Pathways to Sustainable Energy Project: Detailed Review of Activity Implementation (Intermediary Assessment)

Period covered: October 2016 to June 2018

This document provides additional activity-level information to the main report "Pathways to Sustainable Energy: Status Report", an official document under the Committee of Sustainable Energy. For more details on challenges, outstanding activities for phase I and planning for phase II of the project, please refer to the official document ECE/ENERGY/2018/1.

DETAILED REVIEW OF ACTIVITIES

Output 1: Modelling of Sustainable Energy Scenarios

Activity A.1.1: Organization of three Coordination Meetings

By end of April 2017, three modelling institutions were selected to implement significant parts of the project's activities. The selected teams are the Fraunhofer Gesellschaft (Fraunhofer) (represented by the Institute for Environment, Safety and Energy Technology - UMSICHT and the Institute for Systems and Innovation Research - ISI), the International Institute for Applied System Analysis (IIASA), and the Pacific North West National Laboratory (PNNL).

The project team, consisting of the above-mentioned institutes and the UNECE project management team, came together for the first time at the kick-off workshop (first coordination meeting) from 30-31 May 2017 at the Fraunhofer Institute in Germany. Key outputs included the division of work, and related timelines and deliverables; strategies to align the different models used (GCAM and MESSAGE) and discussions on how to derive adaptive policy pathways and the early-warning system. At the meeting, it was further decided to build the scenarios based on the Shared-Socioeconomic Scenario 2 (SSP2) as the baseline scenario.

The project team met for its second coordination meeting from 7-8 March 2018 in Vienna. Discussion points included refinement of the 2018 work plan including related timelines and additional activities required to implement the project (extension of overall timeframe, need for additional sub-regional workshops, etc.). In addition, a brainstorming on scenario formulation, and policy scenarios took place, followed by a discussion on metrics that can be constrained within the models. A first draft table of content for the final report was developed, and the development of research papers to be published was discussed.

The third modeller workshop will take place on 26 September 2018, with another meeting planned for Q1 in 2019. In the meantime, the project team continues to communicate via conference calls and physical meetings, including the workshops and policy dialogues planned for the remaining project period.

Activity A.1.2: Development of Storylines

Through various workshops, UNECE experts drafted storylines that were developed between 2015 and 2016, following the initiation of the project at the Committee's twenty-third session. Since the start of the project in October 2016, the project team continuously worked on the improvement of the four storylines. As the global energy architecture is a fast-moving area and in 2015, the 2030 Agenda on Sustainable Development was adopted by United Nations Member States, the storylines have been continuously updated.

At the outset of the project, the intention was to use the storylines as reference scenarios for the modelling. At the kick-off workshop, the modeller team decided to use the Shared-Socio Economic Pathways 2 (SSP2) as the reference scenario (see more details under activity A.1.4).

The storylines have not yet been published, and still require additional work. This will be done in parallel to the modelling work, as the storylines don't function as inputs to the modelling work.

Activity A.1.3: Conduct Technology Survey

To increase transparency of input parameters used in the models, Fraunhofer prepared a technology survey.[1] The developed technology portfolio provides a general descriptive guide for the power generation technologies deployed in both models GCAM and MESSAGE. Technologies included are: Solar Photovoltaics, Concentrated Solar Power, Wind Power, Hydro Power, Nuclear Power, Coal-fired Power Plants, Gas Combustion, and Biomass. The technology description highlights the working principle and status-quo as well as the most common variations and a technical outlook.

The major conclusion is that both models have a similar cost hierarchy. This means that technologies on the lower or upper end of cost rankings are similar in both models. In the remaining project period for phase I, Fraunhofer will prepare technology zoom-ins for Carbon Capture and Storage (CCS), storage, energy efficiency and power to X (such as power-to-ammonia, power-to-chemicals, power-to-fuel, power-to-gas, power-to-heat, power-to-hydrogen, power-to-liquid, power-to-methane, power-to-mobility, power-to-power, and power-to-syngas. power to gas, power to hydrogen).

Activity A.1.4: Conduct Modelling of Scenarios

At the outset of the project in 2017, IIASA's integrated assessment model MESSAGE covered eleven model regions across the entire world and included the following ECE sub-regions: North America (NAM), Western Europe (WEU), Eastern Europe (EEU), Former Soviet Union (FSU). The FSU region is a legacy construct of previous IIASA energy research but no longer considered adequate for a variety of reasons. Moreover, a higher geographical resolution of the Asian part of the ECE area was considered desirable.

In preparation for the model supported scenario analyses focusing on Pathways to Sustainable Energy, IIASA disaggregated the FSU region, starting in 2017. The FSU countries were split into 4 sub-regions: Russian Federation, Central Asia, Caucasus and BMU (Belarus, Moldova, and Ukraine). The Baltic countries are now included in EEU. To represent the above-mentioned four sub-regions in an adequate detail, the following modelling approach was adopted:

First, the sub-regional energy models were built by aggregating country-specific input data of member States within a sub-region. This included, for example, the vintage capacity of energy

[1] The summary report „Technology Portfolio: Comparison of Technical Input Parameters from MESSAGE and GCAM" can be downloaded on the project website: https://www.unece.org/fileadmin/DAM/energy/se/pdfs/Pathways_to_SE/Report_Technology_Portfolio_UMSICHT_ISI_FINAL.pdf

generation/conversion technologies (essentially using the UDI World Electric Power Plants Database (WEPP), energy resource data based on updates of IIASA's Global Energy Assessment with recent United States Geological Survey (USGS) and Federal Institute for Geosciences and Natural Resources (BGR) data, high resolution assessment of wind and solar energy at the country level from the National Renewable Energy Laboratory (NREL), the trend in the activity of each technology based on statistics of the International Energy Agency (IEA), investment and operation costs, technology-specific data (lifetime, efficiency, etc.).

The models then were calibrated to reflect the base year of the regional energy supply mixes and energy trade flows of that region with other regions. The forward-looking input data and scenario assumptions (the trends over the 21st Century), key drivers of future energy system development such as demographics, GDP growth rates, resource availability or technology clusters, etc. are based on the dynamics of SSP2 master pathway originally developed by IIASA using the MESSAGE-GLOBIOM integrated assessment model (IAM).

The assessment of domestic energy resources is one of the key steps in the study of future energy pathways for each sub-region. Most of the resources assessment exercises to date focus on a regional level, as the energy trade is traditionally defined at a regional scale. One improvement within the context of this project is to update the estimation of the volume of energy resources and the extraction cost of such resources at the country level. Fossil fuel extraction curves were re-estimated and will serve as an important basis for the analysis of enviro-economic energy pathways, energy security, and energy trade in the ECE sub-regions.

Second, these country-level energy system data were aggregated to form the above-mentioned four sub-regions and the regional models designed.

Finally, the four sub-regions were interlinked and integrated into the world model, i.e., nested with the other ten world regions to check functionality and test the model behaviour several decades into the future (ongoing at the writing of this report).

Furthermore, comparison of input parameters and outputs across the MESSAGE model (IIASA) and the GCAM model (PNNL) was undertaken to gain a better understanding which metrics (for reaching the sustainable energy objective) can be reported by both models and which ones would be model specific. To that effect, an initial list of metrics was developed to be used as output indicators in the pathway analyses. Input parameter comparisons were carried out with the objective to minimize the differences in model results due to differences in input assumptions. Uncertainties remain due to differences in methodologies and the structure of functional relationships between the models.

The scenario analyses will comprise three distinct stages:

1) Base scenario (SSP2). This will act as the "No Policy Scenario";

2) SSP2 + current policies (including NDCs, energy policies, etc.,). A policy scenario based on NDCs under the Paris Agreement for 2030 (NDCs kept beyond 2030 until 2100) with four cases along the two axes "International Cooperation" and "Innovation: technology, business models". These will act as the "Current Policies incl. NDCs Scenarios";

3) Base + current policies + adaptive policy pathways to achieve targets (Key Performance Indicators (KPIs) and Long-Term Performance Goals (LPGs) including 2ºC). These will be called "Sustainable Energy Policy Scenarios". In total, the modelers will develop 4-5 policy scenarios.

During the kick-off workshop in May 2017, to derive the baseline input assumptions, the modelers decided to build upon existing scenario work by using the Socio-Economic Pathways (SSPs) as reference scenario. The advantage of using the SSPs is that they have been developed through

various iterations by an international research community, including IIASA and PNNL, with the objective to provide five narratives describing alternative socio-economic developments and plausible major global developments.[2]

To develop the Pathways project scenarios, basic socio-economic assumptions from SSP2 and respective datasets will be used. SSP2 will function as the reference scenario for each scenario developed under the Pathways project as it describes a "middle of the road" scenario. The development of the subsequent policy scenarios is linked to storylines that were developed through a participative approach with energy experts between 2015 and 2016. To explore the multiple pathways that could potentially lead to a sustainable energy future, this reference future needs to be developed first. As the "Reference Scenario", its socio-economic, market and technology assumptions represent middle-of-the-road developments. SSPs do not include climate mitigations policies or measures (other than those existing in 2010). SSP2 provides an appropriate point of departure for the exploration of multiple (alternative) pathways.

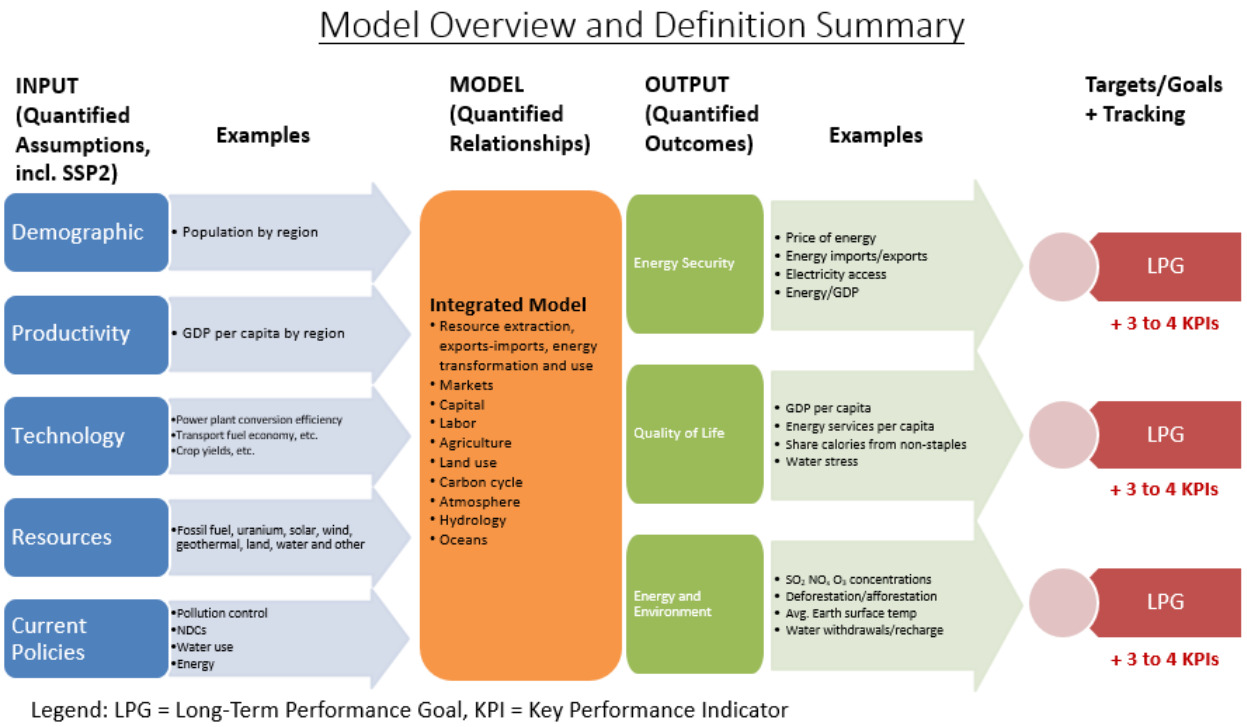
To prepare the scenario development beyond the SSP2 baseline scenario, further information was collected concerning NDCs, energy policies and strategies, energy infrastructure (large-scale power plants, etc.). Preparations to model the second stage of scenarios beyond the baseline scenario are underway. This scenario will be called "Current Policies Scenario".

First illustrative results of the baseline modelling (SSP2) and a set of metrics (with quantifications) were presented and discussed at a stakeholder workshop in March (see activity A.1.6). The finalisation of the list of metrics, Long-Term Performance Goals (LPG) as well as Key Performance Indicators (KPI) is currently ongoing, as is the modelling of the "Current Policies (incl. NDCs Scenario)". A draft glossary of key vocabulary/terminology used for the project (such as scenario, storyline, pathway, KPI, etc.) has been developed, with inputs from the Bureau, by Q2/2018.[3]

After finalisation of the scenarios across the ECE sub-regions and for different time periods, a detailed analysis will be undertaken. Metrics, signposts and key performance indicators will be used to assess if a path meets the criteria for sustainable energy, to determine which path the world is on at a future point in time, and to explore energy system changes.

The following graphic summarizes the modelling approach:

[2] See detailed description of SSPs: Riahi K. et al (2017): The Shared Socioeconomic Pathways and their energy, land use, and greenhouse gas emissions implications: An overview. In: Global Environmental Change 42 (2017) 153–168.
[3] The glossary can be downloaded online: https://www.unece.org/energywelcome/areas-of-work/pathways-to-sustainable-energy/resources.html



Activity A.1.5: Undertaking an Assessment of Existing Strategies and Gap Analysis

As part of the modelling and scenario development work, the project team will assess existing strategies such as national energy strategies and targets, as well as NDCs outlining climate targets. The results of the "current policies" scenario will indicate that current policies and actions are insufficient to achieve the targets set in the context of the project. The analysis of the current policies scenario and comparison with the policy scenario will provide insights into the gaps existing between the strategy in place and the international energy and climate targets set.

UNECE undertook the first assessment of the status of achievement of the three SDG 7 targets through the report "Global Tracking Framework: UNECE Progress in Sustainable Energy".[4] Published in December 2017, the report summarizes the status of progress in achieving SDG7 and also provides an outlook if the progress is on track. The progress tracking initiative relates closely to the Pathways project in particular through the selection of output parameters and the definition of signposts (see activity A2.1 and A2.2) which partly represent SDG indicators.

Activity A.1.6: Organization of (a) workshop(s) to develop and identify policy options

- *Pathways to Sustainable Energy: Project Kick-off and Scenario Scoping, 14 June 2017, Astana*

The project team organized a kick-off workshop to present the project to the larger stakeholder community in Astana, Kazakhstan, on 14 June 2017 as part of the 8th International Forum on

[4] The report can be dow nloaded online: https://www.unece.org/fileadmin/DAM/energy/images/CSE/publications/Global_Tracking_Framew ork_-_UNECE_Progress_in_Sustainable_Energy.pdf

Energy for Sustainable Development (IFESD). Beneficiaries included all ECE countries, however, due to the workshop location, a focus was on representatives from Central Asia, Caucasus, Eastern Europe, and the Russian Federation.[5]

- *Regional Workshop on the Development of National Sustainable Energy Policies, 29 September 2017, Geneva*

The project team introduced the project at a regional workshop "Regional Workshop on the Development of National Sustainable Energy Policies" on 29 September in Geneva, during which representatives from Caucasus, Central Asia, and Eastern Europe presented the status of national sustainable energy policies. Following the presentations, the regional experts discussed approaches and support to develop national sustainable energy policies. As this workshop was co-organized with the Regional Advisory Programme for Sustainable Energy, beneficiaries included countries stakeholders from Caucasus, Central Asia, Eastern and Southeast Europe. However, representatives from all ECE member States were invited to participate.[6]

- *Stakeholder Consultation Workshop: Sustainable Energy Metrics and Reference Scenario Modelling, 5-6 March 2018, Vienna*

The project team organized a stakeholder consultation workshop "Sustainable Energy Metrics and Reference Scenario Modelling" in Vienna with attendance of Bureau members of the Committee on Sustainable Energy, Advisory Board members, as well as selected project participants from governments and the energy sector across the ECE region. With funding for logistics provided by Germany, in total, 25 people attended the workshop.

The main discussion points included the presentation of first modelling results, the results of the technology survey. This was followed by an open discussion on the scenario formulation and possible deep dives. Suggested deep dives comprise: affordability; stranded assets (investment requirements); health (incl. food and water); energy-water-land nexus; disruptive technologies (hydrogen, Power-to-Gas (PtG) and Power- to-Liquid (PtL); renewable energy system integration, role of gas; time for diffusion and development of new technologies; resource availability for new technologies; digitalization and energy, including blockchain; energy productivity and energy efficiency; capital availability; waste to energy; inter/intra-regional trade, regional cooperation and market integration; role of external influencers to the ECE region (e.g. China); biomass; infrastructure and infrastructure resilience.

The main output of this workshop is a recommendation for the use of three distinctive sustainable energy targets, and a set of key metrics to be used in the context of this project. For more information on the targets and KPIs see activity A.2.1.

Over the first year of the project implementation (2017), the modeller teams, the Advisory Board and selected members of the Bureau of the Committee voiced their recommendation to organize additional sub-regional workshops. The project team organized a first sub-regional workshop in Kyrgyzstan in June 2018:

- *Stakeholder Consultation Workshop: National Sustainable Energy Action Plans & Scenarios for Central Asia, 12-14 June 2018, Bishkek*

To address the need for increased stakeholder engagement, the project team organized a Central Asia sub-regional workshop and stakeholder consultation from 12-14 June 2018 in Kyrgyzstan. Targeted at government representatives and other important energy stakeholders from the five

[5] See workshop presentations:
https://www.unece.org/fileadmin/DAM/energy/se/pp/eneff/8th_IFESD_Astana_2017/14_June/Pathways_to_SE/01_Intro.pdf

[6] See presentation here:
https://www.unece.org/fileadmin/DAM/energy/se/pp/EnComm26_Sept.2017/Workshop_29Sep/2_Lisa_Tinschert.pdf

Central Asian countries, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan, the workshop had several objectives. On the one side, the workshop provided an opportunity to inform Central Asian stakeholders about the project. On the other hand, participants actively shared their comments and inputs to shape the development of the scenarios and policy options, from the perspective of Central Asia. Workshop results include a summary of the specific challenges of Central Asian countries in achieving sustainable energy from today's perspective, and an outlook towards policy options and pathways to achieve sustainable energy in the future.[7]

Additional sub-regional, thematic and consultative workshops are planned before the Committee meeting in September (25 Sep 2018) as well as in the context of the 9th International Forum on Energy for Sustainable development in Kiev from 12-15 November 2018.

Further sub-regional workshops are possible and recommended, but subject to additional funding.

Activity A.1.7: Preparation of report outlining policy options (based on modelling)

The project team further drafted a glossary of key vocabulary/terminology used for the project with inputs from the Bureau, which was published online.[8] Further iterations of the document are likely and inputs are encouraged.

During the second modeller meeting in March 2018, the project team drafted a first version of the table of content of the project report. The team decided that the modelling institutions would work on research papers, that will be published and become an integrative part of the report.

The Project Management team at ECE is working on the methodological description of the project approach, as well as the introduction chapter outlining the sustainable energy context, objectives, and scope, and a sub-regional chapter outlining sustainable energy challenges and opportunities for Central Asia.

In addition, research on clustering of policy options and framework development for cross-cutting, holistic and adaptive policy option is underway. To finalize this output, inputs and cross-referencing with the expert groups is required.

[7] Workshop documents can be downloaded here: https://www.unece.org/energywelcome/committee-on-sustainable-energy/committee-on-sustainable-energy/energycommitteemeetings/committee-on-sustainable-energy/committee-on-sustainable-energy/2018/stakeholder-consultation-workshop-national-sustainable-energy-action-plans-scenarios-for-central-asia/docs.html

[8] The glossary can be downloaded online: https://www.unece.org/energywelcome/areas-of-work/pathways-to-sustainable-energy/resources.html

Output 2: Early-Warning System

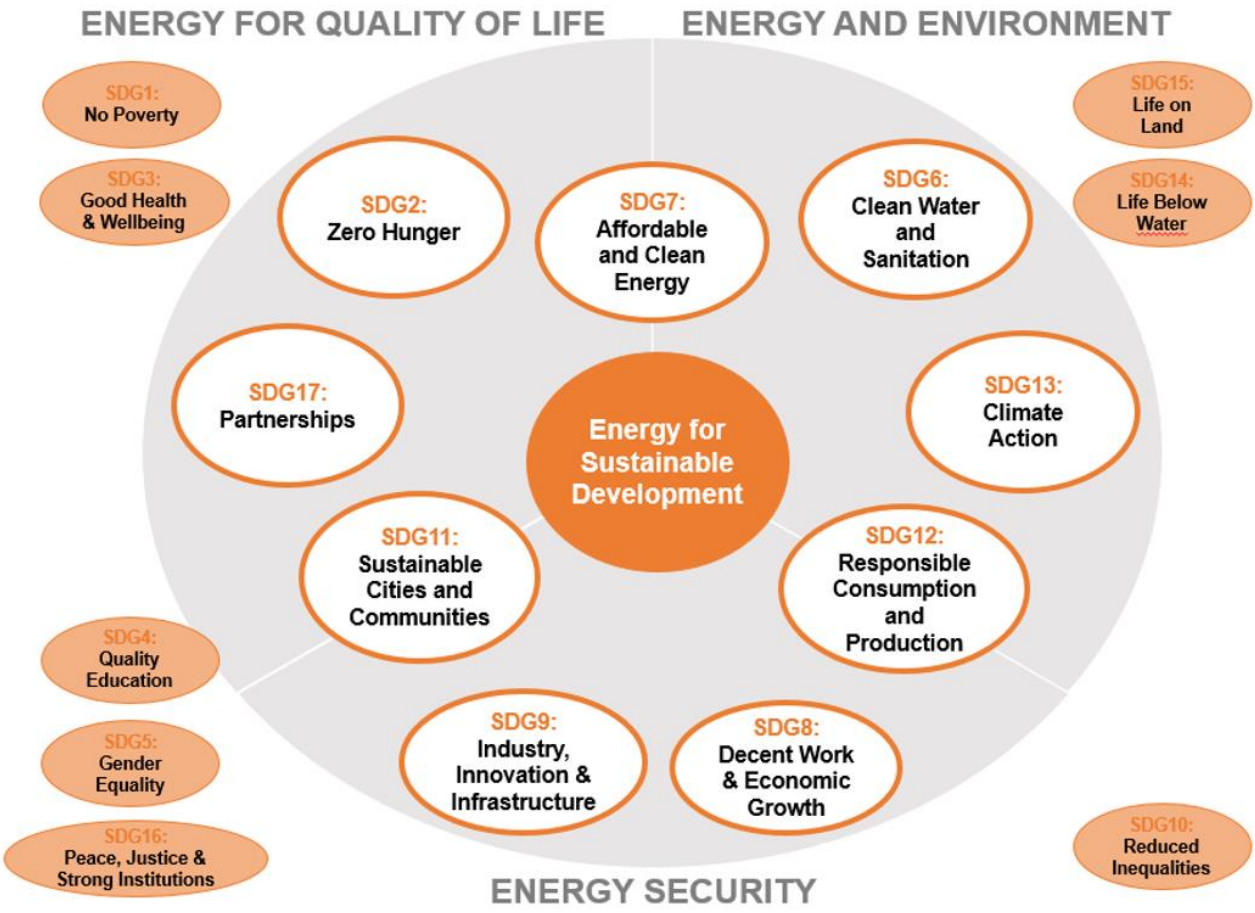
Activity A.2.1: Develop Key Performance Indicators (KPIs) and Signposts

As preparatory work, the project team conducted an analysis of all energy relevant targets and indicators under the 17 Sustainable Development Goals (SDGs). Based on this, energy-relevant SDGs were identified, alongside a selection of energy-related SDG indicators. The fulfilment of these targets (such as on SDG7 the related targets for renewable energy, energy efficiency, and energy access) will be integrated in the scenario formulating and analysis, and should further play a role in setting Key Performance Indicators (KPIs) and signposts that will report if a country is on track with a view to achieving its set targets.

As no universally agreed definition of sustainable energy exits, the modelling team together with the secretariat worked on the definition of sustainable energy which is to be used in the context of the Pathways project. By April 2018, the objectives defining "Sustainable Energy by 2050" are (based on a stakeholder workshop held on 5-6 March 2018 and subsequent Committee Bureau consultation):

> *(i) Pillar I "Energy Security": Securing the energy needed for economic development;*
>
> *(ii) Pillar II "Energy for Quality of Life": Provide affordable energy that is available for all at all times;*
>
> *(iii) Pillar III "Energy and Environment": Minimize the impact of energy system on climate, ecosystems and health.*

The project team further worked on the visualisation of the relationship of the three sustainable energy pillars and the selected modelling metrics with the Sustainable Developments Goals (SDGs). The results are shown in the following graph:

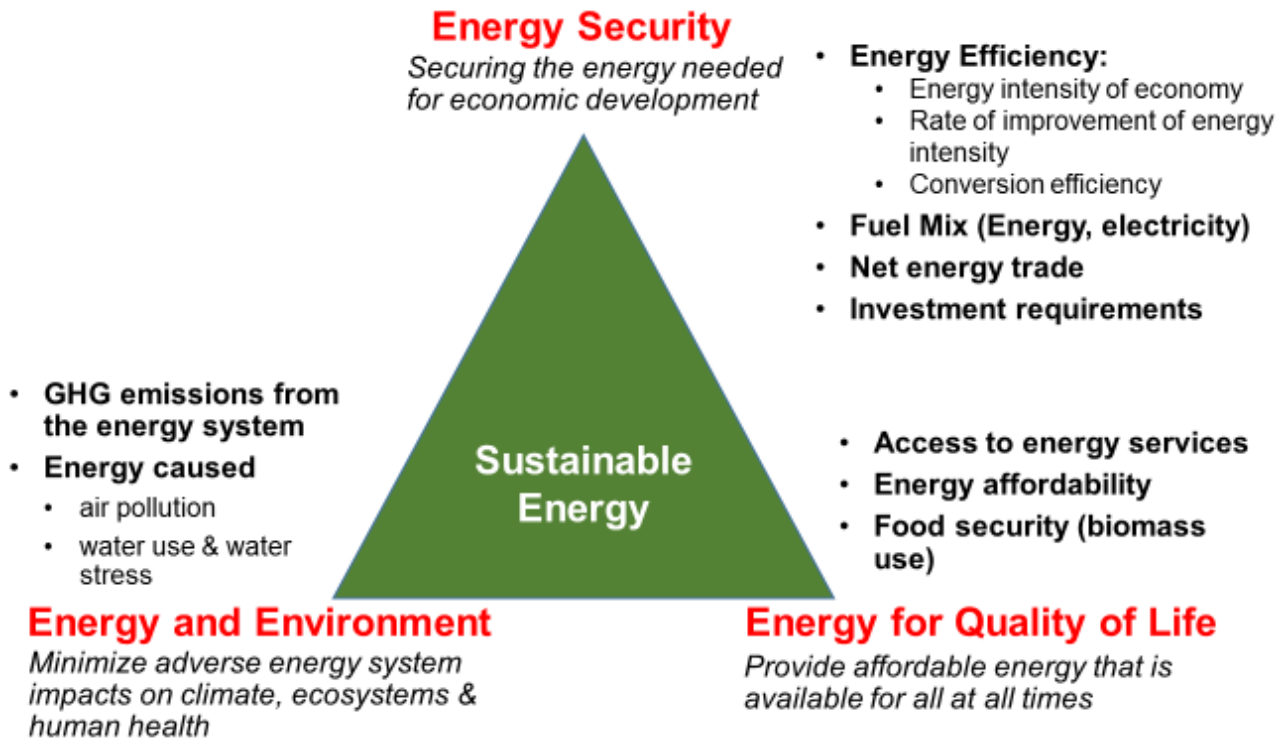


In consultation with the Bureau, the project team identified two constraints (defined modelling outcomes in 2050, see glossary) that can be utilized in the implementation within the Policy Scenarios:

(i) Limit cumulative global greenhouse gas (GHG) emissions from the energy sector over the remainder of the 21st Century to stay below the 2oC maximum temperature limit;

(ii) Reduce air polluting emissions from energy sector: Sulphur Dioxide (SO2), Nitrogen Oxides (NOx), Particulate Matter (PM2.5), possibly others; in ppm or µg/m3. Sub-regional specific targets can be established and implemented for the Policy Scenarios, if desired by the Committee.

In addition, the project team with inputs from the Bureau made a preliminary selection of Key Performance Indicators (KPIs) that can be used in the models. The KPIs function mainly as output indicators, rather than input assumptions. The team selected three to four metrics across the three pillars to play a more prominent role in the scenario analysis and presentation within an ECE context. Some of these metrics will function as Long-Term Performance Goals, some others as Key Performance Indicators (see glossary). Some of them might also become signposts, however, the discussions are still ongoing.



Pillar I: Energy Security

(i) Energy Efficiency, expressed through three metrics:

(1) Energy intensity: units of energy per unit of GDP (in Joule per US$ Purchasing Power Parity (J/US$ PPP)) (SDG7.3 indicator); (2) Rate of improvement in energy intensity (CAGR – Compound annual growth rate) (SDG7.3 indicator); and (3) Conversion efficiency. The chosen metrics relate to the SDG 7.3 target „double the rate of improvement in energy efficiency by 2030“, and will be interpreted in the context of both thermodynamic conversion efficiency as well as the energy efficiency of the economy.

(ii) Diversity of Supply: Fuel Mix in Energy and Electricity

Expressed as share of different fuels in Total Final Energy Consumption (TFC) and Total Primary Energy Supply (TPES), and in electricity, in percentage. The metric relates to the SDG 7.2 target „substantially increase the share of renewable energy in TFC”, and will be interpreted in the context of diversification of supply and the share of low-carbon / fossil fuel energy supply.

(iii) Energy Self-Sufficiency: Net Imports

Expressed as net imports in each sub-region and overall ECE region for gas and electricity. The metric relates to SDGs 8 and 9, and will be interpreted in the context of regional cooperation and interconnectivity.

(iv) Investment requirements to achieve sustainable energy

Expressed as energy investment of GDP, in percentage. The metric relates to SDG 7.A., and SDG 13.A, and will be interpreted in the context of impacts and financeability.

Pillar II: Energy and Environment

(i) Total GHG emissions from the energy sector

Expressed as total global GHG emissions of the energy sector in MtCO2eq. The metric is implemented as a modeling constraint, and further relates to SDG 13. The target value is to "limit cumulative total global greenhouse gas emissions of the energy sector over the remainder of the 21st Century to stay below the 2ºC maximum temperature limit. (about 890-900 Gt CO2)".

(ii) Air polluting energy emissions

Expressed as emissions from the energy sector: Sulphur Dioxide (SO2), Nitrogen Oxides (NOx), Particulate Matter (PM2.5); in ppm or µg/m3. The metrics relate to SDG 3.9.1. If the Committee desires, it is possible to implement emission targets as modeling constraints for the different sub-regions as part of the policy scenarios.

(iii) Water use efficiency and water stress caused by the energy sector

Expressed through two metrics: (1) Cooling water use of electricity generation (l/kWh), and (2) water use associated with energy resource extraction (in terms of GJ liters absolute and/or L/GJ). The metric relates to SDG 6.4.1 "substantially increase water use efficiency", and 6.4.2 „substantially reduce water scarcity". The metrics will be interpreted in the context of water use of the energy sector in power generation and water consumption from energy extractive industries.

Pillar III: Energy for Quality of Life

(i) Energy Affordability

Expressed as total energy expenditures per GDP per capita. The metric relates to SDG 1 and SDG 7, and will be interpreted in the context of energy poverty and household income spent on energy expenditures.

The Bureau expressed as a desired target range for the output value: Maximum 10% of disposable income spent on energy expenditures.

(ii) Access to energy services

Expressed as energy/electricity services per capita (efficiency adjusted energy consumption), in J/capita/year. The metric relates to the SDG 7.1 target "universal access by 2030" and SDG 1.

(iii) Food security

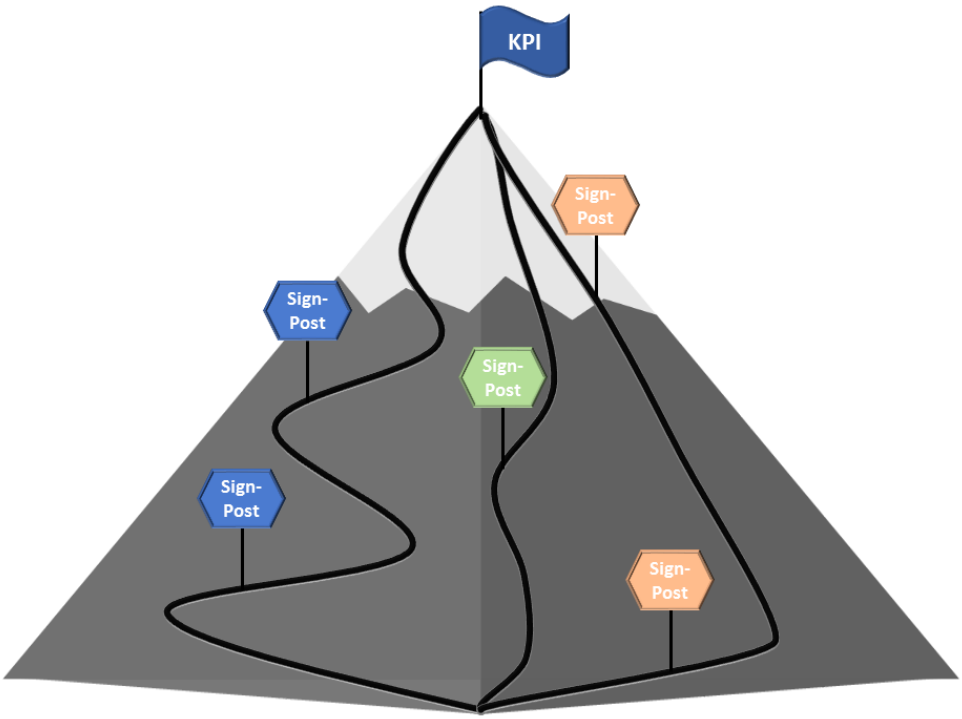
Expressed as share of calories from non-staple food, in percentage (GCAM model only). The metric relates to SDG 2.4 (sustainable agriculture), SDG 2.3 (reduce food loss), and SDG 13.1 (impact of climate change). It is interpreted with a focus on the linkages between sustainable bioenergy (solid biomass) generation and food production.

The indicator work further relates closely to the tracking of progress towards SDG7 (Global Tracking Framework led by IEA and World Bank). The ECE Regional Progress report (2017) provides information on achieving the targets SDG7.1 to SDG 7.3. This information will be linked to the establishment of the early-warning system.[9]

[9] The UNECE regional GTF report is available online: https://www.unece.org/index.php?id=47830

Activity A.2.2: Development of an Early-Warning Mechanism Concept

The purpose of the early-warning system is to inform countries if achievement of sustainable energy objectives is not on track. The early-warning system can help identify the national status of moving towards sustainable energy targets in 2050 and to track progress towards the implementation of the 2030 Agenda and the Paris Agreements. The early-warning system can also support countries in monitoring achievements of providing clean and affordable energy for all while implementing NDCs, and to allow corrective collective measures if the achievements of sustainable energy objectives are not on track. Through the definition of signposts, selected indicators, countries can track if their chosen policy actions prove to be successful, or if course corrections are required. The early-warning system shall further help to assess towards which scenario or pathway the world is moving over time. The following graphic visualizes the scenario development, highlighting different pathways that can lead to the same desired result:



Up until today, the project team initiated the discussion on the functioning of an early-warning mechanism. As a starting point, the role of signposts and Key Performance Indicators was discussed, as well as how this would be used within the model and scenario design process.

Activity A.2.3: Development of Information Materials

The secretariat prepared content for a project website that has been integrated into the ECE website.[10]

The project team further works on a brochure on how the project defines sustainable energy. This will then become an integrative part of the overall project report (relating to Activity A1.7).

[10] https://www.unece.org/energy/pathwaystose.html

Output 3: Policy Dialogue on Adaptive Policy Pathways

Activity A.3.1: Formulation of Adaptive Policy Pathways

Decision makers routinely respond to short-term pressures for action but also maintain a plan to realize a long-term vision such as sustainable development. Even if the short-term action appears consistent with the long-term goal, changing circumstances may prevent achieving the envisaged future. Or the envisaged future (strategic vision) was inherently flawed or unachievable as framework conditions have changed. At this point, the implementation strategy (plan) or the vision or both must be adapted. Adaptive policy pathways then form a basis for planning and testing alternative pathways. In a modelling context, that also may involve adapting previous short-term action. Often this is not possible for socio-political reasons, then adaptation of future strategies to reach the same objective. Signpost may serve here as decision-making points where the sequential corrective action takes place.

In the context of the Pathways project, the intention is to maintain, unless infeasible, the initially specified long-term goal(s) and explore different pathways to reach them. The modellers will have to specify the time-evolution of policies needed to achieve the set objectives. The delivery of pathways and the formulation of policy recommendations will only be possible after modelling results are available, and are envisioned to be developed in 2019.

To initiate the discussion, the formulation of adaptive policy pathways was part of the agenda at the modeller kick-off workshop from 30-31 May 2017.

The finalisation of this activity depends on the finalisation of Activity A1.7.

Activity A.3.2: Formulation of Targeted Policy Recommendations and Preparation of Output Document

The recommendations will be developed after the conclusions of modelling work, the scenario development, the identification of policy options and the establishment of adaptive policy pathways. This work can likely only start in Q4/2018 and can only be concluded in 2019. The development of policy pathways and recommendations requires close input by the Committee and its subsidiary bodies (see also 4.3). The Committee will be involved at its twenty-seventh and twenty-eight sessions. Another opportunity for consultation is a possible Committee meeting in May 2019 (see ECE/ENERGY/2018/1, chapter IV-C)).

Activity A.3.3: Organization of three Policy Dialogue Events

The project team organized a dialogue event titled “Pathways to Sustainable Energy: Policy and Technology Options to Achieve Sustainable Energy” as part of the 8th International Forum on Energy for Sustainable Development in Astana, Kazakhstan, on 14 June 2017. Representatives from Albania, Belarus, and the Former Yugoslav Republic of Macedonia presented how their countries implement sustainable energy strategies, hereby providing first insights on how countries develop, implement, and monitor sustainable energy policies. Beneficiaries included all

ECE countries, however, due to the workshop location, a focus was on representatives from Central Asia, Caucasus, Eastern Europe, and the Russian Federation.[11]

The secretariat further presented the project at the 26th session of the Committee on Sustainable Energy on 27 September 2017 as part of a discussion on tracking progress toward sustainable energy, and strategies to achieve set targets for 2030 and 2050. Beneficiaries included all ECE countries, in particular, government representatives, and the Committee on Sustainable Energy.[12]

Activity A.3.4: Development of Outreach Materials

As part of the project website, the secretariat collects and publishes background information about sustainable energy strategies of member States.[13]

[11] See presentation here: https://www.unece.org/fileadmin/DAM/energy/se/pp/eneff/8th_IFESD_Astana_2017/14_June/Pathways_to_SE/03_Intro.pdf

[12] See presentation here: https://www.unece.org/fileadmin/DAM/energy/se/pp/EnComm26_Sept.2017/4_Pathways_Intro__L_Tinschert.pdf

[13] https://www.unece.org/energywelcome/areas-of-work/pathways-to-sustainable-energy/resources.html