

Switch On Episode 7: Building Solar Microgrids Part 2 Transcript

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Scott Tinker: After assembling a team and procuring the equipment we had come back to the tiny Arhuaco village of Gunchukwa to build the solar microgrid, as we had promised on our visit last year. Before we could begin, the Arhuacos invited our volunteers to also go through the cleansing ritual in their sacred river.

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Volunteer: So we are going to put this one one on the right.

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ST: There are nearly 3 billion people today who still live with little or no energy. And what I want to know is how they'll finally get it. So this is sort of what it was, that's the future. I'm Scott Tinker and I study energy. Come with me around the world to meet people and communities as they *Switch On*. It takes a lot of expertise to build a solar microgrid, especially in very remote areas. Fortunately, Steve from Solar Electric Light Fund has spent his entire career doing exactly this.

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Steve McCarney: We do want to start off as square as we can.

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ST: He planned every step of the install and would train the team as we went along. He had accounted for, and Derek had procured and shipped, every part. The boards to build the concrete foundations, the screws to hold them together and the tools to build them. These included a few power tools and in their fully charged batteries, we even brought in electricity. Even with all our preparation, on day one, we hit our first hurdle. The frames for the solar panels weren't made correctly. You know, see if there's a drill bit this size we can just tap a little bit of a new hole in there. You know what it might be, this one is uh yeah those are pretty close actually.

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SM: What if you board those two out that you're mating right there and board them out and give a little on each side.

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ST: I could, that's the one, all right buddy here we go. Once we had re-drilled the holes for all the brackets we discovered some of the braces were the wrong length. This is weird too, these are all 35 this one's 30. Look we have two more holes here then you could shorten this one and make it like this, yep, and then we could do that but this is what they did right there. Yeah or we can take them all apart and these are a pain to put together but, and you can see where they messed up. They're multiple holes, multiple holes in those.

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SM: How difficult would it be to get everything to be 35?

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ST: We could do it. We could do it.

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Derek Tinker: Yeah we have plenty of batteries.

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ST: That one is easy to make a 35 because it already has one of the holes correct. When we get the second bracket, because we have to get another little L bracket, then we'll have to drill a new hole but that could be done. And then the one that's a 30 over there would need two new holes. And then I don't know what you got here, the one that's out you were already measuring, what are those down there?

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SM: That one was a mix. It was a 30 and a 35.

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ST: Without our files and power tools this small challenge could easily have derailed the entire project. Instead, some of us reworked the frames while others took advantage of the wet earth to dig the foundations.

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SM: It's a good idea to have that big piece of wood over there because if you level point to point you don't know what's happening over there so we want to level all the way across. Let's go with that, that'll be good. We got just a couple more nails to put in on this side. These guys are anxious to try this all right. Right now we should be about an inch off.

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DT: Yep, we are.

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SM: We've got a pretty good line, we've got a little this distance here to do adjustments so we're off to a pretty good start. I think with that and the sunset coming let's call it a day. Good work everybody!

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ST: See how we do. 103 and a half.

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DT: oh that's even better, actually.

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ST: One of our few hired professionals was a mason to prepare the concrete and pour the foundations. The grid part of a solar micro grid is the wiring that runs underground from the solar panels to the battery and between the huts. For this, the Arhuaco farmers brought their own skill set and the stamina to dig hundreds of feet of trenches for the conduit. The village had built a small hut to house the battery, which given its weight, would require its own foundation. A great couple of days I think nobody's backs are broken yet, but we're getting close. We were thinking about what we could do and thought we'd leave a little momento for the future. We thought we'd leave it for the distant future. So what we're going to do before we pour the last concrete mold, is we have a time capsule. And this says 'For our friends, the wonderful people of Gunchukwa, from your friends at Switch and SELF'. And then you sign your name. Sign it here and we put it in here and it goes in the concrete and the concrete goes all around. So it'll be there for 10,000 years for somebody to find. Grab that in, let's put this in for all time, there we go! This is perfect sun, no trees, great clearing. As long as we don't get the goats doing the tango on these things. First panel! It's good!

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SM: You're just getting them in these spots, so these two already here then this one looks like it's gonna need to be loosened.

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Volunteer: We got 36.8 ,so we got a 35.5.

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SM: Yep, the voltage goes down as it heats up. If you come out here in an hour that voltage will have dropped and that's what we expect.

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Volunteer: Hey Steve, we got 34.4.

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SM: Okay, so what's going to happen is all those voltages are going to add up to something now over 100 volts dc. Which is something to be respected.

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ST: All right!

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SM: All right! We got a kilowatt in here. Three kilowatts.

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ST: Congratulations! At last we had the panels installed but this was just the first step.

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SM: Okay now i'm going to just pull it all through.

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ST: While we finished wiring them, the Arhuacos built a fence to separate the now electrified equipment from children and animals. With the conduit trenches dug, we were ready to place the light for the village square in its foundation. The Arhuacos had turned a tree into this light post. The green tropical hardwood was nearly as heavy as steel. This was something the Arhuacos wanted to encourage communal gatherings. It's fitting that it took a community to lift it into place.

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DT: I always wanted to be a brace.

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ST: Right down the chute. After we ran the conduit and wiring between the buildings we had to run it within them.

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SM: Essentially what we're doing is we're protecting the wiring from kids, animals, because animals do like to chew and tubing is going to encase the wiring.

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ST: Steve showed us how to install the lights in every hut.

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SM: When you buy the light, you get this. So what we did was built these up on flat pieces of pressure treated wood that the termites won't eat and all you need to do is get it about as good as you can. Not like that, but more like down. That's pretty flat right there yeah that looks like it. Alright, I'm gonna let go and i'm gonna come back with some more stuff for you guys. A lot of electricity is about bringing the power to the load, which is the lights, and then switches are what interrupt that power. If you make a bad connection. It's just like a switch, it just breaks that continuity and then nothing happens and then you don't know is it that connection is it that connection? One error here means checking sometimes five or six places, which really sets the whole group back especially if it's Friday night and the goats cooking and you're trying to figure out why your circuit isn't lighting and everyone else is.

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ST: They can put a little glue on there and then. I'll stand up here in the middle and pray. Perfect. Come on, here we go. I hear it. I think it passed, yeah it passed through, you should feel it too. Yes yes!

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SM: We spoke a lot about sustainability and the achilles heel to all of these mini grid systems is the battery. So the more times the light gets used, the more time the ceiling fans are running, the bigger the battery has to be. And the harder it is then to raise the funds to replace the battery when the time comes.

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ST: This refrigerator is what the Arhuacos plan to use to raise those funds. They hope to sell enough cold drinks and popsicles over the next eight to ten years to raise the ten to fifteen thousand dollars for the replacement battery.

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Osi McCarney: It's very exciting that, you know, everything is going as planned. It's the only place where they will find cold juice.

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DT: That's a big fridge. That's better than my fridge.

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ST: That's a lot better than your fridge. The battery equipment is technologically complex and when fully charged, dangerous, so we needed more professionals to make sure it was installed correctly. The battery will store electricity made by the panels when there's good sun, then distribute it over the microgrid when the Arhuacos need power. Which could be at night or when it's raining.

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SM: This is the inverter, it converts the 24 volt dc battery into 120 volt ac electricity just like we have back in the states. Clean, smooth, continuous. May it be used well. This is as professional a battery rack as you can use really in these small systems. This is really top quality industrial stuff. And we got it because it's a lead acid battery, it's technology is pretty well known and it's very safe in use compared to let's say some of the new coming technologies that have some flammability issues. So it should be a nice clean battery and at the end of its life, all the lead can be recycled so we're trying to do our part to keep the environment clean. Good work fellas! As a battery, that's as pretty as they get.

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ST: The battery is certainly the biggest challenge of the solar micro grid, but it's also what makes it possible.

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SM: This is in place.

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ST: Solar micro grids are being built in off-grid villages around the world by non-profits like SELF, for-profits that lease them to communities, and government utilities when they're a faster solution than stringing power lines. They may not make enough power for energy-intensive needs, like small businesses, but they can provide people communication and connection through cell phones, radios, and tv. And bring light to encourage literacy, security, and community. Solar micro grids are allowing off-grid communities like this one to take their first steps into the modern era. Tonight we would turn the lights on for the first time ever in Gunchukwa. The village prepared for a celebration. Meanwhile, our Colombian professionals taught the young village leaders how to maintain the battery. This is very foreign technology for them, but from now on, they'll be the ones responsible for their electricity systems. It was Friday

night and the goat was cooking and it was time to see if everybody got their connections right. So we gathered everyone in the village square to turn the lights on, together. It's a very exciting time. A year ago we came as strangers to Gunchukwa. Today we are here as friends. You have taught us patience and balance with nature and we have brought you electricity and light. We trust in your wisdom and the wisdom of your mammos to use it very wisely. And we look forward to being with you in the future. And now we're going to count backwards from five .We will say five four three two one light, together. We will do it very loudly. Are you ready? In espanol and english, ready. Five! Four! Three! Two! One! Light!