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Executive Summary

This report summarizes the results of a study on market analysis and needs for REEE in Jordan. The study was based on one-on-one interviews with staff working in REEE related areas. Twenty three companies in Amman and Irbid with a total number of employees exceeding 1500 has participated the study. Key findings of this study are: 1. The concentration of business activities of companies working in REEE in Jordan is within sales/installations, with majority of employees are working in sales and marketing of REEE systems, 2 difficulties in finding qualified persons with skills related to technical aspects and to general knowledge of REEE, is a common problem for almost all companies participated in the study, 3. About 80% of the companies indicated the need to hire technicians in REEE, and 4. Companies indicated that although there is a clear need for qualified engineers, engineers with multidisciplinary skills (knowledge of finance, marketing, or economics) are also needed.

1. Introduction

This report was undertaken as part of work package 1 of the MUREE Project. MUREE's wider objective is to ensure that universities in Jordan are placed in a position to offer quality

education compatible with European standards and meets socio-economic needs of the emerging knowledge-based society by strengthening renewable energy teaching in order to graduate professional leaders who can meet market needs of the country. Its direct aim is to enhance the capacity and enable Jordanian partner universities to develop sustainable renewable energy bachelor programmes with state-of-of-the-art educational technologies. MUREE will thus contribute to a sustainable outcome that will promote curriculum reform in engineering education and leave a longer-term legacy for Jordanian universities.

In the context of MUREE project, the survey undertaken in this report aims to examine market conditions and the need for REEE qualifications in the labor market. It addresses the first activity of the MUREE project: *The project will commence in a scoping and needs analysis exercise to investigate the current status quo of renewable energy in Jordan.* The investigation should focus on all academic programmes being offer in Jordan in the field of renewable energy, actual market demands, and trends and needs as well government policies and regulations.

The major activity of the project is to design, deliver accredit and adapt 4 of state-of-the art courses which will add value to the existing programme at partner universities in Jordan.

The results of this scoping and needs analysis activity will help determine the most appropriate nature of theoretical, practical and training content to embed in courses of bachelor degree programme.

The report starts with a brief overview of the REEE market in Jordan, then presents the survey approach and results. This is followed with recommendations for consideration during the curricula development phase.

2. Overview of REEE Market in Jordan

2.1. Overlook Energy Situation in Jordan

The country covers an area of about 89,200 km² with 80% of its population of 6 million living predominantly in urban centres, particularly in the northwest of the country in areas constituting 10% of the country's total land area. Amman is the capital and the largest city in the country with a population of 2.5 million. Jordan is experiencing a high population growth rate. Jordan is highly affected by the cost of energy imports, which have been a major burden on its economy. Small quantities of crude oil were discovered in the 1980s but the amount represents less than 1% of the country's oil imports. There is no production or use of coal and a slowly expanding production of natural gas representing 10% of Jordan's annual electricity requirements but with modest reserves. Most of Jordan's gas resources are therefore imported. In 2003, the construction of a pipeline with Egypt was completed, allowing natural gas to be delivered to the Aqaba thermal power plant, the largest station in the country. Many industries and services have since converted from oil to natural gas. Oil shale reserves are known to cover more than 60% of Jordan's territory which are estimated at 40 billion tones, but their exploitation is still in the early stages. Jordan is currently focusing its efforts on exploring other possible indigenous resources to reduce the burden being imposed by costly energy imports.

2.2. The Energy Mix in Jordan

Jordan's Energy consumption (mostly oil products (51%) and electricity (40%)) is characterized by a dominance of the transport sector (36%) followed at equal share (23%) by the residential and industrial sectors). Jordan's electricity is consumed mostly by the

residential sector (41%), followed by the commercial sector (25%) as shown in Figure 2.1, whereas, water pumping accounts for a significant share of electricity consumption (17%). (see Figures 2.1 and 2.2)

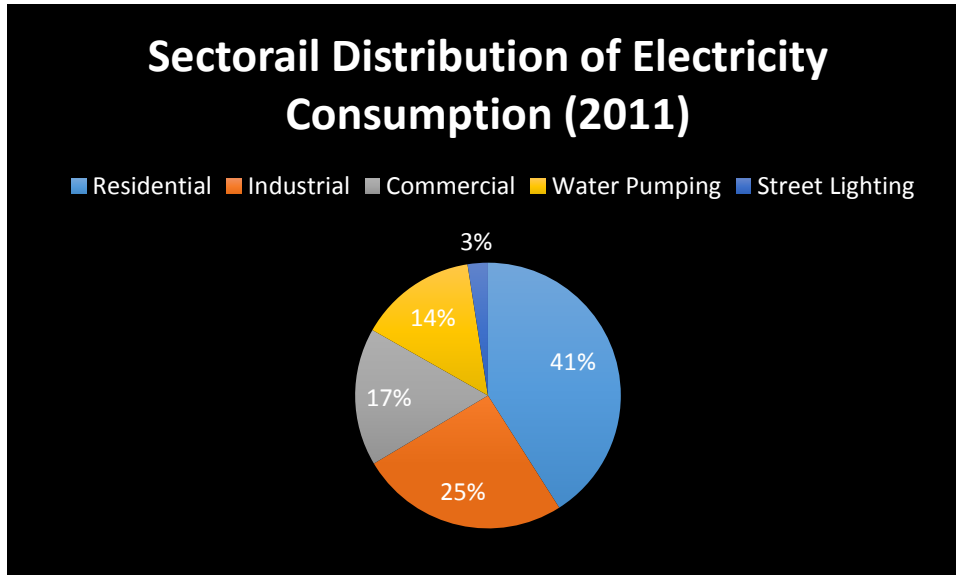


Figure 2.1 Sectorial electricity consumption in Jordan in 2011.

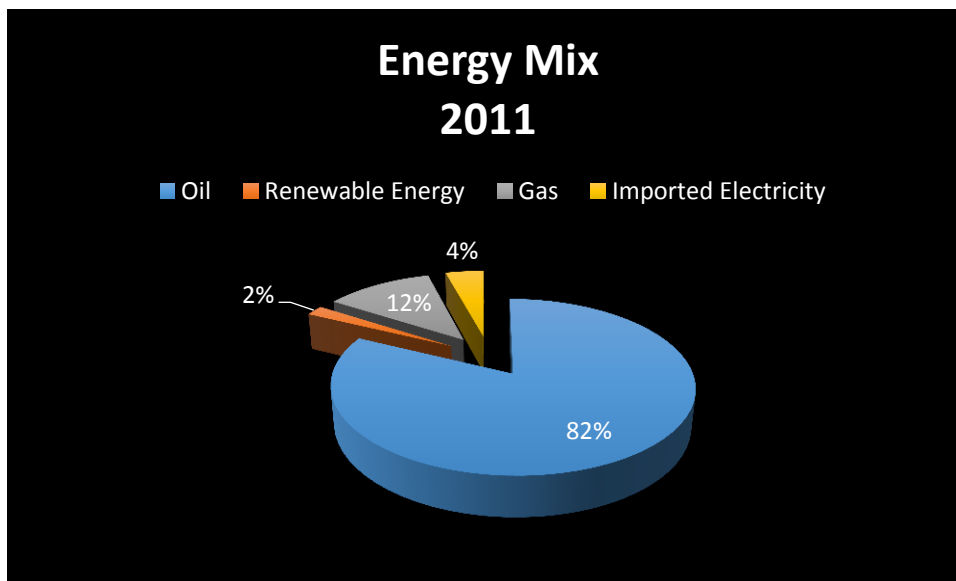


Figure 2.2 Energy mix in Jordan in 2011.

The demand for primary energy is however growing at a rate of 3.7% and is expected to continue to increase at an average annual rate of 6%. Jordan must import over 96% of its energy, and volatile fuel prices were expected to cost the Jordan JD 2.28 billion, representing over 19.5% of GDP and more than 51% of its export (2012). It is anticipated that electricity demand in 2020 will 5770 MW compared with 2270 MW in 2008. The additional generated capacity needed is 4000 MW, which is twice of the existing units. That means additional

electricity stations needed on average of 300 MW per year. This is translated to investments in energy sector to exceed 21 Billion\$ by 2020.

To meet this challenge, a comprehensive Energy Strategy was approved by the Ministry of Energy and Mineral Resources in 2007 to provide a vision for the development of the energy sector over the next decade. The main objectives of this strategy are 1) to diversify energy sources, 2) to increase the dependence on local sources as renewable energy, oil shale and Uranium 3) to increase the dependence of gas and reduce the share of oil. Based on this strategy, the targeted energy mix in 2015 is as shown in Figure 2.3 and in 2020 as shown in Figure 2.4.

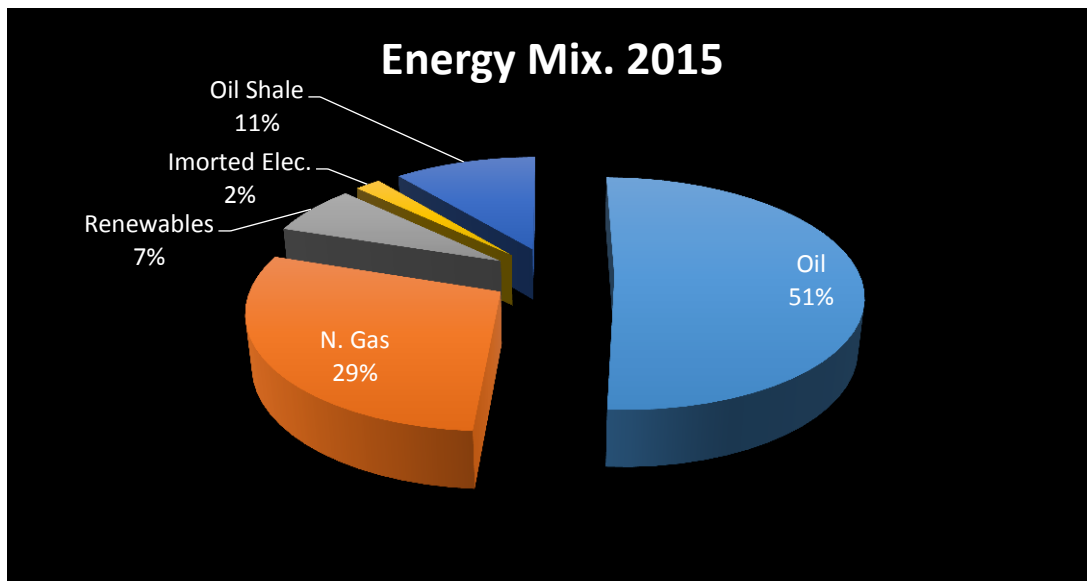


Figure 2.3 Anticipated energy mix in 2015 according to Jordan's energy master plan.

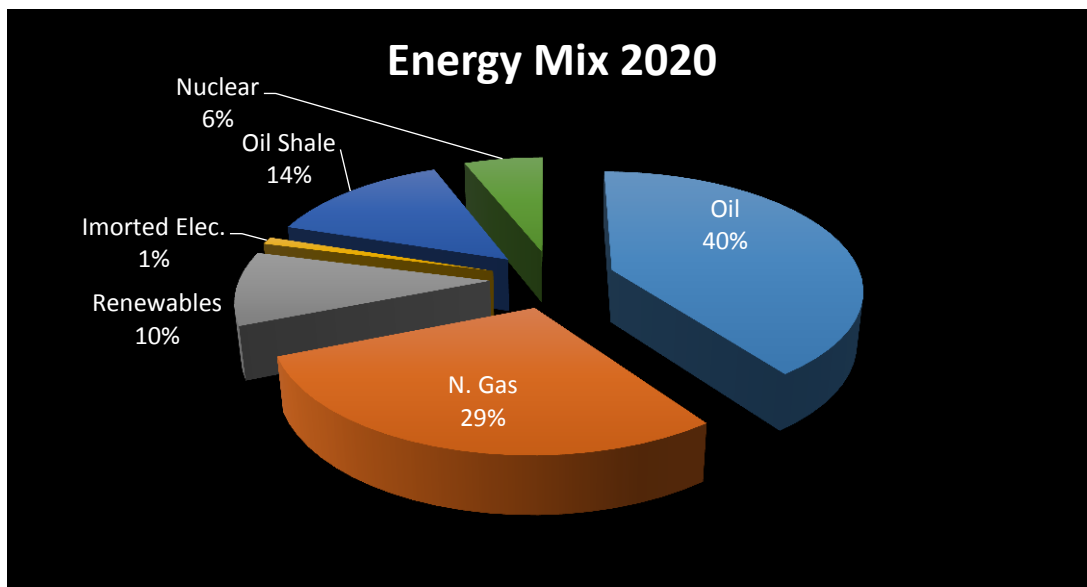


Figure 2.4 Anticipated energy mix in 2020 according to Jordan's energy master plan.

The ambitious Energy Strategy targets to increase the contribution of renewable energy sources to the national energy supply by 7% by 2015 and 10% by 2020, including 600-1000 MW from Wind Energy, 300-600 MW from Solar Energy and 30-50 MW from Waste to Energy.

Repeated attacks against the gas pipeline in the Sinai disrupted supplies in 2011 obliging to switch back to expensive fuel oil and diesel generating over \$2bn losses for NEPCO. A project of LNG terminal in Aqaba has been proposed to diversify gas supplies.

2.3. Policy Framework for the Development of REEE

The main relevant legal framework for REEE is the 2012 Renewable Energy and Energy Efficiency Law (passed in February 2010 and approved in 2012) that covers

- i) conditions of investment, construction and connection to the grid of electricity generating facilities based on renewable energy and
- ii) establishing of the Jordanian Renewable Energy and Energy Efficiency Fund (JREEEF).

The law sets the principles of RE project selection (competitive bidding for medium and large projects) and financing (PPAs and FiT for small projects). In May 2012, ERC set the following FiT: 0.12 JD/kWh (0.1694 \$c/kWh) for solar and 0.085 JD/kWh (12 \$c/kWh) for wind. Also, it set for small PV systems the principle of net metering

An advanced regulation is already in place for the electricity sector since its restructuring. Notably, ERC has the power to set end-user tariffs (block system). Between 2008 and 2011, an automatic adjustment mechanism linked liquid fuel prices (except LPG) with international market prices replacing the administrative pricing below costs. This resulted in a step decrease of subsidies in GDP from 5.8% in 2005 to 2% in 2010. A mix of accompanying measures included an individual cash transfer by the National Aid Fund (NAF) to vulnerable households and an increase of most public administration salaries.

Since 2011, the government has suspended the adjustment mechanism for fuel prices and set again consumer prices below costs, including for electricity. However, electricity generation costs dramatically increased due to the combined effect of

- i) high generation losses (75%) as most units are outdated, using fuel oil and relatively small and due to the adopted dry cooling of the units,
- ii) intermediate transmission and distribution losses (13-16%),
- iii) a step increase of fossil fuels prices (98% of power mix) and iv) additional and expensive fuel imports to compensate the natural gas supply interruptions from Egypt.

Thus, the tariff deficit between the generation cost at JD 0.19/kWh (26.80 USc/kWh) and the customer tariffs (0.083 JD/kWh) (11.70 USc/kWh) has resulted in a significant NEPCO deficit, reaching \$2.5 bn in 2011 (or 15% of GDP) that has to be covered by the state budget. This heavy burden not only threatens sustainability and security of the sector but also diverts significant public resources in difficult budgetary and economic conditions.

In order to align the grid capacities to the RE investment objective, NEPCO has developed a broad investment programme to reinforce the grid notably a “green corridor” of 800 MW from Aqaba to Amman from 2016.

About 34 project proposals for a total potential capacity of around 1,000 MW were selected over the past 6 years and the launch by MEMR in June 2011 of the Direct Proposal Submission Initiative.

3. Labor Market Survey

3.1. Methodology

A survey on Jordan labor market in REEE was conducted during the period January-February 2013 in Amman and Irbid. A total of 23 organizations were one-on-one interviewed. The sample included large, medium, and small commercial and business organizations active in REEE activities in Jordan including energy management services, renewable energy production, solar water heating system manufacturing, retailers and installers. Additionally, the sample included key stakeholders in the energy sector such as Governmental authorities, and NGOs. *Figure 1* shows the distributions by type of organization in the sample. Using semi-structured interview guide (see Annex 1), face to face interviews were conducted with members from the senior management teams in the selected organizations. Interviews lasted on average one hour. The Analysis focuses on both quantitative and qualitative aspects of labor market conditions and challenges for REEE market growth in Jordan.

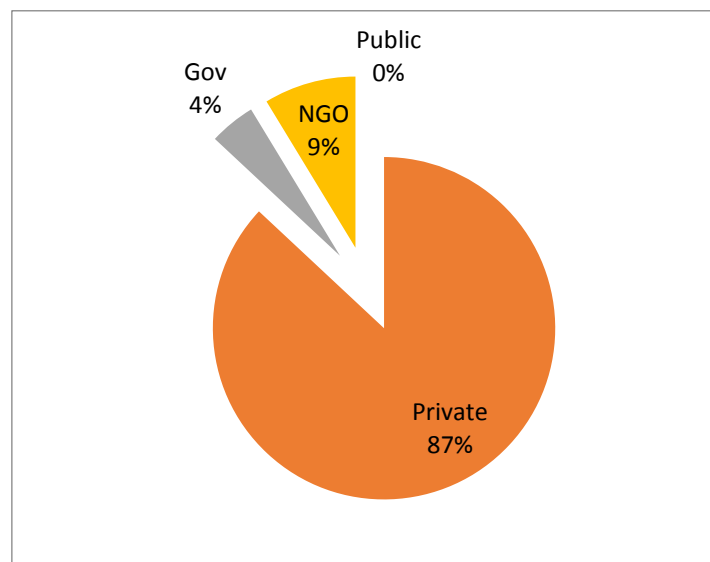


Figure 3.1: Sample distribution by type of organization.

3.2. Survey Results

3.2.1 Characteristics of REEE Organizations

Focusing on the business organizations, and excluding the main energy generating and distribution companies, there is a total of 20 private companies in the sample. Majority of those are active mainly in solar thermal applications. This is explained by the fact that solar thermal is widely used in Jordan for water heating. Estimates from the National Energy Research Center (NERC) put the diffusion rate of solar water heating systems in residential buildings close to 30%.

These companies participated in this survey employ more than 1500 employees, 96 of them are involved directly or indirectly in REEE activities. The concentration of business activities fall within sales/installations, as shown in Figure 2. Three enterprises are engaged in solar thermal and two in the assembly of PV panels. Within the business sample, about 10% of the companies are active in regional markets as shown in Figure 3. 70% of the companies in the study have their turn over from REEE business, as shown in Figure 4.

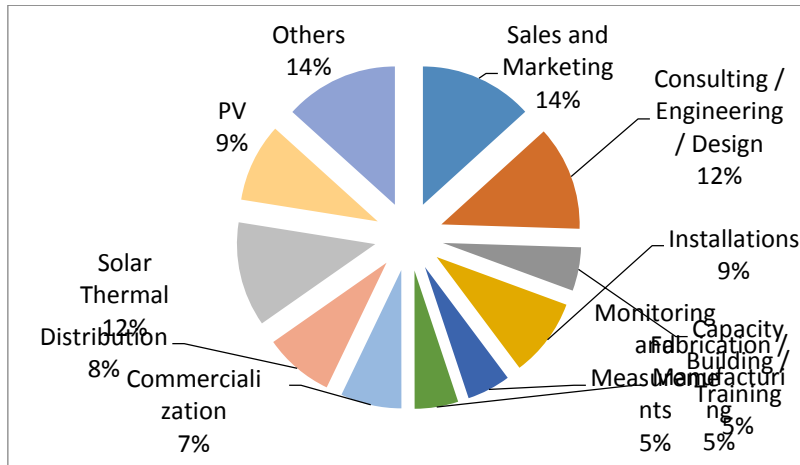


Figure 3.2: Distribution of companies by business activity.

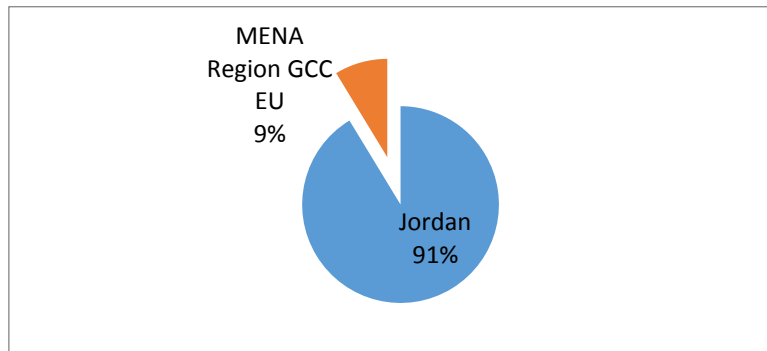


Figure 3.3: Markets of the companies participated in the survey.

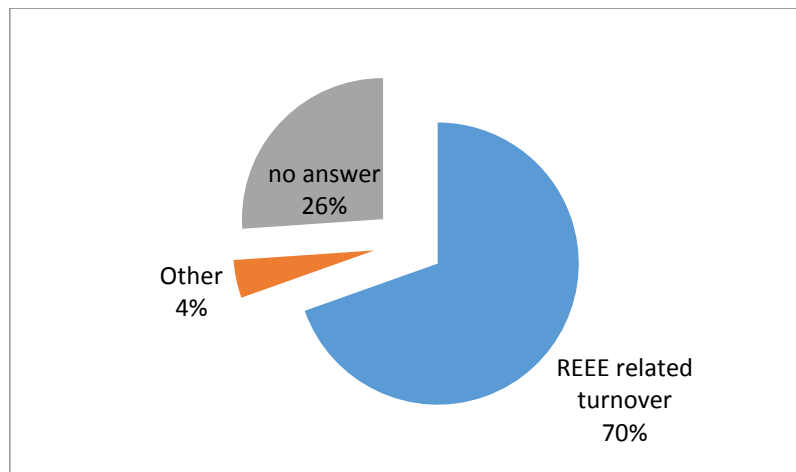


Figure 3.4: Sources of Turnover of participated companies.

3.2.2 Employee Qualifications

The interviewed sample encompasses organizations fully or partially active in REEE, therefore it was difficult to get precise number of the total employed in REEE related

activities. A derived estimate from the total number employed and percentage working in REEE, we estimate around 96 working directly or indirectly in this sector.

Majority are working in sales and marketing of REEE systems. The second largest group is installation and production of solar heating systems followed by engineering/design activities, as shown in Figure 3.4.

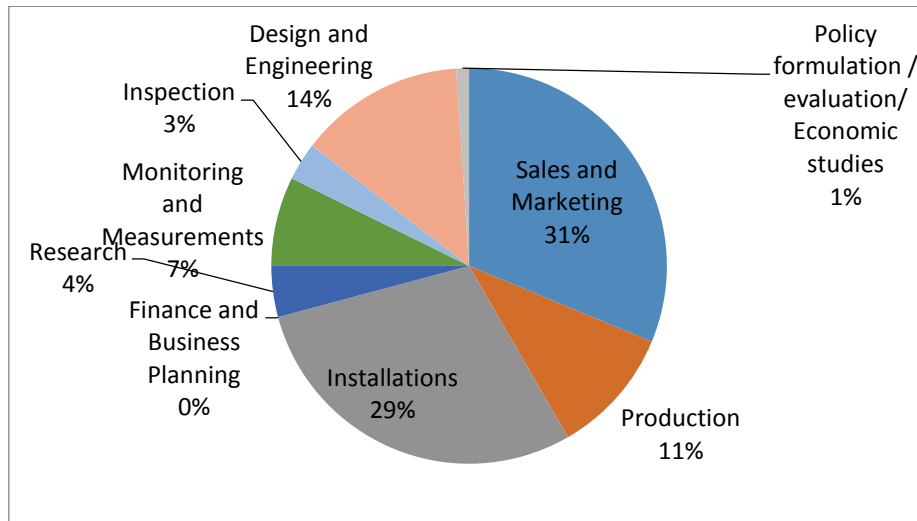


Figure 3.5: Employees in REEE in the participated companies (Total 96 employees).

With regard to the development of REEE related skills, most of the informants indicated that the knowledge was acquired through on job training (Figure 3.6). Few seem to use external courses (5).

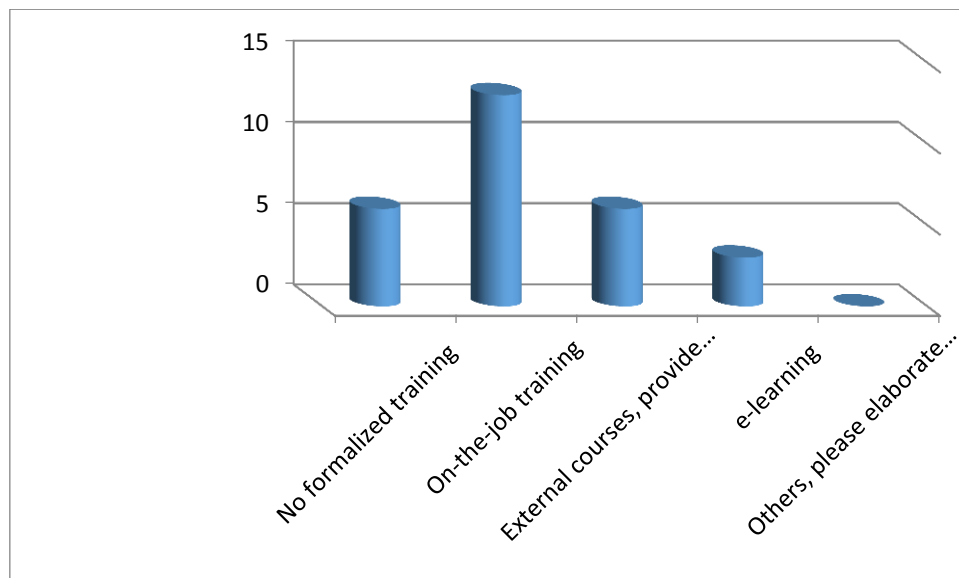


Figure 3.6: Type of REEE training for employees.

3.2.3 Labor Market

Most participated companies use direct recruiting method and through their web site in addition to recruiting in Jordanian universities. One company uses recruitment agencies, as shown in Figure 3.7.

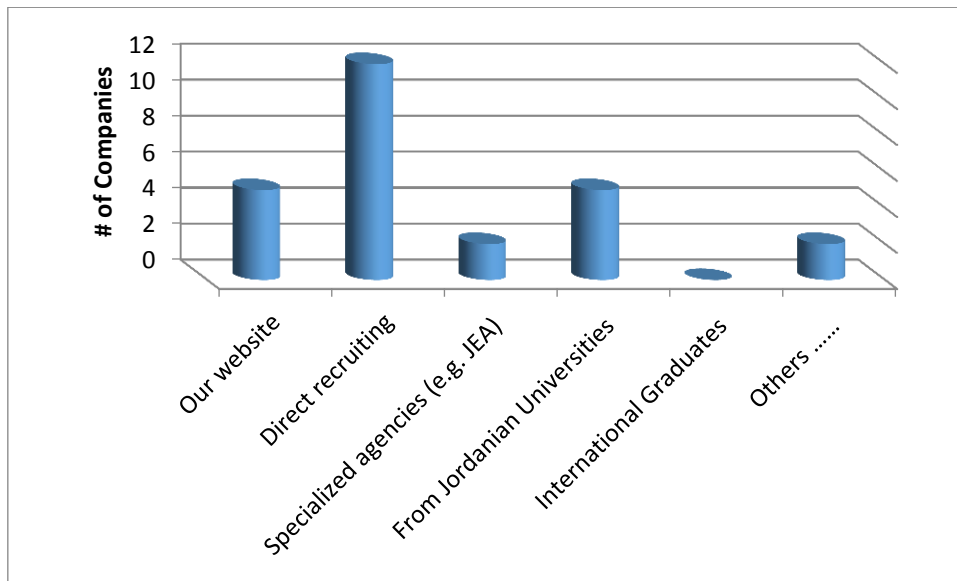


Figure 3.7: Recruitment for professionals in REEE.

In terms of availability of qualified employees, nearly all respondents indicated difficulties in finding qualified persons in REEE (Figure 3.8).

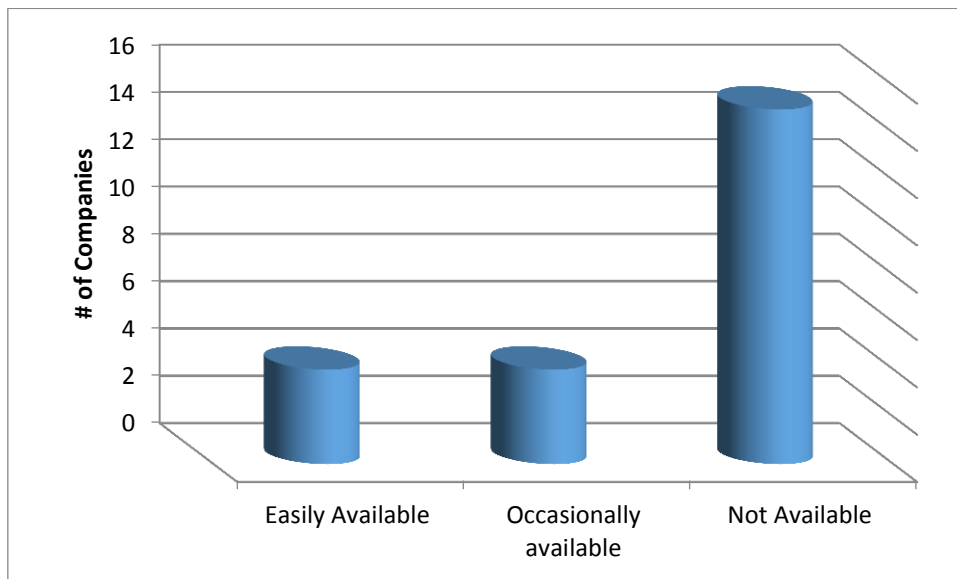


Figure 3.8: Availability of qualified professionals in the local job market in REEE area.

The skills that are most difficult to find are related to technical aspects and to general knowledge of REEE (see Figure 3.9). A quarter of the sample also indicated difficulties with finding skills in economics and policy of REEE as well as general management and finance skills.

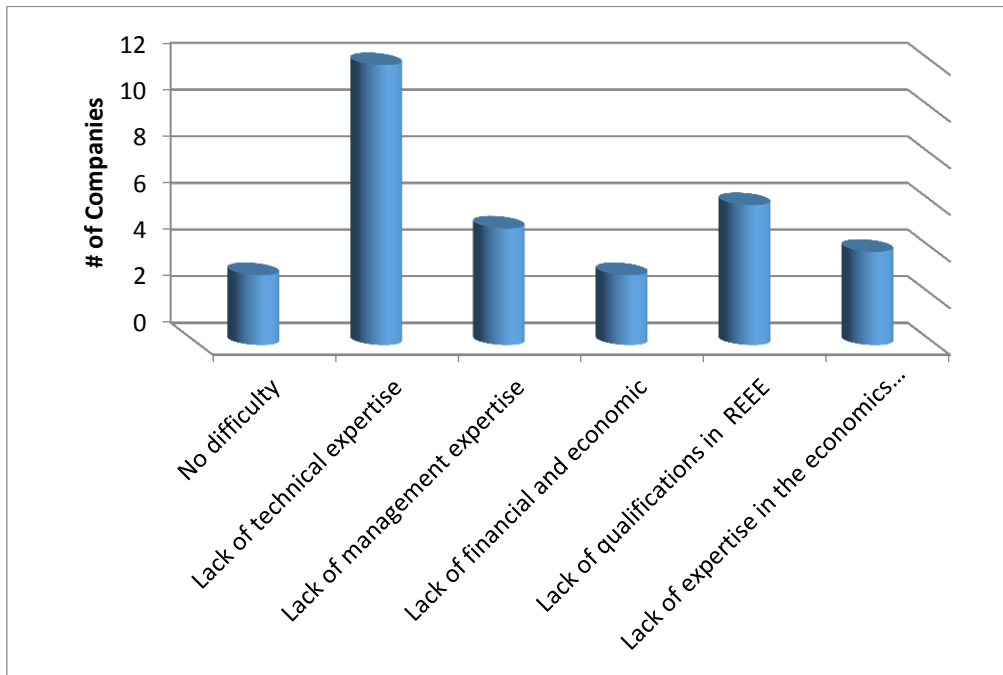


Figure 3.9: Skills most difficult to find in the local labor market by organizations active in REEE.

3.3 Future Prospects

Prospects for future recruitments were explored with respondents through two questions. The first is about plans for future hiring and the second on the type of skills organizations are planning to recruit for. Figure 3.10 shows that more than 50% of the participated companies are planning to hire more staff. Out of these, three stated they are dependent with their growth plans on progress in the policy area. Five companies think they will not hire in the near future and five companies were uncertain about the recruitment prospects in their companies.

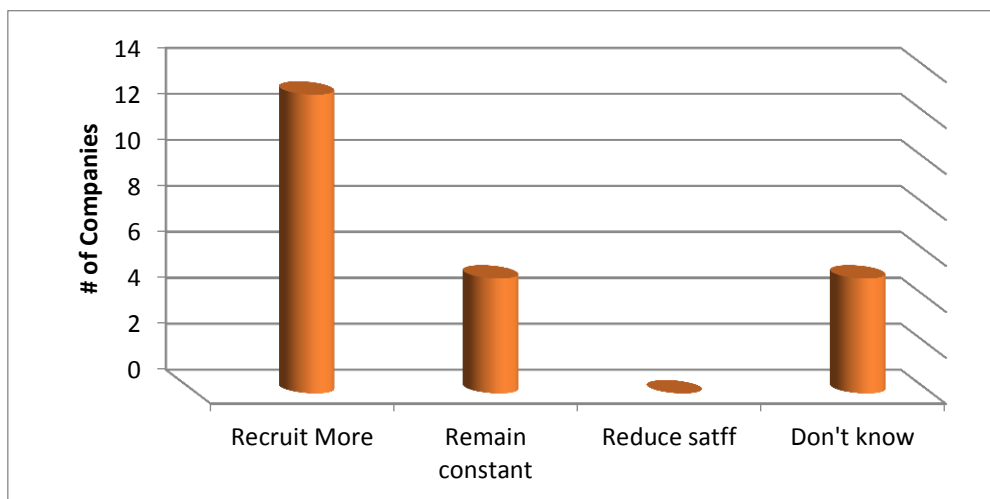


Figure 3.10: Prospects of Companies in the REEE area for future recruitments in the short term (next 2 years).

In terms of skills organizations will be looking to acquire, majority indicated intent to hire professionals with REEE qualifications (See Figure 3.11). About 80% of the companies

indicated the need to hire technicians in REEE. Multi-disciplinary knowledge and sales and marketing skills were frequently mentioned also.

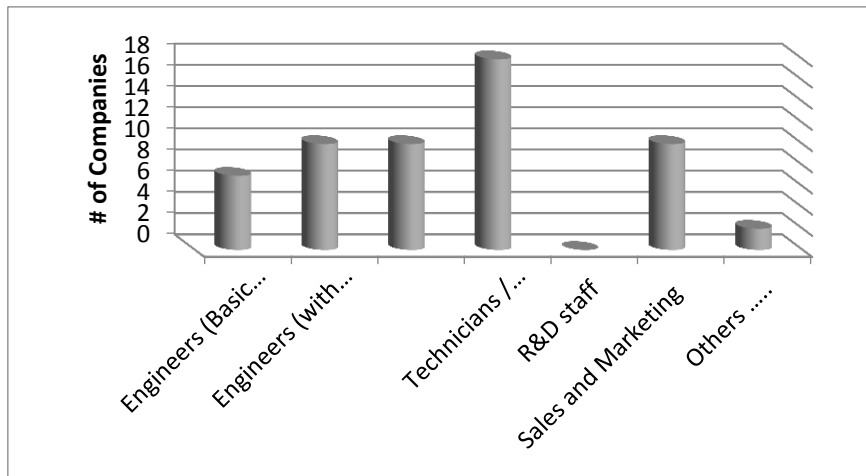


Figure 3.11: Skills organizations will be looking to hire in the near future.

3.4 Needed Competencies and Expertise

The type of competencies needed for the growth of the REEE sector in Jordan was explored with the informants through two questions addressing both own organizational needs and national needs for HR competencies in REEE. Figure 3.12 shows the competencies / expertise needed and currently are missing from the local market, and Figure 3.13 shows the competencies / expertise most important for the growth of the company's business (frequency). Because these profiles represent specific needs of the individual organizations, there is a wide range of expertise reflected in the answers. However, companies seem to be clear on the need for qualified engineers but also engineers with multidisciplinary skills (knowledge of finance, marketing or economics).

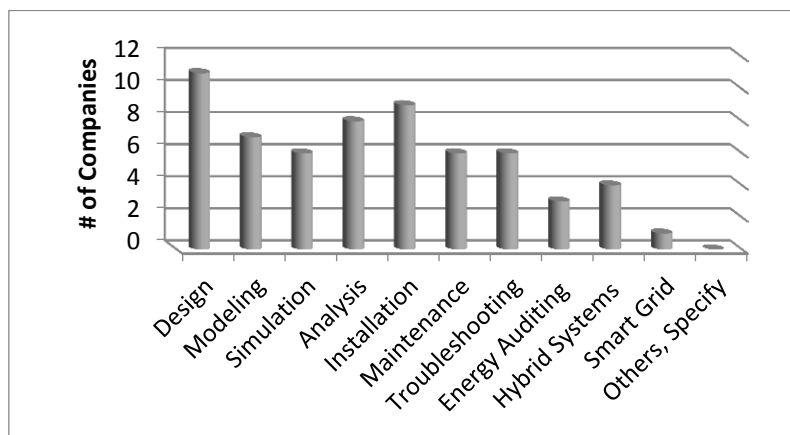


Figure 3.12: The HR competencies/expertise needed and currently are missing from the local market.

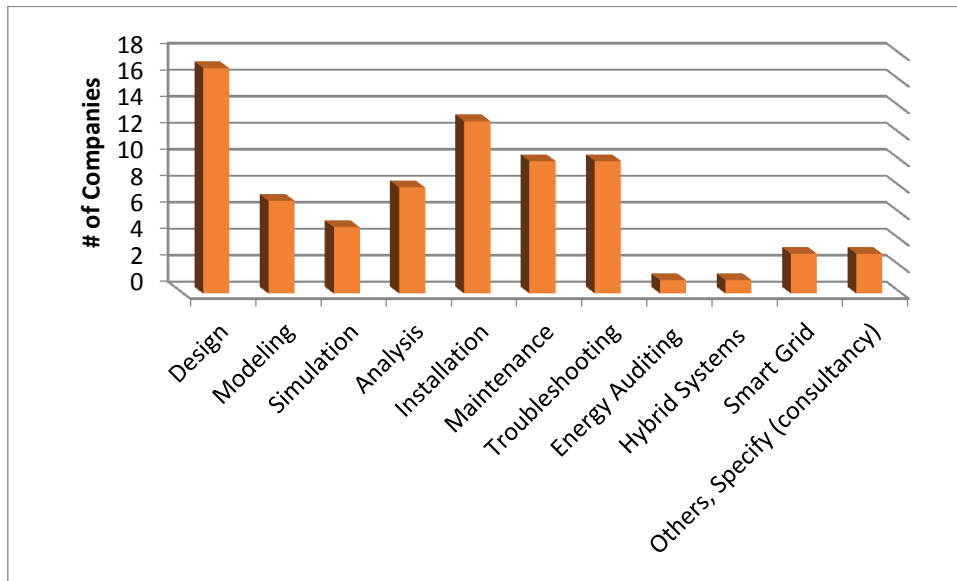


Figure 3.13: The HR competencies/expertise most important for the growth of companies business.

Figure 3.14 shows the REEE topics the HR expertise are needed the most for the local labour market. It is clear that topics related to solar energy are most needed in the local labour market.

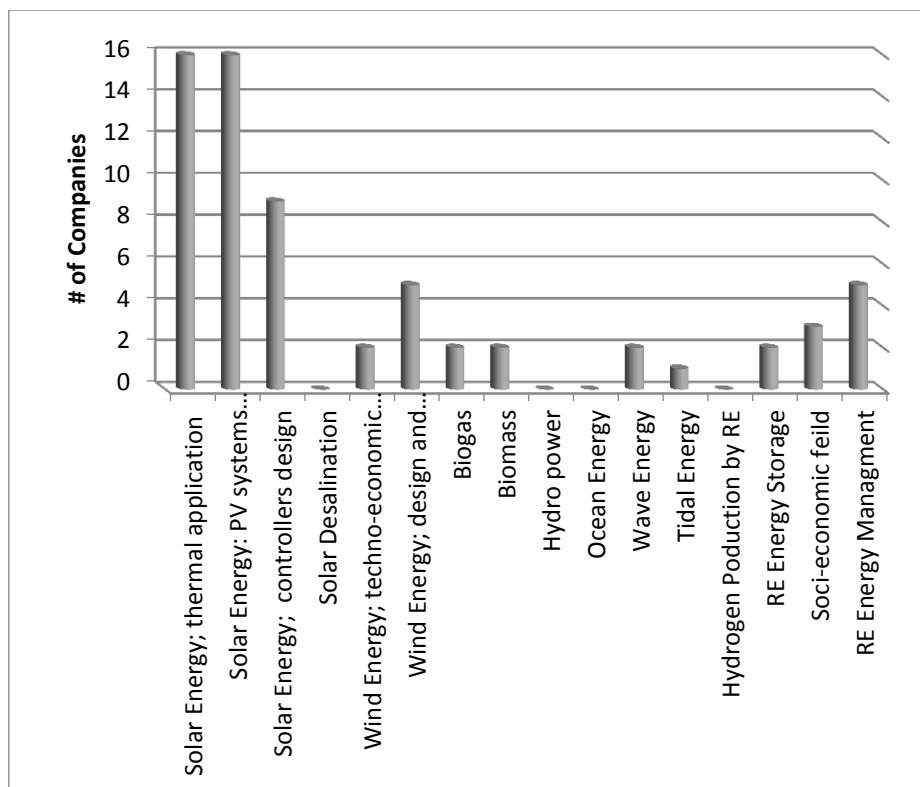


Figure 3.14: REEE topics the HR expertise are needed the most for the local labour market.

3.5 Training in REEE

Figure 3.15 shows that most of the participated companies offer training for their employees in REEE. Only 25% of them offer in-house training. 50% of them indicated that they are willing to send their employees for training in universities. Most of these companies believe that the most effective long-life learning techniques in REEE field are the workshops and tutorials, as shown in Figure 3.16.

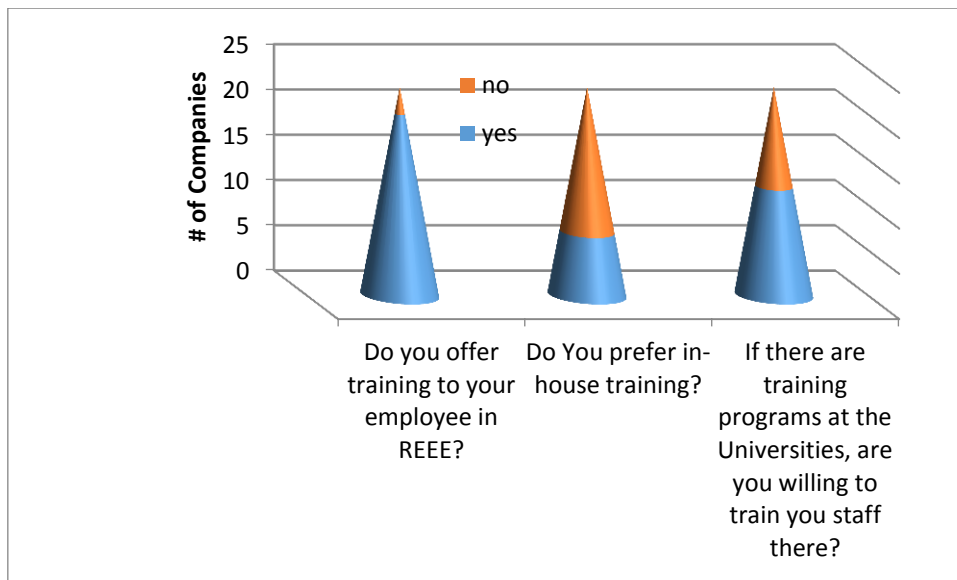


Figure 3.15: Training of employees in REEE.

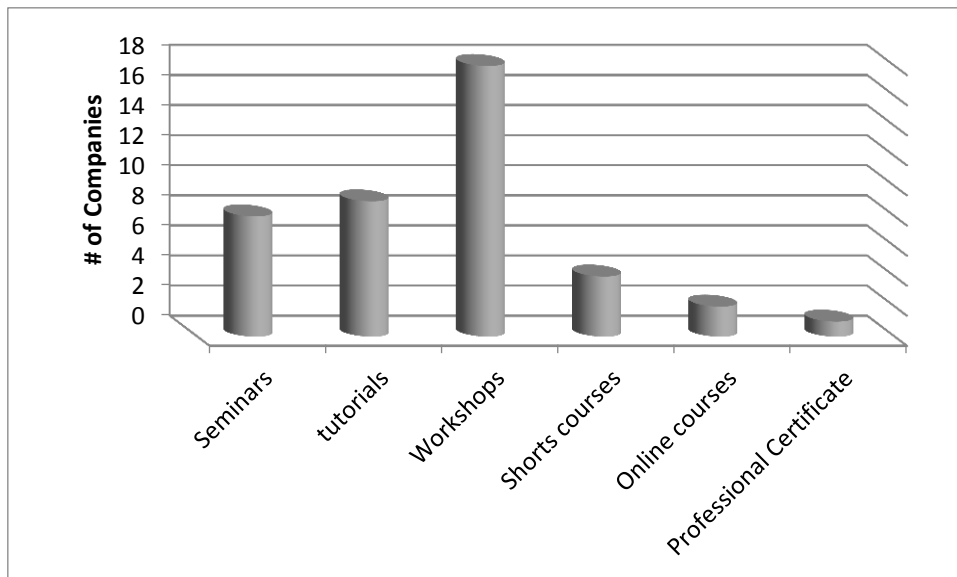


Figure 3.16: Most effective long-life learning techniques in REEE field.

4. Collaboration with MUREE Project

MUREE project presents a unique opportunity to engage key stakeholders in the REEE market of Jordan in the development of HR competencies. Informants from both the private and public sector were positive toward hosting and engaging students in final year training.

We also explored the potential benefits from using the laboratories at the partner universities. While many welcome the idea of having laboratories for testing and certification, many however pointed to the need for standards and regulations to back up certifications and testing. Furthermore, several pointed to the need for establishing trust in local testing services. *Table 1* provides key areas of interest for collaboration with MUREE project by companies and other stakeholders.

Table 1: Areas of interest for collaboration with MUREE Project.

Universities, Research centers and Public authorities	Companies
<p>1. Interested in sharing of laboratories and equipment, collaboration on testing laboratories could work, but need to improve on previous experiences between universities and independent research centers. (2)</p> <p>2. Participation in trainings organized by Mansur, send own staff for short term training courses (2)</p> <p>3. Share our own expertise and provide lecturers (1)</p> <p>4. Provide funding (training students) (1)</p>	<p>1. Cooperation on research, master thesis, intern hosting (9)</p> <p>2. Interested in use of the testing laboratories (7) (but see*)</p> <p>3. Interested in training courses for technicians (5)</p> <p>4. Interested in giving seminars, share our expertise and sharing case studies (5)</p> <p>5. Provide funding for research with commercial applications (1)</p> <p>6. Benefit from knowledge about RE trends (outreach) (1)</p>

5. Conclusion and Recommendations

Jordan set an ambitious target of increasing the share of renewable energies to 10% of the total energy balance by 2020, resulting in employment and economic benefits. It is expected to spend more than 21 Billion Dollars on the energy sector by 2020. However, in order for Jordan to maximize the benefits and reduce the cost of this investment, Jordan shall enter a new phase in manufacturing and installation of renewable energy systems. It is evident from the views of industry actors and public agencies that there are skill gaps in the local labor market with regard to specific competencies. These include engineering competencies in various areas of renewable energies, competencies in the economics and policy areas of REEE, project management skills, and installation and maintenance skills. In terms of future prospects, it is also evident that, with appropriate policies and framework conditions, local enterprises are looking to expand hiring of qualified people in REEE.

Territory education plays an important role in addressing some of these gaps, by providing complementary courses in REEE to existing engineering education. These courses should equip the young graduates with a good level of education in REEE enough to enhance their career opportunities

After analyzing the results obtained from the survey done for curricula development of MUREE the following observations and recommendations are concluded:

In this concluding section we reflect on the results from this survey and implications for curricula development of the MUREE and provide the following observations and recommendations:

1. At this stage and with a proper design MUREE is capable of affecting some segments of the REEE market such as; providing the market with qualified agents and future trainers. However it is not expected that MUREE will be able to cover all the gaps of the labor market for REEE.
2. By taking a close look at the results it can be noticed that there is a clear interest in broad and multi-disciplinary skills in which economics and financial management plays a big role in addition to the strong technical base, taking into consideration regulations, policy changes related to REEE, and engineering management in REEE projects.
3. The curricula should be demand driven and the student should be equipped with knowledge in multi fields. This will be achieved by allowing students to choose subjects from a big pool of courses and giving them the opportunity to build their own track of specialization. This means that there should be a cross linking between different departments and different schools. So many departments in all partner universities can offer associated with REEE.
4. REEE in Jordan is an early stage industry where extended efforts are needed in changing attitudes, establishing legitimacy for industry actors and for shaping policies and framework conditions. Communication and lobbying skills were highlighted on many occasions during the survey as important to establish the business case, change rigid views among public agencies, etc. The curricula should support the objective of building related skills in communication, public outreach and entrepreneurship. These elements should/can be incorporated indirectly through teaching methods and design of student assignments and group projects (even for technical subjects).