Unchained energy – The new dogma of solar architecture

LARS WALDMANN, SCHOTT SOLAR

Architecture is a core scientific discipline that can be found in all societies, nations and regions. The basic assignment of architecture has not changed all that significantly over the course of history. Today, as in the ancient past, the main challenge is to design living space.

This is the mandate across all cultural borders, regardless of whether it's the yurts of the nomads who live in the tundra or the baroque architecture of European feudalism. The differentiated use of material and shapes is what gives architecture its specific cultural characteristics. The one thing that these all have in common is that the design of the building shell must always be viewed also as a response to the technological availability of energy and how society makes use of it. The modern building, our living space today, is apparently chained to a sufficient supply of outside energy. The supply lines link a building to a widely ramified network. But is this really always the case?

The sun, the world's only true supplier of energy without losses, has always played a decisive role in how building shells are designed. During the day, for instance, sunshine with an output of around 700 to 1100 watts lands on every square meter of surface area in Germany. In the sunniest regions of the world, this value can be as high as 1300 to 1800 watts per square meter.

Whether it is a question of where to place openings in a mud hut, the regulation of light entry and ventilation in Arabic architecture or the round shapes of tepees and yurts as energy-optimized spatial borders to the outside, the availability of solar energy in technological terms always plays a key role in design elements of architecture. Our main celestial body, the sun, is clearly an element that dictates the design and the materials used.

The persistent belief in progress and the seemingly limitless availability of energy in the 1960s and 1970s has brought about an architecture in which an artificial sun in the form of generous heating surfaces and lighting systems in windowless building structures became a design element and a form of expression in modern architecture.

The architecture of the 21st century, on the other hand, can rely on proven solar technology that enables the building shell to be creatively designed as an energy shell. In focusing on the basic assignment of architecture and in light of climate change, as well as the fact that fossil energy sources are running low, the self-sustained supply of energy to buildings and their occupants through the building shell will become a key aspect of new architecture that is of growing importance. In other words, solar architecture presents the dogma of designing living space in a futuristic manner. Decoupling the living space from its outside energy supply by coupling the solar energy into the inside. The idea of a plus energy architecture, as it has been realized by a team at the Technical University of Darmstadt under Professor Hegger, could set a precedent and really unleash energy inside living space. The approach taken by Professor Hegger and his team won first prize in the Washington Solar Decathlon 2007. The building is designed in such a manner that it not only covers the energy requirements for climate control and its occupants' electric power consumption with its energy shell, but also generates a considerable surplus of electricity that would then be available for electro mobility or to refinance the investment costs in the future. Today, a true to original replica of the house is on tour on behalf of the Federal Ministry of Transport and offers road shows for citizens and schools.

More and more often, the dogma of solar architecture, in which glass has become its most important building material, is being picked up and executed in an innovative manner. As a glass manufacturer with a 125 year tradition, Schott is extremely focused on glass as a building material and offers numerous functional glasses for use in architecture, lighting and interior design. And as a solar company with a 50 year tradition, Schott began concentrating on building-integrated photovoltaic at a very early stage and has developed special products for this application. In accordance with the company's objective of improving people's working and living conditions through innovative products, Schott has now combined all of the relevant architectural products and activities into one management unit. This unit has prepared the information on products from the areas of flat glass, specialized glass, fiber optics and solar to meet the needs of architects. An internet presence of its own makes it easier to search for products and contacts inside the organization. Everything comes from a single source.

Ambitious projects on sustainable architecture and city planning confirm this trend. The Masdar-City project in Abu Dhabi is only one example. China and India also have plans to design the urban development of mega-cities to suit the growing population in a sustainable and environmentally friendly manner. This is one of the

central challenges facing our generation. In addition to taking on this responsibility, this also offers an incentive to pursue innovative architecture with a large-scale signal effect. Some economists feel that the global importance of designing living space based on the social aspects of rising population numbers and generation of energy in a way that conserves the environment could result in a new long-term economic cycle that is being triggered by fundamental innovations today. Nikolai Kondratieff and Joseph Schumpeter defined their economic theory of long cycles in 1939 by saying that such a cycle lasts around 40 to 60 years and is said to be carried by one basic innovation.

The automobile and information technology are the innovations that resulted from the last two cycles. The steam engine and the chemical industry coined the early years and the modernist period. Perhaps solar technology will become the basic innovation for the next Kondratieff Cycle.

For instance, despite the reservations that the global financial crisis is causing, many market watchers feel that the so-called green technology will develop into a driving economic force for industry. Analysts in the solar field share this opinion and are relatively optimistic about the developments they are forecasting. The appraisal of the government representatives of the BMU (Federal Ministry for the Environment) at the 24th Symposium on Photovoltaics held in Bad Staffelstein at the beginning of March, as well as the Market Workshop of the EPIA (European Photovoltaic Industry Association) that took place at the end of March in Frankfurt, come to the conclusion that the prospects for moderate market growth in photovoltaics in 2009 are quite realistic. For Germany, the new Renewable Energy Sources Act, or EEG, that went into effect in January of 2009 offers attractive yield possibilities for system operators. With a return that exceeds 6 percent, a PV installation on the roof performs much better than any fixed-term deposit account currently being offered. For the individual operator, this investment even pays off double: following amortization of the system and the returns it has already generated, it can still permanently lower the electricity bill, even after 20 years. By this time, the ideas on how to store energy and the electro mobility of the solar power generated will be able to be used in many new ways. Schott Solar offers high quality modules for this type of long-term use that were developed to achieve sustainable high yields and are based on 50 years of market experience.

Over the long term, most experts have no doubt that the sun can be regarded as the energy supplier for future generations. The potential lies not only in the local use of photovoltaics in a building, but also in converting solar heat into electricity via receiver technology in parabolic trough power plants. These can supply electricity for use by entire cities. SCHOTT Solar is successfully active in both areas. In any case, innovative glass technology serves as the basis for this type of development that already enables us to design our living space in a sustainable manner for future generations today.