

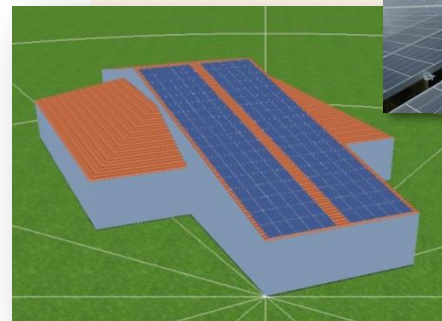


Professional Training by using German concepts adopted to the Brazilian reality

IV German-Brazilian Renewable Energy Business Conference, February 2016

Hans Rauschmayer

- Founded in 2003
- Technologies: PV, Solar Heating
- Training classes since 2008
 - For professionals, students, curious and low income people
 - Most complete program in Rio
- Installations and projects
- International business support
- Well connected to important players
 - GIZ, AHK
 - Sebrae, Senai, SESC
 - Rio Capital da Energia
 - Universities
 - Government
 - Institutions

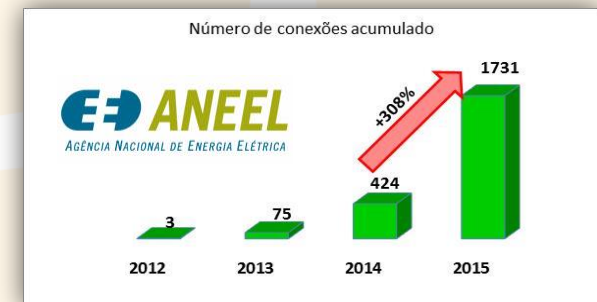


- Until 2011: off-grid systems
 - mostly small and simple
 - Hybrid systems being built by specialized companies
 - Low demand, Few trainings
- 2012: starting on-grid
 - April 2012: Regulation Aneel 482, permitting on-grid installations in Brazil
 - Mixed trainings on and off-grid, first specific trainings for on-grid-systems
- 2013: First running on-grid installations
 - Supply chain is being built up
 - Experience with utility companies and real difficulties
 - Growing demand for trainings
 - About 5 training providers in Brazil
 - August 2013: first on-grid installation in Rio de Janeiro by Solarize



Development of PV market and trainings in Brazil

- 2014: First auction of large-scale plants
- 2015: Expansion of training demand
 - New specialized trainings : surge protection, large scale systems, software PV*SOL
 - Installed systems increase by 300%
 - New regulation Aneel 387/2015, creating new markets
 - Changes on legislation (taxes etc.) → frequent changes in training material
- 2016: We expect consolidation
 - Increasing demand on trainings – basic classes are booked out one month in advance
 - 28 training providers in Brazil (source: Portal Solar, some of them are inactive)
 - More specialized trainings
 - Mostly established supply chain
 - Fewer changes of legal issues



Why did we decide to start with German concepts for our Brazilian classes?

- Worldwide best experience with on-grid systems
- High level standardization (DIN, VDI is the base for EN, IEC)
- Well structured training material (DGS, TÜV)

What are the challenges when adopting these concepts to the Brazilian reality? Let's see some examples ...

Germany

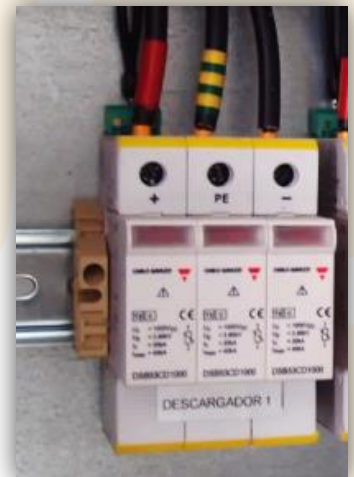
- High level professional education

Brazil

- Very diversely capacitated public in our classes
 - Electric engineers
 - Electricians with or without formal education
 - Other technicians or engineers (Oil & Gas, mechanical)
 - Entrepreneurs & general public

Solutions

- Use simple explications about general pv topics, interchanged with technical details “only for specialists”
- Inform about the specific security issues concerning pv systems
- Reinforce the importance of longevity of pv systems (> 25 years)
- Stimulate use of high quality material, even if expensive



Germany

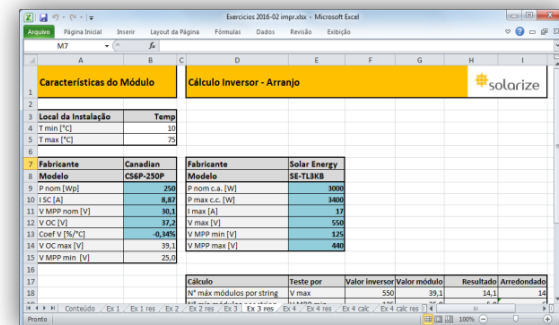
- Low interest rates & expensive workforce
- Stable conditions raise the disposition to invest in efficiency

Brazil

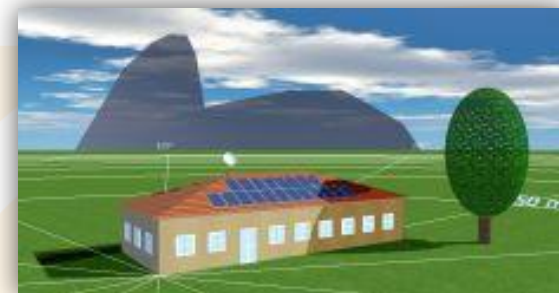
- High interest rates & reduced access to credits
- Unstable political and economical conditions make it unsure if the investment will pay back

Solutions

- Introduce professional tools, but provide simple solutions for beginning installers
- Example: Dimensioning
 - Starting approach: RetScreen software (free) + Excel sheets
 - When established: professional software like PV*SOL
- Example: Commissioning
 - Starting approach: short circuit box + usual multimeters
 - When established: integrated and more reliable instruments



Características do Módulo		Cálculo Inversor - Arranjo	
1	Local da Instalação	Temp	
2	4 T min [°C]	25	
3	5 T max [°C]	25	
6	Fabricante	Canadian	Fabricante
7	Módulo	CSP-250P	Módulo
8	P nom [Wp]	250	P nom c.a. [W]
9	I sc [A]	8,87	P max c.c. [W]
10	V MPP nom [V]	30,1	I max [A]
11	V OC [V]	37,2	V max [V]
12	Coef V [1/°C]	-0,34%	V MPP min [V]
13	V OC max [V]	39,1	V MPP max [V]
14	V MPP min [V]	29,0	
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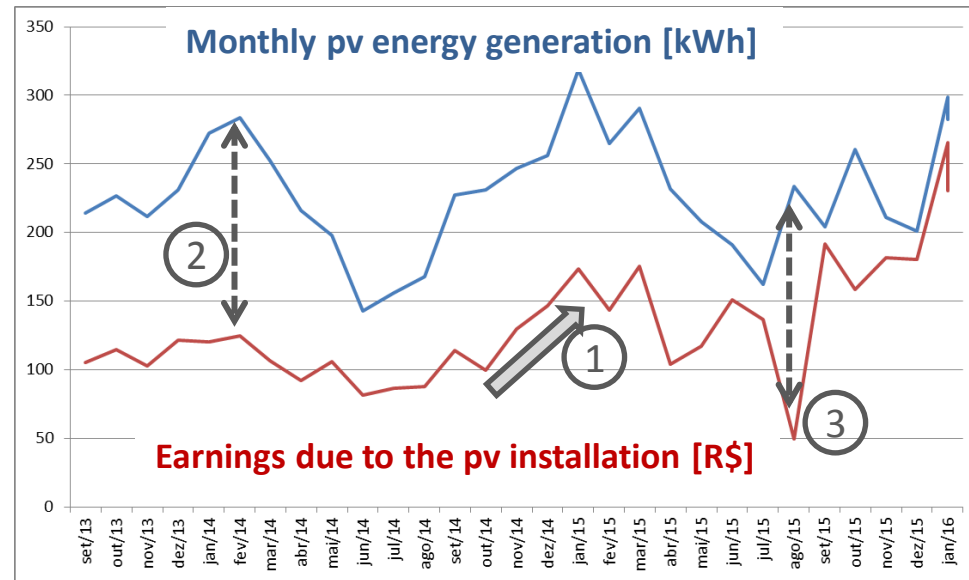


Germany

- Feed in tariff guarantees prices over the next 20 years

Brazil

- Net metering earnings depends on
 - Consumption tariffs in the future (1) (high political impact in the last years)
 - Taxes that vary depending on monthly consumption (2) – state law
 - Base tariff (custo de disponibilidade) absorbs energy in months with low consumption (3)



May I predict the return of pv systems?

Solutions

- Monitor real data and gain experience (Example: Solarize's system in 30 month)
- Explain the rules and make clear that any calculation is imprecise and depends on individual assumptions

- Even highly technical trainings using commodity products need an intercultural adoption
- Photovoltaics in Brazil is still a very new topic with monthly changes
- Will 2016 bring a consolidation?
- Would it be better to standardize trainings?



Thank you for your attention

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Photos: Hans Rauschmayer, where not mentioned

