Photo: Fraunhofer ISE

Eicke Weber, head of Fraunhofer ISE, says net-metering should replace feed-in rates when grid parity is reached, which may happen as early as 2014 even in Germany.

# Grid parity, net-metering and feed-in rates

**Future energy policies:** The updated "Freeing the Grid 2008" report released at Solar Power in San Diego provides an overview of net-metering policies in the US. But what will grid parity mean for net-metering and feed-in rates? A closer look reveals that any net-metering policy that properly protects investments in solar will have to look a lot like a feed-in rate even after grid parity, while feed-in rates do not in fact have to be higher than the retail rate.

Depending on your area's amount of sunlight and retail electricity rate, electricity from solar panels will soon cost no more than power from a wall socket. Indeed, on some remote islands – such as Hawaii, France's Dom/Tom départements, and Corsica – grid parity has probably already been reached thanks mainly to the rising cost of diesel to power generators. According to the US Energy Information Administration, the residential retail electricity rate skyrocketed in Hawaii from around 23.5 cents per kilowatt-hour in June, 2007 to over 33 cents per kilowatt-hour a year later. Market analysts expect grid parity to be reached in sunny places like California, Arizona, Spain and Italy in only a few years. And according to BP's web site, George W. Bush has forecast that grid parity will be reached in the US as a whole by 2015.

So it was surprising when Eicke Weber, head of Germany's Fraunhofer Institute for Solar Energy Systems, announced that grid parity would be reached in Germany a year earlier than it would be in the US. At the "Energie Innovativ" Symposium held in Nuremberg in June, he explained that the rates paid in Germany for solar would drop to 27.9 cents per kilowatt-hour by 2014, putting us below the retail rate of 28.3 cents per kilowatt-hour forecast for 2014.

Weber later told **pv magazine** that his calculation was not only based on the annual eight percent reduction in rates (called "degression") paid for solar in Germany, but also on a six percent increase in the retail rate of electricity – and, he added, "I have heard warnings in the meantime of a double-digit annual price hike." Even if these increases sound a bit steep, keep in mind that smaller increases will only put grid parity in Germany back a couple of years, so what Weber said next still applies: "operators of photovoltaic arrays will then no longer be willing to feed the power they generate into the grid."

If homeowners do not feed power to the grid, what are their options? "Solar guerrillas" in the US stack up batteries in their garage and go completely off grid, but this approach is far more expensive than keeping your grid connection, and Eicke does not see Europeans going off grid. "Once the feed-in rate has fallen below the retail rate, people will simply cover their own consumption first and then get the feed-in rate for excess production," Weber believes.

## Meter mania

Sounds a lot like net-metering. But as in net-metering, the crux is how excess production will be compensated. Countries with net-metering generally only have one power meter, which simply runs backwards when the solar panels produce more electricity than is currently being consumed. Excess production is then the negative kilowatt-hours measured for a given billing period. In contrast, feed-in rates require double metering so that compensation can differ from the retail rate to begin with.

Theoretically, net-metering is also possible with two meters: just subtract production from consumption. The question remains how to pay for excess production. Once grid parity has been reached, Weber would simply like to "allow German households to take the higher retail rate down to the level of zero consumption and have any excess production paid for with the [slightly lower, ed.] feed-in rate." He is aware of the pitfalls of net-metering: "German law allows homeowners to install arrays larger than needed to cover their own consumption." Americans also commonly believe that grid parity will mean an end to feed-in rates, as Vote Solar's Adam Browning explains: "If you start with a feed-in rate, grid parity is where you need to switch to net-metering."

How will that work under German law?

"Weber is right," Heiko Stubner told **pv magazine**. Stubner, a research aide in the Bundestag, points out that Section 33, paragraph 2 of the revised Renewable Energy Act (EEG) specifies separate compensation if the solar power produced is consumed by the operator. "This section was basically drawn up in anticipation of future grid parity as a sort of transitional mechanism." At the moment, it is unclear whether a large number of PV array operators are opting for compensation under this clause; as Stubner points out, such agreements are made between the array owner and the grid operator, so the state is not involved. But

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Stubner says tax issues still complicate the matter, making it unclear whether internal consumption or feeding power to the grid is the more profitable option. "But as we move closer to grid parity, we expect this option to become more important."

At present, Germany uses double meters; otherwise, no rate above the retail rate could be paid. So does Section 33 (2) require triple metering: one meter for consumption, one for production, and one for production consumed internally? Americans will shake their heads at the answer given by Tobias Dünow of Germany's Federal Environmental Ministry: "A third meter is all you need." Dünow agrees with Stubner that Section 33 (2) was designed in preparation for grid parity, but he adds two additional reasons: demand management and payment for PV systems once the 20-year EEG rate has expired.

When the first PV arrays installed under the EEG turn 20 in around twelve years, they would then more or less switch to net-metering. The idea behind demand management, Dünow says, is that customers should be encouraged to consume electricity during the hours of peak solar power production in the early afternoon. The goal is to make solar power more compatible with the grid. Dünow admits that merely adding a third meter does not constitute demand management unless time signals are also used. "This section is not intended as a final product, but merely as a way of getting the ball rolling so that technologies are quickly developed," Dünow adds. But triple metering is not mandatory if another solution can be found. "Industry can work things out on its own; the law does not prescribe anything," Stubner explains. Indeed, as it stands the law does not mention meters at all and could easily be misconstrued as an attempt to apply EEG compensation to off-grid arrays, which both Stubner and Dünow say is not the main idea.

## Feed-in rates in the US

The US approach, called net-metering, requires only one meter, which runs backwards or forwards depending on how much is being consumed and produced. Is that simpler approach not better? "We support net-metering as the bare minimum," James Bradbury told **pv magazine**. Bradbury is legislative assistant to US Congressman Jay Inslee, a Democrat of Washington State who has proposed a federal feed-in law for solar. Part of the problem in the US, Bradbury says, is the "patchwork of specifications across the US"; manufacturers sometimes have to tweak their products, especially devices for interconnections such as inverters and disconnects, from one state to another. National standards would therefore be a major step forward.

But Bradbury and Inslee do not believe that a federal net-metering law would go far enough fast enough. "We disagree with the idea that net-metering alone will get us there," Bradbury says. Feed-in rates, he argues, provide fair compensation, not just a hedge against future increases in electricity rates. And he adds, "Retail or better needs to be paid for excess production as long as that is what it takes to spur clean energy investments."

## Store credit

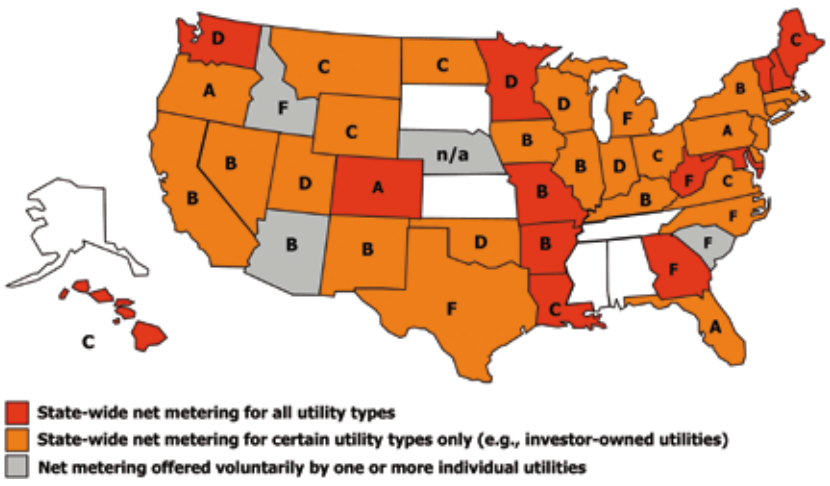
If we take a look at net-metering schemes in the US, we see how far such policies have to go. In Virginia, for instance, excess production is carried forward to the next monthly invoice. Essentially, homeowners are given a sort of store credit for future purchases from their utility. As Vote Solar's Adam Browning explained to **pv magazine**, "We have been able to make the case to skeptical (and often hostile) regulatory bodies that net-metering's impact on a utility is the same as conservation or energy efficiency, that it is emphatically not a sale, but rather a simple crediting arrangement up to the point of a customer's annual net usage." Hence, Virginia never pays homeowners cash for their solar power.

In most such store-credit schemes, the amount carried forward each month actually expires at some point, generally at the end of the calendar year. Your utility then gets all that power from you for free – power you paid for and produced mainly during peak consumption hours.

Virginia's net-metering policy originally specified that net surplus generation would fall to the utility at no cost at the end of the calendar year, but now the amount can be carried forward indefinitely. But there is one caveat: the amount carried forward cannot exceed the amount consumed in the previous year. In other words, a new floating ceiling has been set at double your consumption in the previous year. If you consume 2000 kilowatt-hours in 2008 and you have 2400 kilowatt-hours to carry forward into January of 2009, your utility gets 400 kilowatt-hours for free in January. What's worse, if you built up that net excess generation at the rate of some 200 kilowatt-hours per month, you will end up in December of 2009 with your 2000 kilowatt-hours carried over from 2008 plus the additional 2400 kilowatt-hours you saved in 2009, putting you at 4400 kilowatt-hours. If you once again only consume 2000 kilowatt-hours in 2009, you will then be giving 2400 kilowatt-hours to your utility for free – all of what you saved.

If that calculation sounds unnecessarily complicated, it is. Net-metering schemes often seem so confusing that one wonders whether they are not designed to conceal the fact that homeowners will never get a

Source: DSIRE and NNEC:




"Net metering is available in 44 states + D.C.", writes the Database of State Incentives for Renewable Energy (DSIRE). A closer look reveals that the policies are not created equal. For instance, state-wide policies generally do not actually apply to all utilities. And when we add the NNEC's assessments, the picture becomes even more detailed: while Washington State is red – and therefore seems to have a good policy – for its state-wide policy covering all utilities, the NNEC actually awarded it a D. And if you wonder why PV is not booming more in Hawaii, look no further than its C grade. Other states include Vermont: B; New Hamphire: C; Mass.: B; Rhode Island: B; Conn.: B; New Jersey: A; Delaware: B; Maryland: A; DC: C. Source: DSIRE (Oct 2008) and NNEC.

return on their investments in solar.
Don't believe it? Under the bailout bill (see page 14), homeowners can write off 30 percent of the initial investment from their taxes. Assuming an array costs 25,000 USD, you then get back 7500 dollars in tax money. Your solar roof now only cost you 17,500 bucks.
The retail rate is below ten cents per kilowatt-hour in Virginia, to stay with our example, a steep increase over the prices of just a few years ago, when a kilowatt-hour cost less than seven cents. Unfortunately for solar, the rate has not risen nearly enough. After all, a kilowatt-hour from a solar roof in Virginia is likely to cost far more than 30 cents. If we deduct the 30 percent in investment tax credits, we still end up with a price far above 20 cents, and the retail rate is only half that. Here, you might get half of your remaining $17,500 back, so you would stand to lose roughly a third of your original investment of 25,000 dollars over 15-20 years, with a break-even point coming perhaps in 30 years or more. Even as a hedge instrument, Virginia's net-metering is only useful if you plan to increase consumption as prices rise.

## Freeing the Grid

That makes solar less a good investment and more a good charity donation, as the "Freeing the Grid 2008" report argues: "Excessive limitations on surplus generation and rollover credits could render a customer's system a charitable donation machine and significantly increase the system's payback period." If the calculation were easier to follow and the losses clearer, it would also make solar a harder sell. Perhaps that explains why solar advocates in the US are so reluctant to admit that net-metering is better than nothing, but not great.
An update of the 2007 review by the Network for New Energy Choices (NNEC), "Freeing the Grid" provides an overview and ranking of state net-metering and interconnection policies (Virginia got a barely passing "C" for net-metering). For example, the report says that specifying "that customer-sited generators retain all renewable energy credits for energy they produce" is a best practice, and points are awarded to such state policies. But the study obviously only includes US best practices, and Europeans will have a hard time following the praise in every respect. For instance, New Jersey is cited as having an especially praiseworthy policy because: "Generally, NEG [net excess generation] is credited to the next bill with annual NEG purchased at the avoided cost." Of course, payment of avoided costs for NEG is nothing other than the dreaded floating ceiling described above: if you conserve energy and produce more than you consume, you suddenly get a fraction of the retail rate for excess production.
Europeans should be excused for correctly interpreting that to mean you are penalized in New Jersey for conserving energy, but the NNEC says that such schemes are the best that the US has to offer – and simply does not mention the rest of the world. Indeed, the NNEC does not even acknowledge that this policy constitutes a cap on payment, but says instead that "New Jersey places no limit on capacity for net-metering" – no set limit, that is, just a floating one based on your own consumption. Indeed, NNEC's James Rose does not feel that this floating ceiling is a problem at all: "The treatment of the end of the year NEG isn't that important. The PV systems should be sized to meet the customer's load (or part of their load) to make economic sense."
So while the study emphasizes that "best practices have emerged; there is no need for a state to reinvent the wheel", the scope is limited to net-metering schemes within the US and does not encompass global energy policies.
Of course, annual (if not monthly) cash payout of credit carried forward would be a better way of ensuring that excess production is not left in the lurch as unused store credit that can only be redeemed through greater electricity consumption. But according to "Freeing the Grid", only two states offer repayment for excess generation at the retail rate: Colorado (annually) and Minnesota (monthly). These states have net-metering schemes very close to feed-in rates, the main difference being that the retail rate will fluctuate, whereas feed-in schemes usually lock producers in at a rate set for ten to twenty years. The fluctuations will probably not bother Americans, though; after all, power rates are expected to rise, not fall.

## Net-metering meets feed-in rates?

Now that the bailout bill has extended support for solar in the US, Bradbury says he and Inslee might have a better chance of getting their proposal for federal feed-in rates heard. Up to now, he says that designers of net-metering schemes have not always been open to new ideas like his because they wanted to give their own hard-fought policies a chance to prove their worth. "Extending tax credit incentives was an important, hard-won battle for our renewable energy industries, but now we have an opportunity to consider the next necessary steps," he says.

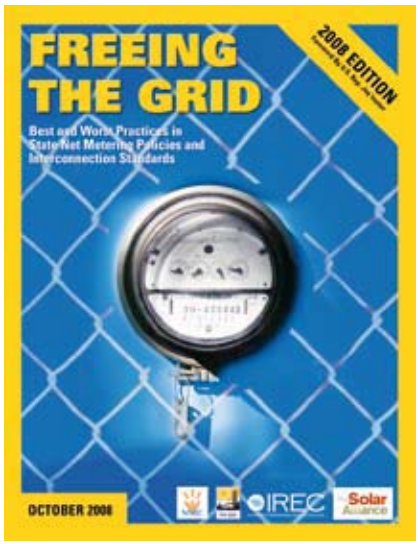


Photo: NNEC

The updated "Freeing the Grid" assesses state net-metering and interconnection policies.

Meanwhile, back in Germany Weber's concept seems to be that people will opt for a kind of net-metering once feed-in rates have fallen below the retail rate but still insist on feed-in rates for excess production. It will be interesting to see if German politicians and power producers go along with such a proposal. After all, solar is the only source of electricity with a higher feed-in rate than the retail rate; wind, biomass, hydro – they all receive feed-in compensation below the retail rate. It is a common misconception that was still part of the Wikipedia entry for photovoltaics at the time of writing: "The price paid per kilowatt-hour under a feed-in tariff exceeds the price of grid electricity" – which is only true for solar, not feed-in rates in general.
So while US net-metering may need to look like feed-in rates soon to cover excess production, Europe's feed-in rates for solar may not need to switch to net-metering once grid parity is attained. The implicit promise behind feed-in rates has been that a sufficient window of opportunity was to be granted for industry to get prices down. If people do not accept compensation below the retail rate once grid parity is attained, critics may charge that solar investors want to have their cake and eat it too. ◆ CM