

Photovoltaik Project in Kenya

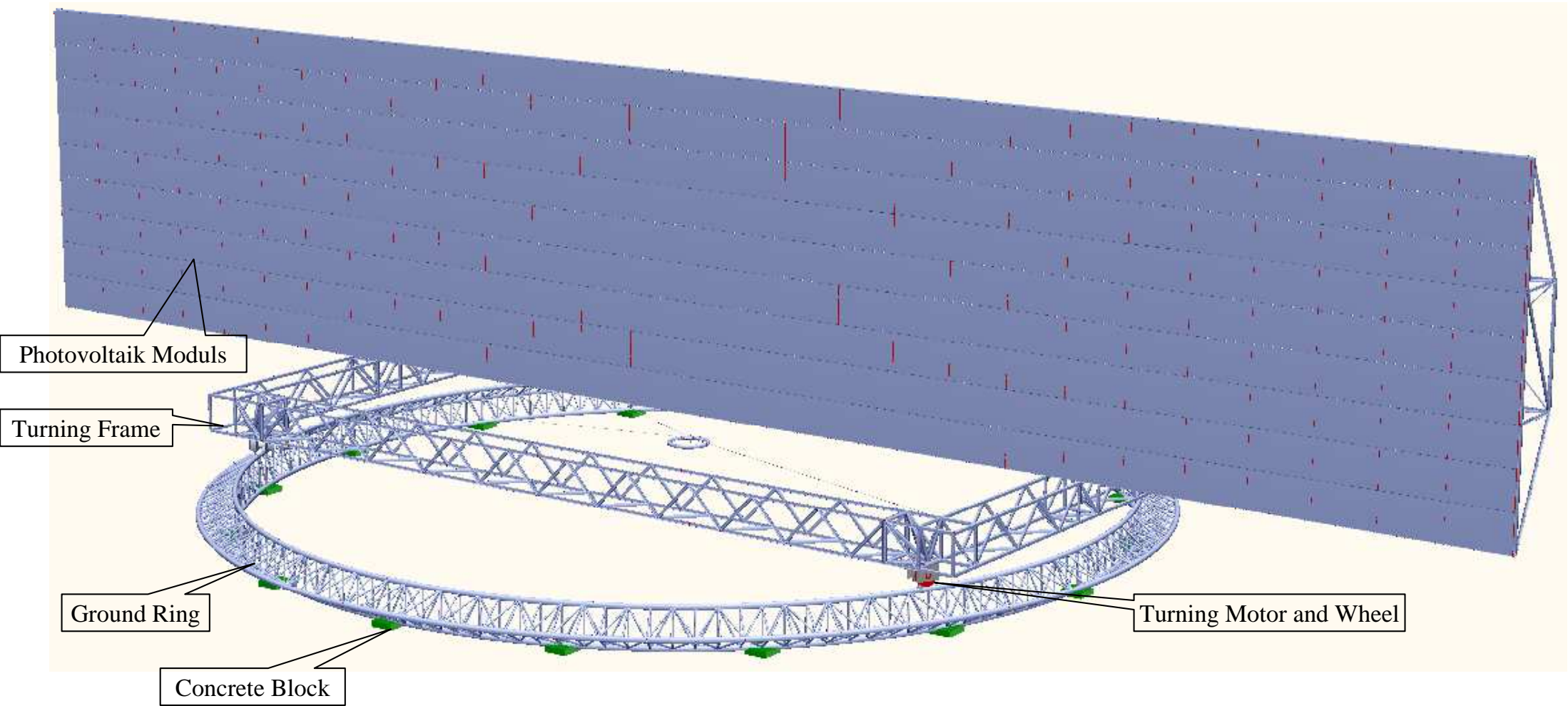
NAROKPARK 1

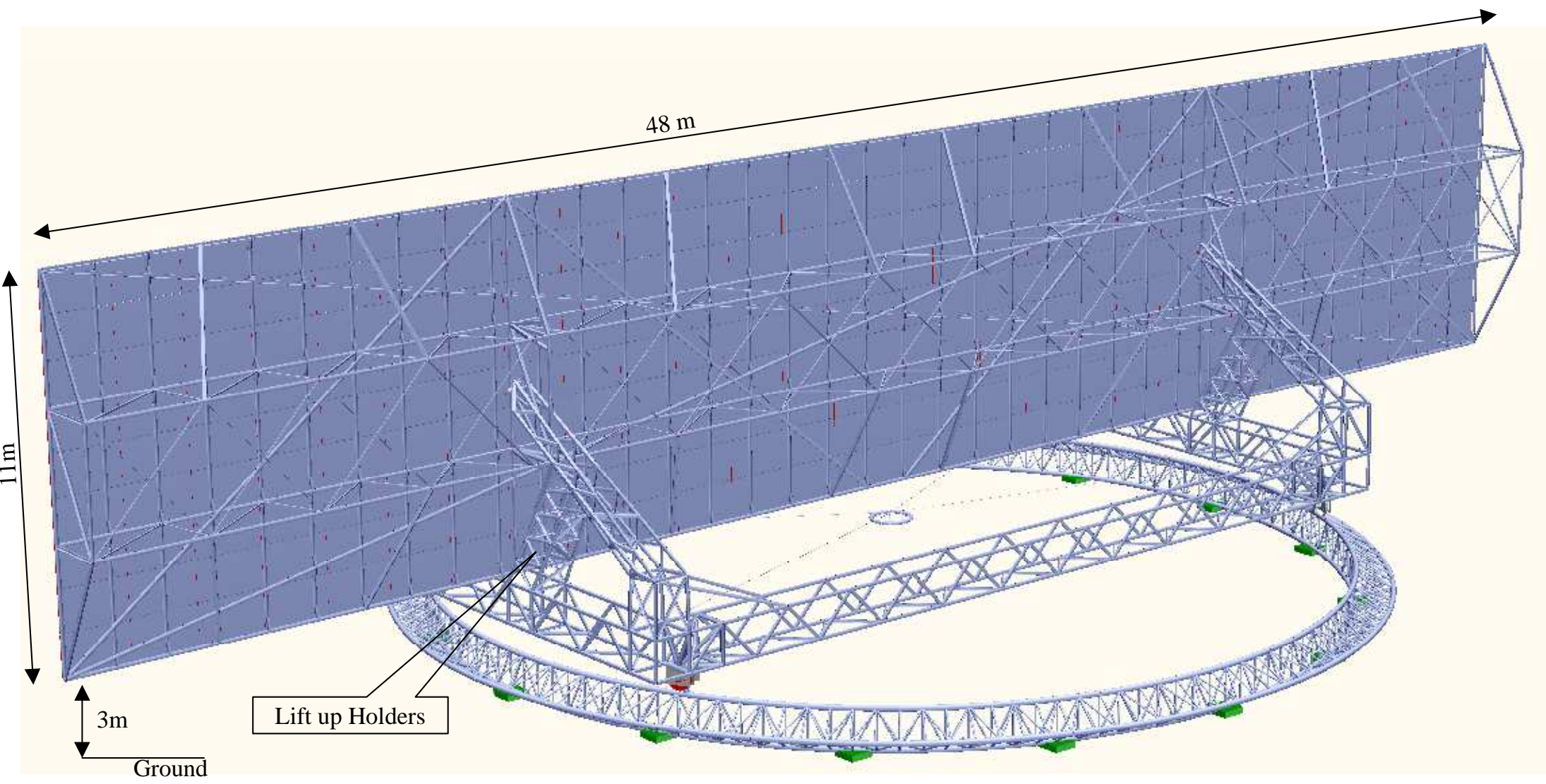
2.3 MW_p

Table of contents

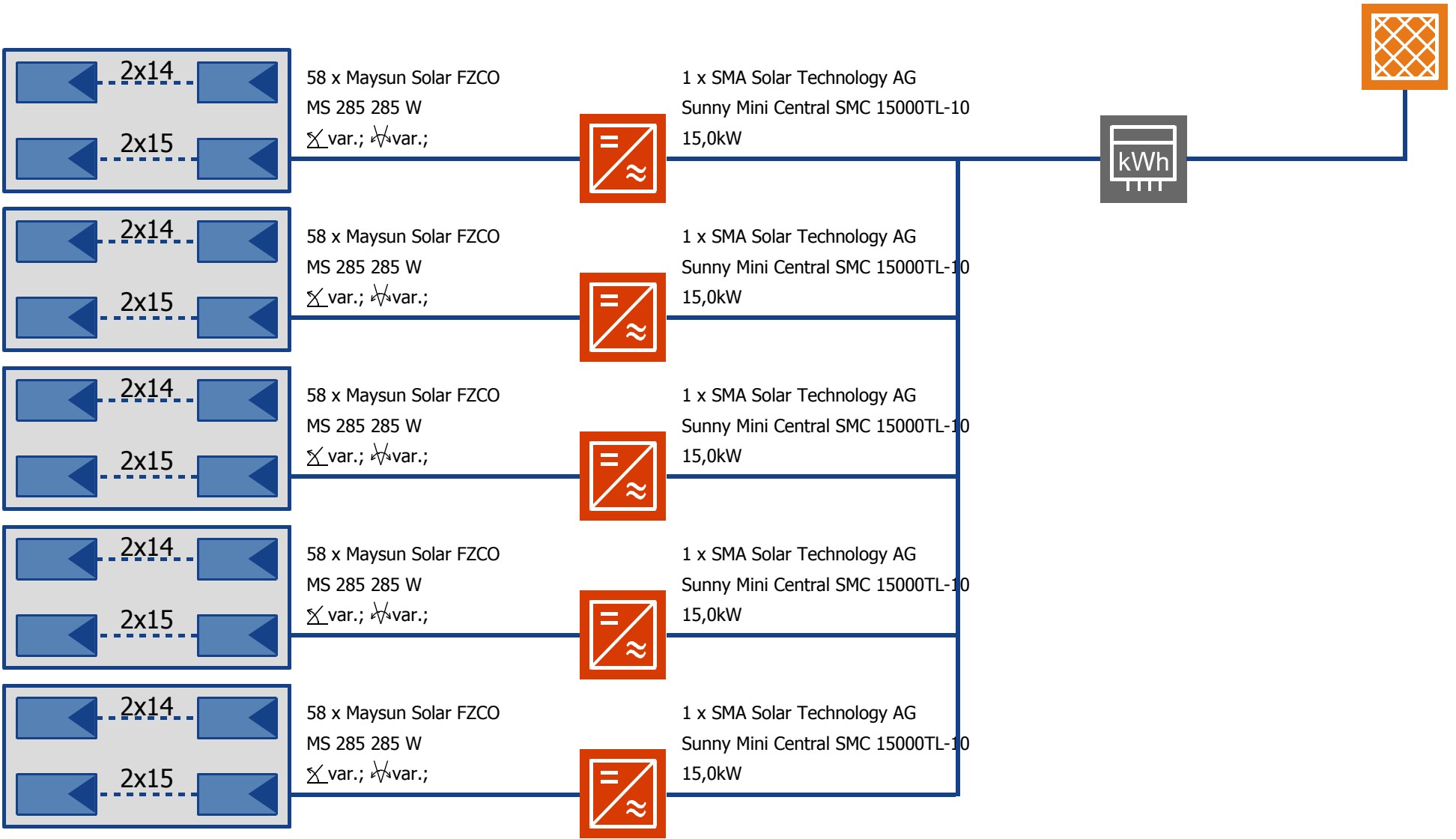
Chapter contents

1	The Machine
2	How much Power one Machine can produce
3	How many Machines per Park
4	Calculation Summery
5	Reimbursement Calculation
6	Ownership declaration
7	Which sort of Transformer
8	
9	First Time Plan for the Project
10	Which sort of Contractors / Workers are needed
11	Land map of the first selection of Park position
12	Standardized Power Purchase Agreement
13	Step by Step the Authorities
14	Construction of the Transformer house and the DC/AC holders
15	The Microcomputer in the Machine
16	The Software in the Microcomputer
17	The driver Unit for the E-Motors
18	The Fence around the Plot
19	The Fire protection System
20	The Factory to produce the Machines
21	Addresses and Contact Info of involved Leads / Contractors / Workers





PV*SOL Expert 4.0 (R9)

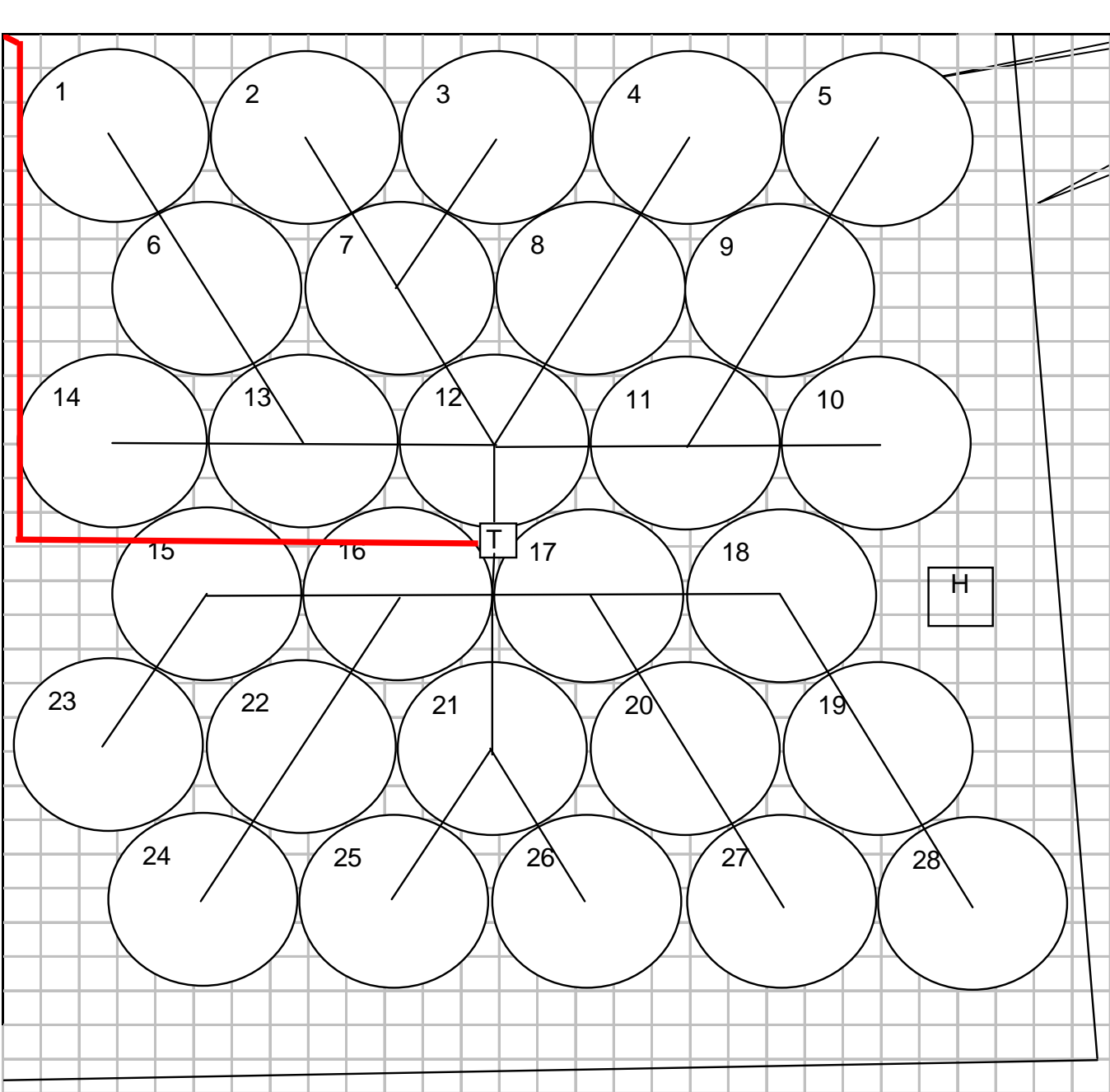


Gross/Active PV Surface Area: 471,80 / 475,13 m²

PV Array Irradiation: 1.119.515 kWh
Energy Produced by PV Array (AC): 143.360 kWh
Grid Feed-in: 143.360 kWh

System Efficiency: 12,8 %
Performance Ratio: 73,6 %
Specific Annual Yield: 1.734 kWh/kWp
CO2 Emissions Avoided: 126.976 kg/a

The results are determined by a mathematical model calculation. The actual yields of the photovoltaic system can deviate from these values due to fluctuations in the weather, the efficiency of modules and inverters, and other factors. The System Diagram above does not represent and cannot replace a full technical drawing of the solar system..



One Machine

Mainroad

Calculation

Given : one Machine = 82,5 kWp

count of Machine = 28 Pcs.

Loss in DC/AC Unit = 2%

Loss in 400VAC / 20 kVAC = 2%

Sun hour per year = 1851 h/a

Power production per hourly

$$82,5 \text{ kWp} * 28 \text{ Pcs.} * 98\% \text{ DC/AC} * 98\% \text{ Trafo} = 2218,52 \text{ kW/h}$$

$$1851 \text{ h/a} * 2218,52 \text{ kW/h} = 4,106487 \text{ GWh / a}$$

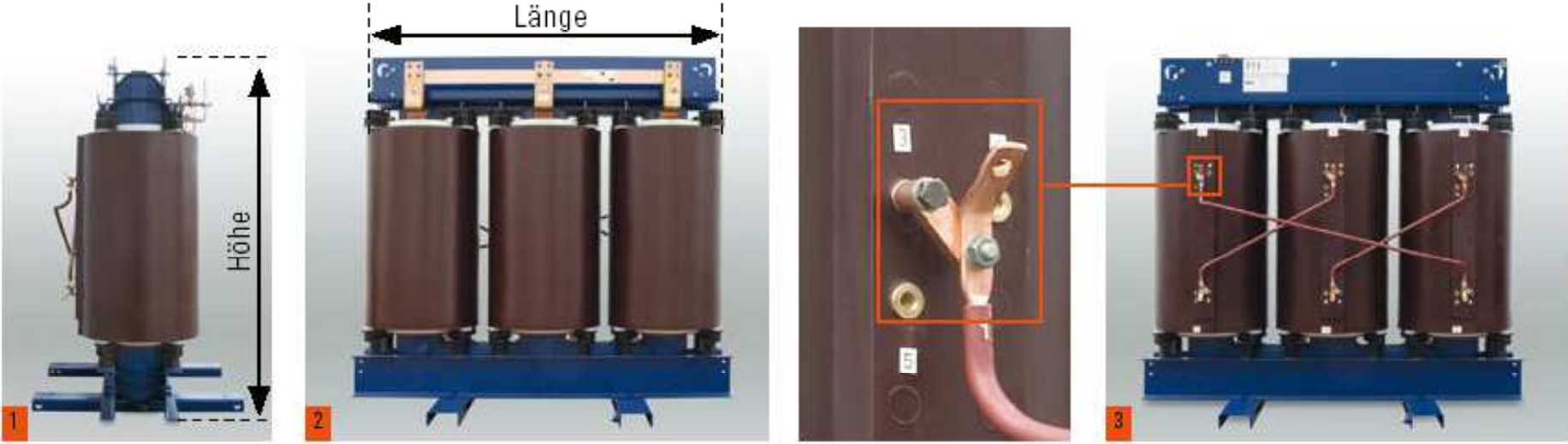
Calculation Narok Park 1		
Ground length	303	m
Ground width	275	m
Unit's count	28	Pcs.
Power of one Unit	82,65	kWp
Park max AC Power	2155	kW
Grid feed in AC per Unit	143360	kWh/a
Feed in price per kWh	0,12	US\$/kWh
Cost's to build Park	4232234	EUR
Investors investment time	240	month
Calculation		
Park feed in per year	4014080	kWh/a
Park income per year in US\$	481690	US\$/a
Park income per year in EUR	422535	EUR/a
Park income per month	35211	EUR/month
Pay back to investor - time	240	month
	29804	EUR/month

Reimbursement Calculation								
							2,84%	
	Rest Investment		pay to Investor		Repayment		Reimbursement	
Park building cost's	4232234	EUR			237458	EUR	120195	EUR
after 1. Year	4114972	EUR	357654	EUR	240788	EUR	116865	EUR
after 2. Year	3991048	EUR	357654	EUR	244308	EUR	113346	EUR
after 3. Year	3860086	EUR	357654	EUR	248027	EUR	109626	EUR
after 4. Year	3721686	EUR	357654	EUR	251958	EUR	105696	EUR
after 5. Year	3575424	EUR	357654	EUR	256112	EUR	101542	EUR
after 6. Year	3420854	EUR	357654	EUR	260501	EUR	97152	EUR
after 7. Year	3257505	EUR	357654	EUR	265140	EUR	92513	EUR
after 8. Year	3084878	EUR	357654	EUR	270043	EUR	87611	EUR
after 9. Year	2902445	EUR	357654	EUR	275224	EUR	82429	EUR
after 10. Year	2709651	EUR	357654	EUR	280700	EUR	76954	EUR
after 11. Year	2505905	EUR	357654	EUR	286486	EUR	71168	EUR
after 12. Year	2290587	EUR	357654	EUR	292601	EUR	65053	EUR
after 13. Year	2063039	EUR	357654	EUR	299063	EUR	58590	EUR
after 14. Year	1822566	EUR	357654	EUR	305893	EUR	51761	EUR
after 15. Year	1568434	EUR	357654	EUR	313110	EUR	44544	EUR
after 16. Year	1299867	EUR	357654	EUR	320737	EUR	36916	EUR
after 17. Year	1016046	EUR	357654	EUR	328798	EUR	28856	EUR
after 18. Year	716104	EUR	357654	EUR	337316	EUR	20337	EUR
after 19. Year	399125	EUR	357654	EUR	346318	EUR	11335	EUR
after 20. Year	64142	EUR	357654	EUR	355832	EUR	1822	EUR

If you Invest 100% in this Project you are the owner of the 100% Power what the Project bring out (AC). The Income minus Security minus Service is payed for about 20 year's to you. During this 20 Years you get free Service and driving of the Machines (Park). After the repayment of the given Investment you are out of the Project. The remaining Machines, Cables, Modules and Is the Owner the Company. The Company will use longer and on the end the Company will remove the Material.

Electrical Connections

- Highvoltage and Lowvoltage connections are placed left and right on the side of Transformator. (Abb. 1)
- The lowvoltage connections and the zero voltage point are to find in top of Transformator. (Abb. 2)
- The Highvoltage connections are mecanical and electrical integrated in the windings for High voltage and together with the contacts for voltage switch. (Abb. 3)

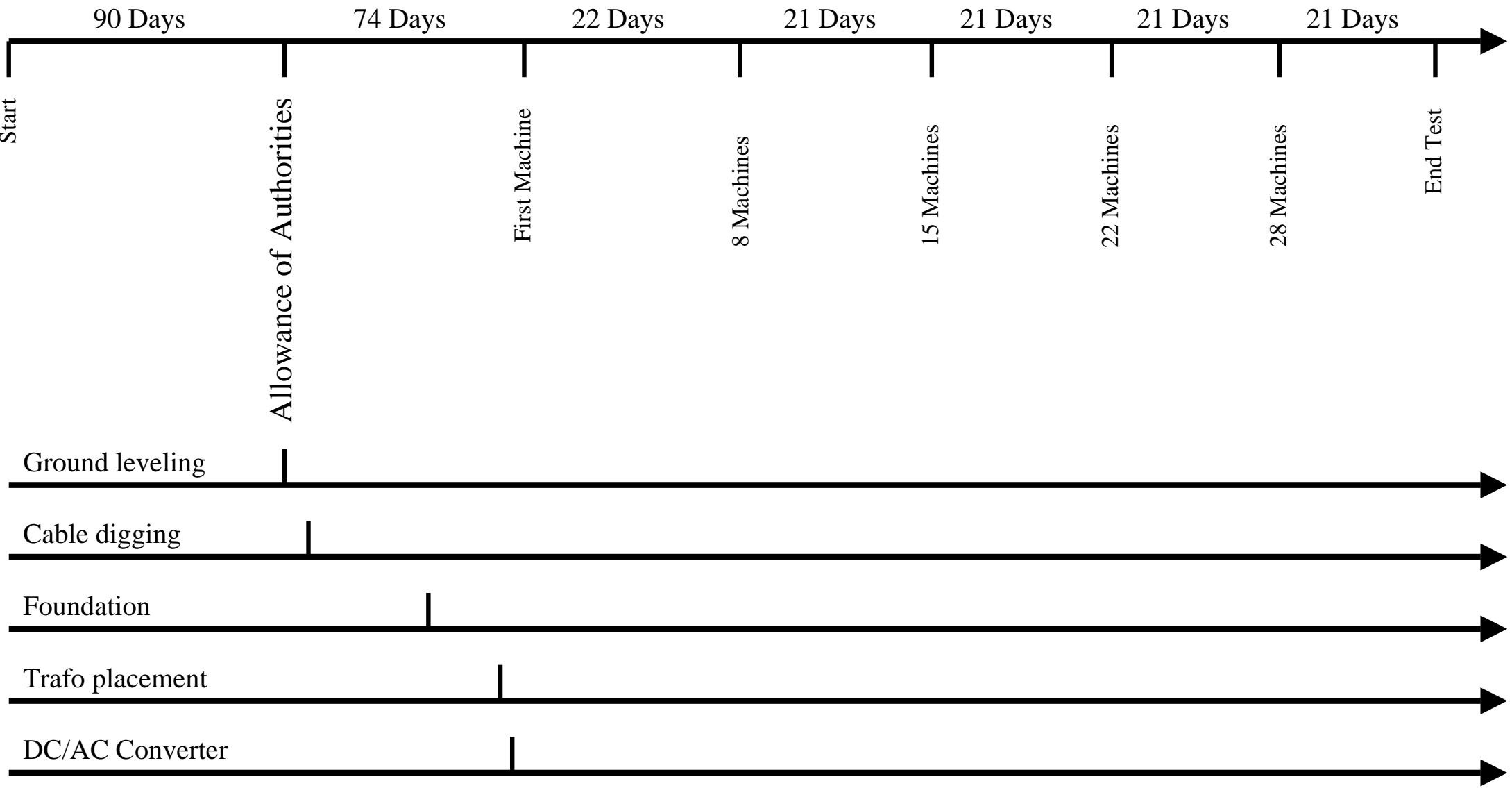


OS Anschluss mit Anzapfbuchsen

Leistung kVA	Typ	OS - US kV	P ₀ W	P _k 120°C W	U _k %	L _{WA} dB (A)	Länge mm	Breite mm	Höhe mm	Ges. Gew. kg
2500	DTTHIL	20 - 0,4	3700	16300	6	68	2200	1270	2300	6350

First Time Plan for the Project

Total Sum of working days = 270



Type of Worker	Shift one	Shift two	Sum of Worker
Measurement	2	2	4
Caterpillar Drivers	1	1	2
Truck Drivers	2	2	4
Crane Drivers	2	2	4
Form workers	4	4	8
Concrete Workers	4	4	8
Welders	2	2	4
Electricians	2	2	4
Helpers/Assistants	20	20	40
Mechanics	2	2	4
Logistic Material Workers	2	2	4
Catering - Cooks	2	2	4
Illness loosing	5	5	10
Sum of all	50	50	100

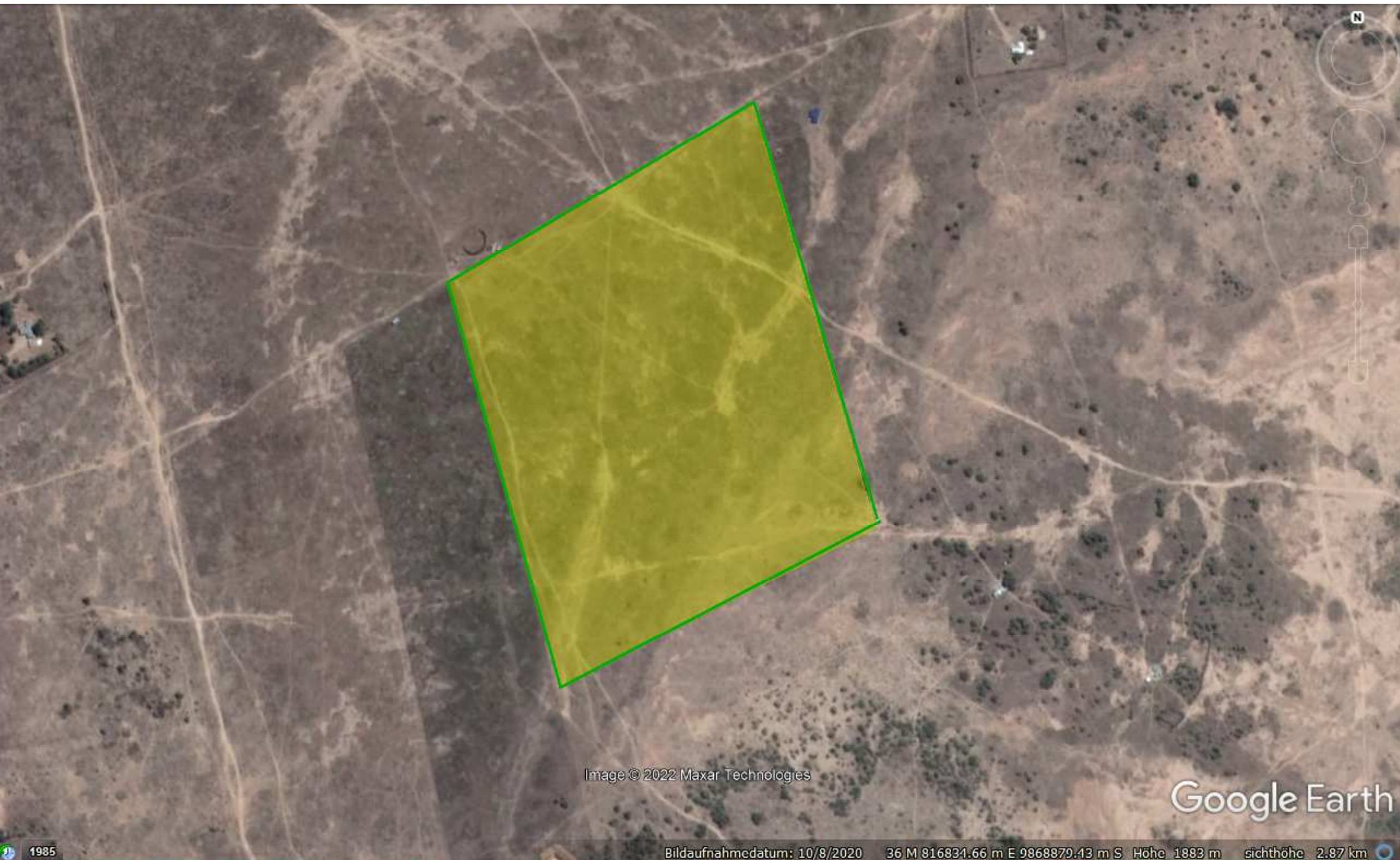
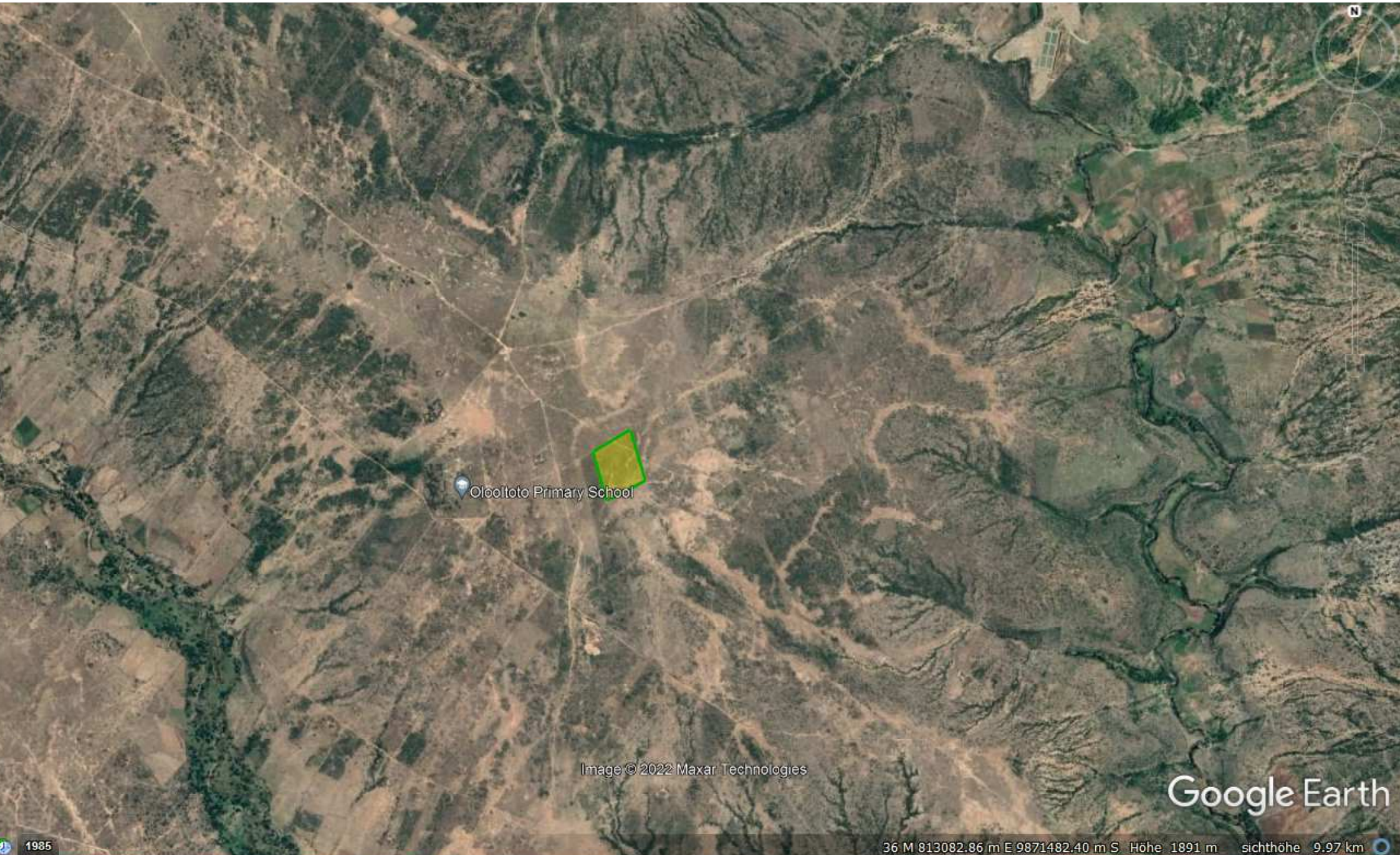


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Google Earth

1985

Bildaufnahmedatum: 10/8/2020 36 M 816834.66 m E 9869879.43 m S Höhe 1883 m sichthöhe 2.87 km



Olcottoto Primary School

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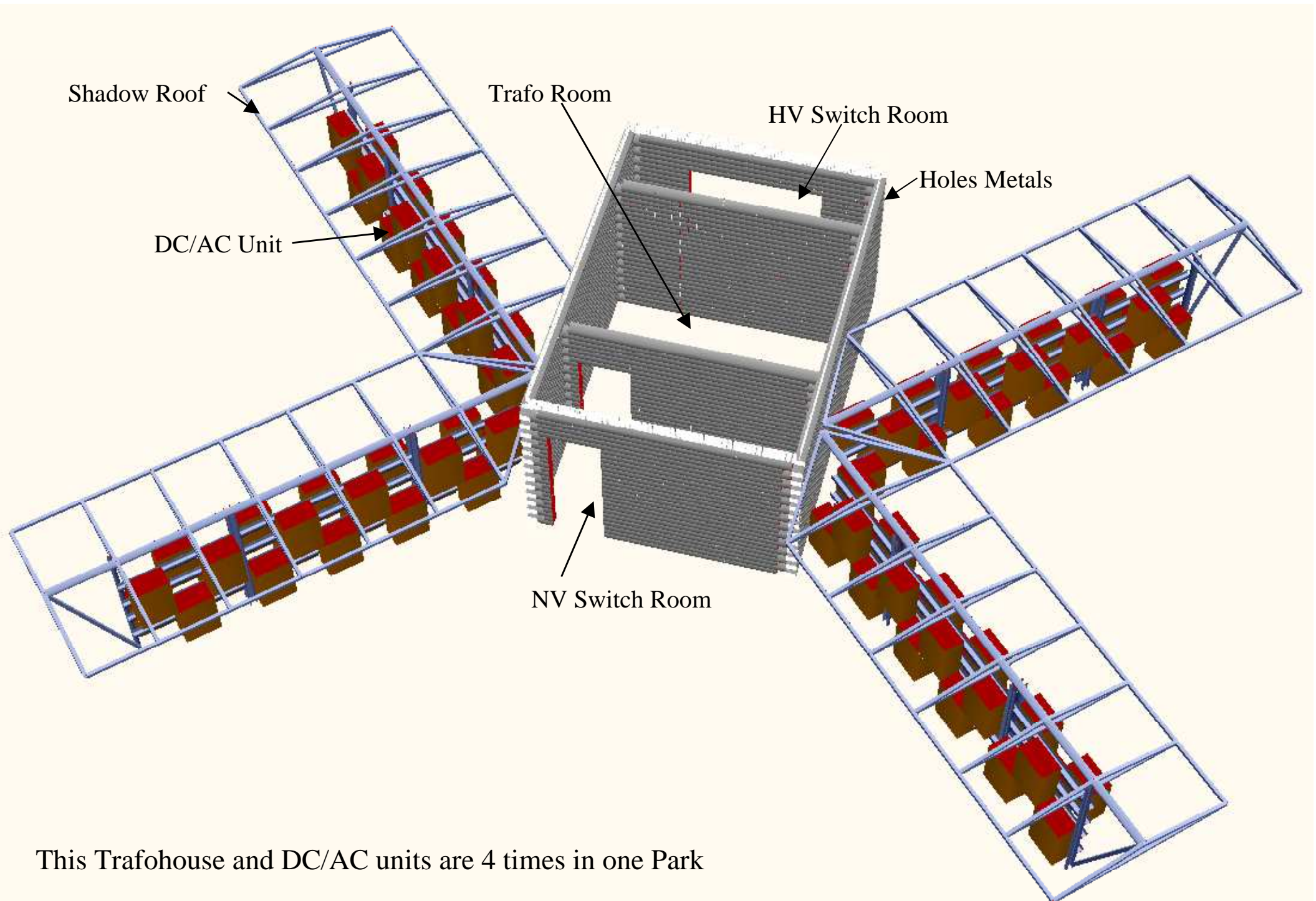
1985

36 M 813082.86 m E 9871482.40 m S Höhe 1891 m sichthöhe 9.97 km



Image © 2022 Maxar Technologies
Image © 2022 CNES / Airbus

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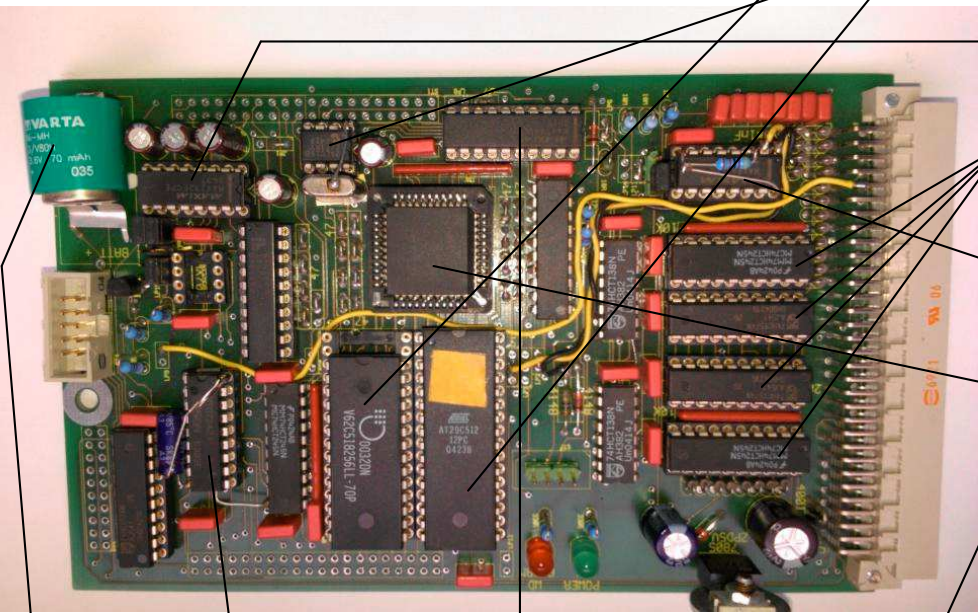


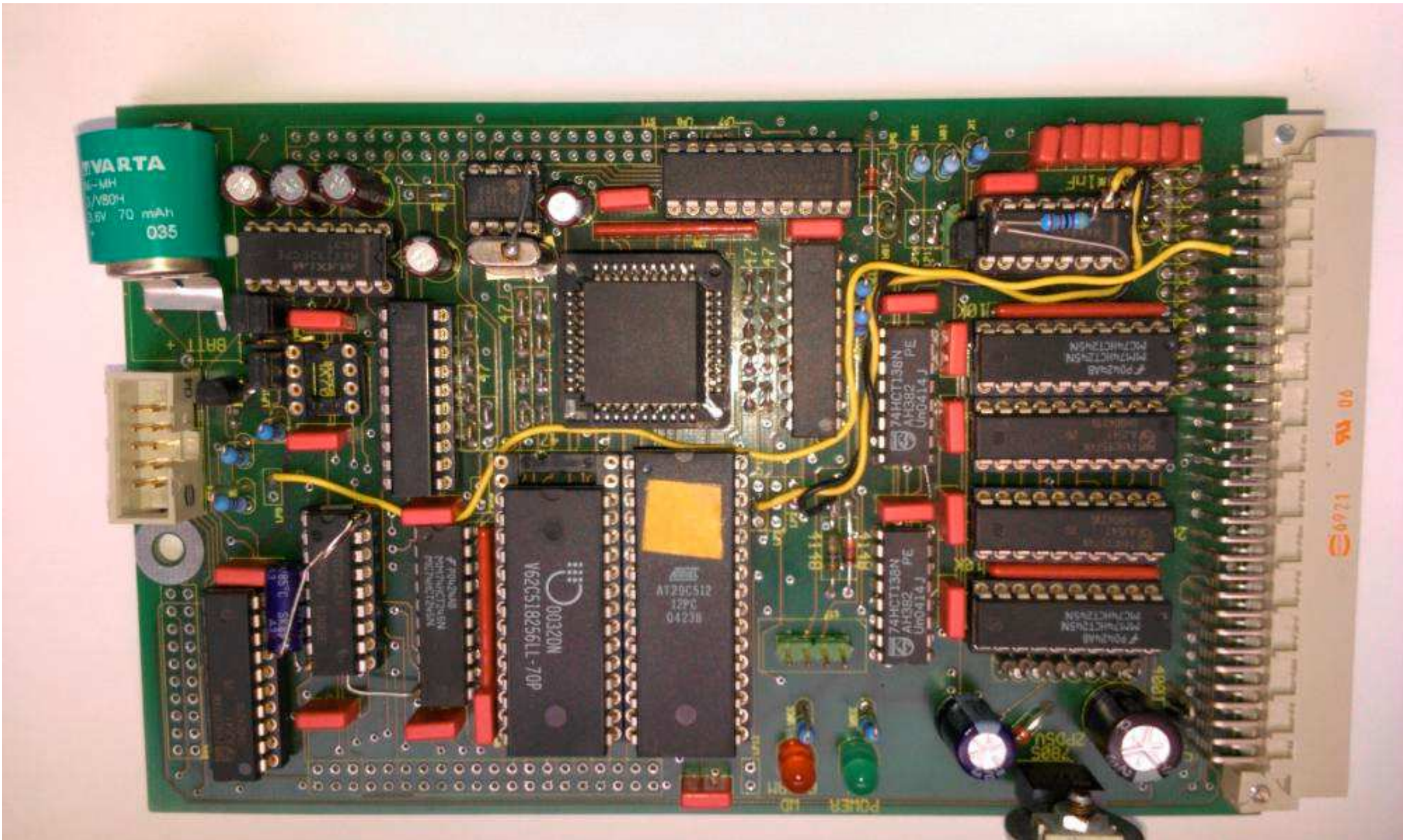
This Trafohouse and DC/AC units are 4 times in one Park

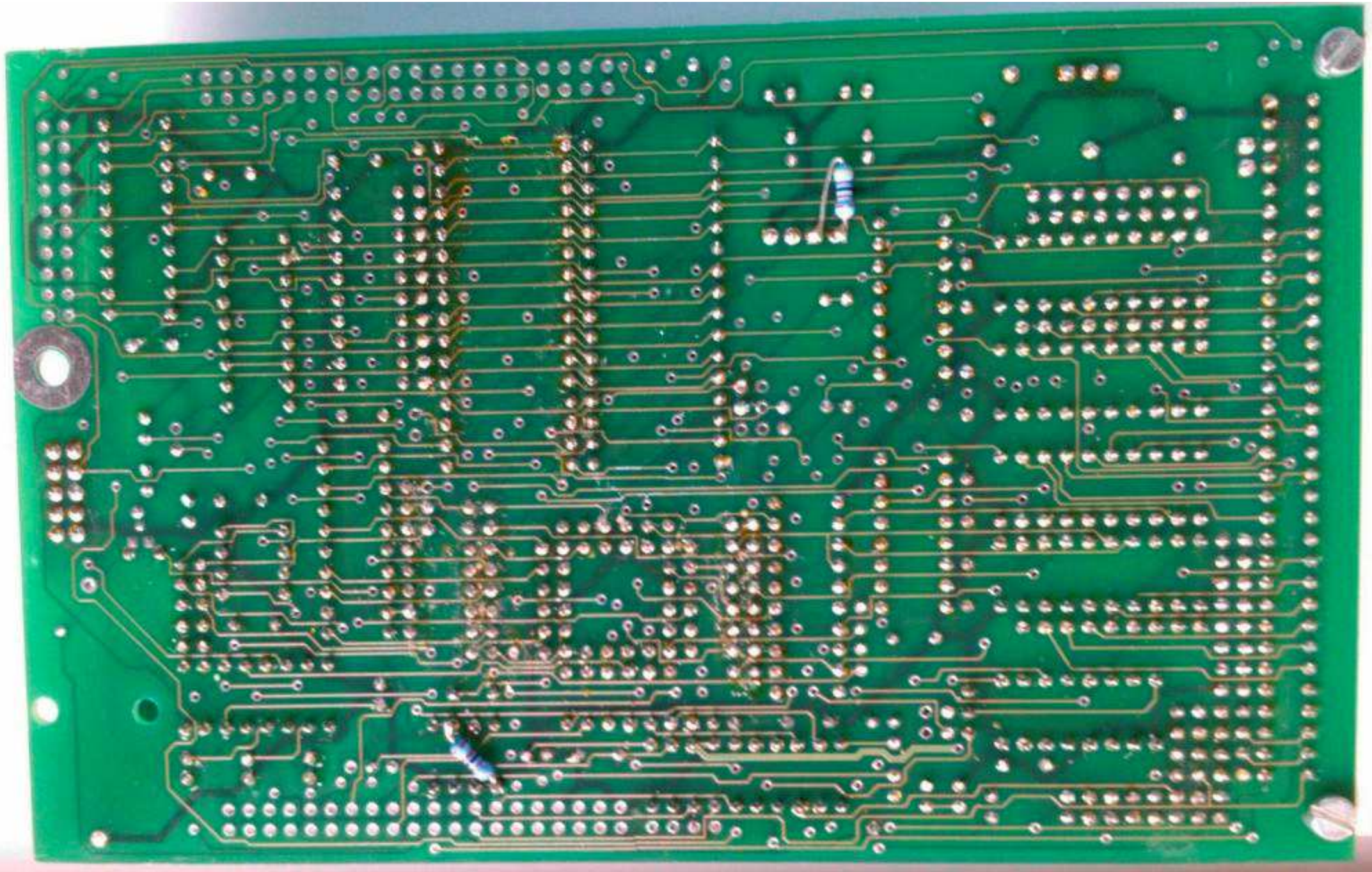
The Hardware is specially build for this System.

On the Circuit you find :

1. RAM for running the Variables in the Program
2. ROM with the BASIC Interpreter
3. EEPROM for storing the Machine adjustment and the non lost able Variables and counter's
4. RS232 serial Interface for Program up/down load and communication with Park Control Unit
5. IO Port's for switch on/off Motors, look to sensors, measurement of Photovoltaic Energy
6. Watchdog for restart the Microprocessor if the Program is in "stop by a fault"
7. CPU to organize everything
8. ACCU for giving Energy to RAM short time when main Power is cut off
9. Real time Clock for giving the Program the actual Date and Time
10. Input for the Signal of World time Signal to sincronize the E-Motor start
11. A/D Converter 8 Bit 0-4V = 00-FF







The Software is written in BASIC Language. The Program is exactly made for the Hardware. The Program is in the undeletable ROM and when the main Power is switched on again, the Program starts automatically. When the Program starts running, it will ask for the geographical position of the Machine, regardless the time and date, because the position will determine the direction and height of the sun.

So the program can calculate which motor and how long it should remain on. On the machine are end sensors to give signal to the CPU when the position in EAST or WEST or in LUNCH time. On the wheels are sensors to give the CPU signal that Motor is running and how far was the way to compensate different Gears or Motors losses.

The Program is communicating with the RS232 Interface and send Information about the actual position and waits for commands from the main control Unit.

This Unit takes the Signals from the IO-Ports of the CPU and change it in 400VAC 3 Phase 10Hz to 80 Hz.

The 2 Outputs are build for 2 x 4 kW asyncron E-Motors. The main is that only one Output is switched on, so the Motor's is not running at the same time. The motors will run alternatively. This will reduce the peak for power consumption of the motors.

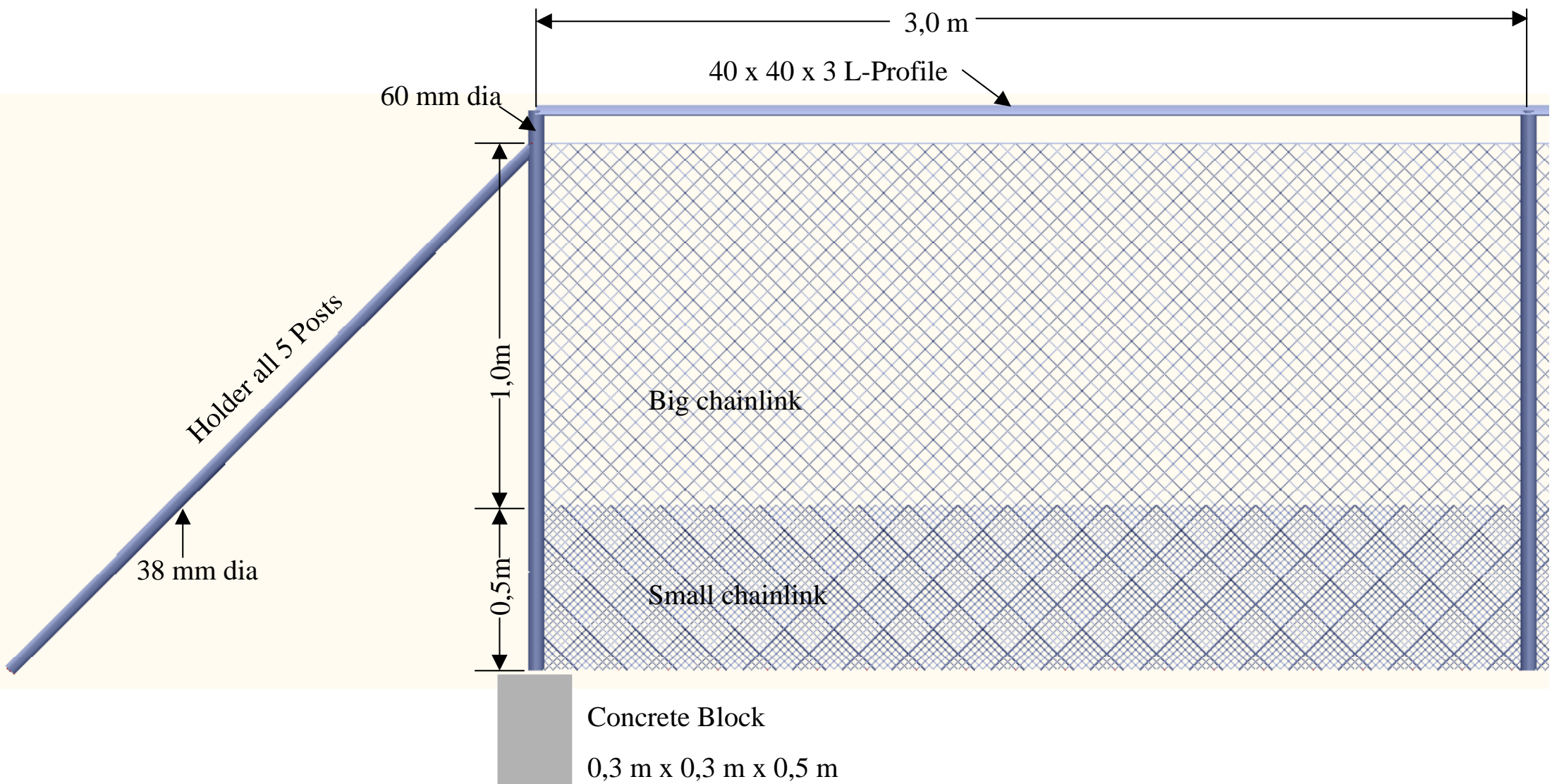
In the moment the motors are switched off, the generated Energy is going in a bulk Resistor. So the internal voltage will not be too high to damage the main Transistors. The switch point of the Resistor is controlled with a voltage control part inside this circuit.

The vertical turn is driven with 4 x 1 kW asyncron E-Motors. The motors are parallel connected.

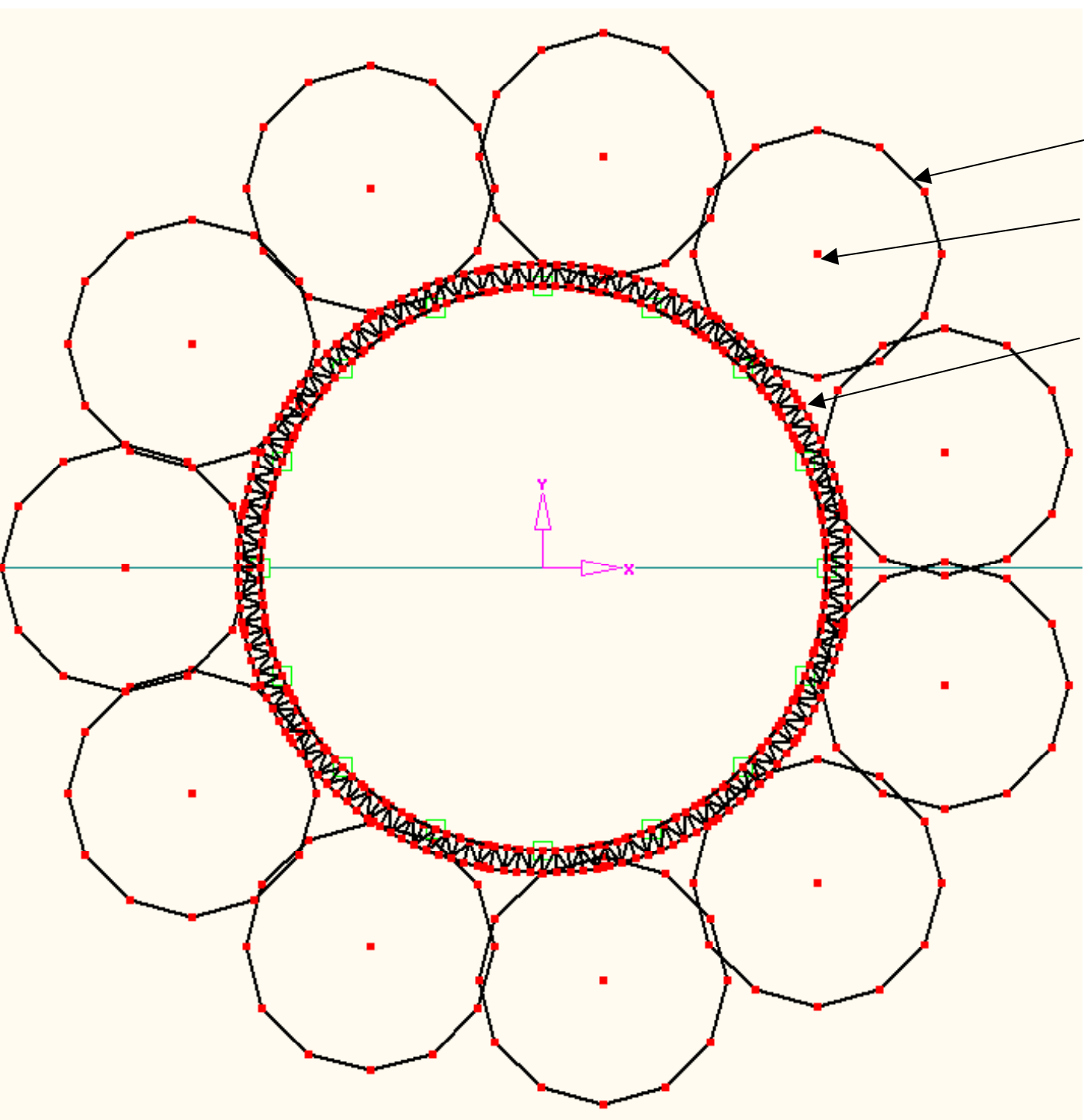
The horizontal movement is driven with 2 x 2 kW asyncron E-Motors. The motors are parallel connected.

The Fence around the Plot

The Fence is made from chain link fence. It is 1,5 m high. See picture. The distance between of the posts is 3 m.



394 Posts, 79 Holders, 1180 m L-Profile, 1180 m x 1 m Big chain link, 1180 m x 0,5 m Small chain link



- Spray diameter
- Sinking Sprinkler
- Ground ring of Machine

Around every Machine are 11 Sprinklers installed. All on one ring pipe. The ring pipe is with two T's connected to the output of a Valve near middle of Machine. The input of a Valve is connected to a Pipe grid between all Machines. On the highest point of an Area is a Water Tank placed with a pump. If fire should occur near one Machine, the Valve for this Machine opens and the Valves of the neighboring Machines will open. So the Ground will get wet and the fire goes off.

Main Planer : Wolfram Berger, von-Witzlebenstr. 33, 56076 Koblenz, Germany, +49 178 29 63 015, europasolar@yahoo.de

Measurements :

Caterpillar Drivers :

Truck Drivers :

Crane Drivers :

Formwork Builders :

Concrete Workers :

Welders :

Electricians Worker :

Mechanics Worker :

Logistic Material Worker :

Catering Cook : Florence Berger, von-Witzlebenstr. 33, 56076 Koblenz, Germany