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IPA12CS02

Development of the Renewable Energy Sector

Final Report

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FINAL REPORT

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List of Acronyms

Acronym	Definition
DGEA	General Directorate for Energy Affairs
DGFREU	General Directorate of Foreign Relations & European Union
DGRE	General Directorate for Renewable Energy
DSO	Distribution System Operator
EBRD	European Bank for Reconstruction and Development
EDAS	Enlisted Distribution & Assignment System
EIB	European Investment Bank
EE	Energy Efficiency
EMRA	Energy Market Regulatory Authority
EPC	Engineering Procurement and Construction
EPDK	Energy Market Regulatory Authority
EU	European Union
GDFAEU	General Directorate for EU Foreign Affairs
GDP	Gross Domestic Product
IFC	International Finance Corporation
KE	Key Expert
KoM	Kick off Meeting
KfW	Kreditanstalt für Wiederaufbau
MENR	Ministry of Energy and Natural Resources
MRC	MRC Consultants and Transaction Advisers
MEUA	Minister for EU Affairs
MWH	MWH Global Consultants
NGO	Non-Governmental Organization

Acronym	Definition
PAR	Project Assessment Report
PV	Photovoltaic
REAP	National Renewable Energy Action Plan
RE	Renewable Energy
RES	Renewable energy sources
RTE	Réseau de transport d'électricité
SME	Small Medium Enterprise
TEB	Türk Ekonomi Bankası
TEIAS	Turkish Electricity Transmission Company
TEDAS	Turkey Electricity Distribution AS
ToR	Terms of Reference
TSO	Transmission System Operator
USD	United States Dollar
WB	World Bank

Executive Summary

The contract IPA12CS02 is the component of the 2012 IPA program (Instrument for Pre Accession Assistance) targeted to assist Turkey in adopting a plan for the acceleration of renewable energy development including the improvement of power system flexibility to integrate a larger share of renewable electricity.

The objective of the Contract is to accompany Turkey's accelerated development while supporting:

- the enhancement of renewable energy sector in line with the Turkey and EU Energy priorities and strategies,
- the implementation of the policy and institutional framework for harmonization to the EU Acquis,
- the market development and scale-up of small-medium scale renewable energy projects.

The activities performed under the assignment reached the expected targets, as per ToR requirements:

- **A strategy** proposal has been developed and delivered, supporting the **acceleration** of renewable energy development in Turkey, the **integration of a larger share** of renewable electricity and the **elimination of the relevant barriers** identified in the proper assessment of the current situation. Relevant recommendations for RES sector improvement and implementation plan have been developed and included in the Strategy Road Map. They mainly impact the following areas:
 - ❖ Energy policy: Development of a Country Energy Model and Plan; design of an ex-ante energy mix up to 2030 in line with EU objectives;
 - ❖ Regulatory Framework: improve Promotion Mechanism moving from FiT to auctions (large and small projects); issue new regulation to Fostering Self-consumption.
 - ❖ Network Planning: urgent development of a RES Network Integration study, eliminating VRE integration limit; adoption of new Network Planning methodologies for Transmission (in line with ENTSO-e guides) and Distribution Grids.
 - ❖ Network Operation: adoption of appropriate processes for RES controlling and curtailment and Distribution Network Operation.
 - ❖ Network Connection: adoption of Grid Follow criteria and update Transmission Grid Code; development of Distribution Grid Code and review the functions of TEIAS for unlicensed Generation.
 - ❖ Streamlining the current processes for License permits/approvals and Unused Capacity; Improving financing conditions for small scale projects Financial feasibility;
- **Business development services** have been provided to **SME** supporting renewable energy projects application to Turkish institutions for a successful financing. The relevant tasks produced the following outputs:
 - ❖ the **analysis** of the current situation of the renewable energy financing and support mechanisms in Turkey, focusing on the possibility to increase the pace

of small scale renewable energy implementation with new recommended mechanisms.

- ❖ Required regulatory actions to develop new finance mechanisms for a sustainable renewable energy sector were discussed with BRSA. BRSA stated their interest to include residential RE and EE investments into mortgage category.
- ❖ **calculator tools** to assess feasibility and bankability of small-scale RE projects, with identification of key inputs, outputs, and KPIs for each type of renewable energy technology. Five calculation tools have been developed for PV solar, wind, biogas, landfill gas, and heat pump projects.
- ❖ **a survey** determining the potential small-scale RE investors/projects eligible for business development services to support their financing by the local banks in the industry and building sectors.
- ❖ 287 small scale renewable energy projects have been originated from various channels and 168 of them were evaluated as eligible. According to the needs of the beneficiary and target party, 118 bankability reports, 23 feasibility studies, 14 feasibility studies for municipalities and 13 procurement documents have been prepared.
- ❖ The combined investment amount of all the projects is USD 135 million, which results in 177GWh of electricity production. With USD 19.2 million net revenue, combined from electricity savings and feed-in tariff, the average payback time for the projects is around 6.5 to 7 years. Energy sector dominates the investments in ground type installations. The projected emission savings for all the projects combined is 89,995 tCO₂ equivalent per year.
- ❖
- ❑ **The Feasibility study and Technical specifications** have been released to **procure** a Monitoring, Forecasting and Control System mechanism for Solar Power Plants. The main outputs were:
 - ❖ **The Feasibility Study of the system**, performed taking in account the available technological solutions, Terna experience and adopted solutions and the best practices adopted by the main System Operators
 - ❖ **Technical Specifications** identifying all the Components of the proposed system and each item to be purchased (be it a software, hardware or any equipment) with its functions and/or technical features specified. Technical Specifications Report include the Components of the proposed system and each item to be purchased (be it a software, hardware or any equipment) with its functions and/or technical features specified.
 - ❖ **Guidance Notes** on Solar Power Forecasting and Control Techniques and Data Acquisition from the field.

The consultancy activity was organized in three main Tasks as per ToR requirements and the relevant results have been consolidated in 11 reports plus 168 specific project assessment reports related to the different issues grouped in the three tasks required by the ToR. The relevant content and findings were disseminated through all the Beneficiaries and openly discussed in 4 public **Tasks Workshops involving around 200 participants from** MENR, DGRE, TEIAS, Ministry of Economy, Ministry for EU Affaires, EMRA ,TEDAS , ELDER, DGRE, WB, LIFE ENERGY, JESDER, TERNA MWH, TUREB, several EDAS (AKDENİZ , AYDEM , GEDİZ , BAŞKENT, BOĞAZIÇI, ÇAMLIBEL, DİCLE , OSMANGAZI,

SAKARYA, TOROSLAR, TRAKYA, ULUDAĞ, VANGÖLÜ, YEŞİLIRMAK), Banks, IFIs, Banking Regulation and Supervision Agency (BRSA), Ministry of Finance, and Capital Markets Board of Turkey.

In parallel with the consulting activities an important Knowledge Transfer process was implemented **to the Beneficiaries through specific Technical trainings.**

Six modules were performed related to Solar PV, RE Heating and Cooling, Storage, Offshore wind, Sustainability and RE Policy, RES integration. The activity involved **204 total participants coming from the** Ministry of EU Affairs, TEIAS, DGRE, EMRA, DGFREU, DG Energy Affairs, Other Stakeholders, TUREB, TEDAS, various EDAS.

A further 2-days training on EU experience on renewable energy financing mechanisms, costs and experience was held at Vakıf Katılım Bank on 20/09/2017 and at Türkiye Finans Katılım Bank on the 21/09/2017.

Four Field Visits in Italy (facilities of storage and converter station) **and Germany** (facilities related to Onshore and Offshore Grid Connection) **involving 10 participants from** DGRE, TEIAS, DGEA, DGFREU

One working seminar in TERNA Head Quarter and Dispatching Center focused on presentation and discussion of relevant issues about the RES integration challenges faced in Italy in the Transmission System and on TERNA background supporting the solution studied for forecasting and monitoring applications and on the type of platforms needed for the collection of the data sources concerning RE forecast .

The whole set of activities has been carried out in the period of 24 months between the Signature of the Contract held on 01/10/2015-and its closing date of 28/09/2017.

1. Aim of the document

This Final Report is submitted to provide demonstration of the achievement of the project aims and objectives and of the activities and products/deliverables developed during the whole period of the contract from the start on 01.10.2015 to the end on 28.09.2017. A detailed summary of the activities developed in the period between the start of the project and July 2016 and from 01/08/2016 to 31/12/2016 is included in the related two Progress Reports already delivered to the Beneficiary on August 5, 2016 and in January 2017 respectively.

2. Project Synopsis: context, background, rationale, objectives overview of the scope and expected results of the contract, the Deliverables

2.1 Context

The activity of this Contract is developed within the framework of the "Positive Agenda" launched by the Commissioner for Enlargement and European Neighborhood Policy and the Turkish Minister for European Affairs and Chief EU Negotiator in Istanbul in June 2012.

The IPA 2012 Energy Sector Program Phase-I Project is financed within a large multi-year EU/IPA funding program managed by the World Bank and implemented by the MENR

The following components are included in the IPA 2012 Energy Sector Program Phase-I Project:

1. CS01 Contract including Institutional review and capacity building of MENR and Review of Turkey's alignment with the EU energy acquis,
2. CS02 Renewable Energy Sector Development Contract including review of current situation, barriers and road map and renewable energy grid integration to distribution and transmission systems,
3. CS03 Natural Gas Contract
4. CS04 Energy Efficiency Contract
5. Visibility and Public Awareness (included in CS01)

The Program targets the achievement of the following key results:

- 1) MENR adopts a program for the enhancement of the Turkish energy sector in line with the EU energy priorities and strategies, based on a review and regulatory impact assessment of alignment with the EU's energy acquis of Turkey's legal and institutional framework for electricity, natural gas, energy efficiency and renewable energy.
- 2) MENR adopts a plan for the acceleration of renewable energy development including the improvement of power system flexibility to integrate a larger share of renewable electricity,
- 3) Turkish financial institutions receive and review financing applications for energy efficiency projects for small and medium-scale industries and buildings.

The present Contract refers to the component 2 of the EU 2012 IPA program (Instrument for Pre Accession Assistance) : IPA 12 CS 02.

2.2 Background

Securing an adequate and reliable energy supply for Turkey's growing economy, efficiently and in an environmentally sustainable manner, is a major challenge.

Economic expansion, rising per capita income, positive demographic trends and the rapid pace of urbanisation are the main drivers of Turkey's growing Energy demand, estimated to increase by approximately 7 per cent each year until 2023.

At present, domestic resources provide approximately 26 per cent of the total energy demand, the remainder being imported.

Turkey's primary goal is to strengthen its security of supply improving the domestic energy generation and diversifying its energy supply.

During the last years, the Turkish energy market has been experiencing vast changes. These changes include liberalization, increasing private sector participation and the establishment of competitive market

Building on successful fundamental energy sector reforms over the last decade, Turkey is moving to develop an increasingly reliable and efficient energy supply system, while also mitigating climate change.

Turkey's energy strategy is in line with best international practices.

Implementation is the key challenge jointly with the development of legal and regulatory measures to attracting the needed investment in energy supply and promoting the efficient use of energy.

2.3 Rationale

Turkey does have huge potential for renewable energy exploitation, whose optimal exploitation could decrease the dependency of the country on imported fossil fuels and decrease the greenhouse gas emissions

The National Renewable Energy Action Plan (REAP) for Turkey has been created in alignment with Directive 2009/28/EC and the template predetermined by the European Commission Decision of 30.06.2009 (2009/548/EC).

The target level for domestic, renewable resources in the production of electricity has been established within the framework of the national energy policy.

On one hand, by 2023 Turkey plans to have an electricity generation mix in which the share of renewable energy accounts for 30% of overall need as well as having 10% of the requirements of the transportation sector met by renewable energy.

On the other hand, there is the commitment to reduce by at least 20% (with reference to 2008 figures) the amount of energy consumed per unit GDP in the year 2023 (in terms of energy intensity).

However the current levels of investment in renewable energy are still lower than expected and there is a strong need to reduce risks and uncertainties on potential investments.

This situation calls for the need to establish the necessary framework conditions enabling a successful development of RES, as:

- a) Removal of barriers linked to the administrative process, licensing and authorizing procedures
- b) Development of legal framework for the implementation of new solutions/technologies.
- c) Improvement of Grid Operation and Connection procedures in order to provide secure access to renewable energy for electricity generation and optimize the usage of any relevant infrastructure
- d) Development of more effective support mechanisms and financial measures for projects

2.4 Project Objectives

The overall objective of the project is to establish the proper Framework Conditions to accompany Turkey's accelerated development while supporting:

- the enhancement of renewable energy sector in line with the Turkey and EU Energy priorities and strategies in renewable energy,
- the implementation of the policy and institutional framework for harmonization to the EU Acquis,
- the market development and scale-up of small-medium scale renewable energy projects.

The overall aim has been broken down into specific objectives/outputs:

- a) Draw up a comprehensive plan to ensure the acceleration of renewable energy development in Turkey, integration of a larger share of renewable electricity and elimination of the barriers identified under the Project.
- b) Provide business development services for small and medium size enterprises enabling SME renewable energy projects to be successfully presented to Turkish financial institutions for financing applications
- c) Provide professional technical services to prepare technical specifications and ToR's of a Monitoring, Forecasting and Control System mechanism for Solar Power Plants
- d) Assure a proper Knowledge Transfer to the Beneficiaries for the implementation of the proposed recommendations and action plan

2.5 Overview of scope and expected results

The project includes the implementation of the following activities (tasks, training, workshops and site visits):

Task 1: Assessment of Current Situation, Barriers and Road Map

- Task 1.A: Assessment of Current Situation and Barriers
- Task 1.B: Recommendations + Training on offshore wind market, legislation and implementation experience + Workshop on Recommendations

- Task 1.C: Road Map - Strategy and Action Plan + Training on sustainability analysis of renewable energy policy and economic analysis of renewable heating and cooling, and RE integration to the grid using case studies +Workshop

Task 1.D: Field Visit – Germany and Italy

Task 2: Establishment of a Financing Mechanism and Formulating Small Scale Projects

- Task 2.A: Financing and Support Mechanisms
- Task 2.B: Design of a calculator tool to assess feasibility and bankability
- Task 2.C: Preparation Feasibility Reports of RE Projects
- Task 2.D: Environmental and Social Considerations and Road Map

Task 3: Monitoring, Forecasting and Control System for Solar Power Plants - Feasibility and ToR + Training on Global Solar Practices and Workshop

The expected achievements of the project are (**project outputs/results**):

- 1) A comprehensive plan**, will be drawn up to ensure the acceleration of renewable energy development in Turkey, the integration of a larger share of renewable electricity and the elimination of the barriers identified under the Project.
- 2) Business development services** will be provided to small and medium size enterprises concerning the SME renewable energy projects application to Turkish institutions for a successful financing.
- 3) Technical specifications and ToR** of a Monitoring, Forecasting and Control System mechanism for Solar Power Plants will be prepared and delivered.
- 4) A proper Knowledge Transfer to the Beneficiaries** will be assured through a shared plan of technical Trainings.

The main beneficiary of the Contract activities is MENR and Target Groups are transmission and distribution system operators, regulatory authority, current and potential investors, lenders and the industry.

2.6 The Deliverables

The expected output of the various activities was grouped in contractual Deliverables, linked to payment schedule, as follows:

D1 – Inception Report

D2 – Task 1A Assessment Report

D3 – Assessment and Recommendations Report of Task 2A.

D4 – Report Project Selection Criteria and Implementation Procedure -Task 2C

D5 – Training on offshore wind market -Task 1B Recommendations Report.

D6 – Survey Results Reports -Task 2C.

D7 – Feasibility Report of Task 3

D8 – Submission of the Design and Specifications of the Calculation Tool - Task 2B - and its Report

D9 – Road-Map Strategy and Action Plan Report of Task 1C

D10 – ToR of the IT system for the establishment of a Monitoring, Forecasting and Control System Mechanism for Solar Power Plants

D11 – Field Visit in Italy and Germany and Field Visit Reports

D12 – Feasibility Reports and Business Plans of RE Projects -Task 2C.

D13 – Recommendation Report and Road Map -Task 2D.

D14 – Case studies & success stories and lessons learned from Task 2C

D-15 – Final Report

3. Contract Time Schedule and its evolution

Original Time Schedule Project General Milestones

- Signature: 01/10/ 2015
- Notice to Proceed: 22/11/2015
- Kick off meeting: 16/12/2015
- Inception Report Within 1 month from the KoM
- Task1 period 13 m from the signature: end in October 2016
- Task2 period 18 m from the signature: end in March 2017
- Task3 period 13 m from the signature : end in October 2016
- End of project 31/03/2017
- Project duration: 18 months

The Contract duration was extended during March 2017 through the Contract Amendment n°1 signed on 21/03/2017 stating:

- The new time period of the contract: 24months versus the previous18.
- The new dead line at 28/09/2017
- A re-organized payment schedule.

4. Summary of the activities performed during the Contract period

This section of the document reports the main activities undertaken during the Contract period.

All and each contract activities have been carried out in close cooperation with the Beneficiary from the approach definition and planning to the whole implementation process.

The activities are summarized here below as regrouped by development phase.

a. Inception phase

During this period, the Consultant and the Beneficiary performed the following activities:

- a) The Consultant finalized the Key Experts mobilization and Project organization along with the Project Management level definition.
- b) The Kick-off meeting was held in Ankara on 16/12/2015 and saw the participation of MENR and WB representatives, and representatives of the working team (Contract Responsible, Project Manager and Task Leaders).
- c) The project implementation strategy was agreed; the Beneficiary highlighted that Storage and Micro-grid issues should have had first priority.
- d) The Beneficiary established the Project communication framework that unfortunately proved to be variable and for some part strait-laced and ineffective:
 - It was stated that all deliverables and request of information and meeting should have been sent to MENR who was in charge to dispatch them to the interested people.
 - The first Beneficiary Contact List (as Activities Interfaces) was defined during the KoM: MENR DGFREU was in charge for financial issues and TEIAS for Task1 and 3.
 - A new Contact List was defined on 4/03/2016 with important change in Task 3 (GDRE as contact in substitution of TEIAS). A meeting should have been organized by DGRE responsible in order to coordinate DGRE and TEIAS roles and activities but it was never held.
 - DGRE communicated its contact point by the end of May 2016.
 - The Technical Project Implementation Committee was identified but never became operational.
 - TEIAS Technical Committee and EMRA contact group were re-defined only in October 2016
- e) The Consultant took the necessary steps to prepare and issue the Inception Report and delivered the Draft of Inception Report complete with detailed Work Plan and all the Annexes to MENR on 14/01/2016. After this delivery, the related approval process required five rounds of comments from the Beneficiary side with a fragmented and time-inconsistent provision of comments from various Stakeholders. The Consultant was able to deliver the final edition via mail only on 15/06/2016. The final version was successfully approved through communication of the Beneficiary on 2/08/2016.
- f) Communication Activities: MENR, during the Steering Committee of 19/01/2016 informed that the activity would have been in charge of IPA12CS01 contract and that a coordination meeting with all the IPA contracts involved would have been promoted and organized by the MENR. No coordination meeting has been held and the web site was made available only in November 2016, however with not easy access. The Consultant has been keeping the contact with IPA12CS01 responsible since the KoM and the First Steering Committee but only in October 2016 it was possible to consolidate the standard solutions for visibility and the access to the site.

b. Implementation phase

During the implementation phase the Consultant performed the following activities (Tasks, Workshops, Training Modules, Site Visits, Monitoring) and issued the related Deliverables:

i. Task1 activities: Assessment of Current Situation, Barriers and Road Map

The Consultant developed all the activities as per ToR requirements. Given the strict interrelation of issues treated in A and B, the related analysis and proposal were conducted jointly and in parallel.

Task 1A and Task 1B

- a) The Consultant developed a first draft of Task1A analysis by April 2016, following the ToR structure and on the basis of an extensive set of public documents and information and on data exchanged by mail but with little direct interaction with the Stakeholders.
- b) After April, the Consultant complemented his analysis through two meetings held in Ankara: one with TEIAS (11-12/05/2016) and the other with MENR, TEIAS and DGRE (31/05-3/06/2016).
- c) During these meetings the main findings of Task1A Assessment were presented to MENR, TEIAS and DGRE and next steps were agreed with a more interactive approach through specific working meeting to be held in June-July in order to deepen analysis, information sharing and capacity building on Task1 issues
- d) The Consultant issued the Draft Report of Task 1A with all the attachments (Contract Deliverable D2) on 15/06/2016.
- e) Comments were received in July from EMRA, DGRE and WB (substantial) and in October 2016 from TEIAS.
- f) The Consultant performed also the activities for Task 1B implementation following the findings of Task1A and prepared a draft Report that was sent to MENR for comments at the end of July. Some comments were received from EMRA and DGRE in the following period until October 2016. No comments were received by WB and TEIAS.
- g) After the summer time the Consultant and the Beneficiary took the stock of the situation for Task1, during a specific meeting with TEIAS (Ankara-MENR Premises, 27/10/2016) and planned the next steps for a more effective development of the entire project. The Consultant presented the status of the D2 (Task1A Draft Report) and D5 (Task1B Draft Report) deliverables identifying and highlighting the detailed topics that had to be discussed directly with TEIAS experts in order to reach a deeper understanding of the Turkish power grid situation and a proper assessment of challenges, barrier and potentials to be considered for allowing a larger penetration of renewable.
- h) At the same time the Consultant made also a specific presentation of Task1A and B report/activities to the new contact team of EMRA/EPDK during the Meeting TERNA EMRA /EPDK (Ankara-EMRA/EPDK Premises- 27/10/2016)
- i) In the meanwhile the Consultant and the Beneficiary organized four specific dedicated seminars and meetings on Task 1, two in Ankara (21-22-23/11/2016 on Task 1 and 28-29-30/11/2016 on Task1 Grid Operation (and also on Task 3 issues) and in Rome (to be held on 14-15-16/12/2016 on Task1). The meeting foreseen in Rome on 14/12/2016 about Terna experience on grid impacts of renewable and possible solutions was cancelled at the last minute at the request of MENR and postponed to the end of January and finally cancelled.

- j) During the meetings of 21-22-23/11/2016 on Task1 issues (Ankara - TEIAS Premises) the Consultant presented and discussed with TEIAS, EMRA, DGRE and MENR the Status and main issues for updating and improving the Draft Reports of Task1A and B. In the following meetings held at the end of November (28-29-30/11/2016) the Consultant complemented the discussion about Task1 issues with EMRA and with TEIAS about Grid Operation issues and procedures.
- k) After the meetings of November and December the Consultant completely revised and restructured the Task1A and B reports integrating all the comments received at different times from October 2016 to January 2017 through multiple channels (meetings, mail, text revision) from WB, TEIAS, EMRA and DGRE and released the new IPA12CS02 Task1A and B Draft Report Revision
- l) updated to 31/12/2016 and including the following documents:
- 00_Documents Map and Executive Summary TASK 1A reviewed 12/2016
 - 01_Regulatory Framework TASK 1A reviewed 12/2016
 - 02_T&D_TASK 1A reviewed 12/2016
 - 03_Pricing and Economics TASK 1A reviewed 12/2016
 - 04_Project Finance Practices TASK 1A reviewed 12/2016
 - 05_Environmental and Social Impacts TASK 1A reviewed 12/2016
 - TASK1A Annex EU Benchmark Report Task 1A 16/06/2016
 - Task 1B Report: IPA12CS02 Recommendations and Guidance Note 1B 26/01/2017.
- m) The Consultant presented and discussed this draft with TEIAS, TEDAS, EMRA, GUNDER, TUREB, ELDER and DSO Baskent in different bilateral meetings during the first half of February. At the same time the Beneficiary collected comments coming from WB, DGRE and all the involved Stakeholders and the Contract Authority and requested the Consultant to proceed for revise and update Task1A and Task1B Reports in order to meet their expectations in line with a provided Comments Matrix, in-text comments and Minutes of the 8th Steering Committee Meeting.
- n) After integrating the received comments and the latest updates and elaborations of its own, the Consultant issued a new release of all the documents constituting the Task1A final draft report IPA12CS02 TASK 1A Reports: Assessment of the current situation-Deliverable D2 Final Draft on 2/03/2017 and the Task1B final draft IPA12CS02 Recommendations and Guidance Note 1B Draft Final 2.docx on 20/03/2017, jointly with all the Tables of comments 1A and 1B duly checked and commented.
- o) This release was submitted to a new round of comments from the Beneficiaries and WB and was discussed in specific bilateral meetings on 25-26/04/2017 with DGRE, EMRA and TEIAS and during a teleconference on 31/05/2017 with WB. All the comments were discussed and integrated in the last update version of the Reports, planned for the first days of June in order to allow the related final Workshop on 20/06/2017.
- p) The Consultant released on 01/06/2017 the documents constituting the Task 1A Report in his Final Draft version and on 02/06/2017 those constituting the Task 1B Report-Deliverable D5 in his Final Draft, the two packages being in the version approved for the related joint Workshop (20/06/2017). In the following days, the Comment Matrix was also released jointly with the presentations supporting the Workshop.

q) The Final Reports submitted to the Workshop discussion included the following documents

- IPA12CS02 TASK 1A Deliverable D2 Final Report:
- 00_Documents Map and Executive Summary
- 01_Regulatory Framework - Annex I. List of the Applicable Laws and Regulations
- 02_Transmission and Distribution Assessment Annex I. Renewables integration into the distribution grid: issues, problems and solutions
- 03_Pricing and Economics
- 04_Project Financing Practices
- 05_Environmental and Social Impacts
- Attachment I: Renewable Generation in Europe: An Overview of the Regulatory Framework.
- Attachment II: Heating and Cooling in the Turkish Electricity Sector

IPA12CS02 TASK 1B Deliverable D5 Final Report:

- 1-IPA12CS02_TASK 1B_Recommendations Final Report
- 2-Attachment I Guidelines for Investors on GPP
- 3-Attachment II Guidelines for Investors on Wind
- 4-Attachment III Guidelines for Investors on Solar PV
- 5-Attachment IV Guidelines for Investors on SHP
- 6-Attachment V Guidelines for Investors on Biomass

r) The two dossiers were presented and discussed in public séance on 20/06/2017 in Ankara. DGFREU collected the comments coming from the workshop and sent them to the Consultant on June 21th, 2017 for the last update on the base of the results of the workshop.

s) On 03/07/2016, the Consultant released for approval of Beneficiary the final version of D2 and D5 Reports and its attachments updated as per workshop results jointly with the related comments matrix.

t) During July all the end beneficiaries and WB expressed their approval (WB approval was subject to only two final small comments on the item 03 of Tak1A and 1 of Task 1B). The Consultant , after integrating these comments obtained the approval for translation and hard copies on .18/07/2017

u) The complete package of Task1A and B Final Reports as approved include the following documents:

IPA12CS02 Task 1A Delivery D2 Approved Final Reports (Approved on 18/07/2017 (June Edition) and 21/08/2017 (August Edition))

- 00_Documents Map and Executive Summary - Ed June 2017
- 01_Regulatory Framework - Annex I. List of the Applicable Laws and Regulations - Ed June 2017
- 02_Transmission and Distribution Assessment Annex I. Renewables integration into the distribution grid: issues, problems and solutions - Ed June 2017
- 03_Pricing and Economics - Ed August 2017
- 04_ Project Financing Practices - Ed June 2017
- 05_Environmental and Social Impacts - Ed June 2017

- Attachment I: Renewable Generation in Europe: An Overview of the Regulatory Framework - Ed June 2017
- Attachment II: Heating and Cooling in the Turkish Electricity Sector - Ed June 2017

IPA12CS02 Task 1B Delivery D5 Approved Final Reports

(Approved on 18/07/2017 (June Editions) and 21/08/2017 (August Editions))

- 1-IPA12CS02_TASK 1B_Recommendations Final Report –Ed August2017
- 2-Attachment I Guidelines for Investors on GPP –Ed June2017
- 3-Attachment II Guidelines for Investors on Wind-Ed June2017
- 4-Attachment III Guidelines for Investors on Solar PV-Ed June2017
- 5-Attachment IV Guidelines for Investors on SHP-Ed June2017
- 6-Attachment V Guidelines for Investors on Biomass –Ed June2017

The whole package in soft and hard copies in two languages (English and Turkish) was released to the Beneficiary on 27/09/2017.

Task1C Road Map -Strategy and Action Plan

- a) The Consultant started to develop the activities related to the definition of Strategy and Road map during March 2017, on the basis of the findings coming from the activity of Task1A and 1B.
- b) Following the progress of these two Tasks and taking into account the comments received to Task1A and B reports, the related discussions with the Stakeholders and results of the Workshop of 20 June, the Consultant developed its strategy proposal in the period from March to end of June and released a complete Task 1C Draft Report - DeliverableD9 (IPA12CS02_Road Map - Strategy and Action Plan in Line with the EU Policies Note 1C Draft Final 2) on 6/07/2017 ,for comments and discussion in the Workshop plan ed on 20/07/2017 .
- c) The Draft was presented and deeply commented and discussed during the workshop of 20/07/2017.The related conclusions including the Comments Matrix containing MENR, EMRA, WB and MEUA comments as well as the in-text comments in the Report were provided by MENR to the Consultant on 28/07/2017.
- d) The Consultant, after integrating all the comments received, released an updated version of the Draft Report on 11/08/2017 jointly with a unified comment matrix table with Consultant answers, containing all the last comments received on deliveries D2 (Task1A), D5 (TASK1B) and D9 (Task1C).
- e) On 21/07/2017 the Beneficiary provided a set of comments coming from DGFREU and DGRE on this second draft of the Task1C D9 Road Map Report while informing that MEUA and WB had approved the update text.
- f) After integrating the last comments, the Consultant released on 29/07/2017 the IPA12CS02_Road Map - Strategy and Action Plan 20170822 jointly with the related Comments Matrix, in an approved version ready for Translation and hard copies.
- g) The final version of the deliverable D9 includes the following document

IPA12CS02 Task 1C Delivery D9 Approved Final Reports (Approved on 23-26/08/2017)

- IPA12CS02 TASK 1 – Road Map Strategy and Action Plan-Ed August2017

The whole package in soft and hard copies in two languages (English and Turkish) was released to the Beneficiary on 27/09/2017.

Task1 Workshops

The Task 1A and 1B workshop was held in Ankara on 20/06/2017 in MENR premises and involved the participation of 69 people representing the following stakeholders: MENR, MENR-EİGM, DGRE, TEIAS, TEDAŞ, 14 EDAS (AKDENİZ , AYDEM , GEDİZ , BAŞKENT, BOĞAZIÇI, ÇAMLIBEL, DİCLE , OSMANGAZI, SAKARYA, TOROSLAR, TRAKYA, ULUDAĞ, VANGÖLÜ, YEŞİLIRMAK), ELDER, TUREB, JESDER, EMRA, WB, LIFE ENERGY, Ministry of Economy, Ministry of Environment , TERNA MWH.

The Task1C workshop was held in Ankara on 20/07/2017 in MENR premises and involved the participation of 50 people representing the following stakeholders: MENR, DGRE, TEIAS, Ministry of Economy, Ministry for EU Affairs, EMRA, TEDAS, ELDER, AKDENİZ, EDAS, BEDAS, YEDAS, DGRE, ADM/DSO EDAS, WB, LIFE ENERGY, JESDER, TERNA MWH

All the material of workshops (agenda, presentation) was provided in English to all the participants both on file and hard copy.

Task1 Training Modules

The Training activity included in Task1 relates to:

- offshore wind market, legislation and implementation experience
- sustainability analysis of renewable energy policy and economic analysis of renewable heating and cooling, and RE integration to the grid using case studies.

The Consultant provided the related training performing the following training modules:

- Training on Storage on April 27, 2017 with an attendance of 40 participants representing; Ministry of EU Affairs, TEIAS, DGRE, EMRA, DGFREU. The module presented what kinds of technologies are needed for different purposes such as frequency regulation and balancing. In addition, the minimum requirements needed for a TSO like TEIAS to make chemical storage feasible were highlighted.
- Training on Sustainability of Renewable Energy Policy on May 11, 2017 morning with an attendance of 27 participants; Ministry of EU Affairs, TEIAS, DGRE, EMRA, DG Energy Affairs, DGFREU. Do's and Don'ts in RE policy were presented and discussed under different points of view: Regulatory, Grid and Schemes.
- Training on Offshore Wind on May 11, 2017 afternoon with an attendance of 38 participants; Ministry of EU Affairs, TEIAS, DGRE, EMRA ,DG Energy Affairs, other Stakeholders, TUREB, DGFREU. The module presented the technology and market. How competitive this technology has become and Turkey potential were presented and discussed.

- Training on RES integration on May 12, 2017 with an attendance of 58 participants; Ministry of EU Affair, TEIAS, TEDAS, EDAS, DGRE, EMRA , other Stakeholders , DGFREU . Italian and EU experience was presented and extensively analyzed. Do's and Don'ts were discussed.
- Training on RE Heating & Cooling on 24 May, 2017 with an attendance of 18 participants DGRE, DGFREU

Except for Sustainability of RE Policy and Economic Analysis of RE Heating/Cooling Trainings (the first one, with 18 participants, was only in English and the second one was not delivered in soft/hard copies), all other training modules' documentation (agenda, presentations) were provided in two languages to all the participant both on file and hard copy.

The Consultant delivered Feedback and Conclusions Reports for all the modules performed

Task 1.D: Field Visit – Germany and Italy

The Consultant organized 4 field visits in Europe, as foreseen in the ToR and scheduled in deliverable D11, during the second week of July (from 10th to 13th). The field visit program is reported in the following Table .

Day	GENERAL	DETAILS	LOCATION	DATE
1	Visit 1.A	Visit 1.A Terna SANC storage station	FLUMERI	10/07/2017
2	Visit 1.B	Visit 1.B Terna SAPEI converter station	LATINA	11/07/2017
3	Visit 2.A	Visit 2.A Onshore converter station of the 900MW HVDC offshore	DORPEN	12/07/2017
4	Visit 2.B	Visit 2.B Offshore Grid Connection Concepts and Regulatory Regime	HANNOVER	13/07/2017

The Turkish delegation participating to the field visit included 10 people from DGRE (6), TEIAS (2), DGEA (1), DGFREU (1).

Visit report by Terna including conclusions and activities that were covered in the field visits in Italy and Germany jointly with all presentations made during the visits has been delivered to the Beneficiary on July 26th, 2017.

ii. Task2 activities: Establishment of a Financing Mechanism and Formulating Small Scale Projects

The Consultant developed all the activities required from the ToR as per scope shown in previous paragraph 2.5.

- Task 2.A: Financing and Support Mechanisms
 - a) The Consultant addressed market research studies to overview RE lending practices in Turkey and to identify financing barriers on 1st of March 2016
 - b) An interview was conducted with Isbank & Vakıfbank on 27th - 28th of March 2016
 - c) Meetings with Ziraat Bank, Development Bank of Turkey and Yapi Kredi Leasing has been conducted on 9th - 10th of May 2016
 - d) A Meeting with EMRA and DGFREU was conducted on 10th of May 2016 to discuss on further financing mechanisms (i), lessons learnt from other foreign RE markets similar to Turkey (ii), the strategies of MENR favoring the real RE investors instead of speculators (iii), innovative RE project approaches (iv), and the content of the workshop (v)
 - e) 1st draft of the D3 Report was submitted on 24th of May 2017
 - f) Task 2A Workshop was held on 5th of July 2017. Recommendations on Financing and Support Mechanism for Small Scale Renewable Energy Projects have been discussed during the workshop with participants from Banks, IFIs, Banking Regulation and Supervision Agency (BRSA), distribution companies, EMRA, MENR, Ministry of Finance, and Capital Markets Board of Turkey.
 - g) 2nd draft of the D3 Report was submitted on 21st of July 2017 after integration of comments from DGRE, WB, and EMRA
 - h) 3rd draft of the D3 Report was submitted on 8th of September of 2017 after integration of comments from DGRE about focusing on small scale prosumers
 - i) A meeting was held with DGRE on Recommendations and Roadmap Plan on 12th of September 2017
 - j) WB comments were received on D13 Road Map report on September 18th, 2017
 - k) Final drafts of D3 and D13 were submitted on September 21st to MENR and WB's final approval.
- Task 2.B: Design of a calculator tool to assess feasibility and bankability of small-scale RE projects
 - a) Brainstorming activities for designing a calculator tool was started on 1st of March 2016: RE Technology and measure types (i), key performance indicators (KPI) & technical parameters (ii), inputs, outputs and assumptions

to be made for each RE projects (iii), and the concept of user interface and database (iv) were determined.

- b) Calculation tool and reports were prepared for wind, solar, biogas, landfill gas & heat pump
 - c) D8 Calculation Tool and Report's 1st draft was submitted on 1st of July 2016.
 - d) Comments from WB and DGRE were addressed D8 Calculation Tool and Report's 2nd draft was submitted on 25th of November 2016
 - e) Workshop on Calculation Tool for small scale RE projects was conducted on 22nd June 2017
 - f) Upon approvals from WB and DGRE on the final draft of the Tool and its Report, D8 was approved on July 28th, 2017
- Task 2.C: Preparation of Feasibility Reports for RE Projects
 - a) Project selection criteria & implementation procedures were started to be discussed internally
 - b) Technical, financial, environmental and social conditions and requirements of available credit lines were determined
 - c) Project selection criteria has been determined based on market conditions and referring to ToR
 - d) Project assessment flowchart was prepared and project pipeline was established
 - e) Business development activities to determine potential Small Scale RE investors/projects was started in the first week of May 2016
 - f) Meetings with Financial Institutions (Isbank, Vakifbank, Ziraat Bankası, Denizbank, TEB, Türkiye Finans Katılım, Yapı Kredi, Development Bank of Turkey) and discussion on the possible collaboration mechanisms for project origination has been carried out by mid May 2016
 - g) List of EPCs in the Turkish market who have track record in roof top small scale PV installations was prepared and meetings with some of these firms was carried out
 - h) Survey on Turkish banks on the availability of EE/RE credit lines from sources such as WB, EBRD, EIB, IFC, AfD, KfW etc.
 - i) Survey with other stakeholders (NGOs, EPCs, Producers & Suppliers etc.) was carried out
 - j) 1st draft of D4 Project Selection Criteria & Implementation Procedures was submitted on 29th of June 2016.
 - k) 1st draft of D6 Survey Result Report was submitted on 29th of June 2016.

- l) Comments on D4 Project Selection Criteria & Implementation Procedures from GDRE and EMRA were addressed, and 2nd draft was submitted on 25th of November 2016
- m) Comments on D6 Survey Result Report from GDRE and EMRA were addressed, and 2nd draft was submitted on 25th of November 2016
- n) Many marketing activities were carried out to facilitate applications from the project beneficiaries, including; surveys for the SME scale RE investors, preparation of a checklist for preliminary screening of the projects, organizing meetings with NGOs; such as GUNDER, GENSED, Biyogaz DER, Agriculture and Rural Development Support Institutions, Solar panel manufacturers and EPC firms, Chambers of Commerce and Industry and Financial institutions
- o) Project Assessment Reports template for Solar PV projects was prepared
- p) 1st draft of Project Assessment Reports template was submitted on 9th of September 2016 and 2 PAR's was submitted on 3rd of November 2016 to collect comments from GDRE, WB and other relevant directorates
- q) 2nd draft of the template was submitted on 25th of November 2016, and 3rd draft of the template was submitted on 3rd of January 2017
- r) 1st draft of the Project Assessment Reports template for wind projects was submitted on 3rd of January 2017
- s) 2nd draft of the D4 Project Selection Criteria & Implementation Procedures and D6 Survey Result Report were submitted in English and Turkish on 13th of June 2017
- t) A meeting was held with WB on 23rd of February 2017 to evaluate D4 and D6 reports
- u) 3rd draft of the D4 Project Selection Criteria & Implementation Procedures and D6 Survey Result Report were submitted on 24th of February 2017 after integration of WB comments
- v) 4th draft of the D4 Project Selection Criteria & Implementation Procedures and D6 Survey Result Report were submitted on 15th of March 2017 after integration of WB comments
- w) 5th draft of the D4 Project Selection Criteria & Implementation Procedures was submitted on 15th of March 2017 after integration of DGFREU comments on including Municipality Companies
- x) 1st list of PARs including 97 projects, 61 of which already received credit disbursement or turned into investment (construction or realization), were submitted on 10th of May 2017
- y) 43 PAR's were submitted on 30th of May 2017
- z) 6th draft of the D4 Project Selection Criteria & Implementation Procedures was submitted on 15th of May 2017 after integration of DGFREU and WB

comments on including LCOE scenarios, cost-breakdowns including connection and anti-damping costs, monthly irradiation, production and cash flow tables etc.

- aa) Consultant lost contact with the DGRE and started drafting PAR's, before obtaining MENR's approval on Selection Criteria and Application Procedure Report, for beneficiaries that are out of the context of the project with no added value. WB and MENR intervened in March 2017 to improve the situation by putting criteria in the Selection Criteria Report that ensures assistance to self-consumption investors, industrial organizations, non-energy SMEs, municipality affiliates and unions rather than commercial energy traders. Thereby, final draft of the D4 Project Selection Criteria & Implementation Procedures and D6 Survey Result Report were submitted on the 13th of June 2017 and approved by the MENR 1 year after submission of 1st draft and after 7th revision
 - bb) 18 PAR's were submitted on 12th of June 2017
 - cc) 61 of the previously submitted 97 PAR's were approved on 21st of June 2017
 - dd) 16 PARs were submitted on 4th of August 2017
 - ee) 32 PARs were submitted on 25th of June 2017
 - ff) 44 PARs among 48 were approved on 6th of September 2017
 - gg) 28 PARs were submitted on 8th of September 2017 and approved on 15th of September 2017
 - hh) 13 PARs were submitted on 22nd of September 2017 and approved on 23rd of September 2017
 - ii) 12 PARs were submitted on 26th of September 2017
 - jj) 10 PARs were submitted on 27th of September 2017
 - kk) 1st draft of D14 Case Studies & Success Stories and Lessons Learned was submitted on 18th of September 2017
 - ll) 2nd draft of D14 Case Studies & Success Stories and Lessons Learned was submitted on 26th of September 2017
- Task 2.D: Environmental and Social Considerations and Road Map
 - a) A Workshop was held on 27th April on the preparation of Guidance Note for site selection of Wind and Solar Projects
 - b) Feedbacks from NGOs about the impacts on natural habitat and biodiversity were collected
 - c) Criticism was taken from Private Investors/Project Developers on the current regulatory constraints and main barriers

- d) 1st draft of environmental and social checklist with ref. to WB's safeguard policies was submitted on 30th of June 2016, and 2nd draft of the checklist was submitted on 25th of November 2016 after integration of WB comments
- e) 1st draft of Environmental Guidance Documents for Solar, Wind, Biogas, Mini Hydro, and Geothermal was submitted on 17th of June 2016, and 2nd draft of the documents was submitted on 9th of January 2017 after integration of WB comments
- f) 3rd draft of the documents was submitted on 27th of April 2017 after integration of WB comments
- g) 1st draft of the D13 Report was submitted on 11th of September of 2017
- h) A meeting was held with DGRE on Recommendations and Roadmap Plan on 12th of September 2017
- i) Task 2D Workshop was held on 14th of September 2017. Roadmap for Financing and Support Mechanism for Small Scale Renewable Energy Projects has been discussed during the workshop with participants from Banks, IFIs, Banking Regulation and Supervision Agency (BRSA), distribution companies, EMRA, MENR, Ministry of Finance, and Capital Markets Board of Turkey.
- j) 2nd draft of the D13 Report was submitted on 21th of September of 2017 to MENR and WB for final approvals
- k) 2-days training on EU experience on renewable energy financing mechanisms, costs and experience were held at Vakıf Katılım Bank on 20th of September 2017 and at Türkiye Finans Katılım Bank on 21st of September 2017.
- l) A meeting was organized with BRSA (Banking Regulation and Supervision Agency) on 25th of September 2017 to initiate discussions on regulatory actions about banking sector

iii. Task 3

- a) The Consultant performed the first draft of the expected Feasibility Study during the period between January 2016 and the end of June 2016 on the base of several exchange of information between the Terna KE's and TEIAS and 3 specific meetings were held on the subject (KoM, the 11th of May and the 2nd-3rd of June).
- b) The Consultant delivered to the MENR the draft report on Feasibility on the 30th of June.
- c) The Consultant and TEIAS exchanged comments and clarifications about the Draft Report during a Meeting TERNA TEIAS (Ankara-MENR Premises, 27/10/2016) and, jointly with the other Stakeholders, agreed to organize further specific dedicated seminars and meetings on Task 3 for the end of November (Ankara) and second half of December (working visit in Rome)

- d) During the meetings of 28-29-30/11/2016 (Ankara-TEIAS Premises) the Consultant presented and discussed the Status and main issues for updating and improving the Draft Reports of Task3 with TEIAS, EMRA, DGRE and MENR. The working session included:
- Discussion of TEIAS and TERNA Dispatching best practices that mainly impact on the project activities
 - Presentation of Task3 specification, discussion of comments, plan of next steps.
- e) In the same occasion, a specific meeting was held with DGRE where the role of DGRE as Policy Maker was highlighted and a deep discussion about use and responsibility for Solar Monitoring system was done. It was agreed that DGRE will coordinate the definition of a table indicating each stakeholder involved and the related use and data needs. That table will be the basis for the system specification development. The system development will be managed by TEIAS assuring the consistency with those table requirements.
- f) During the working visit in Rome (seminar of 21-22-23/12/2016) many of basic issues based on the Beneficiary requests were discussed including:
- Terna experience of the impacts of Renewable integration on Transmission and Distribution
 - Review of Italian best practices about TSO's operational responses to the RES challenges
 - Type of curtailment applications for the RES in Italy and impact of this application to the power market
 - A detailed explanation of forecasting and monitoring application and methodologies adopted by TSO's and the type of platforms for the collection of the data sources concerning RES forecast with specific focus on:
 - Presentations of the Italian Grid code especially with regard of Renewable.
 - Task 3 Presentation of the updated report and agreement about the content of the ToR and the foreseen schedule for the implementation including the large workshop in Ankara.
 - On site visit at the Italian PV power plant of Lanuvio.

During the working sessions, the Consultant presented and discussed relevant issues about the RES integration challenges faced in Italy in the Transmission System and TERNA background supporting the solution studied in Task 3 feasibility report while updating the discussions and information exchanged during Ankara meetings.

- g) Taking in account all the outputs of Ankara and Rome meetings, the Consultant revised Task 3 reports and on 28/02/2017 delivered for comments the update version of the deliverable D7 - Task 3 - Feasibility Report-Final Draft, as required by the Contract and the Inception Report, jointly with the table tracking the treatment of the received comments.
- h) On 3/05/2017 MENR communicated that the draft submitted by the Consultant did not receive a major objection from EMRA, DGRE and TEIAS and decided to proceed for organizing the Workshop to finalize the report.
- i) The Workshop was held on 24/05/2017 in Ankara and the conclusions of the Workshop jointly with the comments to be integrated to the Draft Report were provided to the Consultant by MENR on 25/05/2017.
- j) The Consultant revised the report and finalized the final document sending it to MENR on 9/06/2017 (file Feasibility Report 080617 EN) jointly with the table of changes done according to the Workshop conclusions

- k) On 13/06/2017 MENR informed that the report was approved subject to a small change to be still integrated.
- l) After this further integration, the Consultant issued the Final version of the Task 3 Feasibility Report-D7 deliverable- both in English and Turkish and on 7/07/2017 delivered the whole set of related contractual document including 10 hard copies (5 in English 5 in Turkish). The whole package of soft copies was also re-sent on 24/07/2017 and 28/07/2017 both in word and pdf format.
- m) After the workshop conclusion, and in accordance with them, the Consultant started developing the Technical Specification (ToR) of the system as requested by the contract ToR.
- n) The Specification Draft was sent to MENR on 10/07/2017 and submitted to a round of comments from the end beneficiaries.
- o) The related comments were received on 2/08/2017 and included in the final version of the Specification reports that the Consultant sent to the Beneficiary on 21/08/2017 and completed on 22/08/2017 with some missing attachments.
- p) The final version was submitted to the interested stakeholder and received their approval for translation and hard copies (subject to integration of some small comments of DGRE) on 13/09/2017.

The whole package in soft and hard copies in two languages (English and Turkish) was released to the Beneficiary on 27/09/2017.

Task3 Workshops

The workshop Task3 was held on 24/05/2017 in Ankara and was attended by 30 people representing the following Stakeholders: DGRE, TEIAS, MENR, EMRA, Ministry for EU Affairs.

Task 3 Training Module

The Training activity included in Task1 relates to the solar photovoltaic (PV) market in the world.

The Consultant organized the Training on Global Solar Energy Practices and Policy Experience on April 12, 2017 with an attendance of 23 participants representing DGRE and DGFREU. The module presented an overview of the global market and discussed Turkish YEKA experience. YEKA winning FiT prices were analyzed and compared with global tendencies.

All the training documentation (agenda, presentations) was provided in two languages to all the participants both on file and hard copy.

The Consultant delivered the related Feedback and Conclusions Report.

c. Monitoring activities

The Consultant was regularly participating to all the Steering Committee held in the period as to the WB intermediate progress meetings, preparing and delivering the requested progress reports (they can be seen as attachments of the related official Minutes of Meetings):

- Steering Committee
 - ✓ 19/01/2016, 6th Steering Committee Meeting for MENR's IPA 2012 Project
 - ✓ 12/05/2016, 7th Steering Committee Meeting for MENR's IPA 2012 Project
 - ✓ 31/01/2017, 8th Steering Committee Meeting for MENR's IPA 2012 Project

- WB Midterm Progress Meeting
 - ✓ Project state of the art at April 2016 was presented and discussed during the Call Conference of April 26th, 2016.
- Meetings with MENR 30/05-3/06/2016, October 2016 and monthly until the end of Contract
- The Consultant also issued 2 Contract Progress Report:
 - 31/07/2016 about the first 6 months of the Contract with the situation at 31/07/ 2016, delivered to the Beneficiary on the 5 /08/2016.
 - 31/12/2017 about the second 6 months period with the situation at 31/12/2016, delivered to the Beneficiary on 13/01/2107.

No Steering Committee neither WB meetings have been held after 31/01/ 2017, but a careful revision of all the activities was done in March on the occasion of the Contract Amendment 1 discussion.

After this date, the Consultant kept direct relations with MENR and WB. And the monitoring activity was done continuously, jointly with DGFREU.

5. Key achievements - Project Outputs/Results - Summary of the deliverables provided - List of Project Documents

Task1A: Assessment of Current Situation and Barriers

The Task 1A performed the analysis of the current situation of the electricity sector in Turkey, with the focus on the possibility to increase the pace of renewable energy implementation.

The Final Reports covers:

The overall Turkey analysis of the electricity sector, with a focus on Renewable Energy Sources (RES).

The Assessment of the current situation and possible barriers related to the RES deployment in Turkey.

The results of performed analysis are organized in 6 separate Reports and 2 Annex:

00_Document Map and Executive Summary

01_Regulatory Framework

02_Transmission & Distribution

03_Pricing and Economics.

04_Project Finance Practices

05_Environmental and Social Impacts

Annex I - Renewable Generation in Europe: An Overview of the Regulatory Framework.

Annex II – Heating and Cooling in the Turkish Electricity Sector

The introductory Report guides the readers through the other documents, introducing the content of the other documents and displaying the connection between them; it also contains the executive summary that summarizes the results of this project and sheds some light on the main findings of the assessment of the Turkish RES sector.

The Report on regulatory framework focuses on the Turkish electricity regulatory framework. This document exposes how the electricity sector has evolved through the years and how it is regulated, analyzes the institutions and market players and describes their functions, powers and other relevant features. The document includes the assessment of the commercial schemes for generators, with attention to the dynamics that characterize the RES commercial schemes and supports and to what the Turkish system is foreseeing for these technologies. The assessment of licensing regulation for RES power plants and its dynamics is also performed and presented.

The Report on Transmission and Distribution infrastructure describes the electricity Transmission and Distribution segments in Turkey, focusing on the infrastructures, the relevant operators, and the organization and operations dynamics. The report addresses the needs and measures that are already undertaken in Turkey for the integration of RES power generation into transmission and distribution grid. At the same time, it analyzes and presents the issues that are experienced at transmission and distribution level when integrating RES generation and the usual measures to address these issues. Comparing the two set of issues, it identifies what, in the Turkish electricity system, is still missing and thus required, for a better RES integration and a non-problematic deployment.

At distribution level, the report recognizes a strong need of more RES integration (given the huge potential in Turkey not yet exploited) and the necessity of a stronger focus towards the RES integration by DSO's. However, distributors seem not ready even because they are in a transition period where TEDAS is disappearing and actions towards RES deployment and integration are not clear.

Finally, the report analyses the storage techniques and the deployment of micro-grids at European level exposing the use and the advantages when adopting storage technologies in integrating RES.

The Report on pricing and economics dynamics includes the assessment of what would be the impact of the energy prices change on the RES generation deployment using scenarios analysis and projections. Together with the environment and economic assessment this Report analyses the energy price impact on RES investment schedules while considering the natural gas pricing evolution and its impact on the Turkish system.

The Report includes also the simulation of different scenarios for system development considering alternatives of RES deployment pace. These simulations support an economic analysis of the impact of the RES policy at different levels. On the one hand, consultants have analysed this impact on a holistic level, by comparing the expected total system costs in the period 2016 – 2030 with and without the RES support, thus obtaining a cost benefit analysis. On the other hand, the consultant has tried to infer probable winners and losers and specific risks for future, non-RES investors. Moreover, the analysis is not limited to direct economic implications but, in addition, assesses other necessary metrics, such as adequacy and security constraints, CO2 emissions and RES penetration share in the dispatch.

The model used to perform the simulations is built as an optimization tool that applies state-of-the-art mathematical techniques to find the optimal solution to security constraint economic dispatch (and capacity development in the case of the long-term simulation) that system operators face in real life.

The Report on Project Finance includes the assessment of project financing practices and presents a review of current market and drivers for renewable energy. The related analysis focuses on the development of SMEs and small project in Turkey, but also on the market drivers in financing RES and on the local practices. Additionally, this Report presents the current project financing products in the Turkish market and the results of interviews to stakeholder.

The Report on Environment and Social issues presents the environmental and social rules and the regulations in Turkey assessing the relative compliance. Additionally, this Report is describing the procedures in identifying RES sites and the related barriers. Finally, a financial and environmental assessment of RES deployment under three scenarios is presented.

The Annex about EU regulation addresses the effectiveness of European regulation in promoting renewable generation. The document contains exhaustive background information to address the design of regulatory provisions for the development of a low-carbon energy sector in Turkey. It supports a comparative benchmarking analysis with similar Turkey policies and regulatory measures performed by Turkish key experts.

The focus of the report is the analysis of renewable energy regulation for key EU countries: Italy and Germany. The motivations underpinning the choice of these key EU countries are the following:

- Both EU Member States adopted a wide and rich regulatory framework over years to support different renewable generating technologies. Broad regulatory experiences allow performing a comprehensive analysis and extrapolating a variety of important suggestions to address the development of renewable generation;
- these countries display the largest levels of renewable capacity and generation across European countries;
- they share complementary experiences allowing for a comprehensive evaluation of policies: Germany has been particularly successful in the development of wind generation, while Italy of solar generation.

The last Annex on heating and cooling includes the assessment of RES heating and cooling potentials in Turkey, with the aim to introduce a scaling up methodology to reduce the use of energy generated from fossil fuel based resources that are still present in the Turkish generation fleet.

Task 1.B Recommendations

The Task 1B elaborated on the analysis and findings of Task 1A, selected the most appropriate proposals and Recommendations to overcome the identified barriers and possibly enable a better environment for a stronger deployment of Renewable in Turkey.

The Final Report consolidates the results in 6 Reports, one main report about Recommendations and 5 Guide for Investor

- 1-IPA12CS02_TASK 1B_Recommendations Final Report
- 2-Attachment I Guidelines for Investors on GPP
- 3-Attachment II Guidelines for Investors on Wind

4-Attachment III	Guidelines for Investors on Solar PV
5-Attachment IV	Guidelines for Investors on SHP
6-Attachment V	Guidelines for Investors on Biomass

The Main Report on Recommendations, after recalling the current Situation of Renewable Energy in Turkey and its expected evolution, contains the selected proposals grouped as following:

- Recommendations on Energy Policy: suggestions have been proposed about energy transition pathway, integrated energy plan and compliance monitoring, energy mix to be targeted and sector governance
- Recommendations on Regulatory Issues: the effectiveness of the current Promotion Mechanisms has been analysed and, after exposing the International Tendencies, a proposal was presented for using also in Turkey a consistent and coherent mechanism based on Auctions along with main Guidelines for the Auction Processes. Suggestions to fostering Self-Consumption (Prosumers) and avoid the regulatory uncertainty are also included.
- Recommendations on Network Planning issues: after evaluating the existing barriers to better RES integration into the grid (Res Network Integration), related recommendations are presented for removing these barriers and a VRE Integration Study is proposed. Barriers coming from Transmission Network Planning and Distribution Network Planning processes were also evaluated and the related suggestions for removing these barriers and improving the related processes are included
- Recommendations on Network Operation: the issues related to Controlling and Curtailment of Res Power Plants have been analysed, the resulting barriers for a stronger RES development were detected and Recommendations on RES control were presented. Distribution Network Operation issues that can constitute barriers for the Res deployment have also been analysed and the suggestions to remove the current and expected future barriers are included.
- Recommendations on Network Connection Procedures: barriers related to the Connection of Licensed Generation (Transmission and Distribution Systems) and Connection of Unlicensed Generation (to the Distribution System) were detected and proposals for improving the processes are included along with proposal of needed amendments to the Grid Code and the Distribution Code.
- Suggestions and recommendations are included also about how overcome the hurdles represented by Long Lasting Permits and Approvals, Unused Capacities, Public, Ngo And Media Opposition to Res Projects. Finally, proposal about improving Transparency and Financial Feasibility of the projects are presented.

In the 5 Attachments, specific Guidance Notes are proposed for the appropriate development of PV, Wind, Small Hydro Plant, Geothermal, Biomass projects.

The Guidance Notes are intended to assist developers in the decision making on the location and subsequently design and operation of the related projects. They describe the key environmental and social issues which have to be considered during project development, implementation and operation. They include information on:

- The licensing processes.
- The relevant environmental legal framework;

- The environmental and social standards used by International Financial Institutions in their decision making on financing of such projects.
- The major environmental and social issues which have to be considered when designing, locating, building and operating the related power plant.
- A step-by-step guide outlining how these environmental and social issues can be addressed efficiently when planning a new facility and when going through the licensing process.

TASK1C Road Map

The Task 1C activity was developed building on the analysis, assessment work and recommendations performed under the previous subtasks, also considering the workshop learning points. The activity was concluded by formulating a Strategy and by identifying the appropriate Actions Plan/Road Map to proceed from the existing situation of the Turkish RES market towards the harmonization with the EU policies and the effective achievement of RES national targets, including the development of an adequate, reliable and resilient electricity system.

The Final Report Task 1C Road Map - Strategy and Action Plan in Line with Turkey's and the EU Policies includes:

- The statement of the objectives of the Report, according to the ToR and the Inception Report
- The elaboration and establishment of the Vision of the plan, this is, the long-term goals the country should focus on to increase the renewable penetration in a sustainable manner and harmonized with EU regulations.
- The structure of the Strategy, is organized in building blocks of the plan, with each individual block containing the actions that shape the strategy and put it to work towards the end goal, the vision. The following building blocks are considered and related required actions presented:
 - Supply Outlook
 - Energy Action Plan
 - Regulatory Reforms
 - Transmission and Distribution Planning Methodologies
 - Authorization and Licensing
 - Grid Access
 - RES Generation Control
 - Distribution Network Operation
 - Power System Flexibility
 - Distributed Generation and Sector Organization
- A comprehensive picture of the whole action plan, through actions identified in each of the building blocks and a complete time table with the road map and the desired actions to be developed.

Task 2: Establishment of a Financing Mechanism and Formulating Small Scale Projects

- Task 2.A: Financing and Support Mechanisms
- Task 2.B: Design of a calculator tool to assess feasibility and bankability of small-scale RE projects

- Task 2.C: Preparation of Feasibility Reports of RE Projects
- Task 2.D: Environmental and Social Considerations

Task 2.A: Financing and Support Mechanisms for Small Scale Renewable Energy Projects

The Task 2A performed the analysis of the current situation of the renewable energy financing and support mechanisms in Turkey, with the focus on the possibility to increase the pace of small scale renewable energy implementation with new mechanisms recommended

The Final D3 Report covers mainly analysis of the Turkish electricity market and RE pricing, RE finance in Turkey, economic costs and benefits of the support mechanisms to the Turkish economy.

D3 Report Structure

- 01_ Introduction
- 02_ Introduction to the re sector and major players in turkey
- 03_ Analysis of the Turkish electricity market and re pricing
- 04_ Renewable energy finance in Turkey
- 05_ Estimation of LCOE for prosumers in Turkey
- 06_ Economic costs and benefits to the Turkish economy
- 07_ Community / shared solar / cooperatives
- 08_ Supporting financing of prosumer renewable energy investments through non-pricing mechanisms
- 09_ Conclusion and recommendations

The report evaluates current support mechanisms for RE in general and for small RE and recommends some prospects for future, emphasizing transparency of the tariff and support mechanism, subsidies in the feed-in tariff. The report also evaluates different incentive mechanisms in other successful countries. Many support mechanism and methods have been used currently such as, FITs, competitive tenders, renewable portfolio standards, tax credits, renewable energy certificates, energy funds and community cooperatives have been evaluated from the perspectives of Turkey keynisms in other successful situation of the country.

Finally, the report recommends support mechanisms for small RE projects focusing on PV technology as it is the easier to standardized, and therefore the easiest to finance.

Task 2.B: Design of a calculator tool to assess feasibility and bankability of small-scale RE project

The Task 2.B: Design of a calculator tool to assess feasibility and bankability of small-scale RE project played an important role in project assessment process where 133 project assessment reports were written. The projects were analysed based on financial and technical parameters which were specifically chosen for each project type. The projects have been also evaluated based on a key performance indicator feed-in tariff. The PC also evaluates different incentive mechanisms in other successful countries.

PC has determined key inputs, outputs, and KPIs for each type of renewable energy technology. Five calculation tools were developed for PV solar, wind, biogas, landfill gas,

and heat pump projects, which are expected to constitute the most common project assessment applications.

D8 Report Structure

01_Introduction

02_Calculation tool structure

03_Calculations

Annex Calculations study

Task 2.C: Preparation Feasibility Reports of RE Projects

The Consultant carried out a survey so as to determine potential small-scale RE investors/projects resulting for business development services (RE project reports: project formulation, business plans and implementation support) for viable RE investments which can be financed by the local banks in the industry and building sectors. The results of the survey were explained in D6 Survey Results Report.

Structure of the D6 Report

01_Objective of the Survey Study

02_Overview of the Current Status

03_Technology Overview under the Project

04_Methodology of the Project Origination

05_Survey Study

06_Conclusion

The clients, namely industries and building owners/managers, have used the RE project reports prepared by the Consultant to seek financing from Turkish banks to implement the RE projects. Project selection criteria and implementation procedure has been created to select projects and explained in D4 report.

01_Structure of the D4 Report

02_Objective of The Task

03_Project Selection Criteria

04_Implementation Procedure

Annex A: Environmental & Social Checklist

Annex B: Type-1 Project Assessment Report Table of Contents

Annex C: Type 2 & 3 Feasibility Study Table of Contents (with Procurement Documents

Annex D: Details of Type 1, 2 & 3 Reports

For D12 Project Assessment Reports, three categories have been defined based on the investment costs of the projects. Projects with investment costs lower than USD 50,000

have been defined as 'mini', and higher than USD 300,000 have been defined as 'complex' projects. Anything in between is a 'normal' project.

Within the scope of the project, 287 small scale renewable energy projects have been originated from various channels. PC has established project origination channels as FIs, NGOs, EPCs, and Suppliers. According to the needs of the beneficiary and target party, 118 bankability reports, 23 feasibility studies, 14 feasibility studies for municipalities and 13 procurement documents have been prepared .

Most of the applications received was from the Mediterranean Region of Turkey, with 31.5%, which was followed by the Marmara Region. While only 1 biomass report and 3 wind reports were written, 164 PV reports, for 76 on-ground and 75 rooftop projects with 13 procurement documents, were prepared in all types. The combined investment amount of all the projects is USD 135 million, which results in 177GWh of electricity production. With USD 19.2 million net revenue, combined from electricity savings and feed-in tariff, the average payback time for the projects is around 6.5 to 7 years. Energy sector dominates the investments in ground type installations. The projected emission savings for all the projects combined is 89,995 tCO₂ equivalent per year.

Currently, out of 155 reports and 13 procurements, it is known that credit was disbursed for 42 of them, which are awaiting for their construction to begin. 15 projects are under construction with credit disbursements, while 5 projects started their construction while they are awaiting for credit disbursement. 4 projects have went ahead and started their constructions with equity, and 5 projects have returned to investments after receiving credit disbursements. Of the other 84 projects, some of them were already at idea level, and as a result they received feasibility studies, and the remainder are still in the application process for credits.

Detailed description of the overall impact of prepared D12 PAR's have been discussed in D14 Case Studies & Success Stories and Lessons Learned Report.

Task 2.D: Environmental and Social Considerations

Environmental & Social Checklist were implemented to D4 Project Selection Criteria and Implementation Procedure as Annex A: Environmental & Social Checklist and considered for all projects have been evaluated.

D13 Report and Road Map Plan (Task 2) was mainly built on D3 Recommendations Report and was aiming to materialize each recommendation by turning it into concrete actions and associating them with schedule and relevant stakeholders.

Structure of the D13 Report

01_Overview and Scope of the Document

02_Establishing the Vision

03_Actions to include in the Energy Action Plan

04_Action Plan and Road Map During a one-day workshop, recommended actions were discussed with relevant stakeholders. Majority of the stakeholders came to agree that developing new renewable energy finance mechanisms is crucial for a sustainable renewable energy sector. A complementary meeting was organized with BRSA (Banking Regulation and Supervision Agency) on 25th of September, 2017 to discuss details of

required regulatory actions. During the meeting following regulatory issues were pointed out:

- Definition of sustainable energy finance;
- Reduction of provisioning of energy for commercial banks and financial institutions;
- Introduction of incentives such as interest rate incentives, lower VAT, exemption of banking insurance and transaction tax, accelerated depreciation etc.;
- Development of acceptable measurement and verification procedures, performance guarantees;
- Development of a regulation enabling finance institutions to consider EPC contracts, performance guarantee insurance, and cash flow generation as valuable collateral;
- Reduction of weight for energy loans during capital adequacy ratios of banks
- Inclusion of residential RE and EE investments (for the components that can be considered part of the building such as insulation and replacement of windows) into mortgage category

BRSA stated their interest to include residential RE and EE investments into mortgage category. That will provide following advantages:

- Longer maturity
 - maturity of consumer loans is limited with 4 years; that will allow longer term i.e up to 20 years maturity
- Price advantage
 - Interest rate of mortgage loans is significantly lower than consumer loans
 - Mortgage loans are exempt from banking insurance and transaction tax (5% of interest rate) and resource utilization support fund (15% of interest rate)

Task 3: Monitoring, Forecasting and Control System for Solar Power Plants - Feasibility and ToR

Task 3 activity developed firstly the Feasibility Report about the requested Monitoring , Forecasting and Control System mechanism for Solar Power Plants, taking advantage from the experience gained by Terna in almost 10 years of Solar Power Plants management .The Task 3-Feasibility Report covers the main issues related to the monitoring in real time and forecasting of Solar Power Plants taking into account the possibility to integrate such system in existing plants or implement stand-alone solutions.

The proposal for the implementation of a central system of monitoring, forecast and control includes the following parts:

- data needed from the field and possible scenarios;
- architecture design of the centralized monitoring system, production control and forecasting;
- preliminary correlation analysis of the electrical power by solar plants and meteorological variables;

- aspects of the study on the correlation between the electric power of solar plants and meteorological variables;
- functional and architectural aspects of the forecasting platform;
- technical aspects related to the control and production monitoring system.

Building on the results of the Feasibility study, the Terms of Reference and the Technical specifications necessary to buy the equipment and services for establishment of the designed system in compliance with EU rules were finally defined and provided.

6. Project outputs compared to the Project Objectives

The situation for each specific expected result is the following:

- The comprehensive plan** to ensure the acceleration of renewable energy development in Turkey, the integration of a larger share of renewable electricity and the elimination of the barriers identified under the Project was developed, discussed and shared with the Beneficiary and Stakeholders and finally delivered.
- Business development services** were provided to small and medium size enterprises concerning the SME renewable energy projects application to Turkish institutions for a successful financing.
- Feasibility Study and Technical specifications** of a Monitoring, Forecasting and Control System mechanism for Solar Power Plants was prepared and delivered. The Feasibility and ToR were properly discussed and updated following the comments of the Beneficiary and Stakeholders.
- A proper **Knowledge Transfer to the Beneficiaries** has been assured through several modules of technical Trainings and the **site visits** (Italy and Germany).

7. Difficulties encountered during the project

- **General management of the Project.** The Steering Committee, is a coordinating body quite far from the technical implementation needs of the project. The Technical Project Implementation Committee was identified but never became effective in interfacing and guiding the Project. In this situation, the discussion about the topics for the factual implementation of the project was in the hands of WB consultants and in those of the Beneficiary generating some confusion in guiding the project development.
- **Stakeholder engagement.** Engagement of TEIAS EMRA and DGRE became more effective during the last phase of the project while many difficulties were encountered in involving TEDAS and the DSOs community.
- **Access to available information** due to language barrier. Many of the most important documents are in Turkish with an increasing need in time and cost for translation.
- **Centralized organization of communication and information flow.** The dissemination of the information about the development of the different components of the project was made difficult by the complicated process of steps needed to the related publication on the website. The communication between the Beneficiary and the Consultant suffered from the slow functioning of general mail system and the lack of a dedicated platform for exchanging and sharing information.

- **Diffusion process of issued documents among the Stakeholders, elaboration of comments and approval of the deliverable/documents.** This process proved to be complicated and ineffective without a precise coordination in the modalities of sharing the comments and related timing for approval. As relevant example, the IR was edited in 5 versions through 5 months impacting on the regular progress of the implementation activities.
- **ToR content not sufficiently precise:** the scope of work was defined as a list of granular items not organized in chapter/nature or other criteria. On the other hand, some requests were too general and generated too extensive interpretation by the Contracting Authority. Finally, no structure of consultants was foreseen (neither Task Leader nor Project Leader) to make easier the work organization and ensure a smoother work flow.

8. Lesson learned

- The guidance of the project should be clearly assigned to the Beneficiary attributing the necessary visibility to the final Beneficiary (MENR) and to the Contact Groups of the main stakeholders like TEIAS, EMRA and DGRE. The role of the Contracting Authority should be limited to non-technical issues in order not to superpose to the consultant opinions without having a comparable and demonstrate experience.
- Identifying the Beneficiary interface responsible for each task and strengthen its role is beneficial in order to smooth the flow of exchanges and reduce the timing of each goal;
- A better coordination in the elaboration of the comments is desirable: a shorter period in the reply and limitation of the round of comments with a greater participation of the institution/organization involved.
- A more extended use of dedicated meetings between the Consultant experts and the Beneficiary Contact Groups integrated with the representatives of the other Stakeholders, should be foreseen to present, discuss and consolidate the various Reports/Deliverables.
- A dedicated platform for information exchange between the Consultant and the Beneficiary should be adopted along with a simplified but extensive use of the website.
- A more extended use of English as working language should be mandatory.
- The language issue should be taken into account when organizing the tender with the necessary provisions in terms of skill to be requested to the consultant and the client/beneficiary and in terms of appropriate budget allocation for Translation - Interpretation.
- Planning of ToR should consider a more specific organization of the work packages including Task leaders and Project Leader and be more precise in the scope of work and requested performances.

9. Main Findings and Recommendations

As a result of decades of GDP increase, electricity consumption in Turkey has been constantly increasing, at rates greater than 5% for the last 4 decades.

The electricity system, both supply and grid, has undergone a large transformation in order to keep up with the demand growth while the regulatory framework has been completely changed allowing for private participation and opening to a market environment.

During the last years, the need to diversify the energy supply and the regulatory changes in line with international practices led the legislation to focus on energy efficiency and renewable. Renewable energy support mechanisms are already in place and Energy Efficiency program have been also designed and developed.

The capacity energy mix is each year more “renewable – oriented; the largest contribution is coming from hydro potential, while the penetration of other resources (wind, solar, geothermal) is still small, approx. 5% of the installed capacity in the country.

In summary Turkey has already started the road towards the increase of renewable energy sources in its **generation mix** and **energy matrix as a whole**.

The country has its own Road Map that places Turkey with a non-negligible penetration of energy from RE sources by 2023, in line with the requirements of the European Directives by year 2020 (Increase the share of renewable energy to at least 20% of consumption). MW targets for each technology are already identified and announced The implementation rate seems to be slower that needed but actions to improve the performance are ongoing or identified and the new YEKA model appears to be effective.

The strategy depicted from the already issued National Renewable Energy Action Plan) and pledges (COP21 2015) on the horizon of 2030 is coherent on a global scale with EU target. The MW targets for each technology are already published and the global result is consistent with the EU targets of 27% of final energy derived from renewable energy sources for all EU Member States by 2030. To guide the relevant process and enhance the assurance of success the whole strategy should be reassessed and designed as a comprehensive Energy Transition path towards a low carbon economy and an Energy Strategy Document, as per EU standards, should be developed, a KPI measurement system put in place and a systematic Reassessment planned.

A new approach is also needed in terms of TSO planning processes. Planning methodologies shall be aligned with those of the ENTSO-E and based on the grid following principle, this is, grid investments shall not block or prohibit the renewable development, but renewable development shall configure how the grid is going to be developed and expanded. At the same time a Renewable Integration study should be urgently performed and regularly updated in order to assure the sustainability and adequacy of the different scenarios. The contribution of technologies like Storage and Microgrids should be analyzed and tested via pilot projects in order to improve the flexibility of the system and allow a larger participation of variable energy resources.

The contribution of distributed generation, mostly solar, to the achievement of the global target of RE penetration should not be overlooked. The experience of all the other countries shows that this contribution is significant and can reach even more than 50% of the total penetration. Appropriate support mechanism have to be put in place to spur this expansion and relevant implications on DSO’s planning processes, structure, investments, regulation tools should be carefully addressed.

All the above actions have to be initiated now in order to succeed in the time horizon of 2030.

In the very long term-2050 horizon - EU's 2050 goals seem to pass through a 100% renewable - or emission free dispatch, and Turkey would be faced by a very critical challenge needing an additional contribution of 95 TWh from renewable sources to be added in the period 2030 to 2050

These additional 95 TWh cannot all come from hydro resources (since the potential is close to be exhausted by 2030) nor geothermal, as the resource would be exhausted by year 2030, thus, in the very long term the country would face an enormous challenge in terms of renewable energy scalability. The challenge would then pass through the commissioning of further nuclear units (as already in the Turkish plan), breakthrough of carbon capture and storage (CCS) technologies to be able to use local coal deposits, commercial development of large electricity storage systems and inclusion of other renewable sources not currently included in the plans (offshore wind, tidal energy).

In **system operations terms**, the long-term (post 2030) challenge, will be to deal with a new concept of base load generation where its reduction can be expected with an increase of peaking plant as back-up and need for new system flexibility sources. From a **regulatory perspective**, governments and regulators are in search of the appropriate tools able to assure the security of supply together with the renewable expansion and market development. The debate is currently on-going at a global scale, several mechanisms have been proposed. Choices are being considered on several options: capacity payments and/or capacity markets (to limit the risks associated to pure energy markets-schemes) and development of new ancillary services markets that remunerate flexible plants to make sure that system support is sufficient. On top of this, technological development, and its associated benefits, mostly in the form of large-scale, economic storage systems can lead to new system (and regulatory) designs in which the concept of base load (or base load generation) is no longer needed

9.1 Recommendations

It is recommended to address urgently and with priority the following strategic actions:

- ❑ Develop a Country Energy Model and design on its basis a Transition Energy Plan to 2030
 - ❑ Plan and develop a Renewable Integration Study at the electricity grid scale
 - ❑ Redesign and implement new planning processes at TSO and DSOs
 - ❑ Plan and perform a study /assessment of Distribution Generation potential, its expected development and relevant implications.
 - ❑ Update the country renewable potential assessment with special attention to offshore wind.
 - ❑ Perform an in-depth analysis of monitoring forecasting and control systems (involving T&D systems) on the basis of the actual expansion of PV or other RES
 - ❑ Plan and implement dedicated trainings of the DSC and ICT personnel of TEIAS, open to the staff of Distribution companies and technical structures of Ministry of Energy and other Institutions that play the role of interface with TEIAS
 - ❑ Plan and implement a dedicated training on Storage multiple grid services and applications devoted to personnel of TEIAS and Distribution companies

Rome, 28/09/2017