The Case for Solar Thermal Cooking: Free Fuel—Zero Emissions

Although the sun provides our planet with more energy in one hour than the entire human race consumes in a year, only a small fraction of that endless, free fuel is currently being utilized. With simple solar cooking devices, this energy can be captured every day the sun is shining to cook the food and heat the water of hundreds of millions of people living between thirty-five degrees north and south of the equator—latitudes with the highest insolation (annual days of sunlight). Although many types of solar cookers have been manufactured and used around the world over the past three decades to help people take advantage of this abundant free energy, current estimates are that there are still less than two million in use around the world.

Why aren't more people using solar cookers? There are several reasons. First, solar thermal devices, which can bake, roast, fry and stew food, boil water, provide indoor heating after dark and even generate electricity, are a radical technological departure from the unhealthy and environmentally destructive cooking fires that humans have been accustomed to using for tens of thousands of years. Just like improved biomass combustion technologies, solar cookers will not be adopted at a self-sustaining rate by traditional societies unless their design and their introduction: 1. Are sensitive to local eating and cooking practices; 2. Include long-term follow up, effective marketing plans and access to micro-credit; and 3. Offer an affordable, easy-to-use and maintain and durable product. Finally, as long as countries are providing free or low cost gas stoves, gas canisters and subsidized LPG or kerosene, the incentive to switch to unsubsidized solar thermal technology will remain too low to reach the tipping point.

Integrated Cooking (ICS): The goal of the Global Alliance for Clean Cookstoves is to save lives, improve livelihoods and combat climate change by reducing the smoke from cooking fires. This goal can be most effectively met by providing our planet's neediest populations with the most energy-efficient means to cook food and heat water. For optimum results, the three-part Integrated Cooking System should be the foundation of this effort.

The first principle of ICS is to take advantage of free solar energy whenever the sun is shining by using an appropriate solar cooking device during daylight hours. The second is to burn scarce biomass fuel, kerosene or LPG only after dark and on cloudy days. The third is to multiply the efficiency of both of combustion and solar cooking by using a retained heat container (a box or basket stuffed with wool, cotton, straw or paper) to insulate the heated pot of food and continue the cooking process (or keep cooked food hot) for several more hours. With ICS, families can cook anytime and still dramatically reduce their overall fuel consumption.

The three types of solar cookers (**panel/box/parabolic**) offer a variety of cooking methods and temperatures, at prices that range from less than $20 to over $300. The world's least expensive solar cooker, the foil and cardboard **panel** Cookit, folds into a 12x12 inch square for easy storage and cooks like a crock-pot at up to 275F. Cookits are being manufactured, distributed and used by tens of thousands of Darfur refugee women in eastern Chad. Could this device be improved? Of course it could. The life of the Cookit could be extended from several months to several years if it were made with more durable reflective materials and a waterproof backing that can stand up to the punishing desert environment. NREL solar thermal researchers have generously offered to share with the solar cooker community data about reflective materials, which NREL

has developed for large solar thermal arrays generating electricity in the Mojave Desert. Funding is needed to support the research and field testing of these materials with the Cookit. Funding is also needed to find materials that could provide a more durable replacement for the clear plastic, heat resistant bags currently used to provide glazing around the cooking pot.

Glass-topped solar box cookers made from wood, plastic, cardboard, sheet metal and even chopped straw and mud are providing people in fuel-starved, sun-rich regions with a means to cook several pots of food unattended during the day at temperatures up to 375 F using free solar energy. A solar restaurant in the arid Chilean Andes where the sun shines 310 days per years prepares most of its food and bakes its bread using solar box cookers.

More than a million parabolic solar cookers, which generate a concentrated beam of light hot enough to ignite a piece of paper, are being used in China, India and Africa. In parts of western China and Tibet they have become a common sight inside family compounds where large pots of water are kept continuously at a boil for household use even on freezing but cloudless winter days. A growing number of trekking lodges in Nepal cook with parabolic solar cookers to save on fuel costs and to reduce deforestation. The parabolic dishes used with Scheffler community kitchens provide large and small schools, hospitals, religious institutions and individual homes with solar energy that permits smoke-free, indoor cooking using only the light of the sun.

The Devos parabolic solar cooker has an ample work surface that can be used for grilling meat. This parabolic stove on wheels, which is ideal for street vendors, can be manufactured locally with plywood, sheet metal and ordinary mirrors. The Sol Source 3-in-1 is a portable parabolic solar cooker of bamboo, yak wool and Mylar developed for use by pastoral communities. It cooks food, charges a thermal space heater and makes electricity. All these devices need more research to make them less expensive, more powerful and more durable.

Solar thermal technology has additional applications which can save fuel and reduce harmful emissions caused by the wood, dung and charcoal fires currently used in much of the world to accomplish common tasks. They reduce the need for imported LPG and kerosene, the purchase of which is subsidized with funds that could be better used to improve health, education and infrastructure. Solar thermal devices are being used for roasting coffee, sterilizing medical instruments, ironing clothing, dyeing fabrics, drying surplus crops for storage or sale, producing marmalade and rendering sap into syrup. Small solar cookers like the Cookit can be easily carried to worksites or used by herders to heat water or cook a meal without tending a fire.

The Solar Cookers World Network's 120 independent organizations and businesses and 210 individual promoters in fifty-eight countries urge the Global Alliance for Clean Cookstoves to include significant funding for the R&D and global dissemination of solar and retained heat cooking technology in addition to improved biomass cookstoves. In the twenty-first century, we cannot ignore the vast potential of the sun to provide limitless, free solar thermal energy for zero-emission cooking in the developing world.

For more information please go to Solar Cookers International's website, where you will find a continuously updated, country-by-country, searchable database on solar and retained heat cooking technology.