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IRAN ENERGY ASSOCIATION

German-Iranian Co-operation VI
"Development of three cornerstones for a sustainable Energy future in Iran "

Work package 1.
Feed-in laws and other support schemes in international perspective

- Summary -

Summary

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Introduction

Iran has huge potentials for increased use of renewable energy sources, which could create large economic benefits for the country. This is mainly due to the fact that Iran is an exporter of fossil energy; for each unit of fossil energy saved domestically – either via substitution by renewable energies or by energy efficiency – Iran can generate significant revenues through sales of fossil energy on the international markets and possibly could also exploit the reduction in greenhouse gas emissions as a further environmental and economical benefit. The Iranian energy and industrial sector could also benefit from the development of renewable energies, and the national income could be raised by an active exploitation of the considerable and cost-effective potentials.
For the development of an energy system increasingly based on renewable energies the energy sector needs proper regulation and a specific energy policy. In order to make the best use of Iran's energy sources and to introduce a new path of sustainable economic and socio-political development, Iran could introduce new elements into its energy policy. One of these could be a comprehensive renewable energy legislation (e.g. based on a feed-in tariff as a backbone), as implemented in about 60 other countries in the world.

Although Iran's oil and natural gas resources are abundant, they will likely be exhausted by about the same time when renewable energies are expected to become the main sources of energy globally. Since Iran is also rich in renewable energy resources, it would be highly beneficial if Iran started early in investing in alternative energy technologies, particularly in education and training. In fact, Iran can capitalize on its young population structure and high demand for education to become one of the leading countries in the region in the area of renewable energy technologies. This can help the economy significantly by creating new jobs and maintaining the standard of living, especially in case oil and gas could no longer compete with the new energy resources or were no longer available.

The development of renewable energy sources also enables Iran to produce and distribute electricity in rural and remote areas, which would play an important role in increasing the infrastructural development in these areas as well as increasing welfare while protecting environment and the health of the people. This is particularly important since the level of poverty in the areas with rich wind and solar radiation is rather high.

Iranian Development and Situation

Renewable Energy Potentials

The share of renewable energy in producing electricity in Iran is currently about 3 percent, but has a potential to increase to 38 percent in 2030. This share could even increase to 57 percent if energy is used more efficiently in all sectors which would reduce demand for electricity (IEA/WI 2009).

The Iranian Energy Association and the Wuppertal Institute for Climate, Environment and Energy have recently studied the potentials for renewable energy development in Iran using a scenario analysis. The details of developments expected for each type of renewable energy sources are as follows.

	2005	2030	
		BAU	High Renewable
Total Electricity Generation (million kWh)	186 537	346 375	346 375
Renewable Sources			
Hydro power	4 500	7 030	17 300
Wind power	220	2 730	22 000
Photovoltaic	0	7	7
Geothermal	0	303	5 250
Solar thermal power	0	4	94 000
Biomass	0	18	18
Total Renewable	4 720	10 111	138 575
RE/Total Electricity Generation (%)	3	3	38

Source: Tavanir and authors' estimation, Energy Scenarios Study in Iran, IEA and WI (2009)

Table: Electricity Generation by Renewable and Non Renewable Sources (GWh)- BAU Scenario (2005-2030)

Renewable Energy Development Act

In 2001, the Iranian parliament passed an important law to support private sector investment in renewable energy sources. The Ministry of Energy is obliged to purchase electricity produced by public and private power plants at guaranteed prices. The feed-in rates required by the law were 650 Rials (US $0.067) per kWh for peak and regular times, and 450 Rials (US $0.047) for off-peak times (maximum four hours per day). Renewable Energy Organization of Iran (SANA) was identified as the organization responsible to sign contracts with investors, provide services and monitor the development of the renewable energy industry.

In 2008, the government adjusted the feed-in rates to reflect increasing investment costs due to inflation. The rates increased from 650 Rials (US $0.067) per kWh to 1,300 Rials (US $0.13) per kWh during peak consumption periods and from 450 Rials (US $0.047) to 900 Rials (US $0.094) during off-peak periods.

Renewable Power Generating Plant Applications

Wind and solar are the most important and viable renewable energy sources in Iran. It has been estimated that in 26 areas of the country, as much as 6500 MW electricity can be generated by wind turbines. Therefore, wind energy projects in Iran are well ahead of all other alternative renewable energy sources. By 2009, a total of 20 private sector wind plants had been approved and were underway, which represent a combined capacity of 712 MW. From this, 8 plants with a total capacity of 439 MW have signed a feed-in contract with

SANA. Furthermore, currently there are applications for 21 additional wind power plants that are in the feasibility study phase. These represent a capacity of more than 1000 MW.
Solar irradiation is very high in Iran. DLR (2005) assesses a direct normal irradiance of 2200 kWh/m2/a and Samimi (1994) concluded in his country-wide analysis of irradiation that on 80 percent of Iran's territory solar irradiation would be between 1640 and 1970 kWh/m2/a. The highest values are reached in the central-Iranian region. E.g. according to IPDC (2001) solar insolation in Yazd is in the range of even 2500 kWh/m2/a. There have been some applications to develop solar energy in Iran, but given the vast resources, this area is still highly unexplored. The most important applications are four projected plants in central Iran, Shiraz and Yazd, where the tender documents for a solar thermal power plant are being prepared.

Another important renewable energy resource in Iran is biomass. So far, four projects with a total capacity of 26.1 MW have been approved and are underway. Among these, three plants with the capacity of 13.6 MW have signed guaranteed purchasing contracts with SANA. In addition, there are feasibility studies for 3 more plants with a total capacity of 50 MW.

There are also several applications for small hydro plants in different areas of the country. So far, there have been seven applications for small hydro projects, which represent a capacity of 30 MW.

SWOT analysis of the Renewable Energy Organisation in Iran

Given the high still widely unexplored resources of potentially beneficial renewable energies a SWOT analysis of the Renewable Energy Organisation in Iran has been carried out. Its core results are presented in the following figure:

Strengths	**Opportunities**
1. Skilled labour 2. Equipment and facilities 3. Maintenance ability 4. Marketing 5. Capacity in installation, construction, and operation of renewable energy systems 6. High interest and expertise among the managers of the renewable energy organization	1. Educational programs to disseminate knowledge about the renewable energy in Iran 2. Private sector involvement in renewable energy in Iran 3. International cooperation and participation in renewable energy investments in Iran 4. Iran's favourite geographical position in terms of renewable energy sources 5. World Bank's grants for renewable energy projects 6. Tax on fossil fuels 7. Security of renewable energy system
Weaknesses	**Threats**
1. High investment costs of the renewable energies in Iran 2. Lack of R&D 3. Lack of financial resources 4. Low ability of raising capital 5. High cost of grid connection 6. Low level of human capital in the REO	1. Lack of subsidies to renewable energies 2. Technology transfer problems 3. Old technologies 4. Lack of strategic planning for renewable energy program in Iran 5. Lack of law for renewable energy planning 6. Lack of government fiscal policies to

7. Lack of scientific system and procedures for decision making process in the REO 8. Lack of innovation 9. High price of renewable energies in Iran	support renewable energy programs 7. Lack of consensus among policy makers 8. Lack of acceptance for renewable energy by consumers

Renewable Energy Challenges in Iran

Although a legal framework and financial support for the development of renewable energy have already been introduced in Iran, progress so far has been rather slow. By enacting the feed-in-tariff law, the Iranian parliament has demonstrated that developing renewable energy sources is important to Iranian policy makers. However, although this legislation is designed similarly to renewable energy development laws enacted in more than 60 other countries (gtz-TERNA, 2009), it has not been very effective. It is evident that laws by themselves cannot be effective if the environment for their implementation is not supportive and law enforcement is not strong enough. With this being said, the main challenges facing renewable energy development in Iran can be identified as follows.

1. One of the main barriers for the development of the renewable energy sources in Iran as in rest of the world is the low price of conventional energies relative to the renewable energies. In Iran, this factor is even more pronounced as the country is rich in conventional resources and the energy pricing system has kept fossil energy prices very low. Almost any investment in alternative energy sources with the current energy pricing system in effect is uneconomical and not attractive for domestic or foreign investors.

   There are huge subsidies for electricity production and consumption in Iran. On the production side, fuel costs are kept low by government subsidies on oil and natural gas for power plants. On consumption side, the electricity price is heavily subsidized for both business and households. The low fuel price along with high transmission and distribution losses (17%) contributed to low efficiency rates in power plants, which makes the effective electricity costs (and therefore the subsidy) much higher than international standards.

2. As the SWOT analysis shows, there is no clear consensus among authorities and policy makers about the importance of investment into renewable energy sources, and therefore a rigorous plan for renewable energy is lacking. Opponents argue that since Iran has abundant fossil energy resources, investment in renewable energy is not a priority. They also argue that since renewable energy technology is still immature, it will be more beneficial to wait until the technology reaches a state where it is able to compete with conventional energy resources.

3. Transaction costs, red tape, and uncertainties with regard to policy change and implementation increase risk premiums for investment in renewable energy projects, which diminishes the incentives provided by Iran's feed-in law. Unfortunately, developing countries, including Iran, do not have a good record in governance indexes published by World Bank. The 2008 Governance Report shows that Iran is at the bottom of the list ranking 25 among 215 countries in various indexes such as

Government Effectiveness, Rule of Law, Corruption Control, Regulatory Quality, and Voice and Accountability (Kaufmann et al., 2009)

4. The feed-in-tariff law is a positive step towards attracting private sector investment in renewable energy. However, it has many shortcomings. For instance, the guaranteed feed-in price for electricity is subject to government approval and a rule that increases investment uncertainty. Furthermore, law enforcement mechanisms and penalties for violating law by government agencies are lacking, making the law less effective.

5. Sanctions by the UN and the unilateral sanctions by the US have affected international trade and financial transactions with Iran, which has made technology transfer and financing renewable energy projects more difficult and expensive. The sanctions have also limited foreign investment in various sectors including renewable energy (see the SWOT analysis).

Suggestions for the Improvement of the Feed-in Regulation

To improve the development of the renewable energy sector in Iran, the following measures may prove effective:

1. Energy policy reform is necessary for Iran, as energy prices are much lower than their actual costs. The current system has led to inefficient uses of energy in all sectors of the economy, increased emissions, and lowered incentives to invest in (renewable) energy generation. When the energy prices reflect their actual costs, the measures taken to support development in renewable energy sources would be more effective.

2. The feed-in-law currently establishes a guaranteed purchasing price for electricity produced from renewable energy sources. Since the inflation rate in Iran is historically high and changes frequently, specifying nominal feed-in rates will not be effective. Furthermore, the base price of electricity with which the feed-in rates are compared is already subsidized and therefore does not reflect the actual costs of electricity production. An alternative method that specifies the feed-in tariff for renewable energy relative to actual production cost of electricity produced by conventional sources would be more effective. In addition, setting up a mechanism through which the guaranteed price would be made available in a hard currency for a long period regardless of changes in government and policy makers could be effective to reduce uncertainty. In addition the feed-in tariff should provide for clear and stable revenues that are sufficient to pay back investments over a certain time period. Therefore it would be better to set fixed tariffs annually according to the cost situation and make inflation adjustment on top.

3. The feed-in-tariff law makes the renewable energy producers fully responsible for the grid connection. Since the grid connection is a critical component of the electricity generation and transmission, its details and responsibilities should be specified clearly. Otherwise, this will add to the uncertainties with regard to the purchasing program and will make investment in the renewable energy projects less attractive.

4. According to the current feed-in tariff regulations, the network administrator will determine how much electricity would be purchased from the renewable energy producers in an hour or a day. If an electricity generator produces more than the amount set by the network administrator, it will not be compensated, but will be fined.

Although this arrangement may be necessary for the smooth performance of the network, it will raise the uncertainty regarding the renewable energy plant's revenues. To alleviate this problem, the network should give priority to the renewable generating plants. Load management and grid extensions – if necessary – should be financed by the public – at least in the initial phases of development.

5. In addition to the purchasing price scheme through a feed-in-tariff law, there are also other potential supporting schemes for renewable energy development which could be used instead or to support the feed-in tariff.

    a. For instance, mandatory market share policy leads to a renewable portfolio standard by placing an obligation on suppliers of power to source a proportion of their power from renewable energy generation. This policy can also be accompanied with tradable renewable energy certificates, similar to emission trade programs, so that suppliers can purchase either renewable energy or renewable energy certificates. Through this policy the energy sector would produce a certain share of the energy by renewable energy sources in a specified period. While the feed-in-tariff scheme is likely to increase market scale and encourage technological change, the mandatory market share program stimulates competition (Cherni and Kentish, 2007). However, international comparisons show that so far feed-in systems have outperformed alternative approaches with regards to market growth as well as production costs for renewable electricity (see below).

    b. Furthermore, the government can provide financial support and incentives to renewable energy producers by subsidizing loans, which is crucial as the upfront investment costs are rather high in renewable energy projects; lowering tariffs on renewable energy production equipment; funding research and development; investing in universities and research institutes; and reducing taxes on renewable energy producers. To avoid political cycles and changes in policies which increase uncertainties, the government could establish a renewable energy development fund to support these activities including construction of renewable energy projects in different areas.

    c. The feed-in-tariff law should also be amended to include a specific target for renewable energy share of total electricity generation, a time frame in which the target should be reached, details of the government support scheme, and law enforcement and penalties.

6. Renewable energy technologies are one of the fastest growing technologies in the world, which will significantly contribute to economic growth in many countries in the near future. As with any new technology, a high level of human capital is required for a country to be able to learn and to catch up with the technology development. Therefore, if Iran plans to invest in renewable energy resources, it must also invest in its human capital through education and training in renewable energy technologies. The integration of renewable energy courses into regular curricula in vocational and formal education systems at different levels can help develop knowledge and skills required for the development of renewable energy in Iran.

7. There are different organizations working on renewable energy development, but, as the SWOT analysis shows, their activities including research, production, construction, regulations, and funding are not well coordinated. To make efforts and decisions more efficient, the renewable energy development activities need to be coordinated by a central government agency with high level of authority. The organization for renewable energy (SANA), which is affiliated with the Ministry of Energy, needs to be supported and strengthened by directly linking it to a high-level of decision making bodies.
8. The new technology for renewable energy is developing rapidly in advanced economies. Countries that are behind need to obtain the technology through either foreign direct investment (FDI), which has proven helpful in technology transfer and knowledge spill-over, or an active relation with scientific and research institutes. Iran also needs to develop a plan to facilitate FDI and effective communication with the scientific and research institutes across the world.