Supported by

Federal Foreign Office

Enabling PV
Iran

The Emerging PV Market in Iran

December 2015

PFLÜGER INTERNATIONAL

Iran-Wind.COM

eclareon

BSW GERMAN SOLAR ASSOCIATION

Published by:
German Solar Association – BSW-Solar / Bundesverband Solarwirtschaft e.V.
Französische Straße 23
10117 Berlin, Germany
E: info(at)bsw-solar.de
T: + 49 30 2977788-0
Fax: + 49 30 2977788-99
www.solarwirtschaft.de

Person responsible for content under §55 paragraph 2 RStV: Jörg Mayer (BSW-Solar)

Authors:
Luz Alicia Aguilar (BSW-Solar)

Jörg Mayer (BSW-Solar)

Mohammad Hassan Ghafouri (Iran Wind Group)

Narges Khosroshahi (Iran Wind Group)

Christian Grundner (eclareon)

Esmaeil Vasaf

Stefan Haid (Roland Berger)

Sarah Mahdavi

Asghar Mahmoudi (MD Solarsky)

Dr. Farzad Jafarkazemi (Supervisor)

Funding by: Federal Foreign Office (www.diplo.de)

Project Number (Förderkennzeichen- FKZ): ZMVI6-2515AA0814

Design: Mathias Böswetter (BSW-Solar)

Place and date of publication: Berlin, 3. March 2016

Content

I Figures

II Tables

III List of Abbreviations

BAFA	Bundesamt für Wirtschaft und Ausfuhrkontrolle
BIT	Bilateral Investment Treaty
BOO	Build-Own-Operate
BOT	Build-Operate-Transfer
CAPEX	Capital Expenditure
DSCR	Debt-Service Coverage Ratio
DSO	Distribution System Operator
DTC	Double Taxation Conventions
ECA	Energy Conversion Agreement
ECAs	Energy Conversion Agreements
EORI Nr.	Economic Operators' Registration and Identification number
EPC	Engineering, Procurement and Construction
EU	European Union
FDI	Foreign Direct Investment
FIPPA	Foreign Investment Promotion and Protection Act
FISC	Foreign Investment Service Center
FiT	Feed in Tariff
FYDP	Iran’s Five Year Development Plan
GDP	Gross Domestic Product
GW	Giga Watt
IEEO	Iran Energy Efficiency Organization

IGMC	Iran Grid Management Company
IPDC	Iran Power Development Co.
IPP	Independent Power Producer
IRENEX	Iran Energy Exchange
IRR	Internal Rate of Return
IRR	Iranian Rials
JCPOA	Joint Comprehensive Plan of Action
KV	Kilo Volt
kW/h	Kilowatt Hour
kW/p	Kilowatt Peak
LC	Letter of Credit
LCOE	The Levelized Cost of Electricity
LLCR	Loan Life Coverage Ratio
MAPNA	Iran Power Plant Project Management
MENA	Middle East and North Africa
MoE	Ministry of Energy
MW	Megawatt
NDF	National Development Fund
NPV	Net Present Value
O&M	Operation and Maintenance
OIETA	Organization for Investment, Economic and Technical Assistance of Iran
OpEX	Operational Expenditure / Operating Costs

PPA	Power Purchase Agreement
PTT	Ministry of Post, Telegraph and Telephone
PV	Photovoltaic
RE	Renewable Energy
SABA	Iran Energy Efficiency Organization
SUNA	Renewable Energy Organization of Iran
TAVANIR	The Electric Holding Company of Generation, Transmission & Distribution Company
UN	United Nations
US$	US dollar
WACC	Weighted Average Cost of Capital

IV Goals of Enabling PV Iran

Iran faces an increasing energy demand that cannot be met by conventional energy sources only. Renewable Energy is an economic option when compared with the generation costs of conventional energy. Furthermore, the country has great solar energy potential that can be used. Hence, the main objective of ENABLING PV is to contribute to the sustainable deployment of renewable energy in Iran.

The project is funded by the German Foreign Office and is led by the German Solar Association (BSW-Solar) in cooperation with the consulting firm eclareon, the Iran-Wind Group and Pflüger International. The study aims to establish a long-term cooperation with solar energy companies and industry associations in Iran.

Within the project the processes of investments and project development of PV power plants in Iran were analyzed. This includes the identification of the legal and administrative framework and the description of the two most viable business models for solar PV. For this ENABLING PV IRAN focused on the following activities:

- Description of the most viable business models for solar PV
- Identification of the legal and administrative framework for each identified business model and the barriers hindering its implementation
- Formulation of recommendations to remove these barriers
- Presentation and discussion of the project results with decision makers in order to give input to the optimization of the legal framework. This was done through a workshop in Teheran
- Dissemination of the project results with local and international investors
- Strengthening the cooperation and transfer of knowledge between relevant stakeholders in Iran and Germany

The study was developed through desk research and interviews with market experts, legislators and project developers using standardized interview guidelines. Plausibility assumptions and an analysis of barriers helped to formulate recommendations for policy makers and politicians. Sample calculations of typical projects including cash flow modelling and sensitivity analysis provided an outlook for profitability changes according to changes in system prices, energy yield or remuneration and thus a first guideline for investors. The preliminary results were presented at an event in Teheran on the 21. December 2015 and discussed relevant stakeholders in Iran.

V Executive Summary

Iran's potential for PV is extremely high, having an excellent solar irradiation and high electricity demand. Yet, as Iran is still an infant renewable energy market, there are big challenges to PV investments that need to be overcome. The macroeconomic situation of the country (i.e. high inflation rate, limited access to international finance) and the universal electricity subsidies constitute a difficult framework for the PV development. In addition, knowledge on technology and installation is still limited, thus a strong impetus has to be done on training and qualification. On the other hand, the new support scheme with cost-covering and very attractive Feed-in-Tariffs builds a strong base for an emerging PV market, especially when the trade restrictions will have been removed.

The financial analysis of the two cases of the PPA business model (50 kWp and 5 MWp installations) shows that the high interest rate is the key challenge that limits the investments in the PV sector unless financing of the National Development Fund (NDF) can be used. By calculating with a low interest rates of 6% by funds of the NDF, the analyzed market segments are highly profitable (equity IRR between 30 and 36%) and promise short payback periods around 8 years.

Thanks to the great efforts of the Renewable Energy Organization of Iran (SUNA), for large-scale PV power plant above 100 kWp, there is a fairly well standardized process defined which gives confidence to investors and EPCs. The duration of a project development is estimated to be more than one year, still SUNA strives for more efficient and quicker approval processes. For smaller installations, also regional DSOs are involved. SUNA is still working on standardizing this process.

As long as the identified barriers are not linked to the trade restrictions or the fossil subsidies, they can be tackled by regulators quickly and worked around by investors with some investment in time and money. Main challenges are a better access to national financing, transparent planning processes for the Feed-in-Tariff-funding, uniform standards for contracts, approvals, studies, norms and procedures and – above all – a communication campaign for inspiring the Iranian public on the great potential of solar energy and the serious ambition to let the market grow.

In addition, Iran's new commitment at the COP 21 is another good sign that renewable energy, as a powerful instrument to reduce Greenhouse Gas (GHG) emissions, will get a true chance to make their inroads in the Iranian energy mix.

1. Introducing Iran

The Islamic Republic of Iran with an area of 1,648,196 sq. km is located in South-West Asia. With an estimated Gross Domestic Product (GDP) of US$406.3 billion, Iran is the second largest economy in the Middle East and North Africa (MENA) region after Saudi Arabia. The country, which is the second populous country in the region after Egypt, had an estimated population of 78.5 million in 2014 and is characterized by its high youth population with about 60% of people estimated to be under the age of 30.[1]

Iran's economy is characterized by its large hydrocarbon sector, small scale agriculture and service sector, as well as a noticeable state presence in manufacturing and financial services. The country ranks second in the world in natural gas reserves and fourth in proven crude oil reserves.[2] Additionally, Iran has the world's largest zinc and the second-largest copper reserves, with also important reserves of iron.[3] Despite this, economic activities and government revenues still depend to a large extent on oil revenues.[4]

After two years of recession, the economy expanded by 3% in 2014. It is foreseen that the GDP growth rate will rise to 5.8% and 6.7% in 2016 and 2017, respectively, as oil production reaches 3.6 and 4.2 million barrels per day[5].

The state continues playing a key role in the economy with public banks controlling the financial sector and large public and parastatal enterprises dominating the manufacturing and commercial sector[6] (e.g. 60% of the manufacturing sector belongs to the government[7]).

In March 2010, the Iranian parliament ratified the Targeted Subsidies Reform Act calling for a gradual increase of energy prices within a five- year period (2010–2015).[8] The reform was implemented according to its 20-year vision plan. In its first phase, the indirect subsidies which were estimated to be equivalent to 27% of GDP in 2007/2008 (approx. US$ 77.2 billion), have been replaced by a direct cash transfer program to Iranian households. The program focuses on essential products and services such as petroleum products, water and electricity which resulted in a moderate improvement in the efficiency of expenditures and economic activities. The second phase is still under review and it would involve a more gradual fuel price adjustment and the improvement targeting the cash transfers to low-

---

[1] http://www.worldbank.org/en/country/iran/overview (Visited on 11/12/2015)

[2] Ibid.

[3] http://www.investiniran.ir/en/sectors/industry (Visited on 11/12/2015)

[4] http://www.worldbank.org/en/country/iran/overview (Visited on 11/12/2015)

[5] Ibid

[6] http://www.worldbank.org/en/country/iran/overview (Visited on 11/12/2015)

[7] http://en.iccima.ir/regulations/foreign-investment-laws-in-iran/item/8989-investing-opportunities.html (Visited on 11/12/2015)

[8] Farzad Jafarkazemi (2014)

income households.[9] One of the implementations resulting from this reform plan will be the development of renewable energy plants for electricity generation.[10]

The country faces a fast growing demand for electricity and the average rate of electricity generation growth was 5% per year in the last 10 years[11]. The country should generate 5 GW each year to supply the demand for the coming years.[12] Since the beginning of the subsidy reform, the prices of electricity and water were increased and they will continue to rise gradually only to cover full cost price. The reform was a major change and opened a new era for both energy conservation and the use of renewable energy technologies to generate electricity in Iran, which has a long history of heavily subsidizing its energy.[13]

Although Iran has great potential for solar power generation, there has been little development in the solar field so far. The main reason is the plentiful oil and gas reserves in the country which led to the low price of fossil fuel for electricity generation. In order to stimulate private sectors, some new incentives have been determined to make solar energy a competitive energy resource for nonrenewable power plants. Nevertheless, the government needs to develop reforms to promote competition, rationalize licensing and authorization requirements, reduce the imprint of State-Owned Enterprises in the economy, and improve the financial and banking sector[14].

1.1 Iran-Germany Relation

Diplomatic relations between Germany and Iran were established in 1952. In this year the Iranian legation was opened in Germany.[15] Germany was one of the main trading partners of Iran for many years. Apart from the economic sector, there was a close cooperation in the educational field.

German exports to Iran increased by 30% in 2014, compared to the previous year, and German imports from Iran grew by 8% within the same period. The bilateral trade corresponded to EUR 2.69 billion in 2014, an increase 27% in comparison to previous the year.[16]

Despite the recent indemnities in the two countries' relations, the reputation of German companies' quality is still very important for Iranians. German companies are among the

---

[9] http://www.worldbank.org/en/country/iran/overvie (Visited on 11/12/2015)

[10] https://www.imf.org/external/pubs/ft/wp/2011/wp11167.pdf (Visited on 11/12/2015)

[11] http://amar.tavanir.org.ir/pages/report/stat93/rahbordi.pdf (Visited on 11/12/2015)

[12] http://asreenergy.ir/(S(lmwfxf454ez4cq55e4fdxvar))/Default.aspx?NSID=5&SSLID=46&NID=206988 (Visited on 11/12/2015)

[13] Farzad Jafarkazemi (2014)

[14] http://www.worldbank.org/en/country/iran/overview (Visited on 11/12/2015)

[15] http://www.auswaertiges-amt.de/EN/Aussenpolitik/Laender/Laenderinfos/01-Nodes/Iran_node.html (Visited on 11/12/2015)

[16] http://www.auswaertiges-amt.de/EN/Aussenpolitik/Laender/Laenderinfos/01-Nodes/Iran_node.html (Visited on 11/12/2015)

most trustworthy companies in Iran and the resumption in the economic relations is expected. In order to remedy shortcomings, Iranian companies are willing to import foreign investment, technical know-how as well as machinery and equipment.

2 Electricity Market Profile in Iran

2.1 Electricity Market

Before restructuring the electricity market of Iran in 2004, the government worked as a monopoly with sole responsibility of generation, transmission and distribution. Due to the high consumption growth of electricity and the necessity to enhance private investment, the The Electric Holding Company of Generation, Transmission & Distribution Company (TAVANIR) took some steps to a reforming mechanism of power market starting in 2001. The initial objectives were set to prosper competition in the market, increase the share of private investment in power plants and to improve the efficiency in electricity generation. One decade after implementing the competitive basis of electricity market, most of the market players are still governmental or semi-governmental. The current structure of the electricity market is organized as follows:

a. Electricity Generation

Electricity is provided by i) state owned power plants which are administered by TAVANIR and affiliated Regional Electric companies, ii) hydroelectric power plants under the control of the Deputy of Water and Sewage of Ministry of Energy (MoE), iii) private owned power plants, iv) large industries, and vi) the Atomic Energy Organization which manages the nuclear power plant in Iran. Privatization in generation started by contracting Energy Conversion Agreements (ECAs) and continued by developing some Build-Operate-Transfer (BOT) and Build Own Operate (BOO) projects with private investors. In 2013, TAVANIR tendered and sold some of its power plants and increased the share of private electricity generation to 41% of the total installed capacity[17].

b. Transmission

In each Regional Electric company there is a department under the title of “Deputy of Power Transmission” or “Deputy for Operation” which is responsible for maintenance, operation and development of transmission lines and sub-stations. Because all 16 Regional Electric companies are owned and administered by TAVANIR, the transmission sector is still considered as a regulated monopoly.

c. Distribution

With reference to the legislation approved by the parliament in 2005 known as “Independency Act of distribution companies”, all transmission companies are responsible for the development, operation and maintenance of transmission facilities and must work as

---

[17] . Research calculation based on the “Iran Energy Balance (2013)”

non-governmental entities. During the privatization, about 60% of these companies were transferred to a private holding company[18] and the other remained in TAVANIR.

d. Market Management and Regulatory Framework

The Iran Grid Management Company (IGMC) was funded as a state-owned company to handle the power market and operate the electricity network in 2004. The main objectives and the scope of activities of IGMC are: conducting and monitoring the production and transmission of the national network, developing competitive electricity market in generation and distribution, as well as adopting policy-induced participation of private sector into the market[19]. The market regulation is administrated by the Electricity Market Regulatory Board, which is a group of experts assigned by the Minister of Energy to monitor market performance and to revise the market operation rules and procedures.

Article (G), note 12 of 2004 budget law

"Since 2004, the Iran Power Transmission, Generation and Distribution Company (TAVANIR) is authorized to purchase the whole shares of one of its subsidiaries through its own financial resources, and transfer the entire tasks of national grid management, all the transactions, and establishing the power market and transit to this company."

---

[18] . http://sabainv.com/570_توزیع-نیروی-برق .html (In Persian- Visited on 14/12/2015)

[19] . http://www.igmc.ir/en#177930-introduction (Visited on 13/12/2015)

2.2 Electricity Trade

The electricity trade in Iran is performed in the following three mechanisms[20]:

a. Day Ahead Power Market

Figure 1 shows the basic operational diagram of Iran's power market. Sellers are state-owned regional electricity companies and other private companies which got a license from the Ministry of Energy to offer electricity in the power market. Sellers bid in the market for different quantity level and compete for the bidding price. Sellers which are state owned electricity companies offer the demanded blocks and finally the market clears for the matching points and notifies both seller and buyer. The main characteristic of the power market is that the bidding price is regulated and must be respected in a predefined certain cap. Moreover, they are paid for capacity tariff which compensates the investment cost of generation with a periodic escalation basis.

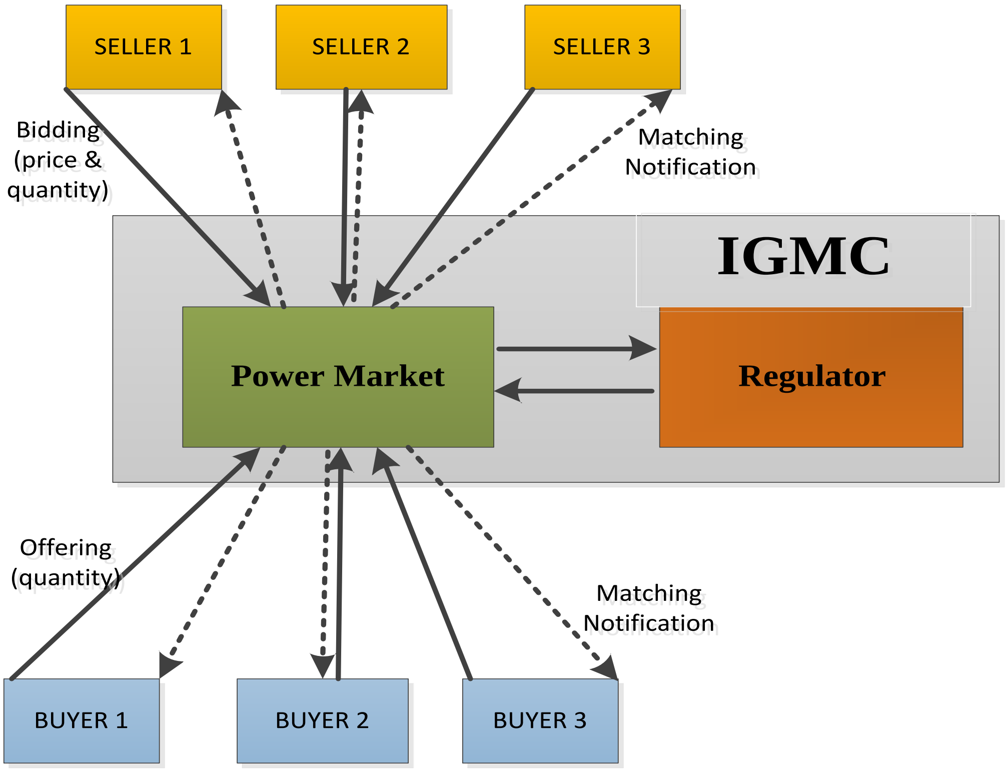


Figure 1 Operation of the power market in Iran[21]

---

[20] . http://www.igmc.ir/en/Company-units/Deputies/Electricity-Market/Market-in-depth (Visited on 11/12/2015)

[21] . http://news.tavanir.org.ir/papers/paper_detail.php?id=7676 (In Persian- visited on 11/12/2015)

b. Power Exchange

In the Iran Energy Exchange (IRENEX), the electricity trade is done through contracts with the purpose of real power delivery in the future. The main specification of the electricity pool is the unregulated bidding and offering mechanism in a competitive basis. It must be noticed that only the private independent power generators can participate in the IRENEX.

c. Bilateral Contracts

Another possibility in the power market is that both, the producer and the consumer, negotiate for specific capacity of electricity in a bilateral contract. Therefore, the price is defined during the negotiation without any regulation. However, the transaction has to be approved by the system operator (IGMC). Bilateral contracts are in their infant stages in which by subsidized tariff for final consumers there is a limited motivation to secure their needs by negotiation.

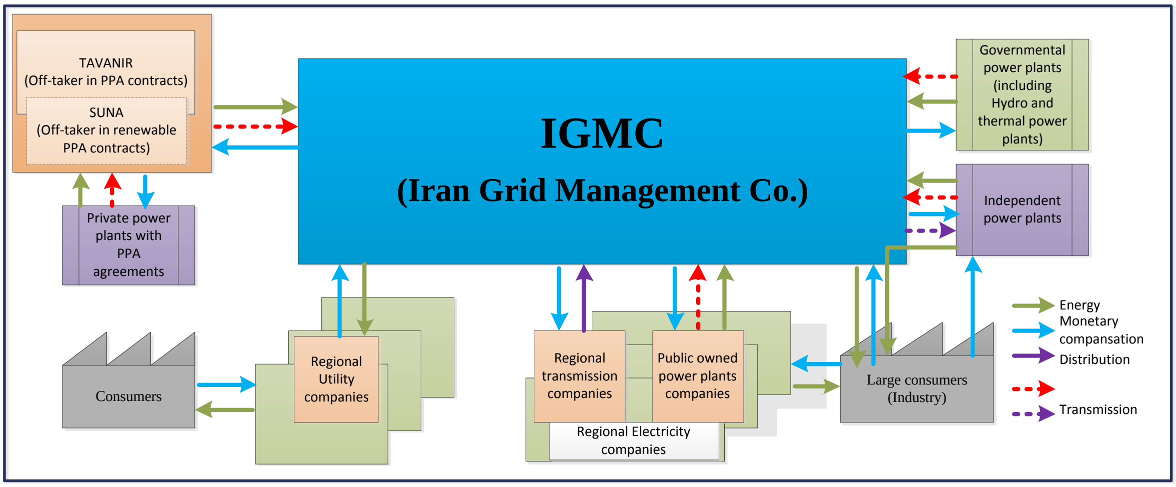


Figure 2 Overview of energy and monetary flows in power industry[22]

Figure 2 illustrates the process and flow of energy and monetary payments including all governmental and private entities. All generation companies, including public regional electricity companies, deliver their electricity to the market and compete for the price and quantity of the sale. It should be noticed that TAVANIR works as off-taker in power purchase agreements (PPA) in the power industry and usually participates in the competitive market on behalf of other private power plants that have PPA contract. Currently, independent thermal power plants benefit of a 5-year PPA. After the PPA period, they directly sell the electricity to the wholesale electricity market, energy exchange or to the potential customers.

Likewise, for renewable resources the Iran Renewable Energy Organization (SUNA) has the role of ‘planning, policy making, providing solutions and publicizing of information in this

---

[22] . http://news.tavanir.org.ir/papers/paper_detail.php?id=7676 (In Persian- with some updates for recent changes - Visited on 11/12/2015)

field[23]'. SUNA is assigned to facilitate private investment in this sector and works as electricity off-taker from the renewable generators. SUNA proposes and develops the legal and financial settings in annual Budget Acts and Five Year Development Plans (FYDPs).

2.3 Electrification Rate

Iran uses a mass transmission network which covers 100% of all urban areas. However, the electrification of rural areas has been a long term objectives in different FYDPs. Due to the vast distribution of villages over the country, rehabilitation and renovation of the network constitutes a major priority of TAVANIR's annual development programs. Besides this, in March 2013 about 603 villages with less than 20 households did not have access to the Grid which results in 98.9% electrification rate for villages, corresponding to 10.000 households not having electricity (see Table 1). The electrification performance in a longer period reveals that the average of the annual electrification growth rate was about 0.9% during 2009 to 2013 (see Table 2).

Table 1 Electrification rate in Iran's rural areas (2013)

Description	**Number of villages**	**Number of households**	**Electrification to the end of 1393 (March 2013)**		**Electrification rate of villages (%)**	**Electrification rate of households (%)**
			Number of villages	Number of households		
Villages with more than 20 households	41954	4133293	41954	4133293	100	100
Villages with less than 20 households	14313	161769	13710	151821	95.8	93.9
Total	56267	4295062	55664	4285114	98.9	99.8

Reference: Iran's Energy Balance (2013)

Table 2 Average annual electrification growth rate (2009-2013)

	Villages	**Households**
Growth rate	0.88%	0.17%

Reference: Research calculation based on 'Iran's Energy Balance' (2013)

2.4 Electricity Consumption per Sector

According to the total electricity consumption in the different sectors in 2013, the industrial and residential sector have the largest share with 34.6% and 31.7% respectively, followed by the agricultural with 16.3%, the public with 8.8% and the commercial sector with 6.6% (see Table 3 and Figure 4). Other sectors including transport represented about 2% of the total electricity consumption in that year. The consumption growth illustrated in Figure 3 shows that the average of annual consumption growth rate for the period 2005-2013 was about

---

[23] . http://www.suna.org.ir/en/history (Visited on 13/12/2015)

4.8%, where the agricultural sector had the highest growth rate equal to 8.1%. The residential and industrial sectors had 4.3% and 5.6% growth rate over the period 2005 to 2013, respectively.

Table 3 Electricity consumption per sector in different years (GWh)

Year	Residential	Public services	Commercial	Industrial*	Agricultural	Other	Total
2005	44108.3	16350.0	8541.7	43014.6	16469.4	4413.8	132897.8
	33.2%	12.3%	6.4%	32.4%	12.4%	3.3%	100.0%
2009	55629.6	21826.6	11015.3	54605.4	21405.1	3956.4	168438.3
	33.0%	13.0%	6.5%	32.4%	12.7%	2.3%	100.0%
2013	64378.9	17830.9	13376.6	70310.6	33103.1	4087.8	203088.0
	31.7%	8.8%	6.6%	34.6%	16.3%	2.0%	100.0%

*including petrochemical companies

Source: Iran's Energy Balance (2013)

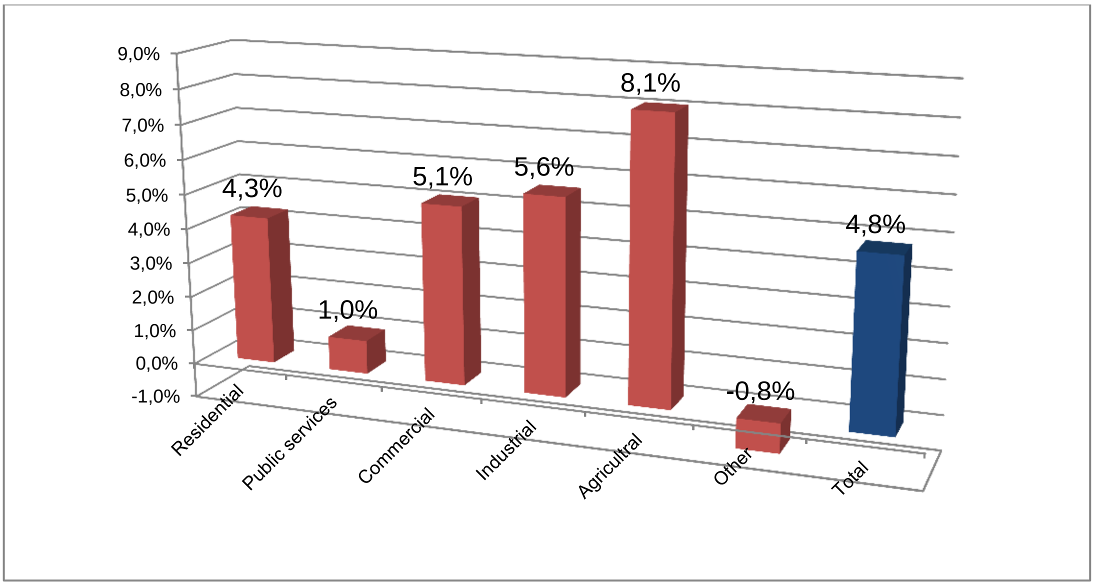


Figure 3 Electricity consumption growth rate (2005-2013) [24]

---

[24] . http://www.suna.org.ir/en/history (Visited on 13/12/2015)

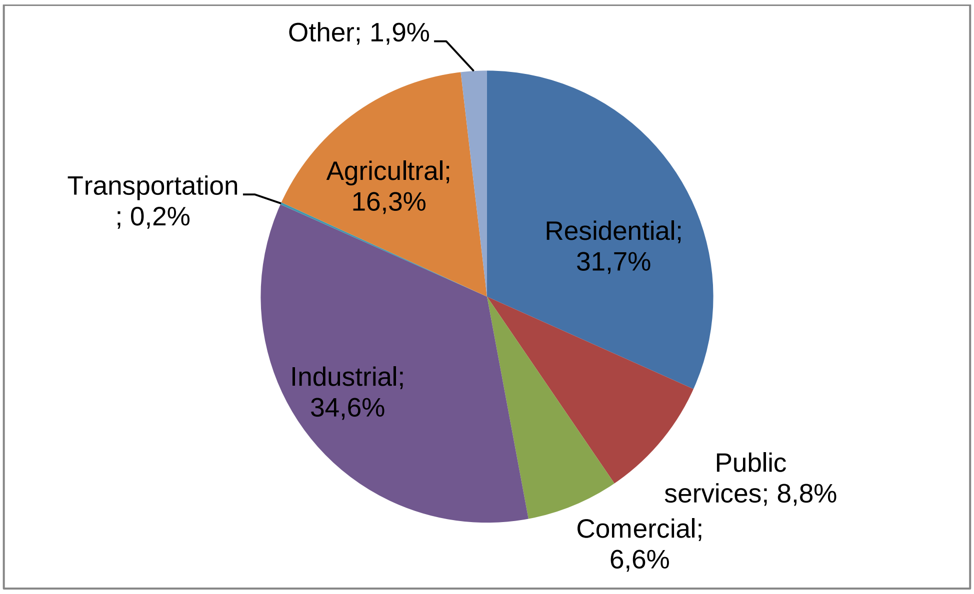
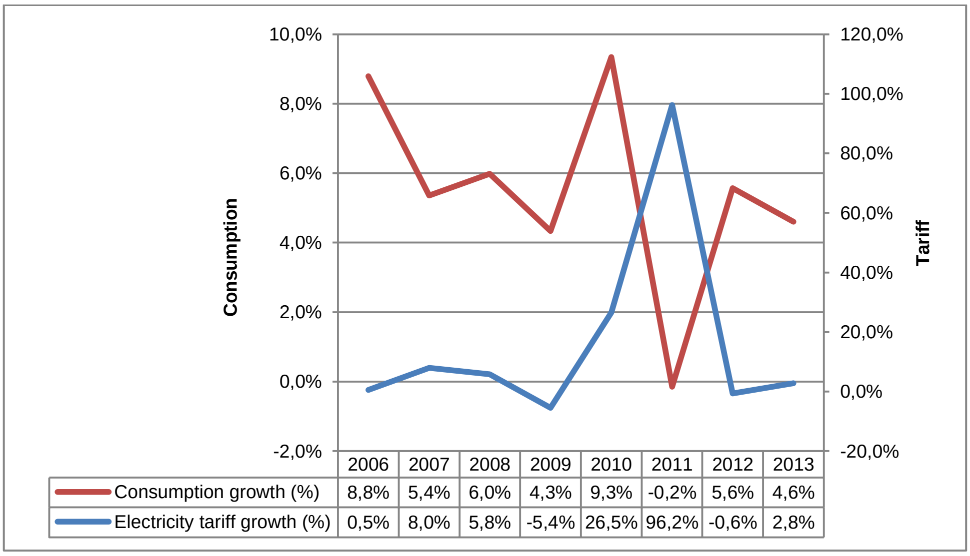


Figure 4 Share of electricity consumption per sector (2013)[25]

Before the energy market liberalization in 2011, and due to the high subsidy in the electricity market, the tariffs were not a determinant factor for the consumption. With the increase of the tariff in 2011 by 96.2%, the power market faced a collapse in the consumption. Hence, the consumption decreased by 0.2% in 2011 compared to 9.3% in 2010. However, in the following years the tariffs did not see major changes and the electricity consumption returned to its long term growth rate of about 5% (see Figure 5).



	2006	2007	2008	2009	2010	2011	2012	2013
🟥 Consumption growth (%)	8,8%	5,4%	6,0%	4,3%	9,3%	-0,2%	5,6%	4,6%
🟦 Electricity tariff growth (%)	0,5%	8,0%	5,8%	-5,4%	26,5%	96,2%	-0,6%	2,8%

Figure 5 Electricity consumption growth rate and percentage changes of the electricity tariff[26]

---

[25] . http://www.suna.org.ir/en/history (Visited on 13/12/2015)

[26] . Ibid

2.5 Electricity Tariffs

2.5.1 Electricity Tariff Structure

The electricity pricing policy is usually proposed by the Ministry of Energy (MoE) in the annual budget law in accordance with the relevant five-year development plans. The pricing mechanism differs in each consuming sector. The agricultural sector has the lowest tariff and commercial sector (categorized in other sector) has the highest one. Until 2010, the electricity tariffs did not have significant changes for several years because the policy makers supported the fixed price regime in the energy market.

Table 4 Electricity tariff in each consuming sector and weighted average tariff- Rls/kWh (2005-2013)

Year	Residential	Public Services	Agricultural	Industrial	Others*	Weighted average
2005	102.7	176.8	21.6	201.4	449.6	152.0
2006	102.9	181.7	21.3	200.4	541.2	152.8
2007	124.7	159.6	21.0	205.9	508.0	165.0
2008	119.4	228.0	22.0	204.7	407.1	174.5
2009	129.0	152.0	21.0	206.0	501.0	165.0
2010	142.3	226.5	46.8	263.6	599.1	208.7
2011	**334.8**	**501.6**	**125.7**	**441.9**	**1275.3**	**409.5**
2012	337.5	491.0	131.1	427.5	1339.5	407.0
2013	346.7	516.3	133.4	442.6	1342.2	418.5

* including commercial customers

Reference: Iran's Energy Balance (2013)

In 2010 the parliament approved the Subsidy Reform Act to be implemented over the 5th five-year development plan. In the first year, the average electricity tariff doubled (increased from 208.7 Rls/kWh in 2010 to 409.5 Rls/kWh in 2011-see Table 4) with the highest increase for the agricultural sector (by 268%). This sector had benefited the high electricity subsidies. The residential tariff was determined below the average price; however, the reform defined it in a multi-tier form based on the monthly consumption level where the price for households increases in relation with the consumption[27].

Table 5 Residential electricity tariffs in non-tropical regions (2015)

Average monthly energy consumption (kWh/month)	Electricity tariff (Rls/kWh)
0-100	409
100-200	477
200-300	1023
300-400	1841
400-500	2114
500-600	2660
more than 600	2933

Reference: TAVANIR's Electricity Tariff website[28] (visited in 11/12/2015))

---

[27] . At the same time, hot climate regions where the consumption of electricity due to wide uses of cooling systems are significantly higher than the average of country, got a predetermined discount.

[28] . http://bahaye_bargh.tavanir.org.ir/ (Visited on 11/12/2015)

Table 5 shows the multi-tiered electricity tariff for household consumption in 2015 approved by the Ministry of Energy. Therefore, the tariffs for household with less than 200 kWh per month is low, whereas for the next 100 kWh, the tariffs increases rapidly to more than 7 times in high consumption rate (more than 600 kWh per month).

In the public sector, the proposed tariff structure is completely different for small scale (less than 30 kW) and for large scale demands (more than 30 kW). For large scale consumers, TAVANIR charges a fix cost for available capacity (demand) during the year. To secure the amount of capacity, an additional payment is required regardless of the energy consumption level. Additionally, a variable tariff per kWh is charged to cover the realized electricity consumption (see Table 6).

In case of small scale consumption, the tariff structure is based on the variable tariff without the additional payment for the capacity (demand). The tariff codes in the table, refers to the type of public organization defined specifically in the instruction of TAVANIR[29].

The tariff structure for agricultural and industrial sectors follows a similar formula as the public sector but at different rates and categories. In summary, the public sector pays higher tariffs than the industrial sector. Agricultural customers benefit from the lowest capacity charge and electricity tariff in all categories (see Table 6, Table 7 and Table 8).

Table 6 Electricity tariff structure for public sector (2015)

Tariff Code		**More than 30 KW demand**				**Less than 30 KW demand**			
		Capacity Fee (Rls/kW)	Energy Fee in different load factor[30] (Rls/kWh)			Capacity Fee (Rls/kW)	Energy Fee in different load factor (Rls/kWh)		
			Low load period	High load period	Mid load period		Low load period	High load period	Mid load period
A-2	Option 1	44640	818.5	3274	1637	-	967	3868	1934
	Option 1	37200	253.0	1012	506	-	327.5	1310	655
B-2		17856	141.5	566	283	-	179	716	358

Reference: TAVANIR's Electricity Tariff website[31] (visited in 11/12/2015)

---

[29] . For example Code A-2 includes all ministries, governmental organizations, municipalities, suburban street lights, research institutes, hospitals, etc.

[30] . Each day, the high load factor is equal to 4 hrs. and the medium load factor is equal to 8 hrs. which remains 12 hrs. in a day with low load period. The exemption is the total annual period in each region, where the high load factor must not exceed 1460 hours.

[31] . http://bahaye_bargh.tavanir.org.ir/ (Visited on 11/12/2015)

Table 7 Electricity tariff structure for the agricultural sector (2015)

Tariff Code		More than 30 KW demand				Less than 30 KW demand			
		Capacity Fee (Rls/KW)	Energy Fee in different load factor			Capacity Fee (Rls/KW)	Energy Fee in different load factor (Rls/KWh)		
			Low load period	High load period	Mid load period		Low load period	High load period	Mid load period
A-3		-	110	220	55	-	110	220	55
B-3		16368	213	426	106.0	-	266	532	133
C-3	Option 1	27280	279	558	139.5	-	416	832	208
	Option 2	-	416	832	208				

Reference: TAVANIR's Electricity Tariff website[32] (visited in 11/12/2015)

Table 8 Industrial electricity tariff structure (2015)

Tariff Code		More than 30 KW demand				Less than 30 KW demand			
		Capacity Fee (Rls/kW)	Energy Fee in different load factor in different load factor (Rls/kWh)			Capacity Fee (Rls/kW)	Energy Fee in different load factor in different load factor (Rls/kWh)		
			Low load period	High load period	Mid load period		Low load period	High load period	Mid load period
4-A	Option 1	47616	506	1012	253	**-**	655	1310	327.5
	Option 2	17856	581	1162	290.5				
	Option 3	-	641	12823	320.5				
B-3	Option 1	26784	298	596	149	**-**	403	806	210.5
	Option 2	13392	358	716	179				
	Option 3	-	403	806	201.5				

Reference: TAVANIR's Electricity Tariff website[33] (visited in 11/12/2015)

Commercial customers with more than 30 kW demand (see Table 9), have variable tariff rates depending on the hourly load factor and fixed capacity charge for guaranteed capacity (demand). However, for customers with less than 30 kW demand a different mechanism based on the multi-tier tariff structure is defined without any fix payment for demand (see Table 10).

---

[32] . http://bahaye_bargh.tavanir.org.ir/ (Visited on 11/12/2015)

[33] . Ibid

Table 9 Electricity tariff in other sectors for demands more than 30 KW (2015)*

Energy Fee (Rls/kWh)			Capacity Fee (Rls/kW)
Low load period	High load period	Mid load period	
818.5	3274	1637	29760

*including commercial customers

Reference: TAVANIR's Electricity Tariff website[34] (visited in 11/12/2015)

Table 10 Electricity tariff in other sectors for demands less than 30 kW (2015)*

Average monthly energy consumption (kWh/month)	Electricity tariff (Rls/kWh)
0-100	1637
100-200	1711
200-300	1786
300-400	1860
400-500	2083
500-600	2381
more than 600	2678

*including commercial customers

Reference: TAVANIR's Electricity Tariff website[35] (visited in 11/12/2015)

Article 1 of the Reform Act emphasizes that the average domestic sales price of electricity would be adjusted gradually until the end of the 5th five-year development plan up to a level which shall be equal to the full cost price[36].

The full cost price includes the total of energy conversion, transmission and distribution costs plus the fuel cost. For the purpose of fuel cost calculation, the Reform Act considered 38% efficiency in generation for the first year of implementation and defined an average increase of 1% in each year up to the end of 5th five-year development plan.

The nominal electricity tariffs in all consuming sectors over the period 2005 to 2013 are showed in Figure 6 and the inflation adjusted tariffs using a consumer price index (real electricity tariffs) in Figure 7. It can be seen that the nominal tariffs grew along with the implementation of Reform Act after 2010 and the real prices decreased as a result of high inflation rate imposed to the economy during the same period.

---

[34] . http://bahaye_bargh.tavanir.org.ir/ (Visited on 11/12/2015)

[35] . Ibid

[36] . Reference: 'Iran–The Chronicles of the Subsidy Reform'- IMF Working Paper- Guillaume et al. (2011)

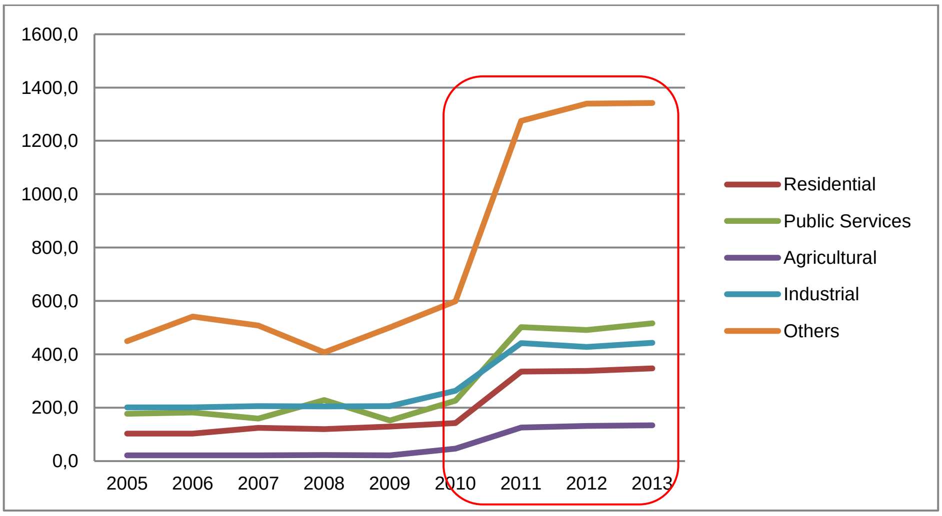


Figure 6 Electricity tariff per consuming sector in current price- Rls/kWh (2005-2013) [37]

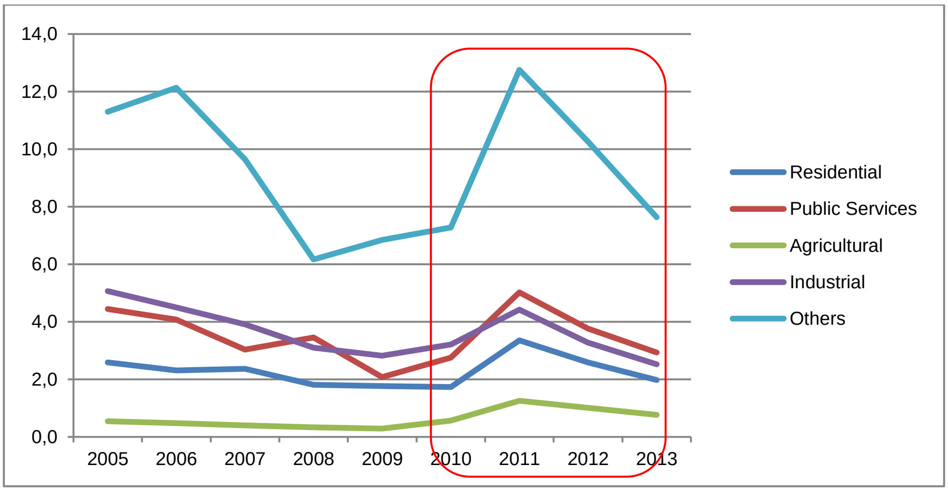


Figure 7 Adjusted Electricity tariff by consumer price index- Rls/kWh (2005-2013- base year of 2011) [38]

2.5.2 Electricity Price Structure of PV Power Plants

In July 2015, the Ministry of Energy introduced a new Feed in Tariff (FiT) for electricity generated from renewable resources. The new FiTs are differentiated for each type of technology (renewable resources and waste heat recovery plants) and the duration of the old 5-year Power Purchase Agreement (PPA) was extended to 20 years. These substantial changes, improved the economy of investment in renewable energy sector.

In addition, to avoid the exchange rate and inflation risk for investors, the adjustment formula is defined in PPA contract in accordance with Article 133 of the 5th five-year development plan and its following executive instruction (see chapter 3 for a detailed explanation of new PPA and the escalation formula).

---

[37] . Reference: Iran´s Energy Balance (2013)

[38] .Reference: Iran’s Energy Balance (2013) and http://www.cbi.ir/category/1624.aspx

For example, in a hypothetical 5 MW PV project with 6,750 Rls/kWh contract tariff and pre-assumption of the inflation rate of 13% and annual growth rate 8% for Euro/Rial exchange rate, the adjustment coefficient for the first operation year would be equal to 1.0948. Therefore, the electricity tariff would be equal to 7,390 Rls/kWh (6,750 × 1.0948) (see Table 10 for sample calculation of the first five-years).

Table 11 Tariff escalation calculation for a hypothetical 5 MW PV project

Year	0	1	2	3	4	5
Consumer Price Index*	100	113	128	144	163	184
Exchange rate**	32,000	34,560	37,325	40,311	43,536	47,018
Escalation Rate	1.00	1.09	1.20	1.31	1.44	1.57
Tariff (Rials/KWh)	6,750.0	7,389.7	8,089.9	8,856.5	9,695.8	10,614.6

* Inflation rate is assumed 13% **Annual Euro/Rls growth rate is assumed 8%

Source: Research calculation

2.6 Electricity Mix and Share of Renewable Energy

Iran holds the fourth-largest oil reserves in the world and the second-largest gas reserves. The abundant subsidized oil and natural gas caused renewable energies (except hydro power plants) to not have a significant role in Iran's electricity generation. The capacity of installed conventional power plants increased about 70% from 2005 to 2013, reaching 70 GW in the last year (see Table 12). In 2013, the gas turbines constituted 35.2% of the installed capacity and the combined cycle and steam power plants had 25.4% and 22.5% respectively. Conventional hydro power plants operating on the large dams had 14.5% and diesel plants constituted less than 1% of the total capacity of the network in 2013. The 1020 MW nuclear power plant in south of Iran was installed in 2011 which left the remaining share to other renewable technologies to 0.2% in 2013 (Figure 8).

Table 12 Nominal installed capacity and electricity generation (2005 and 2013)

Power plant type	2005		2013	
	Capacity (MW)	Generation (GWh)	Capacity (MW)	Generation (GWh)
Steam	15578.0	93382.8	15829.2	89664.0
Gas	12049.3	32128.9	24714.7	66038.8
Combined cycle	6831.7	36194.0	17849.1	87135.1
Diesel	493.1	212.0	439.4	71.1
Hydro	6043.9	16100.2	10266.0	14582.0
Wind	47.6	71.0	110.1	375.6
PV	0.144	0.000	0.069	0.068
Nuclear	0.0	0.0	1020.0	4545.8
Biogas	0.0	0.0	6.9	20.8
Total	41043.7	178088.8	70235.5	262433.3

Source: Iran's Energy Balance (2013)

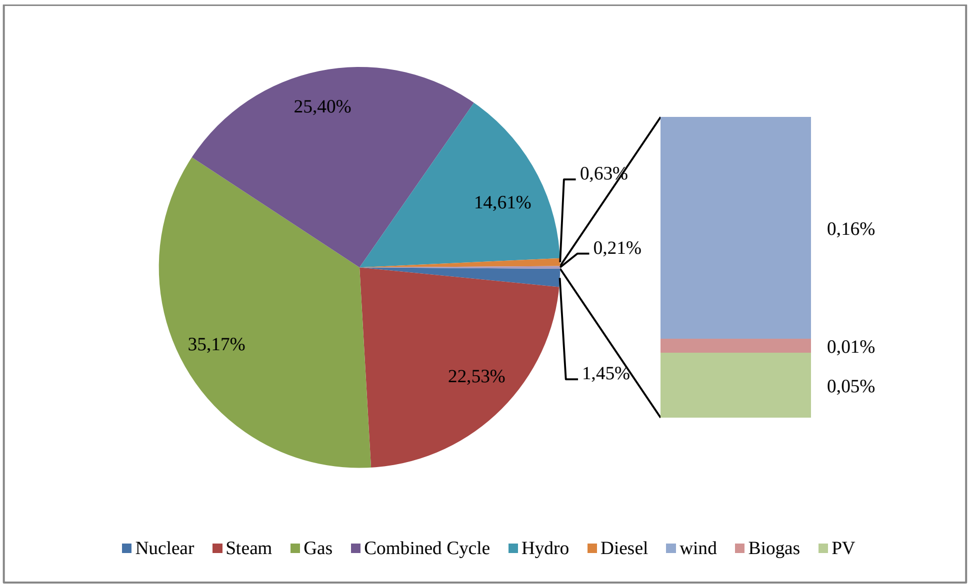


Figure 8 Electricity generation capacity mix (2013) [39]

2.7 Solar Market Today

2.7.1 Solar PV Power Plants

According to the Energy Balance sheet of 2013, most of the PV power plants were installed by the Ministry of Energy for rural electrification. The total installed capacity of PV power plantswas about 87 kWp; among them the 12 kWp off-grid in Yazd province. Besides this, a 6 kWp hybrid PV-wind system was installed at the MoE building in 2012[40] (see Table 13).

Table 13 Actual electricity generation (in kWh) and nominal capacity of solar PV power plants (2013)

Discription	Tehran (MoE building)	Alborz (Taleghan)	Yazd (Darbid)	Semnan (Sar kavir)	Azarbayejan East (Tabriz)	Total
Installed capacity (kWp)	6	30	12	15	24	87
Grid connection	On grid	On grid	Off grid	On grid	On grid	
2005	-	10000	18000	25000	-	53000
2006	-	42000	17000	20000	-	79000
2007	-	32000	15000	24000	-	71000
2008	-	35000	19000	21000	-	75000
2009	-	31000	15000	21000	5000	72000
2010	-	32000	17000	18000	27656	94656
2011	-	24000	-	-	24010	48010
2012	3500	26529	-	-	33779	63808
2013	8500	34226	-	-	25302	68028

1. Due to implemeting connection to the national grid in these villages, installed PV systems no longer work.
2. The 6 kWp hybrid wind-solar system has been working as a 5 kWp PV system connected to the grid after Nov. 2012
3. There are other 10 kWp PV in Tehran working as a stand-alone system with no official recorded operation data.

Source: Iran's Energy Balance (2013)

---

[39] . Reference: Iran´s Energy Balance (2013)

[40] . This reported capacity is only the PV power plants which are different from the distributed PV systems over the country described in section "2.8.3".

2.7.2 Distribution of Solar PV systems

There are several installed PV systems over the country working as distributed source of electricity. Most of them supply electricity to the streets and parks lighting. Others are applied for traffic lights, bus stations, telecommunication systems and distributed residential electricity supply to rural areas. Table 14 shows the total installed capacity of PV systems until March 2013, which corresponds to 32 MWp.

Table 14 Nominal capacity of installed distributed solar PV systems (2013)

Description	Capacity (KW)
Street lights and parks energy supply	23500
Traffic lights and bus stations electrification	2240
Universities, regional power companies and other governmental organizations	1562
Telecommunication systems	3800
Electrification of rural areas (967 households)	979
Total	32081

Source: Iran's Energy Balance (2013)

2.7.3 PV Production Capacity

In 1993 a production line for multi-crystalline silicon solar cells and modules was installed in Tehran by the Ministry of Post, Telegraph and Telephone (PTT). Since then, the application of photovoltaic energy is spreading in various fields in Iran. Currently there are five active factories in Iran which assemble the modules locally. These are located in Khorasan-Jonoubi, Yazd, Khorasan-Razavi, Semnan and Kerman provinces each with a capacity between 10MW to 30MW. At the same time a considerable part of the solar modules used in the country are imported from China and to a lesser extend from Europe. There are also plans to enter into the photovoltaic upstream supply chain, based on considerable silica resources of Iran[41].

2.7.4 Private PV Investment

The private sector was not active in the renewable energy investment until the ratification of Article 133 (section B) of the 5th five-year development plan in 2011. Following the approval of this legal commitment, TAVANIR presented the FiT model for private investment in 2012 which was initially limited to 5 years and proposed the same price (4480 Rials/kWh) for all renewable energy sources[42].

After that, another payment mechanism which is named “Buy-Back contracts” was introduced in Article 19 of Budget Act 2013 to enhance the investment in renewable energies. Under this mechanism, the investment costs have to be compensated through the avoided liquid fuel consumption (mainly the Gas Oil) for each kWh of electricity generation in

---

[41] . Farzad Jafarkazemi, “Solar Business between Iran and Turkey; Future Perspectives and Opportunities”, SOLARTR 2014 Conference & Exhibition, 19–21 November 2014, Izmir

[42] . Hereafter it is named “old FiT”.

the first two years of operation period. The operation and maintenance (O&M) costs, financing costs and investor’s profit modelled in the form of direct sale of electricity to TAVANIR (in the form of PPA for 3 years) and to the competitive electricity market for remaining project life time.

Even though the demand for investment during this period increased remarkably, the actual installed PV was limited to a 514 kWp PV power plant (see Table 15). The main reason for this poor performance in the sector was the insufficient financing resources during the trade restrictions, short PPA periods and the uncertainty of the project cash flow after finishing the 5-year PPA period. All these obstacles encouraged SUNA to introduce the new FiT plan that enables investors to have technology-specific electricity tariffs and benefitting a 20-year PPA contract (more details are described in Chapter 3).

Table 15 Combination of MW installed and planned investment projects in renewable (2015)

Description		Wind	Photovoltaic	Biomass	Small Hydro	Sea wave power	Total
Installed plants		53.88*	0.514	10.56	0.44	-	65.39
Projects with submitted PPA	Under Art. 19 mechanism	551.5	10.3	-	0.17	-	561.97
	Under Art. 133 mechanism	959	5	-	3.6	-	967.6
Total		1564.38	15.814	10.56	4.21	0	1594.96

*Binalood wind farm with the capacity of 28.4 MW was installed by MoE and transferred to private sector in privatization.

Source: http://www.suna.org.ir/ (visited in 12/12/2015)

Currently, there are three private solar plants which acquired their PPAs. The largest one is located in Semnan province with 10 MW installed capacity. The two other ones are located in Fars and Alborz Provinces with 0.3 MW and 5 MW nominal capacities, respectively (see Table 16).

Table 16 PV projects with power purchase agreement (2015)

Item	Capacity (MW)	Location (province)	Type of electricity supply agreement
1	10	Semnan	PPA with SUNA
2	0.3	Fars	PPA with SUNA
3	5	Alborz	Buy-Back contract

Source: http://www.suna.org.ir/ (visited in 12/12/2015)

2.8 Market Potential of Solar PV

2.8.1 Potential of PV in Technical View

Iran is potentially one of the best regions for solar energy utilization. The average solar radiation in Iran is 4.5 to 5.5 kW h/m2, with 300 sunny days per year on ⅔ of its land area.[43] Moreover, a country-wide assessment shows that on 80% of the land in Iran’s territory, the solar irradiation would be between 1640 to 1970 kWh/m^2 per year[44]. Based on 4 categories of solar radiation which are distinguished by different geometry shapes, Iran is divided into 6 main regions. The higher irradiation rates belongs to central-south areas of Iran with the average irradiation of 5.2 to 5.4 kWh/m^2/day in Kerman, Yazd, Fars, Kohkiluyeh va Buyer Ahmad, Hormozgan and Chaharmahal va Bakhtiari provinces. Most of these regions are dry and dusty land with higher operation cost of PV systems due to lack of self-cleaning mechanism.

Figure 9 shows the global horizontal irradiation for Iran.

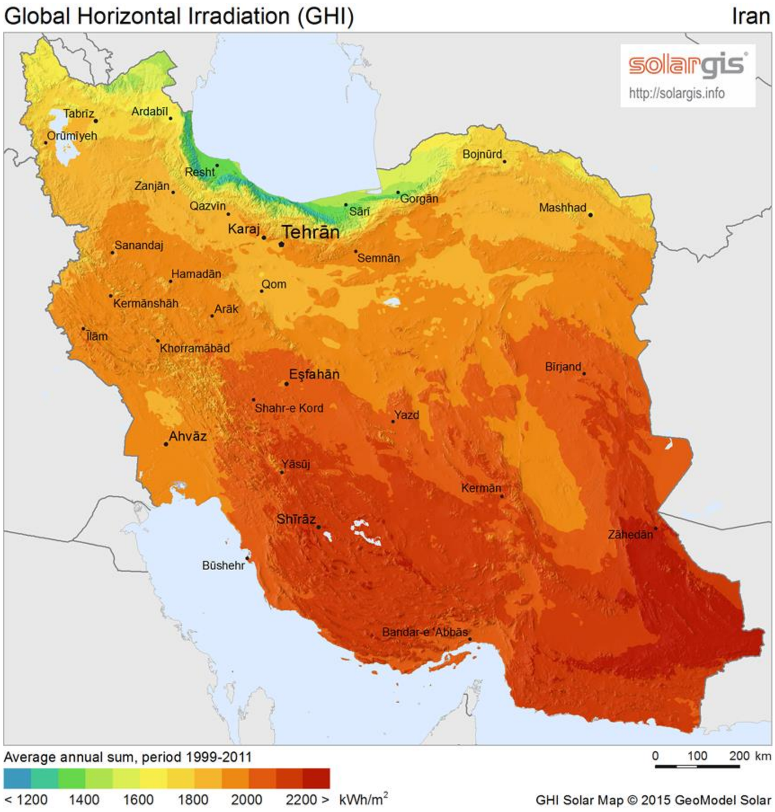


Figure 9 Iran Solar Irradiation[45]

---

[43] Source: SUNA http://www.suna.org.ir/fa/sun/potential-پتانسیل-تابش-و-نقشه-تابش-خورشید-در-ایران (In Persian- Visited on 20/12/2015)

[44] . ‘Development of three cornerstones for a sustainable Energy future in Iran’- German-Iranian co-operation VI- Wuppertal Institute for climate, environment and energy (2010)

[45] Source: SolarGIS © 2015 GeoModel Solar: http://solargis.info/doc/free-solar-radiation-maps-GHI (Visited on 25/12/2015)

2.8.2 Potential Market for Large Scale PV Investment

According to the 5th development plan (2010 to 2015), 5000 MW of installed capacity of renewable energy was determined as the target for renewable energy. This target was supposed to be achieved by the private sector through guaranteed purchase of the electricity.46 However, this target has not been achieved. The new target for the next five-year development plan (6th development plan for 2016-2020) was set by the Ministry of Energy, and has not been passed yet by the parliament. According to this new plan, the share of renewable energy should be at least 5% of the nominal installed capacity of the country in 2020 (at the end of the five year period)47 which would be around 5000 MW out of 100.000MW installed capacity.

Considering the current composition of investment requests for renewable energies in all development phases, it reveals that about 75.5% of the renewable energy market is devoted to wind, 21.5% to PV, 2.6% to biomass and about 0.3% to small hydro power plants. Therefore, the approximate estimation of market for PV systems as power plant investment in next 5 years is equal to 1077 MW (see Table 17).

Table 17 Renewable energy projects under development and potential market in the 6th FYDP (2016-2020)

Renewable energy resources	Wind	Photovoltaic	Biomass	Small Hydro	Sea wave power	Total
Under development* (MW)	5662.96	1615.03	194.29	23.5	0.15	7495.93
Share in total planned investment	75.5%	21.5%	2.6%	0.3%	0.0%	100.0%
Estimated demand for renewable systems)MW)	3777.4	1077.3	129.6	15.7	0.1	5000.0

*with at least construction permission, primary agreement or prepared feasibility studies

Source: http://www.suna.org.ir/ (visited on 12/12/2015)

2.8.3 Potential market for self-consuming PV systems

Calculation presented in Table 18 shows that on average each Iranian household demanded about 2.6 MWh in 2013. A the same time, a typical customer consumed about 13.9 MWh in public sector, 3.9 MWh in commercial sector, 364.8 MWh in industrial sector, and about 100.3 MWh in agricultural sector. Bushehr, Khuzestan and Hormozgan provinces had the highest specific electricity consumption in 2013 in their residential, public and commercial sectors considering that these regions have the warmest climate among residential areas in Iran which make it necessary to use electrical cooling systems. Moreover, the first two ones, Bushehr and Khuzestan, are the top consuming provinces for their local industrial activities. Agricultural electricity consumption is about two times more than the country average in Kerman, Khorasan-Razavi, Tehran and Khuzestan. These regional consumption figures demonstrate the important effect of climate on electricity consumption and are representative

---

[46] http://www.suna.org.ir/en/opportunitiestoconstruction/opportunities (Visited on 25/12/2015)

[47] http://pep.moe.gov.ir/ 6/ستاد-برنامه-ششم-توسعه-در-وزارت-نیرو/مصوبات-و-خروجی‌ها.aspx (In Persian- Visited on 11/12/2015)

of size of consuming units in industrial and agricultural sectors in each region. In addition, it demonstrates the high potential for applying self-consumption roof-top and private owned small scale PV systems.

Table 18 Per capita consumption in each sector-province in MWh (2013)

Province	Residential	Public services	Commercial	Industrial	Agricultural
Khuzestan	9.2	38.0	5.3	2289.0	212.5
Hormozgan	9.0	36.9	7.9	2042.5	85.1
Markazi	1.7	11.1	2.7	887.2	138.6
Kerman	2.6	22.4	3.4	627.5	268.6
Qazvin	1.7	7.9	2.6	601.3	192.7
Zanjan	1.6	11.0	2.3	589.7	79.3
Yazd	1.9	15.6	2.6	512.5	89.7
Lorestan	1.8	21.0	2.5	466.3	87.9
Esfahan	2.0	15.6	2.7	462.8	70.1
Khorasan- North	1.4	9.2	2.0	401.0	118.6
Khorasan-Razavi	1.8	10.6	2.9	225.0	271.5
Semnan	1.7	10.2	2.3	342.2	144.7
Kermanshah	1.8	22.8	2.2	349.4	63.1
Alborz	1.9	7.8	3.4	270.0	152.4
Bushehr	9.6	66.1	6.3	311.5	40.6
Tehran	2.3	11.0	5.2	188.9	220.8
Ilam	2.6	31.9	2.4	281.9	65.3
Hamadan	1.8	12.1	2.1	252.0	112.1
Kohgiluyeh & Bakhtiari	2.7	17.8	3.3	297.6	57.5
Qom	2.3	20.8	3.5	182.2	158.5
Fars	2.4	21.2	3.5	179.2	105.1
Chahar Mahal & Bakhtiari	1.5	12.2	2.1	194.7	93.8
Gilan	1.9	7.8	2.2	256.2	29.2
Golestan	2.3	8.3	2.5	215.3	57.4
Sistan & Baluchestan	3.9	28.4	3.5	169.9	68.3
Azarbayejan-West	1.7	11.9	2.0	200.7	56.6
Azarbayejan- East	1.6	9.2	2.1	199.1	60.5
Khorasan- South	1.3	10.4	2.4	93.6	123.0
Ardabil	1.4	8.1	2.0	145.7	69.1
Mazandaran	2.1	9.0	2.8	172.1	18.4
Kordistan	1.8	11.0	2.0	115.5	58.6
Average country	**2.6**	**13.9**	**3.5**	**364.8**	**100.3**

Source: Research calculation based on 'Iran's Energy Balance' (2013)

3 Electricity Regulatory Framework

The key actors in charge of the regulatory framework in Iran will be presented in the next subchapters.

3.1 Ministry of Energy of Iran

The Ministry of Energy (MoE) of Iran was established in 1975 to be in charge of managing and coordinating water and energy activities except oil and gas. Until the middle of 1990s, the electricity sector in Iran was completely centralized and managed by the Ministry of Energy. In accordance with privatization program, the government seeks to increase private sector participation in currently centralized sector, including the electricity sector.

The MoE is the main organ of the Government, responsible for the regulation and implementation of policies applicable to four main industries including electricity, renewable energies, water and wastewater services. To carry out these tasks and responsibilities, a very complex structure was designed.

Based on the separation of duties, decentralization and delegation of authority, the structure of the Ministry of Energy is divided in three main levels and in this scope each level has specific tasks and areas.[48]

The first level is responsible for governance and policy making. There are five deputy positions in this level that is shown in the organizational chart of the Ministry of Energy of Iran in Figure 10.[49]

The second or middle level is the executive level which is in charge of planning, monitoring and evaluating the implementation of the macroeconomic policies and regulations by their subsidiary companies. Four Expert holding companies administrating electricity industry and water and wastewater industry are at this level. In Figure 11 the Electric Holding Company of Generation, Transmission & Distribution Company (TAVANIR Holding Company), which is the responsible for renewable energy at this level[50], is shown.

The third is the operational level. Each holding company at the second level holds several subsidiaries at the operational level.[51] For example there are 83 companies under the management of the TAVANIR holding company, which are shown in Figure 11 and Table 19.

---

[48] http://www.moe.gov.ir/Inner-Pages/MainNav/ درباره-وزارت-نيرو/ساختار-سازماني/سطح-يك-(حوزه-ستادي)-(1).aspx (In Persian- Visited on 13/12/2015)

[49] Ibid

[50] http://www.moe.gov.ir/Inner-Pages/MainNav/درباره-وزارت-نيرو/ساختار-سازماني/سطح-دو-(مياني)-(1) .aspx (In Persian- Visited on 13/12/2015)

[51] http://www.moe.gov.ir/Inner-Pages/MainNav/ درباره-وزارت-نيرو/ساختار-سازماني/سطح-سه-(عملياتي).aspx (In Persian- Visited on 13/12/2015)

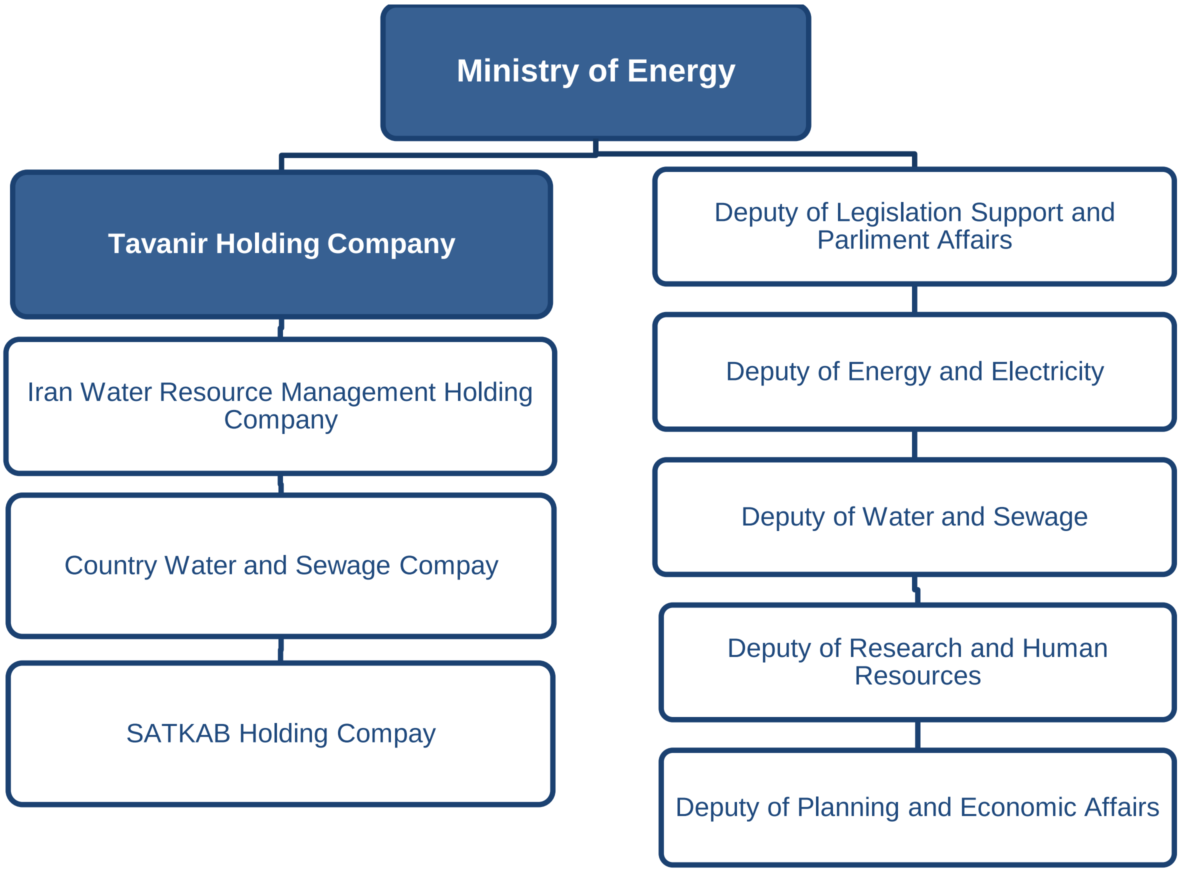


Figure 10 Organizational Chart of the Ministry of Energy[52]

3.2 The Electric Holding Company of Generation, Transmission & Distribution (TAVANIR)

TAVANIR was established to organize the supervisory activities of the government in the fields of operation and development of the Electric Power Industry. It conducts the affiliated companies and utilizes facilities of the Electric Power Industry of the country[53].

Currently the company is responsible for the management of 16 Regional Electric Companies, 28 Generation Management Companies, 39 Distribution Companies, Iran Power Development Co. (IPDC), Renewable Energy Organization of Iran (SUNA), Iran Energy Efficiency Organization (SABA), Iran Power Plant Project Management (MAPNA) and Iran Power Plant Repairs Co[54]. Based on this arrangement all shares of aforesaid companies have been transferred to TAVANIR. The General Assembly of TAVANIR is composed of:

- The Minister of Energy (Chairman the Assembly)
- The Minister of Assets and Economy
- The Head of Management & Planning Organization of the country

---

[52] Ministry of Energy and Tavanir Holding Company, statistical report n 44 years of activities of Iran electric power industry (1967-2010), published in October 2011

[53] http://www2.tavanir.org.ir/info/stat83/sanatlhtml/restructurin.htm (Visited on 12/12/2015)

[54] http://www.tavanir.org.ir/index.php (Visited on 12/12/2015)

- The Minister of Oil
- The Minister of Mine and Industries

The organizational chart of TAVANIR is shown in Figure 11. The organizations which are involved in the procedure of renewable energy are highlighted in blue.

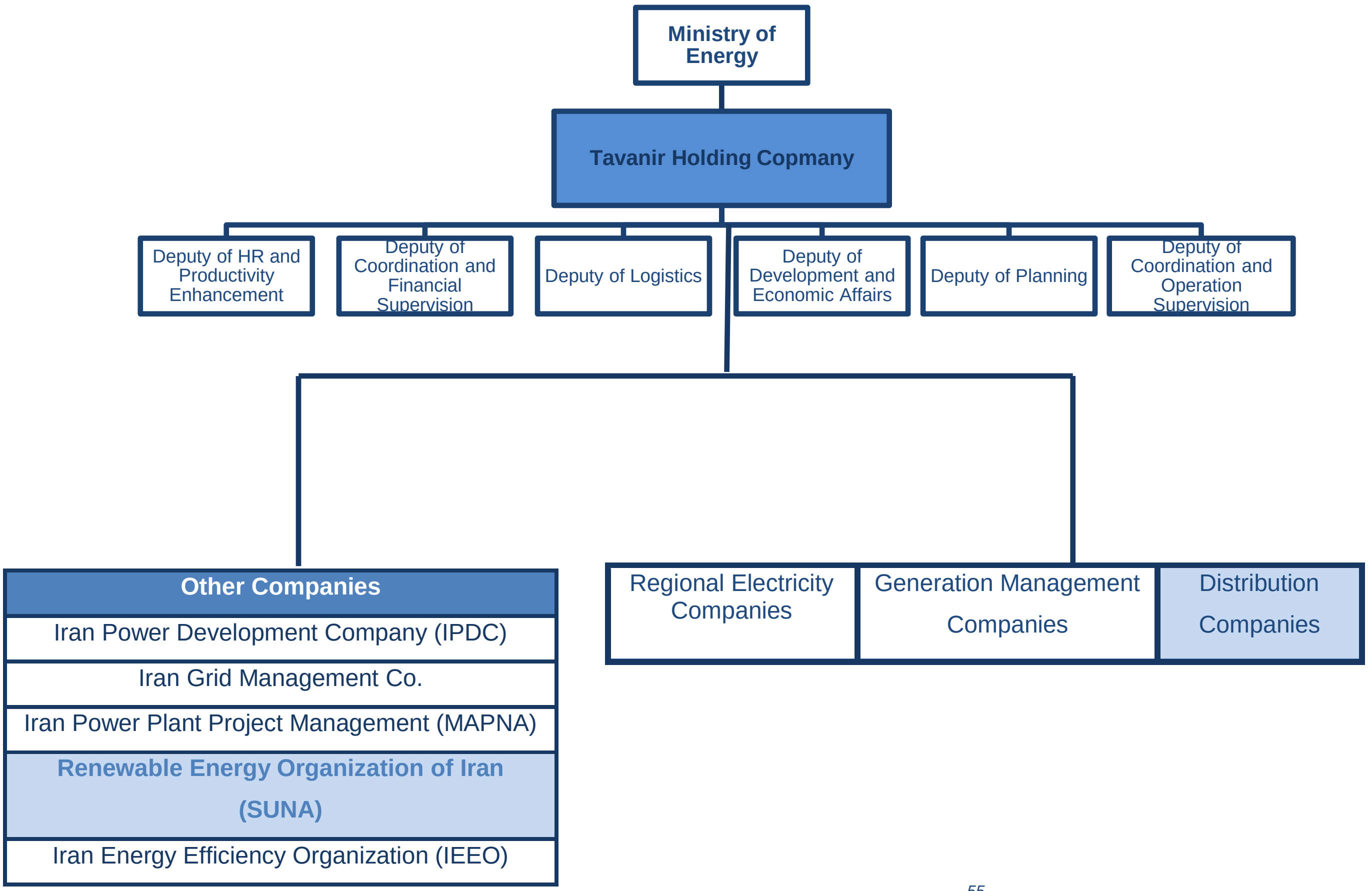


Figure 11 Organizational Chart of the TAVANIR Holding Company[55]

Regional Electricity Companies

The regional electricity companies belong to the Holding Company of TAVANIR, which is responsible for the coordination of their affiliated companies of generation, transmission and distribution, as well as for the sell and supply of electricity to all consumers in their region. These 16 Regional companies are listed in Table 19.

The total share of all these companies is public and is administrated by TAVANIR. . The generation, transmission and distribution facilities in each region are under the ownership of the relative Regional Electricity Company.

Transmission

There is a department under the title of “Deputy of Power Transmission” or “Deputy for Operation” in each Regional Electric company, which undertakes the Duties of Transmission Sector. This department is responsible for the maintenance, operation and development of

---

[55] http://www2.tavanir.org.ir/info/stat83/sanatlhtml/Table/table05.jpg (Visited on 14/12/2015)

400 KV & 230 KV transmission lines and sub-stations as well as 132 KV, 66 KV and 63 KV sub-transmission lines as well for the network development.

Generation Management Companies

The Generation Management Companies are non-governmental companies responsible for the operation of the power plants in the related region. Currently each of these companies acts as a contractor for the operation of power plants with the agreement of the corresponding Regional Electric Company.

These companies offer their services in the fields of optimization, information systems, operation, and recruitment of staff, as well as commissioning and operation of new power plants.

For the implementation of policies related to the privatization of electrical engineering capabilities in the country, the TAVANIR Expert Holding Company has established several companies within the managerial territory of regional electric company as non-governmental or private companies. Since 2012, a few generation companies have been released to the private sector. Table 19 shows 28 Generation companies which are still the subsidiary of TAVANIR.

Distribution Companies

Currently 39 Distribution Companies (DSOs) are working in the country. These companies could be in charge of a province, a city, and in some cases several companies could be responsible for the distribution of electricity in one province. For example, there are two distribution companies in the Mazandaran province. The distribution companies are also presented in the Figure 11 and Table 19. In Figure 11, the departments colored in blue emphasize their role in the permission procedure of renewable power plants in Iran.

The distribution companies belong to TAVANIR and are under supervision of regional electricity companies. Some activities of the distribution companies such as upgrading and renovation services of the distribution network, development of rural electrification of agricultural irrigation systems, sales, meter recording, administration and transportation services have been released to the private sector.

Table 19 TAVANIR, Regional Electricity Companies, Generation Management Companies, Distribution Companies[56]

Regional Electricity Companies	Generation Management Companies	Distribution Companies
Azerbaijan	East Azerbaijan	Tabriz
		East Azerbaijan
		West Azerbaijan
		Ardebil
Isfahan	Isfahan	Isfahan City
		Isfahan Province
		Charmahal & Bakhtiari
Bakhtar	Shahid Mofateh (Gharb) Shazand	Markazi
		Hamedan
		Lorestan
Tehran	Rey Shahid Muntazer Ghaem Tarasht (Shahid Firouzi) Shahid Rajaee Damavand Besat	Great Tehran
		Tehran Province
		Alborz
		Qom
Khorassan	Toos Khayam Khorassan Gas	Mashhad
		Khorasan Razavi
		South Khorasan
		North Khorasan
Khuzestan	Ahwaz (Ramin) Jonoub-e-Gharb (Abadan)	Ahwaz
		Khuzestan
		Kohgilooye & Buyer-Ahmad
Zanjan	Zanjan	Zanjan
		Ghazvin
Semnan		Semnan
Sistan & Baluchistan	Sistan & Baluchistan P.P.	Sistan & Baluchistan
Gharb	Bistoon Kurdistan	Kermanshah
		Kurdistan
		Ilam
Fars	Fars South of Fars	Shiraz
		Fars
		Bushehr
Kerman	Kerman Zarand	North of Kerman
		South of Kerman
Gilan	Loushan (Shahid Beheshti)	Gilan
Mazandaran	Neka (Shahid Salimi)	Mazandaran
		West of Mazandaran
		Golestan
Hormozgan	Persian Gulf Hormozgan	Hormozgan
Yazd	Yazd	Yazd

---

[56] http://www.tavanir.org.ir/index.php (Visited on 12/12/2015)

3.3 Renewable Energy Framework for PV development

3.3.1 Renewable Energy Organization of Iran (SUNA)

In 1996 the Renewable Energy Organization of Iran (SUNA) was established to evaluate the renewable energy potential, to implement projects (solar, wind, geothermal, hydrogen and biomass) and to guarantee the purchase of the electricity generated to attract private sector's participation in this field. Additionally, the organization had the function to study the research policies in order to prepare plans for the development of renewable energies in the country and to provide knowledge and training in this field. In 2000 SUNA became a state organization, filling the gap of an executive body in the government for development of renewable energies. In 2005, all missions and legal operations on renewable energies were centralized in the Ministry of Energy and the Ministry, who assigned this responsibility to SUNA.[57]

The main divisions in SUNA responsible for the development of PV projects are the office of the private sector contribution and solar energy department which are distinguished by colour in SUNA's organizational chart in Figure 12.

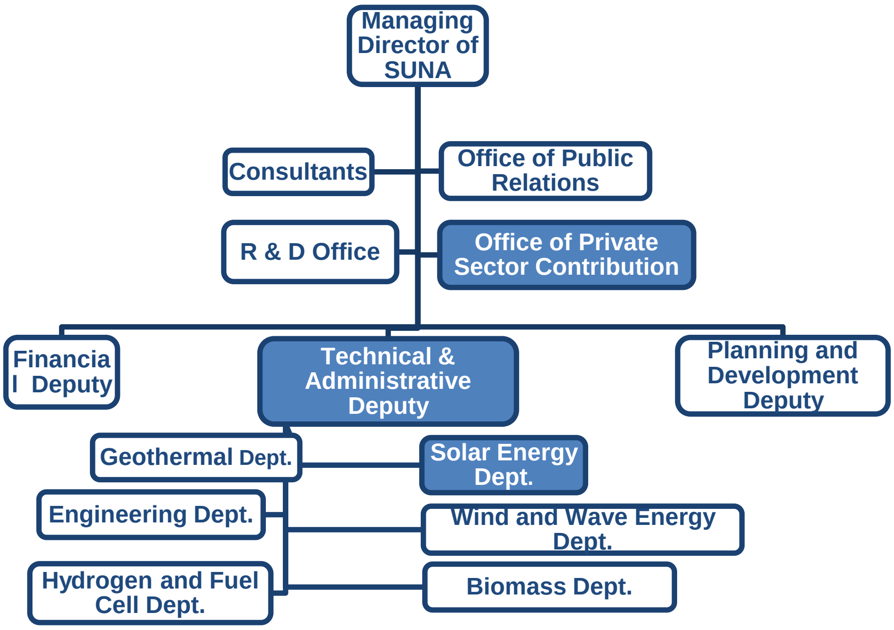


Figure 12 Organizational Chart of SUNA[58]

---

[57] http://www.suna.org.ir/en/history
It is necessary to note that the responsibility of activities related to solar water-heating systems remains with Iranian Fuel Conservation Organization.

[58] http://www.suna.org.ir/fa/aboutorganization/introduction introduction-معرفی-سازمان

3.3.2 An overview on supporting policies for Renewable Energies in Iran

In the past years policies and support mechanisms have been developed to push the development of renewable energy in Iran. These are described in Table 20.

Table 20 Iran renewable energy policies and support mechanisms[59]

NO.	TITLE	YEAR	POLICY TYPE	POLICY TARGET
1	Revised Feed in Tariffs	2015	Guaranteed remuneration of electricity generation (PPA)	Wind, Onshore, Solar, Geothermal, Bioenergy, Hydropower, Multiple RE Sources, All
2	National Development Fund	2010	Economic Instruments, Fiscal/financial incentives, Loans	All infrastructural projects
3	Budget for purchasing Renewable Energy Electricity	2013	Economic Instruments, Direct investment, Infrastructure investments, Economic Instruments, Fiscal/financial incentives	Wind, Onshore, Solar, Geothermal, Bioenergy, Hydropower, Multiple RE Sources, All

Description: [60]

Revised Feed in Tariffs: According to Section B of Article 133 of the 5th National Development Plan of IRI, TAVANIR and companies affiliated to the Ministry of Energy (like SUNA and Distribution Companies) are permitted to sign long term Power Purchase Agreements with the owners of renewable energy power plants.

The feed in tariffs should be determined by the Ministry of Energy each year, which was done based on only one feed in tariff in the previous years. In 2015, the Ministry of Energy determined a new system of feed in tariffs based on the generation costs of electricity by each source.

National Development Fund: Based on the 5th Five-year Development Plan (2010–2015), the National Development Fund was established to transform oil and gas revenues to productive investment for future generation. The Fund is based on the annual petrochemical sales income determined in annual budget law and is independent from the government budget. It provides debt financing in foreign and local currencies and the payment is in the same currency. The financing schemes are different for projects located in less developed regions.

---

[59] http://www.iea.org/policiesandmeasures/renewableenergy/?country=Iran (Visited on 13/12/2015)

[60] http://www.iea.org/policiesandmeasures/renewableenergy/?country=Iran (Visited on 13/12/2015)

Budget for purchasing Renewable Energy Electricity: The Ministry of Energy is obliged to include an amount of 30 Rials per kilowatt-hour as electricity duties in the electricity bills, in addition to the price of electricity sold, and to receive such amount from clients except from rural households. The collected amount will be deposited to TAVANIR and be expended for rural electrification as well as for the generation of renewable electricity.

3.3.3 Feed in Tariff

According to Iranian laws and Regulations, the MoE is obliged to purchase electricity from RE power plants established by the private sector with specific tariffs & conditions. MoE announces the tariffs once a year conforming principles appointed by Economy Council of board of Ministers.

Feed in Tariffs in the past

In the previous years, there were only one feed in tariff determined each year for all types of renewable energy as follow:

• 2012	1792 or 1863 Rls /kWh, for 20 years
• 2013	4371 or 4442 Rls, only for 5 years
• 2014	4480 or 4628 Rls, only for 5 years

The higher rates of each year were related to power plants connected to the distribution grid. The reason is that they generate electricity near to the consumers and save the lost in the transmission lines this way.

In the previous years, the feed in tariffs were calculated based on the avoided costs of fuel, pollution, etc. Based on this approach the feed in tariff was calculated every year. This was sometimes enough for wind energy, but not for solar energy.

Hence, after the new Managing Director of SUNA was assigned by the Minister of Energy in 2015, the approach for determining feed in tariffs changed in 2015. The two different approaches of “today” and “the past” are illustrated in Figure 13.

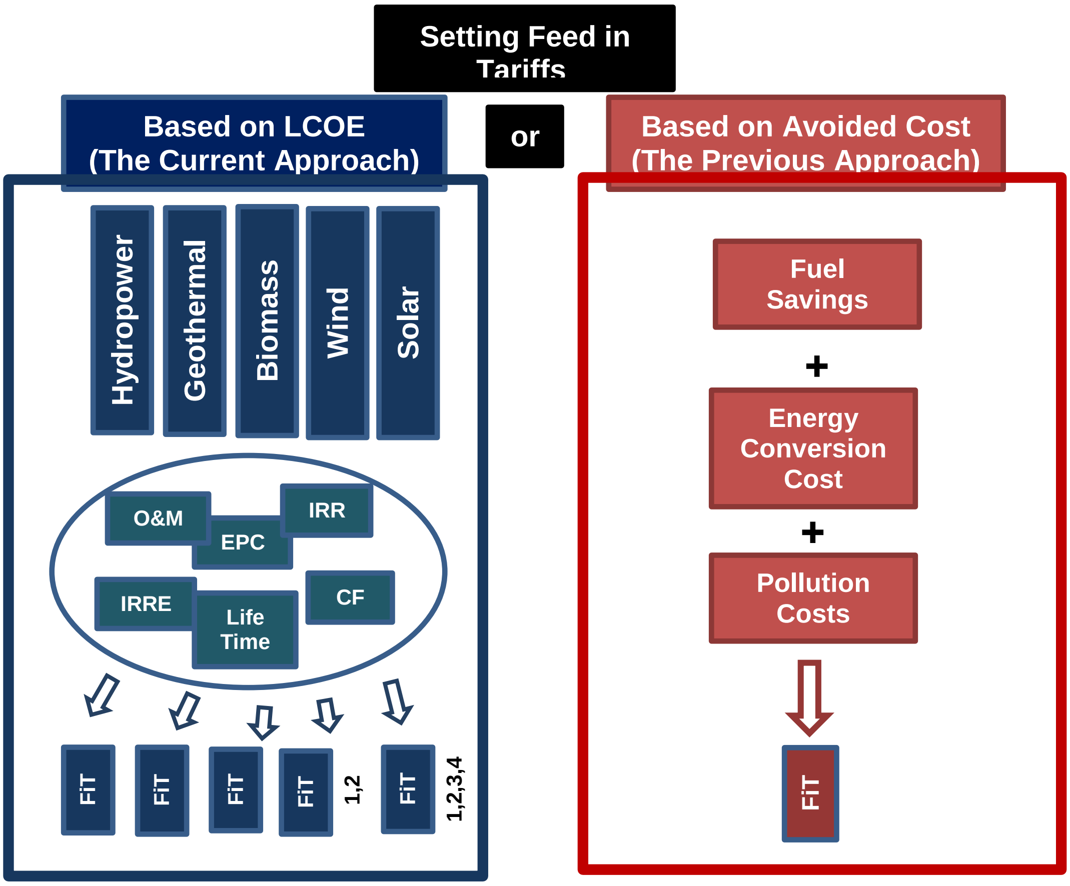


Figure 13 Two different approaches to determine feed in tariffs

Important characteristics of the New Feed in Tariff (2015) compared to the previous feed in tariff

- The Ministry of Energy accepted SUNA's suggestion to have technology-specific feed in tariffs based on the LCOE[61] of each technology. The size of the power plants is considered as another factor in defining the price of electricity.
- The feed in tariff is being paid for 20 years, instead of the previous 5-year payment period.
- The announced rates will be valid for the first 10 years of guaranteed purchase contract, and in the second 10-year-period, the rate will be decreased to 0.7 (excluding wind power plants).
- An adjustment formula was developed to adjust feed in tariffs with the inflation and exchange rate changes. This formula will be used for the 20 years of contract.
- The average rate on the basis of the formula in article 133 is calculated 4873 Rials per kWh and then by taking the equal rate of return on investment and the capacity of development of each type, different prices are determined.

---

[61] The Levelized Cost of Electricity is a measure of a power source which attempts to compare different methods of electricity generation on a comparable basis.

- There is up to 15% extra bonus added to the feed in tariff, if the power plant uses domestic products (manufactured in Iran). For more detailed information about this extra bonus, see Table 23.

Feed in Tariffs for clean and renewable energy sources

In order to promote the extensive utilization of renewable energies, the Energy Minister announced the guaranteed purchase tariffs on 21.07.2015. In line with the legal assignments of the Ministry of Energy regarding renewable energies, this directive is announced based on the following legal deeds and documents: Economic Council Directive No. 100/370732 dated 29.07.2012, articles 44, 61 and 62 of Consumption Pattern Adjustment Law, article 62 of the law of adjustment of a part of government's financial regulations, parts a, d, h and z of article 1 of the law of foundation of Ministry of Energy and articles 7 and 12 of Iran Electricity Organization Law.[62]

Table 21 Feed in Tariffs announced for 2015[63]

Item	Type of Technology	Guaranteed Purchase Price (Rials/ kWh)
1	Biomass – Landfill	2900
	Biomass – Anaerobic Digestion	3150
	Biomass –Incineration	5870
2	Wind Farm with capacity of over 50 MW	4060
	Wind Farm with capacity of less than 50 MW	4970
	Wind generation up to 1 MW (Only for consumers and limited to their connection capacity)	5930
3	Solar Farms with capacities over 10 MW	5600
	Solar Farms with capacity of 10 MW or less	6750
	Solar energy with capacity of 100 KW or less (Only for consumers and limited to their connection capacity)	8730
	Solar energy with capacity of 20 KW or less (Only for consumers and limited to their connection capacity)	9770
4	Geothermal (Including drilling and equipment procurement)	5770
5	Expansion Turbines	1800
6	Loss recovery in industrial processes	3050
7	Small Hydropower – 10 MW and less	3700
8	Other renewable sources excluding Hydropower plants	4873

---

[62] Iran Minister of Energy Resolution regarding the feed in tariffs in 2015 (issued on 25 July 2015), Available from: <http://privatesectors.suna.org.ir/en/privatesectors> (Visited on: 14/12/2015)

[63] Ibid.

Remarks: [64]

1- Power Purchase Agreements with power plants subject of this announcement excluding items 5, 6 and 7 are concluded for a 20 year period with the specified tariffs and (after the PPA is signed) the tariffs will be annually adjusted according to note 3 of Economic Council Directive article 3.

   Note 1: The tariffs for all power plants under this article, excluding wind Power Plants under item 2, will be multiplied by 0.7 as of the first day of the 11th year. The annual adjustment will be applied like before.

   Note 2: The tariffs for Wind Power Plants which reach a capacity factor of 40% or more, will be multiplied by 0.4 for the second 10 years and for those with capacity factor of less than 20% will be multiplied by 1. For power plants with a capacity factor between 20 to 40%, it will be multiplied in a proportional coefficient.

2- The duration of validity of power purchase agreements for power plants under items 5, 6 and 7 will be 10 years with the specified tariffs which will be annually adjusted according to note 3 of Economic Council Directive article 3.

3- For the power plants connected to the distribution grid, subject of article 4 of Economic Council Directive, 148 Rials per KWh will be added to the mentioned prices as transmission service fee.

4- Upon expiration of the power purchase contract, the investor will have the options to sell the electricity within the country against bilateral contract, energy exchange market or any other method acceptable to the Ministry of Energy. Exporting of the electricity generated by the power plants subject of this directive requires obtaining a separate permission.

5- In order to promote local manufacturing of renewable power plants, purchase price from power plants constructed with equipment manufactured using domestic design and workmanship will be increased up to 15% proportionately. SUNA is assigned to prepare and announce the weighted tables containing components and technologies.

6- If investors are benefitted from nonrefundable government aids for construction of the power plants subject of a power purchase agreement, their tariffs will be proportionately amended to avoid repeated utilization of facilities.

7- Rates subject of this directive are applied to contracts whose power plants are commercialized within 18 months from the date of the contract. For geothermal and biomass power plants, this period can be extended up to 9 months. In case of delay in commercialization, the last tariffs announced by Ministry of Energy at the time of

---

[64] Iran Minister of Energy Resolution regarding the feed in tariffs in 2015 (issued on 25 July 2015), Available from: <http://privatesectors.suna.org.ir/en/privatesectors> (Visited on: 14/12/2015)

commercialization of the power plant will be applied to the remaining period of the purchase price agreement.

8- The goal of the policy of the MoE is to reduce the guaranteed purchase prices in proportion with increase in installed capacity in the country. SUNA is obliged to consider this policy in preparing the drafts of tariffs for the coming years.

3.3.4 The Adjustment Formula

In order to adjust the feed in tariffs to inflation and the change in the exchange rate, an adjustment formula was developed (Figure 14).

Adjustment Formula

Every month the base tariff is multiplied by the adjustment coefficient:

$$k = \left(\frac{CPI_{x1}}{CPI_{o1}}\right)^{\propto} \times \left(\frac{€rate_{x2}}{€rate_{o2}}\right)^{1-\propto}$$

K: Index coefficient

CPI: Retail Price Index announced monthly by the central bank of Iran (CBI)

€ Rate: Annual average of the exchange rate of Euro with Rails, as announced by the CBI

$\propto$: Power coefficient between 0.15~0.3 set by investors

X_1: Refers to the first month of payment year

X_2: Refers to the year before payment date

O_1: Refers to the first month of contract year

O_2: Refers to the year before contract date

Figure 14 Adjustment Formula for the feed in tariffs[65]

For example, in a 5 MW PV project with 6750 Rials/kWh, if the inflation rate (first part of the formula) is 13% and the annual change of exchange rate Euro/Rial is 8%, the adjustment coefficient for the first operation year would be 1.09. Therefore, the feed in tariff would be equal to (6750 × 1.09) = 7390 Rials/KWh. See Table 22 for first five-year calculation.

---

[65] Renewable Energy power plants Opportunity to Investment In Iran, prepared by SUNA (16 Nov. 2015)

Example of the application of the adjustment formula:

$$1.09 = (\frac{113}{100})^{0.3} \times (\frac{34560}{32000})^{(1-0.3)}$$

Table 22 Tariff escalation example in a hypothetical 5 MW PV project

Year	**0**	**1**	**2**	**3**	**4**	**5**
Consumer Price Index*	100	113	128	144	163	184
Exchange rate**	32,000	34,560	37,325	40,311	43,536	47,018
Escalation Rate	1.00	1.09	1.20	1.31	1.44	1.57
Tariff (Rials/KWh)	6,750	7,390	8,090	8,856	9,696	10,615

* Inflation rate is assumed 13% **Annual Euro/Rials growth rate is assumed 8%

3.3.5 Breakdown of the Domestic Content Bonuses for PV in 2015

With the feed in tariff of 2015 there is a new policy to encourage investors to use domestic products in their power plants. According to this mechanism and based on the share of domestic products used in the power plant, the feed in tariff increases up to 15% accordingly. Hence, the owner of the power plant will get 15% additionally to the FiT for 20 years.

In Table 23 there is a breakdown of the domestic product bonus announced by SUNA for the year 2015. It is supposed that the bonuses will increase to 30% in the next years' contracts.

Table 23 Breakdown of the domestic content extra bonus for PV in 2015[66]

Item	Component Description		Share of the component	Bonus percentage in 2015
1	PV Panel	Frame	6,67%	1,00%
2		Glass	8,00%	1,20%
3		EVA sheet	7,33%	1,10%
4		Back sheet	7,33%	1,10%
5		Junction Box	5,33%	0,80%
6		Cell	13,33%	2,00%
7		Ribone tape	3,33%	0,50%
8		PV paste	3,33%	0,50%
9	Cable	DC cables	5,00%	0,75%
10	Invertor	Electronic part	18.67%	2,80%
11		Box and other metal parts	6,67%	1,00%
12	Other Components	Instructure	10,00%	1.50%
13		Solar Tracker	5,00%	0.75%
Total Sum			100,00%	15,00%

---

[66] Domestic content extra bonus defined by SUNA(2015) Available at: http://www.suna.org.ir/suna_content/media/image/2015/12/4256_orig.pdf (In Persian- Visited on 14/12/2015)

3.3.6 The Budget for buying electricity in the Feed in Tariff Policy

The main financial source to pay the renewable electricity generated in Iran comes from the electricity bills of end-users in the country, which is equal to 30 Rials per kWh. There are also some other financial resources defined like the equivalent of the saved fossil fuel, or the cost of environmental damage made by generating electricity in fossil fuel power plants, but these have not been implemented yet.

Figure 15 shows that assuming to have 200 Terawatt hours a year electricity bills in Iran, the calculated budget would be around 6000 billion Rials; however based on the cap of 4000 billion Rials set by the parliament in the previous years, that would be the total Budget to buy electricity from renewable energy power plants.

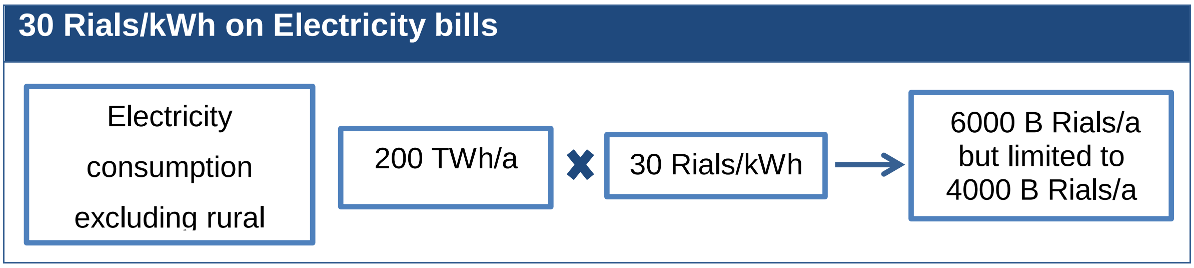


Figure 15 Total Electricity Consumption and total budget for buying electricity

Based on the laws passed each year in the parliament, this 4000 Billion Rials per year should be spent for both buying electricity from renewables, and for rural electrification. The share of each one is not clear and changes year to year and is a source of confusion.

The other point is that this amount of money, even if all of it is spent for buying electricity from renewables, is sufficient for some hundred MWs of energy produced by renewables, but the target of the government is much higher (5000 MW for the next five years).

In this case, the surcharge of 30 Rials per kWh will have to be increased in order to achieve the renewable energy targets of Iran.

3.3.7 Introduction to the Developemt Process for PV

The generated electricity from PV power plants in all sizes is eligible to be sold to the grid with feed in tariffs prices. In previous years, because the feed in tariff was not high enough to make PV power plants profitable, there were very few installation based on this.

In the last three years TAVANIR announced 50% grants for small PV systems; in this scheme, the DSOs were assigned an amount of capacity to do tenders in their region for installing small PV systems. These systems were supposed to be installed on rooftops of public buildings and schools. There have been around 7 MW PV installed based on this scheme in the last three years and some solar companies were created for this.

However, due to the current feed in tariffs for PV power plants announced in July 2015 by the Ministry of Energy, there is a discussion now to stop the previous 50% grant system. By the time this report in being prepared, the decision has not been made.

In the feed in tariff system there are four different tariffs for PV systems based on the size of the power plant. The two smaller ones are for less than 100 kWp and the larger ones are for more than 100 kWp. With feed in tariff system, the permission procedure has been divided in the following two categories:

For PV power plants >100 kWp, the applicant should contact SUNA to get required permissions and finally sign the PPA. SUNA has the experience issuing this kind of permissions for large power plants in the previous years, especially for wind power plants.

For smaller systems (<100 kWp) the applicants should approach their local DSOs instead. In the last months, SUNA has been preparing the typical contract between the applicant and the DSO, and also the contract between SUNA and DSOs; the latter one has been signed by two DSOs by the time this report is being written. As installing roof top systems based on the feed in tariff mechanism is going to be implemented for the first time in Iran, it would face some challenges like the current discussions between DSOs and SUNA regarding the prepared contract between them, but SUNA believes it can finally overcome this and the roof top systems will be developed in the country.

In the next chapter (chapter four), two business models, one for less than 100 kWp and one for more than 100 kWp are considered and the permission procedures are described in detail.

3.3.8 Notes regarding the Power Purchase Agreement (PPA)

Other than the Feed in Tariff and the 20 years duration of the PPA, which have been explained previously in this chapter, there are some other points that should be mentioned:[67]

- Payment condition: SUNA will open a letter of credit (LC) in Rials for the payment in an Iranian Bank with six months credit and equal to the amounts. This circular letter of credit will be extended for two months for an amount equal to an estimation of next six months in a way to cover all contractual payments.
- Securing the contract: The seller is obligated to submit to SUNA a bank guarantee for the development period to some percentage of the contract value which shall be valid until the end of that period. This guarantee is not included in contracts of less than 100 kW.

---

[67] PPA contract issued by SUNA (issued on 2 October 2015) Available at : <http://privatesectors.suna.org.ir/en/privatesectors> (Visited on: 14/12/2015)

- Scheduling: There is a scheduling in the contract from the starting point of development period to commercial operation period, which should not exceed 18 months.
- There are three documents which should be attached to the contract including Establishment license of Power Plant, Agreement for connecting to grid and License of Environment Organization for Establishment of a power plant.

4 Suitable Business Models in Iran

All PV power plants installed in Iran are eligible to feed the electricity into the grid and get the Feed in Tariff. There are two categories:

1. Projects >100 kWp should obtain the required permissions from the Renewable Energy Organization of Iran (SUNA) and sign the PPA with SUNA.
2. Projects <100 kWp should obtain the required permissions including the PPA from their local Distribution System Operator (DSO).There are currently 39 DSOs in Iran.

Within this division and since the 21st of July 2015[68], there are four different tariffs for PV systems based on the size of the power plant, which are categorized in two smaller sizes of less than 100 kWp and two larger sizes of more than 100 kWp.

Table 24 Feed in Tariffs for PV (2015)

Category	Rials/ kWh
1. Solar Power Plants with capacity >10 MW	5600
2. Solar Power Plants with capacity of ≤10 MW	6750
3. Solar Power Plants with capacity of ≤100 KW (limited to their connection capacity)	8730
4. Solar Power Plants with capacity of ≤ 20 KW (limited to their connection capacity)	9770

In this report, two business models have been chosen to analyse their development procedure and their profitability. The first business model is based on large PV systems (>100 kWp). Since many new installations are planned above 1 MW, a typical size of the PV system of 5 MWp was selected.

The second one is based on small PV systems (<100 kWp). The selected size for this study is 50 kWp, representing the size of a system used in the commercial sector. The information to describe the process of project development and the data for the cash flow model in the two business models were obtained through interviews with eleven companies who do business in Iran and with the Renewable Energy Organization of Iran (SUNA)[69].

---

[68] See in Chapter 3, page (add), “Feed in Tariff”.

[69] See in Annex, page (Add this), List of Interviewees.

4.1 Model 1: Feed in Tariff with Power Purchasing Agreement for 5 MWp PV Systems

4.1.1 Business Model Description

The Power Purchase Agreement (PPA) is a contract between an electricity producer and an electricity consumer or reseller, which is SUNA in case of renewable energy in Iran. A PPA fixes a price for the electricity provided by the investor (IPP) to the off-taker (SUNA) over a fixed period of time, which is 20 years in Iran. The investor sells all the generated electricity to SUNA to receive the Feed in Tariff (FiT).

As mentioned in the introduction of this chapter, the process depends on the size of the PV system. In the case of the business model of 5MWp, the process should be executed with the Renewable Energy Organization of Iran (SUNA), who is also the off-taker of the electricity produced[70]. According to the size of the system, the Feed in Tariff corresponds to 6.750 Rials/kWh (17 € cent/kWh[71]).

4.1.2 Stakeholders Involved

The stakeholders involved in the PV systems with more than 100 kWp (here 5 MWp) are as follows:

Applicant: The applicant fills out the required forms given by SUNA, specifies the land and does the development procedure for PV plant including obtaining the required permissions[72] and securing the land.

SUNA: SUNA operates as the government body that issues the permissions which are relevant to the energy ministry and finally signs the PPA with the applicant.

DSOs and the Regional Electricity Companies: the institutions responsible for the grid connection in systems <7 MW are the DSOs.; In the case of systems larger than 7 MW, the applicant should approach the Regional Electricity Companies to provide the required documents (including the grid study) and obtain the grid connection permission.

---

[70] The process procedure is described in chapter 4.1.4

[71] The exchange rate corresponds to 39700 Rials/1 Euro

[72] These are mentioned in chapter 4.1.4.

4.1.3 Power Purchase Agreement Contract

As discussed in chapter 3, for large PV plants (in this case 5MWp), a typical PPA contract between SUNA and the owner of the power plant is foreseen. Here both sides agree on the purchase of electricity based on the Feed in Tariff.

The most relevant elements of this PPA[73] are:

1- The duration of the contract and deadlines:
    a. 20 years contract:
    b. 18 months deadline: Based on the contract, the applicant needs to commission the power plant within 18 months after signing the PPA, otherwise the generated electricity will be bought with the price of the energy market.

2- Feed in Tariff: The feed in tariffs are determined each year by the ministry of energy[74]. The feed in tariff for PV for a 5MW plant is 6750 Rials in 2015 which will be adjusted for the following years by the adjustment formula.

3- Payment:

    a. LC: SUNA has negotiated with some Iranian banks to open LCs (Letter of Credit) for 6 months to ensure the owner of the power plant regarding the payment of the money; this LC should be refreshed every six months.

    b. Delay Compensation: SUNA compensates the delay in payment based on the minimum interest rate of the country determined by the government each year and on a daily basis

4- Grid Connection: all the costs of grid connection should be paid by the owner of the power plant including building the required substation and the grid line if needed.

4.1.4 Process of Project Development

The development process for PV power plants in Iran is quite new, due to the fact that the previous feed in tariffs were not sufficient to attract PV power plant developers. There are only a few power plants already installed (the largest one is 500 kWp by now).

Although the development process is well defined and standardized by SUNA, there is not enough practice to verify it.

---

[73] The PPA contract is available on http://privatesectors.suna.org.ir/en/privatesectors

[74] The feed in tariffs of each year are valid for the Iranian year which begins on 21st March. The Ministry of Energy should announce it at the beginning of each year but it usually takes a few months until it is announced.

Based on the interviews done in this project with eleven Iranian companies, the average time of the development is around one year. The limiting factor seems to be the land acquirement, which implies to buy or lease it.

The development process for PV power plants more than 100 kWp is as follows:

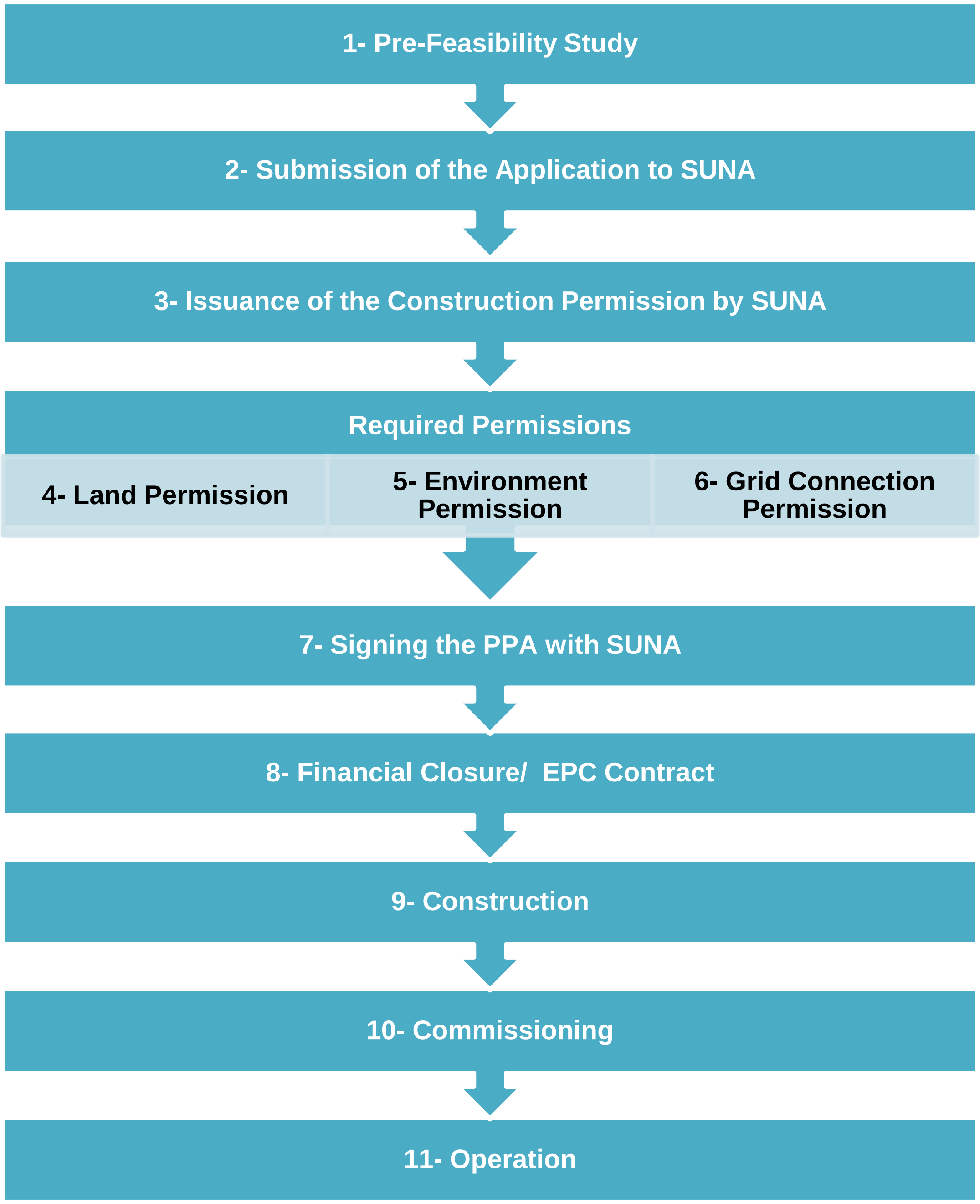


Figure 16 Flowchart of the PPA process for PV systems > 100 kWp

Table 25 Detailed Description of the PPA process for PV systems > 100 kWp

Development Steps for PV > 100 kWp (here 5 MW)			
Feasibility Study	1. Feasibility Study	Description	The Applicant should do a feasibility study to identify the land. The land should have been determined for the first registration in SUNA.
		Actors	Applicant (& consulting company if needed)
		Duration	2-3 months
Project Registration	2. Submission of the application to SUNA	Description	Applicant submits: Form A: Company Introduction Form B[75]: Includes general characteristics such as the capacity and the electricity generation. Additionally in the form the location of the land shall be registered. This cannot be used for other applications.
		Actors	Applicant & SUNA
		Duration	1 week; preparation of the forms
	3- Issuance of the construction permission by SUNA	Description	SUNA proves the documents and issues the construction permission.
		Actors	Applicant & SUNA
		Duration	1 week
Obtaining Permissions	4- Land permission	Description	If the land is in the property of the State (that would be more probable), the applicant should approach the Ministry of Agriculture. After a long process, a leasing contract will be signed, for 30 to 92 years. The assigned land would be 2 hectares for each MW. If the land is private, the applicant negotiates with the land owner to buy or rent the land.
		Actors	Applicant & Local Authorities of the Ministry of Agriculture or Private land owners
		Duration	6 months to 1 year for state-owned land 3 months for private-owned land

---

[75] The form A and B are available on http://privatesectors.suna.org.ir/en/privatesectors

	5- Environmental permission	Description	The applicant approaches the local offices of the Department of Environment[76] and submits a summarized description of the PV plant. The local office of the Department of Environmental proof if the land complies with the environmental criteria. Currently, there are no specific/ customized criteria for PV power plants.
		Actors	Applicant & local Environment Office
		Duration	2 months
	6- Grid connection permission	Description	For PV systems less than 7MW (like in this case), DSOs issue the grid connection permissions. For PV systems more than 7MW, the Regional Electricity Companies issue the grid connection permission The DSOs and Regional Electricity Companies give a list of consulting companies, which are eligible to do the grid connection study. Other consulting companies do not have access to the grid information.
		Actors	Applicant & DSO & authorized consulting companies
		Duration	3-4 months
	7- Signing PPA with SUNA	Description	SUNA proves the documents provided by the applicant and signs the typical standard PPA with the applicant.
		Actors	Applicant & SUNA
		Duration	Unknown (should be 1 to 2 months)
Construction of the Power Plant	8- Financial closure/ EPC contract	Description	The applicant secures the finance The applicant signs the EPC contract
		Actors	Applicant & EPC contractor/ Banks/ Investors/
		Duration	Unknown (not any successfully financed project yet)

---

[76] Website of the Iran Department of Environment: http://www.doe.ir/

	9- Construction	Description	Construction of the power plant Applicant sends the reports to SUNA about the development of the construction
		Actors	Applicant & EPC contractor
		Duration	4 to 6 months
Commissioning & operation	10- Commissioning	Description	Applicant informs the DSO. DSO, IGMC & SUNA supervise grid connection & meters
		Actors	Applicant, SUNA, DSO & IGMC
		Duration	1 month
	11- Operation	Description	The power plant owner operates the power plant. The bills are issued to SUNA SUNA pays the bills (Currently SUNA is negotiating with Iranian banks to open Letters of Credit so that the power plant owners get paid from banks by LC.)
		Actors	Power Plant Owner & SUNA (& Banks if LC)
		Duration	20 years

4.1.5 Financing Schemes

According to the interviews, Iranian developers believe that the main barrier for the development of renewable energy in Iran lays in the lack of financing. The current sources of finance are as follows:

Iranian Banks: Due to the high inflation rate in Iran, Iranian domestic banks provide loans in the national currency and with very high interest rates (mostly more than 20%), that makes investing in renewable energies difficult. (Section 4.1.6)

National Development Fund (NDF): The National Development Fund has been founded to provide soft loans for development projects in the country. The source of the money for this fund is mainly oil export income. In the last years, due to the decrease of oil export, the budget of this fund declined and the number of the projects to be funded decreased accordingly. Therefore, it is difficult to get funding for renewable energy projects and no PV project has been funded in this way by the end of 2015. If the budget of the country increases after dismantling the trade restrictions, the possibility to obtain finance from this fund will increase.

Foreign Banks: After dismantling the trade restrictions and opening the swifts for Iran and improving the financial conditions (such as guarantees) renewable energy projects could be financed by foreign banks. Presently, this source of finance cannot be used in Iran.

Conclusion: Based on the above mentioned barriers, the possibility to finance a PV plant in Iran by the mentioned sources of finance is currently low. Hence after dismantling the trade restrictions, the financial resources from the National Development Fund and the foreign banks would be more available to finance renewable energy projects in Iran. SUNA or Ministry of Energy could also design financial schemes in cooperation with Iranian banks to finance renewable energy projects with soft loans.

4.2 Model 2: Feed in Tariff with Power Purchasing Agreement for a 50 kWp PV system

4.2.1 Business Model Description

The process for developing PV plants <100 kWp is being defined by SUNA at the time of preparing this report; therefor there is no installed PV plant based on this system yet. Nevertheless, during the development of this study, experts in SUNA were interviewed regarding this topic. The general procedure is described as follows:

The applicant should approach the local DSO for the required procedure[77]. In this case the DSO is also the off-taker of the electricity generated. According to the size of the system used in this example, the Feed in Tariff corresponds to 8.730 Rials/kWh (22 €cents/kwh[78]). The example used in this business model corresponds to a power plant of 50 kWp.

4.2.2 Stakeholders Involved

The stakeholders involved in this type of the PV systems are:

The applicant: The applicant fills out the required forms given by the local DSO and follows the process including choosing an installer, and getting required permissions.

The DSOs: The DSOs operate as the governmental body which gives the permissions and finally signs the PPA with the applicant.

The installers: The DSOs and SUNA are currently preparing a list of certified installers for the applicants.

4.2.3 Power Purchase Agreement Contract

For PV plants less than 100 kWp (in this case 50 kWp) there is a typical PPA contract between the DSO and the owner of the power plant. Here both sides agree on the purchase of electricity based on the Feed in Tariff.

This contract is similar to the PPA contract described in 4.1.3 since both are for 20 years and with the feed in tariffs determined by the Ministry of Energy each year, which is adjusted by the formula every month. Nevertheless, the procedure is simpler since the applicant has to get less permissions.

There are some important points in this PPA:

1- The duration of the contract is 20 years.

---

[77] The process procedure is described in chapter 4.2.4

[78] The exchange rate corresponds to 39700 Rials/1 Euro

2- The feed in tariffs are determined each year by SUNA. The current FiT of a 50 kWp PV system is 8730 Rials, which will be adjusted in the following years by the adjustment formula[79].
3- SUNA pays the local DSO, and the local DSO pays the owner of the power plant.

4.2.4 Process of Project Development

Due to the fact that the feed in tariffs for PV were not attractive in comparison to the low electricity tariff, there has been no interest in installing PV on rooftops in the past years. Furthermore, there is no regulation for this.

In the past years, the DSOs had the authorization of Tavanir to do tenders for small rooftop PV systems. These were mainly installed on the rooftops of the governmental buildings, schools and mosques; therefore; there have been some PV installer companies in the market.

In July 2015 after the new feed in tariffs were announced, SUNA decided to activate the rooftop market by defining the requirements. Since small PV systems should be connected to the grid, SUNA is currently negotiating with the DSOs to define the procedure and to give the DSOs the authority to sign the PPA contract on behalf of SUNA.

Although the development procedure is now being defined and standardized by SUNA, there is not enough experience on it.

Based on the interviews done in this project, the average time of the development phase should be short, but no practice has been done yet.

The development process for PV power plants (less than 100 kWp) is as follows:

---

[79] The adjustment formula is explained in chapter (please ADD)

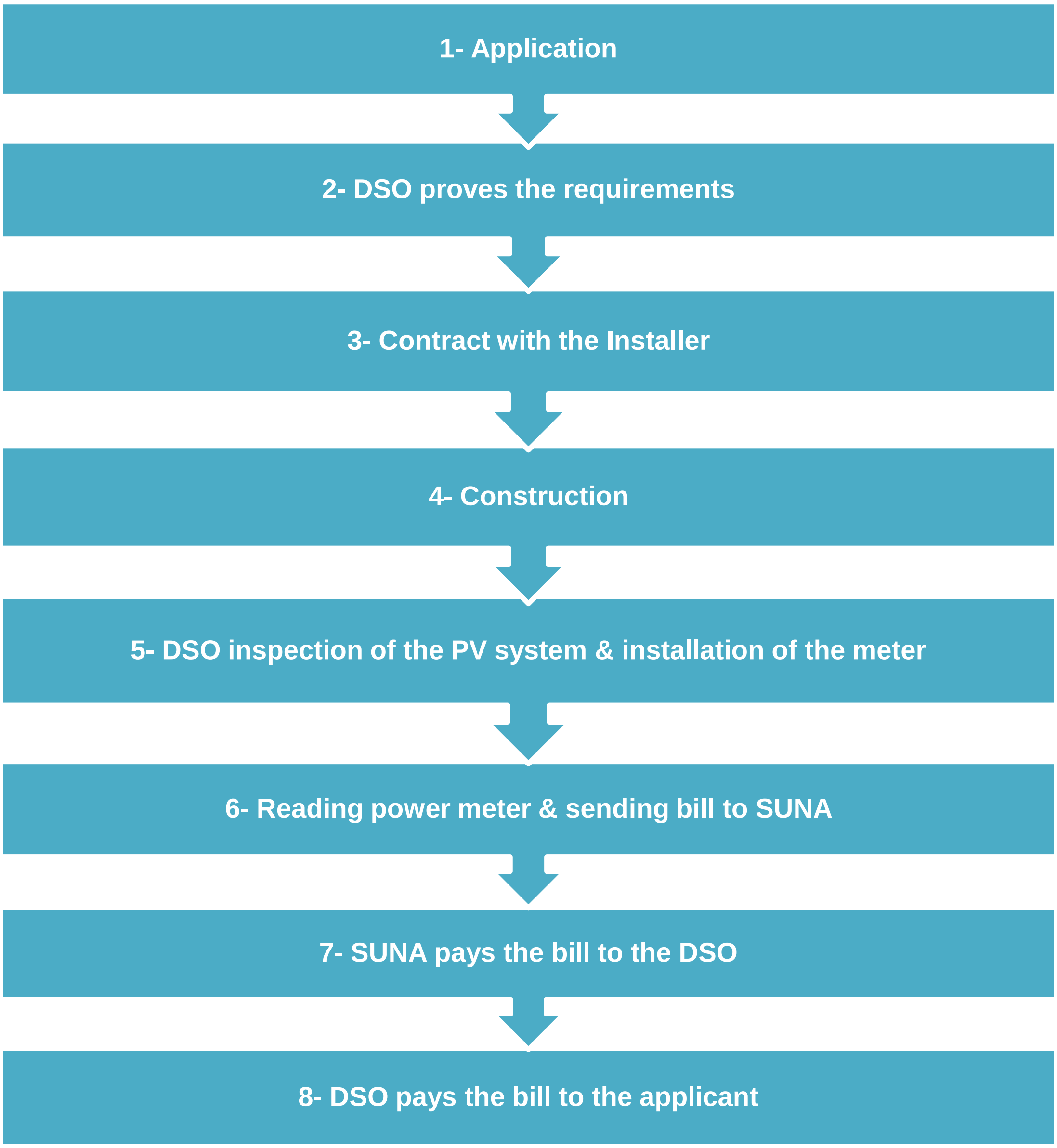


Figure 17 Flowchart of the PPA process for PV systems < 100 kWp

Table 26 Detailed Description of the PPA process for PV systems < 100 kWp

	Development Steps for PV < 100 kWp (here 50 kW)		
	1. Application	Description	The applicant submits the request to the DSO The PV capacity requested should not be more than the current grid connection capacity of the applicant (If no previous grid connection contract exists, the applicant cannot apply for PV system) The required documents are not defined yet.
		Actors	Applicant & DSO
		Duration	Unknown
	2. DSO investigation	Description	DSO proves: - The requested PV capacity limitation - There is no other contract application on this grid connection
		Actors	Applicant and DOS
		Duration	Unknown
	3. Installer Contract	Description	The applicant chooses one installer from the list of qualified installers which should be provided by SUNA or the local DSO. (However, the list of qualified installers has not been defined yet) The applicant signs the contract for the PV installation Installers need to be trained (no training so far) to do the installation of small PV systems (SUNA is planning to train the installers and issue certifications)
		Actors	Applicant & the installer
		Duration	Unknown
	4. Construction	Description	The installer installs the PV system Applicant informs the DSO about the completion of the installation
		Actors	Applicant & the installer
		Duration	For 50 kWp system would about one month. If the equipment and everything is ready, it could be done in two weeks.

	5. DSO inspection of the PV system & installing the meter	Description	The local DSO visits the PV system, and installs the required meter. The applicant pays for the meter. The DSO inspectors are not familiar yet with PV systems. SUNA should hold training courses for DSOs about PV systems.
		Actors	Applicant & the DSO
		Duration	Unknown
	6. Reading power meter & sending bill to SUNA	Description	DSO reads the meter every two months and issues the bill to SUNA The formula and coefficients required to calculate the bills will be determined by SUNA.
		Actors	DSO, and the Applicant
		Duration	Every two months
	7. SUNA pays the bill to DSO	Description	SUNA pays the bill to the DSO (10% more) based on the prepared Agreement between SUNA and DSOs DSO receives this 10% of the bill as its contribution. The Agreement between SUNA and DSOs is new and has not been signed by most of the DSOs yet. Based on this agreement, the DSOs signs PPA (on behalf of SUNA0 with the applicant. The prepared Agreement between SUNA and DSOs is for one year. The contract between DSOs and the applicants is for 20 years.
		Actors	SUNA & DSO
		Duration	Every two months
	8. DSO pay the bill to applicant	Description	The DSO pays the bill to the applicant
		Actors	DSO & Applicant
		Duration	Every two months

4.2.5 Financing Schemes

Nowadays there is no financial scheme for small power plants. Applicants can use domestic banks (described in 4.1.5) with high interest rates, or finance the project with 100% equity. As mentioned in 4.1.5, SUNA or Ministry of Energy could also design financial schemes in cooperation with Iranian banks to finance RE projects with soft loans.

4.3 Profitability Analysis

4.3.1 5 MWp PPA contract with SUNA

The following case study covers a 5.000 kWp ground-mounted project for the above 100 kWp market segment in Iran. The assumptions for the calculation will be varied in the sensitivity analysis in the later chapter 4.3.3.

Compared to world market prices the turn-key system price of 60 Million Rials (ca. 1875 EUR/kWp[80]) is considerably higher. To account for additional cleaning costs in the usually dry and dusty climate of Iran 3% of the total investment costs per year were assumed for operations and maintenance costs. These OpEx costs were escalated with a separate escalation rate because part of these costs will be accounted in EUR (50%) and the other part in the national currency. Thus an average escalation rate of 10,5% per year was used.

Iran receives a high solar irradiation ranging from 1800 to 2200 kWh/m² per year. In many urban regions around 2000 kWh/m² can be achieved, which is why it was used for the simulation.

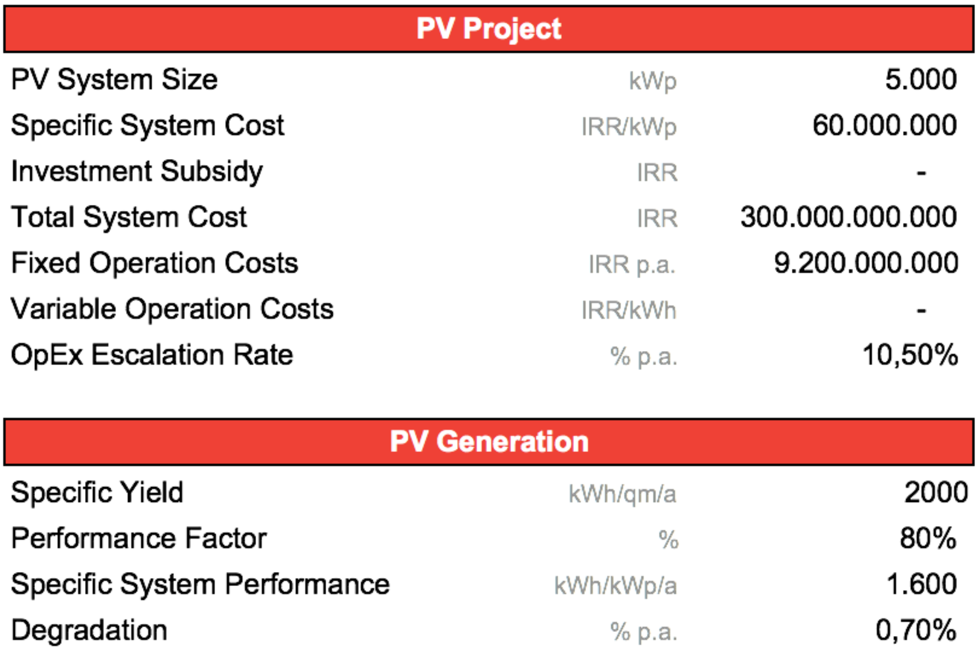
The performance factor[81] was set at 80% to account for performance decreases caused by the dusty and dry climate and the resulting low self-cleaning effect of the modules. For the degradation a very common assumption of 0,7% per year was used due to the lack of experience with operational systems in this emerging market.

---

[80] The exchange rate used is Euro/Rials of 32000.

[81] The performance ratio, often called "Quality Factor", is independent from the irradiation and therefore useful to compare systems. It takes into account all pre-conversion losses, inverter losses, thermal losses and conduction losses. It is useful to measure the performance ratio throughout the operation of the system, as a deterioration could help pinpoint causes of yield losses.

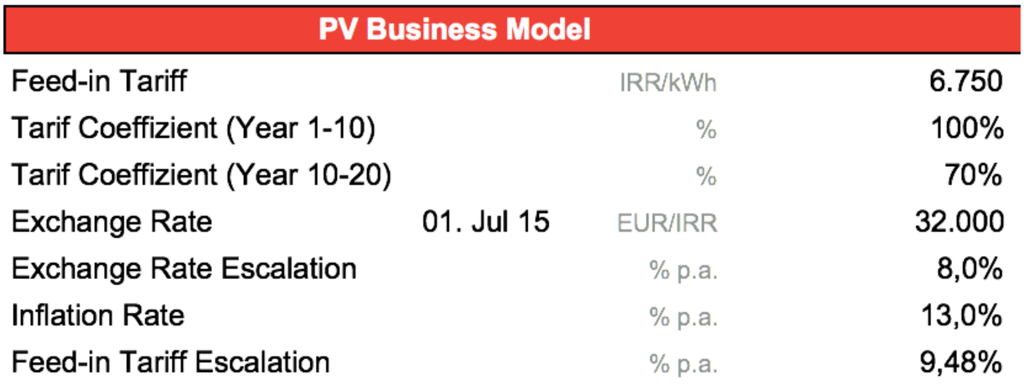
Table 27 PV Project Parameter (5.000 kWp)



PV Project		
PV System Size	kWp	5.000
Specific System Cost	IRR/kWp	60.000.000
Investment Subsidy	IRR	-
Total System Cost	IRR	300.000.000.000
Fixed Operation Costs	IRR p.a.	9.200.000.000
Variable Operation Costs	IRR/kWh	-
OpEx Escalation Rate	% p.a.	10,50%

PV Generation		
Specific Yield	kWh/qm/a	2000
Performance Factor	%	80%
Specific System Performance	kWh/kWp/a	1.600
Degradation	% p.a.	0,70%

Table 28 PV Business Model (5.000 kWp)



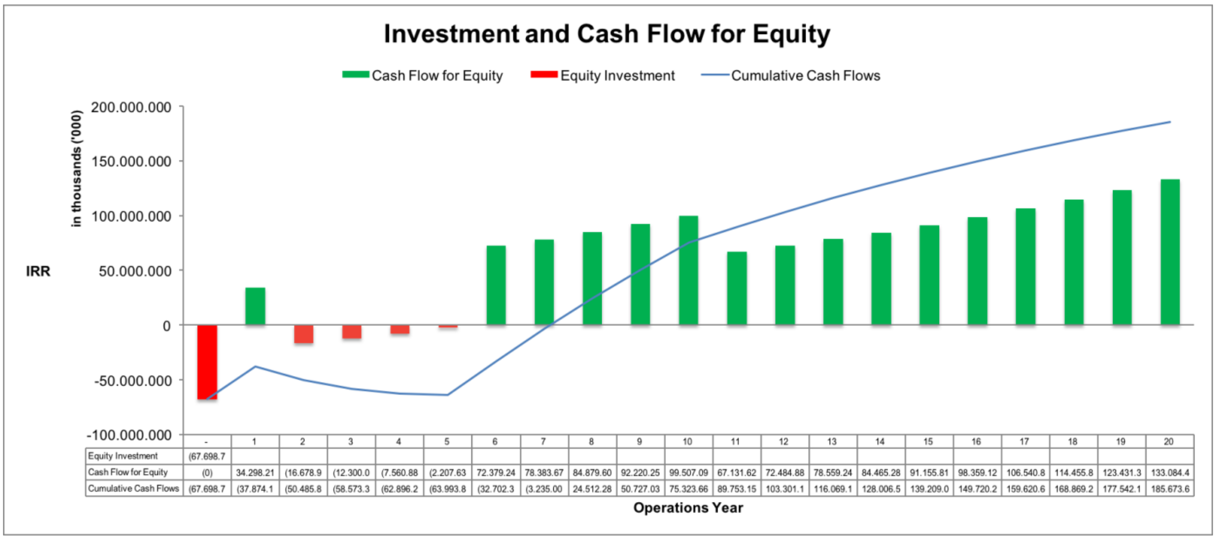
PV Business Model			
Feed-in Tariff		IRR/kWh	6.750
Tarif Coeffizient (Year 1-10)		%	100%
Tarif Coeffizient (Year 10-20)		%	70%
Exchange Rate	01. Jul 15	EUR/IRR	32.000
Exchange Rate Escalation		% p.a.	8,0%
Inflation Rate		% p.a.	13,0%
Feed-in Tariff Escalation		% p.a.	9,48%

The business model of the PV project is based on a feed-in tariff, which is escalated over 20 years. The feed-on tariff escalation rate is a weighted average based on the inflation rate (weight 0,3) and the escalation rate of the EUR/Rials exchange rate (weight 0,7). The feed-in tariff is reduced after the first 10 years of operation to 70%.

Table 29 Financing and Investment Parameter (5.000 kWp)

Investment			
Project Duration		Years	20
Equity		IRR	67.698.704.229
Debt (Gearing)	80%	IRR	240.000.000.000
Loan Tenor		Years	5
Interest Rate		%	6,0%
Discount Rate		%	15,0%

For the financing of the project the use of the national development fund was assumed with an interest rate of 6% p.a. for 80% debt[82] and a loan tenor of 5 years. (For developing regions the interest rate would be 4% and a loan tenor of 7 years.) The discount rate was set at 15% to represent a low risk investment alternative that yields returns just above the expected long-term inflation rate.



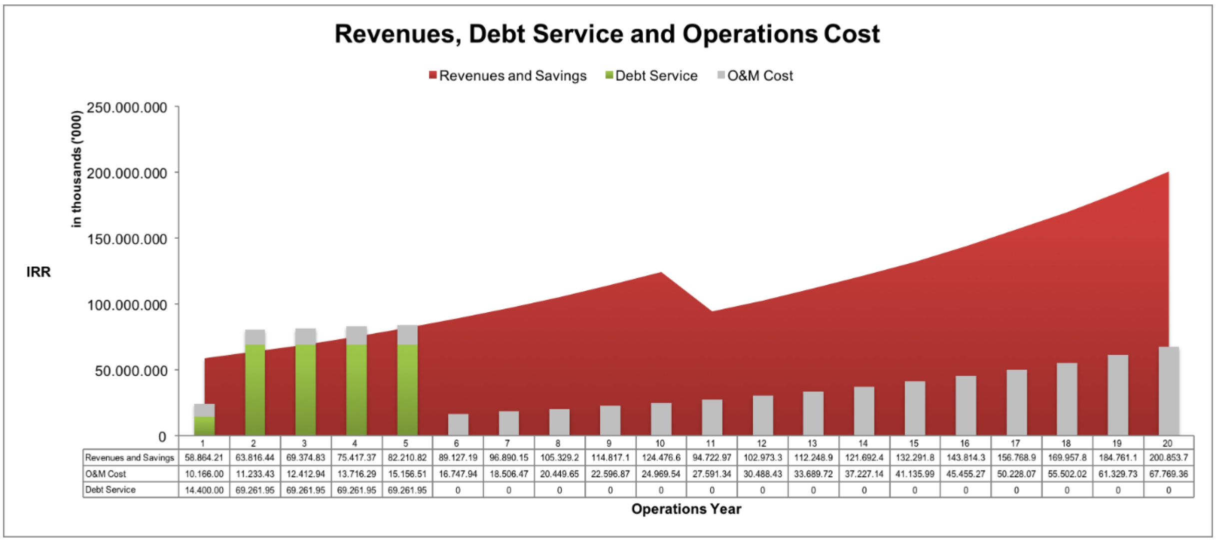
	-	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Equity Investment	(67.698.7																				
Cash Flow for Equity	(0)	34.298.21	(16.678.9	(12.300.0	(7.560.88	(2.207.63	72.379.24	78.383.67	84.879.60	92.220.25	99.507.09	67.131.62	72.484.88	78.559.24	84.465.28	91.155.81	98.359.12	106.540.8	114.455.8	123.431.3	133.084.4
Cumulative Cash Flows	(67.698.7	(37.874.1	(50.485.8	(58.573.3	(62.896.2	(63.993.8	(32.702.3	(3.235.00	24.512.28	50.727.03	75.323.66	89.753.15	103.301.1	116.069.1	128.006.5	139.209.0	149.720.2	159.620.6	168.869.2	177.542.1	185.673.6

Figure 18 Cash Flows for Equity (5.000 kWp)

When looking at the yearly cash flows from investor perspective the investment pays of with the beginning of year 8, which is indicated by the blue line which represents the cumulative cash flows for the investor. Despite the debt service in the first 5 years, the project is profitable enough to repay the investments under 10 years. This is mainly because of the low interest that comes with the NDF loan. In the subsequent years the steep increase of the feed-in tariff revenues caused by the feed-in tariff escalation results in a highly profitable project provided that the assumptions regarding inflation rate and exchange rate escalation materialize as forecasted.

---

[82] A general term describing a financial ratio that compares some form of owner's equity (or capital) to borrowed funds. <http://www.investopedia.com/terms/g/gearingratio.asp> (Last visited on: 29/12/2015)



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Revenues and Savings	58.864.21	63.816.44	69.374.83	75.417.37	82.210.82	89.127.19	96.890.15	105.329.2	114.817.1	124.476.6	94.722.97	102.973.3	112.248.9	121.692.4	132.291.8	143.814.3	156.768.9	169.957.8	184.761.1	200.853.7
O&M Cost	10.166.00	11.233.43	12.412.94	13.716.29	15.156.51	16.747.94	18.506.47	20.449.65	22.596.87	24.969.54	27.591.34	30.488.43	33.689.72	37.227.14	41.135.99	45.455.27	50.228.07	55.502.02	61.329.73	67.769.36
Debt Service	14.400.00	69.261.95	69.261.95	69.261.95	69.261.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Figure 19 Project Cash Flows (5.000 kWp)

The above chart displaying the project cash flows indicates the reduction of the feed-in tariff to 70% after the first 10 years of operation. However, due to the strong escalation of the feed-in tariff a similar amount is already being reached in year 15 of operation.

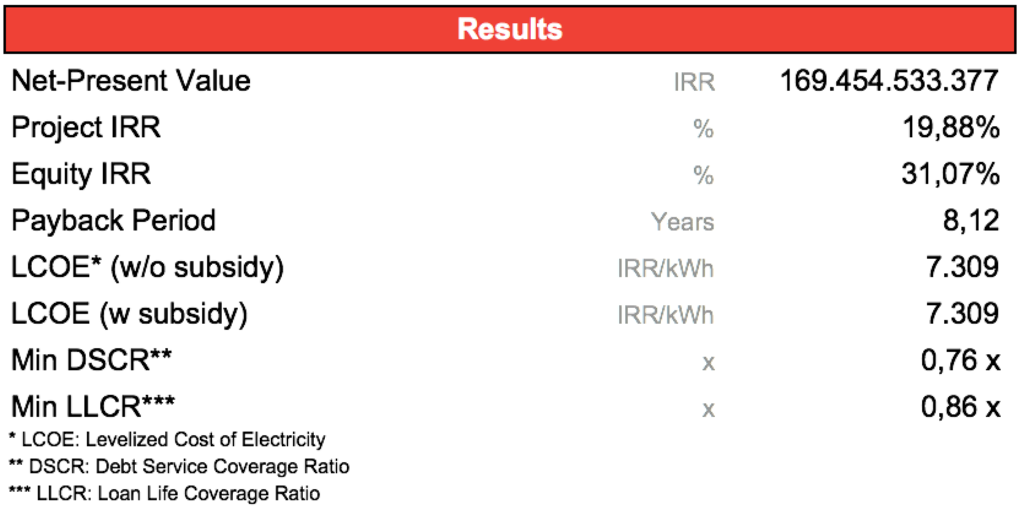
When looking at the specific results the high IRR and the NPV underline the high profitability of the investment. However, due to the high discount rate the LCOE is still relatively high compared to low interest and low inflation rate countries like in the EU. This is only partly offset by the high irradiation. Additionally, the loan performance indicators DSCR[83] and LLCR[84] are below one due to the short debt tenor.

---

[83] In corporate finance, the Debt-Service Coverage Ratio (DSCR) is a measure of the cash flow available to pay current debt obligations. The ratio states net operating income as a multiple of debt obligations due within one year, including interest, principal, sinking-fund and lease payments. Source: <http://www.investopedia.com/terms/d/dscr.asp> (Last visited on: 29/12/2015)

[84] A financial ratio used to estimate the ability of the borrowing company to repay an outstanding loan. The Loan Life Coverage Ratio (LLCR) is calculated by dividing the net present value (NPV) of the money available for debt repayment by the amount of senior debt owed by the company. Source: <http://www.investopedia.com/terms/l/llcr.asp> (Last visited on: 29/12/2015)

Table 30 Investment Results (5.000 kWp)



Results		
Net-Present Value	IRR	169.454.533.377
Project IRR	%	19,88%
Equity IRR	%	31,07%
Payback Period	Years	8,12
LCOE* (w/o subsidy)	IRR/kWh	7.309
LCOE (w subsidy)	IRR/kWh	7.309
Min DSCR**	x	0,76 x
Min LLCR***	x	0,86 x

* LCOE: Levelized Cost of Electricity
** DSCR: Debt Service Coverage Ratio
*** LLCR: Loan Life Coverage Ratio

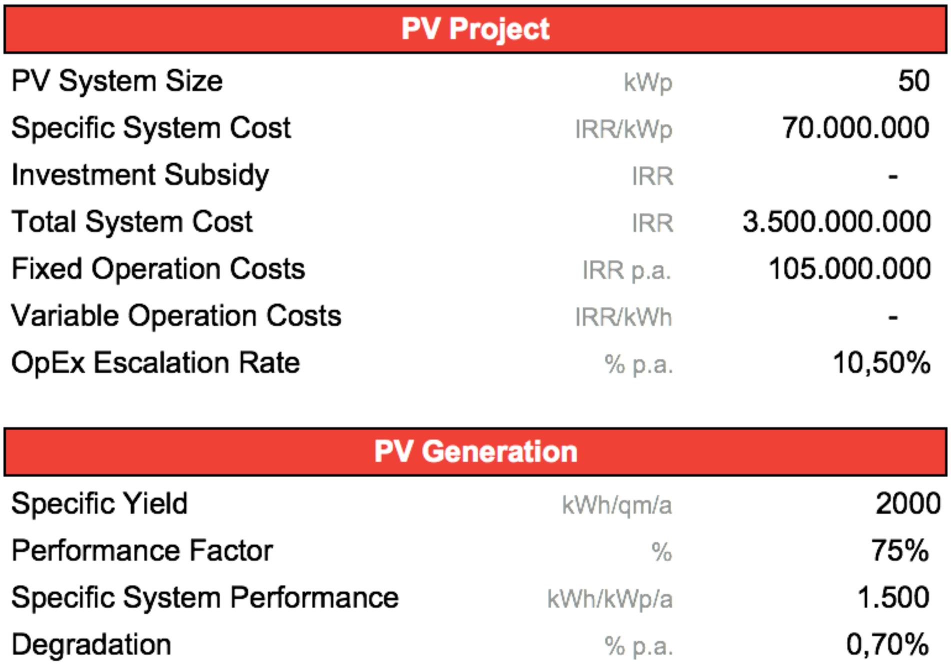
4.3.2 50 kWp PPA contract with the Distribution Company

The following case study covers a 50 kWp roof-top project for the below 100 kWp market segment in Iran. Compared to world market prices the turn-key system price of 70 Million Rials (ca. 2.187 EUR/kWp) is considerably higher. To account for additional cleaning costs in the usually dry and dusty climate of Iran, 3% of the total investment costs per year was assumed for operations and maintenance costs. These OpEx costs were escalated with a separate escalation rate because part of these costs will be accounted in EUR (50%) and the other part in the national currency. Thus an average escalation rate of 10,5% per year was used.

For this business model was considered also a solar irradiation of 2000 kWh/m² per year.

The performance factor was set at 75% to account for performance decreases caused by the dusty and dry climate and the resulting low self-cleaning effect of the modules. For the degradation a very common assumption of 0,7% per year was used due to the lack of experience with operational systems in this emerging market.

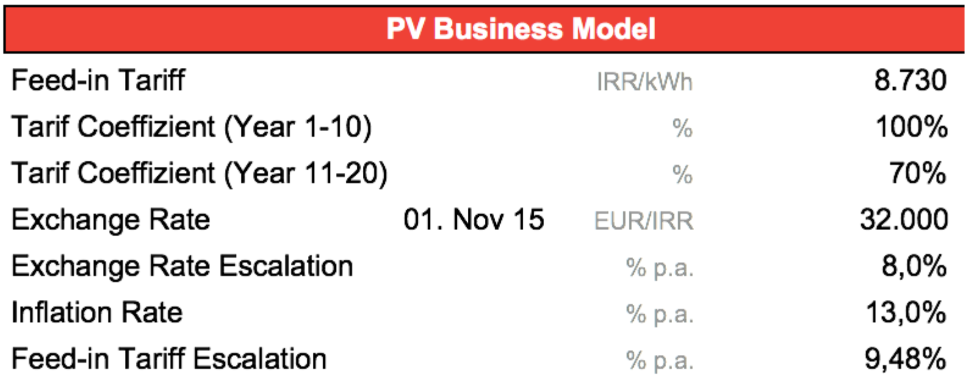
Table 31 PV Project Parameter (50 kWp)



PV Project		
PV System Size	kWp	50
Specific System Cost	IRR/kWp	70.000.000
Investment Subsidy	IRR	-
Total System Cost	IRR	3.500.000.000
Fixed Operation Costs	IRR p.a.	105.000.000
Variable Operation Costs	IRR/kWh	-
OpEx Escalation Rate	% p.a.	10,50%

PV Generation		
Specific Yield	kWh/qm/a	2000
Performance Factor	%	75%
Specific System Performance	kWh/kWp/a	1.500
Degradation	% p.a.	0,70%

Table 32 PV Business Model (50kWp)



PV Business Model			
Feed-in Tariff		IRR/kWh	8.730
Tarif Coeffizient (Year 1-10)		%	100%
Tarif Coeffizient (Year 11-20)		%	70%
Exchange Rate	01. Nov 15	EUR/IRR	32.000
Exchange Rate Escalation		% p.a.	8,0%
Inflation Rate		% p.a.	13,0%
Feed-in Tariff Escalation		% p.a.	9,48%

The business model of the PV project is based on a feed-in tariff, which is escalated over 20 years. The feed-on tariff escalation rate is a weighted average based on the inflation rate (weight 0,3) and the escalation rate of the EUR/IRR[85] exchange rate (weight 0,7). The feed-in tariff is reduced after the first 10 years of operation to 70% of the tariff for the first 10 years.

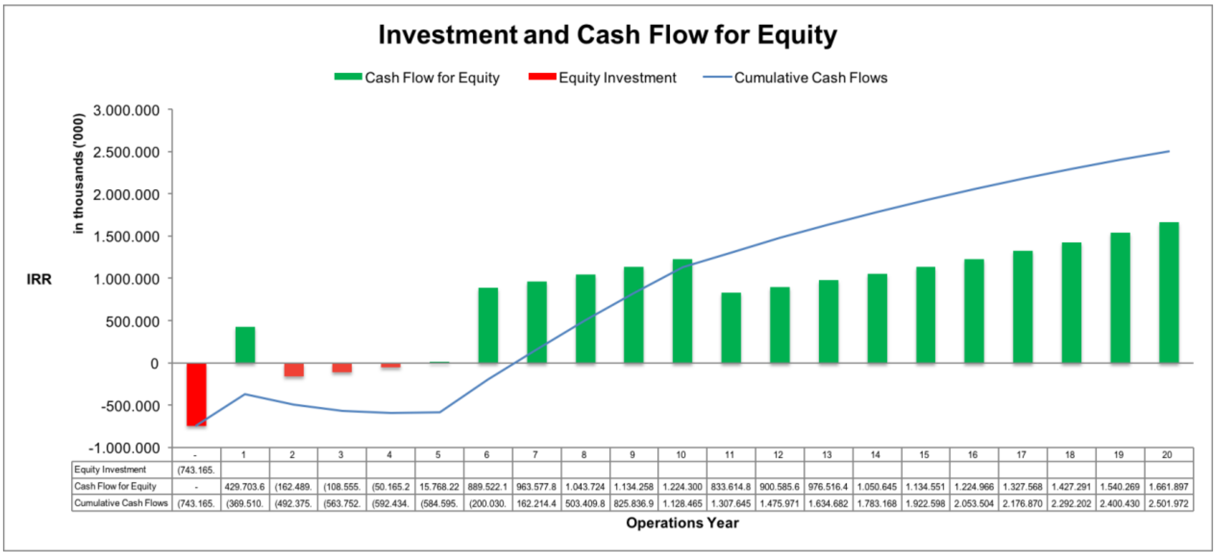
---

[85] IRR corresponds to the Iranian currency Rials.

Table 33 Financing and Investment Parameter (50kWp)

Investment			
Project Duration		Years	20
Equity		IRR	743.165.413
Debt (Gearing)	80%	IRR	2.800.000.000
Loan Tenor		Years	5
Interest Rate		%	6,0%
Discount Rate		%	15,0%

For the financing of the project the use of the national development fund was assumed with an interest rate of 6% p.a. for 80% debt and a loan tenor of 5 years. The discount rate was set at 15% to represent a low risk investment alternative that yields returns just above the expected long-term inflation rate.

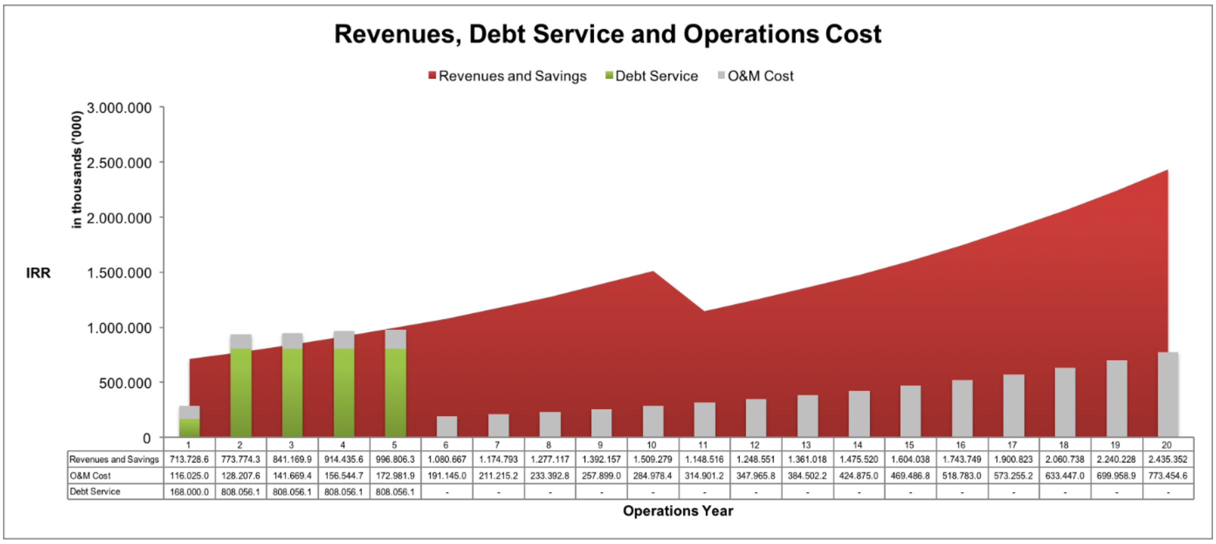


	-	1	2	3	4	5	6	7	8	9	10
Equity Investment	(743.165.										
Cash Flow for Equity	-	429.703.6	(162.489.	(108.555.	(50.165.2	15.768.22	889.522.1	963.577.8	1.043.724	1.134.258	1.224.300
Cumulative Cash Flows	(743.165.	(369.510.	(492.375.	(563.752.	(592.434.	(584.595.	(200.030.	162.214.4	503.409.8	825.836.9	1.128.465

	11	12	13	14	15	16	17	18	19	20
Equity Investment										
Cash Flow for Equity	833.614.8	900.585.6	976.516.4	1.050.645	1.134.551	1.224.966	1.327.568	1.427.291	1.540.269	1.661.897
Cumulative Cash Flows	1.307.645	1.475.971	1.634.682	1.783.168	1.922.598	2.053.504	2.176.870	2.292.202	2.400.430	2.501.972

Figure 20 Cash Flows for Equity (50 kWp)

When looking at the yearly cash flows from investor perspective the payback time of about 7.5 years is indicated by the blue line which represents the cumulative cash flows for the investor. Despite the debt service in the first 5 years the project is profitable enough to repay the investments shortly after repaying debt. This is mainly because of the low interest that comes with the NDF loan. In the subsequent years the steep increase of the feed-in tariff revenues caused by the feed-in tariff escalation results in a profitable project provided that the assumptions regarding inflation rate and exchange rate escalation materialize as forecasted. The decrease of revenues in year 11 is caused by the feed-in tariff reduction with a 70% multiplier.

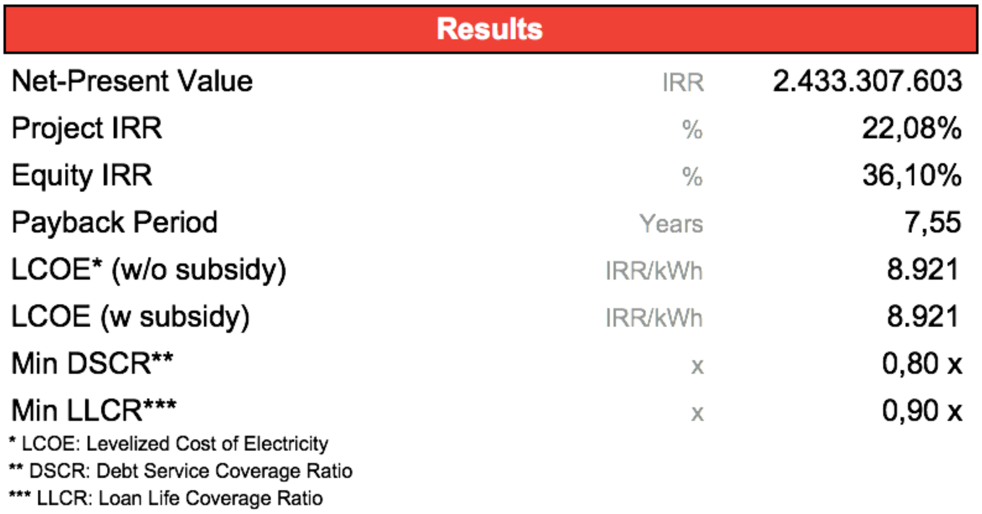


	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Revenues and Savings	713.728.6	773.774.3	841.169.9	914.435.6	996.806.3	1.080.667	1.174.793	1.277.117	1.392.157	1.509.279	1.148.516	1.248.551	1.361.018	1.475.520	1.604.038	1.743.749	1.900.823	2.060.738	2.240.228	2.435.352
O&M Cost	116.025.0	128.207.6	141.669.4	156.544.7	172.981.9	191.145.0	211.215.2	233.392.8	257.899.0	284.978.4	314.901.2	347.965.8	384.502.2	424.875.0	469.486.8	518.783.0	573.255.2	633.447.0	699.958.9	773.454.6
Debt Service	168.000.0	808.056.1	808.056.1	808.056.1	808.056.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Figure 21 Project Cash Flows (50 kWp)

When looking at the specific results the high IRR and the NPV underline the profitability of the investment. However, due to the high discount rate the LCOE is still relatively high compared to low interest and low inflation rate countries like in the EU. This is only partly offset by the high irradiation. Additionally, the loan performance indicators DSCR[86] and LLCR[87] are below one due to the short debt tenor.

Table 34 Investment Results (50 kWp)



Results		
Net-Present Value	IRR	2.433.307.603
Project IRR	%	22,08%
Equity IRR	%	36,10%
Payback Period	Years	7,55
LCOE* (w/o subsidy)	IRR/kWh	8.921
LCOE (w subsidy)	IRR/kWh	8.921
Min DSCR**	x	0,80 x
Min LLCR***	x	0,90 x

* LCOE: Levelized Cost of Electricity
** DSCR: Debt Service Coverage Ratio
*** LLCR: Loan Life Coverage Ratio

---

[86] In corporate finance, the Debt-Service Coverage Ratio (DSCR) is a measure of the cash flow available to pay current debt obligations. The ratio states net operating income as a multiple of debt obligations due within one year, including interest, principal, sinking-fund and lease payments. Source: <http://www.investopedia.com/terms/d/dscr.asp> (Last visited on: 29/12/2015)

[87] A financial ratio used to estimate the ability of the borrowing company to repay an outstanding loan. The Loan Life Coverage Ratio (LLCR) is calculated by dividing the net present value (NPV) of the money available for debt repayment by the amount of senior debt owed by the company. Source: <http://www.investopedia.com/terms/l/llcr.asp> (Last visited on: 29/12/2015)

4.3.3 Sensitivity Analysis (50 & 5.000 kWp)

In the following the results of a sensitivity analysis performed for selected key input parameters are presented. The sensitivity analysis allows to assess the impact a certain input parameter has on the profitability of a system. Also potential projects with varying input parameters due to a different location, installation costs or different financing structures can be compared.

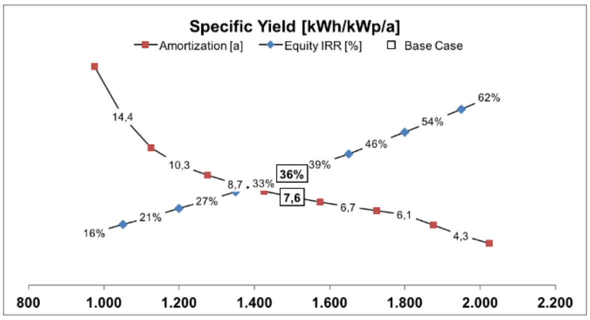


Figure 22 Yield Sensitivity (50 kWp)

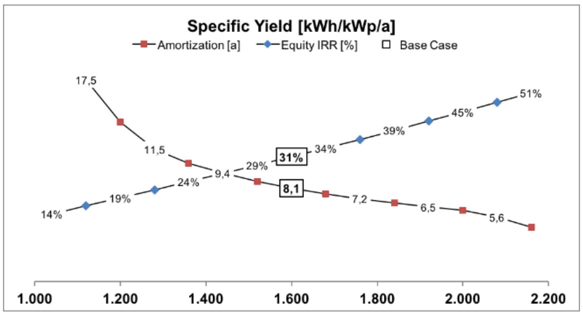


Figure 23 Yield Sensitivity (5.000 kWp)

The yield sensitivity helps to compare locations with different solar irradiation in combination with system setups that result in different plant performance factors by changing the specific yield that is used by the model. When looking at the results one can observe that the payback reacts non-linear on changes of the specific yield than the equity IRR because the payback time within the first years is strongly influenced by the debt service. During the debt service period, every change in revenue caused by a lower/higher yield disproportionately affects the payback period. The equity IRR instead is calculated based on the whole operations period and thus reacts proportionate/linear to changes in specific yield.

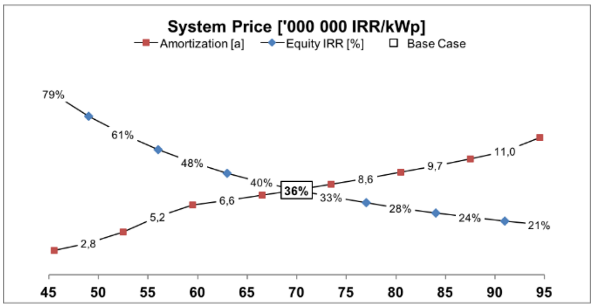


Figure 24 System Price Sensitivity (50 kWp)

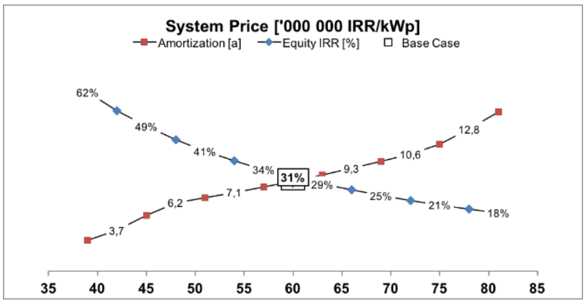


Figure 25 System Price Sensitivity (5.000 kWp)

The sensitivity on the system price helps to compare projects based on total costs for the components and the installation until operation of the system. For this sensitivity the equity IRR reacts almost linear to changes in the system price while the payback again reacts disproportionate to changing system prices because the payback time of the base case scenario is within the loan tenor.

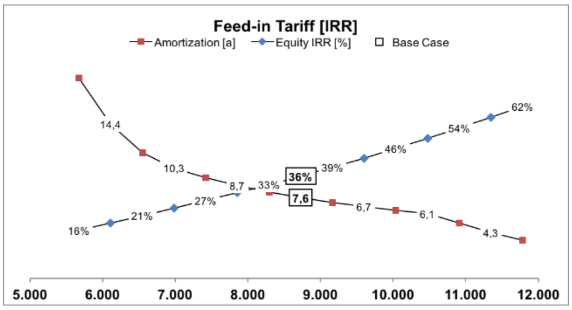


Figure 26 Feed-in Tariff Sensitivity (50 kWp)

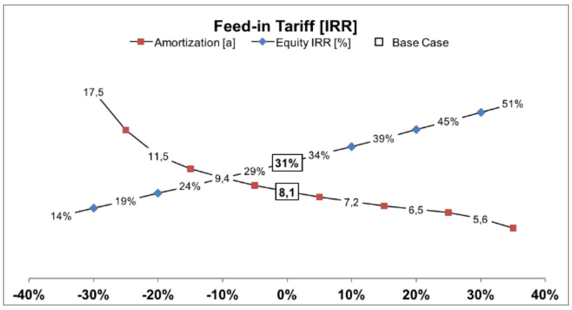


Figure 27 Feed-in Tariff Sensitivity (5.000 kWp)

The feed-in tariff sensitivity reflects changes in the tariff for new projects assuming that the tariff scheme (tariff and inflation adjustments) remains fixed for the whole project lifetime. The equity IRR again reacts proportionate to changes of the feed-in tariff and the payback period reacts stronger due to the debt service being paid within the first years of operation.

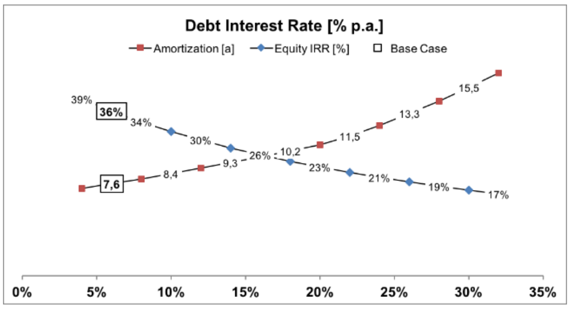


Figure 28 Debt Interest Sensitivity (50 kWp)

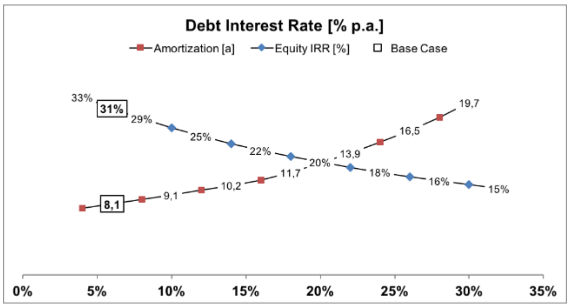


Figure 29 Debt Interest Senstivity (5.000 kWp)

The model uses a 6% debt interest rate based on the NDF financing facility for undeveloped regions. The results for lower interest rates like 4% for developed regions and higher interest rates for commercial banks are depicted in the chart. When changing the debt interest rate both results, the equity IRR and the payback period, react proportionate.

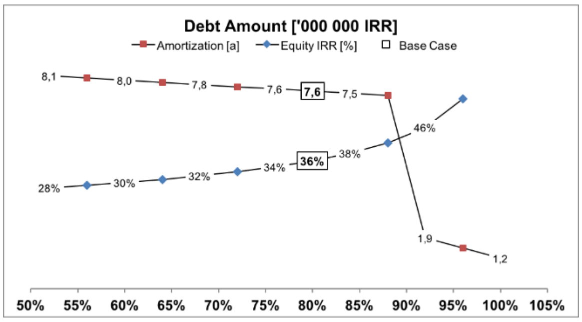


Figure 30 Debt Amount Sensitivity (50 kWp)

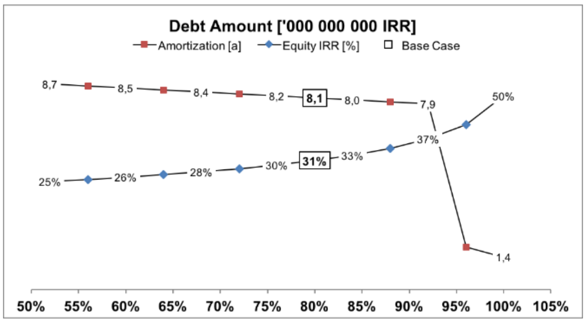


Figure 31 Debt Amount Sensitivity (5.000 kWp)

The debt amount sensitivity is useful to compare results with different degrees of debt leverage. When increasing the debt amount from the base case of 80% debt, the equity IRR and the payback period react disproportionately due to increased leverage. Below the base case both results react proportionate to a decreased leverage. Above 95% leverage the payback falls below 2 years because the cash flow available for equity within the first year is higher than in subsequent years due to the grace period of the debt service.

4.4 Success Factors for developing PV power plants

The critical success factors for the development of a PV power plant, which any investor should consider before pursuing a particular opportunity, are the following:

- Acquiring the required land: The acquisition of the land is a time consuming task in the development of PV plants in Iran, securing the land as soon as possible is one of the success factors.
- Financial Scheme: As financing the PV projects is currently difficult in Iran due to the limited budget of NDF, not having any specific financial scheme defined by SUNA and limited bank relations between Iranian banks and foreign banks, means that a financial plan for the project is a success factor for a developer.
- Grid Connection: Based on the PPA in Iran, the applicant should bear the costs of the construction of the required substation and the gridlines; therefore; if the location is chosen where there is no need for new substation or extra grid lines, the Capital Expenditure (CAPEX) would be lower.
- Signing the PPA sooner: As the policy of the Ministry of Energy and SUNA is to encourage developers and investors to construct the PV plants sooner, and to decrease the feed in tariffs according to the installed capacities, the sooner the PPA is signed the higher the feed in tariff would be.

5 Solar Business Conditions in Iran

The goal of the Iranian government to reach 5 GW from wind and solar energy until 2020 seems ambitious considering the slow development of renewables so far. However, the country has international pressure to achieve this, due to the obligations of the Kyoto protocol. Hence, the country has recently increased and extended its Feed-in-Tariff for renewable energy sources. Nevertheless, under the current financial conditions such as the high interest rate of over 25% in local banks, the requirement would be to bring their own funding.

This chapter describes the business conditions in Iran and give some recommendations for investors of how to overcome the current barriers.

5.1 Trade Conditions & Restrictions

5.1.1 Import of Renewable Energy Components from Germany to Iran:

Due to the bonus of the use of domestic products, some of the components are currently obtained in Iran[88]. Other components such as solar panels and inverters are not available in the local market and must be imported. Still, using locally produced panels or inverters makes the system eligible for the FiT-bonus. Because of the current trade restrictions, all renewable energy components may be officially delivered to Iran. The requirements for this transaction are following explained:

BAFA Application

A German Company should submit an application to the “Bundesamt für Wirtschaft und Ausfuhrkontrolle” (BAFA), to ask if the export of a commodity is subject to licensing and if a license may be granted. The BAFA is the central licensing authority in Germany, responsible for the administrative implementation of the export control policy.

The application is online[89]. For this, it is necessary to have the EORI number (Economic Operators' Registration and Identification number), which is an operator identification number that is a prerequisite for customs permission in the European Union[90].

Other requirements for the BAFA application include a description of the characteristics of the components, the size of the system, the final use of the energy and the contact information of the Iranian company which will get the components[91]. The application is only valid once. In this application, several components and products can be included. One

---

[88] For more details see chapter 3.3.2.

[89] For more information please visit (in German): http://www.ausfuhrkontrolle.info/ausfuhrkontrolle/de/antragstellung/index.html

[90] For more information please visit http://www.zoll.de/EN/Businesses/Movement-of-goods/Import/Duties-and-taxes/EORI-number/eori-number_node.html

[91] In case that the contract value exceeds one million Euros, it is necessary to get an extra permission from the German Federal Ministry of Economy.

important condition is the prohibition to install solar power plants for military uses. Additionally, the applicant should provide the following documents:

- A purchase order from the Iranian company
- A contract with the Iranian company
- An confirmation order with the Iranian company

Once the application has been submitted, the BAFA will take 7 to 9 weeks to give an answer. Further applications will take less time (approx. 2 -3 weeks), once one application has been made and the company has been registered. In case that the BAFA decides that the product(s) need a license, it would be necessary to deliver the necessary requirements. This differs in from case to case.

Iran Custom Procedures – Tax Payment

For the delivery of renewable energy components to Iran, the company should pay customs duties. Each product has a standard tariff which corresponds to a percentage of the price of the goods and is defined every year (according to the Iranian Calendar) in a list.[92] The tariffs are updated every year according to the government policy, the market demands and the domestic manufacturer's protection policies (generally, the tariffs remain the same for years). The current custom tariff for solar panels is 17% and for solar inverters is 22%.

In addition to the standard custom tariff, there are some other factors (like education support fees, etc.) which need to be added. But the total overhead related to this issue would be maximum 2%.

The power plant owner can register the project with the Ministry of Trade and Industry to get permission for costum tariff discount up to 5%. Nevertheless, it is recommended to calculate the project's feasibility study in a worst case scenario without this discount, due to the long period that the consignee can spend in the customs.

Currently there are no legal deductions (Tax & VAT, social security) and it is not possible to get payments for the purchase of electricity in advance.

5.2 Securities and insurances

Currently there is no investment insurance coverage for foreign investments, including PV systems in Iran (by Iranian Insurance Companies) due to the lack of experience in this regard. There are normal liability, engineering and risk insurances (for the installation and operation phase) for fossil fuel power plants, which could be extended to the renewable energy field. There is also a "power plant output energy guarantee", defined as an "income

---

[92] The list is available in: http://www.irica.gov.ir/Portal/Home/Default.aspx?CategoryID=84ce9da5-edb7-40ff-93f1-202b49eb8285

protection insurance", which has not been applied and therefore, there is lack of experience in this field.

On the other side, the Iranian government promotes the foreign investment with the "Foreign Investment Promotion and Protection Act" (FIPPA). This law gives a political protection during the investment process (e.g. against war). Additionally, the payment procedure would be guaranteed by the Ministry of Energy.[93]

5.3 Payment Procedure & Money Transfer

The payment should be done in Rials with a six months bank guarantee (LC) from the Ministry of Energy. This guarantee will be extended every six months. One important remark is that all delayed payments would cause penalty (after one month).

The transaction of money during the trade restrictions period can be done through "Exchange Offices". These offices are licensed by the IRAN Central Bank. Another option is to make the transaction through an Iranian partner. After the removal of the trade restrictions, the whole procedure could be done over a bank account in Iran, when the Iranian banks will be connected to the swift system.

There is a fee for the exchange of Rials into Euros or Dollars. To calculate this fee and to receive the payments of the Feed in Tariff, the Central Bank of Iran has developed an index formula. This is explained in chapter 3.3.2.

5.4 Market Entry – Opportunities

Aside from the challenges to enter the Iranian market, there are several opportunities for foreign investors. These are following described:

- Excellent natural conditions: e.g. high solar irradiations (4.5 to 5.5 kW h/m2) and a favourable climate for photovoltaic electricity production[94]. This makes it possible to reach the double energy output than in some European countries.
- Attractive feed in tariffs and other policies supporting PV[95].
- Political determination to reduce fossil fuel subsidies[96]
- High electrification rate, enabling PV installations to be connected to the grid in most areas of the country.
- The solar PV installation market is in an early stage. Until now the EPC sector in Iran has experience in the installation of off-grid systems in the rural sector and they are willing to participate in the installation of bigger systems. Hence, there is an

---

[93] For more information visit: http://www.investiniran.ir/en/investmentguide/manual
[94] For more information see chapter 2.8.
[95] For more information see chapter 3.3.2.
[96] For more information see chapter 1.

opportunity to improve the market through trainings and know-how transfer from Germany.

- Iran has the potential and experience to manufacture low voltage and medium voltage materials and also mounting systems, cables and etc. and profit from the bonus for the use of local products.[97]
- Products “made in Germany” are well received on the market. 87% of Iranians consider German brands to be of high quality, versus only 18% of the Chinese products.

Benefits and Chances from Renewable Energy for Iran

The increment of the share of renewable energy will lead to enormous benefits and chances for Iran, including:

- The export of natural gas and petroleum can increase simultaneously as the production of renewable energy replaces their domestic consumption.
- Rural areas can be supported by the decentralized structure of renewable energy sources.
- As a consequence from distributed energy production, the drinking water supply can be eased which also supports local agriculture and health can care.
- Climate protection goals can be realized due to the impact of renewable energy sources.
- Iran can act as a role model by defining itself as a user and provider of renewable energy, although it has fossil resources as an alternative.
- The local employment market will be developed. Both the quality as well as the quantity will improve due to the new decentralized structure.

5.5 Market Entry - Risks

- Consumers are not aware of the benefits of solar technologies.
- Economic stability of the country (mostly due to inflation, currency devaluation and budget deficits).
- Uncertainty due to the trade restrictions.
- Sovereign rating currently not existing and the new one could be lower than expected.
- Difficulties with the deployment of rules, e.g. potential difficulties in reducing local staff due to the employee-friendly laws.
- Payment delays from subsidy institutions due to the possible lack of financing. Nevertheless, currently the government is trying to raise the tariff of the electricity bill to increase the FiT.

---

[97] For more details see chapter 3.3.2.

- A further obstacle is the required legitimation from the government. All tasks, even the simplest have to be regulated via complex procedures. This slows the whole process down.
- There is a very strong gas and oil lobby in Iran that has established its influence over the years and might affect the development of renewable energy sources in the future.
- Insufficient national standards for grid connection and photovoltaic installation connections.
- Language barriers: many documents are not available in English, therefore a translator will be mandatory.
- Different corporate cultures.

5.6 Market Entry and Project Development Recommendations

Foreign investors interested in investing in renewable and clean energy should consider the following items:

- One of the most important aspects to consider is to have an Iranian partner. This eases the understanding of the complex governmental procedures, get the necessary permissions (such as the land acquirement) and to overcome the language barriers. Also, it is mportant to have a good relation to the local grid company to ensure the fast and effective connection of the plant.
- Developers/ investors should care about the grid connection; if any new substation or new grid cable needs to be built, the developer/ investor has to bear the cost.
- The local content bonus recommends acquiring the products needed for PV power plants in Iran. The benefits include the bonus for using local products[98] and the avoidance of duties and transport costs. This applies also for hiring staff for construction and maintenance. However, the Iranian staff should be trained to maintain the facility. And however, products from abroad might have advantages in terms of maturity, quality and international certification that compensate for the abdication of the bonus.
- It is not only prohibited to transfer the title to construction permit from one beneficiary to another, but it is also prohibited to transfer more than 25% of the share of the company to others without permission of Ministry of Energy.
- Applicants should inform SUNA about the site selection. SUNA will check if this land is “free” or already reserved by other applicants.

---

[98] See chapter 3.3.2

- The FiT shall stimulate private investments, so in addition to private companies, cooperative companies and actual persons and civil partnership groups might be involved in the construction permit and concluding contract.
- It is important to note that the borders between personal relationships, community and business are blurred. When operating in Iranian territory this is important to consider.
- To overcome the difficulties with the employment rules, it is possible to have short-time period contracts. Currently, it is usual to have contract between 3 and 12 months. Nevertheless, the regular insurance and tax must be paid.
- It is recommended to register at the OIETA (Organization for Investment, Economic and Technical Assistance of Iran[99]) and get FIPPA support if German investors want to invest in renewable energy in Iran.

---

[99] For more information please visit: http://www.investiniran.ir/en/home

5.7 Four Rules for Successful Market Entry[100]

Most of the obstacles can be overcome if companies adhere to certain rules and guidelines. Some foreign companies are better positioned than others (e.g., based on perceived product features or loyalty), but in principle foreign companies should be able to be successful in Iran. We have identified four rules to facilitate a smooth entry.

I. Get the Basics Right

- A good understanding of the country's history, culture and business landscape is a minimum condition. The same goes for language capabilities: many documents are only available in Farsi and some older Iranians do not speak English nor German. Having Farsi speakers in your team will prove invaluable.
- Gaining a good understanding and the build-up of trust will not happen overnight, and certainly not through emails and conference calls. Expect to be present often and ideally establish an anchor on the ground. The country and all its intricacies demand frequent face-to-face interactions.

II. Start at the Top – But Be Aware of Middlemen

- Given the centralized nature of companies and governments bodies, it will take considerable time to get anything off the ground if companies start at the lower end. Aim for an entry point in the highest echelons of an organization. It may not be easy at first, but it will speed up the overall process and expect to mirror the level of seniority in terms of attendance.
- It is always best to go directly to the senior management when possible. If this proves difficult, foreign companies may need to leverage middlemen to gain access – a common practice in the Middle East which can be an effective business accelerator. Such locals can possess essential know-how on how to navigate within their culture and have the right contacts, but using these individuals requires careful consideration of compliance regulations and it comes with certain risks.
- For example, it can initially seem to work well by opening doors and helping to identify opportunities. Later, it may turn out that the middleman has his own agenda or that he closed other doors for you, or that he promised contacts which turn out to be weak and months are wasted.
- Companies should therefore tread carefully, particularly given the vast number of agents and intermediaries that have sprung up in the wake of the re-emerging economy after the santions. Selecting a reliable middleman could be one of the most strategic moves that a company entering Iran makes.

---

[100] "How to do business in Iran – successfully". Think Act, Business in Iran. Roland Berger. November 2015.

III. Prepare Yourself Legally

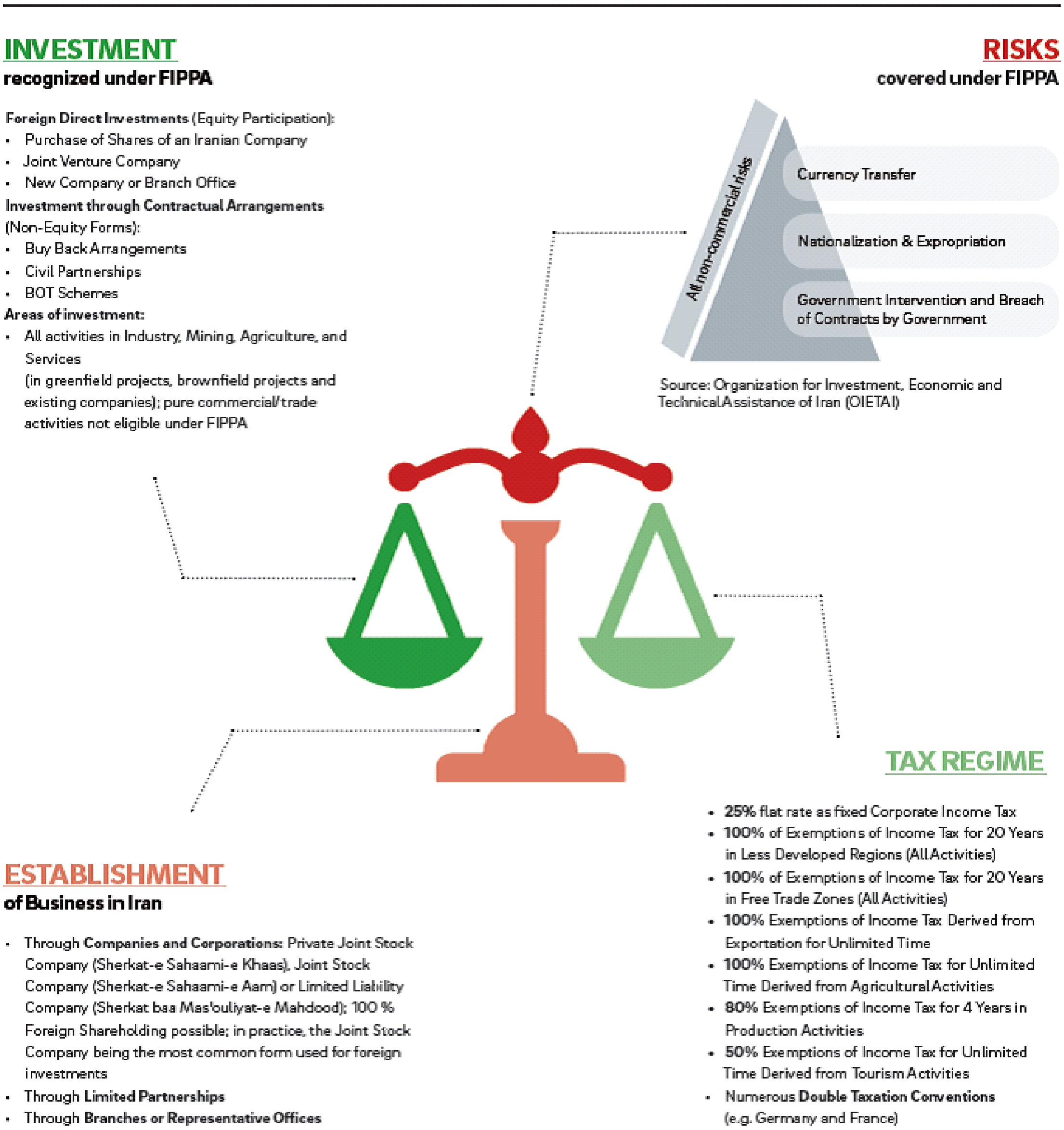
- Following the JCPOA, it is expected that most economic restrictions will be lifted or relaxed in the first quarter of 2016. However, regardless of the status of the trade restrictions – whether they are in the process of being relaxed or are already lifted upon entering Iran – companies need to have a good understanding of the Iranian legal context in order to mitigate their investment risk.
- One way to mitigate investment risks is to structure the business in a way that it falls under a Bilateral Investment Treaty (BIT) and/or another investment agreement. There are 52 BITs in force between Iran and other countries, such as Germany, France, Italy, Austria and Switzerland. Amongst other things, BITs with Iran provide protection against expropriation without compensation, free transfer of capital, guaranteed equal treatment with nationals and, in principle, the possibility of arbitration proceedings (UNCITRAL), even though the free choice of the governing law is limited.
- In addition to the BITs, protection and incentives are also provided under Iranian national law. The Foreign Investment Promotion and Protection Act 2002 (FIPPA) guarantees important privileges to foreign investments such as an equal treatment standard, transfer of funds and dividends, compensation against expropriation and access to foreign courts. However, in order to be privileged, the foreign investor has to obtain a permit from the so called OIETAI Organization. The permit will be issued fairly promptly, if – based on a substantial business plan – the applicant can demonstrate that the business activities are eligible (e.g. not purely commercial). So, as is often the case, the devil is in the detail. The careful and timely preparation of the business plan is essential.
- A positive aspect is that foreign investors are, with few exceptions, allowed to hold up to 100% of the shares when investing in Iranian companies, which is a rare privilege in this region. Foreign investors can also choose freely between the legal forms provided by Iranian Commercial Law, with the Private Joint Stock Company proving to be the most common and suitable corporation form for foreign investors.
- There are also various tax and legal provisions privileging the establishment of foreign companies in free trade zones and special economic zones. Iran has concluded numerous double taxation conventions (DTC) essentially based on the OECD Model Tax Convention with Germany, France, Spain, Austria and Switzerland. However, knowledge of the Iranian practice of implementing the relevant dispositions is essential for any tax optimized structuring.
- Overall, the legal framework in Iran is mature, but it can hold surprises. It is highly advisable to engage a law firm with expertise in international business that has on-

the-ground experience in Iran and can demonstrate up-to-date and reliable knowledge.

IV. Position for the Long Term

- Although establishing a company does not legally require an Iranian partner, no matter the type of business, foreign companies are dependent on local Iranian companies and need to establish such partnerships. Looking for a partner may seem easy given the sheer size of the economy, but the packed hotels in Tehran indicate the interest is high and many companies are vying for the same business.
- A differentiating and long-term positioning is crucial to spark interest. Providing financial investment is appreciated (and needed) but is more a hygiene factor than a true differentiating factor for a sustainable partnership. Iranian partners expect a long-term commitment from foreign companies and this means collectively building a business, based on mutual respect and transfer of knowledge and expertise. To support such an approach, building local employment through offices and factories is a strong commitment.
- A long-term approach will be partly automatic. When doing business in Iran, one key virtue is patience. Decision-making simply takes time due to the culture and administrative roadblocks. When meetings are closed with clear next steps, expect the timelines to be fluid. Pushing the partners in the beginning is a great way to start off on the wrong foot, so prepare for long timelines and unexpected hurdles.
- For some foreign companies, conducting business in Iran will become a reality in the short term while others will choose a passive approach as they find this unique country somewhat daunting. Still, the Iranian opportunity is too big to ignore and companies around the world should start preparing themselves today in order to hit the ground running. For sure, it will not be a smooth ride for most, but with a readiness to invest and learn, successful business in Iran is achievable. Or to put it in the words of the famous 13th-century Persian poet and scholar Rumi: "As you start to walk on the way, the way appears".

Legal Framework for Investments[101]



INVESTMENT

recognized under FIPPA

Foreign Direct Investments (Equity Participation):

- Purchase of Shares of an Iranian Company
- Joint Venture Company
- New Company or Branch Office

Investment through Contractual Arrangements (Non-Equity Forms):

- Buy Back Arrangements
- Civil Partnerships
- BOT Schemes

Areas of investment:

- All activities in Industry, Mining, Agriculture, and Services (in greenfield projects, brownfield projects and existing companies); pure commercial/trade activities not eligible under FIPPA

RISKS

covered under FIPPA

All non-commercial risks

- Currency Transfer
- Nationalization & Expropriation
- Government Intervention and Breach of Contracts by Government

Source: Organization for Investment, Economic and Technical Assistance of Iran (OIETAI)

ESTABLISHMENT

of Business in Iran

- Through **Companies and Corporations:** Private Joint Stock Company (Sherkat-e Sahaami-e Khaas), Joint Stock Company (Sherkat-e Sahaami-e Aam) or Limited Liability Company (Sherkat baa Mas'ouliyat-e Mahdood); 100 % Foreign Shareholding possible; in practice, the Joint Stock Company being the most common form used for foreign investments
- Through **Limited Partnerships**
- Through **Branches or Representative Offices**

TAX REGIME

- **25%** flat rate as fixed Corporate Income Tax
- **100%** of Exemptions of Income Tax for 20 Years in Less Developed Regions (All Activities)
- **100%** of Exemptions of Income Tax for 20 Years in Free Trade Zones (All Activities)
- **100%** Exemptions of Income Tax Derived from Exportation for Unlimited Time
- **100%** Exemptions of Income Tax for Unlimited Time Derived from Agricultural Activities
- **80%** Exemptions of Income Tax for 4 Years in Production Activities
- **50%** Exemptions of Income Tax for Unlimited Time Derived from Tourism Activities
- Numerous **Double Taxation Conventions** (e.g. Germany and France)

---

[101] "How to do business in Iran – successfully". Think Act, Business in Iran. Roland Berger. November 2015.

5.8 Useful Contacts in Iran and for the business with Iran

- Renewable Energy Organization of Iran – SUNA: www.suna.org.ir
- Organization for Investment, Economic and Technical Assistance of Iran – OIETAI: www.investiniran.ir
- German-Iranian Chamber of Commerce: www.Iran.ahk.de
- German Solar Association – BSW-Solar: www.solarwirtschaft.de
- Federal Office for Economic Affairs and Export Control – BAFA: www.bafa.de

6 Recommendations on the General Framework

The Iranian PV market will certainly soon emerge. The government has taken path breaking steps to promote the expansion of solar energy. Based on the new regulation, the market stakeholders will have to gain experience in how to apply the new procedures, thus further lessons for improvement will soon be learnt. Still, some general difficulties have already been identified by potential investors and project developers that can be tackled with the support of best practices from Germany and from other mature PV markets. In this chapter, those barriers will be linked to potential solutions that can be followed-up by Iranian governmental decision makers. Those solutions do not include such general recommendations like the engagement for removed trade restrictions or the reduction of fossil subsidy. Such developments are heavily influenced by other factors than renewable energy policy.

Barrier 1: Financing of Solar PV Projects

Solar energy has hardly any running costs but need high up-front investments. Thus, the availability of financing and financing conditions play a crucial role for those kind of investments.

a. **National Financing:**

The financing of PV projects via debt financing from banks is still too expensive. Private banks ask for interest rates of approx. 25%, which lowers the IRR and increases payback periods significantly. In the starting phase of the Iranian PV market, alternative funding is needed. Iran has already established a national funding scheme that can be used for clean energy projects, too. However, this “National Development Fund” (NDF) is not primarily designed for PV systems. The fund does even not foresee a budget for small PV installations on residential and commercial rooftops, which are explicitly supported by the FiT for plants < 100 kWp.

Recommendation:

Lower and more competitive interest rates reduce the Weighted Average Cost of Capital (WACC) of solar PV, which is the main factor that determines the cost of PV today. Therefore, if the WACC is gradually reduced, the PPA price can be decreased as well, leading to a kick start of the still nascent Iranian PV sector. For providing sufficient project financing loans at lower interest rates than available in the free market, the NDF should therefor increase the share for renewable energy projects, including small PV installations. Also more national credit lines for renewable energy investments should be developed, as it is impossible now and difficult in the mid-term perspective to obtain international funding. Moreover, the authorities should streamline and make funding regulations for national credits and other subsidized credits more transparent to avoid additional information cost for investors.

b. Currency and inflation Risk:

Inflation rate in Iran is currently about 13% per year. It means that the calculated costs for the solar PV parks during the planning phase will increase at the stage of the plant installation. This will impact negatively the calculation of the Levelized cost of electricity (LCOE) for the PV projects, which will be different depending on the project’s phase.

Recommendation:

One option to tackle this currency risk would be to realize solar investments in a currency less exposed to inflation like the USD or Euro. It is acknowledged, that this could only happen after the removal of the trade restrictions. To minimize the impact of the inflation, photovoltaic parks should be installed as fast as possible after signing the PPA with SUNA. This means that imported products have to be entered in the field as well as production has to provide components “just-in-time”, requiring very simple, efficient and clear administrative procedures.

c. Empowerment of the Banking Sector:

The costs of capital are dependent on the risks that a financing organization sees in a PV project. The higher the risks are, the higher is the so called risk-premium that investors and banks will require to face when investing in a project or lending money. Thus a rigorous and consequent reduction of risks can lead to greater trust and thereby to reduced premium risks and costs of capital. Banks must be able to trust that the investments will generate the expected and agreed return. If that is the case they are willing to accept lower interest rates or set up specific credit lines for solar projects. Iranian Banks consider three factors when they assess the creditworthiness of a project, resulting in the demand of collaterals:

- Evaluating the financial ability of the applicant: What is the turnover of the company? Has the company implemented similar or any project before? Have they paid back the loans they received in the past?
- Evaluating the planned project / bankability: Is the planned project well designed? Which company is the EPC for this project? What is the chosen equipment / technology for this project? What is the IRR, RoI, and other financial parameters of the project?
- Evaluating the off-taker risk: Who is going to buy the electricity in terms of creditworthiness / rating?

If Iranian banks get familiar with PV projects, they would provide developers more simply with loans; If they have better estimations on the return of investment, they would demand less collaterals from the applicants and may even consider the PV system as part of the required collateral.

Recommendation:

SUNA has the authority to start informational talks or even negotiations with domestic banks in order to convey a better understanding of the PV technology, of the recent policy framework, of the project development process and of the PV plant in operation. This understanding can be achieved by specific financing workshops / trainings supported by international experts (e.g. German KfW-bank), by developing standardised bankability criteria (like the “BSW-financing-criteria”) and by an intense information exchange between Iranian bank representatives / associations with SUNA and the PV stakeholders. As an objective, domestic should be motivated to design their own financing schemes which enables the Iranian PV market to grow self-sustainably.

Barrier 2: Uncertain Outlook on future FiT-financing

a. Insufficient surcharge for solar targets:

The main financial source to pay the renewable electricity generated in Iran comes from the electricity bills of end-users in the country, which is equal to 30 Rials per kWh. Assuming to have 200 Terawatt hours a year electricity bills in Iran, the calculated Budget would be around 6000 billion Rials, respectively 4000 billion Rials capped by the parliament. Based on the laws, these 4000 Billion Rials per year (equals 122 million Euros, as of Dec. 2015) should be spent for both buying electricity from renewables, and for rural electrification. The share of each one is not clear and annual changes are a source of confusion. Moreover, even if all of this money was spent for buying electricity from renewables, is only sufficient for some hundred MWs of energy produced by renewable. But the target of the government is much higher (5000 MW for the next five years). After the expected breakup of the solar PV market, some investor retention might arise due to the uncertainty of re-financing by the FiT-surcharge.

Recommendation:

In order to give investment assurance to the sector, SUNA should start the negotiation process for defining a growth path of the FiT-surcharge early, which will most probably soon have to be increased. Experience from other countries like Germany show, that a budget freeze in the midst of a running market can destroy investor confidence and break down a formerly steady market expansion. Consequently, negotiations should start far in advance of a foreseeable exhaustion of the FiT-budget.

b. Timely announcement of future FiT

In the moment of the PPA signature between SUNA / DSO and the investor, the FiT of that moment will be deployed. But planning processes have started months earlier, including the economic analyses necessary for assessing the project feasibility. Consequently, future FiTs should be published as early as possible. In the current practice, new FiTs used to be announced even one or two months after the beginning of new Iranian year, which starts on 20th or 21st of March. Thus practice was announcement end of April or even in May.

Recommendation:

To maintain a reliable FiT-policy for investors, SUNA should announce the new feed in tariffs at least at the beginning of the New Year. Some more time in advance would be very much appreciated by the investor community. As a better alternative, SUNA could create a committee to determine the appropriate feed in tariffs a few months before each year. This committee would have the responsibility to monitor the market, the system prices, calculate the profitability analysis and recommends the feed in tariffs to SUNA.

Barrier 3: Incomplete standards for the project development process

Standards for the PPA authorization process are only partly defined yet, which is highly understandable due to the juvenileness of the new legal framework. The PPA process for large installations (>100 kWp) is well defined, but some procedures such as the grid connection process are still missing. For small installations, the process is still under construction. This creates some planning insecurities and higher information costs. Whereas SUNA is highly prepared to push the solar market expansion, on the side of DSOs and regional electricity companies there is still room for higher commitment and improved knowledge. There are not enough experts who know PV systems well. This leads to personalized decisions and deviation from the standard procedures.

Recommendation:

A standard-driven framework should describe clearly, which forms and criteria have to be applied in each step of the process. Specifically, SUNA should define the procedure for PV systems smaller than 100 kWp in detail. Moreover, SUNA should train the DSOs and equip them with standardized forms for reliable interaction with the investor within the approval procedure. Installers should be trained in order to qualify for the group of certified installation companies. With Tavanir and the DSOs, a catalogue of uniform grid connection requirements should be developed. It is important, that all those standards are applied throughout the entire Iran in a uniform way.

Barrier 4: Lack of public knowledge about the change

An energy transition as planned in Iran changes the role of many stakeholders, it costs money and confronts people with new technology they didn’t know before. Thus, resistance against this change will probably arise from many sides. Many barriers can impede the expansion of solar energy, these barriers not only come from immanent conditions but also from opposing parties. On the other hand, the energy transition will only be successful, if the general public, the industry and policy makers / regulators accept and share the joint objectives. This also serves as a counter insurance that the new legal framework will not be removed or significantly modified soon again, which would destroy investor confidence. It is crucial, that the introduction of solar and wind energy will be accompanied by public relation which conveys positive messages and the various benefits of renewable energy such as economic value creation, jobs, emission reduction, environment protection, satisfaction of growing energy demand or civic participation. The latter is also a big challenge for raising private capital in distributed PV. Communication activities should also have a marketing effect and motivate people to invest in solar energy.

Recommendation:

SUNA should initiate and plan communication activities that frame and explain the new regulation, the benefits and the maturity of the technology for the general public. Such activities can be campaigns like the German “Week of the Sun”[102], press work, workshops / conferences for specific multiplier target groups, online media or printed information material. It is even more effective, to implement such measures together with the private sector (e.g. association, chambers) in order to increase reach and trustworthiness in the audience. In Germany, the private sector and the responsible ministry have even founded in 2004 a joint public-private “renewable energy agency”[103] which aims at explaining renewable energy to decision makers and the media via statistics, graphs, studies, surveys, films, press events, award ceremonies, online activities and brochures. Their reach and persuasive power is immense and has played a crucial role in the perpetuation of the German energy transition.

---

[102] The annually organized campaign "Week of the Sun" aims at raising public awareness of intelligent energy solutions and behaviours in Germany, particularly for solar thermal and photovoltaics. BSW-Solar supplies solar newspapers, exhibition posters and advertising material on solar thermal energy and photovoltaics free of charge to all interested actors who organize solar events in their municipality in the scope of the WEEK OF THE SUN. The campaign took place for the first time in 2007 and immediately led to 1,600 solar events all over the country, recently having increased to approx. 4.000 (2014). All local actors who are involved and interested in the spreading of solar energy can take part in the WEEK OF THE SUN: craftsmen, local authorities, solar initiatives, environmental groups, energy consultants, architects, banks or schools. More information: www.woche-der-sonne.de

[103] http://www.unendlich-viel-energie.de/english

Outlook from the recommendations

Through the barrier analysis and the close exchange with local experts, it became clear that Iran's PV sector still requires more qualified expertise and know-how. In particular, the following study areas and practical actions should be carried out to enhance an efficient and sustainable development of the PV industry and market:

- Focusing on the concrete institutional arrangement of the PV sector to identify administrative burdens and delays for the deployment of PV projects, especially after the new FiT scheme is put in practice;
- transparent and simple presentation of information on online platforms to facilitate and simplify the access to project development and permit procedures at national and provincial level;
- empowerment of banks and venture capital providers to understand technology and framework conditions;
- empowering the civil society and potential PV investors on the implementation of the PV distributed generation via communication activities;
- greater involvement of national and international development banks to help in the implementation of “de-risking” measures and in providing specific loan programmes at lower interest-rates, especially after removal of the trade restrictions;
- strengthening the cooperation between the Iranian renewable energy associations and international PV or RE associations through best practice exchange;
- increasing the quality standards for imported and locally produced PV components throughout the whole value chain

To conduct and support the referred study areas and practical actions, it is suggested to develop further projects that facilitate capacity building and knowledge transfer to empower key national actors of the private solar PV sector as well as relevant public institutions. The ultimate goal is to support the creation of a solar PV market that enables to boost a sustainable socioeconomic development in the country.

7 Bibliography

- ‘Development of three cornerstones for a sustainable Energy future in Iran’- German-Iranian co-operation VI- Wuppertal Institute for climate, environment and energy (2010)
- ‘Iran–The Chronicles of the Subsidy Reform’- IMF Working Paper- Guillaume et al. (2011)
- CBI: http://www.cbi.ir/category/1624.aspx
- Dominique Guillaume, Roman Zytek, and Mohammad Reza Farzin (2011), “Iran–The Chronicles of the Subsidy Reform“, International Monetary Fund, (online) Available from:<https://www.imf.org/external/pubs/ft/wp/2011/wp11167.pdf >. (Visited on 11/12/2015) http://www.auswaertiges-amt.de/EN/Aussenpolitik/Laender/Laenderinfos/01-Nodes/Iran_node.html (Visited on 11/12/2015)
- Farzad Jafarkazemi (2014), “Solar Business between Iran and Turkey; Future Perspectives and Opportunities”, SOLARTR 2014 Conference & Exhibition, Izmir.
- “How to do business in Iran – successfully”. Think Act, Business in Iran. Roland Berger. November 2015
- ICCIMA: http://en.iccima.ir/regulations/foreign-investment-laws-in-iran/item/8989-investing-opportunities.html (Visited on 11/12/2015)
- IEA: http://www.iea.org/policiesandmeasures/renewableenergy/?country=Iran (The table has been modified based on the current regulations. Visited on 13/12/2015)
- IGMC: http://www.igmc.ir/en#177930-introduction (Visited on 13/12/2015)
- IPO: http://www.en.ipo.ir/index.aspx?siteid=83&pageid=822 (Visited on 11/12/2015)
- MoE: “Iran Energy Balance (2013)”, Available from: http://pep.moe.gov.ir/ وی‌ارش-
  تب ک/امه رازنا رژ-ت ل-یاد شوردر-ک چهار-ک-ده.aspx (Visited on 9/12/2015)
- MoE: http://pep.moe.gov.ir/ 6/تاد سه- رنامه- شد شم-ب و سعه- در-ت وزارت-روی‌ن/ات مصوب-و-ی‌خروج
  ها.aspx (In Persian- Visited on 11/12/2015)
- MoE: http://pep.moe.gov.ir/ وی‌ارش-تب ک/امه رازنا رژ-ت ل-یاد شوردر-ک چهار-ک-ده.aspx (In Persian- Visited on 9/12/2015)
- MoE: http://www.moe.gov.ir/Inner-Pages/MainNav/ اره درب-وزارت-روی‌ن/تار ساخ -
  سازماني /سطح- ك-ي (حوزه-تادي سه)-(1).aspx (In Persian- Visited on 13/12/2015)
- MoE: http://www.moe.gov.ir/Inner-Pages/MainNav/ اره درب-وزارت-روی‌ن/تار ساخ -
  سازماني /سطح- سه- (ي ياتل عم).aspx (In Persian- Visited on 13/12/2015)
- MoE: http://www.moe.gov.ir/Inner-Pages/MainNav/(1) اره درب-وزارت-روی‌ن/تار ساخ -
  سازماني /سطح- دو-(ي ياذ م)-.aspx (In Persian- Visited on 13/12/2015)
- OIETAI: http://www.investiniran.ir/en/sectors/industry (Visited on 11/12/2015)
- OIETAI: http://www.investiniran.ir/en/whyiran1/strategicposition (visited on 11/12/2015)
- OIETAI: http://www.investiniran.ir/en/aboutus/objectives (Visited on 28/12/2015)
- OIETAI: http://www.investiniran.ir/en/aboutus/organizationchart (Visited on 28/12/2015)
- OIETAI: http://www.investiniran.ir/en/investmentguide/manual (Visited on 28/12/2015)

- OIETAI: http://www.investiniran.ir/en/ebook (Visited on 28/12/2015)
- OIETAI: http://www.investiniran.ir/en/investmentguide/manual (Visited on 28/12/2015)
- OIETAI: http://www.investiniran.ir/en/filepool/49/Procedure-for-Foreign-Investors?redirectpage=%2fen%2febook (Visited on 28/12/2015)
- OIETAI: http://www.investiniran.ir/en/investmentguide/procedure (Visited on 28/12/2015)
- OIETAI: http://www.investiniran.ir/en/investmentguide/sevicecenter (Visited on 28/12/2015)
- Old map of Industry of Iran, available from: http://iranpoliticsclub.net/maps/maps14/ (Visited on 13/12/2015)
- SABA: http://sabainv.com/ وز ةیع-نیوری-قر ب_570.html (In Persian- Visited on : 14/12/2015)
- SolarGIS: http://solargis.info/doc/free-solar-radiation-maps-GHI (Visited on 25/12/2015)
- SUNA: http://www.suna.org.ir/en/history
- SUNA: http://www.suna.org.ir/en/opportunitiestoconstruction/opportunities (Visited on 25/12/2015)
- SUNA: http://www.suna.org.ir/fa/sun/potential-تاذ س پیل-ش اب تـ-وه شـ ق ذـ-ش اب تـ-شروخید-رد-ایران (In Persian- Visited on 20/12/2015)
- SUNA: http://www.suna.org.ir/en/history (Visited on 13/12/2015)
- SUNA: Iran Minister of Energy Resolution regarding the feed in tariffs in 2015 (issued on 25 July 2015), Available from: <http://privatesectors.suna.org.ir/en/privatesectors> (Visited on: 14/12/2015)
- SUNA: Renewable Energy power plants Opportunity to Investment in Iran, prepared by SUNA (16 Nov. 2015)
- SUNA: Domestic content extra bonus defined by SUNA (2015) Available at: http://www.suna.org.ir/suna_content/media/image/2015/12/4256_orig.pdf (In Persian-Visited on 14/12/2015)
- SUNA: PPA contract issued by SUNA (issued on 2 October 2015) Available at : <http://privatesectors.suna.org.ir/en/privatesectors> (Visited on: 14/12/2015)
- SUNA: http://privatesectors.suna.org.ir/en/privatesectors (Visited on 14/12/2015)
- SUNA: http://www.suna.org.ir/en/aguide/applicationsteps (Visited on 28/12/2015)
- TAVANIR: http://news.tavanir.org.ir/papers/paper_detail.php?id=7676 (In Persian- with some updates for recent changes - Visited on 11/12/2015)
- TAVANIR: http://bahaye_bargh.tavanir.org.ir/ (Visited on 11/12/2015)
- TAVANIR: Ministry of Energy and Tavanir Holding Company, statistical report n 44 years of activities of Iran electric power industry (1967-2010), published in October 2011
- TAVANIR: http://www2.tavanir.org.ir/info/stat83/sanatlhtml/restructurin.htm (Visited on 12/12/2015)

- TAVANIR: http://www.tavanir.org.ir/index.php (Visited on 12/12/2015)
- TAVANIR: http://www2.tavanir.org.ir/info/stat83/sanatlhtml/Table/table05.jpg (Visited on 14/12/2015)
- World Bank: http://www.worldbank.org/en/country/iran/overview (Visited on 11/12/2015)

8 Annex

8.1 Interviews and Consultations

1. Atrin Parsian Co.
2. Eight structured interviews were conducted with manufacturers, installation and EPC companies in Iran and SUNA concerning 50 kWp PV systems business model.
3. Faran Co.
4. Faraz Pendaran Aria Mowj Co. (Farpam)
5. Green Energy Co.
6. GEON Group GmbH & Co. KG (with Mr. Sharam Roghani)
7. MAPNA Renewable Energy Generation Co.
8. Mehrabad Renewable Energies Co.
9. Moshanir Co.
10. One workshop was held on 21 December 2015 to present initial results and to receive feedbacks from the audience.
11. Pak Atieh Co.
12. Pars Eltek Energy Co.
13. Pasargad Energy Development Co.
14. Renewable Energy Organization of Iran (SUNA)
15. Sazan Electronic Industries Co.
16. Solar Polar Co.
17. Twelve structured interviews were conducted with manufacturers, installation and EPC companies in Iran concerning 5 MWp PV systems business model.

8.2 Foreign Investment in Iran – Relevant Institutions and Laws

8.2.1 Organization for Investment Economic and Technical Assistance of Iran

The Organization for Investment Economic and Technical Assistance of Iran (OIETAI) is legally empowered to represent the central investment promotion authority of the Government of Iran by providing legal protection and full security to foreign investments by way of facilitating the flow of capital into the country under the **Foreign Investment Promotion and Protection Act.[104]**

The organization's responsibilities include:[105]

- The reception of investment applications as well as the issuance of license, conduct of affairs and safeguard the rights and entitlements of foreign investors in approved investment projects.
- The assistance, coordination and facilitation of the issues related to the foreign investment throughout the licensing process, transfers and repatriation affairs of the foreign investments.
- The negotiations related to the Bilateral Investment Treaties (BITs) with other governments and international organizations. Currently the BIT agreements have been signed with 47 countries including Germany.
- The admission and protection of Foreign Investments within the framework of FIPPA.
- The introduction of legal grounds and investment opportunities.

8.2.2 Foreign Investment Promotion and Protection Act (FIPPA)

The FIPPA protects foreign investment against all non-commercial risks. The most important aspects of this law are the following:[106]

- Foreign Capital is guaranteed against nationalization and expropriation, and in such cases the foreign investor will receive compensation.
- If laws or government regulations lead to prohibition or termination of approved financial agreements within the framework of this Act, then the government shall procure and pay the resulting damages.
- The purchase of goods and producer services of the foreign investment is guaranteed in cases where a state-run organ is the only buyer of a product or producer service at a subsidized price.
- Foreign investments subject to this Act shall enjoy the same rights, protections and facilities available to domestic investments in a non-discriminatory manner.

---

[104] http://www.investiniran.ir/en/aboutus/objectives (Visited on 28/12/2015)

[105] http://www.investiniran.ir/en/aboutus/objectives (Visited on 28/12/2015)

[106] http://www.investiniran.ir/en/investmentguide/manual and http://www.investiniran.ir/en/ebook (Visited on 28/12/2015)

- The Foreign Investment and its profits may be transferred in foreign currency or goods.
- Acceptance of foreign investments in all the production, industrial, agricultural, transportation, communications, and services fields as well as in fields related to water, power, and gas supply and energy fields.
- The possibility of the referral of investment-related disputes to international authorities.
- The possibility of land ownership in the name of the company (registered in Iran) in joint ventures.
- Issuance of visas for three years in Iran for foreign investors, managers, experts and their immediate family members and the possibility of visa renewals.
- The investors are notified of the final decision regarding their applications within at most 45 days.
- Having a choice to choose the investment method in the project as FDI or Foreign Investment in all sectors within the framework of “Civil Participation”, “Buy-Back” and “Build-Operate-Transfer” (BOT) schemes.
- Acceptance of investments by any natural or legal non Iranian or Iranian person utilizing capital of foreign origin and granting the facilities envisaged in FIPPA to them.
- Foreign capitals can enter the country as cash currency, machinery and pieces of equipment, raw materials, technical know-how, and other forms of intellectual property and they will be promoted and protected.
- The foreign investor must choose an audit institute out of the audit institutes recognized by the Association of the Official Auditors of Iran to substantiate their financial and annual reports.

8.2.3 Legal commitments and obligations of the investors

Applications of foreign investors should be submitted to the OIETAI in order to enjoy protection under the FIPPA in issues such as admission, importation, utilization and repatriation of capital. The foreign investors who have obtained the investment license will have some legal commitments with the OIETAI:[107]

- The foreign investor should notify the OIETAI of any changes in the name, address, legal shape, or nationality of the foreign investor or of changes of more than 30% in the ownership.
- The investor is obliged to notify the OIETAI of the transfer of all or part of his/her Foreign Capital to other investors. In case of transfer to another foreign investment, it is needed to obtain the approval of the Council and the permits from the Organization.

---

[107] http://www.investiniran.ir/en/investmentguide/manual (Visited on 28/12/2015

- All the applications of the foreign investor for transferring the profit, capital and the proceeds from the increase in the capital value under FIPPA must be submitted to the Organization accompanied by the report of the audit institute that is recognized by the Association of the Official Auditors of Iran.
- The investor is obligated to bring a portion of the capital into Iran to implement the approved project over the period of time specified by the foreign investment license which is usually 6 months.
- The foreign investor is required to announce the entry of its capital including cash and non-cash items to the Organization within the framework of the license issued for the foreign investor so that they will be registered in the Organization and subjected to FIPPA, otherwise the entered capital will not be covered by the FIPPA.
- The Iranians who intend to utilize capital of foreign origin in Iran and wish to be subjected to FIPPA must be involved an economic and trade activities abroad and need to submit the relevant documents to the Organization.
- Acceptance of foreign investments in the existing Iranian enterprises and economic companies (purchase of shares) is possible provide that added value is created in that economic unit after the purchase of shares.

8.2.4 The process of examining the applications by foreign investors to the investment organization of Iran up to permit issuance

Foreign investors, who would like to make investments in Iran within the framework of FIPPA, need to submit their application to the organization. The application is presented by the OIETAI to the Foreign Investment Council and will be pursued until a permit is issued. The overall procedure that the investor should follow is shown in Figure 32.

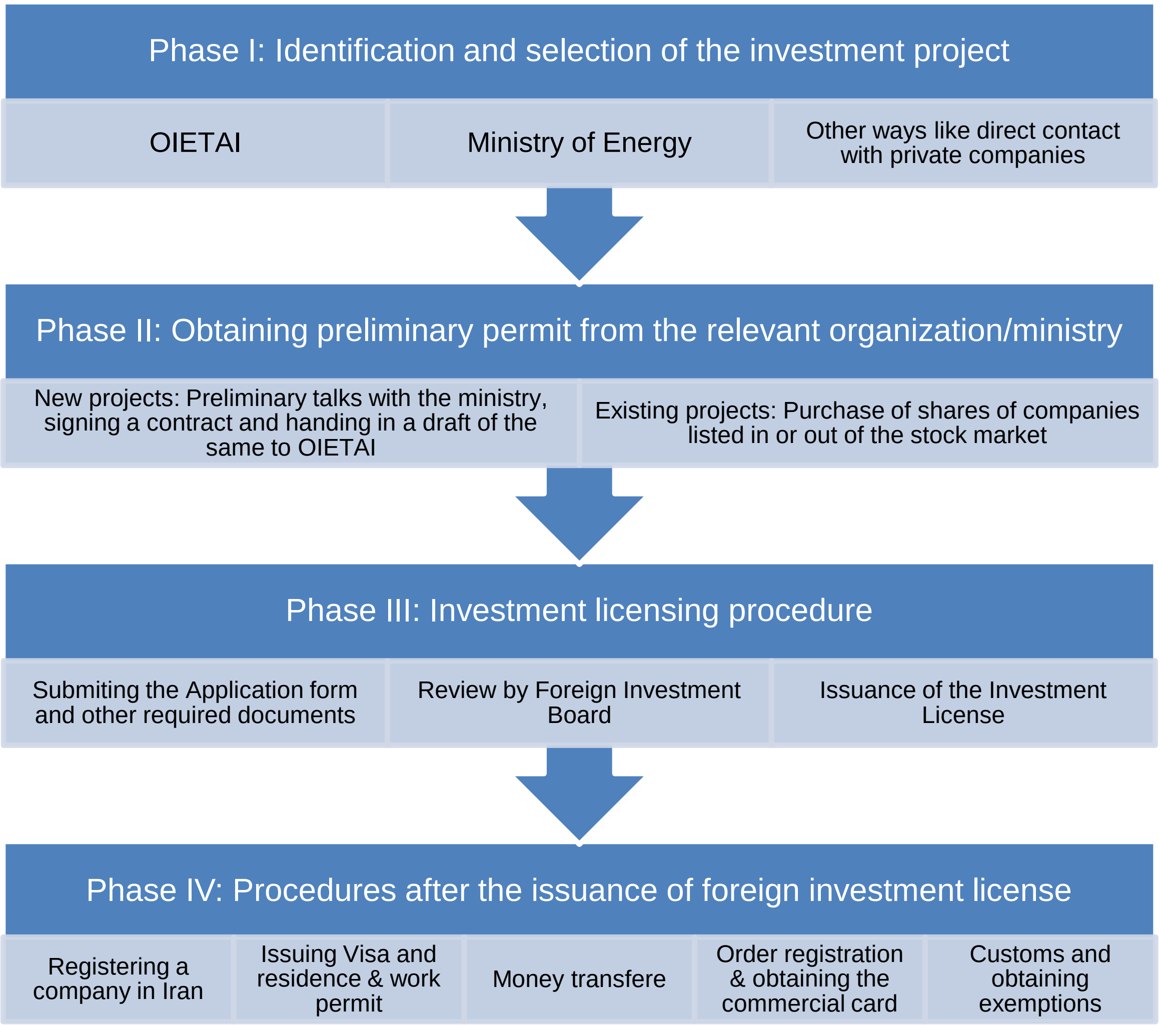


Figure 32 Procedure for the foreign investor[108]

8.2.5 Foreign Investment Service Center

After the issuance of the foreign investment license, the investor can refer to the Foreign Investment Service Center (FISC), who is intended to streamline and expedite the affairs related to foreign investment undertakings in Iran.[109]

In order to assist the foreign investor, fully authorized liaison representatives from 8 relevant executive agencies have been stationed at the FISC, including: the Ministry of Foreign Affairs, the Ministry of Commerce, the Ministry of Labor and Social Affairs, the State Organization for Tax Affairs, the Customs of the Islamic Republic of Iran, the Central Bank, the General Directorate for Registration of Companies and Intellectual Property, and the Organization for Protection of the Environment. [110]

---

[108] http://www.investiniran.ir/en/filepool/49/Procedure-for-Foreign-Investors?redirectpage=%2fen%2febook (Visited on 28/12/2015)

[109] http://www.investiniran.ir/en/investmentguide/sevicecenter (Visited on 28/12/2015)

[110] Ibid

These representatives will assist foreign investors by ensuring efficient execution of the processing and services assigned to their relevant agencies in connection with foreign investment projects.

Services offered by the FISC are not limited to prior-investment stages; foreign investors may, at any time and any stage ever after, refer to this center and benefit from its services. Key services offered by the FISC include:[111]

- Providing and spreading information and necessary guidance to foreign investors concerning investment in Iran.
- Necessary coordination concerning the issues related to foreign investment including issuance of the declaration of establishment , the environment protection license, the permits for subscriptions relation to water, electricity, fuel and telephone, the license for exploration and exploitation of mines, etc. from the relevant authorities, prior to the issuance of the investment license.
- Necessary coordination for the securing of entry visa, residence and employment permits for foreign nationals involved in foreign investment projects.
- Necessary coordination concerning issues related to foreign investments including registration of joint venture company, registration of order for importation of machinery and equipment, and issues related to importation and repatriation of capital, customs and tax affairs ,etc..
- Coordination among various official agencies in connection with requests and applications made by projects involving foreign investment.
- General supervision concerning the fulfilment of decisions surrounding foreign investment projects.

For more information visit the official website of OIETAI:
http://www.investiniran.ir/en/home

---

[111] http://www.investiniran.ir/en/investmentguide/sevicecenter (Visited on 28/12/2015)

8.3 Relevant Documents

8.3.1 Iran at a glance

Official name	Islamic Republic of Iran
Head of State	President H.E. Dr. Hassan Rouhani
National Day	11th of February (Islamic Revolution of Iran-1979)
Capital	Tehran
Area	1,648,196 sq km
Land boundaries	4,137 km
Sea boundaries	2,700 km (Including the Caspian Sea)
River boundaries	1,918 km
Border countries	Afghanistan, Azerbaijan (Nakhichevan), Armenia, Iraq, Pakistan, Turkey, Turkmenistan
Climate	Mostly arid or semi-arid, temperate along Caspian coast and mountainous temperate along west and north-west.
Natural resources	Petroleum, natural gas, coal, chromium, copper, iron ore, lead, manganese, zinc, sulfur
Land use (1998):	
Arable land	300,000 sq. Km 18.2%
Meadows and pastures	900,000 sq. Km 54.6%
Forest and woodland	120,000 sq. Km 7.3%
Other	258,000 sq. Km 15.7%
Irrigated land	70,000 sq. Km 4.2%
Agricultural products	Wheat, rice, barley, potato, grains, sugar-beet, cotton, fresh & dried fruits, dates, pistachio, fruits, nuts, poultry, meat, dairy products, wool; caviar, flowers and medicinal plants.
Population	76.03 million (2012)
Population growth rate	1.34% (2012)
Religions	Muslim 99.56% Zoroastrian, Christian & Jewish 0.44%

Languages	Persian and Persian dialects, Azeri, Kurdish, Lori, Baloochi, Arabic
Literacy (2011)	Total 84.2%
Currency	Rial (IRR)
GDP	448.2 billion US$ (2010)
GDP per capita	6030 US$ (2010)
GDP growth rate	6.4 % (2010)
Total Imports	53451 million US $ (2012)
Total Exports	98033 million US $ (2012)
Foreign Direct Investment	4870 million US $ (2012)
Industries	Oil and gas, steel, aluminum, copper, electric and electronic equipment, cement & other building materials, metallurgy, home appliances, iron, textile, rugs and carpets, tapestry, miniature, ceramic, food processing (particularly sugar refining & vegetable oil production), petrochemicals, and car manufacturing & assemblies
Electricity	Production: 232,955 GWH (2010)
Transportation:	
Railways networks	12000 km (2013)
Road networks	220000 km (2013)
Ports	11 commercial ports
Airports	54

Source: Official website of Organization for Investment Economic and Technical Assistance of Iran (OTETAI). Available from: < http://www.investiniran.ir/en/iranataaglance>

8.3.2 Electricity Costs per Sector

As explained in section 2.2.1, the MoE set different electricity tariff for each sector. Moreover, the electricity tariffs in households depend on the level of monthly electricity consumption and the regional climate characteristics. The procedure is similar for other sectors and it is expected to observe distinct electricity cost structure at regional level in which the composition of costumers, level of consumption due to climate variability and strength of industrial and agricultural activities are completely different.

As it is presented in Figure 33 and Table 35 the share of residential customers is higher than other sectors in each province which is influenced by the population. Among all, Tehran has the largest share of residential customers and the highest share of commercial and public customers.

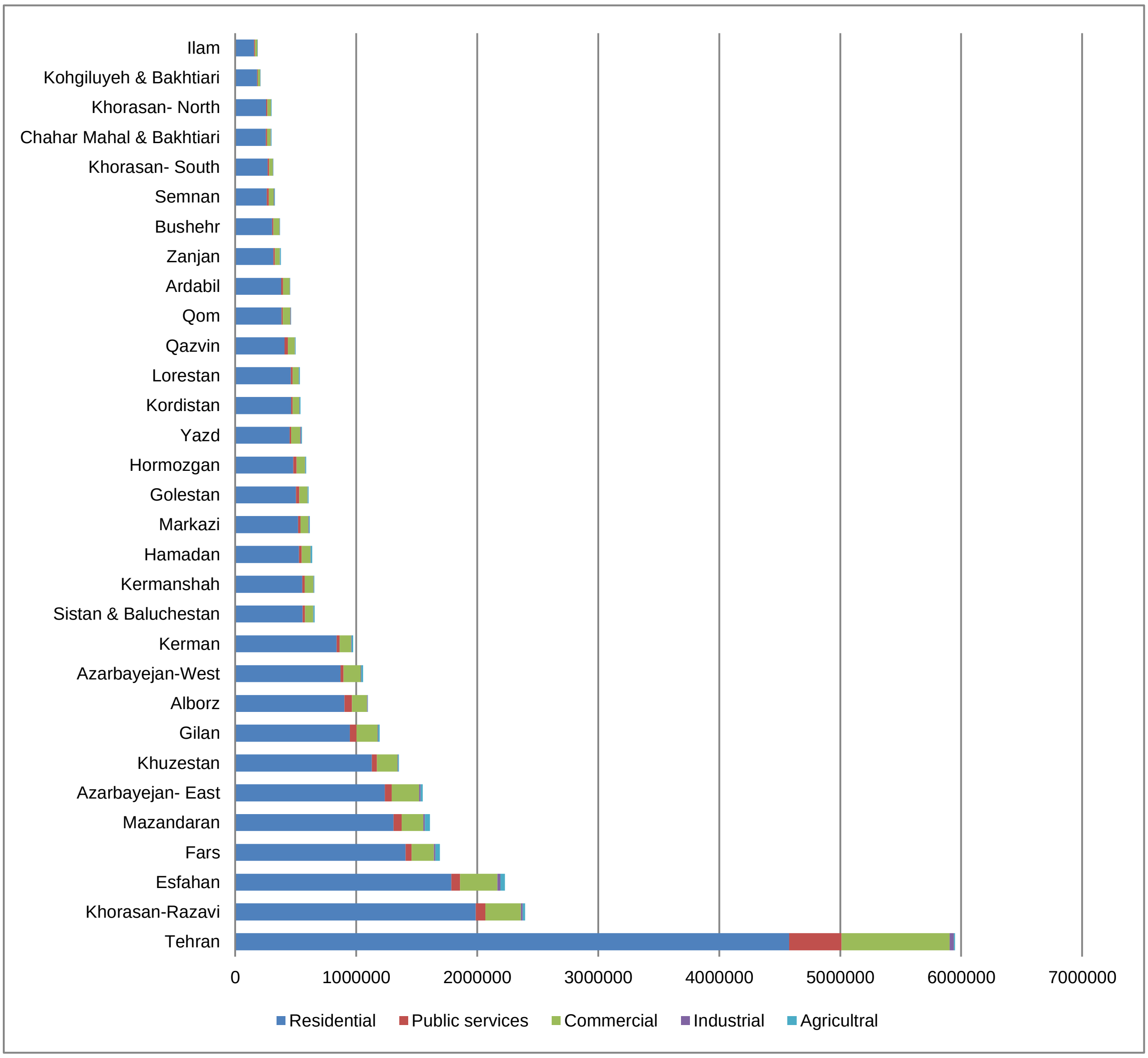


Figure 33 Number of customers in each sector- province (2013) [112]

---

[112] Source: 'Iran's Energy Balance' (2013)

Table 35 Number of customers in each sector- province (2013)

Province	Residential	Public services	Commercial	Industrial	Agricultural
Tehran	4576993	435136	893201	34458	9632
Khorasan-Razavi	1987270	79979	294071	15627	17787
Esfahan	1787024	71847	308012	25800	36817
Fars	1408974	48119	185963	11745	35914
Mazandaran	1307813	68699	179036	10722	42159
Azarbayejan- East	1236558	57046	225443	13222	16320
Khuzestan	1129745	40719	170986	3774	8373
Gilan	948257	53495	174467	4530	14367
Alborz	902540	62780	123321	5136	4187
Azarbayejan-West	870824	25261	140099	4883	16377
Kerman	837322	26149	94430	3791	12696
Sistan & Baluchestan	556798	20432	67667	2023	10326
Kermanshah	554419	19123	72329	2231	6576
Hamadan	526434	22260	71943	4302	10806
Markazi	518710	21413	63502	5427	8479
Golestan	503046	25321	68232	2331	7717
Hormozgan	480189	25772	70025	2579	7229
Yazd	448792	13794	73464	8371	7679
Kordistan	462474	12787	54622	2274	7868
Lorestan	460804	12838	51883	2450	6381
Qazvin	407026	28412	56343	3813	4972
Qom	381584	11942	60366	5354	2953
Ardabil	380304	15485	53196	2506	3246
Zanjan	315127	12288	40827	2931	6889
Bushehr	305800	10727	48374	2038	3190
Semnan	260630	16973	41671	4033	4561
Khorasan- South	267252	12676	30131	1973	4179
Chahar Mahal & Bakhtiari	254432	8333	29773	1994	5051
Khorasan- North	256564	9343	29508	1300	2745
Kohgiluyeh & Bakhtiari	180585	6730	17676	987	2189
Ilam	156544	6739	19543	1023	2330
Total	24670834	1282618	3810104	193628	329995

Source: Iran's Energy Balance (2013)

The calculation of the electricity cost per sector and per province presented in table 13 shows that an average household in Bushehr, Khuzestan and Hormozgan provinces had the highest cost for electricity among others in 2013. They have the highest electricity cost in public and commercial sectors in the country.

The same calculation for the industrial sector reveals that in average, an industrial unit in Khuzestan and Hormozgan where large petrochemical companies and refineries with huge electricity consumptions are located, had about four times more electricity costs than the country average (see Table 36).

The situation for the agricultural sector is completely different. The highest electricity cost for a typical agricultural unit belongs to Khorasan-Razavi, Kerman, Tehran, Khuzestan and Qazvin respectively (an overview is illustrated in Figure 34.

Table 36 Per capita electricity cost in each sector-province in 1000 Rials (2013)

Province	Residential	Public services	Commercial	Industrial	Agricultural
Khuzestan	3200.3	19623.0	7105.0	1013108.5	28344.8
Hormozgan	3132.4	19062.8	10601.6	904002.5	11346.1
Markazi	598.3	5735.5	3597.2	392696.0	18494.0
Kerman	916.4	11571.2	4592.8	277746.5	35831.3
Qazvin	586.9	4060.9	3535.5	266137.1	25704.6
Zanjan	546.4	5665.1	3144.3	261012.6	10576.4
Yazd	674.8	8069.2	3451.4	226844.1	11971.6
Lorestan	620.5	10849.6	3320.9	206376.1	11724.3
Esfahan	696.0	8065.2	3629.9	204832.7	9356.4
Khorasan- North	492.3	4746.5	2655.4	177488.7	15822.7
Bushehr	3315.9	34121.8	8427.5	137891.6	5419.8
Semnan	588.9	5254.1	3103.3	151451.8	19296.8
Kermanshah	622.7	11784.8	2949.2	154653.3	8411.5
Ilam	893.2	16484.2	3272.4	124775.6	8705.2
Kohgiluyeh & Bakhtiari	952.6	9168.2	4390.9	131718.6	7674.8
Alborz	674.2	4017.7	4544.5	119505.4	20336.0
Khorasan-Razavi	640.1	5484.2	3925.5	99573.9	36222.9
Hamadan	624.4	6252.4	2881.4	111516.5	14958.4
Tehran	780.7	5661.5	6941.4	83613.3	29460.3
Gilan	665.9	4032.0	2895.7	113397.8	3900.5
Qom	786.8	10763.9	4721.3	80661.8	21145.5
Golestan	786.2	4270.9	3356.3	95300.1	7658.8
Fars	846.0	10966.8	4635.4	79324.4	14014.2
Chahar Mahal & Bakhtiari	535.7	6275.9	2792.4	86169.2	12513.1
Azarbayejan-West	602.3	6148.9	2704.3	88844.9	7552.9
Sistan & Baluchestan	1352.3	14647.4	4759.2	75178.3	9108.0
Azarbayejan- East	556.2	4768.5	2821.4	88131.1	8075.0
Mazandaran	713.1	4655.1	3794.3	76162.8	2450.9
Ardabil	493.1	4175.6	2723.7	64465.9	9218.4
Kordistan	624.7	5690.6	2689.4	51126.5	7822.7
Khorasan- South	434.2	5356.1	3267.2	41413.9	16414.3
Aerage	**934.0**	**8949.3**	**4104.2**	**193068.4**	**14501.0**

Source: Research calculation based on Iran’s Energy Balance (2013)

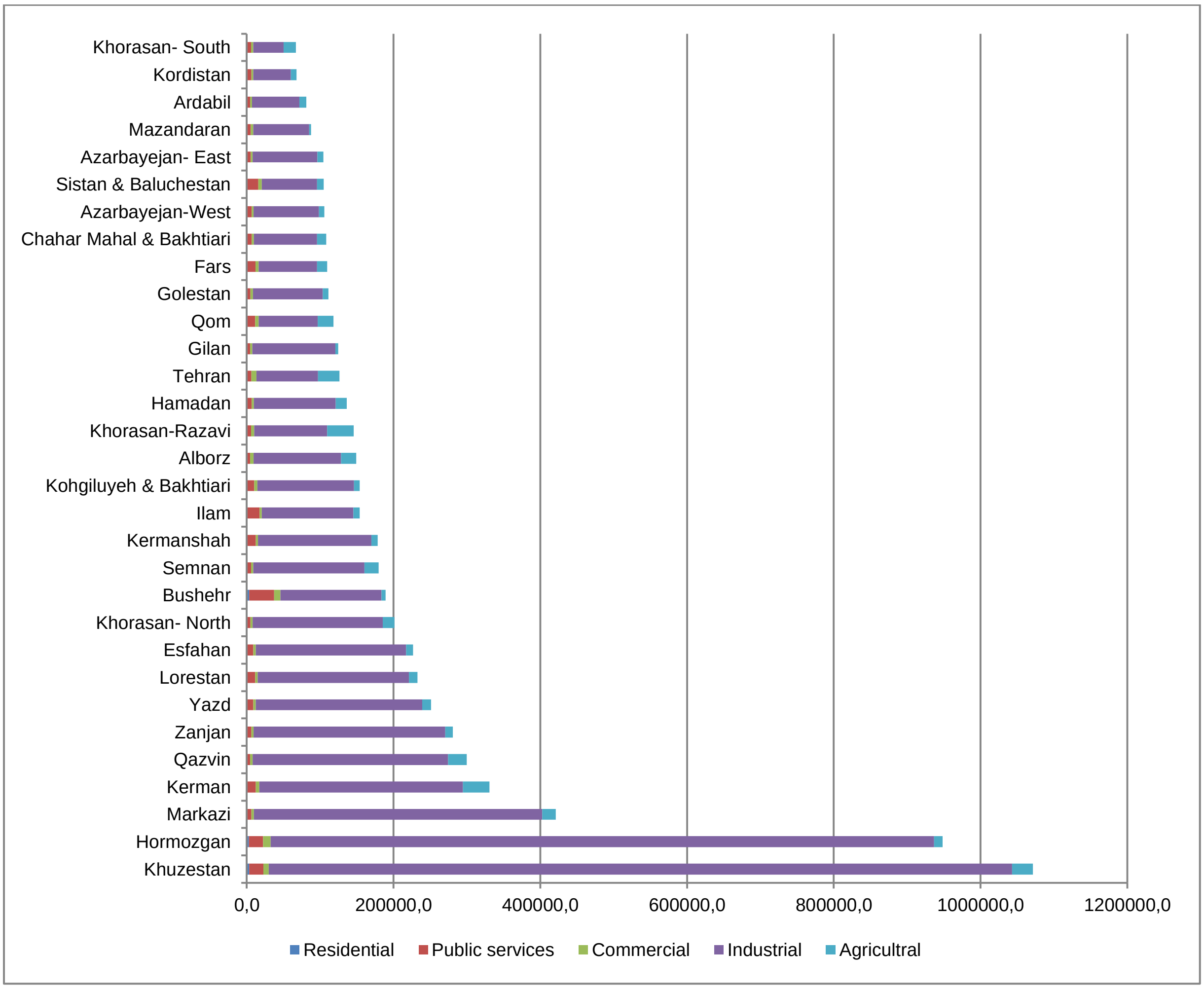


Figure 34 Per capita electricity cost in each sector-province in 1000 Rials (2013) [113]

---

[113] Research calculation based on ‘Iran’s Energy Balance’ (2013)

8.3.3 Interview with SUNA: for PPAs (≥ 5 MW)

I. General Characteristics of PPAs with SUNA

	Parties	Please indicate the parties involved in the FiTs: Applicant (investor) as seller. SUNA as the buyer.
	Level of the legislation that regulates FiTs	Please indicate if the regulation applies to: [×] Federal Level [ ] State Level [ ] Municipal Level
	Statutory provisions	Please indicate applicable laws and/or regulations: The act of correcting the pattern of consumption – 5 year development plan – the adjustment of financial regulations of the country act- Ministry of Energy resolution for FIT – etc.
	Technologies	Please indicate eligible technologies: All technologies- there is no limitation.
	Type of Installation	Please indicate if it applies to: [ ] Existing installations [×] New installations Power plants are installed in the land that is owned by the applicant.
	Period of delivering electricity	Please indicate the foreseen period of delivering the contracted electricity: Contract duration is 20 years. The purchasing period is equal to 20 years of the contract minus the installation period.
	Capacity	Is there a fixed amount (maximum/minimum) of electricity that can be contracted by SUNA under a FiT agreement? What is the amount of capacity normally contracted? There is no limitation. The amount will be fixed in the contract with an agreeable alteration in the result.

	Produced Electricity	Is there a fixed amount (maximum/minimum) of the effectively produced electricity that off takers or buyers should take off? Or it will be bought all the produced electricity, independently from the produced amount? All the produced electricity will be bought.
	Price	Who sets the price? Ministry of Energy sets the price- based on the formula defined by the Economic Council.
		How is the price calculated? Is there a minimum or a maximum price? The price is calculated based on the formula that is defined by the Economic Council and is mentioned in the article 133 the 5th development plan. This formula gives the average price. The Ministry of Energy calculates the different price for each different technology (Solar-wind-biomass- geothermal…).
		Do producers structure their electricity in tranches for selling it to off takers or buyers at different prices? No, all the produced electricity during the contract period will be sold to the SUNA. Then the electricity can be sold in the electricity stock market.
	Excess	How is the excess electricity remunerated that is not being consumed by the off taker or buyers? All the produced electricity will be bought. There is no excess.
		Are there any standard agreements applicable between producers / utility and DSO? Yes. There is an agreement or connection permit between Electrical distributor company (DSOs) & applicant.
		Can excesses be marketed at the electricity exchange? There is no excess. But the seller has the authority to choose to sell all or part of the electricity to other buyers.

	Market segments	What are typical market segments agreeing on power purchasing? [ ] Rooftop’s Households [ ] Rooftop’s Commerce [×] Ground-mounted PV Power Plants

II. Project Development

	Project flow description based on your experience or on your project planning	*Based on your experience, please describe in the sequential order each step that you had to undertake in order to accomplish the PV project. If you didn’t complete the PV project yet, but you are in the process of developing the project, please describe each step in the sequential order that you consider you may undertake to accomplish your PV project. Such steps can include for example:* **This part sould be filled by the applicant** 1. *Site selection* 2. *Electricity production* 3. *Administrative process* 4. *Grid connection permit* 5. *Support scheme* 6. *PV system construction* 7. *Financing* 8. *PV system operation*		
		Step 1	**Description**	Please include a general description. Please also include sub-steps when relevant. **This part sould be filled by the applicant**
			Actors	Who are the main actors involved? --

			Duration	Is there a fixed time foreseen for conclusion of this step? --
		Step 2	**Description**	Please include a general description. Please also include sub-steps when relevant. --
			Actors	Who are the main actors involved? --
			Duration	Is there a fixed time foreseen for conclusion of this step? --
		Step 3	**Description**	Please include a general description. Please also include sub-steps when relevant. --
			Actors	Who are the main actors involved? --
			Duration	Is there a fixed time foreseen for conclusion of this step? --
		Step 4	**Description**	Please include a general description. Please also include sub-steps when relevant. --
			Actors	Who are the main actors involved? --
			Duration	Is there a fixed time foreseen for conclusion of this step? --

		Step 5	**Description**	Please include a general description. Please also include sub-steps when relevant. --
			Actors	Who are the main actors involved? --
			Duration	Is there a fixed time foreseen for conclusion of this step? --
		Step 6	**Description**	Please include a general description. Please also include sub-steps when relevant. --
			Actors	Who are the main actors involved? --
			Duration	Is there a fixed time foreseen for conclusion of this step? --
		Step 7	**Description**	Please include a general description. Please also include sub-steps when relevant. --
			Actors	Who are the main actors involved? --
			Duration	Is there a fixed time foreseen for conclusion of this step? --
		Step 8	**Description**	Please include a general description. Please also include sub-steps when relevant. --

				--
			Actors	Who are the main actors involved? --
			Duration	Is there a fixed time foreseen for conclusion of this step? --
	Project duration	**Overall Duration**		How much time is spent carrying out the project? --
		Waiting Time		Please estimate the overall time spent waiting for an answer from authorities, administrations or grid operators. --

III. Signature of the Contract

	Name of the contract	Does the contract have a specific denomination under Iranian law? Power Purchase Agreement
	Parties	How many parties are involved and who are they? Party 1: Seller = applicant = Investor Party 2: Buyer = SUNA
		What is the difference between free consumer and special consumer? The only buyer of the PV system electricity generation is SUNA, and there isn’t any relations to the final consumer.

	Standard template available	Is a standard contract template available? In case, please provide the name of the document and where this can be found (link) Yes. It is available in the official website of SUNA: http://www.suna.org.ir/fa/guidances-%D8%B1%D8%A7%D9%87%D9%86%D9%85%D8%A7%DB%8C-%D8%B3%D8%B1%D9%85%D8%A7%DB%8C%D9%87-%DA%AF%D8%B0%D8%A7%D8%B1%DB%8C-%D8%AF%D8%B1-%D9%86%DB%8C%D8%B1%D9%88%DA%AF%D8%A7%D9%87-%D9%87%D8%A7%DB%8C-%DA%A9%D9%88%DA%86%DA%A9-
	Duration	Is the duration of the contract set by law/regulation or agreed between parties? What is the common duration of the contract? The duration of the contract is 20 years
	Registration	Does the contract need to be registered? If yes, where? [×] Yes [ ] No In SUNA (not in the registry office). After that the contract is effective.
	Eligible technologies	Which are eligible technologies? All prevalent technologies are eligible, as long as they meet the regular standards
	FiT	What is the FiT? Power Purchase Price mentioned in the draft of the contract: http://www.suna.org.ir/en/guaranteed
	Deadlines	What are the deadlines for the contract signature? If all the permits have been obtained before the signing the contract, there would be no deadlines.

IV. Connection to the Grid

		Please provide some information about these grid connection phases	
	Grid connection	**Selection of the connection point**	Does the FiT Project based needs direct lines to the off taker of electricity or can the grid be used for transmission? If so, are there taxes or surcharges to be paid for using grid? The responsible organization issues the connection permits and the grid connection point will be based on that. There is no cost for this phase.
			Procedure: 1- The applicant designs the grid connection point and applies for the grid connection permit. 2- The responsible organization assesses the request and issues permit **Documents**:
		Application for the connection	**Procedure**: **Documents**:
		Interconnection agreement	**Procedure**: **Documents**:
		Is compensation for connection delays provided to the developer? [ ] Yes [ ] No If the seller produces the electricity before signing the contract, SUNA will not have any obligations. But if everything is implemented according the contract and there is a delay from SUNA side, SUNA will accept its own responsibilities.	

		Is the utility obliged to connect whoever requests it? [ ] Yes [×] No The utility is only obliged to connect the requests that have the connection permits.	
	Costs	**Who bears the costs for the connection line (from the plant to the grid)**	[×] The Developer : If the new utilities is required the developer will bear the costs [ ] The Grid Operator [ ] Other (Specify):
		Who bears the costs for necessary grid reinforcement due to the plant's connection	[×] The Developer or applicant [ ] The Grid Operator [ ] Other (Specify):

V. Certification Requirements for PV Equipment and Staff

	Are there certification or label requirements for PV Equipment?	**Relevant regulations**	Iranian national standards
		Certifications / Labels	-
	Are there certification requirements for staff members?	**Relevant regulations**	Regulations that is sat by the Ministry of Labour
		Certifications	-

VI. Profitability Analysis

	Capital Expenditures	What are the average turn-key investment costs for PV systems (50kW)? 1000 to 1500 US $ per kW
		What is the typical duration of start of construction until grid feed-in? Depends on the size of the power plant. Usually one year.
	Operational Expenditures	What is the common assumption for operation and maintenance costs per kWp and year? (Including an inverter replacement between years 10-15, monitoring, cleaning etc.) Have no information.
		What are typical insurance costs per kWp and year? Have no information.
		How high are typical land and roof leases or purchasing and what is their structure? (fixed upfront, fixed EUR/year, fixed EUR/month, variable EUR/kWh/year, mixed) Ask the land affairs
	Subsidies	Are investment subsidies granted? How are they structured and when are they granted? (fixed amount, per kWp, before or after construction or during operation) No.
	PV Generation	What is the average performance ratio being achieved in the key solar regions of the country? -
		What is the average yield (kWh/qm/y) for the key solar regions based on application potential? 1600-1800 kWh

	Funding	How have PV project developers obtained the funding to finance the FiT based projects? The applicant (developer) is responsible for financing the project. [ ] Have they obtained international funding (i.e. international bank or finance company)? Allowed [ ] Have they obtained national funding (i.e. national bank or finance company)? In current situation the interest rate of national banks are very high and not available. [ ] Did they have to look for (generally international) extra guarantee? Have no information [×] They have not obtained any funding yet, and are still looking for it? Some have been successful
		What is a typical debt gearing (debt/equity ratio) for FiT based PV projects? 30/70 is a common debt gearing
		What are typical margins, upfront fee and commitment fees? If the national development fund is available the interest rate is 4-6% But the common interest rate of the local banks is more than 20%
		What are typical debt tenors and grace periods? If the loan is from national development fund, the grace period is 6 months (less than one year).
	Macroeconomics	How high are current and forecasted (3-5 years) inflation rates? About 10% for the last year. It is predicted that it will decrease in the near future.
		What is the current and forecasted (3-5years) rate of interbank interest? The interest rate for national development fund is 4-6% that with some other costs it will be a little more. Probably it won’t change in the future.

	Revenues	FiT (Feed in Tariffs) regarding the size of the panel: 6750 RLS/kWh (between 100 kW and 10 MW)
		Duration of the FiT: 20 years
		Are differences if the system is: - Rooftop PV system - Ground-mounted PV system No
		Is the FiT based on the local currency or in other currency (e.g. US Dollar)? Local currency

VII. Sensitivity Analysis

	Input Parameters	For the input parameters listed in the previous section a sensitivity analysis will be prepared. From your perspective what are the key risks for a private FiT based PV project? What are the key input parameters related to these risks? Investment costs (Capex)- installation period duration- the amount of produced electricity
	Output parameters	What are the output parameters investors and banks are most concerned with and therefore should be presented as results of the sensitivity analysis? (Equity IRR, Project IRR, payback time, Net-present value, debt service coverage ratio, loan life coverage ratio, other)

VIII. Further Information

		Please include here institutions that can be contacted by interested parties and provide further information		
	Name of the institution	**Contact Person**	**E-mail**	**Website**

8.3.4 Interview with SUNA: for PPAs (≤ 50 kW)

I. General Characteristics of PPA with DSOs

	Parties	Please indicate the parties involved in the PPA: Applicant (subscriber)-Electrical distributor company-SUNA
	Level of the legislation that regulates FiTs	Please indicate if the regulation applies to: [×] Federal Level [ ] State Level [ ] Municipal Level
	Statutory provisions	Please indicate applicable laws and/or regulations: Ministry of Energy resolution for FIT- small RE power plants regulation And other regulations in the official website of SUNA and TAVANIR
	Technologies	Please indicate eligible technologies: All technologies- there is no limitation
	Type of Installation	Please indicate if it applies to: [×] Existing installations [×] New installations
	Period of delivering electricity	Please indicate the foreseen period of delivering the contracted electricity: 20 years
	Capacity	Is there a fixed amount (maximum/minimum) of electricity that can be contracted by SUNA under a FiT agreement? What is the amount of capacity normally contracted? There is no limitation
	Produced Electricity	Is there a fixed amount (maximum/minimum) of the effectively produced electricity that off takers or buyers should take off? Or it will be bought all the produced electricity, independently from the produced amount? There is no limitation. All the produced electricity will be bought.

	Price	Who sets the price? Ministry of Energy (currently)
		How is the price calculated? Is there a minimum or a maximum price? Based on the kWh There is a purchase mechanism for more than 100kW power plants, but not for less than 100kW.
		Do producers structure their electricity in tranches for selling it to off takers or buyers at different prices? We don’t have it
	Excess	How is the excess electricity remunerated that is not being consumed by the off taker or buyers? We don’t have it
		Are there any standard agreements applicable between producers / utility and DSO? Yes. There are typical contracts (in SUNA website) between SUNA and Electrical distributor company (DSOs) & between applicant and DSOs & between applicant and the contractor.
		Can excesses be marketed at the electricity exchange? It is not started for REs yet. (under reviewing)
	Market segments	What are typical market segments agreeing on power purchasing? [×] Rooftop’s Households [×] Rooftop’s Commerce [×] Ground-mounted PV Power Plants

II. Project Development

	Project flow description based on your experience or on your project planning	*Based on your experience, please describe in the sequential order each step that you had to undertake in order to accomplish the PV project. If you didn't complete the PV project yet, but you are in the process of developing the project, please describe each step in the sequential order that you consider you may undertake to accomplish your PV project. Such steps can include for example:* *9. Site selection* *10. Electricity production* *11. Administrative process* *12. Grid connection permit* *13. Support scheme* *14. PV system construction* *15. Financing* *16. PV system operation*		
		Step 1	**Description**	Please include a general description. Please also include sub-steps when relevant. Site selection: The acquisition of land-feasibility study- grid connection assessment.
			Actors	Who are the main actors involved? Applicant-Electrical distributor company-SUNA- neighbours Environmental Organization and Cultural Heritage Organization
			Duration	Is there a fixed time foreseen for conclusion of this step? We don't have enough experience
		Step 2	**Description**	Please include a general description. Please also include sub-steps when relevant. Selecting the PV system and the contractor

			Actors	Who are the main actors involved? Applicant-Electrical distributor company-SUNA- contractor- consultant
			Duration	Is there a fixed time foreseen for conclusion of this step? We don’t have enough experience (It can’t be more than 3 weeks)
		Step 3	**Description**	Please include a general description. Please also include sub-steps when relevant. Administrative process- Declaration to readiness to the DSO- PPA contract -permits(including: grid connection permit)
			Actors	Who are the main actors involved? Applicant-Electrical distributor company-SUNA- contractor- consultant
			Duration	Is there a fixed time foreseen for conclusion of this step? Can’t be predicted
		Step 4	**Description**	Please include a general description. Please also include sub-steps when relevant. PV system construction: including relevant tests- grid connection confirmation
			Actors	Who are the main actors involved? Applicant-Electrical distributor company- contractor- consultant
			Duration	Is there a fixed time foreseen for conclusion of this step? One week after installation
		Step 5	**Description**	Please include a general description. Please also include sub-steps when relevant. Financial statement

			Actors	Who are the main actors involved? Applicant-contractor
			Duration	Is there a fixed time foreseen for conclusion of this step? Can’t be predicted. But it should be defined in the contract.
		Step 6	**Description**	Please include a general description. Please also include sub-steps when relevant. PV system operation (There should be some hubs or centers equipped for after sale services)- electricity generation metering
			Actors	Who are the main actors involved? Applicant-Electrical distributor company- SUNA
			Duration	Is there a fixed time foreseen for conclusion of this step? Every 30 or 60 days (according to electricity bills periods)
		Step 7	**Description**	Please include a general description. Please also include sub-steps when relevant. Financing
			Actors	Who are the main actors involved?
			Duration	Is there a fixed time foreseen for conclusion of this step? Can’t be predicted. But it should be defined in the contract
		Step 8	**Description**	Please include a general description. Please also include sub-steps when relevant.
			Actors	Who are the main actors involved?
			Duration	Is there a fixed time foreseen for conclusion of this step?

	Project duration	**Overall Duration**	How much time is spent carrying out the project? About 2 days per kW (nonlinear relations). Based on the experience in MW farms, installation of each MW takes 3-4 months long.
		Waiting Time	Please estimate the overall time spent waiting for an answer from authorities, administrations or grid operators. Can’t be predicted. Not more than one month.

III. Signature of the Contract

	Name of the contract	Does the contract have a specific denomination under Iranian law?
	Parties	How many parties are involved and who are they? Party 1: Applicant Party 2: Electrical distributor company(DSO) Party 3: SUNA
		What is the difference between free consumer and special consumer? Since the only buyer of the PV system electricity generation is SUNA (and DSOs on behalf of SUNA) there is no difference.
	Standard template available	Is a standard contract template available? In case, please provide the name of the document and where this can be found (link) Yes: http://www.suna.org.ir/fa/guidances-%D8%B1%D8%A7%D9%87%D9%86%D9%85%D8%A7%DB%8C-%D8%B3%D8%B1%D9%85%D8%A7%DB%8C%D9%87-%DA%AF%D8%B0%D8%A7%D8%B1%DB%8C-%D8%AF%D8%B1-%D9%86%DB%8C%D8%B1%D9%88%DA%AF%D8%A7%D9%87-%D9%87%D8%A7%DB%8C-%DA%A9%D9%88%DA%86%DA%A9-

	Duration	Is the duration of the contract set by law/regulation or agreed between parties? What is the common duration of the contract? The duration of the contract is set by regulation-20 years
	Registration	Does the contract need to be registered? If yes, where? [×] Yes [ ] No In SUNA and Electrical distributor company
	Eligible technologies	Which are eligible technologies? All technologies for PV are eligible, as long as they meet the standard certificates (defined by SUNA) and get the verification from the DSO.
	FiT	What is the FiT? Power Purchase Price from clean and renewable sources: http://www.suna.org.ir/en/guaranteed
	Deadlines	What are the deadlines for the contract signature? 60 working days- There is a schedule for the contract.

IV. Connection to the Grid

		Please provide some information about these grid connection phases	
	Grid connection	**Selection of the connection point**	Does the FiT Project based needs direct lines to the off taker of electricity or can the grid be used for transmission? If so, are there taxes or surcharges to be paid for using grid? The grid can be used for transmission. There are no surcharges or taxes defined yet. If the applicant needs a new power meter DSO should pay.
			Procedure: the procedure is under review **Documents**: There are some ambiguities. Needs reviews. Not finalized.
		Application for the connection	**Procedure**: The procedure for assessment and confirmation will be defined by DSOs (based on the preliminary contract) **Documents**: The list of required documents is under review.
		Interconnection agreement	**Procedure**: Is under review. **Documents**: Electrical distributor company (DSO)confirmation
		Is compensation for connection delays provided to the developer? [ ] Yes [×] No	
		Is the utility obliged to connect whoever requests it? [ ] Yes [×] No	
	Costs	**Who bears the costs for the connection line (from the plant to the grid)**	[×] The Developer or applicant [ ] The Grid Operator [ ] Other (Specify):

		Who bears the costs for necessary grid reinforcement due to the plant's connection	[×] The Developer or applicant [ ] The Grid Operator [ ] Other (Specify): (if there is an improvement plan in Electrical Distributor Company, it will bear the costs)

V. Certification Requirements for PV Equipment and Staff

	Are there certification or label requirements for PV Equipment?	**Relevant regulations**	Yes: based on defined standards in SUNA (in guidelines the required standards are defined). http://www.suna.org.ir/fa/guidances-%D8%B1%D8%A7%D9%87%D9%86%D9%85%D8%A7%DB%8C-%D8%B3%D8%B1%D9%85%D8%A7%DB%8C%D9%87-%DA%AF%D8%B0%D8%A7%D8%B1%DB%8C-%D8%AF%D8%B1-%D9%86%DB%8C%D8%B1%D9%88%DA%AF%D8%A7%D9%87-%D9%87%D8%A7%DB%8C-%DA%A9%D9%88%DA%86%DA%A9-%D8%AA%D8%AC%D8%AF%DB%8C%D8%AF%D9%BE%D8%B0%DB%8C%D8%B1
		Certifications / Labels	Yes: based on defined standards in SUNA (in guidelines the required standards are defined) http://www.suna.org.ir/fa/guidances-%D8%B1%D8%A7%D9%87%D9%86%D9%85%D8%A7%DB%8C-%D8%B3%D8%B1%D9%85%D8%A7%DB%8C%D9%87-%DA%AF%D8%B0%D8%A7%D8%B1%DB%8C-%D8%AF%D8%B1-%D9%86%DB%8C%D8%B1%D9%88%DA%AF%D8%A7%D9%87-%D9%87%D8%A7%DB%8C-%DA%A9%D9%88%DA%86%DA%A9-

			%D8%AA%D8%AC%D8%AF%DB%8C%D8%AF%D9%BE%D8%B0%DB%8C%D8%B1
	Are there certification requirements for staff members?	**Relevant regulations**	No. Since the market was small and limited, there wasn’t any condition or regulation for this issue. But the basic knowledge and expertise is required.
		Certifications	No. Since the market was small and limited, there wasn’t any condition or regulation for this issue. But the basic knowledge and expertise is required.

VI. Profitability Analysis

	Capital Expenditures	What are the average turn-key investment costs for PV systems (50kW)? 70.000.000 to 75.000.000 Rls/kw
		What is the typical duration of start of construction until grid feed-in? 1 month for each system to construct
	Operational Expenditures	What is the common assumption for operation and maintenance costs per kWp and year? (Including an inverter replacement between years 10-15, monitoring, cleaning etc.) 1% EPC according to the international standards
		What are typical insurance costs per kWp and year? We don’t have it yet
		How high are typical land and roof leases or purchasing and what is their structure? (fixed upfront, fixed EUR/year, fixed EUR/month, variable EUR/kWh/year, mixed) applicants use their own roofs

	Subsidies	Are investment subsidies granted? How are they structured and when are they granted? (fixed amount, per kWp, before or after construction or during operation) There is a 50% grant budget that allocated to each project for small PVs. But it isn't used before and is under reviewing.
	PV Generation	What is the average performance ratio being achieved in the key solar regions of the country? 75%
		What is the average yield (kWh/qm/y) for the key solar regions based on application potential? 1600 to 1700 kWh/kW in Tehran
	Funding	How have PV project developers obtained the funding to finance the FiT based projects? [ ] Have they obtained international funding (i.e. international bank or finance company)? [ ] Have they obtained national funding (i.e. national bank or finance company)? [ ] Did they have to look for (generally international) extra guarantee? [×] They have not obtained any funding yet, and are still looking for it?
		What is a typical debt gearing (debt/equity ratio) for FiT based PV projects?
		What are typical margins, upfront fee and commitment fees?
		What are typical debt tenors and grace periods?
	Macroeconomics	How high are current and forecasted (3-5 years) inflation rates?
		What is the current and forecasted (3-5years) rate of interbank interest?
	Revenues	FiT (Feed in Tariffs) regarding the size of the panel: 8730 RLS/kWh (between 20kw and 100 kw)

		Duration of the FiT: 20 years
		Are differences if the system is: - Rooftop PV system - Ground-mounted PV system No
		Is the FiT based on the local currency or in other currency (e.g. US Dollar)? Local currency

VII. Sensitivity Analysis

	Input Parameters	For the input parameters listed in the previous section a sensitivity analysis will be prepared. From your perspective what are the key risks for a private FiT based PV project? What are the key input parameters related to these risks? The new FIT for each year- limited budget for payment that changes each year and the risk of payment - inflation – social and political condition
	Output parameters	What are the output parameters investors and banks are most concerned with and therefore should be presented as results of the sensitivity analysis? (Equity IRR, Project IRR, payback time, Net-present value, debt service coverage ratio, loan life coverage ratio, other) Equity IRR- payback period – NPV

VIII. Further Information

		Please include here institutions that can be contacted by interested parties and provide further information		
	Name of the institution	**Contact Person**	**E-mail**	**Website**
	SUNA			http://www.suna.org.ir/en/home
	Tavanir			http://www2.tavanir.org.ir/latin/