stock which bears some resemblances to a bond (see below). A preferred stock-holder is entitled to dividends at a specified rate, and these dividends must be paid before any dividends can be paid on the company's common stock. In most cases the preferred dividend is cumulative, which means that if it isn't paid in a given year, it is owed by the company to the preferred stockholder. If the corporation is sold or liquidates, the preferred stockholders have a claim on a certain portion of the assets ahead of the common stockholders. But while a bond is scheduled to be redeemed by the corporation on a certain "maturity" date, a preferred stock is ordinarily a permanent part of the corporation's capital structure. In exchange for receiving an assured dividend, the preferred stockholder generally does not share in the progress of the company; the preferred stock is only entitled to the fixed dividend and no more (except in a small minority of cases where the preferred stock is "participating" and receives higher dividends on some basis as the company's earnings grow). Many preferred stocks are listed for trading on the NYSE and other exchanges, but they are usually not priced very attractively for individual buyers. The reason is that for corporations desiring to invest for fixed income, preferred stocks carry a tax advantage over bonds. As a result, such corporations generally bid the prices of preferred stocks up above the price that would have to be paid for a bond providing the same income. For the individual buyer, a bond may often be a better buy.

Unlike a stock, a bond is evidence not of ownership, but of a loan to a company (or to a government, or to some other organization). It is a debt obligation. When you buy a corporate bond, you have bought a portion of a large loan, and your rights are those of a lender. You are entitled to interest payments at a specified rate, and to repayment of the full "face amount" of the bond on a specified date. The fixed interest payments are usually made semiannually. The quality of a corporate bond depends on the financial strength of the issuing corporation. Bonds are usually issued in units of $1,000 or $5,000, but bond prices are quoted on the basis of 100 as "par" value. A bond price of 96 means that a bond of $1,000 face value is actually selling at $960 and so on. Many corporate bonds are traded on the NYSE, and newspapers carry a separate daily table showing bond trading. The major trading in corporate bonds, however, takes place in large blocks of $100,000 or more traded off the Exchange by brokers and dealers acting for their own account or for institutions.

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EARTH'S INFRARED RADIATION:

NEW RENEWABLE ENERGY FRONTIER IS TO TACKLED

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The Earth continuously emits 100 million gigawatts of infrared heat into outer space. That is enough to power all of humanity many thousands of times over. Capturing even a fraction of that would mean an end to our energy woes. Researchers from Solar energy is the energy derived from the sun through the form of solar radiation. Solar powered electrical generation relies on photovoltaics and heat engines. A partial list of other solar applications includes space heating and cooling through solar architecture, day lighting, solar hot water, solar cooking, and high temperature process heat for industrial purposes. The sun gives us enough power to light up the country, it is always there, and always will be there tomorrow. Why not use it since it is giving us all this energy every day. The sun produces the biggest deposit of renewable resources in the world, it would be a great opportunity to be able to harness that power and hopefully over time not rely on the earth for energy at all.

Harvard University is now proposing a way to harvest this untapped source of renewable energy. They have come up with two designs for a device they call an "emissive energy harvester" that would convert IR radiation into usable power. It should be noted that this technology is not sufficient for an efficient, affordable harvester. The devices designed generate power by emitting infrared radiation. But these devices emit much more radiation than they receive. This is the imbalance that one can take advantage of to create DC power.

The first design, which appears to be not the most promising, is a heat engine running between the Earth's surface and a cold plate. The heat flowing from the ambient surface air to the cold plate, which radiates it out into the atmosphere, would be used to do mechanical work. The concept is simple, but cooling the plate efficiently to a low enough temperature may be.

As a case study the researchers looked at how much power such a device would generate in Lamont, Oklahoma, where a facility has been measuring IR radiation intensity. They found that they would get an average of 2.7 Watts from the IR radiation emitted by a square meter of Oklahoma over 24 hours, which is pretty low for large-scale power generation.

Light energy is characterized by a dual nature both from a quantum point of view as photons and from a wave point of view as randomly polarized electromagnetic radiation with a wavelength between 400 nm and 700 nm. If the ultraviolet and infrared portion of the spectrum is included, the range of wavelengths is extended at both extremes. Presently, all practical solar cell energy collection schemes utilize the photon nature of light. For example, the conversion of solar energy to electrical energy using the photovoltaic effect depends upon the interaction of photons with energy equal to or greater than the band-gap of the rectifying material. With continued research, the maximum amount of energy captured using the photovoltaic mechanism is estimated to be around 30%.

So the researchers turn to rectifying antennas, or rectennas (Fig, 1). A rectenna is a rectifying antenna, a special type of antenna that is used to convert microwave energy into direct current electricity. They are used in wireless power transmission systems that transmit power by radio waves. A simple rectenna element consists of a dipole antenna with an RF diode connected across the dipole elements. The diode rectifies the AC current induced in the antenna by the microwaves, to produce DC power, which powers a load connected across the diode. Schottky diodes are usually used because they have the lowest voltage drop and highest speed and therefore have the lowest power losses due to conduction and switching. Large rectennas consist of an array of many such dipole elements.

The researchers argue that rectennas can be run in reverse, generating DC power while emitting radiation, rather than absorbing it. In their design, a nanoscale antenna very efficiently emits Earth's infrared radiation into the sky, cooling the electrons only in that part of the circuit. Because the diode is at a higher temperature than the antenna, current only flows from the diode to the antenna. And because the antenna acts as a resistor, this results in a voltage.

Rectennas are traditionally used to generate power from microwaves, but can be used for higher frequency radiation, all the way up to visible light. Infrared frequency rectennas are a developing technology and the proof-of-principle devices demonstrated so far would generate very little power. But further technological advances could improve their efficiency.

Applying solar-cooking techniques such as reflectors to heat up the rectennas could also increase efficiency. For example, in the case study, raising the temperature of a rectenna-based harvester from 20° C to 100° C using solar-cooking techniques would increase the power density of a rectenna from 1.2 W/m^2 to 20 W/m^2. Solar panels for heating and cooking are already used in much of the world. So, we could easily couple that to the (infrared) harvester.

The promising advantage of IR antennas is that they should be easy to make on large areas at a reasonable cost. The critical challenge will be making diodes that would work well at the low voltages that would be expected in the harvester. The researchers suggest a few options to get around this problem. One is to use specially designed low-voltage diodes such as tunnel diodes and ballistic diodes. Theoretically, high efficiencies can be maintained as the device shrinks, but current optical rectennas have only obtained roughly 1% efficiency using light.

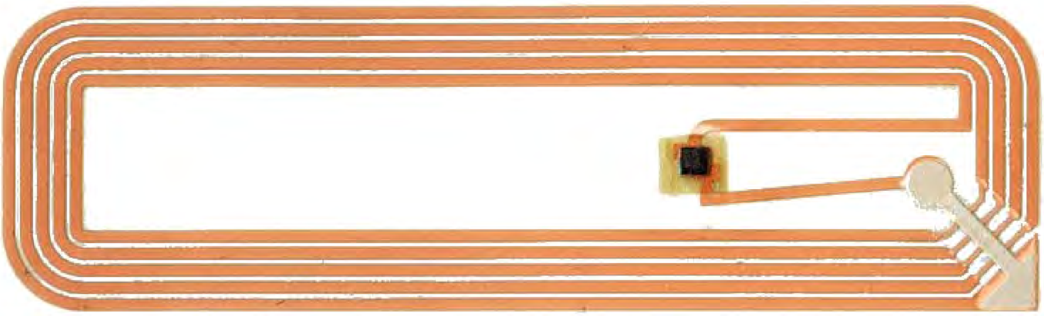

Fig 1 – Rectenna

Needless to say, this vision of IR energy harvesters for renewable power rests on engineers overcoming several technical challenges. This is certain to be a new energy frontier to tackle. However we can imagine one day a sheet printed with thousands of tiny infrared-harvesting rectennas that could be laminated on a solar panel or integrated into a solar water heater.

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THE TYPES OF CONTAINERS IN USE TODAY

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This article attempts to describe some of the types of containers in use today, and highlight some of the problems associated with each and all, in terms of cargo carriage. There are many types of containers in use today, but the purpose of each of them is essentially the same – quick and efficient handling and stowage, and compatible carriage between transport modes. With this in mind, itis somewhat of an irony that there is no complete world-wide standardization with regard to design, construction, materials, dimensions, etc. The most common standards are set by the International Standards Organization (ISO) and the most common containers have lengths of twenty feet (6.1 m) and forty feet (12.2m). These containers are often referred to as TEU’s (twenty foot equivalent units) and FEU’s (forty foot equivalent units) and have an ISO width of 8 feet (2.4 m) and height of 8 feet 6 inches (2.6 m).

The tare weight of a container is the weight of the container without cargo, and this will vary depending on the fittings, weight of construction materials and size of the container. It will typically range between 2-2.5 MT for a TEU and3.5-4 MT for a FEU. The payload weight is the weight of the cargo itself, and apart from the type of cargo this will be constrained by the container’s cubic capacity and the maximum gross weight (the tare weight plus the payload weight) not just for the container itself in terms of structural constraints, but also any weight restrictions imposed by State transport systems.

General purpose containers. As the name suggests, these closed containers are suitable for most types of general cargo, and temporary modification can allow carriage of solid and liquid bulk cargoes. Design and construction are basic - a metal box, with full width doors at one end and a