Renewables Readiness Assessment and Renewable Energy 2030 Roadmap Analysis for Egypt

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The Wide-Scale Deployment of Renewable Energy Technologies in Egypt
Challenges and Recommendations

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The Current Egypt's RE Readiness

- -Egypt enjoys excellent Solar and Wind resources as well as diversified biomass resources, while Hydro resources have been fully exploited .

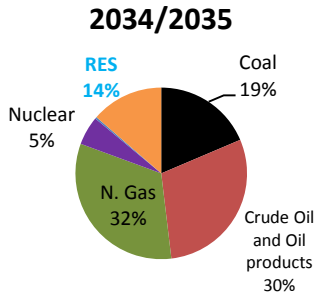
- -Since early 1980s Egypt has developed RE institutional capacities and gained experiences in different RE technology/applications more remarkable on Wind Energy systems .

- -The Egyptian Government has taken concerted action to to support the development of renewable electricity and encourage the participation of the private sector investors. A set of laws, regulations and implementation schemes has been adopted including FiT schems .

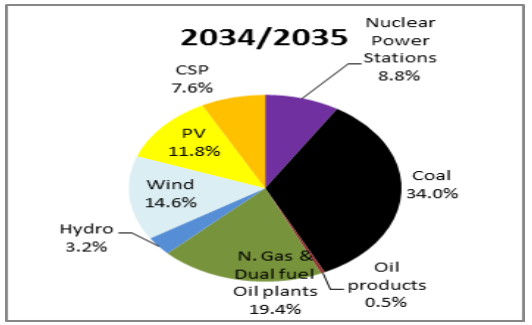
- -A Sustainable Energy Strategy to 2035 has been completed based on four strategic goals to ensure the technical and financial sustainability of the energy sector, while targeting energy diversification through renewable energy and a gradual subsidy phase-out plan by 2020. The selected scenario was approved by the SEC in October 2016

The Energy Strategy Targets to 2035

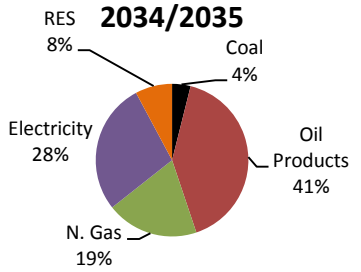
-**The total PE consumption** reached 79.28Mtoe in2009/2010 and is planned to reach 166.49 Mtoe in 2034/2035 ,when RE will contribute 22.76 Mtoe counting for (14%).



-**The total installed power plant capacity** in the reference year 2009/2010 was 24.6 GW and according to the selected scenario it is expected to reach 77.6 GW in 2019/2020, 125 GW in 2029/2030 and 146.7 in 2034/2035. T



-**The total final energy consumption** reached 49.6 Mtoe in 2009/2010, 80.0 Mtoe in 2019/2020 and 114.0Mtoe in2034/2035



Challenges and Recommendations

-Throughout the RRA process, challenges and opportunities for an accelerated RE development have been identified. Consultations led to the formulation of a set of recommendation specifically focusing on the below four service-resource pairs:

- On-grid large-scale solar and wind;
- On-grid distributed solar and biomass electricity;
- Off-grid solar and biomass electricity;
- Thermal renewable energy applications.

-In addition two important challenges are cross cutting to all the four service-resource pairs, specifically :

- Strategies and Regulations
- Institutions and human capacity

-Challenges and Recommendations

Strategies and Regulations

Challenges ,there is a need to:

- -Overcome the difficulties that are facing the implementation of the adopted regulatory framework .
- -Develop policies and measures to facilitate increasing the local content of RES installations or services -Further develop the legal framework for both solar thermal and biomass systems.
- -Enhance the accessibility of information on RES activities in the country including information about projects, studies, R&D activities, RES-E plants,
- . Initiate innovative financing mechanisms, policies, and measures for distributed RE systems .

--Challenges and Recommendations

Strategies and Regulations

Recommendations:

Action 1: Review Strategies and Policies

-Updating the national integrated energy strategy regularly based on updated national energy databases.

-Developing a national strategy to support development of biomass use in the energy sector.

-Review the effectiveness of current policies at high governmental level and develop remedy policies to accommodate the outcome of the above review.

Review the gradual expansion of roof-top PV installations in public buildings; and

Review the progress in the establishment of a quota for public services to procure green electricity.

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Recommendations:

Action 2: Updating the Regulatory Framework

-Improve the effectiveness of the FiT regulations including :

- -Strengthen deployment mechanisms for different RES, and relevant monitoring systems.
- Find solutions for the barriers to RES-E investors using the FIT mechanism
- -Ensure successful implementation of the net-metering scheme for distributed RE systems.
- -Adopt a regulatory system for solar thermal and biomass applications.

-To adopt procedures for Transmission network planning under the FIT system

- Conduct a constant updating of feed-in-tariff studies and regulation:
- Regular review of the FiT prices for PV roof-top systems to enhance market penetration.
- Review and simplify the rules and contracting process for connecting the PV roof- top systems to the grid
- Set basis for the calculations of the number of operating hours for wind FiT projects through clear communication between NREA and Egypt-ERA.

Recommendations:

Action 2: Updating the Regulatory Framework

-Develop a framework for biomass development

- A legal framework for solid waste management that should focus on the institutional responsibilities and incentives for the industry sector to use biomass for energy purposes.
- Applying legal obligations, for local authorities to recycle organic waste
- Review and update the studies related to the development of FiT for biomass system.

-Investigate potential financial mechanisms including:

- Activating a Renewable Energy Fund to cover the gap between the selling prices of electricity generated from RE and its average production cost or through soft loans
- Adopting incentives scheme to the manufacturing of Renewable Energy equipment
- Supporting markets development through financial regulations and business models that can include simplifying the governmental procedures for providing guaranteed loans.

Challenges and Recommendations

Institutions and human capacity

I. Challenges , There is a need for:

- ❑ - Enhancing the effectiveness of state entities active in RE field in serving market liberalization and respond to investors' concerns
- ❑ Further development of the institutional responsibilities and monitoring systems for solar thermal applications Strengthening the capacity and mandate of R&D institutions and enhance coordination with implementing agencies
- ❑ -Ensuring transparency and provision of investment grade information on RE projects and procedures .
- ❑ -Establishing a robust and reliable database for RE market and technologies on the national and international levels.

Institutions and human capacity

Recommendations :

- **Action 3.1: Review the role of state entities about RES-E**

-Establishing a Technical Secretariat within SEC structure to be its technical arm •

- Assessing the role, functions and duties of : •

- Egypt-ERA to properly discharge its responsibilities within a new market environment.
- NREA as focal point for RES in Egypt and as 'one-stop-shop' for RES-E investors.
- NREA, EETC, EETC and Egypt ERA in ensuring transparency and provision of information.
- NREA and Egypt-ERA in establishing a robust and reliable database for RE market and technologies.

- Building capacity of the staff of the executing agencies on power system planning and operation on:
- -forecasting of RES-E generation and load,
- - calculation of capacity credit of RES-E plants and
- -integration of large-scale RES-E into electricity systems.

Institutions and human capacity

-Action3.2: Developing targeted R&D capacity

NREA to coordinate with the EETC, R&D institutions in Egypt and cooperating countries the development of a focused and targeted R&D on issues including:

- Review and optimize the RE systems to be applied in the Egyptian industry.
- Develop different categories of solar water heaters, applicable to a variety of housing and service
- Operating performance RES-E (wind farms and large scale PV) plants under desert conditions
- Integration of large quantities of intermittent RES generation to the transmission grid
- Enhancing Solar PV system performance under Egyptian climatic conditions.

-Action 4- A Plan for Enhancing Human Capacity

- The development of RE involves a change in attitude of the governmental entities, the businesses and the public. To this objective, regular education and training programmes at different levels as well as awareness campaigns at regular intervals explaining the RES-E benefits as well as technology options available should be the subject of a dedicated national action plan .

• Challenges and Recommendations

On-grid large-scale solar and wind;

. Challenges that should be faced include:

- Review the procedures for transmission network planning as to accommodate the RES-E plants connection under FIT.
- Monitoring and Evaluation of the performance of existing RES-E, and Adopt methodology for calculation of reserve& flexibility requirements under conditions of high penetration of intermittent RES-E plants.
- Create and update a RE resources database, that can be accessed by different stakeholders
- Investigate possible market approaches, framework and business models that can facilitate increasing investment on RE
- -Identify, evaluate and implement measures to increase the local contribution in solar and wind project, particularly through enhancing relevant local industries

On-grid large-scale solar and wind;

- **Recommendations**

Action 5: Enhancing grid readiness for RE-E integration

The installed capacity is planned to reach(125GW) including(42GW) of both large scale and distributed on- grid RE-E by 2030 and (147GW)including (52 GW)of RE-E by 2035 .This requires that the grid expansion and operation be planned taking into account the effects of RE-E on its stability and effectiveness. A study is to be conducted with the objectives of :

- -Review the procedures for transmission network planning as to accommodate the RES-E plants connection under FIT system.
- -Develop monitoring platform and process for the evaluation of the performance of existing RES-E, to help update database and forecast expected RE-E inputs to the grid on the bases of the planned capacities and the performance existing RES-E..
- -Adopt a methodology for calculation of reserve& flexibility requirements under conditions of high penetration of intermittent RES-E plants,.

Action 6: Create and update a RE resources database

- , the development of large scale on-grid solar and wind requires more accurate data with resources database, that can be accessed through a user friendly interface to serve the needs of all stakeholders and support the accurate evaluation of the RE-E plants performance

On-grid large-scale solar and wind;

- Recommendation

Action7: Promoting on-grid distributed solar and biomass electricity

-NREA, EETCs and Egypt ERA have to conduct a monitoring of RES-E installations, in the FIT and bidding mechanisms as well as a public consultation on the need to revisit the current regulations.

-Based on the results and the acquiring experience sms on PV distributed systems they have to consider performing an assessment of possible modifications or new mechanism including :

- Extension of the PV roof-top obligation to more categories of public buildings eg. Schools, municipalities
- Provide alternative options to the owner of the systems to adopt FiT and/or the net-metering scheme.
- The EETC should develop efficient and transparent process for submission, monitoring and processing of RES-E applications to connect to the Distribution networks by RES-E investors implementing the FIT

Challenges and Recommendations

On-grid distributed solar and biomass electricity;

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- **Challenges**
- -The current FiT regulations need to be reviewed taking into account appropriate measures for supporting the dissemination of RE distributed PV systems.
- -The electricity distribution companies should develop efficient and transparent process for submission, monitoring and processing of RES-E applications to connect to the Distribution networks.
- -A full scale study on potential for biomass electricity generations need to be conducted as a base to consider the adoption of FiT for biomass systems.
- -R&D on biomass technologies and applications to define its suitability and marketing priorities
- -Develop a system for Monitoring and Evaluation (M&E) of solar and biomass distributed projects
- -Follow up closely on distributed solar and biomass technology development and optimize systems for application in Egypt.

Off-grid distributed solar and biomass electricity

Challenges

- There is a need for developing knowledge and training on different techniques on off-grid electricity particularly on biomass systems.

- There is a need for imposing mandatory certification schemes for the solar systems is a necessity, for all systems, so as to establish an image of reliability to the final consumer.

Recommendation

- A wide range of Strategic, institutional, regulatory capacity building, and financing schemes in addition to market review and consumer protection need to be developed. And
- To Install and require certification and accreditation for installers; this is crucial for the correct operation of solar systems.
- Follow up on the development of the national biomass strategy and legal framework as described earlier in action 1.

Challenges and Recommendations

Thermal renewable energy applications.

1.Challenges

The strategic targets for solar and biomass thermal system need to be reviewed and their practical application potentials need to be evaluated in line with the current energy prices review and community development plans in Egypt.

There is a need for more awareness and accurate planning for the optimal utilization of available space area on buildings' roofs and to strict implementation of existing building codes

Specify Barriers of disseminating DSWH systems need to be evaluated and remedy measures need to be identified

Provide technological support to local RE industries and strengthen infrastructure and to increase the local contribution to all design, procurement and implementation stages.

Challenges and Recommendations

Thermal renewable energy applications.

Action 8: Solar thermal for building and industrial sectors

To increase significantly the share of solar thermal systems in satisfying the final energy needs of both the building ar industrial sectors which will count for over (52.0 million toe) by 2020 and (60.0 million toe) by 2030. A multi-approac strategy and specific steps at both national and sectoral levels are needed including:

- Development of a regulatory and policy framework that facilitate creation of a supply side market, ensu coordination among all stakeholders, provide better financing terms and tax credits and also export advantages.
- Design and organize a training and awareness campaigns to be planned and implemented on a medium-term base
- Imposing mandatory certification schemes for the solar systems is a necessity, for all systems,
- Install and require certification and accreditation for installers; for the correct operation of solar systems.
- Enhance R&D programs to be improved, in cooperation among NREA, MOEE,MOTI with R&d institutions . Set specific Target goal for the increase of the annually installed number of solar thermal systems;

(a) Integration of Solar Thermal Systems in Building through :

- Enhancing effective cooperation of architects, engineers, administration and management staff, academics, urba planners, developers and contractors and eventually, final consumers.
- Maximizing the use of both active and passive solar systems, in the design of both public and private buildings(

Challenges and Recommendations

Thermal renewable energy applications.

) Integration of Solar Thermal Systems in Industry

The following two actions are absolutely necessary to be included in the development plan of solar thermal systems for the industrial sector should be included:

- Identification of the most suitable production processes;
- Information campaign for the possibilities and the advantages of solar thermal systems for the production processes, as well as for the necessary DHW.
- Partnership with private sector

Action 9: Biomass thermal Applications

- Developing a national strategy to support development of biomass use in the energy sector.

- A legal framework for solid waste management that should focus on the institutional responsibilities for collection, choice of sites for recycling and treatment of wastes, with further incentives for the industry sector to use biomass for energy purposes.
- Applying legal obligations, for local authorities to recycle organic waste or to impose fees or penalties to local authorities for landfill waste, thus there should be interest by parties to turn waste into energy.

- Building knowledge for different resources, techniques and applications of biomass energy, especially among those engaged in developing biomass projects.
- Setting national standards for the design, building and testing of different biomass technologies and energy systems.
- Upgrade NREA's biomass labs based on cost/benefit analysis.


Thank You