

**ZENNA**  
Solar. Aber richtig.



## Companies Involved



- ◆ Founded in 2012
- ◆ 4 Employees
- ◆ Planning and consulting of Photovoltaic



- ◆ Founded in 2011
- ◆ 5 Employees
- ◆ Installation of Off-Grid Photovoltaic

## Unsere Dienstleistung



**Roland Schlegel, Partner**  
10 Jahre Erfahrung mit Photovoltaik



**Lukas Küffer, Partner**  
10 Jahre Erfahrung mit Photovoltaik



**Marco Kübler, Partner**  
10 Jahre Erfahrung mit Erneuerbaren  
Energien / Photovoltaik



**Michael Sturm, Projektleiter**  
2 Jahr Erfahrung mit Photovoltaik

Wir beraten zum Thema Photovoltaik:

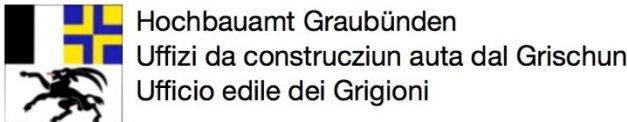
- ◆ Gemeinden
- ◆ Kantone
- ◆ EVU's
- ◆ Dachbesitzer
- ◆ Immobilienbesitzer

[www.ZENNA.ch](http://www.ZENNA.ch)

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Wir sind *keine* Photovoltaik-Anlagenbauer oder Energieberater.

**Unsere Kunden**





## Referenz: Grösste Photovoltaik Anlage im Rheintal



- ◆ 4'200 Solar Module
- ◆ 1.071 MWp
- ◆ 930'000 kWh pro Jahr



# Solar Energy Solutions Belize Ltd.



**SILVAN**

Co-Founder / Director of Sales & Operations



**NADJA**

Co-Founder / Business Manager



**LUKAS**

Co-Founder & Head Tech Advisor



**SAM**

Solar Technician / Maintenance



**DEE**

Solar Technician / Monitoring



**HUBERT**

Assistant Installation

[www.SESB.com](http://www.SESB.com)





## Referenz: Off-Grid Anlage in Belize in Zentral Amerika



- ◆ 96 Solar Module / 32 Batterien
- ◆ 25 kWp Solar / 36kWp Batterie Wechselrichter
- ◆ 32'500 kWh pro Jahr

Solar Beratung





## Power Production today in La Gracia



- ◆ Individual 12 Volt solar systems with car-battery



<https://vimeo.com/145614639>

# Proof of concept Smart Solar Off-Grid

**REPIC**  
Renewable Energy &  
Energy Efficiency  
Promotion in  
International  
Cooperation



Schweizerische Eidgenossenschaft  
Confédération suisse  
Confederazione Svizzera  
Confederaziun svizra  
  
Swiss State Secretariat for Economic Affairs SECO  
Swiss Agency for Development and Cooperation SDC  
Swiss Federal Office of Energy SFOE

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## Power Grid for La Gracia Tomorrow



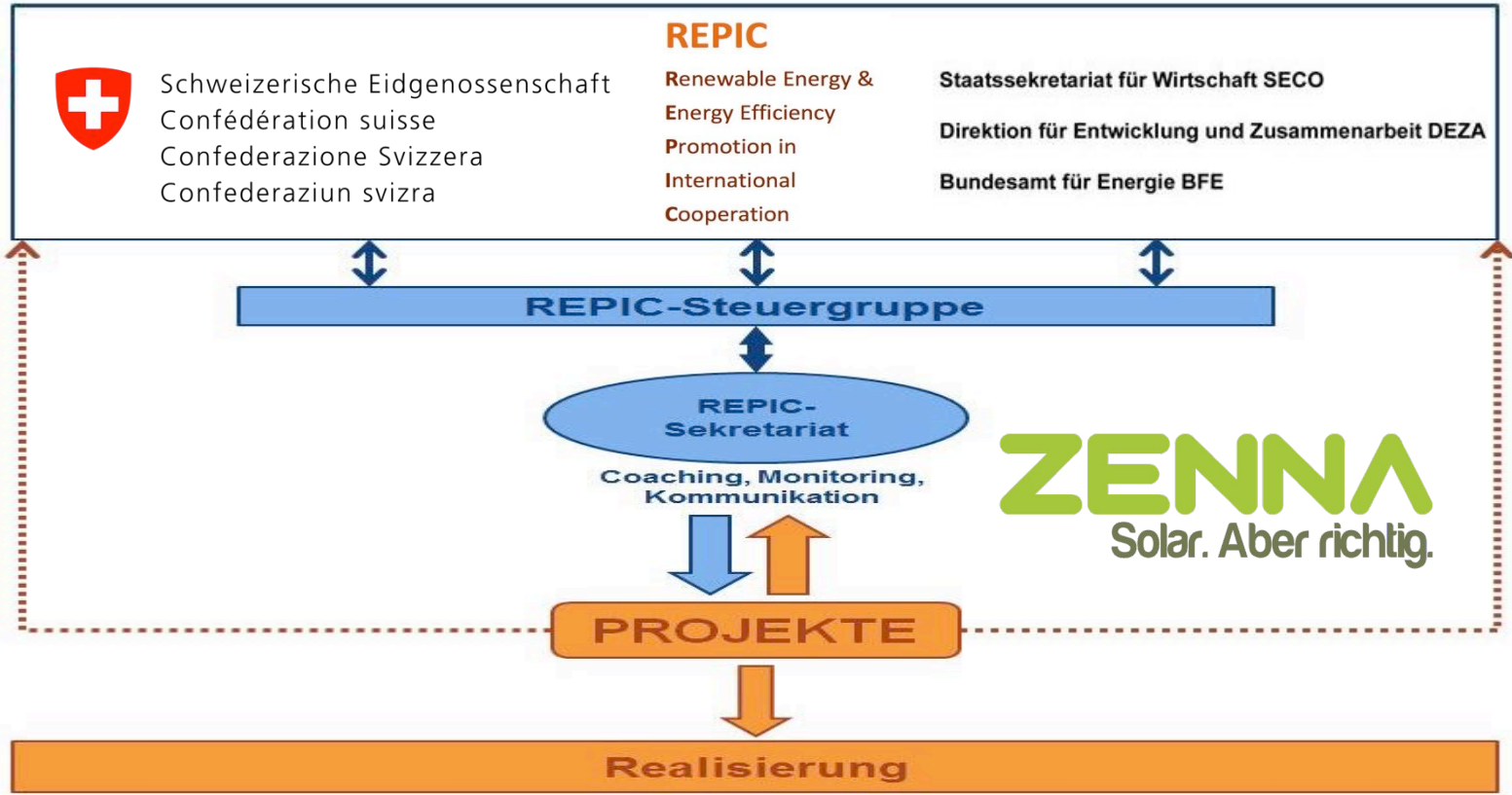


## Why La Gracia?



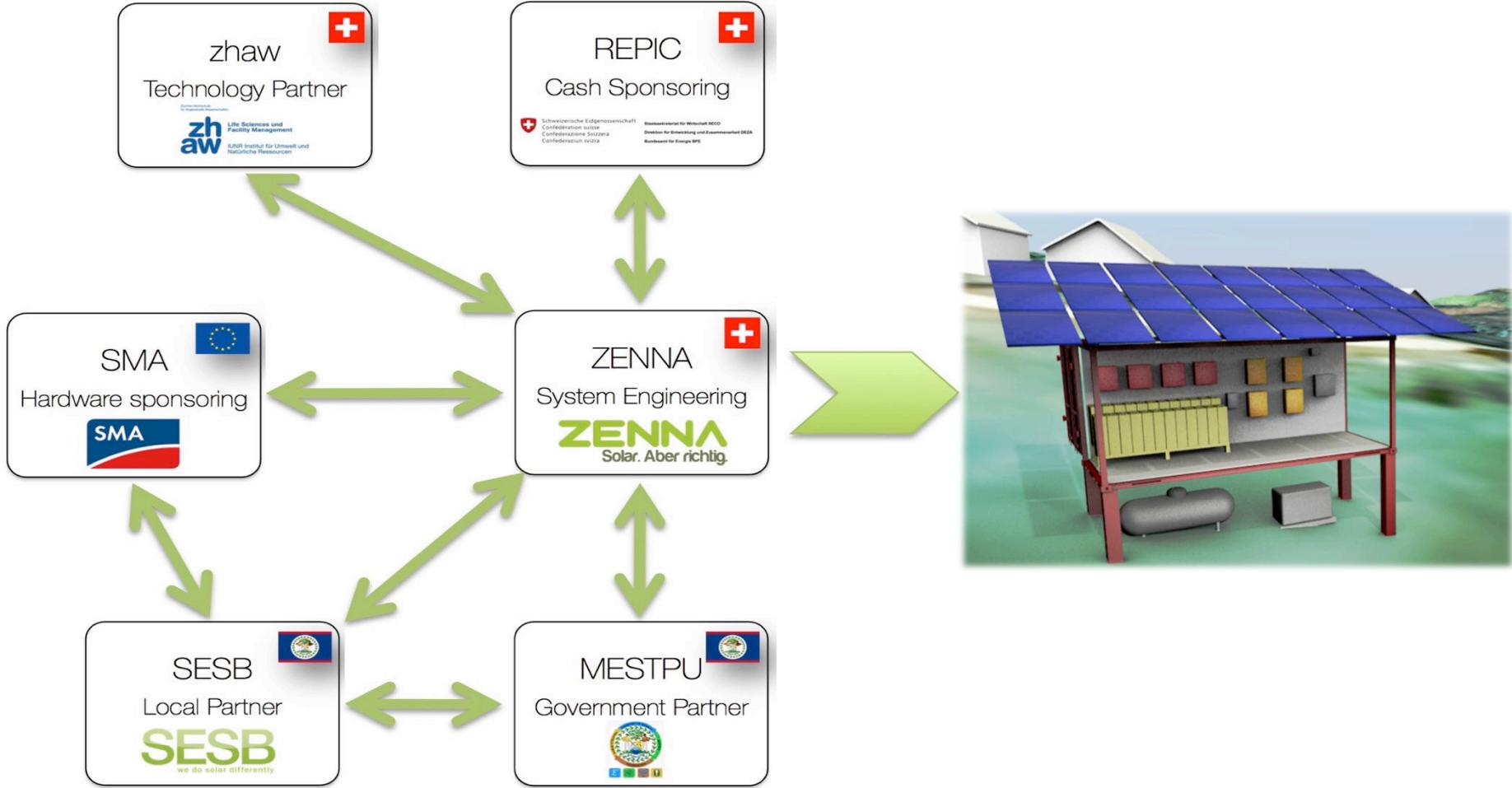


# REPIC - Organisation

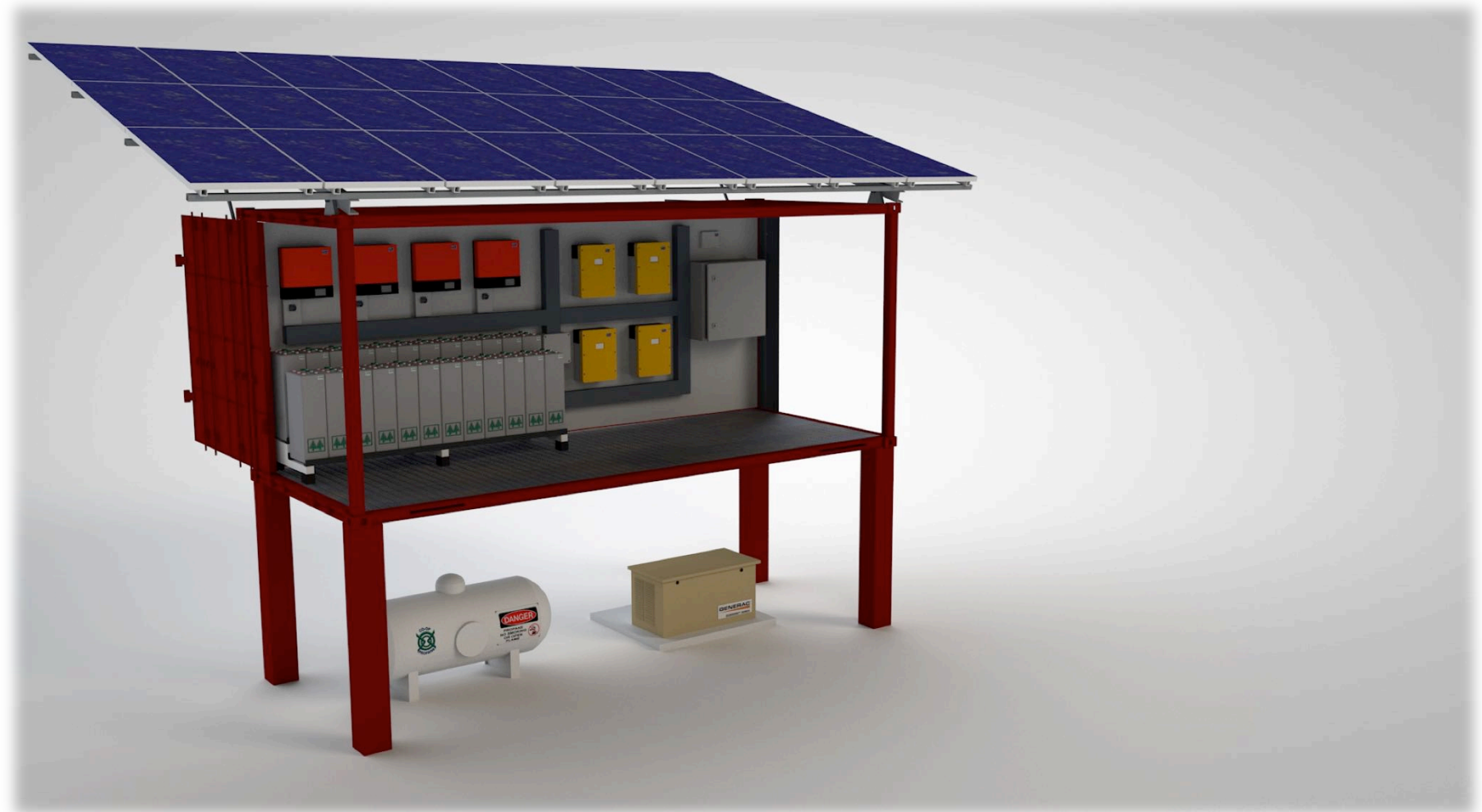




# REPIC Solar Off-grid Project in Belize

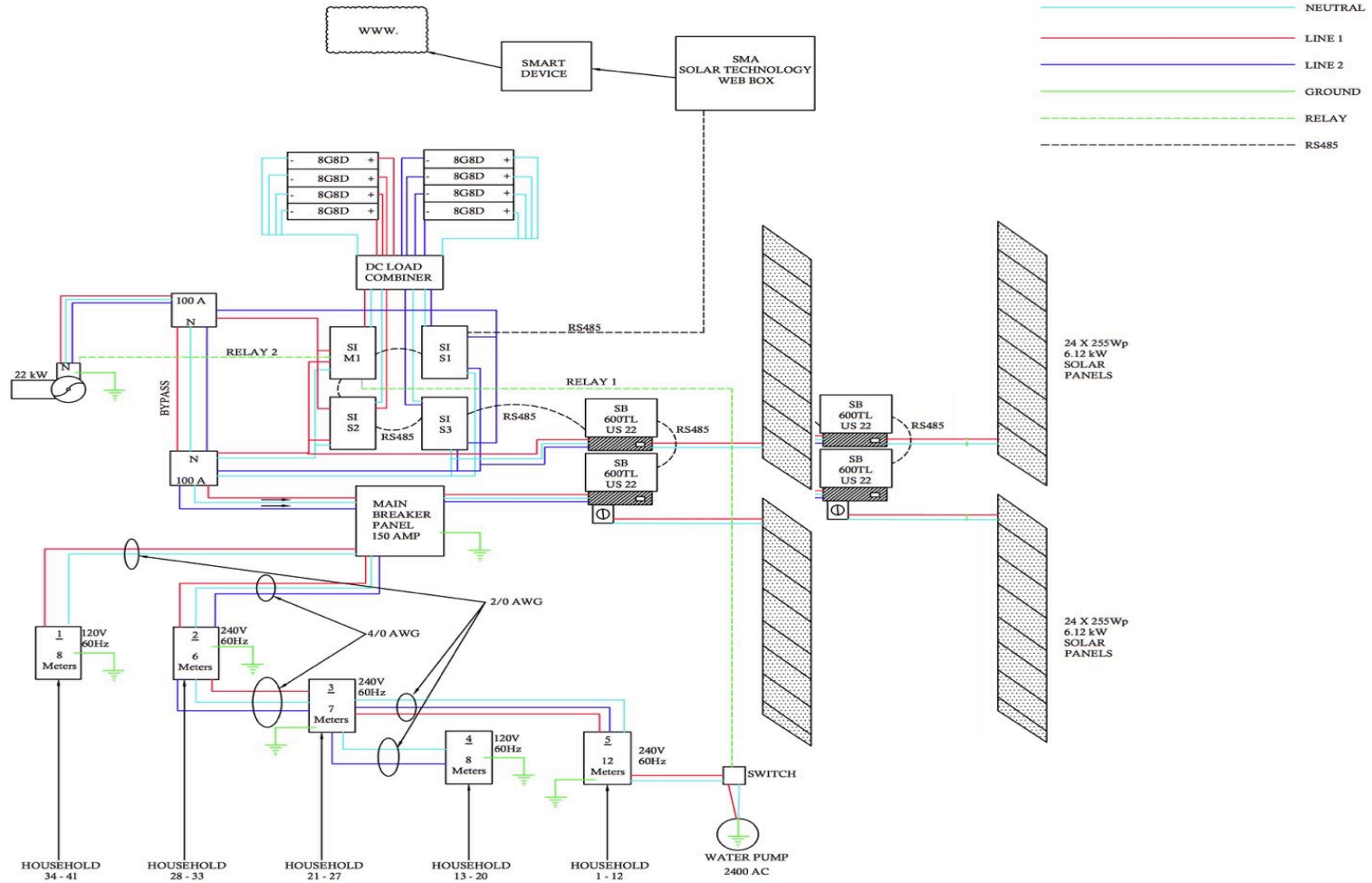


## Off-Grid System

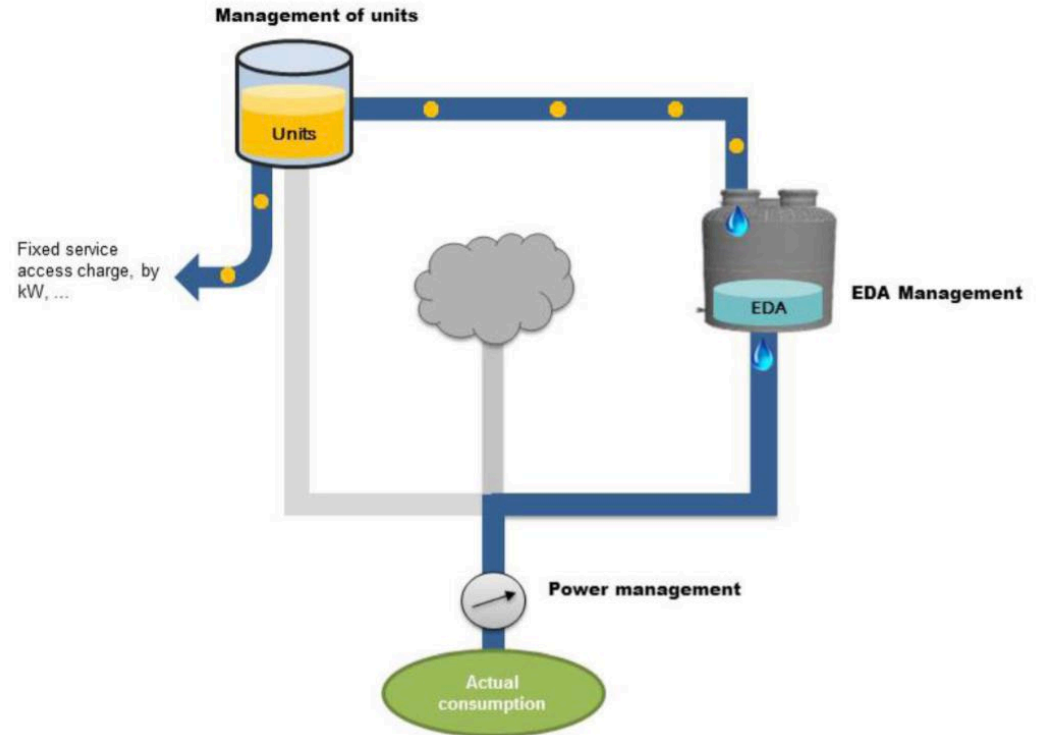




## Off Grid System Layout




# Micro-grid management system





## Customer needs

HESIPII  
HESIPII  
HESIPII  
HESIPII  
No. Ambrose Tillet



**SMART SOLAR OFF-GRID**

**SIGN-UP LIST FOR INTERESTED VILLAGERS FOR SOLAR POWER SUPPLY IN LA GRACIA VILLAGE**




















ONE LINE PER HOUSEHOLD ONLY

NO	NAME OF FAMILY / HOUSEHOLD	AMT OF PEOPLE IN HOUSEHOLD	DISTANCE TO SCHOOL (IN YARDS)	ESTIMATED POWER USE (TICK ONE ONLY)			IS THE HOUSE WIRED FOR AC POWER? Y / N
				LOW	MED	HIGH	
1	Miranda	4			✓		no
2	Martinez	6			✓		no
3	Castillo miguel	5			✓		no
4	Fuentes	9			✓		no
5	Fuentes Marbin	1			✓		no
6	Ramires	6			✓		no
7	Zepeda walter	3			✓		no
8	Flores	5			✓		no
9	Zepeda Veniso	4			✓		no

LOW: Lights, Radio, Small TV, NO FRIDGE  
 MED: Lights, Radio, Small TV, Fridge, Fan  
 HIGH: Lights, Radio, Small TV, Fridge, Fan, Washer, Water pump, Power tools

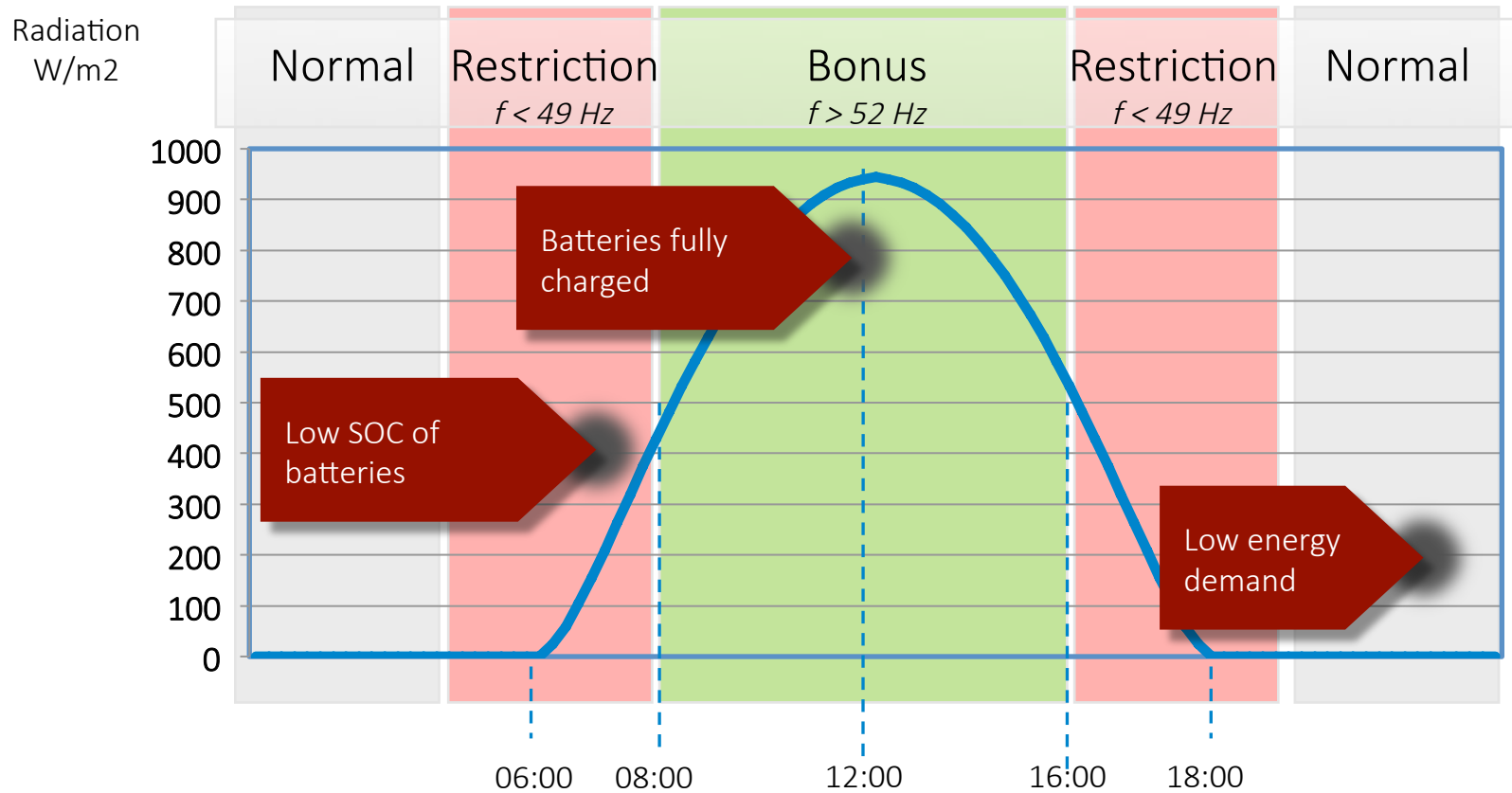
SESB Sign-up-list-villagers.xlsx Page 1

## Business Model and Tariff definition

Tariffs												
Code (Txy)	Monthly cost (US\$)	EDA (kWh/day)	Maximum power (kW)									
T11	4.30	0.55	0,5									
T21	8.60	1.10	0,5									
T41	17.10	2.20	0,5									
T72	30.00	3.85	1,0								24h	
T82	34.30	4.40	1,0								24h	

- ◆ 0.26 US\$ per kWh equivalent to the power from the grid
- ◆ Monthly income of ca. 600US\$ per Person

## Tariff - Frequency mode





## Tariff - Time-Of-Use

Time	Energy price	Status	Auxiliary relay
23:01 - 07:00	0,26 \$/kWh	Normal	OFF
07:01 - 15:00	0,1 \$/kWh	Bonus	ON
15:00 - 23:00	0,4 \$/kWh	Restriction	OFF

## Users' interface: LED's

Colour	Significance
-----	Normal
Green fixed	-----
Green intermittent slow	Bonus
Orange fixed	Net balance
Orange intermittent slow	Depletion of units
Orange intermittent rapid	Depletion of energy
Red fixed	Relay open
Red intermittent slow	Restriction



## Project Budget

	ZENNA (CHF155/h)	zahw (CHF125/h)	SESB (CHF45/h)	
System Design	120	40		
Hardware Order			24	
System Pre-Building			160	
System Moving to La Gracia			16	
System Installation in La Gracia			160	
Building Grid and Powerstations			120	
RampUp System	80		42	
System Live	8		8	
Interim Report to REPIC	32			
System Testing and Optimizing	60		160	
Developing Business Model	20			
System hand-over to GOV	8		8	
Final Report to REPIC	32			
Total Hours	360	40	698	
Working Hour Costs:	CHF 55'800	CHF 5'000	CHF 31'410	CHF 92'210



## Project Budget

	Flight Cost: (eco)	Hotel Cost: (14 Days)	Daily Expenses	
1. Trip to Belize LK (RampUp System)	CHF 2'500	CHF 2'100	CHF 700	
2. Trip to Belize LK (System Optimizing)	CHF 2'500	CHF 2'100	CHF 700	
3. Trip to Belize LK (System hand-over)	CHF 2'500	CHF 2'100	CHF 700	
Travel Cost:	<u>CHF 7'500</u>	<u>CHF 6'300</u>	<u>CHF 2'100</u>	CHF 15'900
Hardware Cost (see appendix):				CHF 192'431
Project Costs:				<u>CHF 300'541</u>
ZENNA AG				CHF 29'131
Zürcher Hochschule für Angewandte Wissenschaften (zahw)				CHF 5'000
Solar Energy Solutions Belize Ltd. (SESB)				CHF 31'410
Project Partners (not more than 3)				CHF 85'000
REPIC				CHF 150'000
Covered Project Costs:				<u>CHF 300'541</u>

## Zusammenarbeit



## Contact



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