RE in electricity consumption in Scotland; 20 GW of installed solar PV (1 GW in public

	Country	Percentage (%) of RE in GFEC in 2005 (EU MSs) and in 2009 (CPs to ECT)	National Overall targets (% of RE in GFEC in 2020)	Various other targets for RE by 2020 (unless another deadline is mentioned)
				buildings); 39 GW of installed offshore wind capacity by 2030; 15 TWh electricity generation from biomass CHP; 14% share of biomass CHP electricity generation; 15% share of RES in heat sector
	European Free Trade Association			
1	Iceland	n.a.	n.a.	n.a.
2	Liechtenstein			
3	Norway	n.a.	67.5	26.4 TWh RE production due to the common electricity certificate market with Sweden; 2 GW installed onshore wind power capacity; carbon-neutrality by 2050
4	Switzerland	n.a.	24	24% of primary energy supply from RES; 4.4 TWh of RES-E generation (excl. large hydro) by 2020, 14.5 TWh by 2035 and 24.2 TWh by 2050; 37.4 TWh large hydropower generation by 2035
	Western Balkans			
1	Albania	31.2	38	10% in transport (EnC obligation); 18% of primary energy supply from RES (2011)
2	Bosnia and Herzegovina	34	40	10% in transport (EnC obligation)
3	Montenegro	26.3	33	10% in transport (EnC obligation)
4	Serbia	21.2	27	10% in transport (EnC obligation); 1.09 GW added installed renewable energy capacity; targeted share in added RES-E capacity; 46% wind, 40% hydropower, 9% biomass; 10 MW of solar capacity
5	FYR of Macedonia	21.9	28	10% in transport (EnC obligation); 24.7% share of RE in electricity generation
	Eastern Partnership			
1	Armenia	n.a.	n.a.	215 MW installed small hydropower and 265 MW added hydropower by 2025; 300 MW installed wind; 33% share of RE in electricity generation capacity by 2025
2	Azerbaijan	n.a.	n.a.	20% of electricity generated from RES; 20% of wind in RE by 2015 and 32% by 2020; 3% of waste-to-energy in RE by 2015 and 5% by 2020; 10% of hydropower in RE by 2015 and 16% by 2020; 9.7% of RE in final energy consumption; 10% of bioenergy in RES-H by 2015 and 13% by 2020; 6% of geothermal in RES-H by 2015 and 14% by 2020; 14% of solar thermal in RES-H by 2015 and 24%

	Country	Percentage (%) of RE in GFEC in 2005 (EU MSs) and in 2009 (CPs to ECT)	National Overall targets (% of RE in GFEC in 2020)	Various other targets for RE by 2020 (unless another deadline is mentioned)
				by2020
3	Belarus	n.a.	n.a.	Most targets outdated - set in 2011 for a short-term period by 2014/2015; 32% share of RE in primary energy supply by 2020
4	Georgia	n.a.	n.a.	45 TWh electricity generation from RE; 20% renewable electricity generation; 41 TWh of large-scale RE in primary energy
5	Republic of Moldova	11.9	17	10% in transport (EnC obligation); 20% of primary energy supply from RES; 10% share of RE in electricity generation
6	Ukraine	5.5	11	10% in transport by 2030 (EnC obligation); 18% share of RE in final energy supply by 2030; 19% of primary energy supply from RES by 2030
	Central Asia			
1	Kazakhstan	n.a.	n.a.	1% share of RE in electricity consumption by 2014 and 50% share in electricity generation by 2050; 5% of total primary energy supply from RES by 2024; 1 GW of additional RE in electricity generation capacity; 793 MW of added wind capacity, 170 MW of added hydropower capacity, 77 MW of added solar PV capacity
2	Kyrgyzstan	n.a.	n.a.	n.a.
3	Tajikistan	n.a.	n.a.	n.a.
4	Turkmenistan	n.a.	n.a.	n.a.
5	Uzbekistan	n.a.	n.a.	100 MW added installed solar PV capacity by 2015
	Others			
1	Israel	0	50	5% of electricity generation from RES by 2014 and 10% by 2020; 6.43 TWh of RE production
2	Russian Federation	0	0	2.5 % of electricity generation from RES (excl. large hydro) by 2015 and 4.5% by 2020; 7 GW installed wind capacity
3	Turkey	n.a.	n.a.	50 GW installed on-grid wind capacity; targets by 2023: 30% of primary energy from RES, 30% of electricity generation from RES, 3 GW installed solar PV capacity, 600 MW installed geothermal capacity, 2 GW installed biomass capacity, 36 GW installed hydropower capacity

Main sources: IRENA Renewable Energy Country Profiles, REN21 Renewable Interactive Map.

Annex 8: IDENTIFIED PROJECTS IN RENEWABLE ENERGY SUB-SECTORS

Table A8. 1: Announced capacity additions in renewable energy technologies in Bloomberg New Energy Finance (BNEF) Database

	Country	Wind	Solar	Hydro	Biomass	Geothermal	Ocean
	Northern America						
1	Canada	13,000 MW (146 projects)	1,650 MW of solar PV (113 projects)	850 MW of small HPPs (42 projects)	More than 700 MW and 31 MWth biomass-fired capacity (38 projects); 470m litres of biodiesel per year capacity (7 projects); 380m litres of bioethanol per year capacity (6 projects)	16 MW (3 projects)	19 MW (6 projects)
2	United States of America	More than 60,000 MW (274 projects)	17,000 MW solar PV (367 projects); 5,000 MW of solar thermal (22 projects)	0	More than 3,600 MW and 55 MWth of biomass-fired capacity (125 projects); 4,300m litres of biodiesel per year capacity (50 projects); 10,200m litres of bioethanol per year capacity (51 projects)	More than 1,400 MW (45 projects)	More than 240 MW (18 projects)

	Country	Wind	Solar	Hydro	Biomass	Geothermal	Ocean
					projects)		
	European Union						
1	Austria	188 MW (2 projects)					
2	Belgium	more than 1,600 MW offshore and 470 MW onshore	1.2 MW of solar PV (1 project)	16 MW of small HPPs (25 projects)	780-930 MW and 24 MWth of biomass-fired capacity (3 projects); 20 MWe and 20 MWth of waste-to-energy capacity (1 project)		
3	Bulgaria	2,300 MW (23 projects)	185 MW of solar PV (12 projects)	80 MW of small HPPs (1 project)			
4	Croatia	275 MW (7 projects)	17 MW of solar PV (1 project)		24 MW and 24 MWth of biomass-fired capacity (5 projects)		
5	Cyprus	110 MW (3 projects)	1.3 MW of solar PV (1 project)		3.4 MW of biomass-fired capacity (4 projects)		
6	Czech Republic	190 MW (10 projects)	115 MW of solar PV (12 projects)		30 MW biomass-fired capacity (6 projects)		
7	Denmark	836 MW (6 projects)			More than 1,050 MW and 500 MWth of biomass-fired capacity (4 projects); 73m litres of biodiesel per year capacity (1 project)		
8	Estonia	89 MW (2 projects)			1.36 MWe / 1.4 MWth biogas capacity (1 project)		
9	Finland	More than 4,550			90 MW and 158 MWth of biomass-fired		

	Country	Wind	Solar	Hydro	Biomass	Geothermal	Ocean
		MW (28 projects)			capacity (2 projects); 108m litre of biodiesel per year capacity (1 project); 9.8m litre of bioethanol per year capacity (1 project)		
10	France	More than 8,100 MW (34 projects)	759 MW of solar PV (33 projects)		522 MW and 159 MWth of biomass-fired capacity (51 projects), 240m litre of biodiesel per year capacity (4 projects)	24 MWth (1 project)	2 MW (1 project)
11	Germany	More than 12,500 MW (44 projects)	182 MW of solar PV (10 projects)		18 MW and 57 MWth of biomass-fired capacity (4 projects); 61.2m litres of biodiesel per year capacity (1 project)	33 MW and 105 MWth (6 projects)	
12	Greece	1,800 MW (5 projects)	More than 2,050 MW of solar PV (12 projects)		0		
13	Hungary	20 MW (1 project)			91 MW and 110 MWth of biomass-fired capacity (4 projects)	12 MWth (1 project)	
14	Ireland	542 MW (15 projects)			16 MW of biomass-fired capacity (1 project)		250 MW (2 projects)
15	Italy	2,450 MW (22 projects)	900 MW of solar PV (73 projects) and 131 MW of solar thermal (4 projects)		78 MW and 8 MWth of biomass-fired capacity (5 projects), 380m litres of biodiesel per year capacity (1 project); 254m litres of bioethanol per year capacity	40 MW (1 project)	

	Country	Wind	Solar	Hydro	Biomass	Geothermal	Ocean
					(1 project)		
16	Latvia			1.1 MW of small HPPs (2 projects)	52 MW of biogas capacity (50 projects) and in addition, 102 MW of biomass-fired capacity (50 projects)		
17	Lithuania				60 MW and 50 MWth of biomass-fired capacity (3 projects)		
18	Luxembourg	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
19	Malta	110 MW (3 projects)			78 MW of biomass-fired capacity (1 project); 270m litres of bioethanol per year capacity (2 projects)		
20	Netherlands	1,150 MW (5 projects)	1.5 MW of solar PV (1 project)		500m litres of biodiesel per year capacity (1 project)		
21	Poland	Around 6,350 (56 projects)		20 MW of small HPPs (3 projects)	175 MW and 119 MWth of biomass-fired capacity (11 projects)	More than 12 MW (2 projects)	
22	Portugal	115 MW (4 projects)	13.5 MW of solar PV (3 projects), 4 MW of solar thermal (1 project)	5 MW of small HPPs (1 project)	18 MW of biomass-fired capacity (2 projects), 310m litres of biodiesel per year capacity (1 project)		27 MW (3 projects)
23	Romania	Around 3,500 MW (30 projects)	293 MW of solar PV (23 projects)		119 MW of biomass-fired capacity (6 projects)		
24	Slovak Republic	173 MW (4 projects)	50 MW of solar PV (5 projects)		1.5 MW of biomass-fired capacity (1 project)	6 MW (1 project)	
25	Slovenia			72 MW in small HPPs (

	Country	Wind	Solar	Hydro	Biomass	Geothermal	Ocean
				2 projects)			
26	Spain	2,650 MW (33 projects)	1,400 MW of solar PV (67 projects); 840 MW of solar thermal (21 projects)		310 MW of biomass-fired capacity (14 projects)	10 MW and 8 MWth (2 projects)	6.5 MW (2 projects)
27	Sweden	Around 4,500 MW (42 projects)			429 MW and 107 MWth of biomass-fired capacity (7 projects); 126m litres of bioethanol per year capacity (1 project)		
28	United Kingdom	Around 40,000 MW (172 projects)	135 MW of solar PV (19 projects)	37 MW of small HPPs (7 projects)	Around 2,230 MW and 700 MWth of biomass-fired capacity (56 projects); 231m litres of biodiesel per year capacity (3 projects); 623m litres of bioethanol per year capacity (4 projects)	10 MW and 65 MWth of geothermal capacity (2 projects)	Around 2,800 MW (26 projects)
	European Free Trade Association						
1	Iceland					610 MW and 45 MWth (5 projects)	
2	Liechtenstein						
3	Norway	4,900 MW (25 projects)		12 MW small HPPs (3 projects)	56 MW of biomass-fired capacity (1 project), 2.4m litres of biodiesel per year capacity (1 project)		2 MW (3 projects)
4	Switzerland						
	Western Balkans						

	Country	Wind	Solar	Hydro	Biomass	Geothermal	Ocean
1	Albania			94 MW of small HPPs (3 projects)			
2	Bosnia and Herzegovina	246 MW (6 projects)		390 MW of small HPPs (15 projects)	24 MW (and 18 MWth of biomass-fired capacity (2 projects)		
3	Montenegro	Around 100 MW (2 projects)		21 MW of small HPPs (4 projects)			
4	Serbia	30 MW in first step and 500 MW in total by 2020	5 MW in first step and 10 MW in total by 2020	1.8 GW of HPPs			
5	FYR of Macedonia	450 MW (6 projects)		340 MW of small HPPs (14 projects)	2.5 MW and 9 MWth of biomass-fired capacity (2 projects); 48m litres of biodiesel per year capacity (1 project)		
	Eastern Partnership						
1	Armenia	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
2	Azerbaijan	20 MW (1 project)		50 MW of small HPPs (1 project)			
3	Belarus	195 MW (3 projects)		83 MW of small HPPs (3 projects)			
4	Georgia			17 MW of small HPPs (2 projects)			
5	Republic of Moldova			0	38m litres of bioethanol per year capacity (1 project)		
6	Ukraine	3,140 MW (15 projects)	360 MW of solar PV (19 projects)	75 MW of small HPPs (5 projects)	More than 41 MW and 8 MWth of biomass-fired capacity (5 projects)		

	Country	Wind	Solar	Hydro	Biomass	Geothermal	Ocean
					projects); more than 310m litres of biodiesel per year capacity (6 projects)		
	Central Asia						
1	Kazakhstan	600 MW (2 projects)	2 MW of PV (1 project)	0			
2	Kyrgyzstan			80 MW of small HPPs (4 projects)			
3	Tajikistan			62 MW of small HPPs (3 projects)			
4	Turkmenistan	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
5	Uzbekistan	1 MW (1 project)	100 MW of solar PV (1 project)	71 MW of small HPPs (2 projects)			
	Others						
1	Israel	50 MW by the end of 2013 (1 project) and additional 440 MW later (5 projects)	200 MW of solar PV by 2015 (7 projects) and additional 157 MW later (9 projects); 370 MW of solar thermal (2 projects)		More than 32 MW of biomass-fired capacity (16 projects)		60 MW (2 projects)
2	Russian Federation	940 MW (6 projects)	187 MW of solar PV (5 projects)	50 MW of small HPPs (1 project)	4 MW and 7 MWth of biomass-fired capacity (4 projects); 738m litres of biodiesel per year capacity (5 projects); 1,425m litres of bioethanol per year capacity (6 projects)		12 MW (1 project)

	Country	Wind	Solar	Hydro	Biomass	Geothermal	Ocean
3	Turkey	1,800 MW (26 projects)	120 MW of solar PV (2 projects), 50 MW of solar thermal (1 project)	210 MW of small HPPs (9 projects)		105 MW and 50 MWth (3 projects)	24 MW (1 project)

Source: IRENA Renewable Energy Country Profiles (www.irena.org, July 2014).