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The Rationalization of Costs under the Application of Concentrated Solar Power Systems

As an Alternative to Electrical Energy

Dr. Shaymaa Kamil Mwayesh Asadi

Ibn khaldun private university college

Abstract

: the **importance** of research is to rationalize the cost of electricity production through the use of Concentrated Solar Power Systems as alternative clean and renewable energy from the fossil energy as one of the modern methods in electric field which provides the friendly-energy of environment in sufficient quantities and reduces emissions and pollutants that cause global warming. In addition to calculation of costs by using the costs management tools for the purpose of rationalizing costs and thus rationalizing government expenditure. The **problem** of research is the lack of electricity in Iraq and insufficient quantities which don't meet the citizen's needs. As well as frequent and continuous interruptions and poorly equipped importation from out of Iraq leading to huge production costs and increased pollution and lack of interest in cost management tools in Iraqi government institutions, which lead to increase in government spending. The **aim** of this research is to rationalize electricity production costs by using the Concentrated Solar Power systems as an alternative to conventional energy.in additional to calculation of rationalization costs through the activity base costs system (ABC).The **hypothesis** of the research on base use the Concentrated Solar Power Systems is environmentally friendly as an alternative to fossil energy and works to reduce (costs, emissions, and pollutants) in additional to Rationalize costs by use activity base costing system (ABC) for calculation of the rationalization. The most prominent **results** through the concentrated solar power systems we can fulfil the reduction and led to the rationalization of costs and provide the (quality, efficiency, non-pollutions, continuous power, environmentally friendly, sustainability tools, citizen's satisfaction).

***Key Word*: The Rationalization of costs, Concave Mirror Technology, Concentrated Solar Power Systems.**

1. Introduction

Renewable or clean energy is not modern concept. the Solar cell technology is very old dating back to the early 19th century, and the first to invent it is the French physicist "Alexander Becquerel" in 1839 looking at the impact of light and it was considered the basis of the solar cell by discovering the emission of energy when the fall of sunlight on an electrode. Based on this idea the world's first solar cell, Charles Frits, was developed using selenium compounds on a thin layer of gold, but these cells were not efficient in generating energy until Russell's first solar cell was invented in 1941[1] .and Attention continued in renewable energy evolving Until the early 1950s when high-strength chips were developed of silicon material is placed in certain geometrical shapes and dimensions and able to convert sunlight into electric power, but the cost was very high then and continued to work with solar energy and still used to this day[2]. Renewable power is known inexhaustible energies they include energies derived from nature such as solar, wind, hydropower and others energy from sources that don't cause pollutants to the environment, such as carbon dioxide, radioactive waste and harmful chemicals. we are living in a phase where most of the energy comes from coal mines oil wells and other energy, this fuel will be consumed very quickly as it can drain with it all the existing reserve within a period of not more than a century of time. Therefore it is necessary to search for renewable natural resources, and save the environment from pollution such sources (solar, hydro, aerobic, nuclear, and terrestrial) [3].

1.1.Sources of obtain on the energy [4].

There are many types of energy that help humans to meet daily activities such as (lighting, cooking, and heating) or the transportation and operation of all electrical devices and others .In nature, its classified into two types the renewable and non-renewable energy there are a wide difference between them. The renewable that we mentioned in the introduction is the energy inexhaustible lifelong It is described (clean, safe, and quiet). The most prominent sources are (wind, sun, and water). and the non- renewable will be exhausted over time and will end after a period of time. The main source of unclean energy is fossil fuels such as (petroleum, coal, natural gas, and nuclear power).The main differences between the renewable & non- renewable energy is as following: [5]

- The renewable energy it exists since the earth was created to this day. And the non-renewable needed millions of years until the raw material were formed.
- The renewable energy can be used directly without refining or manufacturing in contrast. and non-renewable that needs refining and processing,
- Renewable energy is described as in exhausted across the time, on Reverse the other type the other species that will end if the source reserves are exhausted.
- The Renewable energy is available for all the worlds in high quantities such as the sun and wind and non-renewable energy is distributed in varying quantities between countries there are oil producing countries, and other importers of oil and gas.

- Renewable energy is environmentally friendly, but the second type is a polluting energy of the environment, where toxic gases are released when they burn, affecting the ecosystem surrounding them.

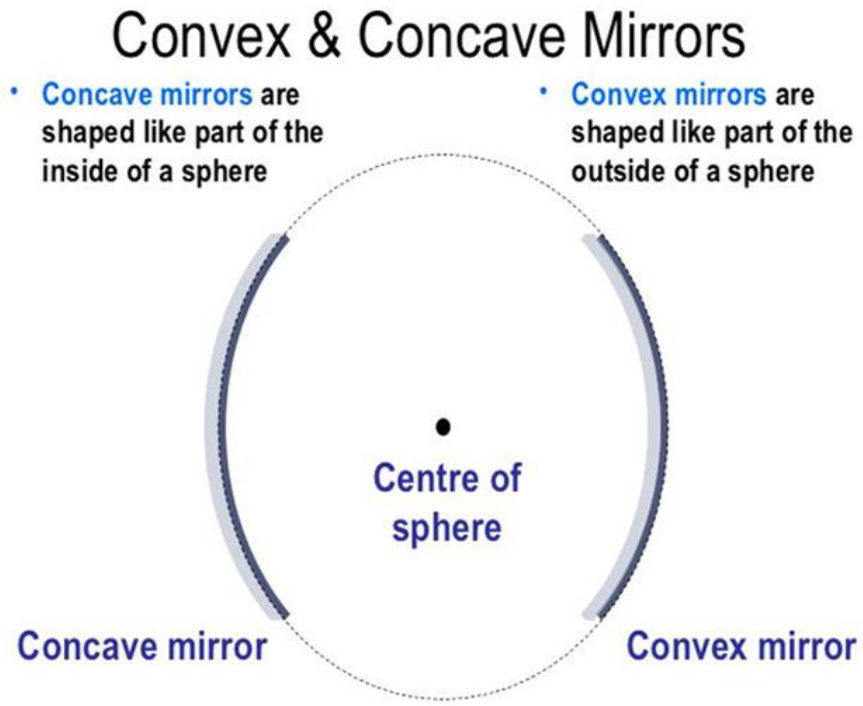
1.2.The Disadvantages of Renewable energy [6].

There are some of disadvantages of renewable energy as following:

- Usually affected by weather fluctuations throughout the year according to the four seasons and climatic conditions that is, if the weather is rainy, the production of energy from the sun is nil, and if the wind movement is slow, the turbines cannot spin to produce energy.
- Produced a low energy in a short period of time on Reverse the power plants that produce large amounts of energy in a short time.
- It is need to large areas to produce large amounts of electricity.

1.3.Concepts about the Mirror

The mirror appeared old by reflecting the images of objects on water Surface Then volcanic stones used in the manufacture of mirrors such as the black volcanic glass, and mica stone in the period between (4000-3000 BC) began the manufacture of mirrors using metal sheets made of copper and bronze alloys. The **Mirror** knows one of the tools which the human used in a way daily to see his true image and it is objects to it brightness and it gathering imaginations and reflects in a real picture. The types of mirrors in terms of surfaces the **plane** and **spherical** mirror; the **plane** mirror known as a flat surface characterized by the image objects in imaginary and equal to the body length as that image dimension from the mirror is equal to the object dimension from it and the imaginations exist in the image of objects upturned in a sideway shape is used as a type of mirrors in homes and in cars [5]. And the **Spherical** Mirrors is the reflector surface is part of a ball have two shapes **first**: **Concave Mirror** known as being the Surface reflector to inside the mirror which Collect the rays falling on it. These mirrors are used in medical fields to inspect the objects and diagnosing cases and industrial fields such as the manufacture of lamps searchlights, cars and telescopes industry. **Second**: **Convex Mirror** which the reflector surface is outside the mirror and called the **split mirror** because it split the rays that fall on it. Is characterized by the wide range of objects that appear on it and uses as side mirrors for cars, And in control operations [6].and **the figure (1) Show the Concave & Convex Mirror** [7]



There are some of concepts relations with the Spherical Mirrors as following:

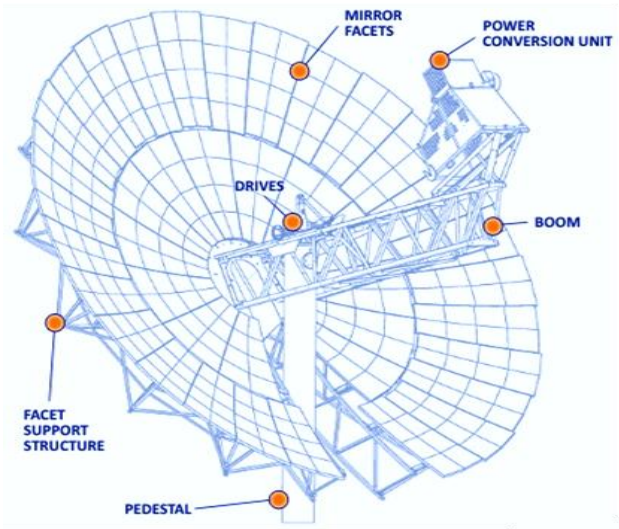
- The mirror pole is the center of the surface of mirror.
- The Center for pelleting is the center of the ball comes to this center back of the mirror Convex and front of the concave mirror.
- The focus of the mirror is the point where the rays gather reflected when the parallel rays fall on surface of mirror.

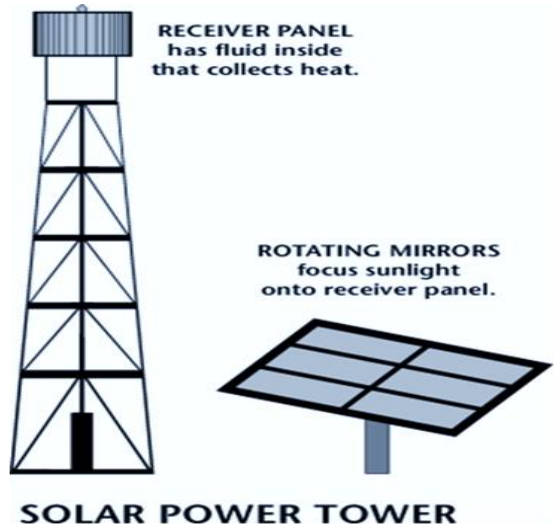
- The main axis of the mirror or optical axis is the straight line that connects the mirror pole and the center.
- Focus of concave mirror is the point that in the original axis of the mirror and collects the fallen rays parallel and parallel for its axis.
- The focal length of the mirror is the distance between the mirror pole and the focal Dimension is a part of the main axis of mirror.

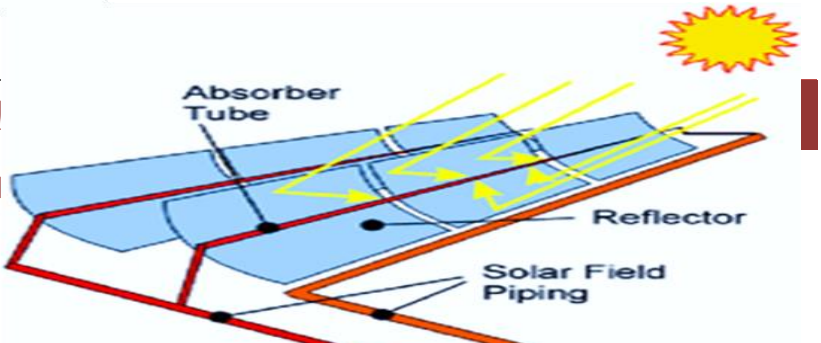
1.4.The Concentrated Solar Power systems (CSP)

Plants work to exploit the resulting heat from solar radiation that a Falling on the ground in electricity generating and many techniques are used to concentrate solar energy as a source of heat. This source used to boil water that drives steam turbines that generate electricity as much as coal and nuclear power plants to provide thousands of people [8].**There are many types of concentrated solar power systems**

- **Parabolic Dish system**: is using a parabolic dish of mirrors to direct and concentrate sunlight onto a central engine that electricity produces.
- **Solar power Tower system**: is a technology uses many large sun-tracking mirrors Commonly that referred to as heliostats to focus sunlight on a receiver at the top of a tower. A heat transfer fluid heated in the receiver used to generate steam which in turn used in conventional turbine-generator to electricity produce.
- **Parabolic Trough system**: the plants working on solar collector systems that Consisting of special mirrors in the form of parabolic trough, which collects and concentrates sunlight on a central tube that transfers heat to heating sites and generates steam that runs traditional turbines to electricity generate. And **the figure (2) Show the Type of Concentrated solar power systems (CSP).** [9].







1.5.The Rationalization Of Costs

The rationalization of costs known as methodology to prevent the depletion of economic resources inputs in enterprises using modern systems or technologies and increase the productivity efficiency [10].And through activity base costing system (ABC) we can calculated the costs of rationalization and (ABC) known a Philosophy based on the fact that activities consume resources and products consume activities and distortions arising from the distribution of indirect industrial costs on a single basis have become irrelevant and far from logical [11].

2. Materials & methods

The General Directorate of production electric power/Central it's the company that provides the electric power to the Central area in Iraq there are many of plants that provides the power is **(Thermals, Gazes, hydroelectric, Diesels)** And their number **(28)**. So the **Table (1) Show the calculation of the Total costs for the General Directorate of Production electric Power/Central for year 2017 the amounts in [1]ID using the activity base costing system (ABC)**

The Account Name	Labor	Row materials	Backup Tools	Staff Supplies	Maintenance Service
The Account Number	311	321	323	326	331
Total costs of 2017	**83,299,547,898**	**1,031,873,078,037**	**1,027,298,136**	**35,221,501**	**2,622,956,547**
Cost Driver	**Working hours**	**Number of order**	**Number of supplies**	**Number of supplies**	**Number of maintenance**
	7,319,760	26,880	2,808	2,808	14,160
Overhead Rate	**11,380**	**38,388,135**	**365,847**	**12,543**	**185,237**
Cost Object (Plants)					
Doura Thermal	2,867,783,380	36,852,609,930	21,950,815	752,596	88,913,781
South Baghdad Thermal	2,867,783,380	36,852,609,930	21,950,815	752,596	88,913,781
Alzubaidea Terminal	2,867,783,380	36,852,609,930	21,950,815	752,596	88,913,781
Doura Gas	2,867,783,380	36,852,609,930	35,121,304	1,204,154	88,913,781
AL-quds Gas	2,867,783,380	36,852,609,930	35,121,304	1,204,154	88,913,781
AL-taji Gas /1	2,867,783,380	36,852,609,930	35,121,304	1,204,154	88,913,781
AL-taji Gas /2	2,867,783,380	36,852,609,930	35,121,304	1,204,154	88,913,781
South Baghdad Gas /1	2,867,783,380	36,852,609,930	35,121,304	1,204,154	88,913,781
South Baghdad Gas /2	2,867,783,380	36,852,609,930	35,121,304	1,204,154	88,913,781
AL-sadir Gas	2,867,783,380	36,852,609,930	35,121,304	1,204,154	88,913,781
Doura alrasheed Gas	2,867,783,380	36,852,609,930	35,121,304	1,204,154	88,913,781
Hadetha hydroelectric	3,058,968,938	36,852,609,930	21,950,815	752,596	133,370,672
Sad Samara hydroelectric	3,058,968,938	36,852,609,930	21,950,815	752,596	133,370,672
Sad hemren	3,058,968,938	36,852,609,930	21,950,815	752,596	133,370,672

[1] **Represent the Iraq dinar.**

hydroelectric					
Samarra Diesels	2,867,783,380	36,852,609,930	43,901,630	1,505,192	88,913,781
AL-shheed ali sabaa Diesels	2,867,783,380	36,852,609,930	43,901,630	1,505,192	88,913,781
Hadetha Diesels	2,867,783,380	36,852,609,930	43,901,630	1,505,192	88,913,781
AL-jadrea Diesels /1	2,867,783,380	36,852,609,930	43,901,630	1,505,192	88,913,781
AL-faraby Diesels	2,867,783,380	36,852,609,930	43,901,630	1,505,192	88,913,781
Balad Dieselss	2,867,783,380	36,852,609,930	43,901,630	1,505,192	88,913,781
AL-huria Diesels	2,867,783,380	36,852,609,930	43,901,630	1,505,192	88,913,781
AL-khadmia Diesels	2,867,783,380	36,852,609,930	43,901,630	1,505,192	88,913,781
AL-ramady Diesels	2,867,783,380	36,852,609,930	43,901,630	1,505,192	88,913,781
AL-falwja Diesels	2,867,783,380	36,852,609,930	43,901,630	1,505,192	88,913,781
ALdoura filtered diesels	2,867,783,380	36,852,609,930	43,901,630	1,505,192	88,913,781
AL-jadrea diesels /2	2,867,783,380	36,852,609,930	43,901,630	1,505,192	88,913,781
North Baghdad diesels /1	2,867,783,380	36,852,609,930	43,901,630	1,505,192	88,913,781
North Baghdad diesels /2	2,867,783,380	18,426,304,965	37,682,232	1,291,957	80,022,403
Financial services, legal, administrative	2,428,056,595	18,426,304,965	6,219,398	213,236	8,891,378
Total costs of 2017	**83,299,547,898**	**1,031,873,078,037**	**1,027,298,136**	**35,221,501**	**2,622,956,547**

Researches service	Transport, dispatch and communications	Rental of fixed assets	Miscellaneous expenses	Depreciation
332	**334**	**335**	**336**	**37**
211,064,387	**11,791,907,601**	**146,604,164**	**773,458,979**	**22,121,360,960**
Number of supplies	**Working hours**	**Number of rental**	**Number of supplies**	**Working hours**
2,808	**7,319,760**	**37,440**	**2,808**	**7,319,760**
75,165	**1,611**	**3,916**	**275,448**	**3,022**
4,509,923	405,964,228	2,819,311	16,526,901	761,580,019
4,509,923	405,964,228	2,819,311	16,526,901	761,580,019
4,509,923	405,964,228	2,819,311	16,526,901	761,580,019
7,215,876	405,964,228	3,759,081	26,443,042	761,580,019
7,215,876	405,964,228	3,759,081	26,443,042	761,580,019
7,215,876	405,964,228	3,759,081	26,443,042	761,580,019
7,215,876	405,964,228	3,759,081	26,443,042	761,580,019
7,215,876	405,964,228	3,759,081	26,443,042	761,580,019
7,215,876	405,964,228	3,759,081	26,443,042	761,580,019
7,215,876	405,964,228	3,759,081	26,443,042	761,580,019
7,215,876	405,964,228	3,759,081	26,443,042	761,580,019
4,509,923	433,028,510	4,698,851	16,526,901	812,352,021

4,509,923	433,028,510	4,698,851	16,526,901	812,352,021
4,509,923	433,028,510	4,698,851	16,526,901	812,352,021
9,019,846	405,964,228	7,518,162	33,053,803	761,580,019
9,019,846	405,964,228	7,518,162	33,053,803	761,580,019
9,019,846	405,964,228	7,518,162	33,053,803	761,580,019
9,019,846	405,964,228	7,518,162	33,053,803	761,580,019
9,019,846	405,964,228	7,518,162	33,053,803	761,580,019
9,019,846	405,964,228	7,518,162	33,053,803	761,580,019
9,019,846	405,964,228	7,518,162	33,053,803	761,580,019
9,019,846	405,964,228	7,518,162	33,053,803	761,580,019
9,019,846	405,964,228	7,518,162	33,053,803	761,580,019
9,019,846	405,964,228	7,518,162	33,053,803	761,580,019
9,019,846	405,964,228	7,518,162	33,053,803	761,580,019
9,019,846	405,964,228	2,819,311	33,053,803	761,580,019
9,019,846	541,285,637	2,819,311	33,053,803	1,015,440,026
7,742,034	526,593,598	2,819,311	28,371,180	987,878,082
1,277,811	87,765,600	2,819,311	4,682,622	164,646,347
211,064,387	**11,791,907,601**	**146,604,164**	**773,458,979**	**22,121,360,960**

The Table **(2) Show the Total costs of the plants & Actual Capacity MW/H &Costs of Actual Capacity MW/H in ID.**

No	The plant name	[2]Total costs of the plants	Actual Capacity MW/H	[3]Costs of Actual Capacity MW/H
	On base capacity	**[4]34,651,000MW/H**	**25,611,757MW/H**	**25,611,757MW/H**
1-	**Doura Thermal**	41,778,085,072	3,650,853	11,443
2-	**South Baghdad Thermal**	41,778,085,072	3,650,853	11,443
3-	**Alzubaidea Terminal**	41,778,085,072	3,653,952	11,434
4-	**Doura Gas**	41,805,268,983	1,137,405	36,755
5-	**AL-quds Gas**	41,805,268,983	1,137,405	36,755
6-	**AL-taji Gas /1**	41,805,268,983	1,137,405	36,755
7-	**AL-taji Gas /2**	41,805,268,983	1,137,405	36,755
8-	**South Baghdad Gas /1**	41,805,268,983	1,137,405	36,755
9-	**South Baghdad Gas /2**	41,805,268,983	1,137,405	36,755
10-	**AL-sadir Gas**	41,805,268,983	1,137,405	36,755
11-	**Doura alrasheed Gas**	41,805,268,983	1,137,405	36,755
12-	**Hadetha hydroelectric**	42,093,443,345	818,188	51,447

[2] **Represent the total cost of the plants and the financial services, legal, administrative add to each plants of the cost.**
[3] **Represent the Total costs of the plants / actual capacity.**
[4] **Budget capacity**

13-	**Sad Samara hydroelectric**	42,093,443,345	821,287	51,253
14-	**Sad hemren hydroelectric**	42,093,443,345	821,287	51,253
15-	**Samarra Diesels**	42,093,443,345	220,043	191,296
16-	**AL-shheed ali sabaa Diesels**	41,826,524,158	220,043	190,083
17-	**Hadetha Diesels**	41,826,524,158	220,043	190,083
18-	**AL-jadrea Diesels /1**	41,826,524,158	220,043	190,083
19-	**AL-faraby Diesels**	41,826,524,158	220,043	190,083
20-	**Balad Diesels**	41,826,524,158	220,043	190,083
21-	**AL-huria Diesels**	41,826,524,158	220,043	190,083
22-	**AL-khadmia Diesels**	41,650,326,730	220,043	189,283
23-	**AL-ramady Diesels**	41,826,524,158	220,043	190,083
24-	**AL-falwja Diesels**	41,826,524,158	223,142	187,444
25-	**ALdoura filtered Diesels**	41,826,524,158	223,142	187,444
26-	**AL-jadrea Diesels /2**	41,821,825,307	223,142	187,422
27-	**North Baghdad Diesels /1**	42,211,006,722	223,142	189,167
28-	**North Baghdad Diesels /2**	23,721,163,330	223,142	106,305
	Total costs of 2017	**1,153,993,219,969**	**25,611,757**	**3,051,255**

From the table above the actual capacity are **25,611,757**. And The Table **(3) Show the Difference between Actual & Budgeted capacity and difference capacity Percentage.**

No	The plant name	Actual Capacity	Budget Capacity	[5] Difference incapacity	[6]Percentage
	On base capacity	**25,611,757MW/H**	**34,651,000MW/H**	**-9,039,243MW/H**	26%
1-	**Doura Thermal**	3,650,853	4,939,361	-1,288,508	26%
2-	**South Baghdad Thermal**	3,650,853	4,939,361	-1,288,508	26%
3-	**Alzubaidea Terminal**	3,653,952	4,943,554	-1,289,602	26%
4-	**Doura Gas**	1,137,405	1,538,833	-401,428	26%
5-	**AL-quds Gas**	1,137,405	1,538,833	-401,428	26%
6-	**AL-taji Gas /1**	1,137,405	1,538,833	-401,428	26%
7-	**AL-taji Gas /2**	1,137,405	1,538,833	-401,428	26%
8-	**South Baghdad Gas /1**	1,137,405	1,538,833	-401,428	26%
9-	**South Baghdad Gas /2**	1,137,405	1,538,833	-401,428	26%
10-	**AL-sadir Gas**	1,137,405	1,538,833	-401,428	26%
11-	**Doura alrasheed Gas**	1,137,405	1,538,833	-401,428	26%
12-	**Hadetha hydroelectric**	818,188	1,106,954	-288,766	26%
13-	**Sad Samara hydroelectric**	821,287	1,111,147	-289,860	26%

[5] **Difference in capacity = actual - budget**
[6] **Percentage = Difference in Capacity/ budget Capacity**

14-	**Sad hemren hydroelectric**	821,287	1,111,147	-289,860	26%
15-	**Samarra Diesels**	220,043	297,703	-77,660	26%
16-	**AL-shheed ali sabaa Diesels**	220,043	297,703	-77,660	26%
17-	**Hadetha Diesels**	220,043	297,703	-77,660	26%
18-	**AL-jadrea Diesels /1**	220,043	297,703	-77,660	26%
19-	**AL-faraby Diesels**	220,043	297,703	-77,660	26%
20-	**Balad Diesels**	220,043	297,703	-77,660	26%
21-	**AL-huria Diesels**	220,043	297,703	-77,660	26%
22-	**AL-khadmia Diesels**	220,043	297,703	-77,660	26%
23-	**AL-ramady Diesels**	220,043	297,703	-77,660	26%
24-	**AL-falwja Diesels**	223,142	301,896	-78,754	26%
25-	**ALdoura filtered Diesels**	223,142	301,896	-78,754	26%
26-	**AL-jadrea Diesels /2**	223,142	301,896	-78,754	26%
27-	**North Baghdad Diesels /1**	223,142	301,896	-78,754	26%
28-	**North Baghdad Diesels /2**	223,142	301,896	-78,754	26%
	Total costs of 2017	**25,611,757**	**34,651,000**	**-9,039,243**	**26%**

The Table **(4) Show the Difference between the Actual & Budget capacity costs in ID Percentage.**

No	The plant name	[7]Cost of Actual Capacity MW/H	[8]Cost of Budget Capacity MW/H	[9]Difference Unfavorable costs	[10]Percentage
	On base capacity	**25,611,757MW/H**	**34,651,000MW/H**	**-9,039,243MW/H**	**26%**
1-	**Doura Thermal**	11,443	8,458	2,985	26%
2-	**South Baghdad Thermal**	11,443	8,458	2,985	26%
3-	**Alzubaidea Terminal**	11,434	8,451	2,983	26%
4-	**Doura Gas**	36,755	27,167	9,588	26%
5-	**AL-quds Gas**	36,755	27,167	9,588	26%
6-	**AL-taji Gas /1**	36,755	27,167	9,588	26%
7-	**AL-taji Gas /2**	36,755	27,167	9,588	26%
8-	**South Baghdad Gas /1**	36,755	27,167	9,588	26%
9-	**South Baghdad Gas /2**	36,755	27,167	9,588	26%
10-	**AL-sadir Gas**	36,755	27,167	9,588	26%
11-	**Doura alrasheed Gas**	36,755	27,167	9,588	26%
12-	**Hadetha hydroelectric**	51,447	38,026	13,421	26%
13-	**Sad Samara hydroelectric**	51,253	37,883	13,370	26%
14-	**Sad hemren hydroelectric**	51,253	37,883	13,370	26%

[7] **The Cost of Actual Capacity MW/H From table (2)**

[8] **The Cost of budget Capacity MW/H= total costs of the plants/ budget capacity.**

[9] **Represent Cost of Actual Capacity - Cost of budget Capacity**

[10] **Represent Difference Unfavorable costs / Cost of Actual Capacity MW/H.**

15-	**Samarra Diesels**	191,296	141,394	49,902	26%
16-	**AL-shheed ali sabaa Diesels**	190,083	140,497	49,586	26%
17-	**Hadetha Diesels**	190,083	140,497	49,586	26%
18-	**AL-jadrea Diesels /1**	190,083	140,497	49,586	26%
19-	**AL-faraby Diesels**	190,083	140,497	49,586	26%
20-	**Balad Diesels**	190,083	140,497	49,586	26%
21-	**AL-huria Diesels**	190,083	140,497	49,586	26%
22-	**AL-khadmia Diesels**	189,283	139,905	49,378	26%
23-	**AL-ramady Diesels**	190,083	140,497	49,586	26%
24-	**AL-falwja Diesels**	187,444	138,546	48,898	26%
25-	**ALdoura filtered Diesels**	187,444	138,546	48,898	26%
26-	**AL-jadrea Diesels /2**	187,422	138,530	48,892	26%
27-	**North Baghdad Diesels /1**	189,167	139,820	49,347	26%
28-	**North Baghdad Diesels /2**	106,305	78,574	27,731	26%
	Total costs of 2017	**3,051,255**	**2,255,289**	**795,966**	**26%**

From the table (4) the total Costs of Actual Capacity MW/H are **3,051,255** IDs and Costs of Budget Capacity MW/H are **2,255,289** IDs. So the Difference is **795,966** IDs per unit this is a waste in the costs and the company is failed to provide the electricity to the citizens .which led to increase the costs and frequent electric cuts.

3. Discussion & Results

The General Directorate of production electricity power/Central **if** applied the **concentrated solar power systems** it can provide the electric from the Sun rays and environmentally friendly. So the **Table (5) Show the Total cost of electricity for the Non-Renewable energy system VS [11]concentrated solar power systems for year 2017 in IDs.**

No	The plant name	[12]Costs of Non-Renewable energy system	[13]Costs of Parabolic Dish system (5%)	Costs of Solar power Tower System (4%)	Costs of Parabolic Trough System (5%)
0	**On base Actual capacity**	**25,611,757MW/H**	**5,000,000 MW/H**	**4,000,000 MW/H**	**5,000,000 MW/H**
1-	**Doura Thermal**	41,023,410,884	2,051,170,544	1,640,936,435	2,051,170,544
2-	**South Baghdad Thermal**	41,023,410,884	2,051,170,544	1,640,936,435	2,051,170,544
3-	**Alzubaidea Terminal**	41,023,410,884	2,051,170,544	1,640,936,435	2,051,170,544
4-	**Doura Gas**	41,050,594,795	2,052,529,740	1,642,023,792	2,052,529,740
5-	**AL-quds Gas**	41,050,594,795	2,052,529,740	1,642,023,792	2,052,529,740

[11] The capacity of concentrated solar power systems on base the opinions of technically for **(Dish, Tower, and Trough)** which are **(5,000,000:4,000,000: 5,000,000)** MW/H. Respectively.
[12] Costs of Non-Renewable energy system from table**(2)** total costs of the plants
[13] The costs of concentrated solar power systems on base the opinions of technically for **(Dish, Tower, and Trough)** which are **(5:4:5) %** respectively.

6-	**AL-taji Gas /1**	41,050,594,795	2,052,529,740	1,642,023,792	2,052,529,740
7-	**AL-taji Gas /2**	41,050,594,795	2,052,529,740	1,642,023,792	2,052,529,740
8-	**South Baghdad Gas /1**	41,050,594,795	2,052,529,740	1,642,023,792	2,052,529,740
9-	**South Baghdad Gas /2**	41,050,594,795	2,052,529,740	1,642,023,792	2,052,529,740
10-	**AL-sadir Gas**	41,050,594,795	2,052,529,740	1,642,023,792	2,052,529,740
11-	**Doura alrasheed Gas**	41,050,594,795	2,052,529,740	1,642,023,792	2,052,529,740
12-	**Hadetha hydroelectric**	41,338,769,157	2,066,938,458	1,653,550,766	2,066,938,458
13-	**Sad Samara hydroelectric**	41,338,769,157	2,066,938,458	1,653,550,766	2,066,938,458
14-	**Sad hemren hydroelectric**	41,338,769,157	2,066,938,458	1,653,550,766	2,066,938,458
15-	**Samarra Diesels**	41,071,849,970	2,053,592,499	1,642,873,999	2,053,592,499
16-	**AL-shheed ali sabaa Diesels**	41,071,849,970	2,053,592,499	1,642,873,999	2,053,592,499
17-	**Hadetha Diesels**	41,071,849,970	2,053,592,499	1,642,873,999	2,053,592,499
18-	**AL-jadrea Diesels /1**	41,071,849,970	2,053,592,499	1,642,873,999	2,053,592,499
19-	**AL-faraby Diesels**	41,071,849,970	2,053,592,499	1,642,873,999	2,053,592,499
20-	**Balad Diesels**	41,071,849,970	2,053,592,499	1,642,873,999	2,053,592,499
21-	**AL-huria Diesels**	41,071,849,970	2,053,592,499	1,642,873,999	2,053,592,499
22-	**AL-khadmia Diesels**	41,071,849,970	2,053,592,499	1,642,873,999	2,053,592,499
23-	**AL-ramady Diesels**	41,071,849,970	2,053,592,499	1,642,873,999	2,053,592,499
24-	**AL-falwja Diesels**	41,071,849,970	2,053,592,499	1,642,873,999	2,053,592,499
25-	**ALdoura filtered Diesels**	41,071,849,970	2,053,592,499	1,642,873,999	2,053,592,499
26-	**AL-jadrea Diesels /2**	41,067,151,119	2,053,357,556	1,642,686,045	2,053,357,556
27-	**North Baghdad Diesels /1**	41,456,332,534	2,072,816,627	1,658,253,301	2,072,816,627
28-	**North Baghdad Diesels /2**	22,966,489,142	1,148,324,457	918,659,566	1,148,324,457
	Total costs of 2017	**1,132,771,620,948**	**56,638,581,047**	**45,314,864,838**	**56,638,581,047**

From the previously table the financial services, legal, administrative don't add because its incurred in all cases.so the **Table (6) Show The Costs of electricity per unit for the Non-Renewable energy VS concentrated solar power systems in IDs**

No	The plant name	[14]Costs of Non-Renewable energy system	[15]Costs of Parabolic Dish system	Costs of Solar power Tower system	Costs of Parabolic Trough system
0	**On base Actual capacity**	**25,611,757MW/H**	**5,000,000 MW/H**	**4,000,000 MW/H**	**5,000,000 MW/H**
1-	**Doura Thermal**	11,443	410	410	410
2-	**South Baghdad Thermal**	11,443	410	410	410
3-	**Alzubaidea Terminal**	11,434	410	410	410
4-	**Doura Gas**	36,755	411	411	411

[14] Costs of the Non-Renewable energy system from table (**4**) costs of actual capacity

[15] The Costs per units of (Parabolic Dish, tower, trough) systems are from table **(5) costs for all type / capacity (5000, 000:4000, 000:5000, 000)** MW/H. respectively

5-	**AL-quds Gas**	36,755	411	411	411
6-	**AL-taji Gas /1**	36,755	411	411	411
7-	**AL-taji Gas /2**	36,755	411	411	411
8-	**South Baghdad Gas /1**	36,755	411	411	411
9-	**South Baghdad Gas /2**	36,755	411	411	411
10-	**AL-sadir Gas**	36,755	411	411	411
11-	**Doura alrasheed Gas**	36,755	411	411	411
12-	**Hadetha hydroelectric**	51,447	413	413	413
13-	**Sad Samarahydroelectric**	51,253	413	413	413
14-	**Sad hemren hydroelectric**	51,253	413	413	413
15-	**Samarra Diesels**	191,296	411	411	411
16-	**AL-shheed ali sabaa Diesels**	190,083	411	411	411
17-	**Hadetha Diesels**	190,083	411	411	411
18-	**AL-jadrea Diesels /1**	190,083	411	411	411
19-	**AL-faraby Diesels**	190,083	411	411	411
20-	**Balad Diesels**	190,083	411	411	411
21-	**AL-huria Diesels**	190,083	411	411	411
22-	**AL-khadmia Diesels**	189,283	411	411	411
23-	**AL-ramady Diesels**	190,083	411	411	411
24-	**AL-falwja Diesels**	187,444	411	411	411
25-	**ALdoura filtered Diesels**	187,444	411	411	411
26-	**AL-jadrea Diesels /2**	187,422	411	411	411
27-	**North Baghdad Diesels /1**	189,167	415	415	415
28-	**North Baghdad Diesels /2**	106,305	230	230	230
	Total costs of 2017	**3,051,255**	**11,328**	**11,328**	**11,328**

The Table **(7) Show the Rationalization & Reductions of costs & percentage of reductions for the Renewable energy system vs concentrated solar power systems in IDs**

No	The plant name	Costs of Non-Renewable energy system	concentrated solar power systems	[16]The Reductions in costs	[17]Percentage of Reductions in costs
0	**On base Actual capacity**	**25,611,757MW /H**	**5,000,000 MW/H**	**-1,346,047 MW/H**	**37%**
1-	**Doura Thermal**	11,443	410	11,033	96%
2-	**South Baghdad Thermal**	11,443	410	11,033	96%
3-	**Alzubaidea Terminal**	11,434	410	11,024	96%
4-	**Doura Gas**	36,755	411	36,344	99%
5-	**AL-quds Gas**	36,755	411	36,344	99%

[16] The reductions in costs = **Costs of non-Renewable energy system - concentrated solar power systems**.

[17] The Percentage of Reductions in costs = **The reductions in costs / Costs of non-Renewable energy system**

6-	**AL-taji Gas /1**	36,755	411	36,344	99%
7-	**AL-taji Gas /2**	36,755	411	36,344	99%
8-	**South Baghdad Gas /1**	36,755	411	36,344	99%
9-	**South Baghdad Gas /2**	36,755	411	36,344	99%
10-	**AL-sadir Gas**	36,755	411	36,344	99%
11-	**Doura alrasheed Gas**	36,755	411	36,344	99%
12-	**Hadetha hydroelectric**	51,447	413	51,034	99%
13-	**Sad Samara hydroelectric**	51,253	413	50,840	99%
14-	**Sad hemren hydroelectric**	51,253	413	50,840	99%
15-	**Samarra Diesels**	191,296	411	190,885	100%
16-	**AL-shheed ali sabaa Diesels**	190,083	411	189,672	100%
17-	**Hadetha Diesels**	190,083	411	189,672	100%
18-	**AL-jadrea Diesels /1**	190,083	411	189,672	100%
19-	**AL-faraby Diesels**	190,083	411	189,672	100%
20-	**Balad Diesels**	190,083	411	189,672	100%
21-	**AL-huria Diesels**	190,083	411	189,672	100%
22-	**AL-khadmia Diesels**	189,283	411	188,872	100%
23-	**AL-ramady Diesels**	190,083	411	189,672	100%
24-	**AL-falwja Diesels**	187,444	411	187,033	100%
25-	**ALdoura filtered Diesels**	187,444	411	187,033	100%
26-	**AL-jadrea Diesels /2**	187,422	411	187,011	100%
27-	**North Baghdad Diesels /1**	189,167	415	188,752	100%
28-	**North Baghdad Diesels /2**	106,305	230	106,075	100%
	The Rationalization of costs	**3,051,255**	**11,328**	**3,039,921**	**99%**

From previously table we suggest to the administration exclude of the **Non-Renewable** plants and high costs which non- add value. And the **Non-Renewable** plants don't meet the need of citizens for electric power and replace these plants with concentrated solar power systems. And **the Table (8) Show the Effect if applied the concentrated solar power systems**

Items	Non-Renewable energy systems	concentrated solar power systems
The Costs	High costs	Low costs
The Power of Provide	intermittent	Continuous
The Quality	poor	perfect
The emissions	A lot of emissions	emissions with acceptable rates
The noise	A lot of noise	Non- noise
The pollutions	A lot of pollutions	Non- pollutions
The efficiency	Non- efficient	high efficient
The eco-system	Non- Environmentally friendly	Environmentally friendly
The Sustainability	Non-Sustainability Tools	Sustainability Tools
The Citizens Satisfaction	Non- provide Citizens satisfaction	provide Citizens satisfaction

In all mentioned before through the concentrated solar power systems we can fulfil the reduction and led to the rationalization of costs and provide the (quality, efficiency, non-pollutions, continuous

power, environmentally friendly, Sustainability Tools, and Citizens satisfaction). And Through the activity base costing system (ABC) we can calculate the costs of Rationalization & Reduction. So this phenomenon can be mainstreamed for application to electricity field.in addition to the Cost accounting able to prove adaptation to other sciences such as Electrical Engineering, Physics, Energy, and other sciences.

4. Conclusion

- The Rationalization it minimizes the costs while maximizing the capacity efficiency in electrical field. And through the activity base costing system (ABC) we can calculate the costs of Rationalization in electrical energy.
- Through the concentrated solar power systems we can achieve the Sufficiency of electrical energy. In addition to we can export electric power to the neighboring countries.
- Through the concentrated solar power systems we can fitful the Citizens Satisfaction.

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