SOLAR ENERGY
CAPABILITY STATEMENT
WWW.RAMBOLL.COM/ENERGY
CONSULTANCY SERVICES WITHIN SOLAR ENERGY

Energy from the sun is the single largest source of energy on Earth. The daily insolation of light from the sun on our globe is approximately 6,000 times our total daily energy consumption. In addition to being an inexhaustible and clean technology, solar energy is a well-proven and reliable technology, which has been in commercial use for decades. It is also one of the fastest growing alternative energy sources, and since 1999 growth rates have averaged 20% per year.

Due to the relatively simple technology involved and the variety and flexibility of applications – from small scale to large scale – solar energy is applicable in many contexts and is a competitive way to produce heat or power. When in operation, nearly no resources are required. The potential of solar energy – estimated at as much as one third of the world’s energy demand – remains to be fully exploited.

Ramboll has since 1994 been deeply involved in solar energy projects and is today a leading consultancy in this field. Our project references include the establishment of 15 of the largest solar heating plants in Scandinavia, including the world’s largest plant in Marstal at the Danish island of Ærø. Over the last four years we also have been involved in photovoltaic solar energy projects with electrical outputs of up to 46,300 kWh annually.

From planning to implementation Ramboll’s competencies in connection with the planning and implementation of solar energy plants include:

- Project management
- Technical and economic feasibility studies
- Authority liaison and permits
- Design of plant, energy storage, monitoring and control systems etc.
- Tendering and procurement of all parts of the plant, including construction works
- Commissioning, including plant and CMS adjustment
- Follow-up on operation, including performance assessments

SELECTED PROJECT REFERENCES

- Marstal District Heating, Ærø, Denmark - 33,500 m² solar heating plant, 1993-2012
- Akershus Energi Varme, Lillestrøm, Norway - 12,500 m² solar heating plant, 2011
- Gram District Heating, Gram, Denmark - 10,000 m² + 34,000 m² solar heating plant – incl. seasonal storage, 2009-2015
- Vojens District Heating, Vojens, Denmark - 17,500 m² + 54,000 m² solar heating plant - incl. seasonal storage, 2011-2015
- Gråsten District Heating, Gråsten, Denmark - 19,140 m² solar heating plant, 2012
- Minera Gaby, Calama, Chile - 36,000 m² solar heating plant, 2013
SUPPORT AND CONSULTANCY SERVICES

As the owner’s engineer Ramboll typically manages the project and acts as the engineer in all phases and technical areas. Our clients include district heating utilities and municipalities, and our services include:

- **OUTLINE DESIGN/FEASIBILITY**
  - Project planning and analysis
  - Energy storage
  - Technology integration

- **BASIC DESIGN**
  - Conceptual design and layout
  - Permits and authority liaison
  - Procurement

- **DETAILED DESIGN**
  - Design review

- **POST CONSTRUCTION**
  - Final takeover
  - Guarantee tests
  - Follow-up on O&M

- **TEST & COMMISSIONING**
  - Inspection
  - Final operation
  - Commissioning and preliminary take-over

- **MANUFACTURING & CONSTRUCTION**
  - Contract management
  - Construction management and supervision

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**Solar heating plants**

A special Scandinavian concept for solar heating is large-scale plants, supplying energy to the local district heating network through a heat accumulator. Ramboll has participated actively in the development of these solar heating plants and performed research into the latest technologies and underground storage systems. We have also provided consultancy services relating to their integration into existing heating and Combined Heat and Power (CHP) plants.

**Big and small**

Ramboll has provided consultancy services in connection with both large-scale and small-scale solar heating plants, ranging in size from 200 m² to more than 50,000 m².

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**WHY CHOOSE RAMBOLL FOR YOUR PROJECT?**

- Have been involved in more than 20 different solar heating projects in ten countries around the world, covering a combined total of more than 200,000 m².
- Have participated or are currently participating in 60-70% of all solar energy projects in Denmark.
- Have in-depth and detailed knowledge and experience in the design and operation of solar heating plants.
- Participate in different related fields like energy storage projects and technology integration including biomass CHP, heat pumps and upgrading of existing heating plants.
- Independent consultant.