HOUSE PLANNING HELP

Episode 61

Should My House Be Off-Grid?

The show notes: www.houseplanninghelp.com/61

Intro: My panel today consisted of Mike Coe. He lives in an autonomous house and we spoke to him in episode 54. If you haven't heard that episode, not only is it very good, but Mike afterwards created a video tour for us so if you head to houseplanninghelp.com/54 you can check out that video if you haven't done so already.

Also on the panel is Paul Scheckel who is author of The Homeowner's Energy Handbook – Your Guide to Getting Off the Grid, and Ken Silverstein who is a journalist. He tends to focus on issues around energy, he writes for Forbes and the Christian Science Monitor just to name but two so we will get straight to it.

The quality of this recording is not quite as high as I would like it to be. I'm trying to improve it for future hangouts because as I mentioned these hangouts are important so bear with me on that one. I started by asking Paul to give me a brief explanation of what it means to go off-grid.

Paul: Typically going off-grid is a term used when we try to disconnect from the electrical power lines and that's kind of how it's seen in a broad and very limited sense so off-grid, off the power grid. I like to take the approach where we can get off multiple grids - we can try to get off transportation grid, get off the propane grid, get off the fossil fuel grid, so to speak, and take it as wide and deeply as we can.

Ben: And just continuing this a bit, who were the first people to go off-grid? Perhaps Ken you can explain a little bit, you have been writing about all these issues that affect energy over the years. Has it changed or is it the same amount of people who are off-grid?

Ken: It's a trend that's escalating but it's not one that's without controversy, in fact there is a lot of controversy attached to it. It may on the surface seem like a rather benign concept. The reason that this trend is escalating, at least here in the United States, is that the cost of rooftop solar panels has dramatically fallen and the price keeps falling which makes them an inexpensive proposition for homeowners. At the same time the people selling them are

providing attractive financing options so it's becoming an economical option for homeowners to do with the financing, the low cost of the panels, etc. And then there is the government incentives which are also increasing the trend if you will. The reason it is controversial is that the more people who come off the grid means fewer people are there to support the existing grid which makes electricity expensive for those who cannot afford to go off the grid.

Ben: Is it the best system to be using at this time? When it was set up we understand that you would have your power station or whatever it might be but as we've moved on in technology, is it still the best way of delivering energy and, as customers, is it still the best choice for us?

Ken: A centralised grid has a lot of advantages which is why it came to be. The advantage is that it can more efficiently distribute electrons to a mass number than if electricity is distributed on site. So it's a more efficient system but there is a lot of drawbacks to a centrally planned system. It is very difficult to get transmissions sited, transmission lines are ugly so there's some incentive for it to be distributed. If there is a hurricane there is less of a chance mass numbers would be wiped off the grid. We saw what happened in New York and New Jersey during tropical storm Sandy so there are some advantages to being distributed but for the vast majority of us for the foreseeable future, and Mike and Paul may disagree, but I would argue that the vast majority of us are going to remain attached to the grid and there needs to be some equitable system to pay for that because the grid still needs to be modernised and even expanded in many cases.

Ben: Well that's a really good point so let's move on. Mike why did you go off-grid?

Mike: Actually I was about to bounce in and say I would like to not disagree with that, with Ken. As I say I'm not completely off-grid, I use the electricity grid as a battery and I did that because that seems to be the most sensible way to proceed at the time so I have a photovoltaic array which, at the moment for instance I'm just looking, we're exporting about 500 watts so I'm generating more power than I'm using but when we come to night-time, even though the house has been constructed to have minimal energy consumption throughout, we will still be drawing in power.

At the moment for me to go off-grid it would be more of an ideological decision than one that made any kind of financial or engineering sense because the amount of batteries that you would

require and the extra electronics and so forth would be costly and not necessarily environmentally benign when you are talking about lots of lithium or nickel, nickel metal hydride or whatever storage cells.

I think there are different reasons people go off-grid and some people do do it for ideological reasons. Other people are beginning to do it, as Ken was saying, for financial reasons because photovoltaic panels have become do cheap. Other people, of course, do it out of necessity because they actually aren't in a position to connect to a grid at all because they live somewhere very very remote, so I think people have different reasons for doing it. Mine was that it fitted in with the whole overall low energy design strategy to stay on grid but in a way to use it as a battery.

Ben: And also you've mentioned it's not just the grid but you have other aspects of your house so that you are totally independent. Do you foresee these situations arising or, as you say, is it all about energy efficiency really?

Mike: It was in my case. I'm just going briefly say I was reading the other day that apparently those dark and despotic oil magnates the Koch brothers, I think in conjunction with the American Republican Party are attempting to put a tax, aren't they, on people who actually have photovoltaic installations. Obviously they have massive interests in the oil industry and they can see their possible, there's a loss of funding coming because people are generating more and more of their own power, so they are trying to put a tax on people who've got photovoltaic installations on the basis that it is destabilising the electricity grid and therefore they should be made to pay for that. I don't know that's just a side issue.

Coming back to your question, Ben, I don't connect to mains water or mains drainage even though we have them available so I haven't disconnected those out of necessity. In this case it really is for environmental reasons because it seemed to me, in designing a house that intrinsically is ultra low energy, you've still got other energy demands made by private dwellings, and that the provision of a water supply and the taking away of your waste and processing it and so forth actually involves quite a lot of energy which you really don't have any control over. You can't say I'm going to go to the toilet a lot less so that I don't put such a load on the sewage system. So by bringing those services in-house, by storing rainwater, treating it to provide the house's water supply and then by using a dry composting toilet system to deal with all our own personal waste, together with a grey water soak away, I've

brought those services in-house but I've done it in such a way that they don't expend any additional energy at all. So that was very much done for an environmental reason.

Ben: And maybe Paul it's worth coming to you and just finding out what we've heard a little about from Mike. How do you compare to what he is and where is your geographic location, are you near to civilisation, near to a city or out in nowhere?

Paul: Yeah we are pretty far from civilisation here, which is primarily why we ended up off-grid. It would have cost us about $50,000 to bring power lines in. We live on an old piece of farmland and it's quite rural, however I didn't exactly fall into this position. I mean yes it was the piece of land that I could afford 25 years ago when I was looking for land but also there's a bit of altruism, too. I have always been interested in solar power, always been interested in energy efficiency and electric cars and all those things I've done in my life. I've tried to earn a living which is not a very good way to go in the nineties trying to make electric cars but also for altruism and green living and the self sufficiency of it. I've always tried to be as self-sufficient as I can which as I get older I realise what a myth that really is.

In terms of getting off of various grids, as I discussed earlier, I've made bio diesel for several years to try to meet my transportation needs. A few years ago, after we upgraded our solar electric system, I was hit with a very large propane bill and, after feeling so smug about having excess electricity and a lot of hot water to heat as a dump load, I was hit with this large bill so I thought how can I get off of the propane grid. So I started to investigate ways to make renewable natural gas and there is a chapter in one of my books about making backyard biogas.

So part of it is altruism, part of it was for financial reasons and part of it is because for me it is a whole lot of fun. I love technology and I love harvesting energy from nature and this is one way for me to help fulfil that need for that sort of project.

Ben: And is the book as well, or the couple of books that you have written, just sharing that knowledge that you have learnt over the years?

Paul: Sure, it's sharing that knowledge. The first book I wrote has a sort of reference guide for myself but also for other energy auditors and interested homeowners and the second one was sharing that knowledge and also the enthusiasm for things like making wood

gas. You can actually run a car on wood gas and you can heat your hot water with renewable natural gas that you make from food scraps from your kitchen so there are a lot of interesting things that I think we can do and perhaps will need to do in the future as we live in a more and more carbon-constrained world.

Ben: One think that keeps popping into my mind is that these few people who go off grid will be in rural locations. I can't see it being anywhere else because it wouldn't make sense to do this in a city or would it?

Paul: I personally don't recommend anybody to go off-grid if you are already on the grid. I think it's not a great idea. I love using the grid as battery storage. It's so energy intensive to get all those pieces of equipment. I've got 50 kWh of battery storage, I've got 24 batteries, it's about a ton and a half of lead in a shed outside replaced every ten years – it's kind of crazy.

Ken: Paul I would say that what you said actually there is a lot of questions implicit in what you said but one of them is that when the sun is not shining or the wind is not blowing how are you getting your electricity. How are the lights remaining on and is that storage system that you are using, for the lack of a better term, efficient?

Paul: Well it's lead acid battery technology. It's over a hundred years old. They are about 70% efficient in terms of storing and releasing the energy that's put into it. I have a battery backup system so that when the sun shines the batteries are being charged. When the wind blows, I have a 1000 watts of wind capacity, the batteries are being charged and when the sun goes down and the wind stops blowing I draw down the batteries. In the wintertime that can be problematic. I have a backup generator because there are months when the sun doesn't shine and the wind doesn't blow, and I need an additional source of electricity.

Mike: I mean obviously there are considerable amounts of effort and cash being put into developing advanced battery systems, aren't there, driven by . . . Obviously the lithium battery came about largely because of the portable computers and mobile telephones and now the development of electric vehicles and this famous Tesla factory. Tesla Motors intend to devote huge amounts of effort and finance into a specialist battery factory and there are other potential technologies possibly still on the laboratory at the moment. I heard of a lead water battery, I mean I don't know whether that ever has the possibility of becoming a true practical product but, in terms of being off-grid, I think it's likely that Paul's lead acid batteries will

soon be superseded by something that is much much more efficient, stores a lot more energy in a smaller space and ultimately price per kilowatt of storage is almost inevitably going to come down.

Ben: And I suppose that that is a large part of this. It does sound like batteries have held us back but are we at the point when more of this, and we've been saying that it's been picking up momentum, but it will make sense?

Ken: You know on the economics of it that's not an easy question to answer. I agree with Mike's sentiments that battery technology will get better and it will get cheaper, but there is a transition period that is yet to be defined in terms of how long that will take. We are clearly not there yet.

There are in the United States California has a mandate for the utilities to buy battery storage to increase its economies of scale. That will help things along. A government mandate gives the developer some incentive to go into the labs and create because they have a ready-made market but at this point I think battery storage is not where it needs to be and, until it gets to that point, the economics of it for most of us just doesn't add up.

Ben: Paul, are there any other things that we should be thinking about? Going back to the question I set at the beginning of "should my next house be off grid?" What do I need to consider? You've produced this book that has lots of information in, so where would we start?

Paul: Start with efficiency, that's always my mantra. Efficiency first renewals next. If you have a very efficient house you have a house that doesn't require lots of energy input and that is a way of basically lowering the cost of your energy supply by reducing the amount you need to buy. Also it allows you to diversify your energy sources so if you need the grid you are not going to need very much of it, you need solar you are not going to need very much of it so start with efficiency. Who would rather burn a 1000 gallons of oil instead of burning 100 gallons of oil! Or the same with wood - we heat primarily with wood. I would rather cut, split, stack and burn one cord rather than three cords of wood. So start with efficiency.

Then identify what resources you have what's available, what's practical, what's cost effective. Really it comes down to what are your values, what are your goals, what do you want to do with your home, what statement do you want to make, what comfort level are you willing to negotiate with yourself and your family.

Ben. And Mike with your house, I've been lucky enough to have visited it. It is lovely and warm even in the depths of winter so has this cost you a lot of money? I know that one of the questions that I saw before we started this hangout was that "I would like to go off grid but the cost was too much."

Mike: Well it depends on how you approach it, obviously. I mean I would absolutely agree with what Paul just said that you put energy efficiency first. Get the building envelope right - high thermal mass in my case, huge amounts of insulation. Then whatever the future holds for us in terms of fuel shortages or changes in technology or changes in climate, which is obviously an important consideration, if you've got your building envelope right then you can change the ancillaries that support it relatively easily.

In my case yes, I didn't really set up, because I'm not really a property developer because it was very much a self-build I didn't set out to build necessarily a house that could be scaled up into multiple units. I set out effectively to make the best job I possibly could and people can take what they want from it. There are many many of the way this house has been built that can be translated to other buildings but it was always a question of, yes, get the house as energy efficient as possible. And I did pay a premium for that to a certain extent. I could have built the same size house more cheaply or I could have built a bigger house on the same site if the local council would have allowed me to for the same cash but the overriding factor in the decision-making process was always well, is this efficient, is this going to us the best possible energy performance?

Now that the house is operational and it's pretty much finished, apart from those little irritating jobs that you never get round to completing, and it's performing, it has exceeded my expectations fairly considerably. Without going into immense detail compared to the relatively ordinary Victorian semi-detached house that we were living in previously, typical of the type of houses that many people in Britain still live in with standard servicing, I am saving more than £3000 a year so approaching $5000 a year. I am better off by that amount simply by living in this house.

Ben: And you are more comfortable as you've mentioned.

Mike: Yes.

Ben: We are getting towards the end of our hangout and Ken I just wanted to ask you about more of this maintaining the utilities. How do you think they view this movement if it is gaining traction?

Ken: Well this is what the original comments that I made that I didn't yet expound upon. Utilities for obvious reasons feel threatened by this phenomena and the reason is because they collectively spend $25 billion a year in this country (US) to maintain the grid and to improve it and then ultimately to expand it. So if more people go off the grid that leaves fewer people to support the grid which means that utilities would have a harder time raising the capital they need to make the improvements that they would need. They would go to the capital markets and potentially pay higher to borrow money to make these improvements. Investors would demand a risk premium, if you will, so utilities are resistant to this change.

Naturally they are selling less electricity they are also making less money and so there needs to be some type of reconciliation between the utilities that maintain the grid and those who go off the grid and that's a lot of these battles that are going on state wide. It's a little like the public school system which is, at least where we live, is supported by property tax whether you have a child in school or not with the idea that public schools are of benefit to everyone so everyone pays property tax regardless of whether or not they have children in private schools or whether or not they have children in schools because the idea is that it is a public good and the grid similarly is a public good.

When you feed electricity to people's homes or businesses it creates an economic ripple effect that keeps going. So having a durable and reliable grid is a vital vital thing, so I'm very sympathetic to the utilities' arguments that there needs to be some kind of equitable cost sharing arrangement.

I wanted to also add a very quick thing about the battery storage and how long a timeline that is, if I can. I'll be brief. The story which is I think where you came upon me that was just in Forbes. I had interviewed the Rocky Mountain Institute and it suggested that in the sunnier climates like Hawaii, in the Southwest, that this trend towards more self-reliance will be much faster than it will be in say the East Coast where it will be primarily cheaper coal-burning power but it seems to think that the trend will happen nationally at some point that it will begin on the West and gradually move into the areas that are more reliant on cheaper burning fossil fuels.

Ben: Paul, do you have any closing thoughts for us?

Paul: I would just like to follow up on what Ken just said and here in Vermont one of the smallest states in the country we have a net metering law and that allows for renewal energy/grid tie-ins to max out at about 4% of grid capacity. And we are meeting that and some of the utilities here have exceeded that 4% and they are getting nervous. That 4% of revenue loss means to them that they are spending a larger portion of their budget on poles and wire maintenance, and they are losing money and they are nervous about that. It's getting to be an interesting set of dilemmas out there that they are having to face and it will be an interesting future as the grid changes and our sense of energy and carbon changes over time.

Ben: And Mike.

Mike: Yeah just picking up on that point it is an interesting thing, it's a strange situation perhaps that the traditional utilities find themselves in in that their core business is being eroded in a way that they can't really control. We've had, I can't remember what the current state of it is, but we have had in the UK various incentives whereby electricity and gas companies have been obliged by government to help people improve the insulation of their houses so that they can reduce their energy demands and so forth. It's been part of the whole package but that puts any commercial entity in a very strange position where they are actually having to subsidise methods that will ultimately reduce their revenues. It a bit like I set up a furniture factory but I am obliged by legislation to provide grants to people so that they don't need to use as much furniture, so it's a very odd situation.

There's one further thing possibly applies more to the UK than anywhere else. It relates to peak gas and peak oil and traditional fuels in that we have had a disastrous series of decisions about reequipping the UK's energy-generating capacity. We have just about managed to persuade the Chinese to build the new nuclear power station here which won't come on stream till probably 2030 or something and we are paying a massive price for it. We are apparently beginning to look at bringing in massive diesel generators for emergency backup because it is perceived that there is not going to be enough spare capacity in the grid to meet peak demands in coming years if we have, you know, exceptional drain on the system due to unusual weather patterns. We have a real risk, in this country anyway, of the grid collapsing at various times which is why the Government are sneaking in these enormous

diesel generators which obviously isn't environmentally great but they are desperate that the lights don't go out.

I think having in that context the capability to go off-grid and distance yourself from all of that, should the power supplies become unreliable, it's certainly a very worthwhile facility to have at your disposal. I hope that it's not required but, not wishing to sound smug and pompous, I'm in a better position to cope with it than somebody who is living in a grid connected house with no backup!