

**Terms of Reference for SHURA's next study on  
"Net Zero by 2053: Policy Roadmap for the Turkish Energy Sector"**

**SHURA Energy Transition Center**

**03/08/2022**

**1. Background**

In 2021, two important developments signaled a turning point for Turkey's long-term energy strategy. The ratification of the Paris Agreement in October 2021 and subsequent pledge to achieve net-zero greenhouse gas (GHG) emissions by 2053 by the Turkish government to decarbonize the economy, are paving the way for an accelerated energy transition and more ambitious climate action. Achieving net-zero GHG emissions will require clear long-term policy visions, underpinned by a roadmap that outlines how each sector of the economy can achieve significant emission reductions. This should include the definition of interim targets to be reached until 2053 in climate policies, action plans and policy mechanisms necessary to achieve these targets. The power sector will play a crucial role in this transition, since decarbonization in other sectors will often be attained most efficiently through electrification, be it in the residential and industrial heat sectors or in the transport sector through electric mobility. To this end, energy efficiency, renewable energy and electrification represent critical key pillars of energy transition.

While Turkey's economy will continue to grow, energy demand needs to decouple. Energy efficiency is key to decarbonize the Turkish energy sector as a priority. Decarbonization will most efficiently be achieved by a renewables-based power system. It implies using hydro power, biomass/biogas and geothermal to the largest possible extent. This requires first and foremost, massive deployment of new wind and solar power, and adequate instruments to make this potential to be realized. Electrification is another key element of the transition. Given the fact that efficient decarbonization of the energy system will require considerable levels of electrification of the heating/cooling, parts of the industry and transport sectors, it will be key to lift barriers to electrification and make sure taxes and levies direct consumers to the least carbon sources. A power system based on variable renewables will also require an increase in flexibility, both on power supply as well as demand side. Demand response, battery storage, hydrogen, flexible biomass and hydro supply will be important to get the power system safe and efficient. Moreover, for safe operation, TSOs and DSOs need to have real time information and control of generation and demand; this requires digitalization and smart meter rollout in the power system. In some areas and sub sectors, either because carbon content is needed in some industrial processes, or because higher levels of energy intensity are needed (high temperature heat in industry, seasonal storage in power sector, heavy freight transport, shipping, aviation), hydrogen/e-fuel use should also be considered.

SHURA has analysed in its various studies Turkey's potential on these main pillars of energy transition towards 2030, including system flexibility (see Annex). All these studies focused on leveling CO<sub>2</sub> emissions by 2030 while there is a need to revise them within the framework of 2053 net-zero target

of Turkey. Developing a decarbonization roadmap for the power sector to 2053 requires a comprehensive analysis of the system from generation to end-use demand, while considering macroeconomic trends and new technologies. For this aim, SHURA has initiated a quantitative study for defining a roadmap for the Turkish power sector to reach net-zero target by 2053. “Net Zero by 2053: A Roadmap for the Turkish Electricity Sector (Quantitative Assessment)” is conducted through modelling work based on inputs and assumptions in 5-year intermediary time steps, with a focus on mid-term 2030. The quantitative study will assess the power sector considering power generation mix (including coal phase out), flexibility options and end-use electricity demand parts tapping buildings, industry and transportation across all energy transition pillars. The outputs of the quantitative study will form the basis for this “Net Zero by 2053: Policy Roadmap for the Turkish Electricity Sector” study.

The proposed policy roadmap study will provide a complementary qualitative analysis and seeks to propose some of the key policy steps, major strategies, implementations and regulatory reforms on the pathway of the transformation of the energy sector with a focus on the power sector for Turkey reaching net zero emission economy by 2053.

## **2. Objective and tasks**

The study will be built upon “Net Zero by 2053: A Roadmap for the Turkish Electricity Sector (Quantitative Assessment) analysis. The aim of this study is to identify the major policy strategies, implementations and regulatory framework for energy transition targets and pathways for the energy sector with a special focus on the power sector to reduce its carbon footprint over the course of the next three decades to provide the backbone for Turkey achieving net-zero emissions by 2053.

The key elements relevant for policies/strategies in the study will need to be build upon renewable energy capacity developments, energy efficiency potentials, electrification, power system flexibility, digitalization and green hydrogen.

### **Task 1: Assess the current policy and regulatory landscape to form a baseline upon which policy and regulatory reforms can be proposed.**

The regulatory/policy context should be clearly analyzed and understood to be able to identify the gaps and needs for Turkey’s policy roadmap for a decarbonized 2053 energy sector scenario, with the view that an overarching long-term policy strategy is needed for designing necessary targets, policies, actions and roadmaps. In this sense, a thorough assessment of policies, implementations, regulations, targets and pledges related to the energy sector decarbonization will be conducted. In addition to the literature review, scanning the regulatory sources and related media to capture the energy sector targets in the next task will be carried out to come up with a clear picture of the energy sector regulatory/policy scheme in Turkey.

### **Task 2: From the quantitative analysis, identify the key short-, mid- and long-term targets and goals for the power and relevant end-use sectors.**

Determining an overarching strategy with a legal basis is needed, that provides a sound basis and framework, including clear and step-by-step overall targets breaking down to 5 year steps; with 2030

as important intermediate time step. Break-down in sectoral targets is also required, such as new installations annually, semi-annual auctions, transparent time line and processes etc. for first years, to give a vision that becomes more generalized at later stages to define overall targets based on the analysis of the main barriers.

**Task 3: Summarizing international experiences and best-practices in designing policy and regulatory frameworks to foster decarbonisation in the power and end-use sectors.**

Upon the clarified picture of the regulatory scheme; international policy approaches (utilizing the RAP Power Sector Blueprint as a benchmarking tool), regulations, enabling targets and major industry players' commitments to facilitate the way forward to 2053 decarbonized power and end use sectors will be identified and analyzed. Part of this task will be to analyze what if any impact the ongoing international energy crisis has on mid- to long-term energy transition pathways. The consultant will be collaborating with RAP on international analysis in this task.

**Task 4: Gap identification and policy recommendations.**

Finding where the current policy and regulations (from Task 1) fail to meet the targets set out in Task 2, and critically assess which policies and regulations could be adopted from those identified in Task 3. This task should result in clear policy and regulatory recommendations, and a roadmap including targets, strategies, implementations and a comprehensive vision for a net-zero energy sector with a special focus on power sector. The roadmap will include all recommended steps with target years, responsible entities and sub-steps with details to be later tracked regularly. Metrics to measure the progress on the regulatory path will also exist in the roadmap.

**Task 5: Validation and verification of the proposed policy and regulatory framework via extensive stakeholder interviews. (Review of Tasks 1-2-4)**

Collecting stakeholders' views for the encountered problems in the existing regulatory environment, the gaps in the regulatory and the needs for the policy approach and targets will be a leverage for SHURA's assessment from the sector side. Public and private sector stakeholders will be interviewed bilaterally on different dates, then the outcomes will be discussed collectively in a half-day workshop to better identify the regulatory needs and policy vision for a decarbonized energy sector to 2053. SHURA to initially contact stakeholders.

**Task 6: Preparing a policy maker friendly report.**

The preliminary final report will be submitted to SHURA for concurrence and comments. The consultant will prepare the final report considering SHURA's comments. The Consultant shall document the overall study results in a comprehensible manner in a final report that includes at least the following elements:

- A concise summary in English and Turkish at native level.
- A long version of the study results, with a focus on strong visual representation of the results, and a transparent description of the methodological approach;
- Appendices with descriptions of the models, data sets, and assumptions used;

- A PowerPoint presentation of the overall study results.

### 3. Deliverables and timeline

| Deliverables   | Responsible              | Timeline              |
|--|--------------------------|-----------------------|
| <b>Contract starts</b>   | SHURA                    | September 2022        |
| <b>Task 1: Assess the current policy and regulatory landscape</b>            | Consultant               | October 2022          |
| <b>Task 2: Identify the key short-, mid- and long-term targets and goals</b> | Consultant               | October-November 2022 |
| <b>Task 3: Summarizing international experiences and best-practices</b>      | RAP & Consultant         | October-November 2022 |
| <b>Task 4: Gap identification and policy recommendations</b>                 | Consultant & SHURA & RAP | December 2022         |
| <b>Task 5: Stakeholder interviews</b>  | SHURA & Consultant       | January 2023          |
| <b>Task 6: Preparing a policy maker friendly report</b>                      | Consultant               | January 2023          |

#### Some more details on the process:

- 1) SHURA provides earlier SHURA studies to consultant
- 2) Consultant, based on knowhow and input received by SHURA prepares key parameters for discussions, and presents to SHURA. These will need to be agreed upon and approved by SHURA.
- 3) The work will be carried out in close consultation with SHURA’s project management team: To this person, at least biweekly progress meetings will be organized; all task results will be discussed with SHURA via several internal sessions. The task outputs will need to be agreed upon and approved by SHURA.
- 4) The consultants should submit a detailed technical proposal specifying methodology/approach/expertise they will use for each task. It will be important to include in the proposal how complex interactions such as sectoral dynamics will be handled.

### 4. Requirements

The consultant must be a firm with a comprehensive knowledge of Turkey’s energy system fundamentals and power system dynamics, including existing policies, regulations, implementations and targets. The consultant must have experience to write policy maker friendly reports that include policy/regulation suggestions and the roadmap.

The consultant needs to be a firm that has a team with experts having the following requirements:

- Team with proven record of analytical skills in the field of power system analysis and planning
- Experienced team in applying a suitable method with a proven track record for a number of similar analyses.

- Advanced university degree (masters or equivalent) in economics, engineering, environment or natural science, or other relevant field related to energy;
- A senior expert with a minimum of ten years of progressively responsible experience with regulatory/policy analysis of power system and an expert with skills on power systems analysis;
- Track record of publications in relevant field;
- Track record of establishing successful and effective engagement with policy makers, regulators and the utility is an asset;
- Excellent written and spoken Turkish and English.

The consultant's qualifications should be demonstrated by solid experience, previous work and the proposal that will be submitted as part of the tender offer for the consultancy. The proposal to be submitted as part of the tender offer should clearly state and elaborate the methodology and types of background data to be used in the study and include information regarding the qualifications stated above.

### **Annex**

SHURA's grid integration study "Increasing the Share of Renewables in Turkey's Power System," that was released in May 2018 demonstrated the ability of Turkey's power system to integrate up to 50% renewables at relatively little additional costs until 2026 (including 30% share in VRES, wind and solar energy). The update of this study completed in 2022, demonstrated that up to 70% of renewables capacity could be integrated with relatively acceptable operational challenges (redispatch and curtailment levels remain well below 5% of annual production) until 2030 (including 35% wind and solar). The study highlighted the need for integrated power system planning that emphasizes overall system stability, especially when phasing out coal.

Another SHURA study released in August 2020, "Optimum electricity generation capacity mix for Turkey towards 2030" focused on the identifying the cost-optimal power mix for different shares of renewables considering different policy regimes to balance economic and environmental goals. The result of this study showed that renewable energy investments (mainly wind and solar) remain the cheapest investment choice of all power generation technologies across all scenarios and make up for the majority of the new investments for power sector towards 2030. The study also investigated how carbon pricing can impact power system development to 2030.

SHURA has also published an extensive analysis on energy efficiency, "The most economic solution for Turkey's power system: Energy Efficiency and Business Models" in October 2020. The study demonstrates that with the implementation of cost-effective efficiency options, an additional 10% reduction in electricity demand is possible by 2030 compared to the Baseline scenario, centered on the projections of the Ministry of Energy and Natural Resources. This projection covers not only buildings and industry, but also other end-use areas such as street lighting and the efficiency of the transmission and distribution grid, including the impact of electrification. According to SHURA's estimation, a net benefit of 1.2-1.5 Euros arises for every Euro 1 spent on expanding the technology portfolio.

Finally in June 2021, SHURA's "Socioeconomic Impact of the Power System Transition in Turkey" study included a macroeconomic modelling based on SHURA scenarios for 2030, involving a renewable energy share of at least 50% in power generation with wind and solar constituting 30%; 10% improvement in energy efficiency compared to the government baseline, and partial electrification of transport (2.5 million electric vehicles and 1 million charging points) and heating (2 million heat pumps and smart homes). The scenario was a realistic assessment at the time going beyond government targets for 2030 and achieving a leveling of CO<sub>2</sub> caused by the power sector. It was found that the economic benefits of the scenario was three times as large as the economic costs. On the socioeconomic front, probable shifts in production and employment from less efficient sectors to more efficient and technology intensive sectors was detected; necessitating a closer look at just transition policies.