Zeitschrift: IABSE structures = Constructions AIPC = IVBH Bauwerke

Band: 7 (1983)

Heft: C-26: Solar chimneys: The principle - the pilot plant - prospects for the future

Artikel: Prospects for the future

Autor: Schlaich, Jörg

DOI: https://doi.org/10.5169/seals-18274

3. Prospects for the future

From a technical point of view it is already possible today to build solar chimneys of large size and generating capacity. Chimneys with heights of as much as 1,000 m give rise to no special problems. They can be built either free-standing or stayed, depending upon their height-to-diameter ratio, of reinforced concrete or in the form of a cable net or membrane structure (see Fig 1).

Even the wind turbines for the solar chimneys are no technical problem. As they are vertical-axis machines, they are from the very start much easier to master than classic wind-mills with their horizontal axes. Mounted on simple support structures placed directly on the ground, these wind turbines are statically and dynamically independent of the chimney. It is also possible to support the blades of a large-diameter turbine at their outer edges, e.g. by means of electromagnetic pads. Further one may mount in large-diameter chimneys not one turbine but 6 or 7 with a radius of $^{R}T/_{3}$ each without any great loss of generating capacity.

Thus, there remains only the aforementioned question of the most appropriate sheeting for the collector roof, a question more of an economic nature than a technical one.

At present it is simply too early to make a well-founded statement about the economic prospects of using renewable sources in general [6] nor of solar chimneys in particular. Neither the naiveté of the environmentalists nor the occasional arrogance of the "Megawatt Clan" is sufficiently capable of handling the greatest challenge in the history of mankind, which is to find the solutions to the problems of energy and population growth, which are linked through the standard of living, or in other words through energy consumption. We owe it to the Third World with its crying need for energy even today, to develop energy sources that they can afford. Solar energy should not be excluded from such considerations as long as its success or failure has not been clearly proven.

Solar chimneys represent one possibility. They permit large-scale electricity generation with simple technology where unproductive arid or desert land is available free. An added advantage is their thermal storage capacity at no extra cost. Since it may be expected, as described above, that the data collected at Manzanares support the calculations, it will have been demonstrated that solar chimneys are able to generate electricity at costs that are competitive and even lower than most known solar power plants today. Other solar energy plants may of course have other advantages, for example that they are competitive for a decentralized power supply in remote areas. Therefore, our office is also working on other types of solar energy plants in addition to solar chimneys, including in particular those with concentrators or heliostats, based on metal membrane structures, for high-temperature energy production; i.e. solar farms and solar towers (7), (8), (Fig. 25).

It is also too early to ascertain which kind of renewable energy source is worth pursuing further. In view of the seriousness of the energy problem, as indicated above, we should even refuse to admit this question, but rather demand that as many different types as possible to be developed. The research funds flowing in this direction are in any case ridiculous if we compare them with other government expenses, not to mention the military budgets. We should fight for more!!.

If this paper has shown that also civil engineers can and should join scientists and engineers of other faculties to solve the energy problem, it has served its purpose.

(Jörg Schlaich, Stuttgart)

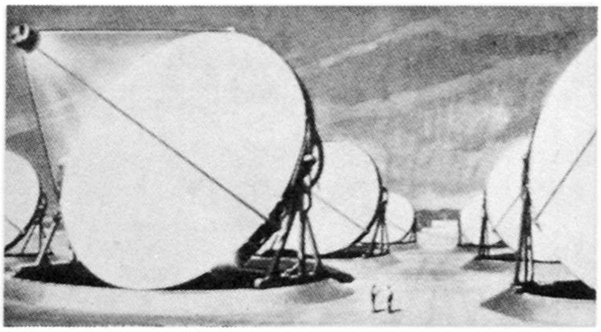
The solar chimney pilot plant in Manzanares/Spain:

Sponsor: The Federal Minister for Research and Technology (BMFT), Bonn, and his Project Management, Department for Energy Research, KFA Jülich/Fed. Rep. of Germany.

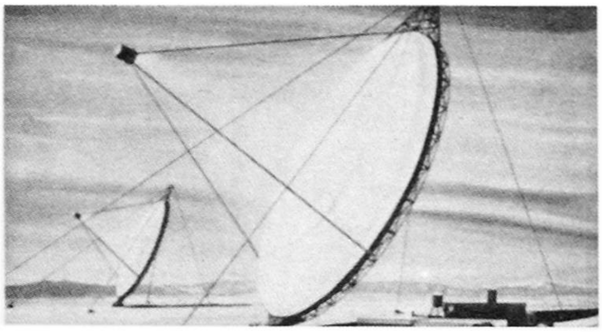
Grantee, project management, design, supervision, measurements:
Schlaich+Partner, Civil Consulting Engineers, Stuttgart
J. Schlaich and R. Bergermann
Structural staff: G. Mayr, K. Friedrich
Physical staff: W. Haaf, H. Lautenschlager

Spanish partner: Unión Electrica, Madrid

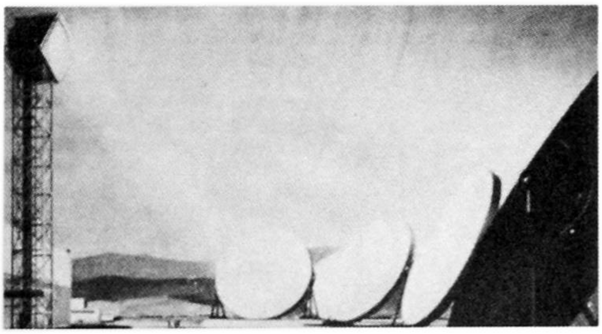
Major participating institutes and contractors:
Institut für Aero- und Gasdynamik, Universität Stuttgart
Euroconsult S.A., Madrid
Promoción de Infraestructuras S.A., Madrid
Maurer Söhne, München
Balcke-Dürr AG, Ratingen
Institut für Meteorologie der Universität Mainz



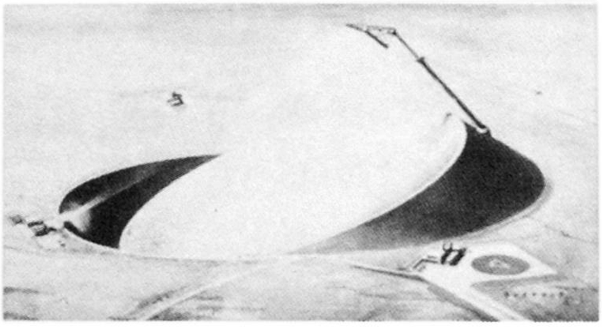
Solar Farm.
For production of electric power via steam, photovoltaic, Stirling engine or gas turbine.
A farm consists of several mirrors with diameters between 10 and 17 meters, each producing 12-34 kW electrical power.



Large Mirrors.
Mirrors which are biaxially adjustable to the sun with diameters of say 50 meters and thermal power of ~1800 kW or electrical 300 kW.



Solar Tower.
For production of electrical power via steam.
Several mirrors with long and permanently adjustable focus and with diameters of 10 to 17 meters and 70 to 200 kW thermal power form a heliostat field. They are adjusted to one common receiver.



Fixed membrane mirrors of say 80 meters diameter with thermal power of 4500 kW or electrical 750 kW.

Fig. 25: Metal membrane solar concentrators (projects)

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