المؤتمر الدولي العلمي الحادي عشر للهندسة الكيميائية الخضراء حول "أثر تحولات الطاقة على حماية البيئة في ظل تحقيق أهداف التنمية المستدامة"

01 - 03 يوليو 2024

القاهرة – جمهورية مصر العربية

Application of the solar cells in CNG stations

1. Introduction
2. Feasibility studies of the solar cells in CNG stations
3. Energy conservation and emissions reduction
4. Conclusion

Introduction

- GASTEC is the pioneering Company in the field of adopting CNG as an alternative fuel in vehicles in Egypt and Middle East since more than 25 years. The Company owns the largest fueling stations network in Egypt as it has about 360 station, all over Egypt with a large base of compressors with different capacities as well number of stations under-construction. Also, it owns vehicles conversion centers to run by CNG that work with different capacities. In addition to specialized CNG Cylinder Testing Centers. It is noteworthy that the Company ranks the first among the NGV companies in Egypt attaining the highest market share.

- Gastec is one of the companies in the Petroleum Sector that applies the Sustainable Development goals (SDGs), as it applies, according to its activities a number of goals, including the Goal no. (7) which is “Affordable and clean energy” and the goal no. (13) which “climate action”, so, GASTEC decided to use the solar energy as one of the energy sources inside its stations.

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المنظمة العربية للتنمية الإدارية
جامعة الدول العربية

Introduction

Bureau Veritas Certification

BUREAU VERITAS

EGYPTIAN INTERNATIONAL GAS TECHNOLOGY(GASTEC)
Address: FIRST SECTION FROM 90TH ST - BESIDE downtowen mall - 5th settelment - new cairo

Bureau Veritas Egypt certify that the Management System of the above organisation has been audited and found to be in accordance with the requirements of the management system standards detailed below.

ISO 50001 :2018

Scope of certification

SCOPE : MANAGING & OPERATING CNG AND GASOLINE FUELLING STATIONS, VEHICLE CONVERSION, MAINTENANCE AND CYLINDER TESTING CENTRES
BOUNDRY: The energy system boundary covers the company Headquarters (Gastech H.Q) and El-Abbassia station, and Al-Salam Station Location

Original cycle start date:	**17th December 2023**
Expiry date of previous cycle:	**NA**
Certification Audit date:	**14th December 2023**
Certification cycle start date:	**17th December 2023**

Subject to the continued satisfactory operation of the organization's Management System, this certificate expires on: **16th December 2026**

Certificate No. **EGY.23.004 E/EnMS** *Version: No.1* *Issue date:* **17th December 2023**

R. Mubarak
Certification BL Manager

EGAC Accredited EnMS Certification CAB # 116003

Certification body address: Bureau Veritas Egypt: 57 Hassan Affaton Street, Ard El Golf, Nasr City, P.O. Box 1731, Cairo, Arab Republic of Egypt.
Further clarifications regarding the scope and validity of this certificate, and the applicability of the management system requirements, please call: (+202 24183020), visit our website https://www.bvcertification-eg.com/

GASTEC Energy Management Policy

GASTEC
EGYPTIAN INTERNATIONAL GAS TECHNOLOGY

Egyptian International Gas Technology (GASTEC) is a leading company in the field of adopting CNG, as an alternative fuel in vehicles in Egypt, as it owns the largest network of CNG stations.

GASTEC designs, constructs and operates fueling stations with compressed natural gas (CNG) & liquid fuel and vehicles conversion and maintenance centers to work by the dual fuel system (CNG/Gasoline-CNG/Diesel), in addition to transporting CNG to commercial and industrial facilities and CNG cylinder testing centers countrywide.

GASTEC'S ISO 50001 Energy Management System Policy is consistent with the company's vision and supports its strategic directions through addressing energy issues within sustainable development standards that rationalize energy consumption with the purpose to reduce gas emissions in order to contribute to limit climate change . It is also integrated and overlapped with the company's business operations.

In order to accomplish these tasks achieve the goals of energy management related to its activities, and to control its use and management, GASTEC is committed to developing, applying, maintaining and improving the energy management system, **by committing to the following:**

- Ensure the compliance with the laws and legislations related to energy and other needs related to the use, consumption and efficiency of energy within the company.
- Work to reduce energy consumption, control its use, and reduce the negative effects resulting from its consumption by defining energy uses, especially those that consume energy in large quantities(significant energy uses) in order to ensure the optimal use of energy resources, which leads to improving energy performance.
- Set the objectives for the Energy Management System, review them periodically and work to achieve them with the aim of continual improvement and stimulating energy saving.
- Provide information, human resources, materials and other resources necessary to implement the energy management system and achieve its objectives.
- Develop and evaluate energy efficiency performance indicators in order to continuously assess the effectiveness of the energy management system.
- Provide, implement and develop training and awareness programs for the energy management system within the company and those that ensure the training of everyone directly related to the energy management system.
- Support the procurement of energy-saving products, equipment and services that have a positive impact on the performance of the energy management system.
- Commitment to take into account opportunities to improve the performance of the energy management system and process control when designing new or modified activities, facilities or equipment.
- Commitment to continual improvement of the energy management system by improving the company's energy performance.
- Document, periodic review and disseminate the energy policy and information related to energy efficiency internally to all employees of the company and externally to all individuals and interested parties, ensuring the understanding of the policy and encouraging effective decision-making to improve energy performance.

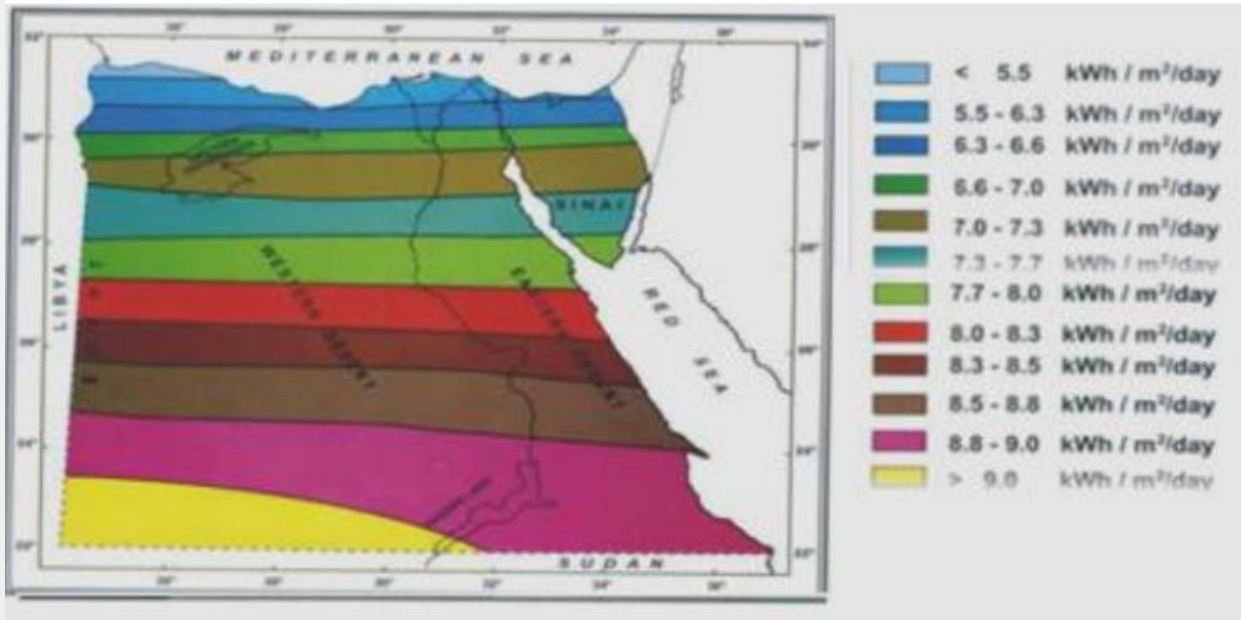
Eng./ Abdelfattah Farahat
Chairman & Managing Director

Issue No: 1 | Issue Date: 1/12/2022 | www.gastec-egypt.com | Copy No:

Introduction

- PV Systems in Egypt

- Egypt is located in the sun belt of the earth, thereby receiving abundant solar energy that can be usefully harnessed with an annual average of direct solar radiation of about 2000-3200 kWh/m2/year



Annual average of direct solar radiation on Egypt. (http://www.nrea.gov.eg/annual2012-2013.pdf).

Introduction

- **Objective of the study**

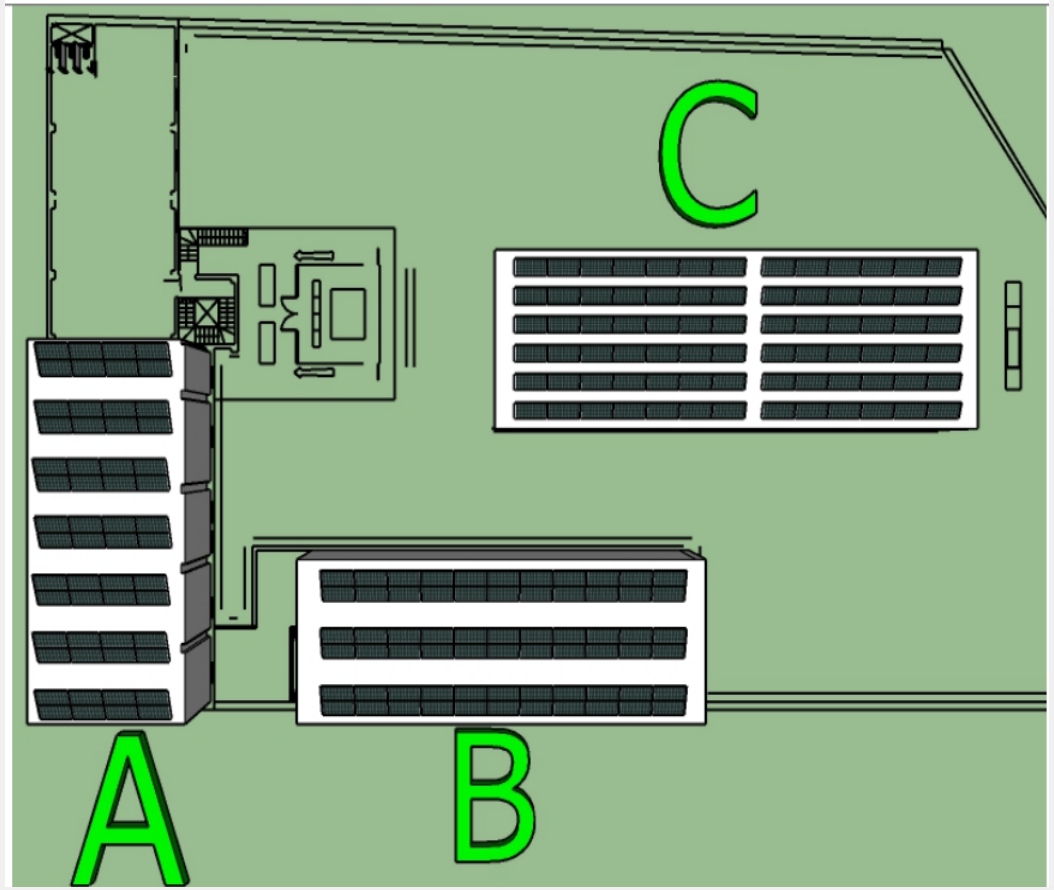
The main objective of this study is to present how GASTEC used the canopies and the roof of the administrative buildings, which is considered as dead areas in conducting green energy represented in the form of solar energy, also it illustrates the energy conserved and the quantity of carbon dioxide reduced from the usage of the solar energy

- **CNG stations**

As a result of high demand for converting vehicles to run on natural gas, and also, it’s one of the government’s requirements to reduce the demands for petroleum products, there was an increase in constructing and operating CNG stations, that consume a large amount of electricity. CNG Stations consume approximate 1200 MWH/YEAR

Feasibility studies of the solar cells in CNG stations

Technical studies of the solar cells in CNG stations



PVSYST V6.83	Ever Green Energy(EGE) (Egypt)	11/09/19	Page 3/5

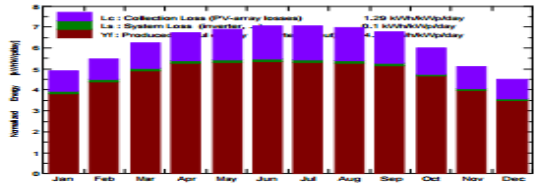
Grid-Connected System: Main results

Project : Gastec-TANTA
Simulation variant : 80kW

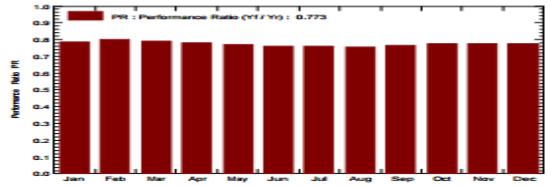
Main system parameters		System type	Tables on a building		
Near Shadings		Linear shadings			
PV Field Orientation		tilt	30°	azimuth	0°
PV modules		Model	TALLMAX	Pnom	400 Wp
PV Array		Nb. of modules	200	Pnom total	**80.0 kWp**
Inverter		Model	Blueplanet 92.0 TL3-INT	Pnom	92.0 kW ac
User's needs		Unlimited load (grid)			

Main simulation results
System Production — **Produced Energy** **138.7 MWh/year** Specific prod. 1733 kWh/kWp/year
Performance Ratio PR 77.30 %

Normalized productions (per installed kWp): Nominal power 80.0 kWp



Performance Ratio PR



80kW
Balances and main results

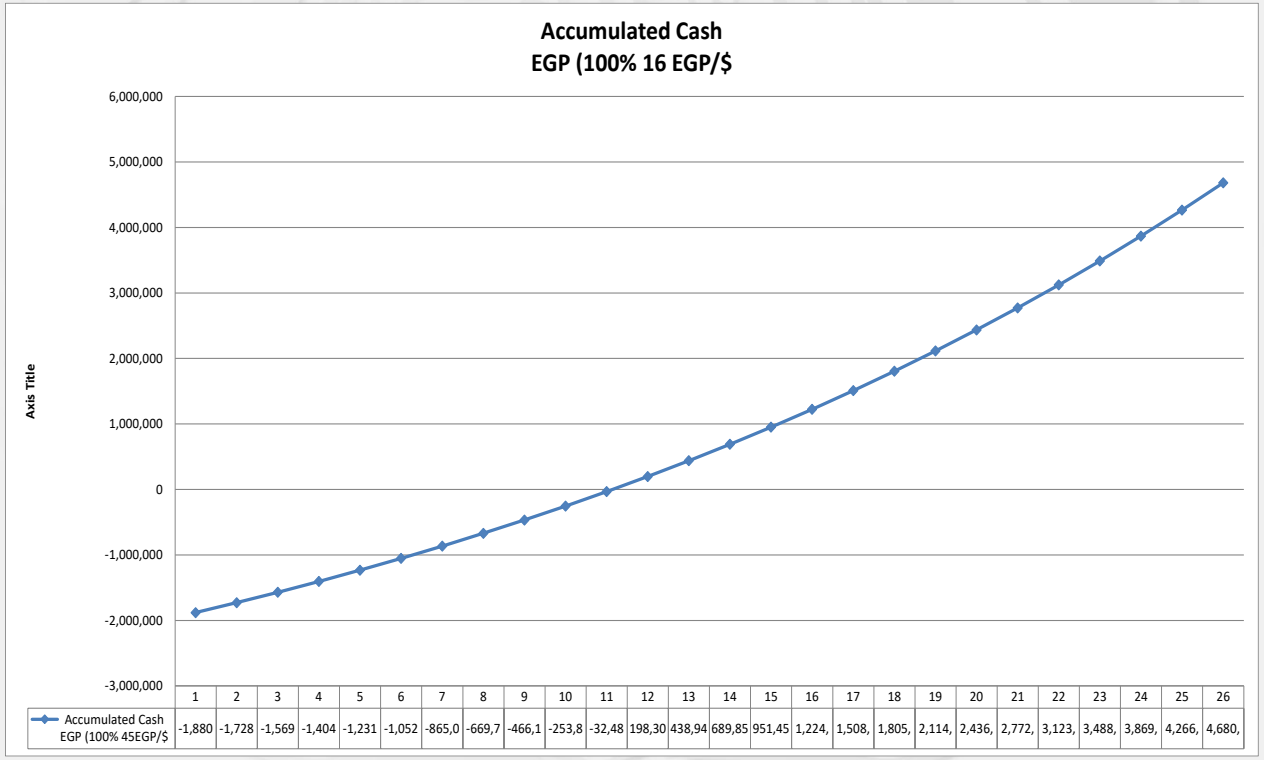
	GlobHor kWh/m²	DiffHor kWh/m²	T_Amb °C	GlobInc kWh/m²	GlobEff kWh/m²	EArray MWh	E_Grid MWh	PR
January	101.6	37.20	13.93	151.7	135.7	9.72	9.51	0.784
February	116.8	44.22	14.71	153.9	141.2	10.08	9.86	0.801
March	165.7	61.31	17.83	192.9	177.3	12.44	12.17	0.788
April	194.7	71.31	20.77	202.3	185.0	12.90	12.62	0.780
May	227.5	74.41	24.43	214.2	195.6	13.45	13.16	0.768
June	235.3	68.57	27.03	211.1	192.7	13.15	12.86	0.762
July	238.1	68.04	29.05	218.1	199.4	13.51	13.22	0.758
August	217.5	66.45	29.05	216.2	198.0	13.38	13.10	0.758
September	181.1	54.77	26.76	202.7	186.7	12.68	12.41	0.765
October	147.1	53.58	23.84	186.3	171.4	11.81	11.56	0.776
November	107.0	37.38	19.44	153.1	139.3	9.73	9.52	0.777
December	93.0	37.40	15.62	140.0	124.3	8.87	8.68	0.775
Year	2025.4	674.64	21.91	2242.5	2046.5	141.73	138.68	0.773

Legends: GlobHor Horizontal global irradiation
DiffHor Horizontal diffuse irradiation
T_Amb Ambient Temperature
GlobInc Global incident in coll. plane
GlobEff Effective Global, corr. for IAM and shadings
EArray Effective energy at the output of the array
E_Grid Energy injected into grid
PR Performance Ratio

Feasibility studies of the solar cells in CNG stations

Financial studies of the solar cells in CNG stations(NET Metering system)

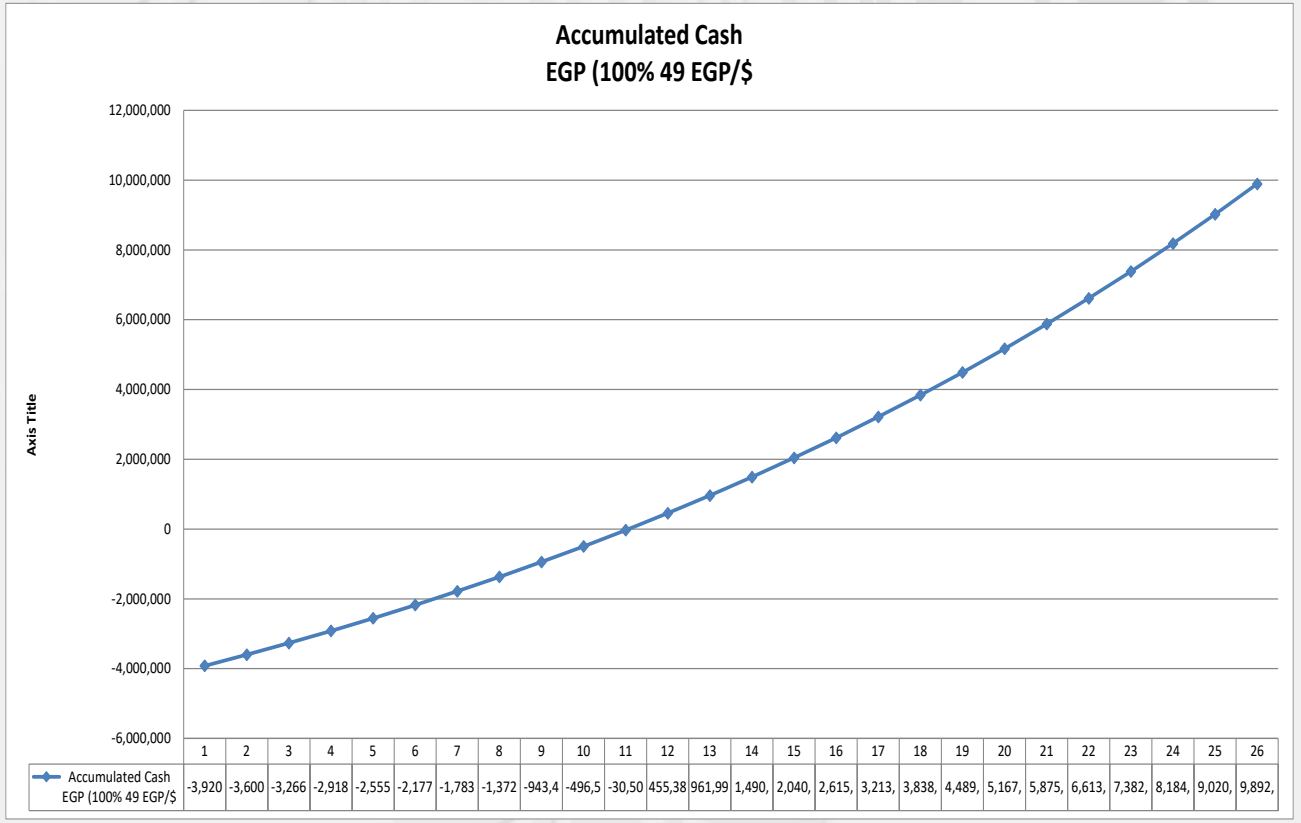
Station	Tanta stations
Total power generated KWP	80 KW
Capex	EGP 1,152,000 LE
NPV	EGP 1,946,698.20
IRR	26%
Payback period	5 YEARS



Feasibility studies of the solar cells in CNG stations

Financial studies of the solar cells in CNG stations(NET Metering system)

Station	Tanta stations
Total power generated KWP	80 KW
Capex	EGP3,136,000
NPV	(EGP 1,369,005.49)
IRR	13%
Payback period	11 YEARS



The Energy conservation and emissions reduction

Application of the solar cells in CNG stations

GASTEC had been constructed (7) PV projects in (7) stations starting from 2019 with total cost approximately about 7.5 million EGP with total power generated approximately 472.8 KWP and approximately energy yield 862.860 MWH /Year and Reduce CO2 emissions 690.3TON /Y, which is illustrated as following:

Station's name	Total power generated KWP	% of total power required	Actual power generated KWH/year	Quantity of CO2 reduced Ton/year
Qena 1	25	5%	45625	36.5
Port Saied	92.8	15 %	169360	135.5
Tanta	80	13%	146000	116.8
Abbasia	45	7%	82125	65.7
Qena 2	50	60%	91250	73
Asyut	100	16%	182500	146
Damietta	80	13%	146000	116.8

The Energy conservation and emissions reduction

GASTEC solar cells construction plan

- The plan in 2024, is to establish 8 stations with the total power 295 KWP and approximate energy yield 538.375 MWH /Year which Reduce CO2 emissions 430.7 TON /Y

Conclusion

- Solar Energy is one of many sources of renewable energies that can be exploited in generating electricity as a green energy. GASTEC decided to empower the stations by solar power system implementing the Egypt's government trends in applying the Sustainable Development Goals. GASTEC also, it intends to complete this objective by implementing the solar cells in its other stations according to its criteria. By implementing solar power system GASTEC and the government will be benefited as government do not requires to invest, and more reduction in GHG and also, GASTEC saves the partial cost of energy reducing its indirect GHG emissions.

Thanks

Thank you