



Energy Research Unit Activities in AAST

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Introduction

Introduction:

- Due to the growing demand for energy and the increasing shortage of traditional energy resources, in addition to the associated problems of energy crisis, the trend to use extend the share of renewable and alternative energy resources became mandatory taking into consideration the implementation of energy conservation policies.
- Hence, the Energy Research Unit was established on February 18, 2014, at the College of Engineering, AAST, Alexandria, to provide solutions for energy problem and to be a center of excellence in energy not only in AAST but also for the community service.



Introduction

مقدمة:

- نظرًا للطلب المتزايد على الطاقة والنقص المتزايد في مصادر الطاقة التقليدية وما يصاحب ذلك من مشاكل ، فإن الاتجاه إلى استخدام الطاقات المتجددة والبديلة ، مع ضرورة الحفاظ على الطاقة ، أمر حتمي محليًا ودوليًا.
- تم إنشاء وحدة أبحاث الطاقة في 18 فبراير 2014 ، بكلية الهندسة بأبي قير، لتقديم الحلول المناسبة لطبيعة المتقدم سواء على مستوى الأكاديمية بكافة فروعها أو من خلال دورها في خدمة المجتمع.



Mission of Energy Research Unit

link the energy research with the community needs in order to find an implementable solution for energy problems, in addition to deliver the technical support in AAST and community.

الرسالة:-

ربط أبحاث الطاقة باحتياجات المجتمع من أجل العثور على حل قابل للتنفيذ لمشاكل الطاقة، بالإضافة إلى تقديم الدعم التقني في AAST والمجتمع.



Objective of Energy Research Unit

- Link the researches related to energy with the current needs and future plan of the AAST and community
- Integrate and support the research through the encouragement of multi-discipline project to deliver an innovative solution
- Make AAST as a center of excellence in the field of energy

الأهداف:-

- ربط البحوث المتعلقة بالطاقة بالاحتياجات الحالية والخطة المستقبلية في AAST والمجتمع.
- تكامل ودعم البحث من خلال تشجيع مشروعات متعددة التخصصات لتقديم حل مبتكر.
- جعل الأكاديمية العربية للعلوم والتكنولوجيا مركزا متميزا في مجال الطاقة



Energy Committee

- An energy committee has been established in order to help in developing, achieving, following the energy management and energy efficient policies

لجنة الطاقة:-

تم إنشاء لجنة للطاقة من أجل المساعدة في تحقيق الأهداف، والمهمة الرئيسية هي بناء نظام إدارة الطاقة



Activities of Energy Research Unit

- The establishment of an energy committee at the academy level
- Conducting the necessary studies for energy conservation within the AAST campuses
- Make energy audits and analysis of energy consumption
- Integrate renewable energy resources (PV plants) within the existing system
- Build a energy Monitoring system
- Provide the consultancy services to use an energy efficient equipment's such as lighting, HVAC, etc.
- Enhance the existing Bsc. and Msc. program and develop a new program related to energy
- Develop a training programs related to energy and energy efficient.



Activities of Energy Research Unit

الانشطة:-

- انشاء لجنة الطاقة علي مستوى الاكاديمية.
- إجراء عدد من الدراسات لترشيد الطاقة بالأكاديمية والمجتمع
- إجراء مراجعات وتحليل الطاقة والاستهلاك
- عمل الدراسات والإشراف على تنفيذ مشروعات الطاقة المتجددة
- تصميم وتنفيذ نظام آلى لمراقبة الأحمال
- تطوير البرامج الدراسية واستحداث برامج جديدة خاصة بالطاقة
- إعداد برامج تدريبية فى مجال الطاقة وكفاءتها



50 kW Solar Power Plant (On-Grid) with Weather Station. (ABB)

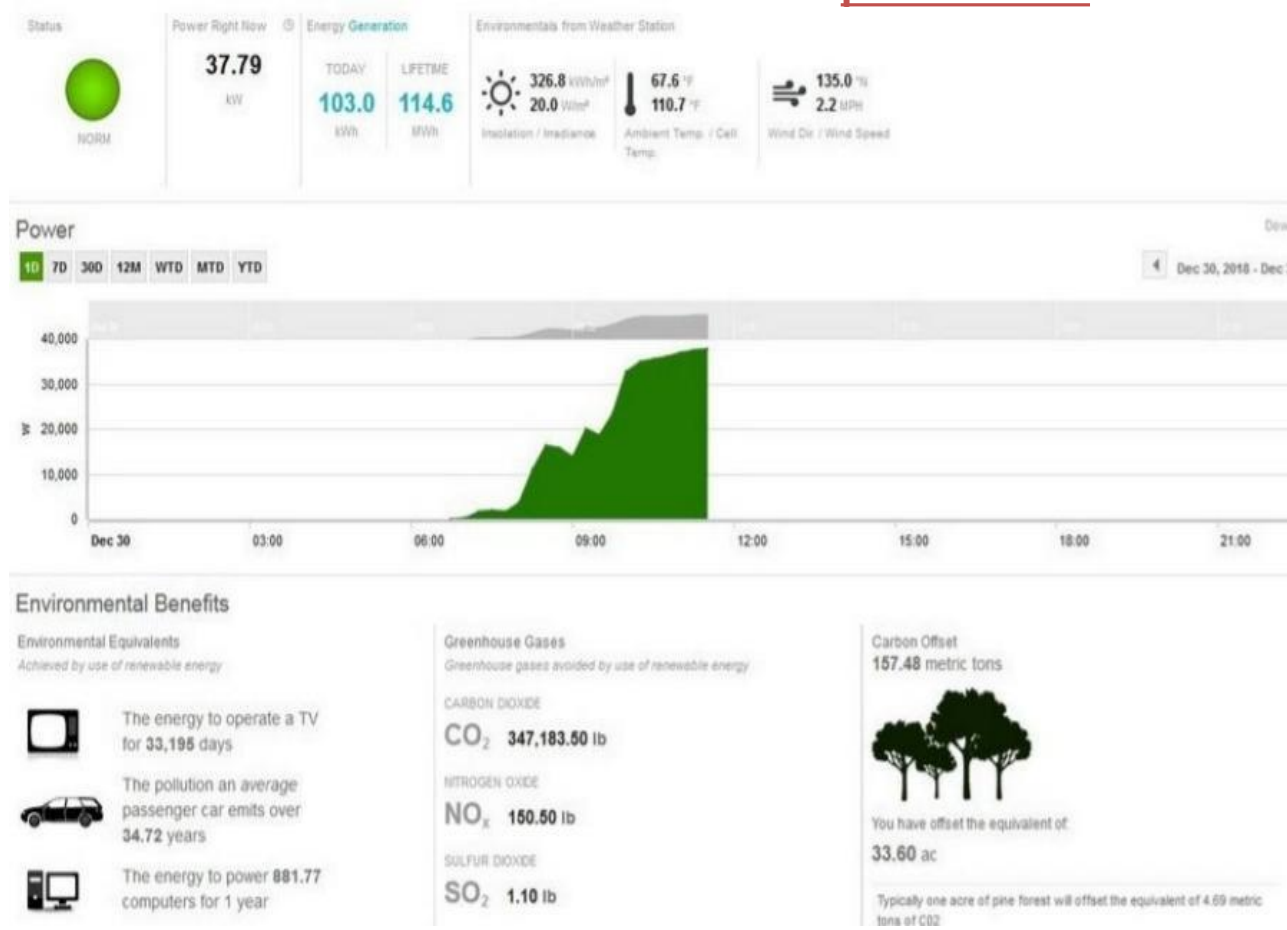
-
- On-grid
- Off-grid
- Hybrid
- For education, research and training purpose in addition to energy efficient and management





50 kW Solar Power Plant (On-Grid) with Weather Station. (ABB)

plant viewer



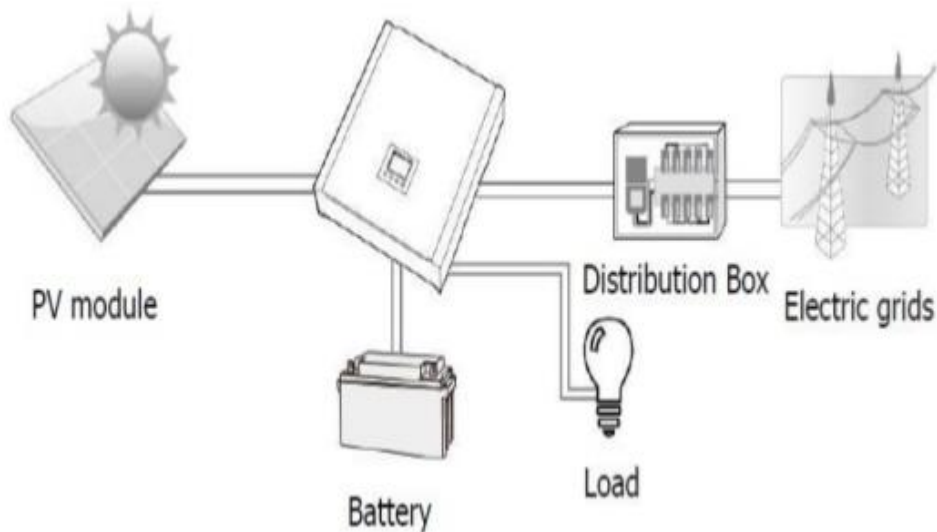


Hybrid 10 kW PV Inverter. (InfiniSolar)

This hybrid PV inverter can provide power to connected by utilizing PV Power, utility and battery power.

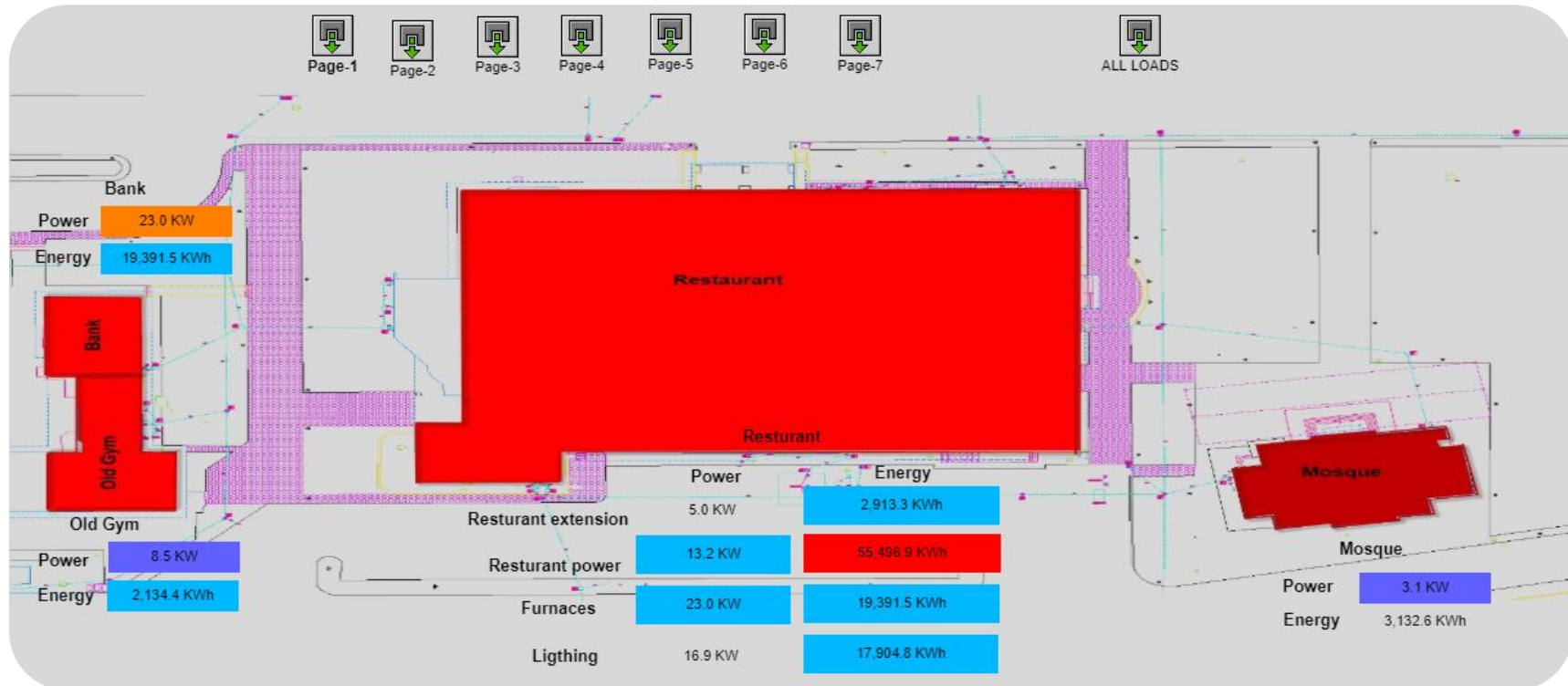
Depending on different power situation, this hybrid inverter is designed to generate continuous power from PV solar modules (solar panels), battery, and the utility.

There are three operation modes: Grid-Tie with backup, Grid-Tie and Off-Grid.





Implement Online Monitoring of Energy Consumption in Abu-Kir Coumps

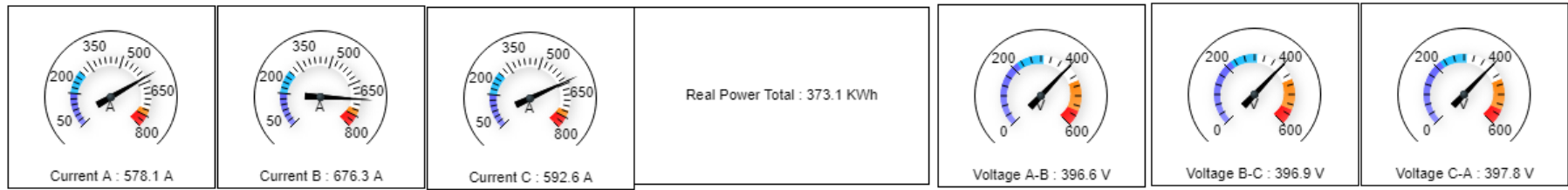




Energy Meters

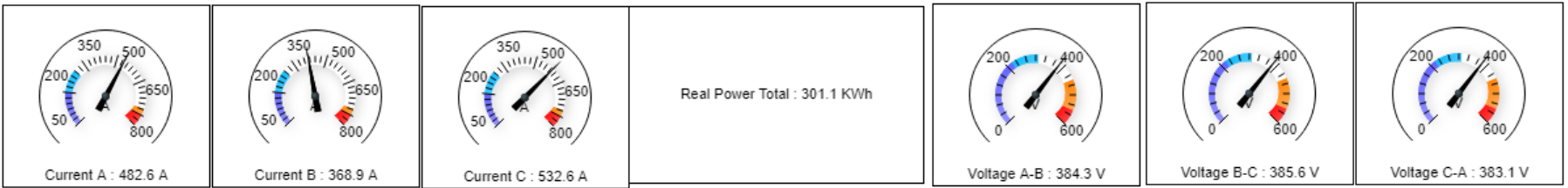
Transformer 7

Real Energy Into the Load : 156,159.8 KWh



Transformer 3

Real Energy Into the Load : 184,016.4 KWh



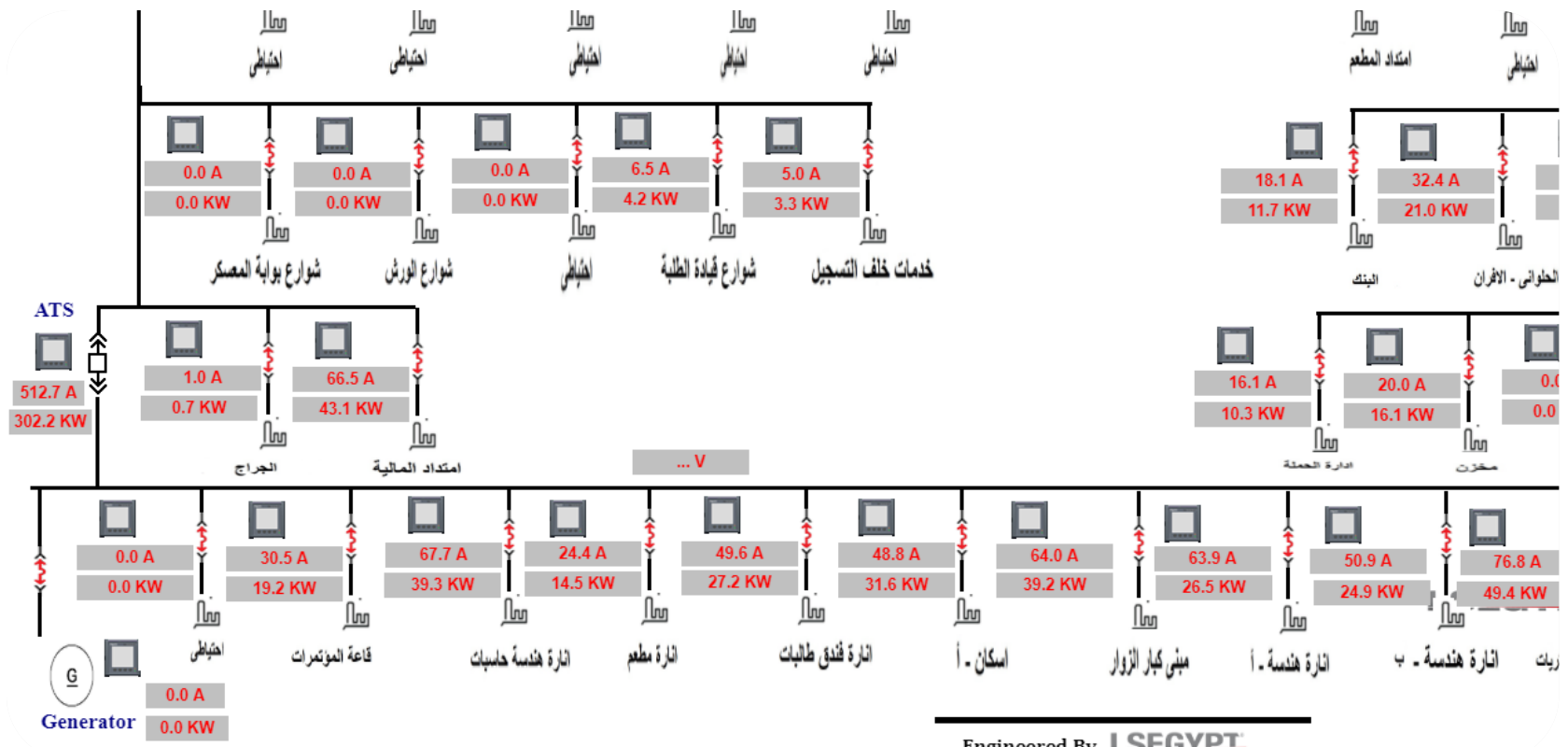
Diesel generator

Real Energy Into the Load : 5.8 KWh





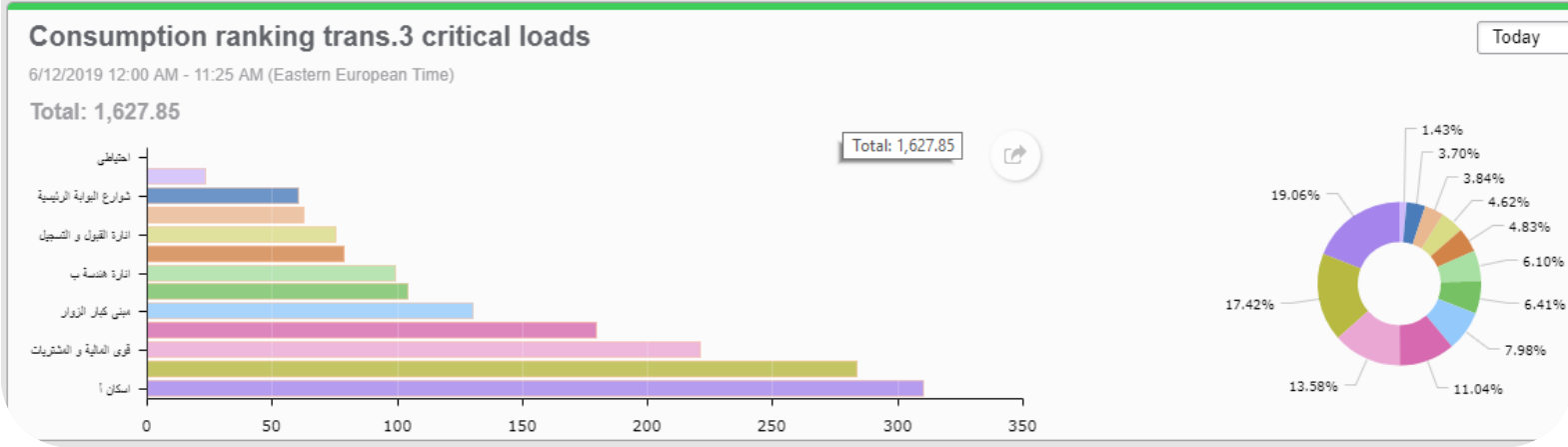
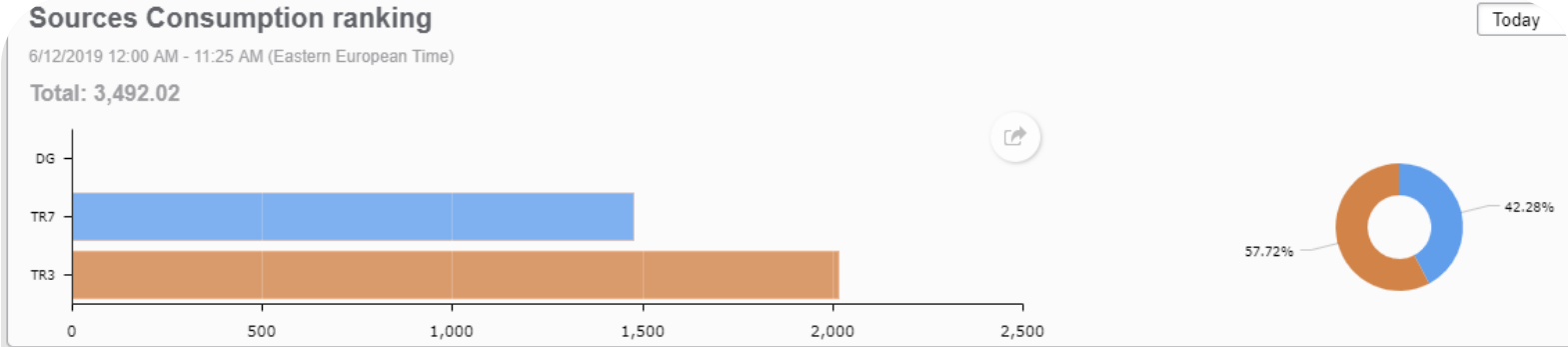
Power Station Monitoring system



Engineered By **LSEGYPT**
مهندسون بـ **LSEGYPT**



Sources Consumption Ranking



Energy plan for energy reduction including lighting, HVAC, utility, etc..

150 kW PV plant in Aswan campus







New Energy Program

B.Sc., M.Sc. and M-Eng. programs include:

- B.Sc. of Energy Engineer, (smart village)

http://www.aast.edu/en/colleges/coe/smartvillage/dept/index.php?unit_id=529

- M.Sc. in Renewable and environmental energy (Alexandria)
- M.Sc. of Smart Grid technology (Alexandria)
- M.Sc. of Smart Energy Management system (Alexandria)
- Meng of Renewable energy and energy efficient (Alexandria)
- 4 Modules for Wind Energy
- Bsc in Oil and Gas

http://www.aast.edu/en/colleges/coe/alex/dept/contenttemp.php?page_id=740000

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http://www.aast.edu/en/colleges/coe/alex/dept/contenttemp.php?page_id=740002

1



Training courses

1. Renewable Energy System
2. Solar energy
3. Practical fundamental solar energy
4. Wind Energy System
5. Energy Management and Auditing (EMA)
6. Building Management system (BMS)



1-Renewable Energy System

Learning Outcomes:

- Understand the principle of renewable energy.
- Select the suitable renewable energy resources .
- know different resources of renewable energy.

Course contents:

- Energy resources and overview of world energy.
- Energy demand and production / Consumption .
- Energy conversion and storage.
- solar energy
- wind energy
- Hydro-power
- Bio-energy .
- Practical / Laboratory.
- Advanced topics of renewable energy.
- Application and case study.



2-solar Energy

Learning Outcomes :

- Understand the concept of solar energy.
- Know the application of solar thermal system.
- Design solar thermal system.

Course contents :

- Fundamental of solar astronomy.
- Solar radiation.
- Introduction to concentrator optics.
- PV system.
- High temperature systems.
- Solar collectors theory and technology energy in Solar collectors.
- Flat plate collectors design.
- Solar water heating and Solar heating.
- Solar air heating.
- Solar air cooling and liquid absorption technology.



3- Practical fundamental solar energy

Learning Outcomes :

- Understand the principle of solar energy.
- Differentiate between on-grid and off-grid PV system.
- Know the components and operation of solar heater.

Course contents :

- PV system components and configurations.
- PV types and solar inverters
- On-grid PV system.
- Off-grid and hybrid PV system.
- PV installation
- Solar heater.
- practical / laboratory.



4-Wind Energy System

Learning Outcomes

- Understand the feature, characteristics and types of wind turbine
- Select the suitable wind turbine.
- Design and control wind farm.

Course contents

- Introduction to wind energy.
- Wind turbine characteristics and resources.
- Aerodynamics of wind turbines.
- Wind turbine mechanics and dynamics.
- Wind turbine generations.
- Wind turbine installation.
- Trends in control system design of wind turbine.
- wind turbine design calculations
- Environmental aspects
- Wind turbine economics.



5. Energy Management and Auditing (EMA)

Learning

Outcomes :

- Understand the codes and standards of energy .
- Understand the concept of energy audits and procedures.
- Know the tools and equipment needed to perform an energy audit .
- Learn how to write energy reports.

Course

contents :

- Fundamentals of Energy management system. .
- Energy efficient and conservation.
- Introduction, codes standards & Legislation I & Legislation II
- Types of Energy audits and its basics component .
- The audit Process
 - i- Pre site work
 - ii- Preparing for audit visit
 - ii- post Audit Analysis
 - iii- The Energy audit Report.
- The Energy action Plan Specialized audit tools.
- The Building Envelope Audit.
- The Electric system Audit.
- The Indoor Air Quality and HVAC Audit.
- Industrial, Commercial and Residential audits .
- Energy efficient and renewable energy.
- Energy management automation.



6. Building Management system (BMS)

Learning

Outcomes :

- Understand the principles of BMS system.
- Select the suitable lighting and HVAC systems of energy efficient applications.
- Know BMS configurations and technologies.
- Design BMS system.

Course

contents :

- Overview on energy management and control.
- Fundamentals of Energy auditing .
- Energy efficient and renewable energy.
- Energy conservation techniques and performance assessment for lighting systems.
- Lighting control and efficiency standards.
- Residential and commercial lighting systems.
- Energy conservation techniques and performance assessment for HVAC systems.
- Building insulation and air leakage.
- Solar Heating and HVAC application.
- BMS control system and automation.
- Design and installation of BMS.



Renewable Energy Lab Overview



17/10/2020



Wind Energy Trainer With Grid Connected

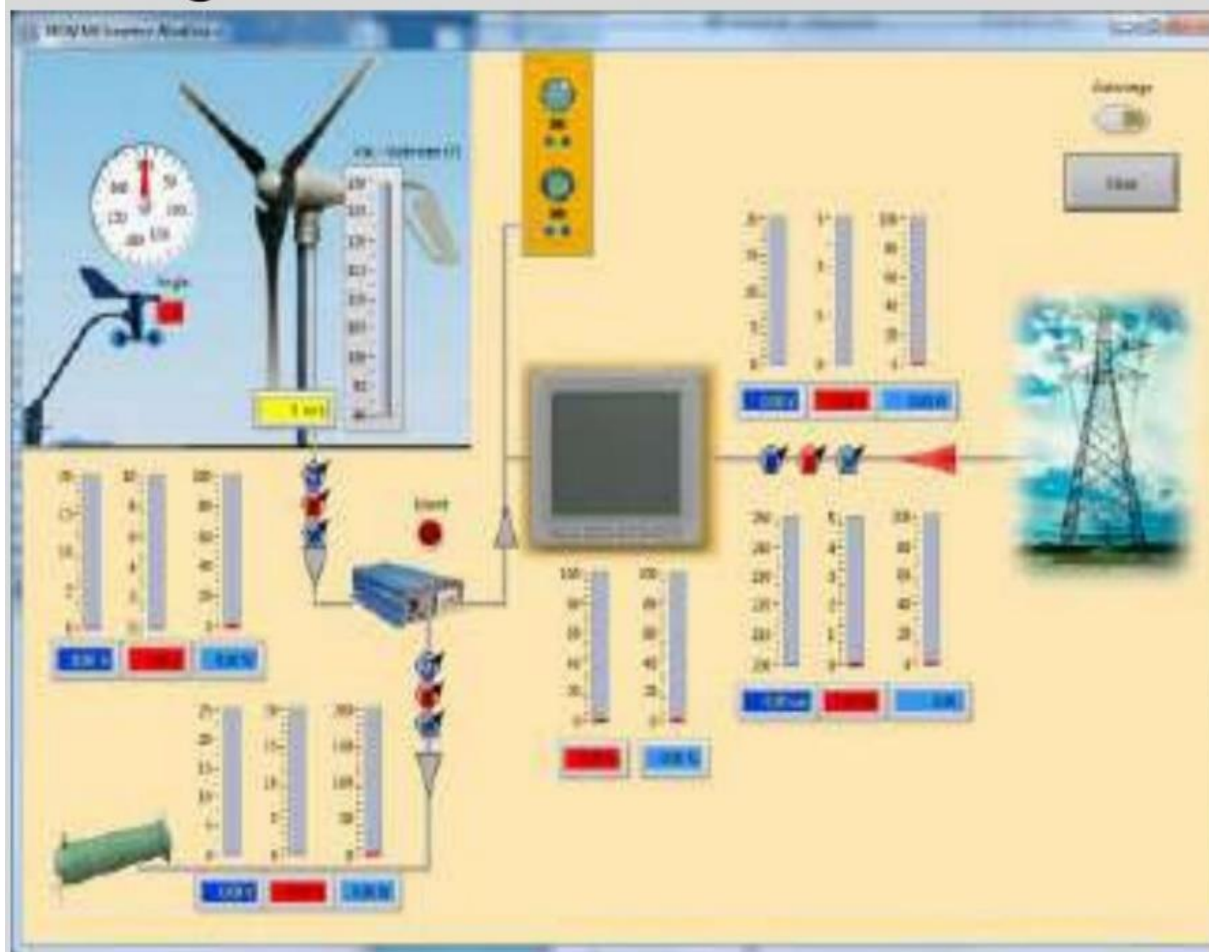


Grid connected wind energy setup consists of wind energy generator with wind simulator, grid connected inverter, grid connected controller, and power analyzer.

17/10/2020



Wind Energy Trainer With Grid Connected Interface



Wind turbine, load module, measurement module, Grid tie inverter, energy management module, wind simulator motor.



HyDrive Electric Hybrid Vehicle Trainer (HELIOCENTRIS)



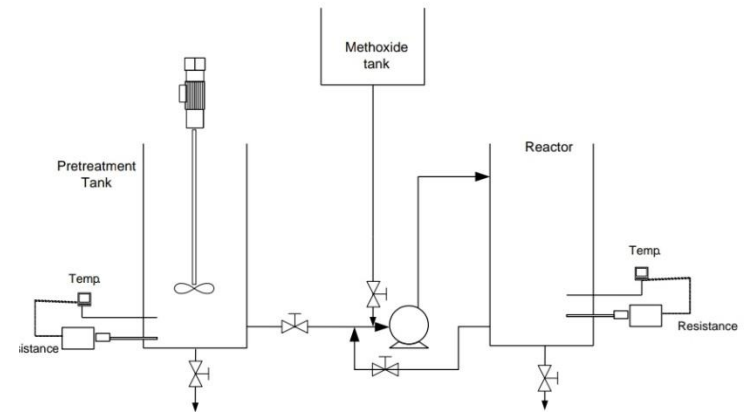
Hybrid electric vehicle module operated by battery and fuel cell



BIODIESEL PRODUCTION SETUP



DL BIO-10



Biodiesel generation process with digital controller



Computer Controlled Thermal Solar Energy Unit, with SCADA

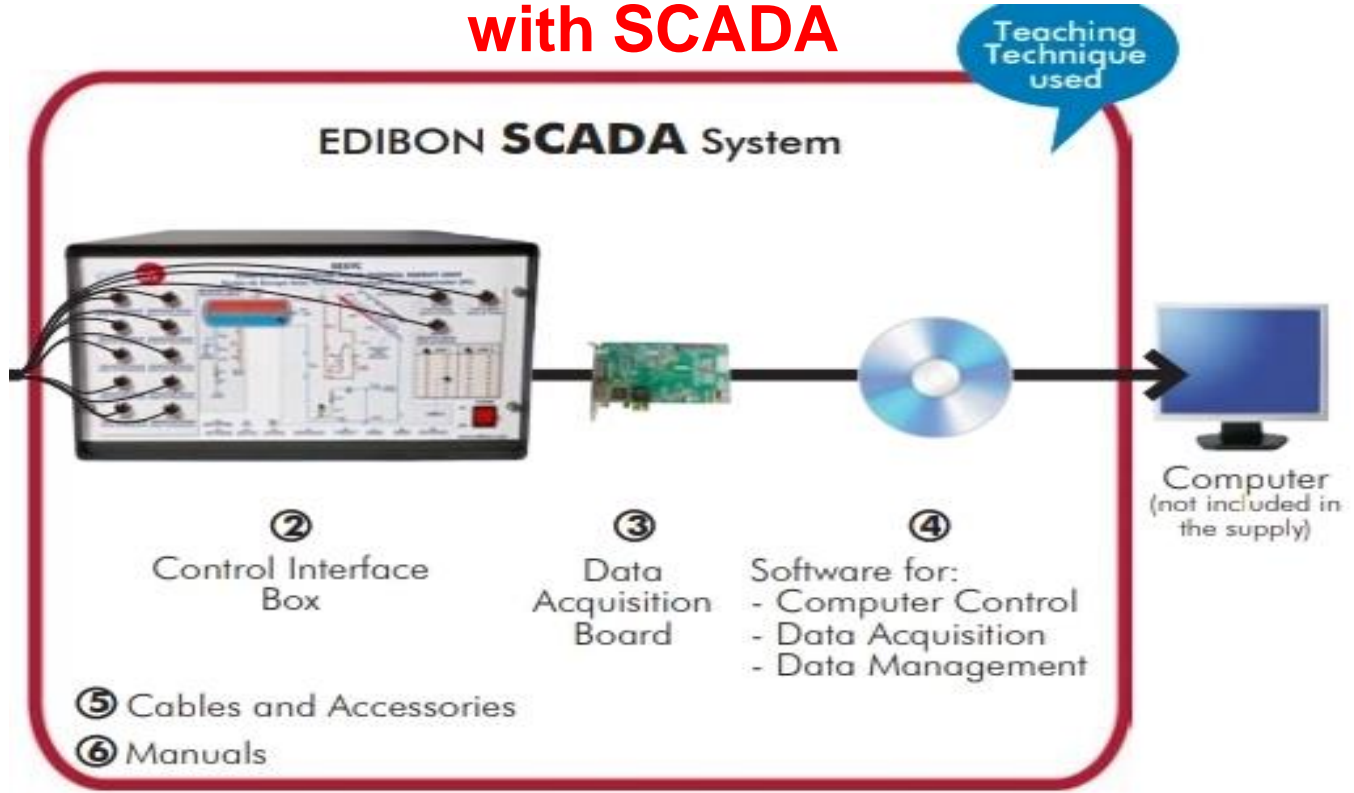


Solar Heater system with sun simulator capacity 300l
with digital interface

17/10/2020



Computer Controlled Thermal Solar Energy Unit, with SCADA



* Minimum supply always includes: 1 + 2 + 3 + 4 + 5 + 6
(Computer not included in the supply)

Digital interface and control loop of solar heater and sun simulator



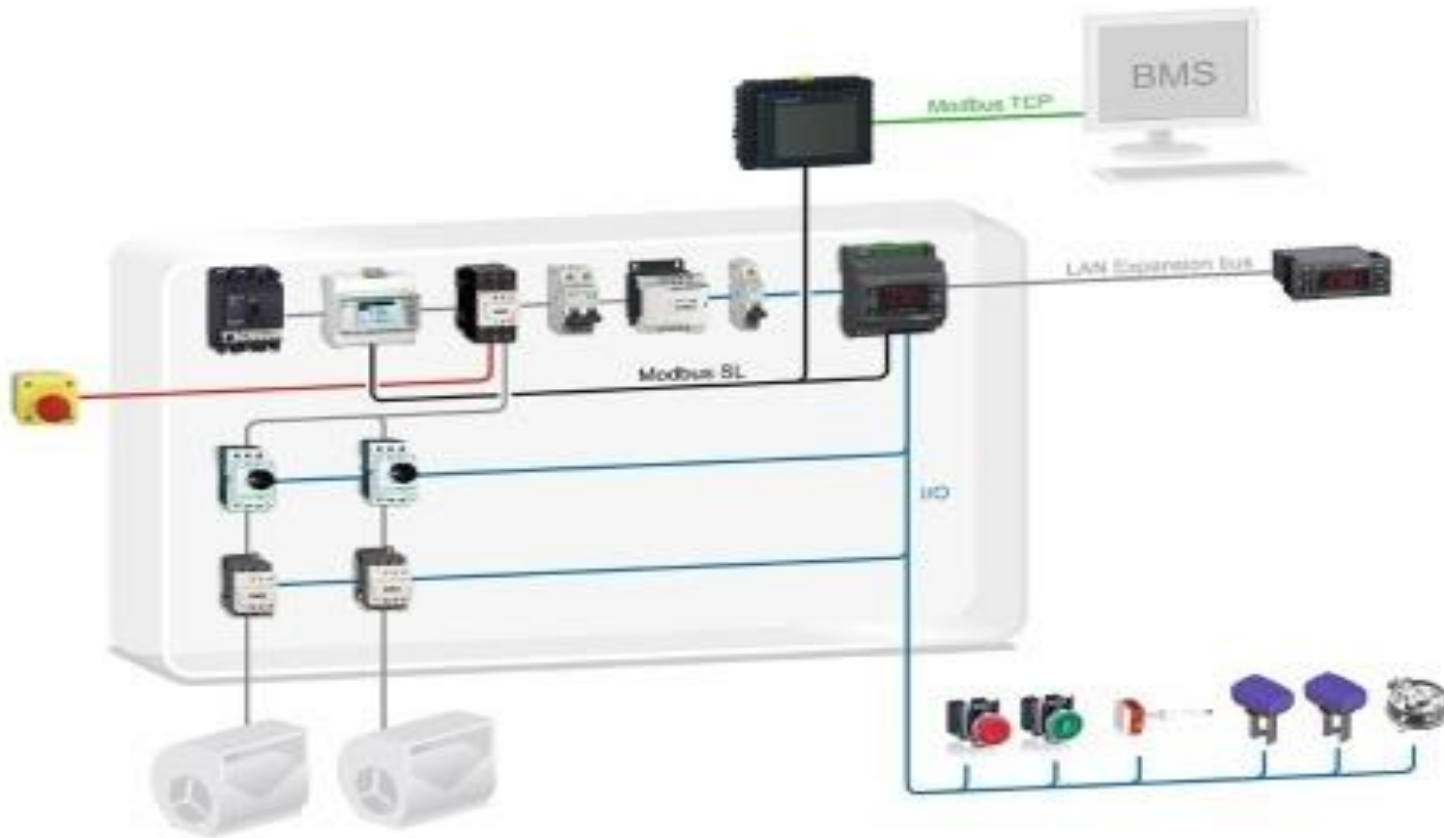
Air-Handling Unit (AHU)



Complete solution with full features for energy efficient AHU, connected to a Building Management System.



Air-Handling Unit interface and Building Management System Solution





Weather Station VANTAGE PRO2 Multi-Component Air Quality Monitor.



Air Quality
Measurement Station



Wireless weather
station



PV Power Plant

50 kW Solar Power Plant (On-Grid) with Weather Station. (ABB)

- On-grid
- Off-grid
- Hybrid

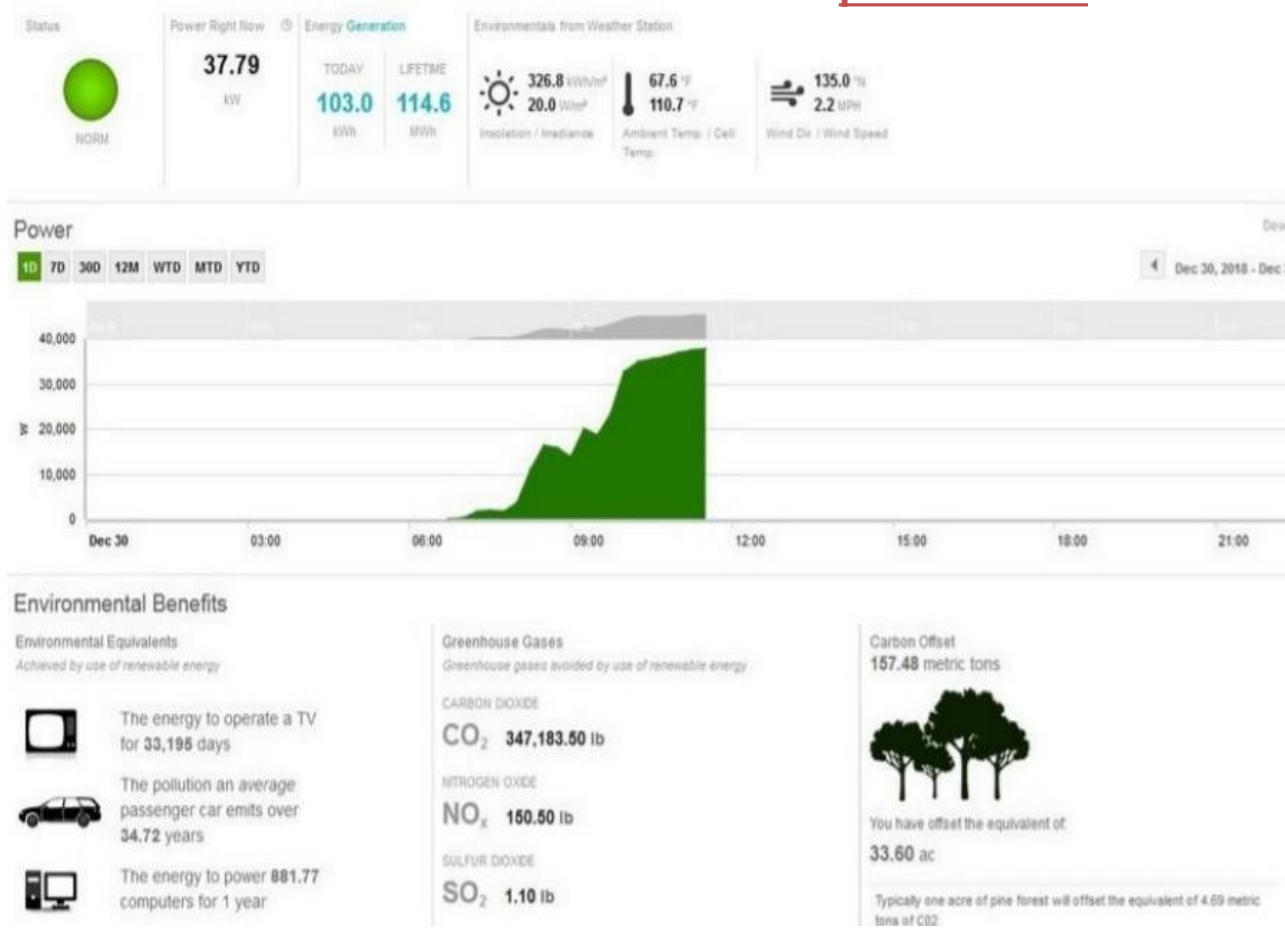


17/10/2020



50 kW Solar Power Plant (On-Grid) with Weather Station. (ABB)

plant viewer





MPR-47s New-Generation Network Analyzers

NEW



MPR-4X Series New-Generation Network Analyzers

With their compact design and 45mm depth, MPR-4X series new generation network analyzers occupy less space in the panels and have a wide range of operating voltage (45-265 VAC/DC). In addition up to 8 MB internal memory, they offer wide I/O solutions with their replaceable modular structure based on customer requirements and areas of application.

MPR-4X Series offer a wide range of analog and digital inputs/outputs and relay outputs with their I/O modules.

Remote Monitoring Software:

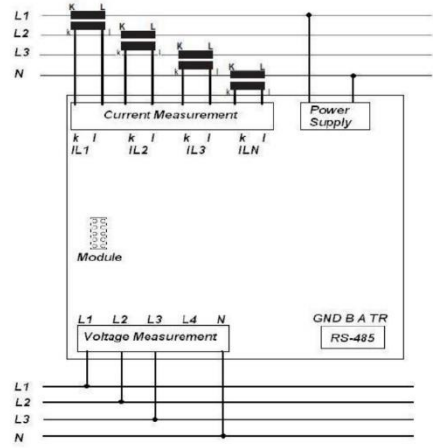
With the energy management software developed by ENTES, energy consumption and quality can be monitored in real time by reading the values measured by devices. As a result, comprehensive energy monitoring, data storage, optimum energy consumption control with the analysis of stored data, improvements in energy costs, and sustainable goals for energy systems are accomplished.





MPR-47s New-Generation Network Analyzers

Product Code	Dimensions / mm	3xV, 3xI, Frequency, W, VAR, VA, P, Q, S, kWh, kVAh, Demand, Max., Min, Cos φ, i neutral	THD-I	THD-V	Harmonics 1-51 st	RS-485	Digital Input	Digital Output	AI mA/V	AO mA	AO V	Relay Output	Pulse Output	Real Time Clock	Memory	Voltage/Current Unbalances	Pulse Counter	Operating Hours Meter	Alarm	Event Logs	Outage Records
MPR-45	96x96	●					*	*	*	*	*	*	*	●				●	*	*	●
MPR-45S	96x96	●				●	*	*	*	*	*	*	*	●	8MB			●	●	●	●
MPR-46	96x96	●	●	●			*	*	*	*	*	*	*	●			*	●	*	*	●
MPR-46S	96x96	●	●	●		●	*	*	*	*	*	*	*	●	8MB		*	●	●	●	●
MPR-47S	96x96	●	●	●	●	●	*	*	*	*	*	*	*	●	8MB	●	*	●	●	●	●



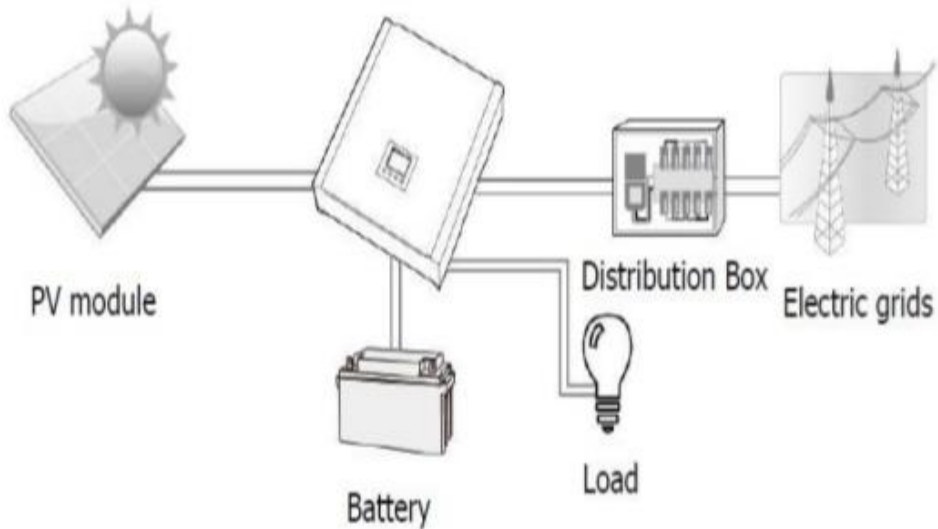
16/8/2020

Building Capacity of AASTMT labs in Renewable Energy and Energy Efficiency



Hybrid 10 kW PV Inverter (InfiniSolar)

This hybrid PV inverter can provide power to connected by utilizing PV Power, utility and battery power.





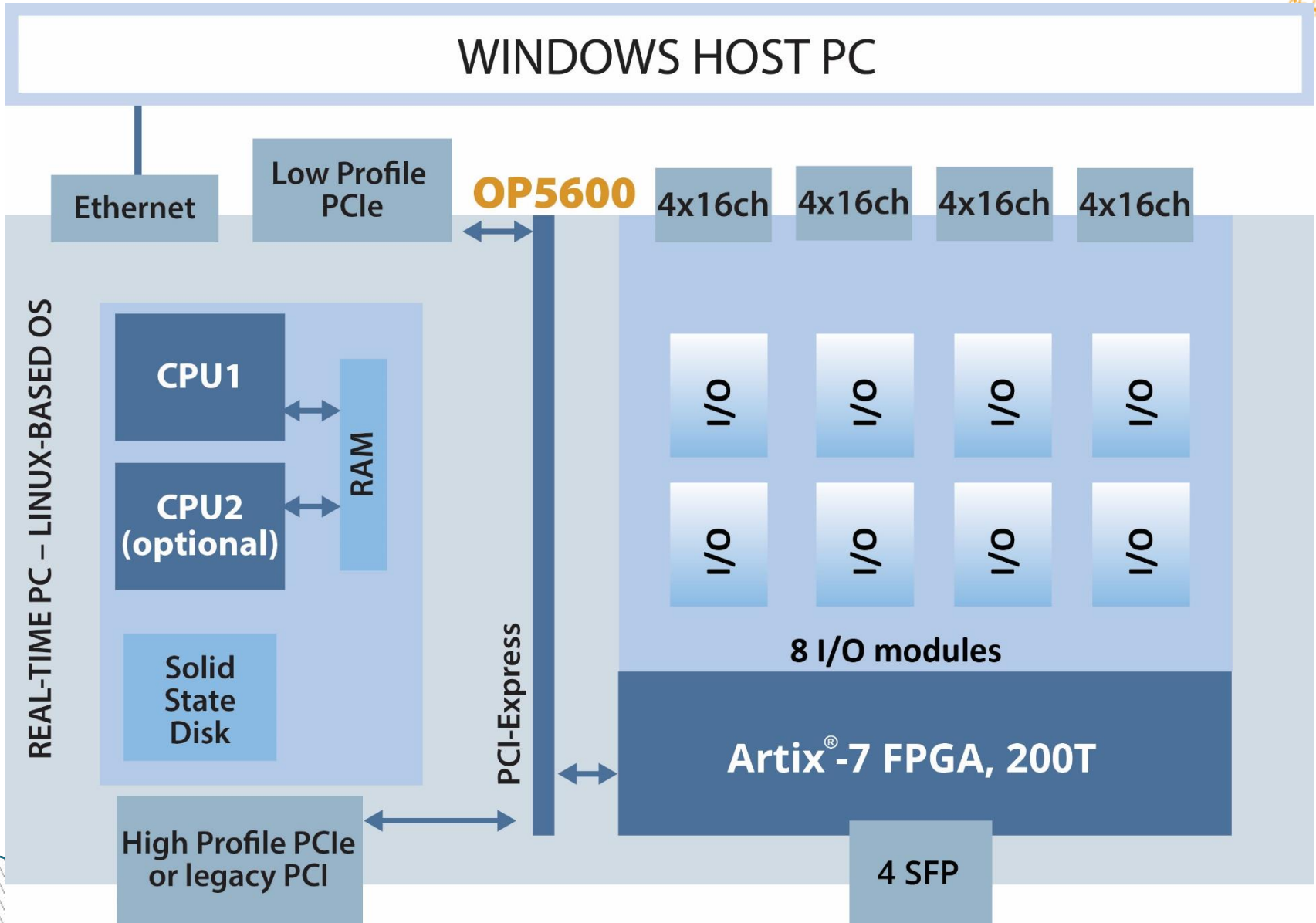
Real Time Simulator (RT-Lab)

Opal simulator

Versatile Real-Time Digital OP5600 SIMULATOR

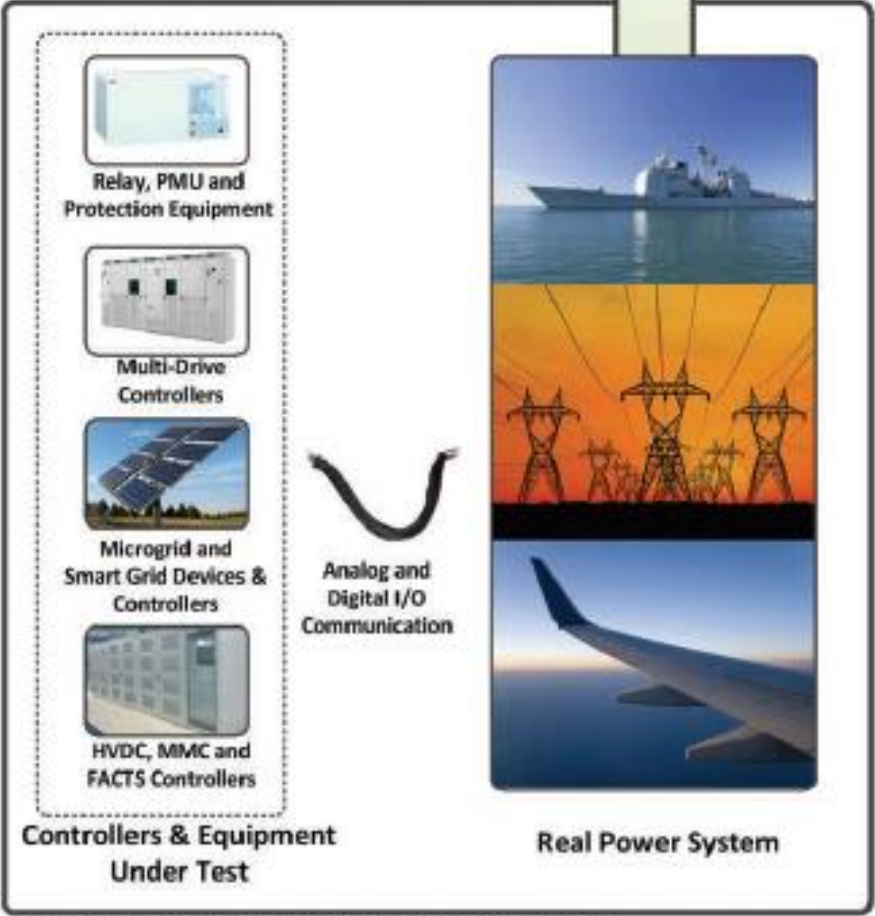
- The OP5600 real-time simulator is the most adopted simulation platform by OPAL-RT's users in industry and academia.
- OP5600 combines the performance, versatility and reliability that is ideal for demanding hardware in the loop applications.
- It can be applied in the power systems, aerospace, automotive, oil and gas or other electro-mechanical industries, the OP5600 has the power to simulate systems, while offering all the I/Os required to get your hardware into the loop.



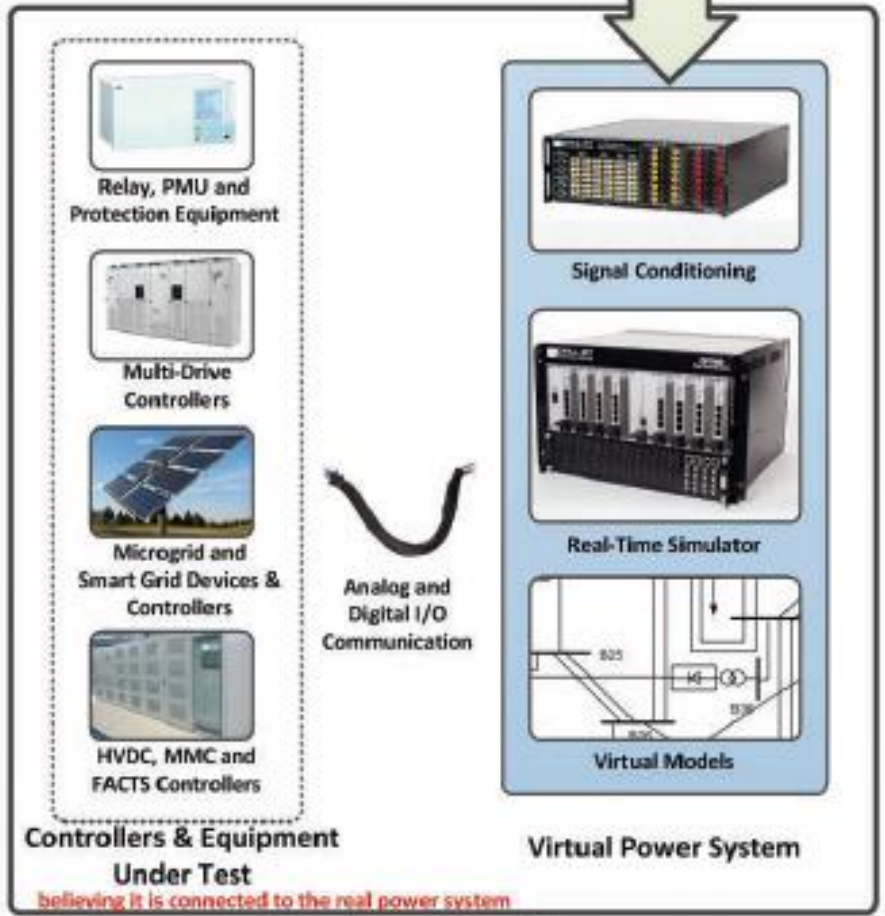


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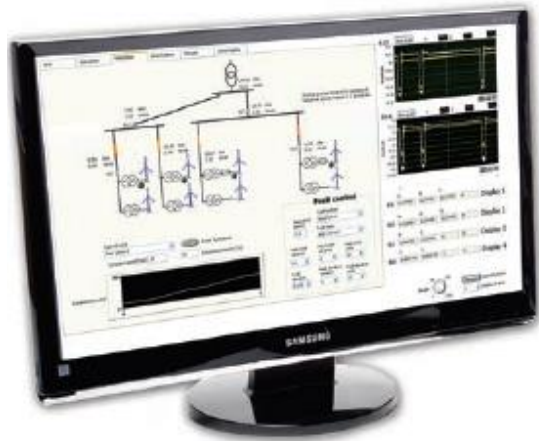
The real power system is replaced by a virtual model running on a real-time digital simulator



Real Life Operation and On-site Commissioning and Testing



Hardware-in-the-Loop Testing



Test and Development Software
Running on a Host PC



eMEGAsim™ Real-Time
Digital Simulator

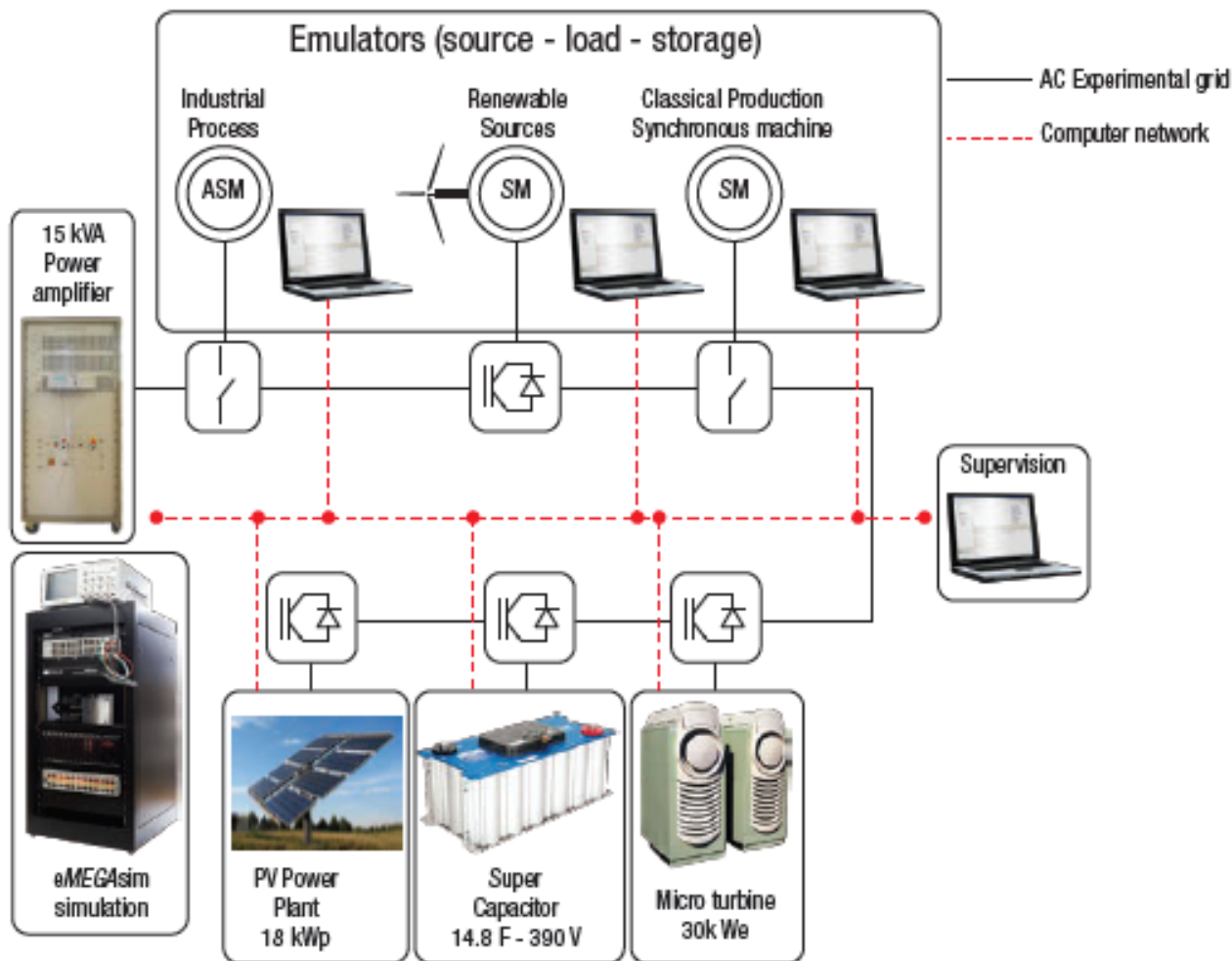


Wind Turbine Controller Under Test





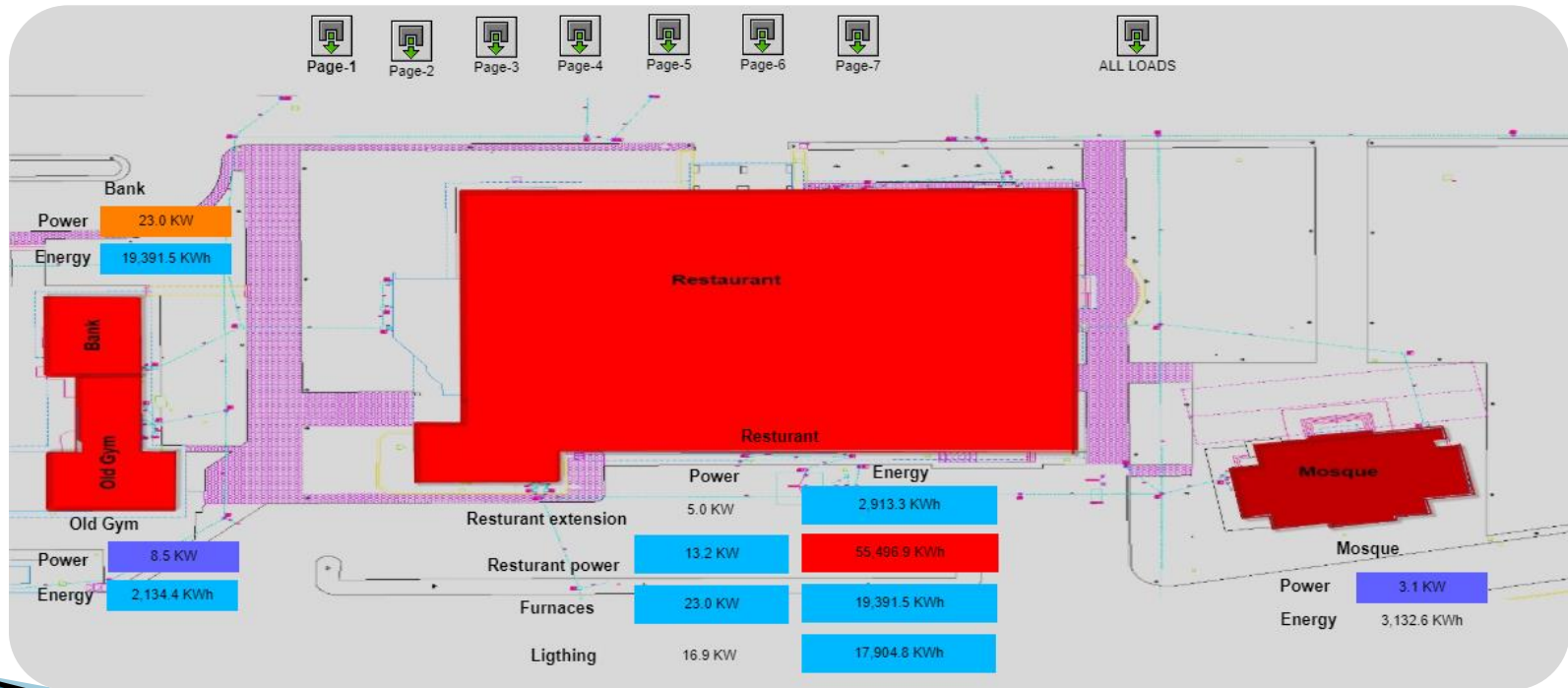
Real-time Platform for Microgrid PHIL Testing





Online Monitoring System for Energy Consumption in Abu-Kir Coumps

The monitoring system consists of 43 smart power meters integrated with data center

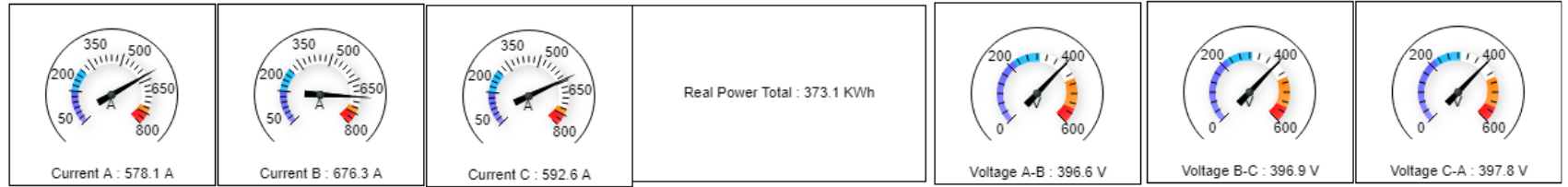




Energy Meters Overview

Transformer 7

Real Energy Into the Load : 156,159.8 KWh



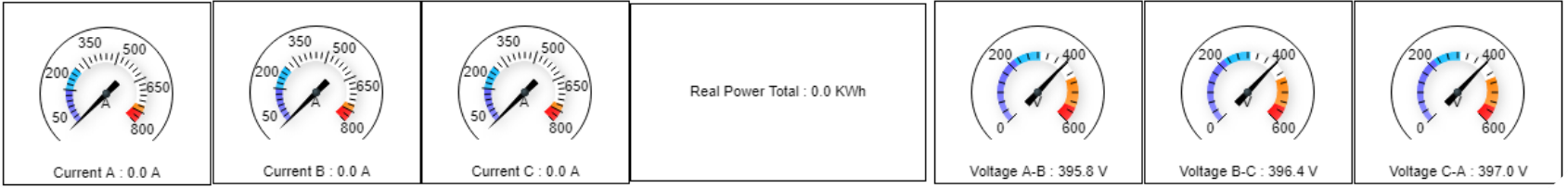
Transformer 3

Real Energy Into the Load : 184,016.4 KWh



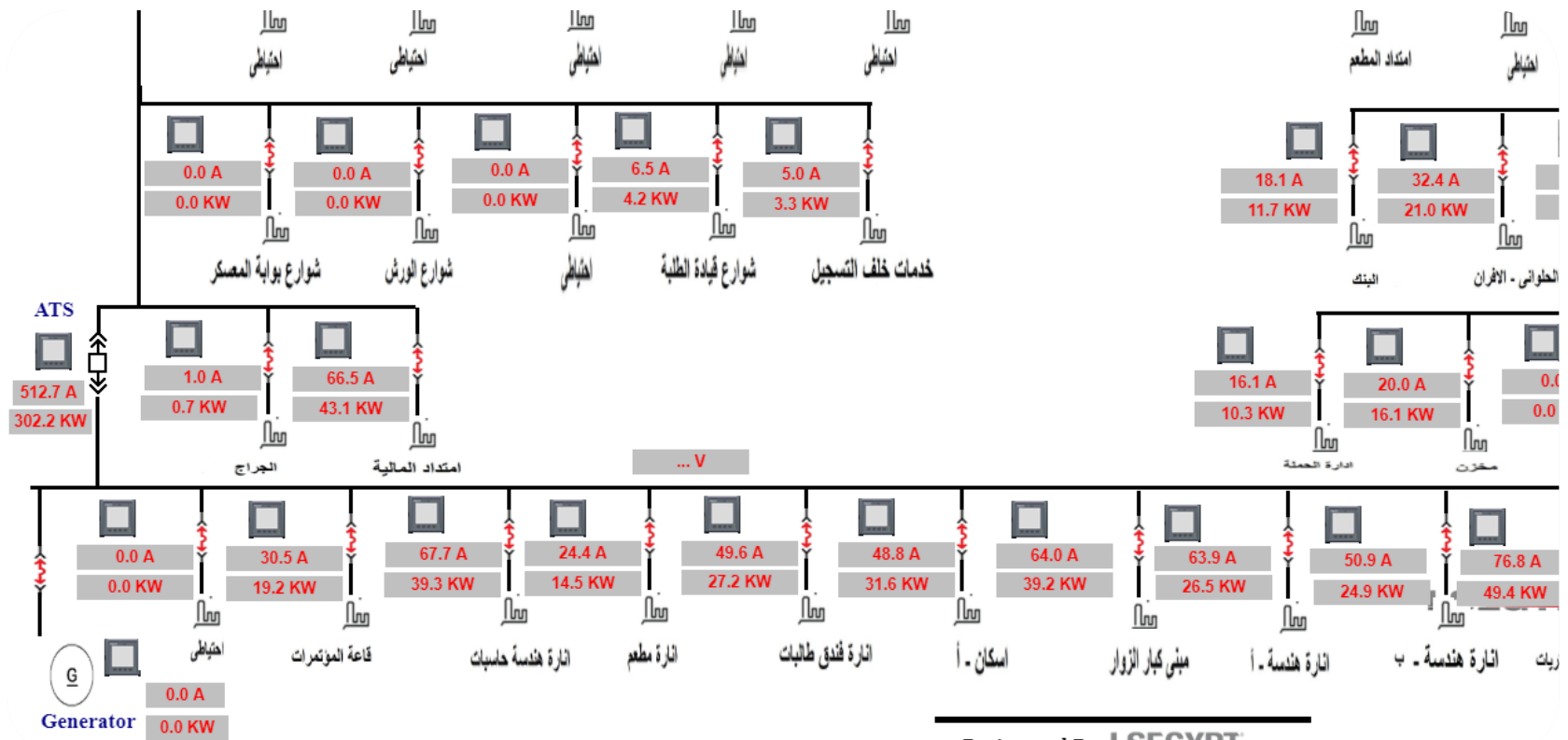
Diesel generator

Real Energy Into the Load : 5.8 KWh





Power Station Monitoring system



Engineered By **LSEGYPT**
مهندسون بـ **LSEGYPT**

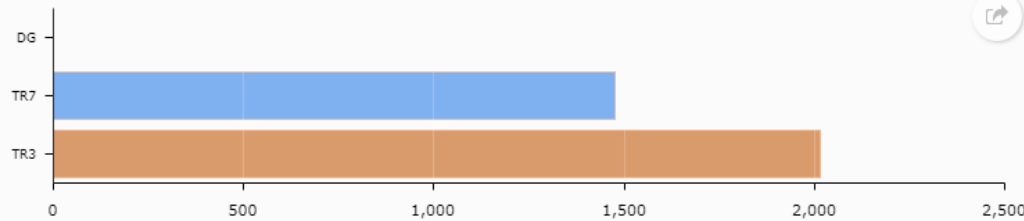


Sources Consumption Ranking

Sources Consumption ranking

6/12/2019 12:00 AM - 11:25 AM (Eastern European Time)

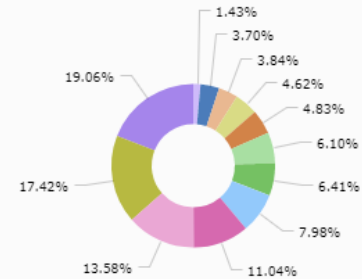
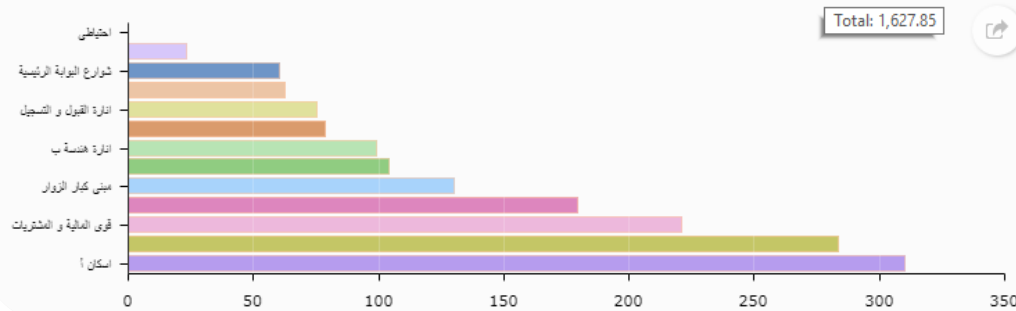
Total: 3,492.02



Consumption ranking trans.3 critical loads

6/12/2019 12:00 AM - 11:25 AM (Eastern European Time)

Total: 1,627.85





Measurement and Miscellanies

WTF-B200 Wind Speed and Direction Anemometer

- Whole set of WTF-B200 wind vane anemometer includes WTF-B200 display, WFS-1 wind speed sensor, SC/FX wind direction sensor and cables.

Application

- Cranes
- Weather
- Agriculture
- Hydraulic and Hydroelectricity
- Construction
- Education





Measurement and Miscellanies

FERVE F-814 battery and Alternator Tester 12 V

- Intakes for generator and battery discharge Tester
- For lead acid batteries, with a capacity between 32 and 180 Ah





Measurement and Miscellanies

Auto Meter SB-300 Intelligent Handheld Battery Tester

- Tests flooded, deep cycle, and AGM batteries with CCA range of 100-1600 - also detects discharged batteries, bad cells, and has built in reverse polarity protection.





Measurement and Miscellanies

1. AEMC 405 Power Clamp-On Meter
1000V AC/DC, 1000A AC/1500A
DC True RMS
2. Variable load
3. Data logger
4. Power Quality analyzer
5. 2 storage oscilloscope 4-channel
with voltage and current probes





Measurement and Miscellanies

Fluke 430 Series Three-Phase Power Quality Analyzers

**Pinpoint power problems faster,
safer and in greater detail**

The Fluke 434 and 435 three-phase power quality analyzers help you locate, predict, prevent and troubleshoot problems in three- and single-phase power distribution systems. Troubleshooting is faster with on-screen display of trends and captured events, even while background recording continues. The new IEC standards for flicker, harmonics and power quality are built right in to take the guess work out of power quality.





Measurement and Miscellanies

Fluke 430 Series

Three-Phase Power Quality Analyzers



- **Troubleshoot real-time:** Analyze the trends using the cursors and zoom tools—even while background recording continues
- **Highest safety rating in the industry:** 600 V CAT IV/1000 V CAT III rated for use at the service entrance
- **Automatic Transient Mode:** Capture 200 kHz waveform data on all phases simultaneously up to 6 kV
- **Fully Class-A compliant:** Conduct tests according to the stringent international IEC 61000-4-30 Class-A standard
- **Measure all three phases and neutral:** With included four current probes
- **AutoTrend:** Every measurement you see is always automatically recorded, without any setup
- **Warranty:** Rugged, handheld troubleshooter with Fluke three-year warranty



Thank you for you attention

Contact: mostafa.geliel@aast.edu