DISCUSSION OF DIFFERENT MEASURES TO MONITOR AND BOOST THE USE RATE OF SOLAR COOKERS IN DEVELOPING COUNTRIES

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ABSTRACT

Solar cooker use rates have been the object of heated debate for some time. Solar cooking would be easier to promote if use rates could be monitored in a reliable way. Also, this would open the possibility for efficient, use rate based incentives.

A number of questions have to be addressed:

- How to maximise the impact of cooker use in terms of savings and green house gas (GHG) reductions?
- How to monitor this impact in a reliable, feasible and convincing way?
- What kind of incentives should be used and how?
- Who should be the highest priority beneficiaries of these incentives?
- How to make sure that solutions to these questions are compatible with today's and tomorrow's energy systems?

The discussion is based on results from field tests, as well as on experience from European cost-based feed-in legislation. Recommendations are presented.

Keywords: solar cookers, use rate, monitoring, incentives

1. INTRODUCTION

Solar cooking might not be a major part of the global energy supply although many people believe this is about to change. Small as it is, it is a passionate issue - there can be harsh reactions to the mere mention of solar cooking. Some years back, the technology itself was under attack - Roger Bernard (the father of the original panel cooker) recalls a man challenging him in public to boil an egg in a solar cooker. Roger did, and he didn't stop there.

It was easier then. The technical people ended up doing their homework. Solar eggs were forgotten - but the passion remained. Solar critics now concentrate on the acceptance issue, with some success.

Acceptance is measured in use rate – in other words, how frequently a given device is used. Solar cooker use rates have been the object of heated debate for some time. Positions can be quite extreme: proponents sometimes assume that solar cookers are used all the time, by a maximum of users. Critics tend to reply with generalisation of isolated observations ("when I visited the village, not a single solar cooker was used - solar cookers are not accepted by users").

2. THE MONITORING OF SOLAR COOKER USE

Solar cooking would be much easier to promote if use rates could be monitored in a reliable and convincing way. Also, this would open the possibility for efficient, use rate based incentives.

Unfortunately, as the Solar Cooker Field Test in South Africa (Bierman, 1999, Grupp, 2003) has shown, the monitoring of a non-fuel device is not easy; where there is no fuel used, fuel use can't be measured - at least not directly. One cannot just meter electricity use, or count gas bottles, or weigh biofuels - although one has to do all this, and more. A pretty difficult question has to be answered, with some assumptions attached. The question is twofold:

1. how much energy would a given household have used if there would not have been a solar cooker in the household?

2. how much energy did the given household actually use?

While part 2 of the question can be measured, part 1 is open to doubt. In general, fuel use by a non-user control group serves as an approach. The difference between the two values is assumed to be the fuel saving by the solar cooker which can be questioned, particularly in situations of difficult fuel supply.

Also, the whole procedure takes a lot of time, money, and qualified and motivated monitors - for a result which does not convince critics and keeps solar cooking out of potential high impact projects.

There is an easier method: the determination of the number of "meal portions" prepared on the solar cooker. The reasoning is that a meal portion prepared on the solar cooker would have been prepared on another stove if there would not have been a solar cooker in the household.

On this basis, data on average fuel consumption per meal portion can be used to estimate solar cooker fuel savings. Some assumptions remain, such as the linearity of fuel consumption to the number of meal portions. But, while the quantitative precision of this method is limited, the advantages are convincing:

- the resulting fuel savings are definitely related to the actual use of solar cookers

- the monitored information is quite basic and therefore easy to control: how many times, and for how many meal portions, was the solar cooker used?

- this basic information can be monitored with an automatic use meter (see Fig 1)

- the monitoring costs remain reasonable.

3. <u>HOW TO MAXIMISE THE IMPACT OF COOKER USE IN TERMS OF SAVINGS AND GHG REDUCTIONS?</u>

There are three basic options:

1. technical development to improve the "usability" of the cookers (morning / evening / limit conditions / versatility / capacity / handling / after sales service / user support / product credibility / durability) - this is mainly a technical problem, but it has cost implications

2. improve manufacturing and distribution to step up the number of cookers sold which implies a) that the real and perceived benefits outweigh the cost and inconvenience and b) that the cooker is simply affordable which puts tough requirements on the whole supply and support chain

3. increase the use rate which is the main impact factor: the best cooker is worthless if it is not used.

4. <u>WHAT KIND OF INCENTIVES SHOULD BE USED AND HOW?</u>

There are lessons to be learned from incentive schemes for other renewable energy technologies. A comparison of the success of the feed-in scheme of the German "Erneuerbare Energien Gesetz" (EEG), with the relative failure of quota based schemes (Grupp, 2005) clearly shows that incentives should not be directed at hardware (such as power plants or solar systems) but based on energy actually produced. It is essential that the recipient - just like any utility - only gets paid for kWh; if he doesn't deliver energy he loses his investment, which is a powerful motivation in the right direction.

What does this mean for solar cooking? It means that subsidising cook*ers* is less effective than subsidising cook*ing*. This has important implications on who should be subsidised as a priority: it is not the cooker developer, manufacturer, distributor, but the cook.

This is in contradiction to the way solar cooker projects were usually conceived which was "charity money buys cookers" which were given (or sold) to potential users who were expected to use the cooker - and who often did not. Apparently, the perceived benefits (in terms of monetary savings, fuel savings, clean air, safety…) were not worth the trouble (need for a change of behaviour, uncertain results, limits in performance, hassle of solar cooking…). Solar cooker projects can reduce the trouble (with improved cookers), and/or increase the benefits, spelled out: *pay the cook real money for the real use of the solar cooker*.

5. ADVANTAGES…

1. At first glance, paying for the use of solar cookers looks like a bribe, but it is a fair exchange. According to Kyoto logic, GHG reductions are negotiable. The cook, in emitting less GHG, does a favour to all, from industrial emitters to the atmosphere.

2. Paying for the use of solar cookers should work if the payment is right - and it can be increased until it works. Even today's perfectible solar cooker use rates save GHG emissions for less than 8 US$/t CO2eq (Grupp, 2003).

… AND REQUIREMENTS

A metering and payment system has to be set up which meets some important requirements. It has to be:

1. credible: users, investors, market players must have enough confidence to give it a try;

2. tamper-proof: the meter must be able to distinguish between a cooker just standing in the sun and a cooker being used. Tests at Synopsis have shown the feasibility of such a concept for concentrating cookers, a concept for box cookers is ready for testing; and

3. feasible: the sums involved cannot carry a costly system.

A solution for a particularly favourable case - based on accounting by prepaid electricity meter cards in the framework of an existing local or central grid - is described below.

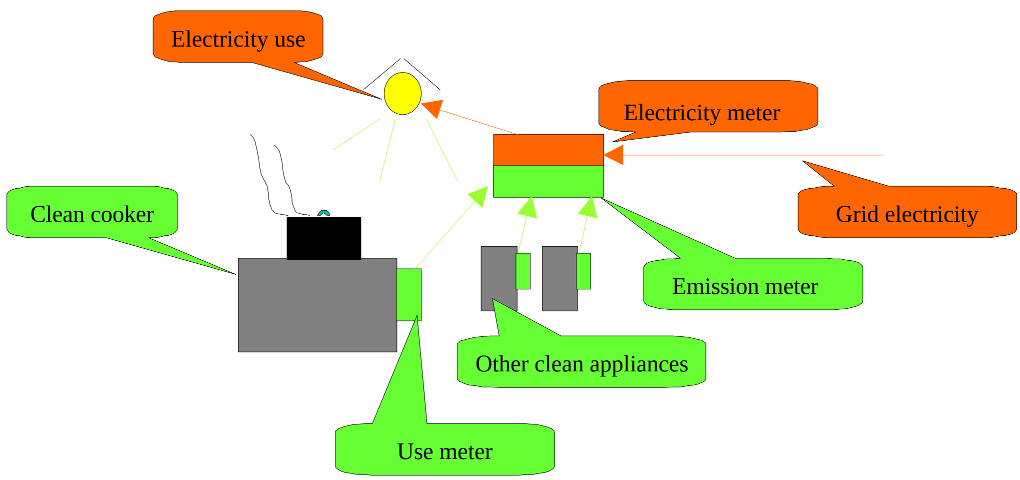

Fig 1: Clean cooker use metering concept: the cooker is fitted with a "use meter", counting meal portions which are converted into avoided emissions using carbon value. Prepaid meter cards are credited with the corresponding amount for grid electricity use. Other clean devices can be added to the system. The concept allows for a virtual heat-to-electricity conversion, provides for emission accounting by prepaid meter cards with little extra cost. There is no need for extra electrical capacity, since no electricity is used for cooking. The grid can be local.

6. APPENDIX: ARE THESE PROPOSITIONS COMPATIBLE WITH TODAY'S AND TOMORROW'S ENERGY SYSTEMS?

It would not make sense to build a parallel energy supply system that would either become obsolete once the electricity grid arrives or - worse - would keep the grid away.

One can distinguish between different grid functions. The function of today's grid is to supply brute power produced in central power plants through feeder lines. For cooking, it could bring in power for electric cookers. Due to high cost, losses and limited central generating capacity, there are many places where it will never arrive.

The future grid will fulfil several functions; it will use feeder lines only as back-up solution, when local generation capacity is low; it conveys less electricity (only for electricity-specific purposes), over shorter distances - and at lower cost. It would not be used to supply heat for cooking, but rather the intelligent control and meter-based incentive and payment functions - the heat would be supplied by more adapted and less costly sources. The additional functions of future grids are:

1. to exchange power produced in decentralised ways, between places where power is needed and places where it is in surplus,
2. to synchronise locally produced AC power
3. to transport information,
4. to act as an exchange medium for services (decentralised payment in kWh-currency).

In this way, local grid services would cost only a fraction of the services of today's grid - and would be accessible to many more users.

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