Electricity Distribution Company of Chaharmahal and Bakhtiari Province

Suggested package of one megawatt Solar Power Station

To attract investors through Provincial Investment Services Center

Consulting company:

Ayandenegar Spadana Company

Chahar Mahal and Bakhtiari Province, Share-e-kord city, Melat Street, ٤٥ Block.

Tell:

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Abstract

١-Investment table

All numbers are in million rials					Cost(Euro)
Year					
Row	Description	Price	Done	Required	
١	land	٠	٠	٠	٠
٢	Landscaping	٧١٢٣	٠	٧١٢٣	٢٥٧٢٢
٣	Building	٣٠٨٩	٠	٣٠٨٩	١١١٥٤
٤	Installations	٢٩٦	٠	٢٩٦	١٠٦٩
٥	Luggage and office supplies	٣٨٨	٠	٣٨٨	١٤٠٠
٦	equipment and machinery	١٣٤٣٣٢	٠	١٣٤٣٣٢	٤٨٥١٠٥
٧	Vehicle	١٧٠٤	٠	١٧٠٤	٦١٥٤
٨	Costs before operation	١٤٧٠	٠	١٤٧٠	٥٣٠٦
٩	Unforeseen costs	٢٩٦٧	٠	٢٩٦٧	١٠٧١٨
Total fixed investment costs		١٥١٣٦٩	٠	١٥١٣٦٩	٥٤٦٦٢٩
Capital in the first year's turnover		١٦٥٥	٠	١٦٥٥	٥٩٧٥
Total investment of the plan		١٥٣٠٢٣	٠	١٥٣٠٢٢	٥٥٢٦٠٤

All numbers are in million rials			
Description	Build time	Operation time	total
Total Financial source	١٥١٣٦٩	١٦٥٥	١٥٣٠٢٣
Total Financial source(Euro)	٥٤٦٦٢٩	٥٩٧٥	٥٥٢٦٠٤

a) Point to head : ١٨ percent
b) Payback Period(PP): ٤/٧٧ year
c) Internal rate of return(IRR): ١٨/٧٢ percent
d) Net Present Value(NPV): ١٩٦٢١٤ (Million Rials)= ٧٠٨٥٨١(Euro)

Currency calculation (Euro) this section uses the weighted average rate of currency purchase and sale based on transactions registered in the Senate Currency Monitoring System in January ٢٠٢٢. Accordingly, the exchange rate (Euro) of ٢٧٦٩١٢ Rials has been used as the basis for currency calculations (Source: https://www.sanarate.ir/).

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Introduction

All human progress in technology depends on a vital component called energy. Without energy, none of today's tools can work. Currently, a large part of the energy resources are provided by non-renewable fossil fuels. Because these fuels are non-renewable and have very harmful effects on the environment, humans in the modern age have always been looking for a way to supply renewable energy, which is one of the best sources of energy permanently utilized. It is sunlight. Since the economic development of societies today depends on the correct and efficient use of energy, and until now fossil fuels have played an important role in providing the energy needed by human societies. But with the depletion of these resources on the one hand and the advances in technology on the other hand, the use of solar energy has attracted the attention of many advanced countries. In this regard, our country has the best opportunity to use this kind of clean energy, given its geographical location. In Iran, the idea of developing renewable power plants began in earnest and planned in the Fifth Development Plan. According to the Fifth Development Plan, by the end of the program, the country's ٥،٠٠٠ MW of electricity would be generated from renewable energy. The country now produces about ٦٠٠ to ٧٠٠ megawatts of renewable energy, far below the landscape goals (the country's Fifth Economic and Social Development Plan ended in ١٩٩٤). According to the plans under the Sixth Development Plan, at least between ٥٠٠ and ١،٠٠٠ megawatts of electricity generation capacity from renewable energy should be in circulation annually. However, the provinces of the country have a high capacity to absorb solar energy. Chaharmahal va Bakhtiari province is one of the provinces with high capacity in electricity generation from solar energy. The average hours of sunshine in the province are between ٣ and ٤،٠٠٠ hours. Therefore, the project justifies the economic justification for the construction of a solar power plant.

Chapter ١:

Specifications of the project

١-١-location

The site of the one megawatt solar power plant could be one of the proposed presented in Table ١-١.

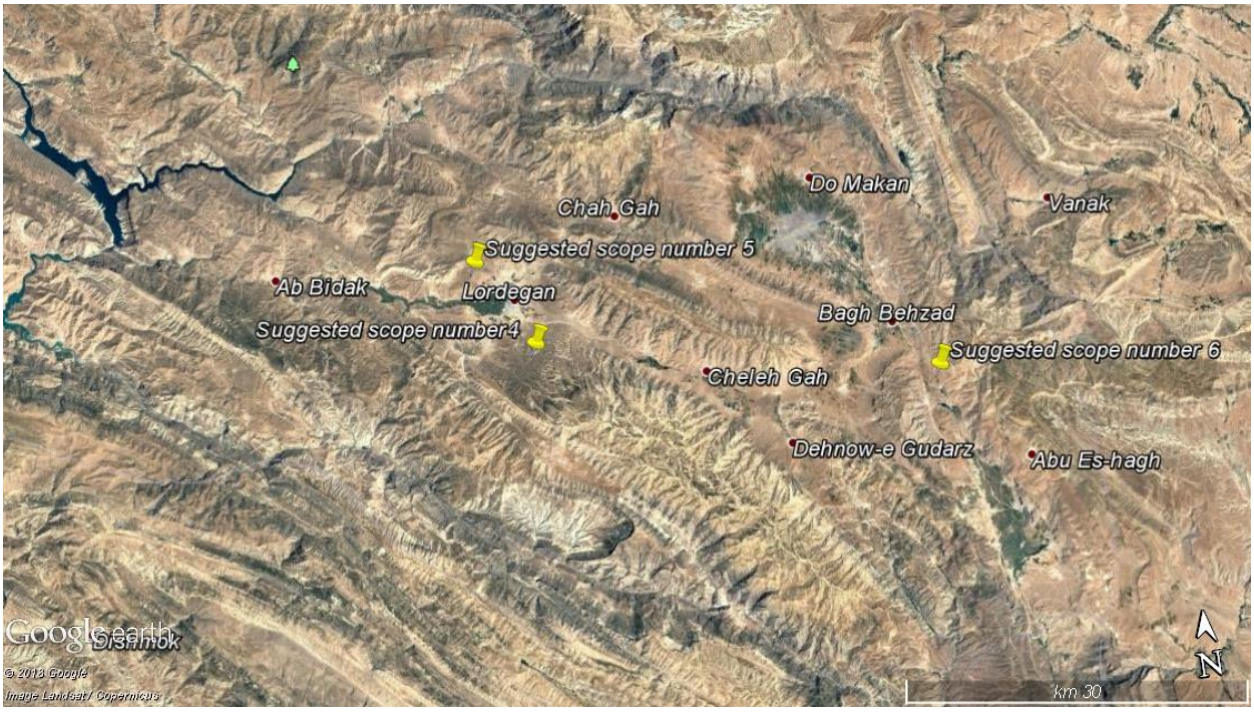
Table (١-١): List of Proposed Areas for the Construction of a One MW Solar Power Plant

Row	Post	Address	Capacity(MW)
١	Shahr e Kord	From Shahrekord University to the beginning of the Chaleshtor	١
٢	Farsan	Farsan to Dehcheshmeh	
٣	Farsan	Farsan to Babahidar	
٤	Lordegan	Rig area	
٥	Lordegan	Lordgan Industrial Pole	
٦	Chenar Mahmoudi	Chenar Mahmoudi to Shahriari	
٧	Naghan	Naghan to Ardal	
٨	Naghan	Naghgan Industrial Pole	
٩	Dashtak	Dashtak to Kaj	

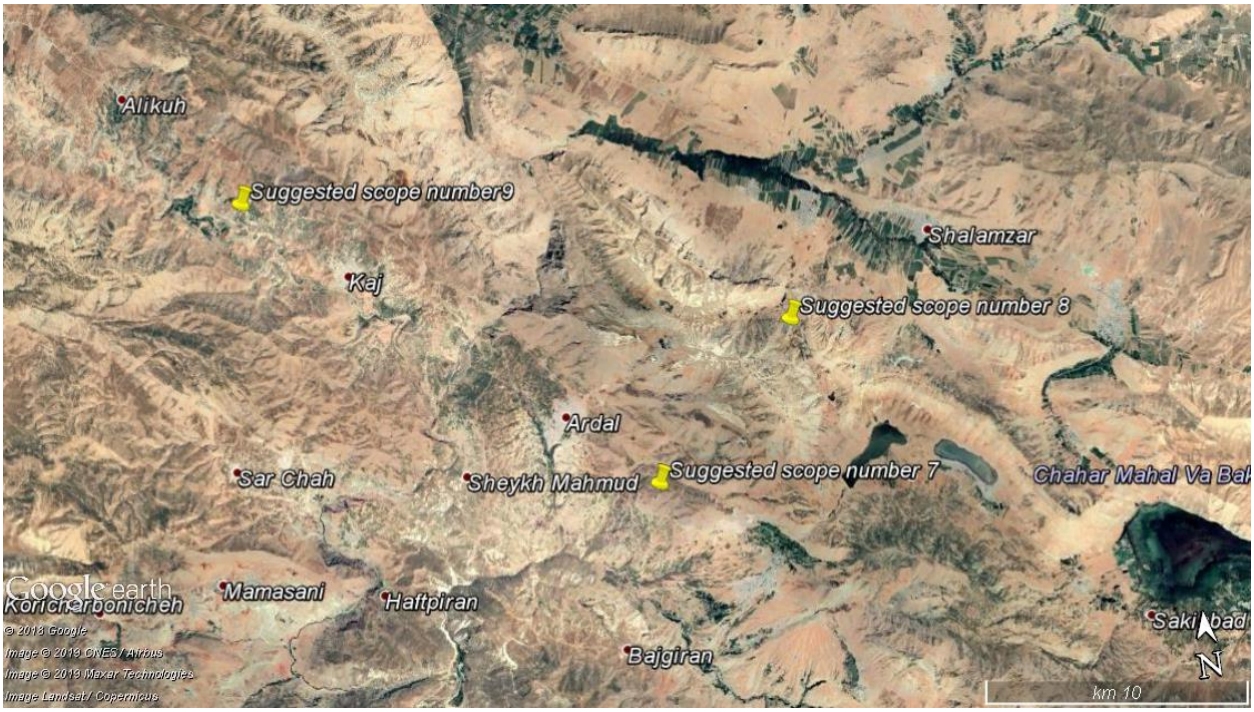
Figure ١-١ (a, b and c) shows the project execution boundaries in Google Earth.



A



B



C

Figure (١-١): Location of Project

۲-۱- Access routes

The route shown in Table ۲-۱ can be used to access any of the project implementation areas from the center of the province.

Table (۲-۱): Access routes

Row	Beginning	Address	Destination	Distance(km)
۱	Shahrekord	Mahdieh-Ashkhtak-Chaloshtor	Suggested Scope One	۷
۲		Sureshjan-Pardanjan-Farsan-Dehchesheh	Suggested Scope Two	۳۲
۳		Sureshjan-Pardanjan-Farsan-Babahidar	Suggested Scope Two	٤٥
٤		Sefidasht-Faradanbe-Borujen-Gandman-Aloni-Lordegan	Suggested scope four	۱۷۰
٥		Sefidasht-Faradanbe-Borujen-Gandman-Aloni-Lordegan	Suggested Scope Five	۱٤۰
٦		Sefiddasht-Faradanbe-Borujen-Gandman-Koshki, Chenar Mahmoudi	Suggested Scope Six	۱۲۰
۷		City of Kian-Taghank-Shalamzar-Gahro-Naghan-Ardal	Suggested range seven	۷٥
۸		Kian-Taghankak-Shalamzar-Ardal-Naghan	Suggested Scope Eight	٦٥
۹		Kian City-Taganak-Shalamzar-Gahro-Nagan Industrial Pole	Suggested Scope nine	۹٥

۳-۱-Climate

According to the coupon division of Chaharmahal va Bakhtiari province, in general, the eastern part of the region has a temperate and cold climate with hot and dry summers (Dcas) which can be mentioned as examples of its stations in Shahrekord and Imam Qus. The region has ۲ to ٥ m of elevation, cold temperate climate, and dry summers (Dcas). The western part of the area is covered with oak forests, with a subtropical climate with hot and dry summers (Dcas), which is located at Lordegan and Manj station, and finally has more than ۲ m of elevation (H) that is covered by snow.

Table (۳-۱): Climatic Factor

Climatic Factor	Mean
Temperature(c)	۱۳/٥
Rain(mm)	٥۶۰
Relative Humid (%)	۳۴/٥
The number of frosty days	۱۱۱
Sunny hours	۳۱۴۲

٤-١- The population of residential centers

The purpose of the residential population survey is to identify investors in the primary target markets for product sales as well as to provide the manpower and equipment needed to continue operating. Hence, Table ١-٤ shows the average population of each proposed project implementation area.

Table (٤-١): Average population of project implementation areas (٢٠١٦)

Row	residential centers	Population(٢٠١٦)
١	Suggested Scope One	١٩٥٠٠٠
٢	Suggested Scope Two	٥٠٠٠٠
٣	Suggested Scope Two	٦٢٠٠٠
٤	Suggested scope four	١٠٧٠٠٠
٥	Suggested Scope Five	١٠٧٠٠٠
٦	Suggested Scope Six	٦٢٥٠٠
٧	Suggested range seven	٤٧٠٠٠
٨	Suggested Scope Eight	٣٧٠٠٠
٩	Suggested Scope nine	٣٢٠٠٠

٥-١- Access to infrastructure facilities

Due to the uncertainty of the exact location of the projects, infrastructure facilities are generally provided for the proposed areas in terms of telephone coverage, access and human resources in Table ١-٥.

Table (٥-١): Access status of project implementation areas to infrastructure

Infrastructure facilities	Yes	No
Phone coverage	*	
Access Road	*	The access road is asphalted
Access to human resources	*	Worker and specialist workforce

Second chapter:

Product specifications, process and method of production

١-٢-Introduction

All human progress in technology depends on a vital component called energy. Without energy, none of today's tools can work. Currently, a large part of the energy resources are provided by non-renewable fossil fuels. Because these fuels are non-renewable and have very harmful effects on the environment, humans in the modern age have always been looking for a way to supply renewable energy, making this one of the best sources of energy to be permanently utilized from sunlight.

٢-٢- History Use of Solar Energy

Recognizing solar energy and using it for various purposes goes back to prehistoric times. Perhaps during the pottery period, the clergymen at the temples were polished with the help of large golden cups and the sun's rays illuminated the altar fires. One of the Egyptian pharaohs built a temple that would open at sunrise and close at sunset. But the most important account of the use of the sun is the story of Archimedes the great scientist and inventor of ancient Greece who set fire to the Roman fleet using the sun's thermal energy. It is said that Archimedes, by mounting a large number of small square mirrors on one moving stand, focused the sun's rays on the Roman ships from a distance and thus set them on fire. In Iran too, the traditional architecture of the ancient Iranians has shown their particular interest in the proper and effective use of solar energy in ancient times. Although solar energy and its benefits were well known in the past centuries, the high cost of such systems on the one hand, and the supply of cheap oil and gas on the other hand, hampered the development of these systems, Oil prices in the second half of the year led the advanced industrialized nations to pay more attention to the issue of energy production in other ways than using fossil fuels.

٣-٢- Solar Energy Applications

According to the results of the feasibility studies of cage fish breeding in Karun ٤ fish following are the most suitable species for breeding.
Solar energy is currently used in two general ways:

١. Use of solar thermal energy for domestic, industrial and power plants.

٢. Direct conversion of sunlight to electricity by means of a device called photovoltaic.

١-٣-٢- Use of solar thermal energy

This part of the sun's energy applications includes both power plants and non-power plants.

۱-۱-۳-۲-Powerhouse applications

Facilities that convert the sun's absorbed heat into electricity are called solar thermal power plants. These facilities are divided into three categories based on the types of concentrators available and the geometric shapes of the concentrators:

• Power plants whose receivers are studded parabolic mirrors.

• Power plants with a receiver in a tower and reflected by large mirrors called a heliostat (central receiver).

• Power plants receiving parabolic plates (Appendix ۱). The characteristics of each power plant are summarized below.

۱-۱-۱-۳-۲- Linear parabolic solar thermal power plants

In these plants, linear parabolic reflectors are used to focus the sun's rays in their focal line, and the receiver is tubular in the focal line of the reflectors. Inside this tube is a special oil flowing through the heat of the sun's rays to warm and cool. The hot oil passes through the heat exchanger and converts the water to steam. The steam is then transferred to conventional circuits in thermal power plants to convert it to electric power using a steam turbine and generator. To further utilize and increase the efficiency of the receiving tube, the surface is coated with metal oxide with a high coefficient. Also, the surrounding glass pipes are wrapped to prevent heat loss and radiation loss, as well as to protect the receiving pipe. They also created a vacuum between the two tubes. For the sun's rays to reach the receiving tube directly throughout the day. There is also a solar tracking system in these power plants, whereby paralyzing mirrors constantly follow the sun and focus its rays on the receiving tube. Changes in solar radiation at these plants are offset by a fossil fuel storage and heating source. Linear parabolic power plants have been used in several countries, such as the United States, Spain, Egypt, Mexico, India and Morocco. Which are either under construction or in operation. Studies have also been carried out in Iran and a project for a ۲ kW power plant has been carried out by the Iranian New Energy Organization in Shiraz.

۲-۱-۱-۳-۲- Solar power plants of central receiver type

In these plants, the rays of the sun are focused on a receiver mounted on a relatively tall tower by a field consisting of a large number of mirrors, called a heliostat. As a result, the beam concentrates a lot of heat energy, which is absorbed by the operating fluid moving inside the receiver, and is transmitted to the conventional water and steam system by a heat exchanger in traditional power plants, and superheated steam at pressure and temperature. Designed for use in generator turbines. The operating fluid is placed in the heat exchanger next to the water and converts it to steam at high pressure and heat. In some systems the fluid causes water to flow directly into the receiver into the steam. For permanent use of this type of power plant when there is no sunlight (e.g., cloudy hours or nights) heat storage systems or possibly support equipment that may use fossil fuels to generate steam to generate electricity can be.

۳-۱-۱-۳-۲- Plate solar thermal power plants

In these plants, reflectors, which are in the form of a parabolic plate, are used to concentrate the solar beams in a spot, and the receivers in the parabolic center absorb the heat energy through the current fluid and use it with a thermal machine and generator. Converts to mechanical and electrical.

۲-۳-۱-۲- Non powerhouse applications

Non-power applications of solar thermal energy include many things: solar water heaters and baths - solar cooling and heating - solar desalination - solar dryers - solar ovens - solar ovens and solar homes (appendix ۲).

٤-۲- Solar Energy Potential in Iran

Research by experts in many parts of Iran shows that the solar radiation energy is much higher than the international average. So that in some places it is measured above ۱ to ۲ kWh. Statistics show that the average solar radiation energy on the surface of Iran is about ٤,٥ kWh. On the other hand, sunshine in Iran is very different from some of the lower latitudes, such as Saudi Arabia. Because the sun there is more heat, but the radiation is pleasant in Iran, this difference makes us able to use the sun's energy to generate electricity using photovoltaic systems. Because these systems are less efficient against high heat. In other words, while countries around Iran produce only ۱٤ to ۱٥ percent electricity from a photovoltaic system with a capacity of only one kilowatt, we can increase its efficiency to ۱٦ to ۱۹ percent, making Iran the most economical and economical. Most of the countries in the region use solar energy (Figure ۱-۲).

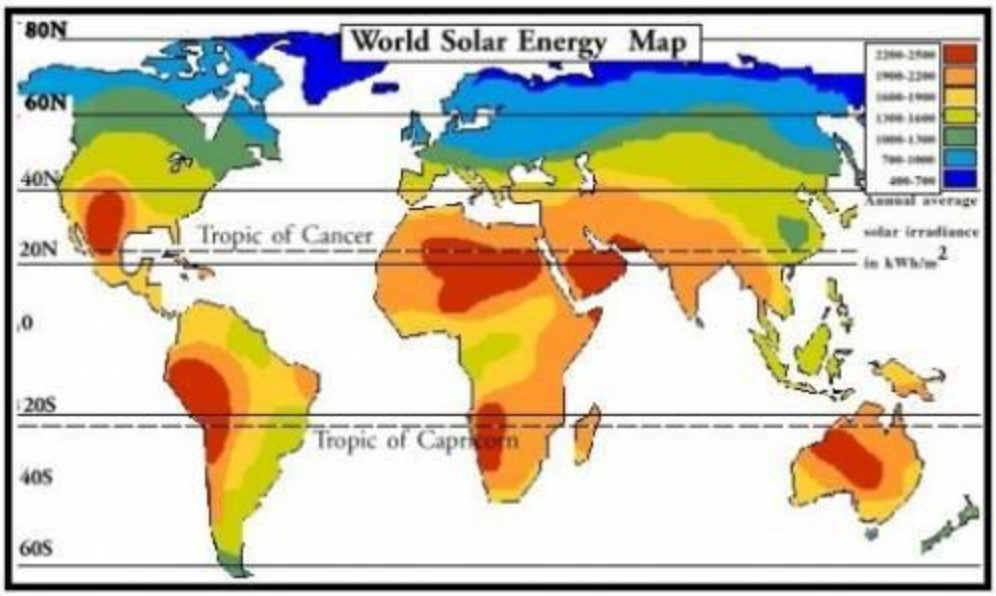


Figure (۱-۲): The average solar radiation in the world

۵-۲- Generation of electricity from the sun's rays

۱-۵-۲- Photovoltaic energy

A phenomenon that is produced by light, without the use of excitation mechanisms, generates electricity as a photovoltaic phenomenon, and any system that uses this phenomenon is called a photovoltaic system. The photoelectric effect was first described by Albert Einstein. According to this phenomenon, when a quantum of light energy, ie a photon, penetrates a material, it is likely to be absorbed by the electron and transmit the electron. Solar cells are also known as "photovoltaic cells" or "optical power". The name comes from the fact that photo means light and voltaic means electricity. These cells convert sunlight directly into electricity. Photovoltaic is a science that deals with the conversion of light into electricity, in other words, the conversion of light photons into electricity. Photovoltaic systems are one of the most widely used applications of renewable energy. Various systems with different capacities (from ۱,۲ watts to several megawatts) have been installed all over the world and their reliability and performance depend on the number of applicants every day. Acceptable voltage can be obtained from the solar cell series. They are called a series of parallel and parallel cells of the photovoltaic panel. Today, such cells are generally made of silicon material and the required silicon is made of sand, which is abundantly found in the desert regions of the country. So there is no shortage in Iran in terms of supplying the raw material to these cells. Sunlight is made of photons or particles of solar energy. Photons contain varying amounts of energy that are similar to different wavelengths of optical spectra. When photons collide with a photovoltaic cell, they may be reflected, passed through, or

absorbed directly. Only absorbed photons provide the energy to generate electricity. The simplest energy photovoltaic systems supply a large number of small calculators and wristwatches used daily.

Photovoltaic systems can generally be divided into two main sections, which we will briefly explain.

٢-٥-٢- Solar Panels

This part is actually converting the sun's radiant energy into electrical energy without mechanical intermediation. This section actually controls all of the system's specifications, powering the panels' inputs as designed and injecting and controlling the user's need for a load or battery. It should be noted that in this section the specifications and constituents vary according to the needs of the electric and consumer load as well as the local weather conditions.

٣-٥-٢- Consumer or electric charge

Depending on the DC output of the photovoltaic panels, the consumer can have two types of DC or AC, as well as different configurations of the photovoltaic panels to meet the needs of different consumers with different capacities. Given the increasing decline in fossil fuel reserves and the dangers of using nuclear power plants, in the not too distant future, electricity generated from solar energy will be used as a viable and safe alternative to fossil fuels and nuclear power plants.

٤-٥-٢- How solar cells work?

The following equipment is needed to generate electricity based on solar cells:

- ✓ Photovoltaic array
- ✓ Solar tracking systems
- ✓ DC / AC power inverter or electronic converter
- ✓ Storage
- ✓ Other equipment

The arrangement of this equipment is shown in Figure ٢-٢.



Figure(٢-٢): The process of generating electricity from solar energy

١-٤-٥-٢- Photovoltaic array

The photovoltaic array consists of a set of photovoltaic panels, which are made of photovoltaic modules. Photovoltaic modules are also composed of photovoltaic cells that convert the sun's energy into electricity.

The four main types of photovoltaic cells are:

- Single Crystal

- Polycrystalline

- Amorphous cells

- Nano-photovoltaic cells (latest solar cell introduced)

• Single crystal cell

These types of cells consist of pure single crystals. In these cells, silicon is composed of a continuous crystal lattice without impurities. The benefit of such cells is its high efficiency, which is about ١٥٪. Its disadvantages include the sophistication of this silicon, which makes it difficult to increase its price. According to research and news reports, arrays with a yield of around ١٨٪ are currently being produced and marketed.

• Polycrystalline cell

Such cells are made up of several interconnected single silicon crystals. The manufacturing process is that molten polycrystalline silicon is molded into ingots and then cut into thin tablets and prepared for solar cells. These types of cells have a much easier manufacturing process than they used to, and therefore cost less. At the same time, the efficiency of this group of solar cells is lower than before, with something estimated at about ١٢٪.

• Amorphous cells

In general, the major difference between this group of solar cells and the previous two is that instead of using the crystalline structure, the disordered cells of silicon atoms are used in thin layers. Is. These types of cells can be mounted on both a dry and flexible substrate, one of their unique advantages. The disadvantages of these cell types are their low efficiency, which is estimated at about ٦٪. Today, these cells are made of different panels in terms of shape and capacity. At present, arrays with a yield of around ٩٪ are also produced and marketed.

• Photovoltaic Nano cells: The third generation of solar cells (Nano cells) is expected to be launched in the coming years and will greatly reduce the high cost of first and second generation solar cells.

Solar cells are often made of silicon, copper, cadmium sulfide and gallium arsenide, which is better positioned among these materials because of their light properties.

Note: For proper power generation, photovoltaic arrays can be connected in different modes. For higher voltage, the arrays are parallel to each other and for greater current, or can even be connected in parallel.

Table (١-٢): Efficiency of different photovoltaic modules

module	Efficiency (%)
Single crystal silicon	١٢/٥-١٥
Polycrystalline silicon	١١-١٤
Copper Indium Gallium Selenite	١٠-١٣
Cadmium telluride	٩-١٢
Amorphous silicon	٥-٧

٢-٤-٥-٢- Solar radiation tracking systems

Photovoltaic arrays are mounted in either fixed or removable tracers that adapt to the sun's angles according to the season. However, in some cases arrays are installed in seasonal mode. The most important thing to install in photovoltaic arrays is the angle of installation. The angle of the solar radiation to the solar panels has a great impact

on its electrical energy production. The simplest way to install arrays is to fix them. However, due to the variation of the suns angle during the day and its movement in different seasons, the amount of sunlight shining on the plates decreases throughout the day and year**.**

A seasonal fixed installation method can be used to correct this weakness. In this case, the angle of installation of the photovoltaic arrays varies for each season, and the angle of installation must vary with each season. Another option is to use a removable detector. Tracks have two types:

Detectors that rotate on one axis or on two axes and always keep the photovoltaic panels in direct sunlight, thereby increasing the output efficiency of the panels.

Fixed base panels the panels are mounted on a fixed slope stand facing the sun. For areas like Iran in the Northern Hemisphere, photovoltaic panels should be installed so that the surface is light absorbing to the south as the sun is visible in the south during the year. But to maximize the annual energy uptake by a solar system, it is best to have a steep slope angle approximately equal to the latitude of the installation. For example, for the city of Shahrekord, if the panels are installed at a ۳۰ degree angle to the south, they will have the highest energy consumption throughout the year.

Table (۲-۲): Panels efficiency for different installation modes

Type of installation	Fixed	Two-season constant	Four-season constant	Bipolar tracker
To the optimal state	۷۱/۱٪	۷۵/۲٪	۷۵/۷٪	۱۰۰٪

۳-٤-۵-۲- Inverter or DC / AC power converter

A converter is a device that extracts DC power from photovoltaic arrays and converts it into standard AC current used in the home, and matches its characteristics such as voltage and frequency to the components required by the consumer. Generally, the photovoltaic units are divided into two groups, connected to the grid and separated from the grid. Therefore, converters used in each case must have their own characteristics. Power electronics converters can be divided into two general categories of separate network converters and network connected converters.

۱-۳-٤-۵-۲- Network Power Converters

Such converters convert the DC power of the solar arrays into alternating current at the desired voltage and frequency level and must be capable of supplying the load at the desired voltage and frequency in a sudden change of load. They must also be capable of reactive power exchange to feed reactive loads. Most of the grid separators are connected to the load to separate the DC and AC segments by an isolated

transformer. Two basic parameters have to be considered when selecting separate converters from the grid:

١. Output waveform

٢. Losses in unemployment

The acceptable waveform for alternating loads is the sinusoidal waveform. However, some converters produce a sine-like waveform, especially a low-voltage, square wave or waveform. Such waveforms can cause problems in starting the induction motor.

Another problem relates to inverter losses. In this case, when the transducer is switched on and the load is not connected to it, it can consume unloaded current which can lead to battery drain. Therefore, to solve this problem, the converter control system must be designed to eliminate this problem. In general, separate network converters should meet the following minimum requirements:

- Severe input voltage fluctuations

- Generates or near the sinusoidal output voltage waveform

- Output voltage control

- Top Twelve

- Ability to withstand short-term overload, such as running an induction motor

- Reactive load nutritional capacity

- Short circuit current tolerance

٢-٥-٤-٣-٢-Grid-connected converters

The output of this type of converter must be synchronized with the main power grid. Synchronization means that the voltage level, frequency and phase voltage of the converter output are consistent with the grid voltage. The criteria for efficiency, safety, power quality of the converter and its protection system must be taken into account when selecting a converter connected to the network.

٤-٤-٥-٢- Storage device

The storage of the photovoltaic system is usually battery type. The battery system may include all or some of the following:

١. Battery compartment

٢. Battery charge controller

٣. Separate side panels for critical load circuits

In the battery compartment, the energy storage is in the form of a battery, and if there are sub-sections of the critical circuit, the critical load circuits work when consumed. In this case, when the global grid is powered, the solar unit is separated from the main grid and only the predetermined sensitive loads are fed by the unit. Sensitive load circuits are wired from a sub-circuit that is separate from the rest of the electrical circuits. If power outages occur during daylight hours, the photovoltaic array can supply the battery with the help of batteries. If a power failure occurs at night, it will supply the required battery life. Lead-acid, nickel-cadmium, nickel-hydroxide and lithium batteries are available today, with lead-acid batteries consuming more.

The most important factor in selecting a battery for photovoltaic systems is the ability to discharge and charge excessively at various times without causing any damage to the battery. Batteries can be serialized or paralleled to achieve higher capacities.

The battery is used in both separate and grid-connected systems and stores surplus energy when the photovoltaic system output is over load. When the sunlight is unavailable or the solar power output is less than the load, the battery enters the circuit and compensates for the lack of energy. Therefore, the battery must be capable of being recharged and recharged repeatedly.

١-١-٤-٤-٥-٢- Follower of maximum power

The voltage curve of a sample solar panel is shown in Figure ٤-٤. As can be seen, for every point on the curve there is a voltage and a corresponding current that is not necessarily the maximum current or maximum voltage. For example, at point E the voltage is maximum but the current corresponding to zero or for point B is maximum, but the voltage is not maximum. For optimum use of the energy generated by the photovoltaic panel, a point must be selected that has the highest current and voltage. Achieving the optimum point by the maximum power follower is the point where the highest voltage and current is generated. For example, in the figure below, point C is the point where the maximum voltage and current is generated.

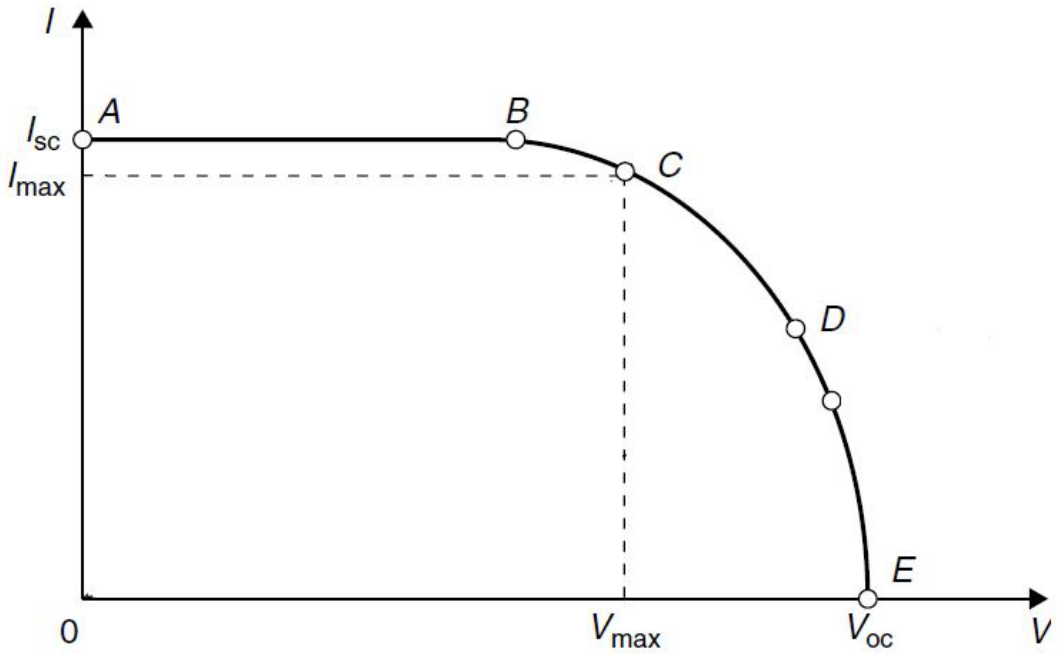


Figure (٤-٢): Current-voltage curve of a solar panel

In Fig. ٥-٢ the voltage output is shown in terms of voltage for a photovoltaic panel.

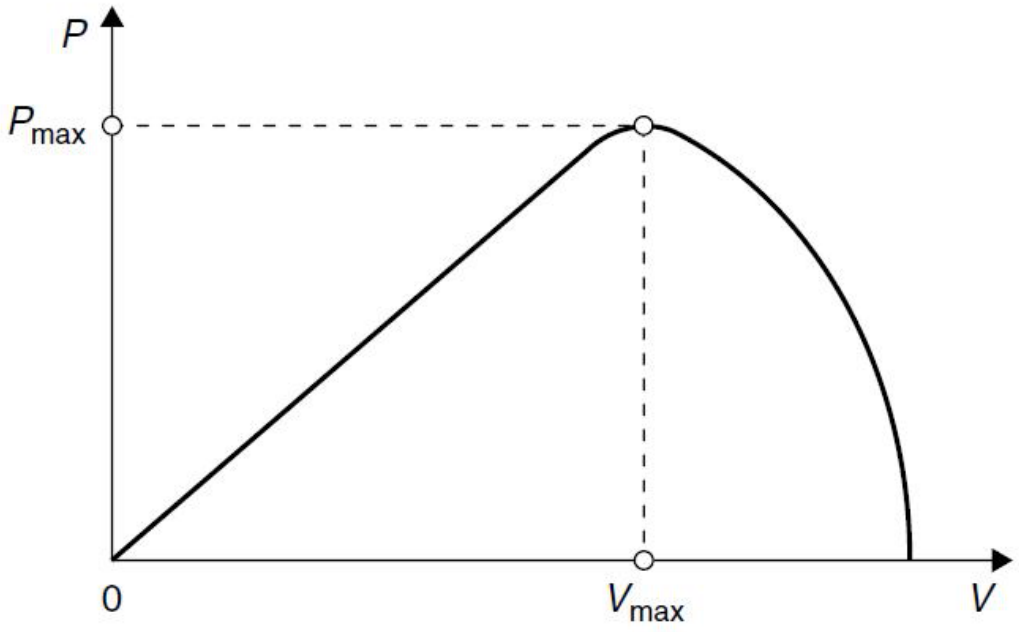


Figure (٢-٥): Power-voltage curve of a solar panel

The maximum power follower is actually a high efficiency DC-DC converter that adjusts its output voltage to an optimum value to obtain maximum power. The pursuit of maximum power in the cloudy, cold days or when the battery is used can play a very effective role. However, the cost and complexity of the maximum power must be taken into account when selecting a follower. In cases where photovoltaic units are equipped with maximum power requirements. The output of the photovoltaic system is directly related to the converter and the follower of maximum power.

٥-٤-٥-٢- Other equipment

Other components of the photovoltaic system are referred to as BOS. The equipment includes wiring and mounting systems to allow photovoltaic modules to be used in the electrical system. In addition to BOS, there are other equipment such as control devices, metering devices, etc. that are not part of the main equipment.

٥-٥-٢- Advantages and Disadvantages of the Photovoltaic System

١-٥-٥-٢- Advantages of Photovoltaic System

The major advantages of photovoltaic systems can be summarized as follows:

- Does not require fuel
- No environmental pollution
- High reliability
- Easy portability
- Quick installation and removal
- Very low service and maintenance needs
- Long life (more than ٢٠ years)
- Direct energy conversion without any mechanical rotation and no damping

Low maintenance costs, no need for intermittent servicing, and the ability to quickly install and dismantle are things that make the photovoltaic system even higher than other renewable energies. The aforementioned advantages give the photovoltaic system special capabilities, which in many cases make it economically feasible in comparison with other conventional systems (grid power, diesel generators, etc.).

٢-٥-٥-٢- Disadvantages of photovoltaic system

The major disadvantages of photovoltaic systems can be summarized as follows:

- ✓ High cost of initial investment
- ✓ Low efficiency of photovoltaic panels
- ✓ Dependence on sunlight to give energy
- ✓ In certain applications, there is a need for a power saver (generally a battery) to work during off hours or fluctuations in radiation.

Chapter ٣:

Investment and technical justification of the plan

۱-۳- Fixed costs

Table (۱-۳): The land

All numbers are in million rials								
Row	Description	Unit	Ownership type	Value	Unit price	Total price	The final cost	Cost to Euro
۱	Land	$M^۲$	Assignment	۱۰۰۰۰	۰	۰	۰	۰
Total							۰	۰

Table (۲-۳): Landscaping

	All numbers are in million rials							Cost(Euro)
Row	Description	Value	Unit	Unit price(Rials)	Total price	Done	Required	
۱	Excavation and leveling	۱۰،۰۰۰	$M^۳$	٤۲،٦۰۰	٤۲٦	۰	٤۲٦	۱،٥۳۸
۲	Tabulation and sidewalk construction	٤۰۰	$M^۲$	٦٤۰،۰۰۰	۲٥٦	۰	۲٥٦	۹۲۳
۳	Lighting	۳	Mercury	۲۸٤،۰۰۰	۹	۰	۹	۳۰
٤	Road construction and access roads	۳۰۰	M in length	۱،۳۸٤،٥٦۰	٤۱٥	۰	٤۱٥	۱،٥۰۰
٥	green space	۱	Number	۱۰،٦٥۰،٥۰۰	۱۱	۰	۱۱	۳۸
٦	Door	۱	$M^۲$	٤۲،٦۰۰،۰۰۰	٤۳	۰	٤۳	۱٥٤
۷	fencing	۸۰۰	Number	۷،٤٥٥،۰۰۰	٥۹٦٤	۰	٥۹٦٤	۲۱،٥۳۸
Total						۰	۷۱۲۳	۲٥،۷۲۲

Table (۳-۳): Building

	All numbers are in million rials							Cost(Euro)
Row	Description	Value	Unit	Unit price(Rials)	Total price	Done	Required	
۱	Office	۳۰	$M^۳$	۳۸	۱۱٥۰	۰	۱۱٥۰	٤،۱٥٤
۲	Security	۲٥	$M^۳$	۳٤	۸٥۲	۰	۸٥۲	۳،۰۷۷
۳	Store	۲٥	$M^۳$	۳۰	۷٤٥	۰	۷٤٥	۲،٦۹۲
٤	W.C	۱۰	$M^۳$	۳٤	۳٤۱	۰	۳٤۱	۱،۲۳۱
Total						۰	۳۰۸۸	۱۱،۱٥٤

Table (٤-٣): Installations

	All numbers are in million rials							Cost(Euro)
Row	Description	Value	Unit	Unit price(Rials)	Total price	Done	Required	
١	CCTV	١	Device	٥٣،٠٠٠،٠٠٠	٥٣	٠	٥٣	١٩٢
٢	Fire Extinguishing System	٣	Device	٧،٠٠٠،٠٠٠	٢٢	٠	٢٢	٨١
٣	Cooling Heating System	٢	Device	٩٦،٠٠٠،٠٠٠	١٩٢	٠	١٩٢	٦٩٢
٤	Water storage tank	١	Device	١٨،٠٠٠،٠٠٠	١٨	٠	١٨	٦٥
٥	Fuel storage tank	١	Device	١١،٠٠٠،٠٠٠	١١	٠	١١	٣٨
Total							**٢٩٦**	**١٠٦٩**

Table (٥-٣): equipment and machinery

All numbers are in million rials					
Row	Description	Total price	Done	Required	Cost(Euro)
Photovoltaic Panel					
١	the frame	٨٤٥٤	٠	٨٤٥٤	٣٠،٥٢٨
٢	Glass	١٠١٣٩	٠	١٠١٣٩	٣٦،٦١٥
٣	EVA sheet	٩٢٩٠	٠	٩٢٩٠	٣٣،٥٤٩
٤	Back sheet	٩٢٩٠	٠	٩٢٩٠	٣٣،٥٤٩
٥	Junction box	٦٧٥٥	٠	٦٧٥٥	٢٤،٣٩٥
٦	TB	١٦٨٩٤	٠	١٦٨٩٤	٦١،٠١٠
٧	Ribbon tape	٤٢٢٠	٠	٤٢٢٠	١٥،٢٤١
٨	PV adhesive	٤٢٢٠	٠	٤٢٢٠	١٥،٢٤١
٩	DC cable	٦٣٣٧	٠	٦٣٣٧	٢٢،٨٨٥
Solar inverter					
١٠	Electronics	٢٣٦٦٢	٠	٢٣٦٦٢	٨٥،٤٥١
١١	Boxes and metal parts	٨٤٥٤	٠	٨٤٥٤	٣٠،٥٢٨
Other equipment					
١٢	Structure	١٢٦٧٤	٠	١٢٦٧٤	٤٥،٧٦٩
١٣	Solar Detector	٦٣٣٧	٠	٦٣٣٧	٢٢،٨٨٥
١٤	Installation and execution	٧٦٠٤	٠	٧٦٠٤	٢٧،٤٥٩
Total			٠	١٣٤٣٣٠	٤٨٥،١٠٥

Table (٦-٣): vehicles

All numbers are in million rials								Cost(Euro)
Row	Description	Value	Unit	Unit price(Rials)	Total price	Done	Required	
١	Automobile	١	Device	١٧٠٠،٠٠٠،٠٠٠	١٧٠٠		١٧٠٠	٦،١٥٤
Total						٠	١٧٠٠	٦،١٥٤

Table (٧-٣): Furniture and office supplies and workshops

	All numbers are in million rials							Cost(Euro)
Row	Description	Value	Unit	Unit price(Rials)	Total price	Done	Required	
١	Computers & Accessories	١	Device	٧٤،٥٠٠،٠٠٠	٧٤,٥	٠	٧٤,٥	٢٦٩
٢	Table and chairs	٢	Complete set	٧٦،٥٠٠،٠٠٠	١٥٣	٠	١٥٣	٥٥٤
٣	chairs	١٠	number	٥،٣٠٠،٠٠٠	٥٣	٠	٥٣	١٩٢
٤	Refrigerator	١	Device	٣٢،٠٠٠،٠٠٠	٣٢	٠	٣٢	١١٥
٥	Oven	١	Device	٣٢،٠٠٠،٠٠٠	٣٢	٠	٣٢	١١٥
٦	Cooling and heating appliances	١	Device	٢١،٥٠٠،٠٠٠	٢١,٥	٠	٢١,٥	٧٧
٧	Kitchenware	١	Collection	٢١،٥٠٠،٠٠٠	٢١,٥	٠	٢١,٥	٧٧
Total						٠	٣٨٧,٦	١،٤٠٠

Table (٨-٣): Cost before operation

All numbers are in million rials				
Row	Description	Total price	Done	Required
١	Cost before operation (٢٪ fixed capital)	١٤٦٩	٠	١٤٦٩
Total(Euro)			٠	٥،٣٠٦

۲-۳- Plan investment

Table (۹-۳): Working capital

All numbers are in million rials											
Year											
Description	Period	First year	Second year	Third year	Forth year	Fifth year	Sixth year	Seventh year	Eightieth year	Ninth year	Tenth year
Expected capacity percentage											
		۱۰۰٪	۱۰۰٪	۱۰۰٪	۱۰۰٪	۱۰۰٪	۱۰۰٪	۱۰۰٪	۱۰۰٪	۱۰۰٪	۱۰۰٪
Cost of raw materials	٤٥	۱۱۹	۱۱۹	۱۱۹	۱۱۹	۱۱۹	۱۱۹	۱۱۹	۱۱۹	۱۱۹	۱۱۹
Inventory of manufactured products	۱٥	۳٦۲	۳٦۲	۳٦۲	۳٦۲	۳٦۲	۳٦۲	۳٦۲	۳٦۲	۳٦۲	۳٦۲
Product in production	۱٥	۳٦۲	۳٦۲	۳٦۲	۳٦۲	۳٦۲	۳٦۲	۳٦۲	۳٦۲	۳٦۲	۳٦۲
Accounts Received	۳۰	۷۲٤	۷۲٤	۷۲٤	۷۲٤	۷۲٤	۷۲٤	۷۲٤	۷۲٤	۷۲٤	۷۲٤
Deducted: Payment Accounts	۳۰	-۸۹	-۸۹	-۸۹	-۸۹	-۸۹	-۸۹	-۸۹	-۸۹	-۸۹	-۸۹
Cash (salary)	۳۰	۱۷٥	۱۷٥	۱۷٥	۱۷٥	۱۷٥	۱۷٥	۱۷٥	۱۷٥	۱۷٥	۱۷٥
Total working capital required		۱٦٥٥	۱٦٥٥	۱٦٥٥	۱٦٥٥	۱٦٥٥	۱٦٥٥	۱٦٥٥	۱٦٥٥	۱٦٥٥	۱٦٥٥
Annual increase in working capital		۱٦٥٥	۰	۰	۰	۰	۰	۰	۰	۰	۰
Total working capital required (EUR)		٥،۹۷٥	٥،۹۷٥	٥،۹۷٥	٥،۹۷٥	٥،۹۷٥	٥،۹۷٥	٥،۹۷٥	٥،۹۷٥	٥،۹۷٥	٥،۹۷٥

Table (۱۰-۳): Summary investment plan

All numbers are in million rials					Cost(Euro)
Year					
Row	Description	Price	Done	Required	
۱	land	۰	۰	۰	۰
۲	Landscaping	۷۱۲۳	۰	۷۱۲۳	۲٥۷۲۲
۳	Building	۳۰۸۹	۰	۳۰۸۹	۱۱۱٥٤
٤	Installations	۲۹٦	۰	۲۹٦	۱۰٦۹
٥	Luggage and office supplies	۳۸۸	۰	۳۸۸	۱٤۰۰
٦	equipment and machinery	۱۳٤۳۳۱	۰	۱۳٤۳۳۱	٤۸٥۱۰٥
۷	Vehicle	۱۷۰٤	۰	۱۷۰٤	٦۱٥٤
۸	Costs before operation	۱٤٦۹	۰	۱٤٦۹	٥۳۰٦
۹	Unforeseen costs	۲۹٦۸	۰	۲۹٦۸	۱۰۷۱۸
Total fixed investment costs		۱٥۱۳٦۸	۰	۱٥۱۳٦۸	٥٤٦٦۲۹
Capital in the first year's turnover		۱٦٥٥	۰	۱٦٥٥	٥۹۷٥
Total investment of the plan		۱٥۳۰۲۳	۰	۱٥۳۰۲۳	٥٥۲٦۰٤

Table (۱۱-۳): How to get funding to complete the project

All numbers are in million rials			
Description	Build time	Operation time	total
Total Financial source	۱۵۱۳۶۹	۱۶۵۵	۱۵۳۰۲۳
Total Financial source(Euro)	۵۴۶۶۲۹	۵۹۷۵	۵۵۲۶۰۴

۳-۳- Plan variable costs

Table (۱۲-۳): Main material cost

All numbers are in million rials					Cost(Euro)
Row	Description	Total price	Done	Required	
۱	Food and Catering	۹۵۹	-	۹۵۹	۳۴۶۲
Total			-	۹۵۹	۳۴۶۲

Table (۱۳-۳): Fuel and energy costs

All numbers are in million rials								Cost(Euro)
Row	Description	annual consumption	Unit	Unit price(rials)	Total price	Done	Required	
۱	consuming water	۱۰،۰۰۰	M^3	۵،۳۰۰	۵۳	۰	۵۳	۱۹۲
۲	Kerosene	۲،۰۰۰	Liter	۱۰،۵۰۰	۲۱	۰	۲۱	۷۷
۳	gas capsule	۲۰۰	Number	۱۷۰،۰۰۰	۳۴	۰	۳۴	۱۲۳
Total						۰	۱۰۸	۳۹۲

Table (۱۴-۳): salary

All numbers are in million rials						
Row	Description	Number	Monthly salary for each person (thousand Rials)	Monthly salary(thousand Rials)	yearly salary	Cost(Euro)
۱	technical manager	۱	۴۳،۰۰۰	۴۳،۰۰۰	۵۲۰	۱،۸۴۶
yearly salary					۵۲۰	۱،۸۴۶
Employer share insurance equals ۲۳٪ of annual salaries and benefits					۱۱۸	۴۲۵
Total salaries and benefits of production personnel					۶۳۸	۲،۲۷۱
۲	Project Manager	۱	۵۳،۰۰۰	۵۳،۰۰۰	۶۳۹	۲،۳۰۸
۳	Guard	۱	۳۸،۰۰۰	۳۸،۰۰۰	۴۶۰	۱،۶۶۲
yearly salary					۱۱۰۰	۳،۹۶۹
Employer share insurance equals ۲۳٪ of annual salaries and benefits					۲۵۳	۹۱۳
Total salaries and benefits of production personnel					۱۳۵۲	۴،۸۸۲
Total salaries and benefits for all personnel					۱۹۸۱	۷،۱۵۳

Table (۱۵-۳): maintenance cost

All numbers are in million rials					
Row	Description	Asset value	Rate (%)	Cost	Cost(Euro)
۱	Landscaping	۷۱۲۳	۰/۰۲	۱٤۲	٥۱٤
۲	Building	۳۰۸۹	۰/۰۲	٦۲	۲۲۳
۳	Installations	۲۹٦	۰/۰٥	۱٥	٥۳
٤	equipment and machinery	۱۳٤۳۳۲	۰/۰۱	۱۳٤۳	٤۸٥۱
٥	Office Supplies	۳۸۸	۰/۰٥	۱۹	۷۰
٦	vehicles	۱۷۰٤	۰/۱۰	۱۷۰	٦۱٥
Total		۱٤٦۹۳۲	-	۱۷٥۲	٦۳۲۷

Table (۱٦-۳): Cost of depreciation

	All numbers are in million rials				
Row	Description	Asset value	Rate (%)	Cost	Cost(Euro)
۱	Landscaping	۷۱۲۰	۰/۱۰	۷۱۲	۲،٥۷۲
۲	Building	۳۰۹۰	۰/۱۰	۳۰۹	۱،۱۱٥
۳	Installations	۳۰۰	۰/۱۰	۳۰	۱۰۷
٤	equipment and machinery	۱۳۴۳۰۰	۰/۰۱	۱۳۴۳	٤،۸٥۱
٥	Office Supplies	۳۹۰	۰/۱۰	۳۹	۱٤۰
٦	vehicles	۱۷۰٥	۰/۲۰	۳۴۱	۱،۲۳۱
۷	Unforeseen costs	۲۹۷۰	۰/۱۰	۲۹۷	۱،۰۷۲
Cost of depreciation of fixed assets		۷۰۳۷۲	-	۳۰۷۰	۱۱،۰۸۸
Cost before operation		۱۴۷۰	۰/۱۰	۱۴۷	٥۳۱
Total		۲۲۱۷۱۷	-	۶۲۸۸	۱۱،٦۱۹

Table (۱۷-۳): The cost of sales and insurance

All numbers are in million rials			Cost(Euro)
Row	Description	Total cost	
۱	Product sales costs (۱٪ sales)	٤۰۷	۱،٤۷۰
۲	Administrative and organizational costs (۱٥٪ sales)	۲۰۳	۷۳٥
۳	Fixed asset insurance (۲ per thousand asset value)	۳۰۳	۱،۰۹۳
Total		٤۲۹	۴۰۷

٤-٣- Total cost

Table (١٨-٣): Product cost (direct production costs)

All numbers are in million rials										
Year	First year	Second year	Third year	Fourth year	Fifth year	Sixth year	Seventh year	Eightieth year	Ninth year	Tenth year
Expected Capacity	١٠٠٪	١٠٠٪	١٠٠٪	١٠٠٪	١٠٠٪	١٠٠٪	١٠٠٪	١٠٠٪	١٠٠٪	١٠٠٪
Raw material costs	١٢٥	١٢٥	١٢٥	١٢٥	١٢٥	١٢٥	١٢٥	١٢٥	١٢٥	١٢٥
Salary of production personnel	٨٢	٨٢	٨٢	٨٢	٨٢	٨٢	٨٢	٨٢	٨٢	٨٢
Repair and maintenance	٢٢٨	٢٢٨	٢٢٨	٢٢٨	٢٢٨	٢٢٨	٢٢٨	٢٢٨	٢٢٨	٢٢٨
Fuel and energy	١٤	١٤	١٤	١٤	١٤	١٤	١٤	١٤	١٤	١٤
Unpredicted (٥٪ of the above items)	٩	٩	٩	٩	٩	٩	٩	٩	٩	٩
Fixed asset depreciation cost	٣٩٩	٣٩٩	٣٩٩	٣٩٩	٣٩٩	٣٩٩	٣٩٩	٣٩٩	٣٩٩	٣٩٩
Total cost of product	٨٥٦	٨٥٦	٨٥٦	٨٥٦	٨٥٦	٨٥٦	٨٥٦	٨٥٦	٨٥٦	٨٥٦
Total cost of the product (Euro	٢٣،٧٨٩	٢٣،٧٨٩	٢٣،٧٨٩	٢٣،٧٨٩	٢٣،٧٨٩	٢٣،٧٨٩	٢٣،٧٨٩	٢٣،٧٨٩	٢٣،٧٨٩	٢٣،٧٨٩

Table (١٩-٣): Operating costs

All numbers are in million rials										
Year	First year	Second year	Third year	Fourth year	Fifth year	Sixth year	Seventh year	Eightieth year	Ninth year	Tenth year
Expected Capacity	١٠٠٪	١٠٠٪	١٠٠٪	١٠٠٪	١٠٠٪	١٠٠٪	١٠٠٪	١٠٠٪	١٠٠٪	١٠٠٪
The salary of the administrative staff	١٧٦	١٧٦	١٧٦	١٧٦	١٧٦	١٧٦	١٧٦	١٧٦	١٧٦	١٧٦
Costs of product sales	٥٣	٥٣	٥٣	٥٣	٥٣	٥٣	٥٣	٥٣	٥٣	٥٣
Administrative and organizational	٢٧	٢٧	٢٧	٢٧	٢٧	٢٧	٢٧	٢٧	٢٧	٢٧
Depreciation of costs before operation	١٩	١٩	١٩	١٩	١٩	١٩	١٩	١٩	١٩	١٩
Total Operating Costs	٢٧٤	٢٧٤	٢٧٤	٢٧٤	٢٧٤	٢٧٤	٢٧٤	٢٧٤	٢٧٤	٢٧٤
Total Operating Costs (Euro)	٧،٦١٨	٧،٦١٨	٧،٦١٨	٧،٦١٨	٧, ٦١٨	٧،٦١٨	٧،٦١٨	٧،٦١٨	٧،٦١٨	٧،٦١٨

Table (۲۰-۳): Non-operating costs

All numbers are in million rials										
Year	First year	Second year	Third year	Fourth year	Fifth year	Sixth year	Seventh year	Eightieth year	Ninth year	Tenth year
Expected Capacity	۱۰۰٪	۱۰۰٪	۱۰۰٪	۱۰۰٪	۱۰۰٪	۱۰۰٪	۱۰۰٪	۱۰۰٪	۱۰۰٪	۱۰۰٪
Fixed asset insurance (۰،۰۲٪ fixed asset)	۳۹	۳۹	۳۹	۳۹	۳۹	۳۹	۳۹	۳۹	۳۹	۳۹
Total non-operational costs	۳۹	۳۹	۳۹	۳۹	۳۹	۳۹	۳۹	۳۹	۳۹	۳۹
Total non-operational costs(Euro)	۱،۰۹۳	۱،۰۹۳	۱،۰۹۳	۱،۰۹۳	۱،۰۹۳	۱،۰۹۳	۱،۰۹۳	۱،۰۹۳	۱،۰۹۳	۱،۰۹۳

Table (۲۱-۳): Breakdown of fixed and variable costs

Breakdown of fixed and variable costs						
Row	Description	Total cost	Fixed costs		Variable costs	
		Amount	Amount	Percent	Amount	Percent
Direct production costs (sales cost)						
۱	Raw material cost	۹۵۸	۰	٪۰	۹۵۸	٪۱۰۰
۲	Salaries and benefits of production personnel	٦۹۲	٤٤۹,۸	٪٦۵	۲٤۲,۲	٪۳۵
۳	repair and maintenance	۱۷۵۳	۱۷۵۳	٪۱۰۰	۰	٪۰
٤	Fuel and energy	۱۰۹	۲۱,۸	٪۲۰	۸۷,۲	٪۸۰
۵	Miscellaneous and unpredictable (۵٪ of the above items)	۷۰	۳۵	٪۵۰	۳۵	٪۵۰
٦	Cost of depreciation of fixed assets	۳۰٦۹	۳۰٦۹	٪۱۰۰	۰	٪۰
Total direct production costs (sales cost)		٦٦۵۱	۵۳۲۰,۸	٪۸۰	۱۳۳۰,۲	٪۲۰
Operating Costs						
۷	Salary of administrative personnel	۱۳۵۳	۹٤۷,۱	٪۷۰	٤۰۵,۹	٪۳۰
۸	Distribution and sales (۰،۰۰۵٪ sales)	٤۰۷	۰	٪۰	٤۰۷	٪۱۰۰
۹	Administrative & Organizational (۱٪ Sales)	۲۰٤	۲۰٤	٪۱۰۰	۰	٪۰
Total Operating Costs		۱۹٦٤	۵٤۰	٪۵۹	۸۱۲,۹	٪٤۱
Non-operating costs						
۱۰	Fixed Assets (۰،۰۰۲ Fixed Assets)	۳۰۲	۳۰۲	۱۰۰٪	۰	۰٪
۱۱	Depreciation of costs before operation	۱٤۷	۱٤۷	۱۰۰٪	۰	۰٪
Total Non-Operating Costs		٤٤۹	٤٤۹	۱۰۰٪	۰	۰٪
Total		۹۰٦٤	٦۸۸۸,٦٤	%۷٦	۲۱۷۵,۳٦	%۲٤
Total(Euro)		۳۲۷۳٤	۲۵۰۲۲	%۷٦	۷۷۱۲	%۲٤

٥-٣- production schedule

Table (٢٢-٣): Production and sales plan

All numbers are in million rials										
Sunny hours throughout the year	Sunny hours throughout the year			Sunny hours throughout the year			Sunny hours throughout the year		Sunny hours throughout the year	
٣٠٠٠	١٠٠٠			٣٠٠٠٠٠٠			٩١٤٨		٢٧٤٤٤	
Year	First year	Second year	Third year	Fourth year	Fifth year	Sixth year	Seventh year	Eightieth year	Ninth year	Tenth year
Percentage of product production capacity	١٠٠٪	١٠٠٪	١٠٠٪	١٠٠٪	١٠٠٪	١٠٠٪	١٠٠٪	١٠٠٪	١٠٠٪	١٠٠٪
The sum of total production(MWh per year)	٣٠٠٠	٣٠٠٠	٣٠٠٠	٣٠٠٠	٣٠٠٠	٣٠٠٠	٣٠٠٠	٣٠٠٠	٣٠٠٠	٣٠٠٠
Unit selling price (Million Rials / MWh)	٩١٤٨	٩١٤٨	٩١٤٨	٩١٤٨	٩١٤٨	٩١٤٨	٩١٤٨	٩١٤٨	٩١٤٨	٩١٤٨
Unit selling price	٢٧٤٤٤	٣٢٩٣٣	٣٩٥١٩	٤٧٤٢٣	٥٦٩٠٨	٦٨٢٨٩	٨١٩٤٧	٥٩٠٠٠	٧٠٨٠٠	٨٤٩٦٣
(Million Rials / MWh)	٩٩١٠٧	١١٨٩٢٩	١٤٢٧١٣	١٧١٢٥٧	٢٠٥٥٠٩	٢٤٦٦٠٩	٢٩٥٩٣٢	٢١٣٠٦٤	٢٥٥٦٧٧	٣٠٦٨٢٣

٦-٣- Economic Schedule

Table (٢٣-٣): Prediction of profit and loss account

All numbers are in million rials										
Description	First year	Second year	Third year	Fourth year	Fifth year	Sixth year	Seventh year	Eightieth year	Ninth year	Tenth year
net sales	٢٧٤٤٤	٣٢٩٣٣	٣٩٥١٩	٤٧٤٢٣	٥٦٩٠٨	٦٨٢٨٩	٨١٩٤٧	٥٩٠٠٠	٧٠٨٠٠	٨٤٩٦٣
Deducted: the cost of the sold goods	٦٥٨٨	٦٥٨٨	٦٥٨٨	٦٥٨٨	٦٥٨٨	٦٥٨٨	٦٥٨٨	٦٥٨٨	٦٥٨٨	٦٥٨٨
Gross profit	٢٠٨٥٦	٢٦٣٤٥	٣٢٩٣١	٤٠٨٣٥	٥٠٣٢٠	٦١٧٠١	٧٥٣٥٩	٥٢٤١٢	٦٤٢١٢	٧٨٣٧٥
Deductions: Operating Costs	٢١٠٩	٢١٠٩	٢١٠٩	٢١٠٩	٢١٠٩	٢١٠٩	٢١٠٩	٢١٠٩	٢١٠٩	٢١٠٩
Operating profit	١٨٧٤٧	٢٤٢٣٦	٣٠٨٢٢	٣٨٧٢٦	٤٨٢١١	٥٩٥٩٢	٧٣٢٥٠	٥٠٣٠٣	٦٢١٠٣	٧٦٢٦٦
Deductible non-operating costs	٣٠٢	٣٠٢	٣٠٢	٣٠٢	٣٠٢	٣٠٢	٣٠٢	٣٠٢	٣٠٢	٣٠٢
Special interest before tax deduction	١٨٤٤٥	٢٣٩٣٤	٣٠٥٢٠	٣٨٤٢٤	٤٧٩٠٩	٥٩٢٩٠	٧٢٩٤٨	٥٠٠٠١	٦١٨٠١	٧٥٩٦٤
Deductible tax	٣١٧٠	٣١٧٠	٣١٧٠	٣١٧٠	٣١٧٠	٣١٧٠	٣١٧٠	٣١٧٠	٣١٧٠	٣١٧٠
Net profit	١٥٢٧٥	٢٠٧٦٤	٢٧٣٥٠	٣٥٢٥٤	٤٤٧٣٩	٥٦١٢٠	٦٩٧٧٨	٤٦٨٣١	٥٨٦٣١	٧٢٧٩٤
Accumulated profit	١٥٢٧٥	٣٦٠٣٩	٨٤١٥٣	١١٩٤٠٧	١٦٤١٤٦	٢٢٠٢٦٦	٢٩٠٠٤٤	٣٣٦٨٧٥	٣٩٥٥٠٦	٤٦٨٣٠٠
Net profit (Euro)	٥٥١٦٢	٧٤٩٨٤	٩٨٧٦٨	١٢٧٣١١	١٦١٥٦٤	٢٠٢٦٦٤	٢٥١٩٨٦	١٦٩١١٩	٢١١٧٣١	٢٦٢٧٨٨

Table (٣-٢٤): Prediction of projected revenue

All numbers are in million rials										
Description	First year	Second year	Third year	Fourth year	Fifth year	Sixth year	Seventh year	Eightieth year	Ninth year	Tenth year
Special interest before tax deduction	١٨٤٤٥	٢٣٩٣٤	٣٠٥٢٠	٣٨٤٢٤	٤٧٩٠٩	٥٩٢٩٠	٧٢٩٤٨	٥٠٠٠١	٦١٨٠١	٧٥٩٦٤
non-movable assets depreciation	٣٠٧٠	٣٠٧٠	٣٠٧٠	٣٠٧٠	٣٠٧٠	٣٠٧٠	٣٠٧٠	٣٠٧٠	٣٠٧٠	٣٠٧٠
Depreciation of costs before operation	١٤٧	١٤٧	١٤٧	١٤٧	١٤٧	١٤٧	١٤٧	١٤٧	١٤٧	١٤٧
Total cash flow plans	٢١٦٦٢	٢٧١٥١	٣٣٧٣٧	٤١٦٤١	٥١١٢٦	٦٢٥٠٧	٧٦١٦٥	٥٣٢١٨	٦٥٠١٨	٧٩١٨١
Total cash flow plans(Euro)	٧٨٢٢٧	٩٨٠٤٩	١٢١٨٣٣	١٥٠٣٧٦	١٨٤٦٢٩	٢٢٥٧٢٩	٢٧٥٠٥١	١٩٢١٨٤	٢٣٤٧٩٧	٢٨٥٩٤٣
Fixed investment project	١٥١٣٦٨			٥٤٦،٦٢٩(Euro)						
Capital in Circulation Scheme	١٦٥٥			٥،٩٧٥(Euro)						
Total investment plan	١٥٣٠٢٣			٥٥٢،٦٠٤(Euro)						
Project return rate(IRR)	١٨/٧٢ percent									
Return of capital	٤/٧٧ year									

Table (٣-٢٥): Net Cash Flow Value (NPV)

			Net Cash(Euro)
Row	Rate (%)	Net Cash	
١	٠	١٩٦٢١٥	٧٠٨٥٨١
٢	٠/٠٥	١٨٦٨٠٠	٦٧٤٥٨١
٣	٠/١٠	٦١٥٦٩	٢٢٢٣٤٠
٤	٠/١٥	٣٢٠٤٥	١١٥٧٢٤
٥	٠/١٨	-٦٦٠٦	-٢٣٨٥٥
٦	٠/٢٥	-٢٨٣٢٧	-١٠٢٢٩٧
٧	٠/٣٠	-٤٥٠٥٤	-١٦٢٧٠٣
٨	٠/٣٥	-٥٨٢٠٣	-٢١٠١٨٦
٩	٠/٤٠	-٦٨٧٣٢	-٢٤٨٢٠٨
١٠	٠/٥٠	-٨٤٣٨٦	-٣٠٤٧٤١
١١	٠/٦٠	-٩٥٣٤٦	-٣٤٤٣١٨

Table (٢٦-٣): Head-to-head analysis

All numbers are in million rials		Amount	Amount(Euro)
Row	Description		
١	Fixed Production Costs (M.Rial)	٦٩٢٩	٢٥٠٢٢
٢	Variable Production Costs (M.Rial)	٢١٣٥	٧٧١٢
٣	Total fixed and variable production costs (M.Rial)	٩٠٦٤	٣٢٧٣٤
٤	Total Production Amount (MWh)	٣٠٠٠	٣٠٠٠
٥	Sale price of each (M. Rial / MWh)	٩,٢	٣٣,٢
٦	Total Sales (M.Rial)	٤٠٧٠٦	١٤٧٠٠٠
٧	Total Sales Margin (Total Cost Variable - Total Sales)	٣٨٥٧٠	١٣٩٢٨٨
٨	Margin Ratio (Sales / Margin)	٠/٩٥	٠/٩٥
٩	Head-to-head production value = (MB sales / fixed costs)	٧٣١٣	٢٦٤٠٨
١٠	Head-to-Head Rial Sales = (Sales Margin / Fixed Cost Ratio)	٦٩٢٩	٢٥٠٢٢
١١	Safety margin (Sales total / (Sales per head - Total sales))	٠/٨٢٠	٠/٨٢٠
١٢	Production Capacity at Head-to-Head Point (Safety Margin - ١)	٠/١٨٠	٠/١٨٠
١٣	Head-to-head point * ١٠٠ (Sales margin / Fixed costs	**١٨ percent**	**١٨ percent**

Table (٢٦-٣): Description of Value Added

Row	Description	Total cost	Total cost(Euro)
١	Gross Value Added Gross (Production Costs-Sales Costs	٣٩٠١٠	١٤٠،٨٧٥
٢	Net domestic value added (fixed asset depreciation - gross domestic product)	٣٥٩٣٦	١٢٩،٧٨٧
٣	Gross Value Added Gross Value	٩٦٪	
٤	Net value added net worth	٨٨٪	

Table (٢٧-٣): Cash Flow Forecast Table

All numbers are in million rials										
Description	year									
	First year	Second year	Third year	Fourth year	Fifth year	Sixth year	Seventh year	Eightieth year	Ninth year	Tenth year
Expected capacity percentage	٪٠	٪١٠٠	٪١٠٠	٪١٠٠	٪١٠٠	٪١٠٠	٪١٠٠	٪١٠٠	٪١٠٠	٪١٠٠
Cash Flows (Internal Resources)	٠	١٦٣٩٥	١٦٣٩٥	١٦٣٩٥	١٦٣٩٥	١٦٣٩٥	١٦٣٩٥	١٦٣٩٥	١٦٣٩٥	١٦٣٩٥
External Resources										
Brought to shareholders	٧١٨٣٨	٧٧٧	٠	٠	٠	٠	٠	٠	٠	٠
Total external resources	٧١٨٣٨	٧٧٧	٠	٠	٠	٠	٠	٠	٠	٠
Internal and external resources	٧١٨٣٨	١٧١٧٢	١٦٣٩٥	١٦٣٩٥	١٦٣٩٥	١٦٣٩٥	١٦٣٩٥	١٦٣٩٥	١٦٣٩٥	١٦٣٩٥
Uses										
Fixed investment costs	١٥١٥٥٣	٠	٠	٠	٠	٠	٠	٠	٠	٠
Cost before operation	١٤٧٠	٠	٠	٠	٠	٠	٠	٠	٠	٠
capital in circulation	٠	١٦٥٥	١٦٥٥	١٦٥٥	١٦٥٥	١٦٥٥	١٦٥٥	١٦٥٥	١٦٥٥	١٦٥٥
tax	٠	٣١٧٠	٣١٧٠	٣١٧٠	٣١٧٠	٣١٧٠	٣١٧٠	٣١٧٠	٣١٧٠	٣١٧٠
Total use	١٥٣٠٢٣	٤٨٢٥	٤٨٢٥	٤٨٢٥	٤٨٢٥	٤٨٢٥	٤٨٢٥	٤٨٢٥	٤٨٢٥	٤٨٢٥
Surplus (deficit) of resources	٠	١٨٤٩٢	٢٢٣٢٦	٢٨٩١٢	٣٦٨١٦	٤٦٣٠١	٥٧٦٨٢	٧١٣٤٠	٤٨٣٩٣	٦٠١٩٣
Resource surplus (Euro)	٠	٦٦٧٨١	٨٠٦٢٦	١٠٤٤١٠	١٣٢٩٥٣	١٦٧٢٠٦	٢٠٨٣٠٦	٢٥٧٦٢٨	١٧٤٧٦١	٢١٧٣٧٤

Chapter ٤:

Schedule

Table (١- :hedule

Row	Stage	Timing of construction of solar power plant					
		The first three months			The second three months		
١	Feasibility studies						
٢	Feasibility studies						
٣	Land preparation						
٤	Obtain network connection permission						
٥	Guaranteed purchase contract						
٦	Financing						
٧	Supply of equipment						

٨	Construction						
٩	Test and pre-launch						

Chapter ٥:

Appendix

Appendix (nber One)

Linear parabolic power plant





Central Receiving Power Plant





Plate power plant





Solar Farm





Solar Panel



فروشـگاه آنلایـن آوستـا مـــارکت
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