Solar Electricity cannot FIT the UK.

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The domestic rooftop Solar Panel Installation industry does not present the costs and benefits of Solar Energy correctly under the UK's 2012 Feed-in-Tariff subsidies (FIT). If it seems too good to be true then it is probably not. All the firms use a version of the same Solar Calculator which shows a significant cash profit in 25 years, but only by ignoring the bill for winter power when the solar yield is small. We will re-evaluate the actual costs and benefits.

Solar energy yields the most expensive form of electricity and would need some powerful rational to justify the expense. Only well off people can afford the initial investment to have FITs pay their entire electricity bill and return most of the capital.

The primary stated goal is to reduce carbon dioxide emissions but this is overstated by making the comparison with a UK average of coal and gas fired power stations. The CO2 savings are actually negligible on a personal, national or global scale. Everyone can save the same CO2 by insulating their homes or by driving 20% less or by switching to a low emissions vehicle.

The FIT payments are made by electricity providers and are recouped by charges to everybody else's electricity bills. This represents an unearned, undeserved income for the solar homeowner with negligible public benefit. The installer jobs created are fully supported through the FITs regime by all UK taxpayers. Since the mechanism is not a direct grant or payment by the government the solar installer industry claims it is not a subsidy by another name. The equipment, down to screws, nails and timber is all of foreign manufacture and does not benefit UK industry.

The Calculations

The Solar Calculator needs basic information. An installation of a south facing 2.9kW-peak set of panels in Bournemouth would cost £11,700 and yield a total of 2631 kWh/year. This is about 90% of the usage for a 3-4 bedroom home in Bournemouth, which would cost £9472 at 14.4 p/kWh from the grid over 25 years. However, most of the energy is delivered in the summer when demand is at its lowest so the homeowner uses only **25-50%** of the yield, depending on weather patterns for the year. Choosing a 40% usage gives 1052 kWh and the unused 1579 kWh goes back to the grid. The output declines by 20% over 25 years, a 20% to be paid for at the full grid price. This decline is not evaluated by the Solar Calculators. The latest panels have an efficiency of 18% in converting solar energy to electricity but further improvements in yield and cost are some years off.

Early adopters of solar panels will have paid all the costs themselves. Over 25 years this means the cost of this 1052 kWh is **44 p/kWh,** compared with grid electricity at 14.4 p/kWh in 2011 which would be charged for the 1578 kWh needed in winter. If the home had had a meter capable of selling the summer excess solar to the grid at a commercial rate of, say 8 p/kWh, this would reduce the cost to **22p/kWh**. Clearly, solar energy is not financially viable for the average UK homeowner without large, permanent subsidy by the government.

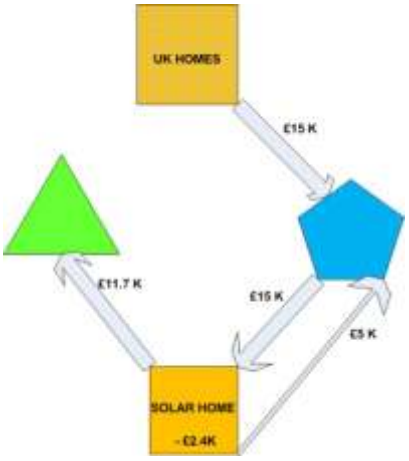

Diagram: Cash flows show that UK Homes and the Solar Home owner pay for a solar panel installation.

So, the FITs are 21 p/kWh for every kWh generated, whether you use it or not, and an extra 3 p/kWh for each unit returned to the grid. This amounts to £600 /year for 2631 kWh. The winter power bill is £227, taken at source by the power company, and you receive £373 in cash. In 25 years this yields £9314 towards the initial £11,700 investment. The Solar Calculator ignores the winter bill and states the whole benefit as £14997, increased by £76 with a little double accounting of benefits. Still, the entire electricity bill of £9472 has been paid, though the capital

repayment account is still down by £2386. Like all such schemes, the benefits build up slowly. Sell the home in 10 years and the investment will be lost in the noise of the sale. The diagram above shows who benefits promptly.

Had one simply paid the electricity bill from the £11,700 instead of buying solar panels the account would stand at +£2228.

Under the previous FIT rate of 42 p/kWh, from which many are benefitting, the profits, or ill-gotten gains, will be substantial.

CO2 savings of 31 tonnes are claimed but the DECC figures give 24 tonnes against a gas fired power station which is 40% of emissions from a coal fired station. Other websites, such as carbonfootprint, make similar high claims for CO2 emissions. Closing all our coal fired power stations would save over a billion tonnes in 25 years.

This analysis assumes that the excess cash was simply saved or even spent. The picture improves greatly if the cash return is added to a savings account with a compound yield of 4% less tax. The account would hold about £14,004 at the end. Note that it would be disastrous to borrow the original £11,700 from a bank. Similarly, if the £11,700 was in a savings account at 4% less tax, drawn down for the electricity bills, there would still be £11,900 in the account after 25 years.

Inflation

Inflation and rising energy prices are not evaluated and are more difficult to judge. The FIT payments are index linked to the retail price index ,factor R, currently running above 4%. However, this is likely to lag several points behind the price of grid energy, factor G, especially if it comes from windmills. The panel performance will also decline by d=5%. The effects are illustrated in the Chart that shows the shortfall which would develop below 85% usage in 10 years at current inflation rates. [p/kWh=F*21*R + (1-F-d)*(24*R-14.4*G), R=G=1 in 2011, R=1.42, G=1.84 in 2021].

To be in profit at all one needs to invest the cash benefits into an account which keeps pace with the rise in electricity prices – 7% seems plausible. These are complexities which any well off solar investor should be able to handle.

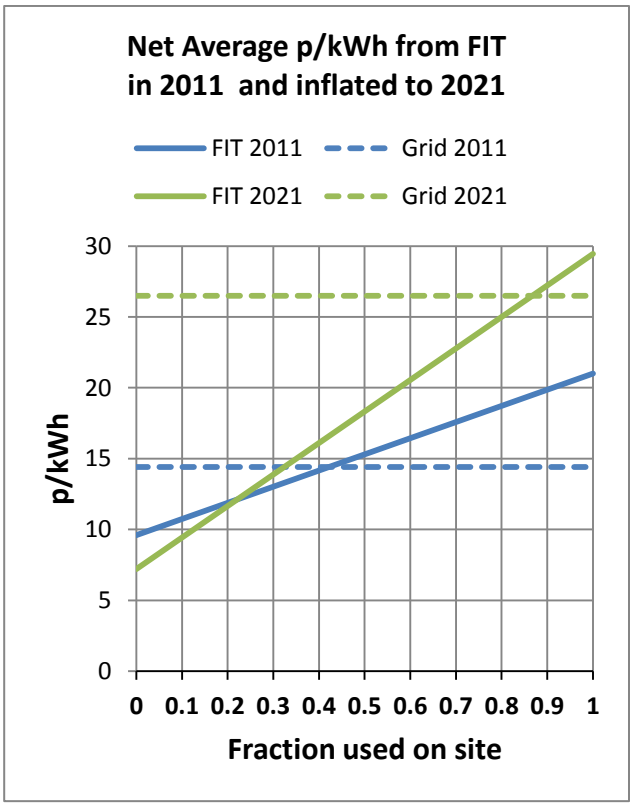

Chart: Impact of Usage and inflation on FIT support for Solar Home. By 2021 electricity prices will inflate faster than the RPI.

The best alternative is to invest the £11,700 so as to pay the electricity bills from the earnings. This also means that the capital is always available should circumstances change.

Costing a Distributed Solar Power Station

A power station generating an average of a million kW/hr gives 8.76 billion kWh/year. This could be matched by installation of 3.3 million rooftop generators at 2.9kW each, which amounts to almost every suitable rooftop in the UK. This will not happen. The installation cost of this ONE solar power station would be £39Bn. The FIT cost to the UK over 25 years would be £50Bn, or £100Bn over 50 years, the lifetime of a new nuclear power station costing £7Bn. Perhaps these numbers are so small compared to the national debt that they do not matter?

Smart Meters

Smart meters benefit the energy suppliers directly and customers only in a secondary way. They will show how much electricity is exported if the home has some renewable source so they can charge for every kWh not exported as clouds sweep across. The meters will give accurate real time measures of who is using electricity and when. This will enable the suppliers to forecast demand more accurately and also adjust charges to manipulate and smooth out demand. You get to pay for the meter.

Where is Solar Electricity Viable?

There are many UK niche applications where stand alone gadgets are good value. Solar powered, motion activated lighting can work well all year round. Active Road signs in remote places are economic.

There is a great deal more sunshine below the 40th parallel. The solar output can be doubled and, with daytime demands for air conditioning, all the electricity can be used on site. In developing countries or any location without grid connections almost **any electricity** can be far more valuable than its price. The relation between cost, price and value is an important factor.

North Africa qualifies well but, after revolutions the local populations expect to achieve a much better lifestyle. They will need a large fraction of any solar power generated there. The DESERTEC project to build vast solar power stations in the Libyan desert to service much of the EU over a large Supergrid network provides very expensive energy. It would be excellent for the Libyans.

The 2012 FIT subsidies effectively buy rooftop solar panels at public expense. It is a wildly expensive way to build a solar power station, losing any advantage of scale. Solar energy in the UK is not commercially viable and no energy provider would build one without a permanent subsidy to cover the difference between the lowest cost clean energy and solar. Three million panels to produce an average Gigawatt of power would occupy 30 sq km. of land. Solar energy, based on current technology and costs can never make a significant contribution to our needs.

The calculations of real cost and benefit from these solar deals is quite straightforward. Public institutions like churches, charities, Councils, schools and hospitals should make the same checks. Even if a deal seems to give a large profit organisations should realise that it simply uses up money which could be better spent and will eventually come out of other revenue sources.

We conclude that Solar rooftop power should not be deployed in the UK at any public expense or subsidy.

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