Journal Publications:

1. **Apr 2020   Validation and Self Shading enhancment of the SoL: a photovoltaic estimation model, Madrid**

   Abstract: *The estimation of electrical power generation in photovoltaic (PV) grid-connected systems based on meteorological data is a nontrivial, highly useful task, for instance to achieve accurate energy assessment. Widely used PV generation simulators are PV Systems (PVsyst), System Advisor Model (SAM) and PVLib. These simulators are characterized by presenting numerous features and providing complete results, however the PV estimation model SoL is an example of a new approach to PV generation estimation. SoL is characterized by its simplicity and computational efficiency. The objective of this paper is validating the recently published SoL model using real data from two PV locations for several years and facilities and comparing the results with those of three other PV simulators, namely PVsyst (in Spain), SAM (in Denver) and PVLib (both). It has been found that SoL estimates power production accurately for both locations and its estimations are more precise than those given by PVsyst, SAM and PVLib. It proves to be more computationally efficient than PVsyst, it can work with higher resolutions than SAM and PVsyst and requires fewer inputs than PVLib, SAM or PVsyst. Finally, a self-shading model is proposed as an enhancement for the SoL model. The number of inputs required is minimal, and it is an approximate yet efficient model. The estimation when using the self-shading enhancement is even more accurate than the previous estimation for SoL in locations where self-shading is evident. SoL proves to be an appropriate model for power estimation, and its results are enhanced when using the self-shading model proposed in this paper.*

Academic Projects:

1. **Thesis: Economic analysis of the companies that act as RES Agreegators in European Electricity Market, 2017 Thessaloniki**

   Abstract: *In a changing electricity market landscape, where the share of intermittent renewable energy in the energy mix is increasing, system flexibility becomes crucial. As part of the solution, the aggregation of renewable energy can significantly accelerate the integration of intermittent electricity sources and decrease the reliance on renewable energy support schemes. Aggregators of generation are therefore expected to have an increasingly important role to play in the future.*

   The purpose of this project is to study and analyze the technical and financial documents of the companies that are active in the European electricity market as RES Aggregators. This analysis is based on the published technical and financial data of each company for the years 2015 and 2016.

   The first chapter is concerned with the role and the importance of the RES Aggregators in the electricity energy market and the models of such business activity which have been identified in Europe. Furthermore, it refers to the two current remuneration schemes for the energy generated and originated from Renewable Energy Systems. Finally, it refers to the recent

Greek Law 4414/2016, concerning the remuneration scheme of RES units in Greece and it is based on the European Commission guidelines on state aid for environmental protection and energy 2014-2020, which are mandatory and essential for all national European markets, including the Greek market.

The second chapter introduces the process that was used to analyze the companies and their financial data, followed by a brief presentation of each company. Afterwards, the data which are about the installed capacity, the power generation, the sales of energy and the financial status of each company, are presented. In case where the data were sufficient enough the aforementioned fields have been analyzed per country, per technology and segment of activity of each company.

In chapter three are presented aggregated charts with the financial data of the companies, the installed capacity and the sales for the years 2015 and 2016. Also, the earnings before income, taxes, depreciation and amortization are analyzed in €/MWh for the various sectors of each company activities.

Finally, chapter four is dedicated to the presentation of aggregate charts with the results and the comparison methods that were followed. The comparison methods are about the earnings per MWh, as well as the influence of the assets on the depreciation of each company. Eventually, based on these results we commented, and we came up to the conclusion which is related to the business activity of each company.

2. Design of the electrical installation of an industrial pumping station, 2017, Thessaloniki

Abstract: At a pumping station there are various machines and load that must be connected to the electric system in order to function. Specific study must be done for the dimensioning of the cables, of the transformer and the protection devices. Furthermore, drawing for the wirings must be done following the requirements and any limitations. This study depends on the size and the needs of the machines and loads.

3. Design of the converters of an autonomous photovoltaic installation with battery storage, 2016, Thessaloniki

Abstract: The subject of this work is the design of the converters of an autonomous photovoltaic (PV) installation.
The main elements of the device are shown in the figure below.
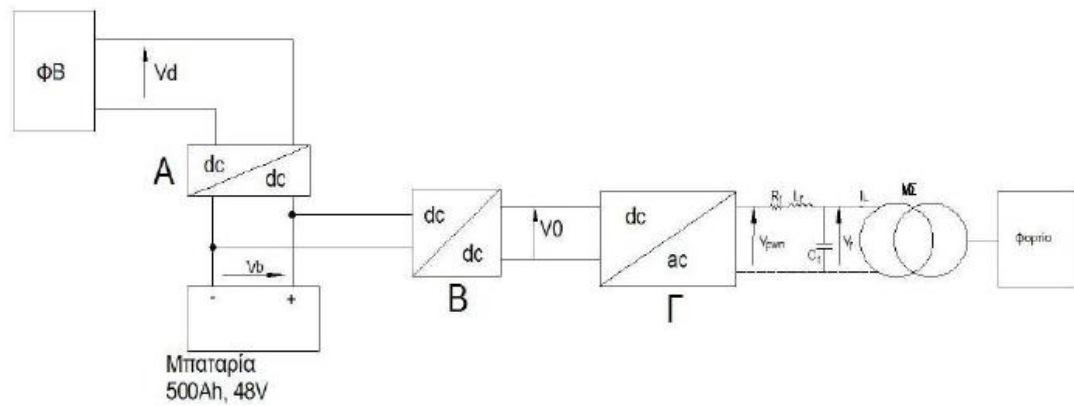
- PV panels to produce the necessary electricity
- Converter A (dc-dc) that accepts as input the voltage of the PV generator that ranges between 59-80 Vdc and adjusts it to the desired input voltage of the battery charger
- Converter B (dc-dc) that raises the voltage from the battery to the supplied installation
- Inverter C that converts the continuous voltage to alternating with desired frequency and width
- Passive LC filter that reduces the total harmonic deformation of the voltage that supplies the load
- Lifting M / S so that we finally have the mains voltage and frequency in the consumer (230V / 50Hz)

4. Study in Servomotors systems of an Industry, 2016, Thessaloniki

Abstract: A servomotor is a rotary actuator or linear actuator that allows for precise control of angular or linear position, velocity and acceleration. It consists of a suitable motor coupled to a sensor for position feedback. It also requires a relatively sophisticated controller, often a dedicated module designed specifically for use with servomotors. The subject of this work is the design of the controllers of an industrial servomotor system that consist of 4 different servomotors and performs a work cycle, making a paper packing box.

5. Lighting Protection in the High Voltage Channel, 2015, Thessaloniki

Abstract: A lightning protection system is designed to protect a structure from damage due to lightning strikes by intercepting such strikes and safely passing their extremely high currents to ground. A lightning protection system includes a network of air terminals, bonding conductors, and ground electrodes designed to provide a low impedance path to ground for potential strikes. Lightning protection systems are used to prevent lightning strike damage to structures. Lightning protection systems mitigate the fire hazard which lightning strikes pose to structures. A lightning protection system provides a low-impedance path for the lightning current to lessen the heating effect of current flowing through flammable structural materials. If lightning travels through porous and water-saturated materials, these materials may literally explode if their water content is flashed to steam by heat produced from the high current. The subject of the work is the design of the Lighting Protection system and all the drawings for the

wirings must be done following the requirements and any limitations for an industrial building combined with a photovoltaic park next to it.

6. **Calculation of a large wind turbine coupling devices in an electrical network, 2015, Thessaloniki**

Abstract: The figure below shows a dual-feed wind turbine (A / C) with an asynchronous torque-fed induction generator as used until a few years ago. In the dc branch there is a large inductance so that the Id current is considered constant.
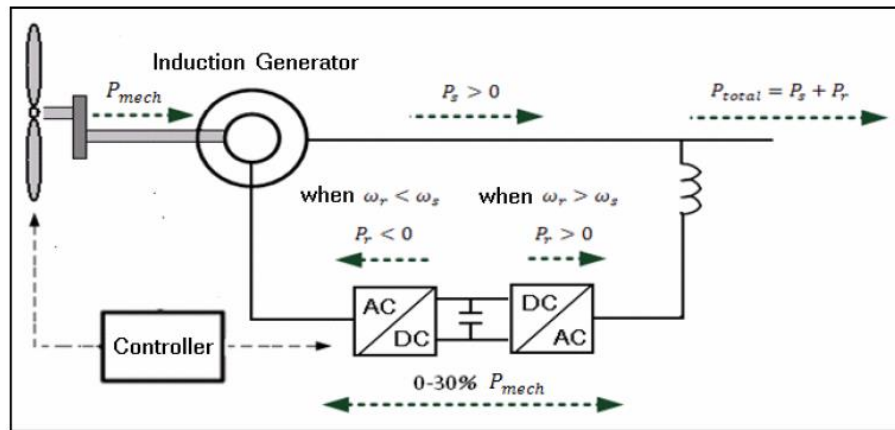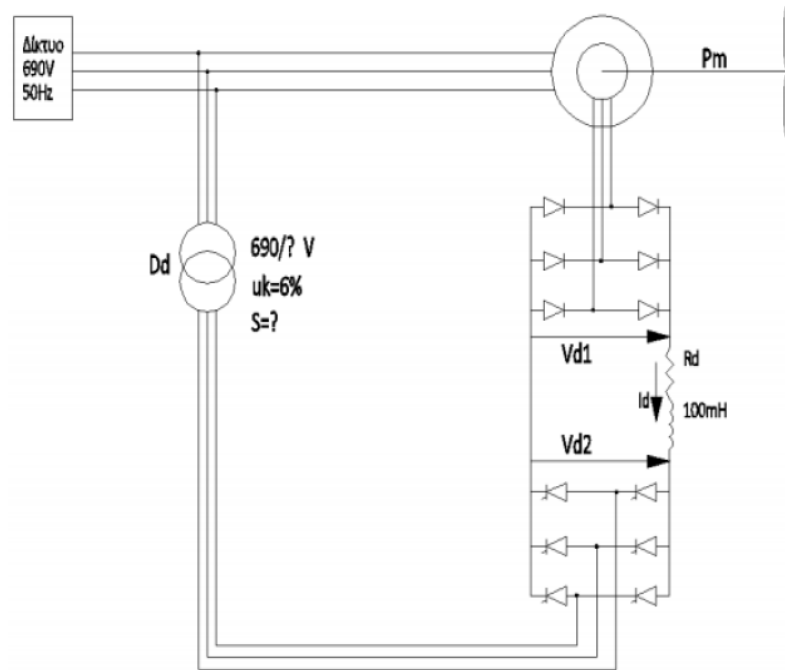
The transformer that supplies the inverter has a short-circuit voltage of 6%. The transformer losses are neglected. The circuit will be simulated in PSIM. The A / C will be simulated as a "load" of constant power equal to Pm. In each of the following calculations we will report the results of our calculations as well as the corresponding ones of PSIM and we will comment on the differences. We consider the generator to operate at its maximum permissible speed of 1355 rpm. For the inverter, we assume that the breaking angle of the thyristors for which the maximum limit slip is achieved is $\alpha = 160\,°$.

Work Projects:

1. **Design of the photovoltaic Parks in Spain and Australia**
   The detailed design of photovoltaic parks consists of:
   - Implementation of the photovoltaic park, detailed drawing of the implementation of the photovoltaics panels, inverter, internal roads, fences, trenches etc using AutoCAD
   - All the electrical calculations related with the connection of the photovoltaic modules in series and in parallel at the inverter
   - Dimensioning of the cables of Low and Medium Voltage
   - 25 years forecasting of the production of the park using PVsyst
   - Electric design of the photovoltaic park in DigSILENT and load flow calculation to find the power factor of the inverters in order to regulatory compliance in the Point of Connection with the Grid.
   - Low and Medium Voltage Single-Line diagram
   - Etc.

2. **Study of closure of Carbon and Nuclear Power Plants and Penetration of Renewable Generation in the Spanish Electric Grid,** using PSSE implementing python automation

   The notion of decarbonization relates to the reduction of carbon inputs to socioeconomic metabolism or of greenhouse gas (GHG) emissions such as CO_2 or CH_4. To fulfil with the reduction of the carbon inputs, most of the Carbon-based power plants will close and will be replaced with renewable generation. The same thing will happen with some of the Nuclear Power Plants. As a result, opportunities will come up for introduction of renewable energy generation.

3. **Python Script Automation in DiGSILENT for Wind Farm Load Flow Calculations**

   With Python Script Automation to a software as DigSILENT the simulation time can be reduced by 10 times. The more cases you have, the more time you gain.

4. **Software development for Cable Sizing**

   The sizing of the cables depends on the:

   - The máximum operating current
   - The máximum drop voltage
   - The máximum drop voltage at start-up for machines
   - The máximum short circuit current
   - The minumum short circuit current

   When the cables for a big project are more than 300, an efficient way must be found to calculate all those cables in a short time. One solution is to develop a software to automate the process.

5. **Load Flow, Short Circuit calculations for transformer sizing and Machine Start Up using ETAP**

   Electrical calculations for low, medium and high voltage of an industrial station. Transformer sizing and Machine strat-up calculations.

6. **Software development of Modules for Back Office and POS for a big company**

   Software development in C#, SQL, Javascript, CSS, Angular. Design of Modules and microservices.