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EDITORIAL

Editor's message: beaming energy from the space

Our society is consuming energy figures which are so large that sometimes they become meaningless when mentioned; electricity alone in 2012 was 20,900 TWH (IEA World energy statistics), 68% from fossil fuels, 11% nuclear and 21% 'renewable'; the energy that comes from resources that are not significantly depleted by their use, such as sunlight, wind, rain, tides, waves and geothermal heat. It is estimated that energy consumed in the buildings (residential and commercial end users) accounts for 20.1% of this total ([International Energy Outlook 2016). Losses are not considered here, but they are not negligible, either.

Despite the different perspectives of global warming deniers about anthropogenic CO_2 as the cause of climate change, the facts are that the amount of fossil fuels employed for producing electricity is huge; their combustion produces this compound; CO_2 absorbs infrared radiation having a greenhouse effect that in turn contributes to global warming; and the average global temperature has been increasing notoriously in the last 15 years, which means that global warming is actually happening.

Environmental issues regarding to CO_2 emissions, and that sooner or later these resources will be over, are the driving force for researching about methods for reducing the use of fossil fuels. This item is so important, that regardless the technological challenge, several proposal solutions are under evaluation.

Solar energy is probably the only alternative source for reducing the CO_2 emissions. It can be taken in several indirect forms, wind and waves, or directly solar panels transforming light into electricity, or by basic heating. About half of the Sun radiation is infrared, average isolation over at ground level in a clear day is optimistically about 5 KWH/m^2. Panels over the surface must be large, and must interact with a good storage system to achieve a reliable source.

In 1973, Peter Glaser patented a method and apparatus for converting solar radiation to electrical power, using solar panels placed in the space and send the collected energy to the Earth by means of microwaves. This method avoids the atmospheric filtering and the interruption of the day–night cycle, so that energy could be delivered almost continuously.

Despite the cost of this proposal, it is worth to study it today, since in the future it could be a practical alternative for power supplying to the always growing energy demand of the modern society. This proposal requires that the transmitted power is collected on Earth by a great antenna and a system that converts microwaves beamed from the space directly into electricity. One advantage is that this energy can be delivered to different locations over the Earth. Perhaps the solution is a combination of ground panels in places with high isolation, and this system in places close to the north or south latitudes where isolation is weaker.

A challenge is that the weight matters in the new components, so the best devices would be the most efficient, not only in terms of energy conversion from electricity of the

solar panels into microwaves, but in terms of weight power ratio. Another issue will be reliability, since, obviously, replacement or repairment will be difficult.

The ability for aiming the beam property is also essential, both for efficiency issues as well as for concerns due to the idea from the public of having a microwave beam towards the Earth that, although invisible, could sound dangerous, especially for those who believe that microwaves affect health. However, the size of the installations must be considered; a beam large enough so that energy density, in combination with large antennas that are strategically located, the exposure to microwaves is not greater than what we already experience by broadcast towers, mobile phone signals, and even Wi-Fi and Bluetooth devices, so there is no reason to be afraid.

Alternatives for not polluting energy sources are being implemented every day, it looks like the right time for applying this technology is not tided by engineering or safety, but the comparative cost, so that it is possible that this option will remain in queue for some time.

The efficiency of the solar panels in space has been proven for years in the International Space Station as well as in other satellites and space probes; now the main issue is a matter of beaming and collecting energy. Although projects like this look expensive, it would be more expensive not to be ready with a proper technology when it is necessary; so engineers in many fields must work to develop cheaper launching methods, even more efficient and light solar panels, useful also at ground level, and microwave generators. Regardless of this application, microwave engineers have been working for years in developing devices aiming to comply requirements of efficiency, lightness and reliability, which are always well appreciated.

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