INTERSESSIONAL PANEL OF THE UNITED NATIONS COMMISSION ON SCIENCE AND TECHNOLOGY FOR DEVELOPMENT (CSTD)

Geneva, Switzerland
6-8 November 2017

Contribution of Turkey

to the CSTD 2017-18 priority theme on 'The role of science, technology and innovation to increase substantially the share of renewable energy by 2030'

Response to UNCTAD Request for Inputs for CSTD 2016-17

Priority Theme 1: The Role of Science, Technology and Innovation to Increase Substantially the Share of Renewable Energy by 2030

What are the policies (renewable energy strategies, regulations, standards, fiscal measures, financial incentives, etc.) in place in your country that encourage renewable energy projects or aim at increasing the share of renewable energy in your country's energy mix? Who are the main actors in the renewable energy sector and what are the linkages between them? Do you have any documentation, references, web addresses or reports on the cited policy measures? If yes, please share it with us.

The National Renewable Energy Action Plan (NREAP) of Turkey reinstates the targets of ensuring a 30% share of renewable energy in the electricity generation mix as well as a 10% share of renewable energy in the transportation sector in the year 2023. The importance of these targets are underlined by the projection that there will be a near doubling of the electricity demand from about 246 TWh in 2013 to 424 TWh in 2023. The renewable energy share in electricity production is currently already about 30% while the maintenance of this share in the context of a steeply rising electricity demand is an essential target for Turkey. National renewable energy R&D projects based on cooperation between the Scientific and Technological Research Council of Turkey (TÜBİTAK), the Ministry for Energy and Natural Resources (MENR), and the General Directorate for Renewable Energy (MENR-YEGM) are underway to support these national targets. In addition, the Ministry of Development (MoD) has supported national thematic research laboratories in the areas of renewable energy. Large scale public tenders in the renewable energy sector, the most recent of which have been 1 GW of solar PV and 1 GW of wind power each with a 15 year purchase guarantee have further taken place with R&D investments requirements for at least 10 years in our country.

Based on the adoption of energy as a priority of the National Science, Technology, and Innovation Strategy as well as decisions to initiate and monitor national energy technology projects (see responses in the next section), the Supreme Council for Science and Technology (SCST) has had a central role in stimulating and increasing the target orientation of approaches to promote the development of energy technologies. In addition, TÜBİTAK has supported the priority of energy in R&D and innovation based on the launch of over 75 calls in prioritized research topics and technologies since the year 2012 for research actors in two new and distinct programs, namely those with an emphasis on the leadership of universities and the private sector with incentives for collaboration between actors. In addition, a program to address the needs of public institutions based on the consortium of research actors has accommodated the national energy technology projects. These research and technology development programs have effectively supported the energy ecosystem in Turkey alongside the research infrastructure support of the MoD and the cooperation of MENR. In support of the energy ecosystem, the Science, Technology, and Innovation Policy Department of TÜBİTAK is actively engaged in the call planning of the energy calls, the coordination of technology roadmaps, and the bibliometric analyses of the competences of universities, including those in the field of energy. In addition, the TÜBİTAK Energy Institute is a leading research center conducting applied research and development projects in energy technologies.

The institute aims to lead the development of energy technologies domestically in parallel with Turkey's development goals for 2023 and to develop projects for these goals, including power electronics.

Regulatory Framework of Energy and Renewable Energy Laws

The effectiveness of R&D and innovation policies is interdependent on the regulatory framework, including laws that promote the increase of renewable energy technologies in the energy system. In this way, the regulatory framework that is summarized below supports these targets of Turkey for the year 2023, including targets for at least 10 GW of solar PV and wind power technologies by the year 2023.

The "New Electricity Market Law (Law No. 6446)" establishes the current electricity market system and defines license types, licensing mechanisms, and investment incentives. In this context, "Law on the Utilization of Renewable Energy Resources for the Purpose of Generating Electrical Energy (Law No: 5346)" provides the legal framework for renewable energy incentives. Accordingly, renewable energy resources have been defined as non-fossil energy resources such as hydro (less than 15 km^2 of reservoir area and run-of-the-river hydroelectric), wind, solar, geothermal, biomass, biogas (including landfill gas), as well as wave, current and tidal energy. Since the adoption of this Law in 2005, the "Law Amending the Law on the Utilization of Renewable Energy Resources in Electricity Generation (Law No: 6094)" has improved and further encouraged renewable energy opportunities in the energy sector. The amendments include an obligation to purchase electricity that is generated from renewable resources. In addition, a new feed-in tariff plan has categorized the different levels of feed-in tariffs for different technologies as well as a local equipment bonus when the facilities are built using components manufactured domestically. Accordingly, the Renewable Energy Resources Support Mechanism based on the provision of feed-in-tariffs have been in effect with differing prices for hydro, wind, solar, biomass and geothermal energy (Table 1). The fixed tariff is valid for 10 years from the date of commissioning.

Table 1. Feed-in-tariff in Turkey for Renewable Energy

Technology	Incentive (USD cent/kWh)
Wind energy	7.3
Solar	13.3
Hydro	7.3
Biomass	13.3
Geothermal	10.5

By the year 2023, Turkey aims to install 61,000 MW of renewable energy to generate approximately 159 TWh of energy. Table 2 represents the distribution of the renewable sources for electricity generation based on the concrete targets per energy source in the given years up to the year 2023. In particular, the objectives for the different technologies are 34,000 MW of hydropower, 20,000 MW of wind energy, 1,000 MW of geothermal energy, 5,000 MW of solar energy (photovoltaic and concentrated solar power) and 1,000 MW of biomass. When compared to the year 2013, these targets require substantial increases in the installed power capacities of various renewable energy sources (Table 3).

Table 2: Concrete renewable energy targets per energy source up to the year 2023

Energy source (MW)	Base year	2015	2017	2019	2021	2023
Hydropower	19,620	25,526	28,763	32,000	33,000	**34,000**
Geothermal energy	162	412	559	706	853	**1,000**
Solar energy	0	300	1,800	3,000	4,000	**5,000**
Wind energy (land-based)	2,261	5,660	9,549	13,308	16,800	**20,000**
Biomass	159	377	9,549	683	836	**1,000**
Overall	22,202	32,275	530	49,697	55,488	**61,000**

Source: National Renewable Energy Action Plan (NREAP) of Turkey

Table 3. Comparison of Electricity generation and installed capacity between 2013 and 2023 forecasts

Renewable Energy Sources	Installed power capacity (MW)			Electricity generation (GWh)		
	2013	2023	Δ	2013	2023	Δ
Hydro	22,289	34,000	53%	59,420	91,800	54%
Wind	2,759	20,000	625%	7,558	50,000	562%
Geothermal	310	1,000	223%	1,364	5,100	274%
Solar	0	5,000	-	0	8,000	-
Biomass	224	1,000	346%	1,171	4,533	287%

Source: National Renewable Energy Action Plan (NREAP) of Turkey

In addition to the electricity sector of which the target is at least a 30% penetration of renewables in 2023 with projected shares as high as 38%, the penetration of renewable energy sources into other energy sectors, e.g. heating and cooling in buildings and transport, are also important. In the heating and cooling sector, existing projections indicate a possible share of 14% in 2023 and a 10% share in the transport sector. According to the values in Table 4, the energy magnitudes of these shares are given in Table 5 with an expectation of about 13,709 thousand toe of renewables in the electricity sector.

Table 4: Renewable energy projections for heating and cooling, electricity, and transport sectors

Usage of renewable energy sources	Base year	2015	2017	2019	2021	2023
Heating and Cooling	12.54%	13.01%	13.30%	13.56%	13.86%	14.16%
Electricity	27.02%	31.50%	35.27%	37.75%	37.77%	37.57%
Transport	0.07%	1.70%	3.70%	6.00%	8.88%	10.08%
Total	13.48%	15.29%	17.10%	18.75%	19.83%	20.47%

Source: National Renewable Energy Action Plan (NREAP) of Turkey

Table 5: Sector contribution to the share of renewable energy in final consumption of energy

Expected gross final consumption of energy from renewable sources (ktoe)	Base	2015	2017	2019	2021	2023
Heating and cooling	6,154	6,453	6,652	6,851	7,050	7,249
Electricity	5,621	7,499	9,425	11,281	12,526	13,709
Transport	10	293	689	1,185	1,868	2,267
Total	11,786	14,245	16,766	19,317	21,445	23,225

Source: National Renewable Energy Action Plan (NREAP) of Turkey

Furthermore, the Turkish Government has a strong commitment to energy efficiency, especially as put forth by the "Energy Efficiency Strategy Document 2012-2023", which provides strategic guidelines and actions for creating energy efficiency in the building, transportation and industrial sectors in Turkey. In particular, the document plans to enhance energy efficiency, preventing unconscious use and dissipation, and decreasing energy density either within the sectorial base or at the macro level. These guidelines form important components of the Turkish national energy policy, in all its stages from energy production and transmission to final consumption. In this context, the "Energy Efficiency Law (Law No: 5627)" has aimed to increase efficiency in energy generation, transmission, distribution and consumption phases at industrial establishments, buildings, power generation plants, transmission and distribution networks and transport. In the context of this Law, MENR-YEGM has also provided financial support to "Efficiency Increasing Projects" (VAP) in industries with an annual energy usage greater than 1000 tonne oil equivalent (toe). In contrast, "Environmental Law (Law No: 2872)" allows industrial plants to receive a reduction of up to 50% of their electricity bills through the establishment of their own waste treatment facilities. In addition, the "Geothermal Law (Law No: 5686)" establishes the rules and principles for effective search, exploration, development, production and protection of geothermal and natural mineral water resources. Within the complete framework of these laws, the increased penetration of renewable energy in the energy system is supported in providing opportunities to off-set the usage of fossil energy.

Further References:
National Renewable Energy Action Plan (NREAP) of Turkey
Available at:
http://www.ebrd.com/documents/comms-and-bis/turkey-national-renewable-energy-action-plan.pdf

---

Can you share success stories of renewable energy projects in your country? How do you ensure the sustainability of the project and scale or replicate it? In your answer, information on the following: location, time period of implementation/starting date, main actors, beneficiaries, funding, technology and innovation used, issues addresses, stage of implementation, sustainability, etc. may be included. Do you have any documentation, references, web addresses or reports on the specific examples cited? If yes, please share it with us.

R&D and innovation is an essential aspect of the "Priority Theme 1: The Role of Science, Technology and Innovation to Increase Substantially the Share of Renewable Energy by 2030." For this reason, a best practice of Turkey in upholding this theme in national efforts is based on a targeted approach to roadmapping, funding, and evaluating R&D projects in prioritized energy technologies.

Energy constitutes a prioritized sector for R&D and innovation in Turkey within the National Science, Technology and Innovation Strategy as resolved by the Supreme Council for Science and Technology (SCST), which is the highest decision-making body for science, technology and innovation policy in Turkey. In addition, two programs under the Tenth National Development Plan of Turkey (2014-2018) are the "Energy Production Based on Local Resources Program" and the "Energy Efficiency Development Program." The programs are prepared in collaboration with the Energy Security and

Efficiency Expert Commission. The Middle Term Program of the Tenth National Development Plan further emphasizes the importance of security of energy supply, local production of renewable energy technologies, and other targets. Subsequent Annual Programs have also included the development of energy infrastructure. In this framework, the "National Energy R&D and Innovation Strategy" was coordinated by TUBITAK with the involvement of sectoral stakeholders. The vision of the Strategy is:

> *"Utilize energy resources effectively and efficiently without compromising environmental quality and welfare based on the knowledge and innovative products that are produced in the field of energy technologies."*

Important developments that followed this Strategy were the formation of a High-Level Prioritization Group for Energy to prioritize the technology sub-fields in the energy field. The Group involved stakeholders from academicians with leading expertise in energy, top CEOs in the energy sector, governmental representatives, and non-governmental organizations for energy efficiency. Energy efficiency in buildings and the industry took place among the top priorities, after which the "Energy Efficiency Technology Roadmap" was coordinated by TUBITAK based on the multiple stages of Delphi statement collection, expert meeting, Delphi survey, data analysis, and a focal group meeting. The Energy Efficiency Technology Roadmap was finalized based on milestones directed to seven targets.

For the realization of the targets in the Energy Efficiency Roadmap, since 2012, TUBITAK has been opening over 75 calls in the priorities of the energy sector in two different research and technology development programs, which are coded as the TUBITAK Programs 1003 and 1511. In addition, calls in the sub-domains of renewable energy, particularly solar energy, received a significant emphasis in the calls based on the priority that was deemed to solar energy by the High-Level Prioritization Group.

- The Support Program for Research, Technological Development and Innovation Projects in Priority Areas (TUBITAK 1003)
- The Support Program for Research, Technological Development and Innovation Projects in Priority Areas (TUBITAK 1511)

To ensure the sustainability of the funded R&D projects, the Call Planning Consultation Committees (CPDK) of these programmes periodically examines and evaluates the funded projects and compares the projects against the targeted objectives of the call and milestones of the projects.

Furthermore, the agenda of the 26th meeting of the SCST in 2013 was "Energy" in which national R&D and innovation initiatives and landmark projects for the energy sector were launched. These projects are under the joint responsibility of the Ministry of Energy and Natural Resources (MENR) and TUBITAK. The associated institutions include the Ministry of Development, Ministry of Economy, and the Ministry of Food, Agriculture and Livestock. The national landmark projects for energy R&D are as follows:

- Development of Wind Energy Power Plant Technologies (MILRES)
- Development of Solar Energy Technologies (MILGES)
- Development of Hydroelectric Energy Technologies (MILHES)
- Development of National Design and Manufacturing Capability for Thermal Power Plants (MILTES)
- Development of National Design and Manufacturing Capability for Thermal Power Plant Flue Gas Treatment Technologies (MILKAS)
- Development of Coal Gasification and Liquid Fuel Production Technologies

These national landmark R&D projects were funded under the Public Institutions Research and Development Projects Support Program (TUBITAK 1007), the target audiences of which are the academia, private sector, and consortiums to address public needs.

In addition, the simultaneous launch of public tenders in the wind and solar sectors is planned to be another aspect of integrated policies to reach the 2023 renewable energy targets of Turkey. Table 6 summarizes the main characteristics of the two public tenders with large scale capacity targets that will be distributed throughout the designated Renewable Energy Resource Areas (YEKA) in Turkey.

Table 6. Brief Description of Technology Deployment Tenders in Renewable Energy Resource Areas

YEKA Public Tenders	Brief Description
Renewable Energy Resource Areas (YEKA) – Solar Tender	A total of 1 GW of solar energy will be installed in the YEKA area of Konya Karapınar given that the local content share in the first phase of 500 MW will be 60% and 70% in the second 500 MW.
Renewable Energy Resource Areas (YEKA) – Wind Tender	A total of 1 GW of wind energy will be installed in the designated YEKA areas given that a wind turbine manufacturing plant is built with an annual production capacity of at least 150 turbines or 400 MW with at least 65% local content and R&D center with at least 80% local employment.

Further References:
"Energy Policies of IEA Countries: Turkey 2016 Review"
Available at:
https://www.iea.org/publications/freepublications/publication/EnergyPoliciesofIEACountriesTurkey.pdf

Priority Theme 2: Building Digital Competencies to Benefit from Existing and Emerging Technologies, with Special Focus on Gender and Youth Dimensions

---

Can you provide examples of digital policies/projects/initiatives to benefit from existing and emerging technologies specially focused on gender and youth? How have the policies benefited women and youth? What are the particular challenges confronted in implementing these projects?

Turkey acknowledges the importance of building digital competencies to improve welfare of society and increase economic growth. In order to build digital competencies, the "Information Society Strategy and Action Plan 2015-2018" and "2016-2019 National e-Government Strategy and Action Plan" have been put into action. In addition, the "Tenth Development Plan 2014-2018" includes actions to improve digital competencies. Within this framework, the SCST has also resolved to increase digital opportunities in education and government upon which two SCST meetings have been dedicated to these themes. In particular, the role of education and human resources has been the theme of the SCST 24th meeting in which decrees on "Developing Digital Contents for Primary and Secondary Education Curriculum and Making Them Accessible" and "Promoting Development of Digital Course Contents for Higher Education and Making Them Accessible" were among the two related decisions that were taken. In relation to these initiatives, TÜBİTAK has launched the support program "TÜBİTAK 5002– Academic e-Course Calls" that aim to support the development of enhanced online course material for the access of all students so that equal opportunity to high quality teaching material is assured across levels of education.

E-Government in Turkey (10th Development Plan 2014-2018)

E- government has a critical role in increasing efficiency and productivity of the public sector. By the end of 2012, nearly 600 services had been integrated to the e-Government Gateway. This improvement has taken positive reactions from the society as the satisfaction level of citizens on e-government services has reached to %94.4 by the end of 2012. Developments and objectives in e-Government are given below:

Table 7. Developments and objectives in e-Government in Turkey

	2006	**2012**	**2013**	**2018**
Individuals Using e-Government Services	26.7[2]	45.1	48.0	65.0
Enterprises Using e-Government Services (%)[3]	66.2	81.5[4]	85.0	90.0
Satisfaction Rate of e-Government Services (%)[5]	95.0[6]	94.4	97.5	98.0
Number of e-Govt. Gateway Registered User	0.01	13.8	15.0	30.0
Number of Services Provided through e-Government Gateway	22[7]	547	700	3,000

Source: 2006 and 2012 data are from TURKSTAT and TURKSAT. 2013 and 2018 data are estimates of the Tenth Development Plan.
(1) The ratio of persons benefitting from e-government services to internet users of 16-74 age range.
(2) 2007 data
(3) The ratio of enterprises using e-government services to all enterprises having 10 and more employees.
(4) 2011 data
(5) The ratio of satisfied and medium level satisfied persons to total number of e-government services users.
(6) 2009 data
(7) December 2008 data

In addition to the objectives in the "Tenth Development Plan," the "2016-2019 National e-Government Strategy and Action Plan" was accepted by the decision of Supreme Planning Council on 19 July 2016 (www.edevlet.gov.tr).

Information Society Strategy and Action Plan 2015-2018

The Information Society Strategy and Action Plan 2015-2018 has actions to support economic growth and employment by increasing strength and competitiveness of ICT industry, boosting diffusion of ICT and creating a prolific ecosystem for internet startups. Diffusion of ICT into society is one of the eight main pillars of the action plan. Turkey targets to increase diffusion of ICT with a special focus on gender. Women's internet usage rate was %38.8 by 2014 and with the actions in the Information Society Strategy and Action Plan 2015-2018, it is planned to increase to % 65 by 2018. In Tables 8-12 below, selected facts and targets in the "Information Society Strategy and Action Plan 2015-2018" can be found:

Table 8. Broadband Infrastructure and Sectoral Competition Targets

Targets	2012	2018
Broadband Subscriber Penetration Rate (%)[1]	26.5	70
Fiber Internet Subscribers (in thousands)	645	4,000
LTE Subscribers (million)	-	10
Alternate DNS Management Market Share Ratio(%)	10.8	25
Broadband Access Per Capita Income of Cost Ratio (%)	1.9	1

(1) This figure is the ratio of number of broadband subscribers to population; mobile broadband subscribers are included in number of broadband subscribers
Source: Information Technologies and Communication Authority, Ministry of Development

Table 9. Diffusion of ICT into Society Targets

Targets	2014	2018
Internet usage rate (%)[1]	48.5	75
Internet usage rate of disabled persons (%)[1]	10.4(2010)	25
Women's internet usage (%) [1]	38.8	65
Internet usage rates of individuals over 45 (%)[1,2]	19	30
Households with broadband internet access (%)	57.2	75

(1) In the last three months
(2) Calculated by the Ministry of Development using TURKSTAT data.
Source: TURKSTAT

Table 10. ICT-Supported Innovative Solutions Targets

Targets	2012	2018
Number of Living Labs	2	20
Percentage of Municipalities with GIS (Geographic Information Systems) Infrastructure	3	30
Number of Receiver Hospitals in Telemedicine	10	100

Source: Ministry of Interior, Ministry of Health

Table 11. Internet Entrepreneurship and e-Commerce Targets

Targets	2012	2018
Ratio of online shopping among internet users (%)	24.1	70
Individuals with entrepreneurship training (%)	6.3	15
Number of angel investors networks (per million population)	0.1	1

Source: TURKSTAT, Global Entrepreneurship Research Association, Ministry of Development

Table 12. User-Centric and Effective Public Services Targets

Targets	2012	2018
e-Government services use rate (%) - Among internet users (16-74 years old) - Among all enterprises (10+ employees)	 41.3 73.7	 60 85
Number of services to be revised in terms of citizens centricity	-	50
Number of institutions in the government cloud	-	30
Number of data sets in the Open Data Catalogue	-	> 10,000

Source: TURKSTAT

How can the science, technology and innovation community contribute towards overcoming these challenges? Can you give any success stories in this regard from your country or region?

Science, technology, and innovation can contribute towards increasing literacy as well as the quality of education based on innovative education technologies. The recent call planning of TÜBİTAK in Social Sciences has included a call on "Innovative Technologies in Education" that aims to support the research of education technology applications, the development of innovative technologies from primary to secondary education, and the development of models for the integration of these innovative technologies into the curricula. Experiences from the integration of digital technologies into education in Turkey will also be evaluated and built upon. An example with international recognition may be given from the "Literates Teach Computer Use to Illiterates" Project that was conducted by UNDP, Ministry of Development, Habitat Development and Governance Association and Microsoft. This project supports Turkey's e-transformation process by improving ICT skills of disadvantaged individuals, particularly children, youth, women and the handicapped. The project is carried out in partnership with National Youth Parliament, City Councils Youth, Women and Handicapped Assemblies and local authorities in 78 provinces with the support of 1200 voluntary young trainers, 50 master trainers and hundreds of young volunteers. Since 2005, almost 150.000 individuals were trained on basic computer and internet skills, office programs, digital life and internet security and web design and software development. The average age of participants is 19 years old, of which 58 percent are women and 42 percent are men Trainings are delivered at facilities provided by ministries and local authorities. Continuous Training Centers and IT Academies deliver these trainings with the support of local authorities where infrastructure is inadequate. This project was highlighted as a best practice by UNDP and chosen by the European Commission in 2008 as one of the best 5 projects in Geographic Participation category of European e-Inclusion Awards.

Further References:
"The Tenth Development Plan (2014-2018)"
Available at:
http://www.mod.gov.tr/Lists/RecentPublications/Attachments/75/The%20Tenth%20Development%20Plan%20(2014-2018).pdf

"Information Society Strategy and Action Plan 2015-2018"
Available at:
http://www.bilgitoplumu.gov.tr/en/wp-content/uploads/2016/03/Information_Society_Strategy_and_Action_Plan_2015-2018.pdf