Project Trip January 2019
Wind Energy For Tula/ Ethiopia

A Report

26. 1. – 10. 2. 2019

J. Hahn, Rüsseina

Report For The Project Trip
Wind Energy For Tula/ Ethiopia 26. 1. – 10. 2. 2019

Travelling Team:

Back row, standing from the right:
Jürgen Mummet, Dipl.-Eng. in. media technology, Dresden (26. 1. – 10. 2.);
(Shiferaw, jeep-driver, Addis Abeba);
Daniel Gaffron, model builder, Glashütte (26. 1. – 10. 2.)
Uli Kretzschmar, press speaker/PR team leader, Dresden (26. 1. – 10. 2.);
(Liranso Salomon, translator and interpreter, Hossaina)
Martin Menzel, truck driver, Bodenbach (1.- 10. 2.);
Maria Kaiser, sociologist/ specialist for personal (1. – 10. 2.)
Carsten Neumeister, Dipl.-agricultur, Höfgen (1. – 10. 2.).
Sitting, from the right:
Jochen Hahn, Dr. theol., priest, Rüsseina (26. 1.- 10./14. 2.);
Holger Reinhardt-Weik, Dipl.-agricultur, Rüsseina (1.- 10. 2.);
Josef Staubach, Dr. rer. nat., mathematician i. R., Pesterwitz (1. – 10./14. 2.)
Werner Hofmann, carpenter i. R., Cossebaude (26. 1. – 10./14. 2.);
Emil Weik, school pupil from Rüsseina (1. – 10. 2.);
Willi Fischer, electrical engineer/ energy manager, Tanneberg (26. 1. – 10. 2.);
Nils Neumeister, school pupil, Höfgen (1. – 10. 2.);

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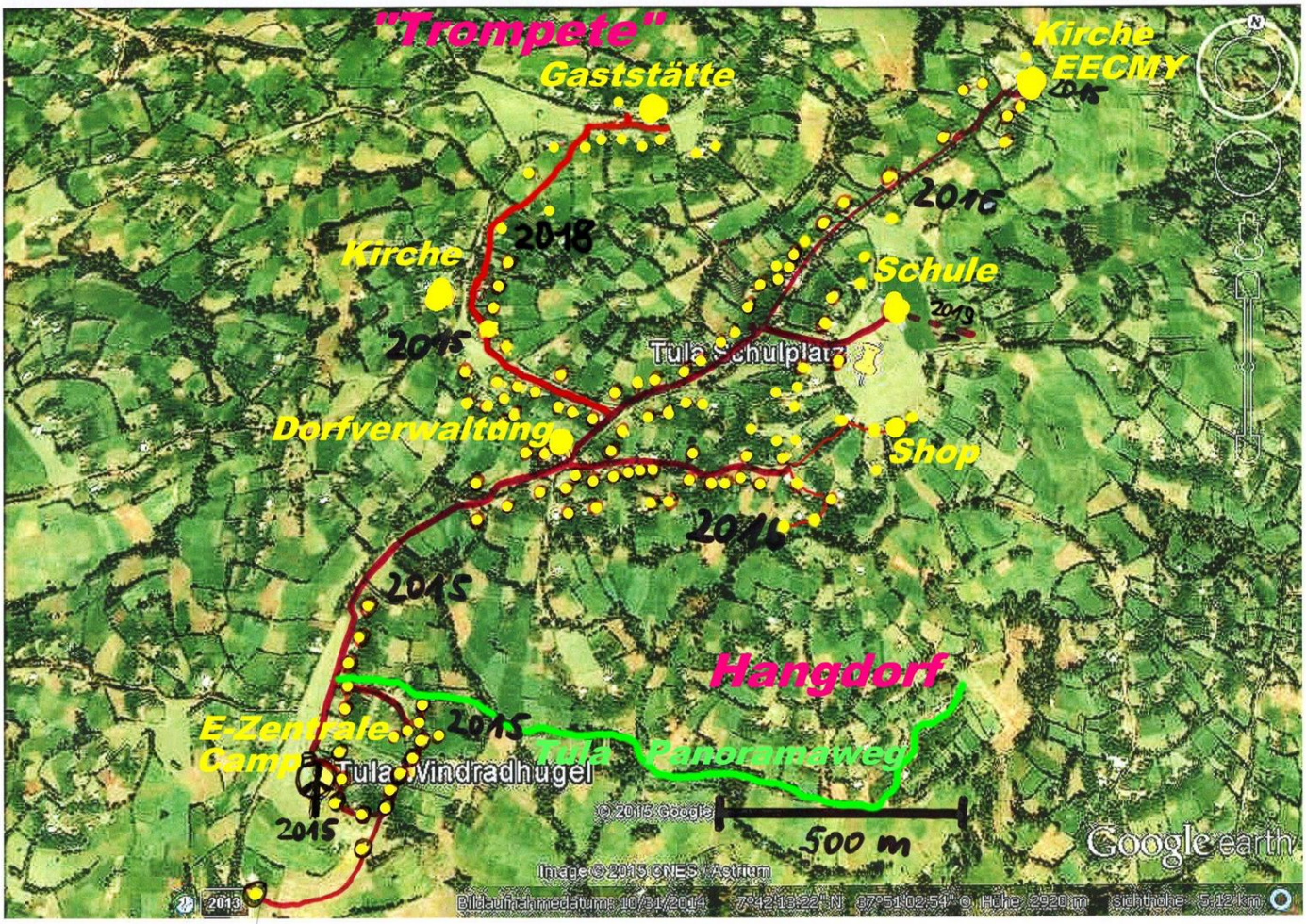
1. An overview of Tula village.

Tula lays about 20 km northwest of the district city Hossaina, at about 2950m above sea level. Hossana lays 400-500 m, lower, which proves a particular challenge for transport vehicles in the last kilometres before Tula. Deep erosion furrows demand a considerable skill from the driver to make this journey. Nevertheless amazingly, trucks manage this route much better due to their large wheels and wide wheelbase.



The village itself is covered with agriculture, it is certainly not bare but full of plantations, particularly the high growing "Wrong banana", grains, green cabbage (Kale) fields. Eucalyptus trees line the footpaths. Small groups of family homes pop up in this agricultural landscape, sometimes right in the middle of a field, but often lined up like a pearl necklace alongside the main path. The part of the village that we were able to lay cables to so far, lay at almost the same level without any great differences, although now and again tree filled ravines cut through the landscape. The main axis from the wind turbine hill to the Mekane Yesus-Church is about 25 km. In the northwest, from the part of the village (named by us as) „Trompete", it stretches further north (off the map shown above). On the steep decline in the southeast region (named by us as the "Hangdorf" meaning hillside village) is a further settlement of 50 families. Every yellow dot on the map marks a home connection made to this date.

In total it is thought that 270…300 families should be living in Tula. According to the inhabitants of Tula, there should be approximately 3000, this maybe a slight exaggeration.

2. What has happened? Project trip 2018 and goals for the project 2019

A more extensive description of work done in 2018 can be found in the Project Report 2018 (also at www.creaprotect.de). In 2018, we were able to lay a new power line all the way to „Trompete“, so that the technicians were able to make the home connections themselves. In addition, the low voltage cable that was leading to the Mekane Yesus church, could be exchanged for a higher voltage, more suitable cable. The map above shows the current status of home connections made before January 2019. As well as that, a second solar unit, including a solar house was erected and connected, in order to increase the production of the entire installation.

The problem that arose in 2018, was that in the case of a short circuit along the main line and branch lines the planned fuse boxes that should cut the power, did not react – even though the cables were the right size. As well as that, the existing eucalyptus electricity masts (poles) are mouldy and rotten at the base or better said eaten away at ground level.

The solutions to both these problems were planned to be solved in 2019.

Consequentially a village meeting was called in 2018 where subsequent plans were discussed. As was translated for us that the so-called “Amba-village” further away in the eastern valley with its own church, should also get its own electricity supply. Which lead us to make our plan to build a separate solar powerhouse, “a small solution” for about 60 families. This plan defined our whole preparations for 2019. (See:- report 2018 under 13. 2 and 13.3).

Therefore, for 2019, we had planned to build an Electricity powerhouse in Amba Village inclusive of pre-assembly of a solar roof (3 KW), transportation of material, area survey and a plan for laying cables. In the main village of Tula, the last 30 homes should be prepared for their electricity connection so that the total limit of homes connected to electricity of 150….160, which we had always stated, would be reached. We also specified this at the village meeting where there was no loud negative reaction.

3. 26 suitcases and a lot of material

That was the opportunity! 13 people, each with two suitcases (maximum luggage allowance 23kg pro suitcase) and hand luggage extra. This way a great deal of tools and installation materials for approx. 70 homes and electrical appliances could be taken without extra transportation costs

As in every year, light switches and plug sockets, tool boxes and water pumps, bags of screws and fuse boxes, pile up with transformers and inverters, alongside tins of fish and meat in the vicarage kitchen in Reusseina

The „Re-Organisation“ of all the materials spread throughout all 26 suitcases later in Tula, proved to be a complete nightmare. If only we had separated things for „Tula main village“ and „Amba-Village“. Here is proof of the principle „You only really have your material when you know where it is.“ The re-organisation was only possible though patient and painstaking work of all team members.

4. Two travelling groups, a big chartered bus and a truck

Twelve men and one woman – there have never been so many.

Logistically, this is only possible though a well thought out relay. The “first group (from 26. 1. 2019), could make all necessary purchases in Addis Abeba und Hossaina, set up camp and build the shower unit and toilet. For the second group of nine, we hired a small bus for the 2nd February, which bought the group to the beginning of the rough impassable roads, where just before sunset they were picked up by jeep and truck and brought to Tula village. The problem was not so much the number of people but the mass of luggage. The second group arrived in Tula on the 2.2.

5. Everything is going suspiciously smoothly. – Shopping in Addis Abeba (1st group)

Before the second group made their way to Ethiopia on the 1. 2. 2019, the first group had the opportunity to make important purchases from 28. 1, in Addis Abeba. Surprisingly enough we had organised everything after 1 ½ Days. This is something that we have hardly ever experienced before. A small backpack full of Ethiopian Birr. (It was almost impossible to close the zip.) – And off we went to the solar shops. 100.000,00 Birr of officially rolled bank notes tied up with package string laid on the counter and so 16 solar panels changed hands. Business went the same for the other things. A folding aluminium ladder, an iron door, rolls of cables (unfortunately a little less than was needed), a tar tub, a concrete mould and a transport cart made to our specific wishes, also a pick- up truck for the transport. We were a little worried and asked ourselves, "Are things going suspiciously well? Something is bound to happen." – And it did … later …. and therefore more. Heavily loaded, on the 29.1. we left towards Hossaina. We landed covered in dust from the track, on the 30.01. in Tula.

6. Condition of the installation.

It is an exciting moment every year: You turn the corner of the access road on to the big meadow. Anxious question. Does the installation really still work? Deep breath. The wind turbine is still standing. All the rotor blades are on. First look at the E-house: Light? Voltage still on the accumulator? Solar regulator working? – Sigh of relief. Just the wind regulator sticks. After a storm, it must have stopped working. We will have to do something about this. The wind energy unit produces admittedly less energy than several solar panels. However, at the moment it is required to be a night time producer, in order to balance out the nightly voltage loss in the accumulators. Otherwise, we are very grateful that the entire installation is making a very good impression.

7. And, it Happened: From plans and protests – man may think but God steers.

Our goal was clear: Amba Village, right down in the valley. Here we believed that we could install a separate energy power unit. Materials had to be bought in Hossaina for this: Corrugated iron, nails, boards und slats for the roof construction. The PV-boards were already there.

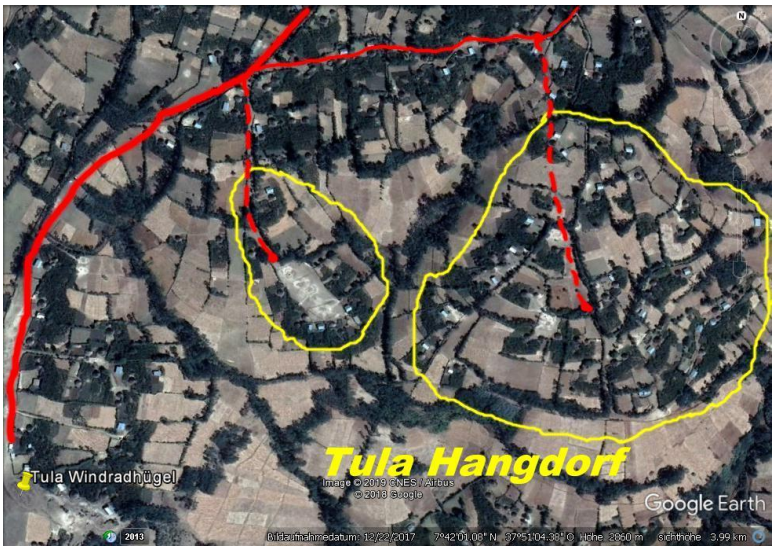
Fully loaded, the pick-up climbed the path to the MekaneYesus-Church in Tula. Our final decision was that we would drive directly to Amba Village. However, the journey finished at a dead end while we were still in Tula. An excited crowd stood in our way on the field, discussing wildly, emotionally and loudly amongst each other. What's up here? One lady told me in English: „We don't understand why you are going to another village when here in Tula are still many families that do not have electricity. " This is the first time we heard that Amba Village does not actually belong to Tula, and is actually a separate village. Now we began to understand. Nobody explained this in 2018. This was also new to our translator, Liri. A mistake in translation? A misunderstanding? In order to defuse the conflict, we decided to turn back, and later, in peace and quiet to talk to the village representatives. It was suddenly clear that we could not simply carry out our plan. There was no point. To risk conflict between two villages? Why? We want to help the people whether they live here or there. In addition, by no means did

we want to cause strife. That would be against all our intentions. Therefore, it was important to find an alternative.
The meeting with the mayor and the village representatives, in one of the two churches on 4th February, went very peacefully and objectively. We asked how many families in Tula do not yet have an electricity connection. Answer: approx.125 families! A slight shock for us. We really still do not know the full extent of Tula village. Then it was obvious to us, what we had planned in Amba Village – a separate energy unit, as a smaller version for approximately 60 families, should just be installed in Tula. At best in the part of the village called „Trompete“, which is situated a little way away from the main village and is exactly the same size as Amba Village. A sigh of relief came from the village representatives as I demonstratively crossed Amba village off our map. It was clear to us, thanks be to God what the protest had stopped. What could have been the outcome if we had arrived at Amba Village with all the material, full of joy, only to find out that we had erected a second building site without actually completing our task in Tula? Not to say anything about the tension caused between these two villages.
This is an experience often made: Thank god that our plans did not come to head. Man may think but God steers.

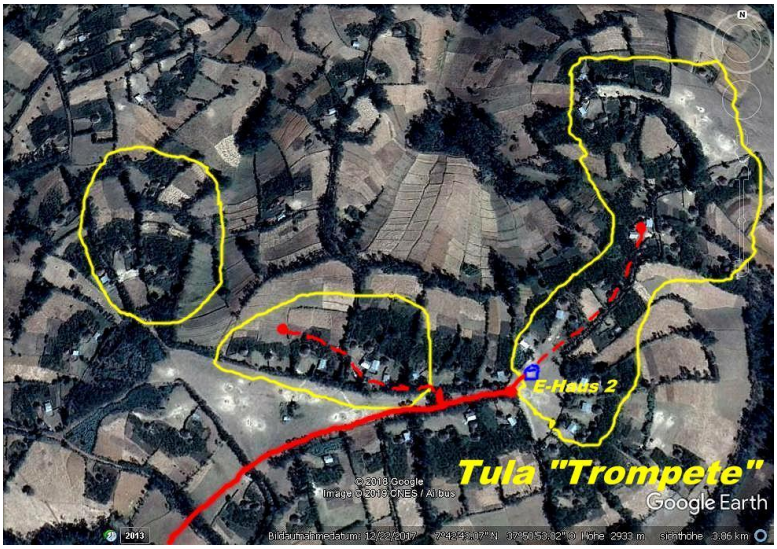
8. A complete re-think of plans

8.1. Expansion plans

Tours with local representatives through „Trompete“ and along “Hangdorf” gave us a clearer picture of areas of the village which we had not yet taken into account. On both maps, the parts of the village not yet connected to the electricity network are marked in yellow. There should be approximately 125 families altogether, that do not have electricity.
Even though the “Hangdorf” village is considerably spread out, it is still however logistically accessible. The map shows two parts of the hillside village which can each be reached from different starting points. Plans for additional cable-lines (16^2 Cu or 25^2 Al) are indicated. Further extensions to the network would be made with 6^2 or 4^2 Cu. cables.



In the so called „Trompete“ the complete north east part has not been connected. (An area we knew nothing about. The houses on the North edge of the large field, as well as, single houses in the North West area. Branch lines also planned here (16^2 Cu or 25^2 Al) are indicated. All further extensions will also be made with 6^2 or 4^2 Cu.



8.2. Consequence: Creation of a second energy unit.

Now the question, what next?

1st variation: We develop the existing energy headquarters further so that in the end, approx. all 270 homes can be supplied with electricity. From a cable point of view, this is technically possible. On the other hand, it is also a nice thought just to have to maintain one headquarters. This variation fails on the extent of energy storage. The accumulator would have to be so over dimensional that the weight of it would, in this situation, no longer be transportable (over 200 kg per 2-V-cell). Moreover, the accumulators that would then be too small, would be left over and useless.

2nd Variation: We plan, to erect a new separate smaller energy unit in „Trompete“ as was actually intended for Amba Village, with the existing accumulator, the existing 4,5 KW-inverter and a new solar unit (approx.. 4-5 KW). The already existing branch cable must only have one connection point to the main cable. This way a compact area of the village of about 60 families can receive electricity, and we would have, as planned, a “smaller version” to present as reference.

The main headquarters would then need to be set up with a somewhat larger accumulator block and an 8 KVA-inverter. The existing 9 KW-PV-installation with the wind power installation would be a big enough energy producer for the approx. 210 homes.

9. Project work in Tula (30. 1. – 9. 2. 2019)

9. 1. Greetings from IKEA – installation of the home fuse boxes

Simple, value for money and just the job. – that’s how to describe our special creation, the house fuse box.

The casing: Small plastic sorting boxes von IKEA with an attached lid.

The contents: A DIN rail attached with cable binder, one tilting double fuse holder, two rows of clips for the cable connections. Holes to put the cables through and screw holes are melted with a solder iron. Finished.

In preparation, our two teenagers put together approx. 70 pieces with a little help from a few of the other group members.

The house fuses are such a low voltage (500 mA), that as soon as too much power is demanded the trip switch will trip and cut off the electricity supply and therefore stopping the chance of a fire starting.

9.2. Safety Concept: Checking and testing the circuit breakers (something interesting for the experts)

The entire network is equipped with circuit breakers at different points , not so much to protect against overload (as the total demand is relatively low) more so that in the case of a short in the circuit the power is not cut off to the complete network but only in the affected area. Also, routes that are laid with cables that are too long and too thin for the stretch can mean that the circuit breakers don’t work in the case of a short at the end of the line. Therefore, we fitted the branch line connections to small groups of homes with 6 A (B 6), and larger area connections with 10 A (B 10) circuit breakers. This is all very plausible, but only partially worked.

One good result beforehand: The safety switch on the Mast (B 6) had the desired effect in the case of a short at approx. 300 m along a thinner cable to the homes (6^2, 4^2).

Not the same with the 10A connection to the main branch line: Despite larger cables the 10 A circuit breaker did not react when tested. Instead, the inverter at the E-House switched off in the case of an overload. Although for a short moment 30 A must have flown through the cables. This test carried out in 2018 remained a puzzle for us.

Willi Fischer, who works for Enso (Electricity company), was able to solve the puzzle for us at home: One safety switch (B-type) needs four times the amount of electricity to short circuit. This is not a problem in a normal network. Our inverter cannot manage that amount due to its power restriction.
Super-duper 10 A-Safety switches (Z-type) solve this problem at the main branch connection point. Tests were successful. However, the safety switches at the branch connections leading to the groups of homes must be exchanged (ca. 3 A), because the B 6-safety switch with 4 times the voltage sometimes switched off later than the Z 10 at the main branch connection point (double voltage). This then makes it harder to find the problem again.
At the moment, there is no solution for the main safety switch at the E-House. We have tested a fuse with a melting wire. Even super-duper 16 A safety switches do not work. We cannot install a lower (10 A) because the normal demand (village use) is too low, We shall solve this problem by installing a larger inverter, that should easily manage a super-duper 16 A safety switch, which is explained in full in point 8. 2 The smaller inverter in the second E-house, planned for "Trompete" can be protected with a super-duper 10 A fuse, as here clearly fewer homes are demanding electricity.

9. 3. An inverter gets an overhaul

In 2015 the installation was damaged by lightning. The main inverter was not working. In 2016, we could install a replacement inverter. Then we wanted to repair the old inverter to have as a stand-by appliance. As it was not clear at the beginning which part in the inverter was defect, the repair dragged on. In 2018, we brought the inverter back to Germany for tests. First, we took the heavy ring transformers out. This year we were able to return the repaired inverter. After putting it back together in the E-house and programming the circuit board by means of laptop, tests were successful. At last, this way there is a working substitute inverter. This is of particular importance, since a breakdown of this „heart" would cripple the whole power supply.

9. 4. When electricity masts (poles) wobble – Finding a solution to stabilise the masts.

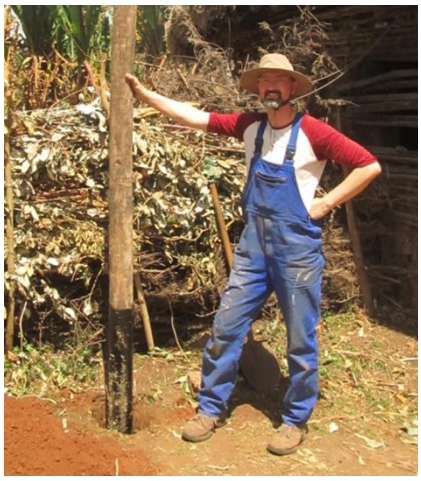
This was not good news last year: The eucalyptus poles that we have used as electricity masts have rotted in the earth after just a few years. More to the point, the termites have eaten them away so that they would fall down if the cables were not holding them up. That is why we would like to put various solutions to the test to solve this problem.

Variation A: Using another type of wood

We recommend that in future the technicians use other trees (for instance pine). They grow in Tula and are more durable. This would be the easiest variation.

Variation B: Protect the wood with tar

For this reason, we bought some paste similar to Bitumen and using old textile bandage we were able to paste a considerable thicker layer onto the base of the pole. This worked well and the end product was impressive. Four poles were treated in this way and installed as a test project. The advantage to this method is that since little material is necessary, each mast can be prepared on location where it would finally be erected.



Variation C: Producing concrete castings
This is probably the most complicated, but with a good quality concrete, the most durable variation. We had a cast form made up by our metalworker in Addis Abeba which we made a test base with. In principle this worked. Unfortunately, one-week drying time was too short, so that the screw element tore slightly when tightening into place. We were able to fit one mast. So, we will see the results of how the concrete has held next year. This variation is the Mayors favourite. The question is just whether such an expenditure of time and money is feasible with so many masts.

9. 5. Extensions to the solar installation

Actually, the solar panels and the PV-regulator were meant for the E-house, planned to be built in Amba Village. Now the question was, store it or build with it? As it was clear that there would certainly be considerably more homes connected to this headquarters (Hillside village, 60 homes) and that a bigger accumulator would have to be installed. It was then obvious that we should extend the solar power unit on the existing E-house. As we already had regulators in our luggage, it was no problem to integrate these extra panels into the existing accumulator system. A roof had to be built for the solar panels. The materials (corrugated iron and nails) were at hand. In a village meeting, pole deliveries were organised. Already the following morning, the first villagers arrived with the first eucalyptus poles, where a community representative marked each delivery from his list. That same afternoon, at 15.00 hrs. the wooden building was standing complete with corrugated roof. So, we were able to fit the slatted frame work and mount the solar panels on the same day.
The next day, the complete solar installation was mounted and put into operation. The whole thing consisted of two Solar fields á 1,6 KWp. Giving a total solar power production of approx. 9 KWp to the network.

10. Problems of electricity payments, wages and reserves

One of the main problems of the electricity installation is not a technical one. It lies in the long-term management of the finances. In a concluding discussion with the community representatives, all questions could be discussed again openly and frankly. At the moment, the following rules apply:

1. Revenues:
At this point, each household pays 25,- Birr/per month (0,78 Euro) into the community electricity treasury. If there are repairs needed in individual homes, this is covered by these payments and the family does not have to pay the extra cost of repair.
With approx. 140 homes, there should be 3,500,- Birr/per. Month (=109,00 Euro) revenue.

2. Expenditures:
The technicians receive a monthly lump sum of 800 Birr (=25,- Euro) and 25 Birr (=0,78 Euro) for each home connection, which is paid as a connection fee from each family. The security guard that camps in the E-house each night gets 500,- Birr/per month (= 15,60 Euro). He earns his money in his sleep, so to say.
The cost of diesel (for use of the generator especially in the rain season) cannot be calculated exactly. As once indicated by the technicians, it should not be much more than 80 Litre/per year. (approx. 20,- Birr per litre) + Motor oil: approx.. 150,-Birr/per month.
Total expenditures per month: 3,050,- Birr.
There is a total monthly income of 3,500,- Birr, against a total monthly outgoings of 3,050 Birr.
The total monthly surplus reserve of 450,- Birr, is clearly too low.

This is why we urgently recommended the following to the community representatives:
1. The monthly contribution should be raised to 35,- Birr. per. home.
2. Each of the technicians wages should be raised to 1.000 Birr/per month (=32,- Euro) and the security guards' to 700,-/800,- Birr. Then with 140 connections, there will be a surplus revenue of 500,- Birr more per month in reserve.
3. People must pay the technicians or the electricity funds for any repairs made within their homes.
4. Since it is probable that in the future the number of connections will be considerably more (+ approx.120) then the total business of the electricity installation will be more effective and the total surplus reserves will be much higher. Of course, we have recommended a further wage rise for the technicians with the outlook of keeping their job attractive so that there is no need for them to look for work in the city
5. Surplus reserves accumulated are under no circumstances to be used for any other purpose in the village.

We are eager to see if the community representatives put these recommendations into motion. It seems to be a matter of mentality. This is our only explanation: Building up a surplus reserve is a strange concept to these people who live so close to nature. Natural agriculture does not allow a build-up of great reserves because of the problems of preservation. Everyday objects, such as tools or whole homes, can always be produced from natural materials. This is where thousands of years of culture collide with the modern forms of maintenance and long-term provision.

11. Measurements, energy supply, energy demand
Due to having to switch the electricity off during the time working on the network, installations and wind regulator, taking accurate measurements of electricity (supply and demand) was very restricted and not always possible.

Solar power yield:
The solar installation (3 kWp) built in 2018 had for example, according to the meter reading, yielded in total 3,500 KWh. That is 1,166 KWh pro installed KWp. However, it must be considered that the solar input is restricted when the accumulators are full. In practice, the solar installation could deliver a little more if the accumulator could hold more. With a total 9 KWp installed solar performance the installation should in reality yield 10,500 KWh/ per year.

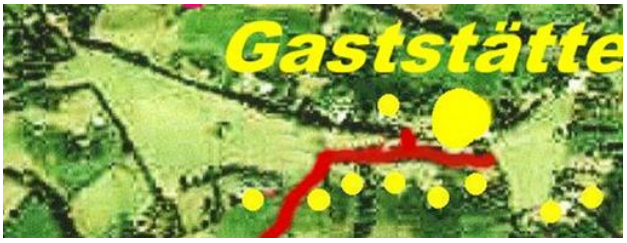
Wind yield
The wind power installation yielded 12KWh, in the measured time of one night until the morning hours. This offers a considerable puffer after the night consumption and allows the PV-installation to start on a high-accumulated voltage in the morning. Unfortunately, the wind power installation had to be closed down for the time being because of regulator problems. We will have to change to another regulator alternative here. As it is exactly the night-time performance of the wind power unit that is very important for the energy stability of the accumulators.

The village's daily electricity demand
At the moment, the total daily amount of electricity used by the village is between 16 und 20 KWh. In the peek consumption times (between 20.00/21.00 hrs.) the present energy use of the village homes currently connected is approx. 1,4-1,7 KW (In a German household that would be one or two hot plates on the stove). Many families are content with one 6W-LED-Light and if necessary, a small charging unit or a radio plugged into the socket.

12. Our life in the camp – Small improvements make life easier

There is already an extensive report of our life in the camp from 2018. Living in a tent is by far the best solution for a good night sleep. In the outbuilding where our food and odd pieces of materials are stored is warmer but this pro is certainly curtailed by the company of rats. In Tula there are adequate camping utensils for 10 people with added extras including a complete cooking unit, safely packed away in plastic barrels. Food is cooked on two traditional Ethiopian ceramic wood stoves and this year, with an induction plate. Our head cook Werner Hofmann, manages daily to conjure up stunning meals from tins of food we bought with us and vegies from the market. We are convinced that good, well-cooked, regular meals help considerably to reduce sickness.
The cold shower, which we build up each visit, serves for bodily hygiene. This is made of water barrel strung up on a tree, at about 3m high, a showerhead and a shower curtain. Since this year, the water does not need to be painstakingly filled into the barrel with a canister and ladder. Now, an electric pump takes care of this. We are happy to have a halfway reasonable toilet (with a real loo seat) at our disposal. A transport box from the ship transport 2013/14, was successfully remodelled. This year our guest family in Tula built an Ethiopian toilet right next to ours. There is a certain amount of difference to be seen here …..

13. „Tula-Panoramaweg"(Panorama Way) as well as other things a name giving



Already two years ago, we began to give individual areas names, for ourselves. We called the outer most north westerly part of Tula „Trompete" (Trumpet). A bird's eye view shows the shape of a trumpet funnel and a mouthpiece. Now the local restaurant there carries the same name. They would like to make a sign with the name on it, which our translator Liranso, wrote down for them.
Also the footpath along the south edge of the village with

grand views, carries its name well, Tula-Panoramaweg. The mayor noted it down. There will surely be more names to be given.

14. Plans and perspectives for Tula

14. 1. Extensions to the cable network in „Hangdorf“ (Hillside village) 2020

Because of the fact that in the area Hillside village, known as Hangdorf, and the area called Trumpet, approx. 120 families have not yet been connected (see section 8). The main focus in 2020 will be the connection of “Hangdorf”, as this is where expectations seem to be at their highest.
The technicians must carry out the complete cable laying and installations. We will have the job of laying the two main line cables. Most of the installation materials are already in Tula (which were originally for Amba Village). Merely the entire length of cable must still be obtained

14. 2. Modifications to the energy headquarters 2020

Due to the planned connection of “Hangdorf” the demand for energy will be considerably more than now, That is why in 2020, a larger accumulator block (instead of 1400 Ah approx. 2000 Ah) and a larger inverter (instead of 5 KVA then 8 KVA) must be installed. The solar installation has already been expanded to 9 KWp this year too. As the accumulator block that was disconnected cannot yet be used in the E-house in „Trompete“, it must be temporarily kept in the building next to our E-house and must be regularly charged up.

14. 3. A complete energy centre for „Trompete“ 2020/21

Simultaneously to the work in “Hangdorf” in 2020 , a separate energy unit should be built. Since it is not possible to put the clay (daub) on the walls during the dry season, presumably only the shell and the solar roof can be completed. Only when the clay walls are finished will it be possible to install the energy unit in 2021: Moving the present accumulator in, installing the solar regulator and mounting circuit boxes, installing the former 5 KW inverter.
Of course, it would be ideal to have a finished E-house complete with clay walls already and waiting in Trumpete in 2021. Then, this E-headquarters could be immediately put into operation.

15. Necessity of a last large material transfer to Ethiopia 2019

The necessary extensions to be made to the installation in Tula means the use of a lot more new materials again. Since the prices in Ethiopia are double, sometimes treble the cost of the same in Germany (caused by the high customs duties), it seems much cheaper to buy the materials in Germany and through the help of Mekane Yesus Church, bring the material, tax free to Ethiopia.

The following materials and components are needed:

1.Insulated single-wire in different gauges. The quantity must still be determined with the use of maps. It will be a lot of wire.
2. Accumulator block with 12x2V-cells. Problem: Each single cell weighs approx. 150 kg and must be transported very carefully.
3. 1x inverter 8 KVA
4. 2x Solar regulator
5. Installation material for the assembly in the homes. This can also be transported in flight luggage.

The total cost is being investigated at this time. It will be at least 20.000€, presumably more. These funds must be collected by the middle of 2019, in order to realise the export in time. There must also be organisational steps made for the duty free import by the Mekane Yesus Church. All of this is a very big challenge for our organisation

16. The cost of the project in January 2019

The total cost of the project in January 2019 (without flight costs and food) lies by approx. 14.000,- Euro. This has been covered completely by collected donations.

17. A cordial thanks for all the help

Our project lives from people, who unselfishly make their way, at their own cost, to take part in the growing electricity network in Tula. At the same time, all progress accomplished up to now would not have been possible without the many donors, who in many cases through repeated donations have made the work up to now possible. We thank you with all our hearts.

Last, but not least, we are very thankful to the village Tula. The villagers are very willing to work. The community representatives spur them on well. We are also grateful to the Mekane Yesus Church, who accompanies our project in partnership. Thank you also to our translator Liranso Salomon from Hossaina, our long-term Jeep-driver, Shiferaw, Wolde Giorgis Demisie's family with Melat, as well as our metalworker Yosef in Addis Abeba.

18. Donations Welcome

For further project work towards the electricity network in Tula, tapping open connections, including the building of a separate small energy headquarters (see point 14.) we plead urgently for more donations.

Account:
Windenergie Äthiopien e. V.
IBAN DE 81 3506 0190 1600 0760 15
BIC GENODED1DKD (Landeskirchliche Kreditgenossenschaft LKG/ KD-Bank)
„Spende Tula“ “Donation Tula”
(Please always give a complete address and name so that we can issue a donations certificate.)

For more extensive information about the projekt (Deutsch und Englisch): www.creaprotect.de

Gez. Dr. J. Hahn, Chairperson of the board