SOLAR ENERGY: ACHIEVING THE FULL POTENTIAL

ECOFYS

Consultation services from pre-feasibility study to operational support

A SUSTAINABLE ENERGY SUPPLY FOR EVERYONE

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Solar energy: achieving the full potential

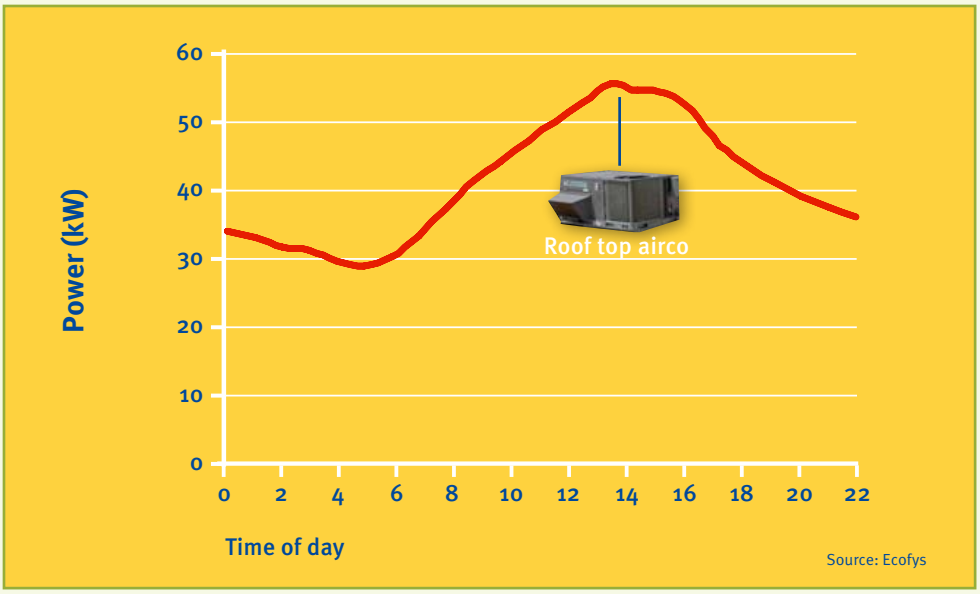
The sun is an inexhaustible source of energy that can be exploited for a wide range of applications. The solar radiation delivered to the earth contains 10.000 times the energy needed for the world's current total energy needs. Solar energy can be applied in many ways. Solar panels convert sunlight into electricity, using a process known as photovoltaic (PV) solar energy or solar electricity, while solar water heaters convert sunlight into heat, using solar thermal energy to power hot water systems in buildings. Solar electricity can also be generated in solar thermal power plants, using concentrated solar power (CSP).

We offer a wide range of services in the field of solar energy, from preliminary studies to supervising the implementation of actual projects. We also carry out strategic studies, business analysis studies as well as technical and economic feasibility studies. We advise utility companies, developers, housing corporations, governments, banks, the solar energy industry and non-profit organizations.

The potential for solar energy in the Middle East

In 2008-2009 we carried out pre-feasibility studies on the potential for using solar energy in several Middle Eastern countries. Based on site visits, data analysis & modelling studies, the technical and commercial options and constraints were investigated. The potential of solar energy was reviewed alongside other sustainable energy solutions. Our work resulted in strategic recommendations based on large solar plants and a proposal for solving 'peak supply' problems.

Typical Middle East power demand



Concentrated Solar Power plant

We carried out a pre-feasibility study for the 50 MW Guzman CSP plant in the Seville region in Spain. The study included:

- Contracting strategy; alternative contracting strategies for risk management, finance and potential partners.
- Technology supply; we analyzed the global supply situation in terms of key components, lead times and potential sourcing risks.
- Design optimization; we analyzed the planned 50 MW CSP plant, which is based on proven parabolic trough technology, and optimized the design for mirror area and storage.

The output of this study was a report containing specific recommendations on how to take the project to the next stage of development (completion in 2010).

Large-scale solar energy

In addition to applications in the built environment, solar energy plays an important role in generating large-scale renewable electricity, especially in southern Europe, the Middle East and the United States. The options include photo-electric, concentrated solar power and concentrated photovoltaic power plants. We offer a range of services to those engaged in large-scale solar energy projects.

Due diligence studies for solar energy projects

Good investment decisions related to solar energy projects require a clear understanding of risk. A due diligence study by our specialists will give you a complete picture of all the risks involved.

Independent assessments

At Ecofys we offer banks, investors and developers complete due diligence studies on solar energy projects and a second opinion if required. We give these organizations a clear understanding of aspects such as:

- checking licenses
- the technology and components to be used
- the amount of solar radiation at the site
- the expected electricity output
- checking contracts (EPC, O&M and revenue guarantees)
- financial issues, such as account settlement protocols and revenue guarantees.

We provide these due diligence services as independent consultants with experience of working with both local and experienced national partners on a variety of projects.

Experienced experts

We have extensive in-house technical expertise as well as experience of delivering numerous solar energy studies and projects. For example, we provided complete due diligence for a 12-megawatt photo-voltaic plant in Albacete, Spain.

Solar energy in the built environment

In new construction projects and in existing buildings, we support those involved in the construction chain with the installation of photovoltaic systems. This support ranges from feasibility studies to turnkey delivery of systems.

PV systems in the built environment

At Ecofys we have over 25 years' experience of working with PV systems in the built environment. As experts in sustainable energy and energy conservation, we support clients with the design, construction and marketing of houses equipped with PV systems.

Construction

The success of PV projects depends crucially on integrating the installation of the solar panels in the construction process. Thanks to our extensive knowledge of this market, we can support the design, specification, writing and procurement of PV systems and assess quotations. In complex projects, we join the construction team to monitor the quality of the system. At the end of the construction period, we arrange for the PV system to be commissioned and can continue monitoring it during use. We can supervise, on your behalf, a complete turnkey project.

Marketing support

Building, selling or letting dwellings or commercial property fitted with PV systems demonstrates both courage and innovation. Although, from an aesthetic point of view, PV is the most attractive source of sustainable energy, many still think the technology is too expensive. So it's essential that the value and pay-back period of PV systems are clearly explained to prospective buyers and tenants.

Our familiarity with grant systems, financial engineering and marketing enable us to support property developers and managers in this area. This includes issues such as the sale of the generated PV electricity to the electricity company, leasing arrangements, legal aspects and tax considerations.

PV system monitoring

At Ecofys we have over 20 years' experience of assessing the operation of photovoltaic (PV) solar energy systems. This has enabled us to develop services such as yield monitoring, commissioning tests and on-site inspections. These services provide you with cost-effective quality management and monitoring, both at time of installation and during the full operational life of PV systems.

We monitor PV systems from small 100 Wp AC modules to large systems with ratings of several hundred kWp.

Automatic monitoring and maintenance management

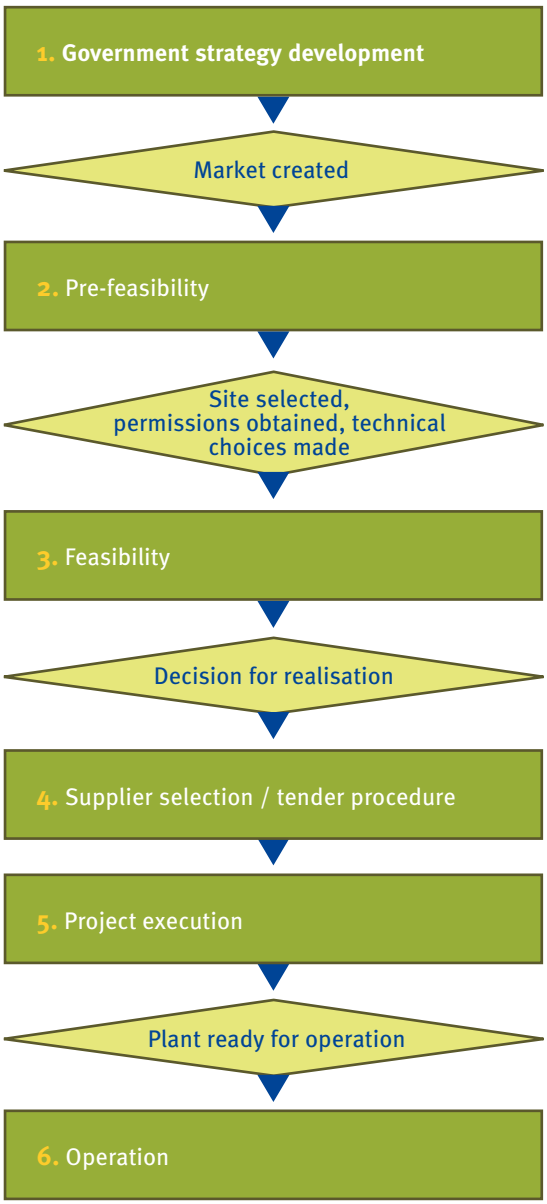
Depending on the type and scale of the system, we advise on a range of monitoring and maintenance management options, from scheduled inspections to automatic management systems. These systems automatically produce status reports based on relevant measurements.

Nieuwland 1 MW PV project

We have provided monitoring services for many projects, such as the 1 MW project in Amersfoort (500 PV houses). For this project, each house was fitted with an Eclipse PV display. This product, which was designed for the consumer market, measures, displays and saves details of the daily PV output and domestic electricity consumption. Some PV systems are also monitored more extensively, including continuous measurement of parameters such as insulation, temperature and electrical output.

Your business – our solutions

When developing a solar supply power plant (whether PV or CSP) we distinguish five phases:



Ecofys services:

- Government masterplan
- Subsidy frameworks
- Legal aspects
- Supply chain analysis

- Pre-feasibility study: qualitative study of site selection, technical risks, construction, trackers, energy yield and financial aspects
- Advice on contracting strategy

- Feasibility study: quantitative study of energy yield and financial aspects, technical design and construction
- Due diligence services

- Tender procedure
- Selecting suppliers

- Supervision on behalf of project owner
- Inspection of progress

- Due diligence service

- Monitoring of solar plant
- Prediction service

PV power plant grid connection assessment Andalusia, Spain

We have been contracted by a major energy company to assess the grid connection rules and available grid capacity for developing renewable multi-megawatt projects in Andalusia in Spain. This study was based on an in-depth review of the Spanish and Andalusia renewable energy legal and regulatory frameworks. It includes compiling and evaluating publicly available documents relating to the grid capacity and grid development plans. The results of this assessment were compiled in a report, which included an executive summary for decision makers.

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To find out how we can help you achieve your ambitions, please get in touch with us by sending an e-mail to: **info@ecofys.com**.

For a complete overview see **www.ecofys.com**.

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