SUSTAINABLE ENERGY FOR ALL

The Challenge to Universal Access in Bolivia

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ENERGÉTICA
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energía con equidad

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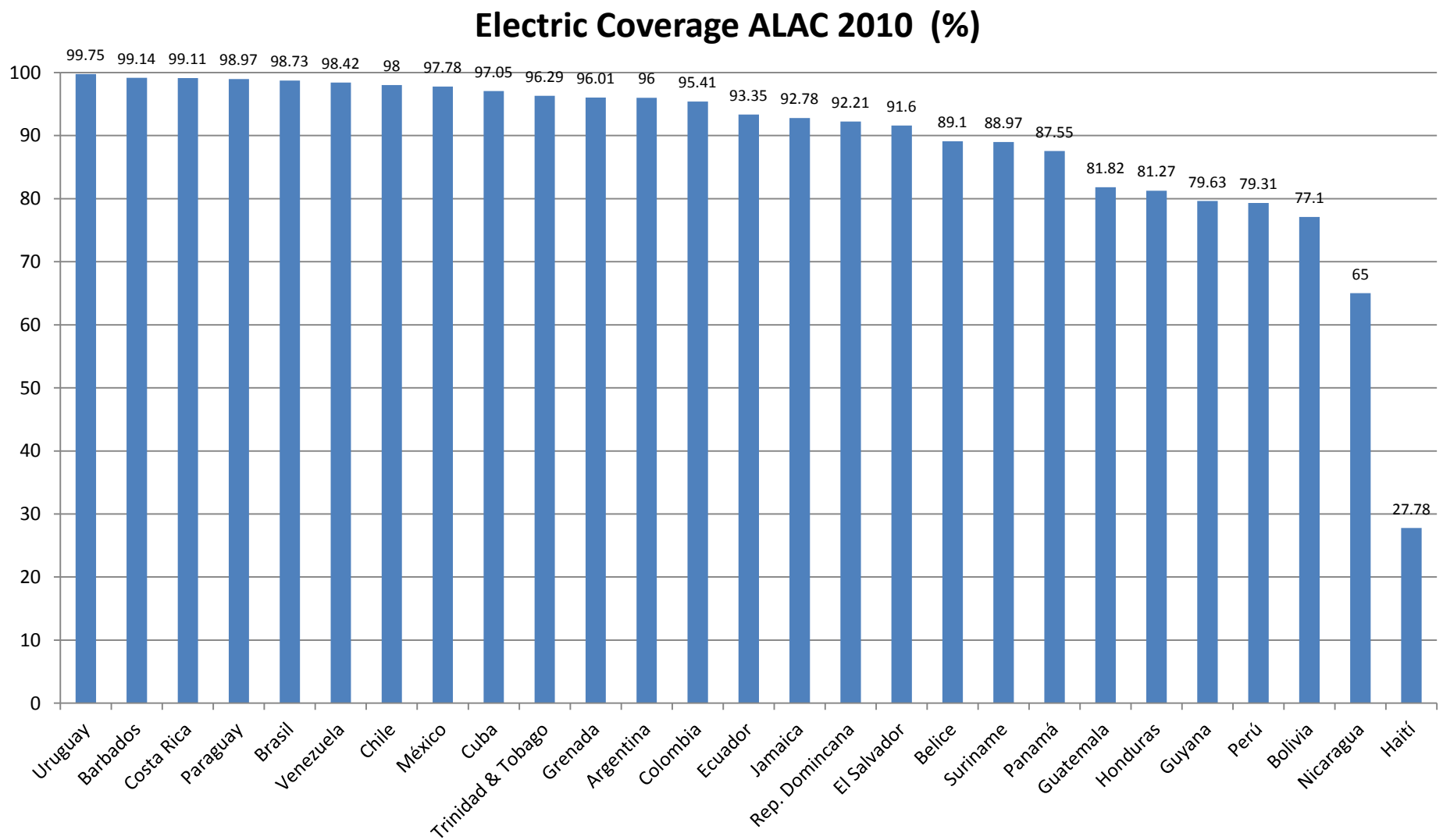
Access to Electricity in LAC – 2010

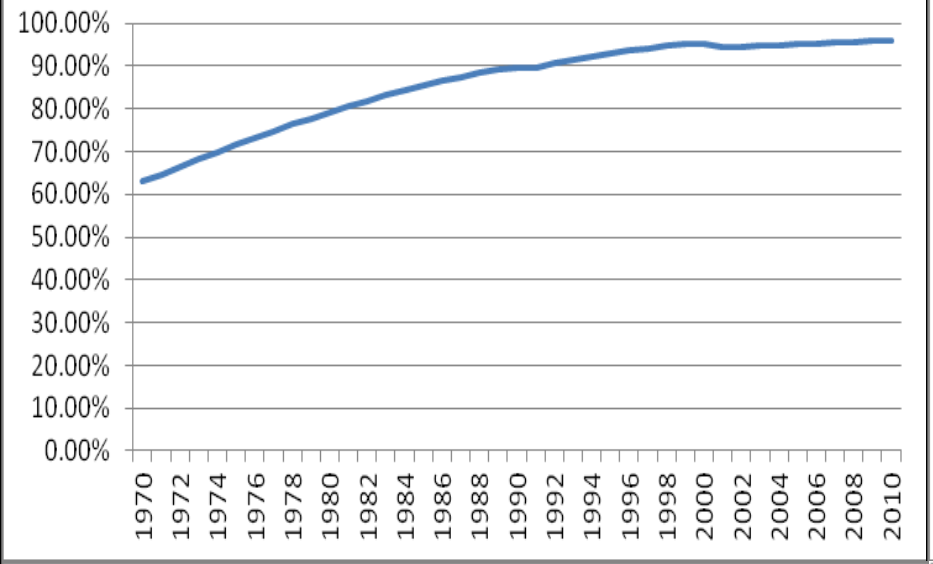
(OLADE – BID 2012)



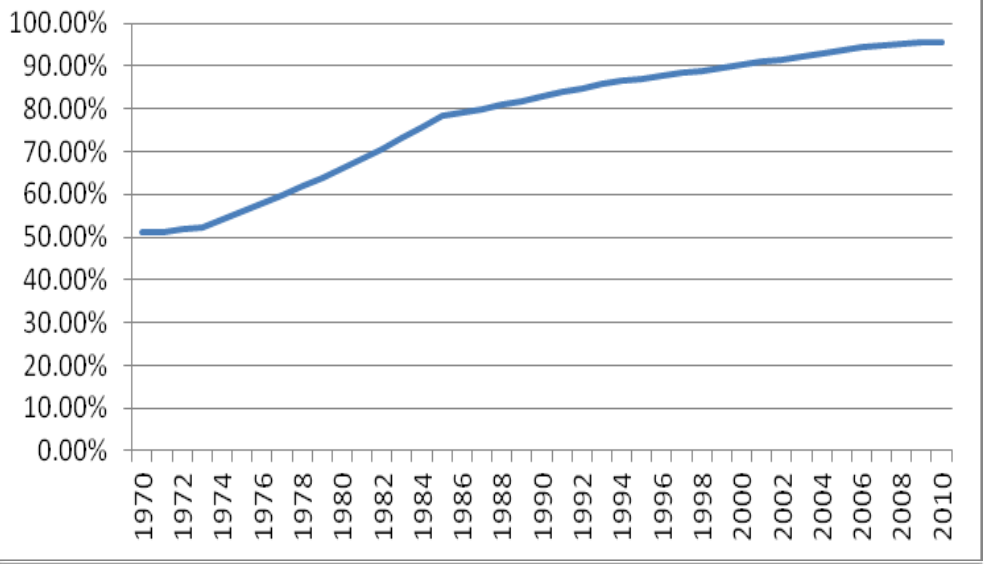
- 95% population have access to electricity
- 34 MM people don´t have access, majority in rural areas
- Except two countries, all have coverage above 70% (in 2013)

Quantity	Coverage
13 Country	Above 95%
4 Country	95% - 90%
8 Country	90% -70%
2 Country	Below 70%

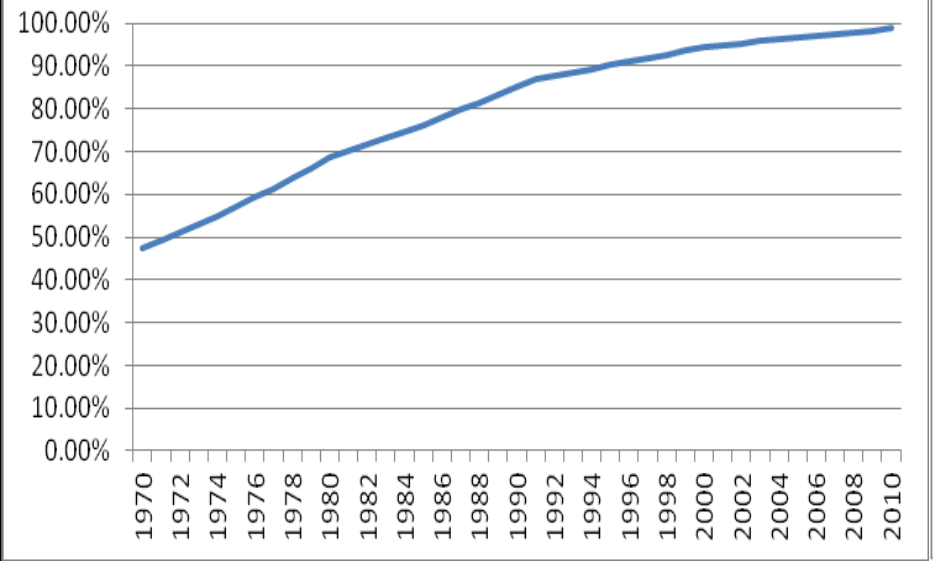
Argentina
Cobertura eléctrica total



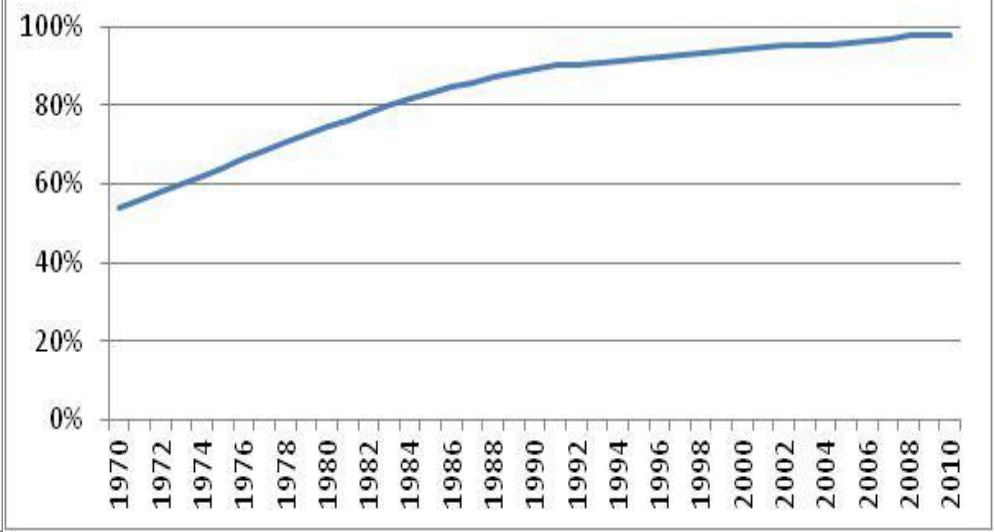
Colombia
Cobertura eléctrica total

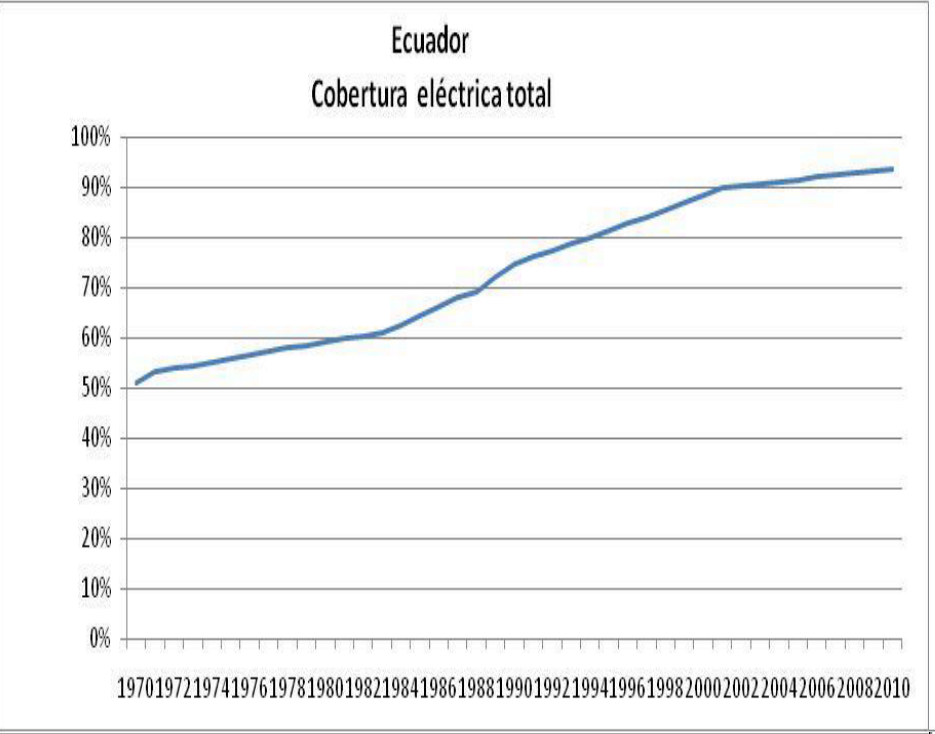


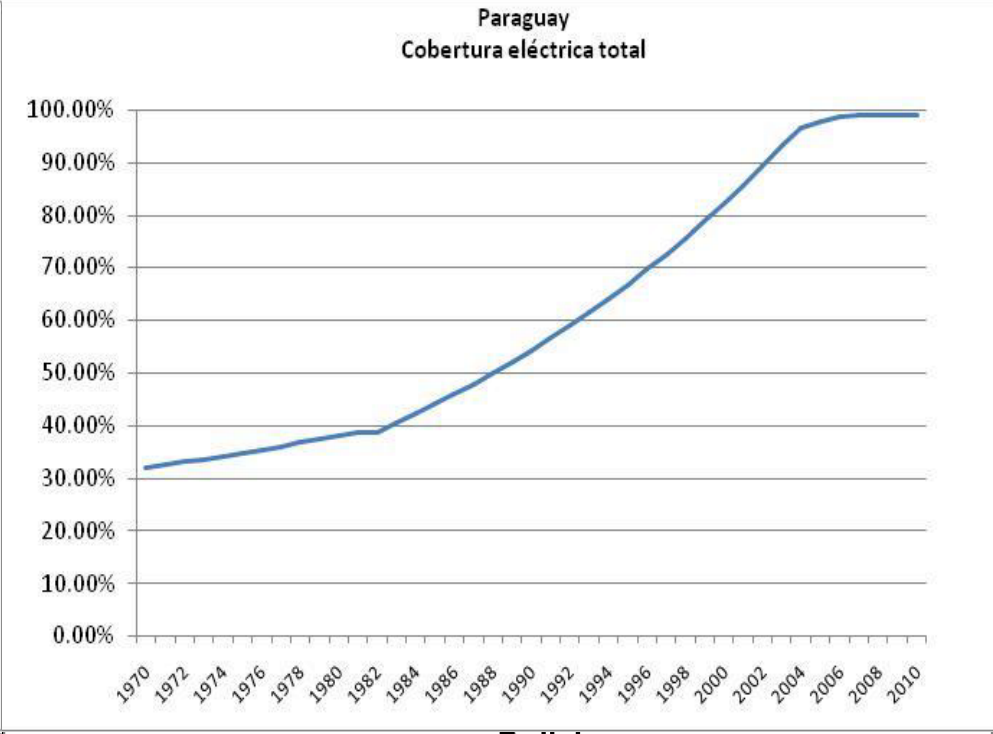
Brasil
Cobertura eléctrica total

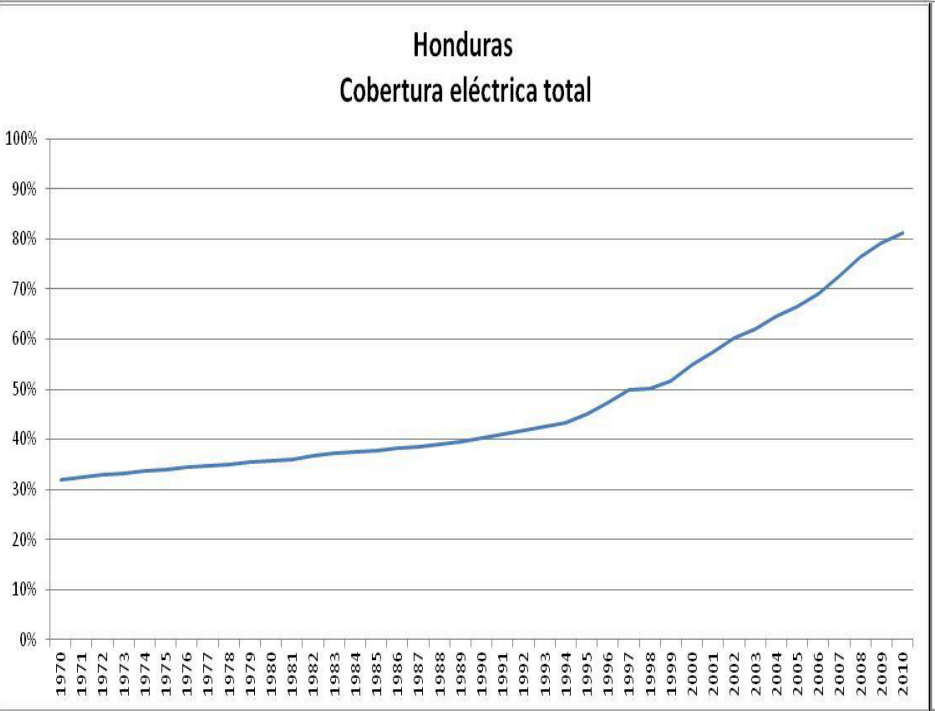


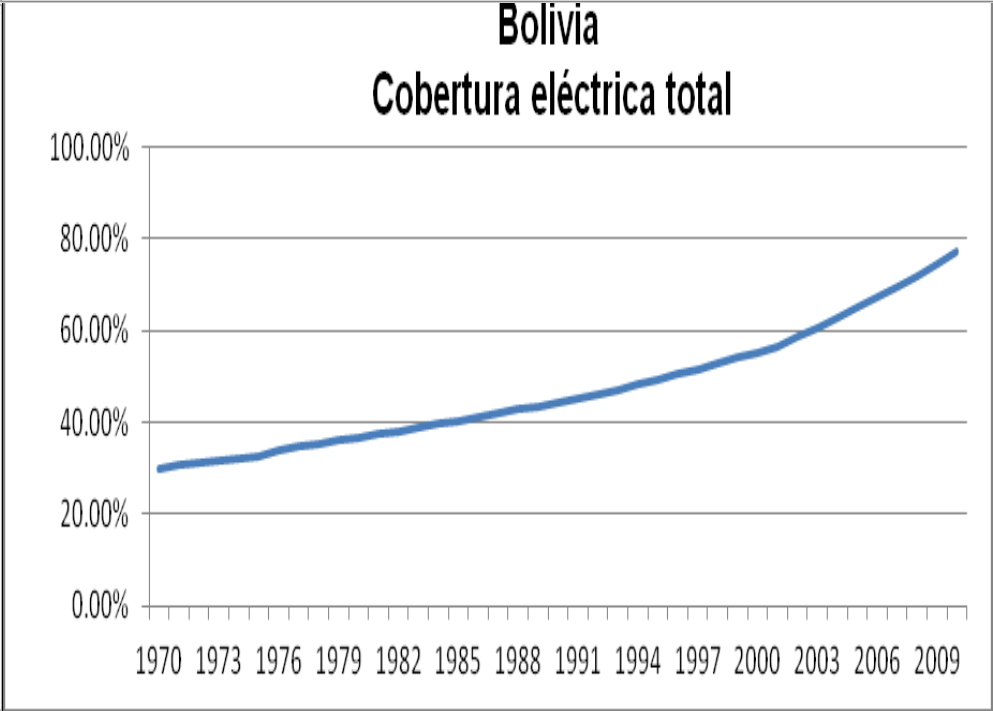
Chile
Cobertura eléctrica total




Ecuador
Cobertura eléctrica total
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
1970 1972 1974 1976 1978 1980 1982 1984 1986 1988 1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010


Paraguay
Cobertura eléctrica total
100.00%
90.00%
80.00%
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
1970 1972 1974 1976 1978 1980 1982 1984 1986 1988 1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010


Honduras
Cobertura eléctrica total
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
1970 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010


Bolivia
Cobertura eléctrica total
100.00%
80.00%
60.00%
40.00%
20.00%
0.00%
1970 1973 1976 1979 1982 1985 1988 1991 1994 1997 2000 2003 2006 2009

- OLADE estimates that closing the gap between 95% to 100% can take 5 to 10 years
- Achieve universal access is complex and very expensive
- The most people without electricity live isolated and dispersed
- Not is possible extend the grid. Renewable energy options is the only solution

Bolivia: Access to electricity

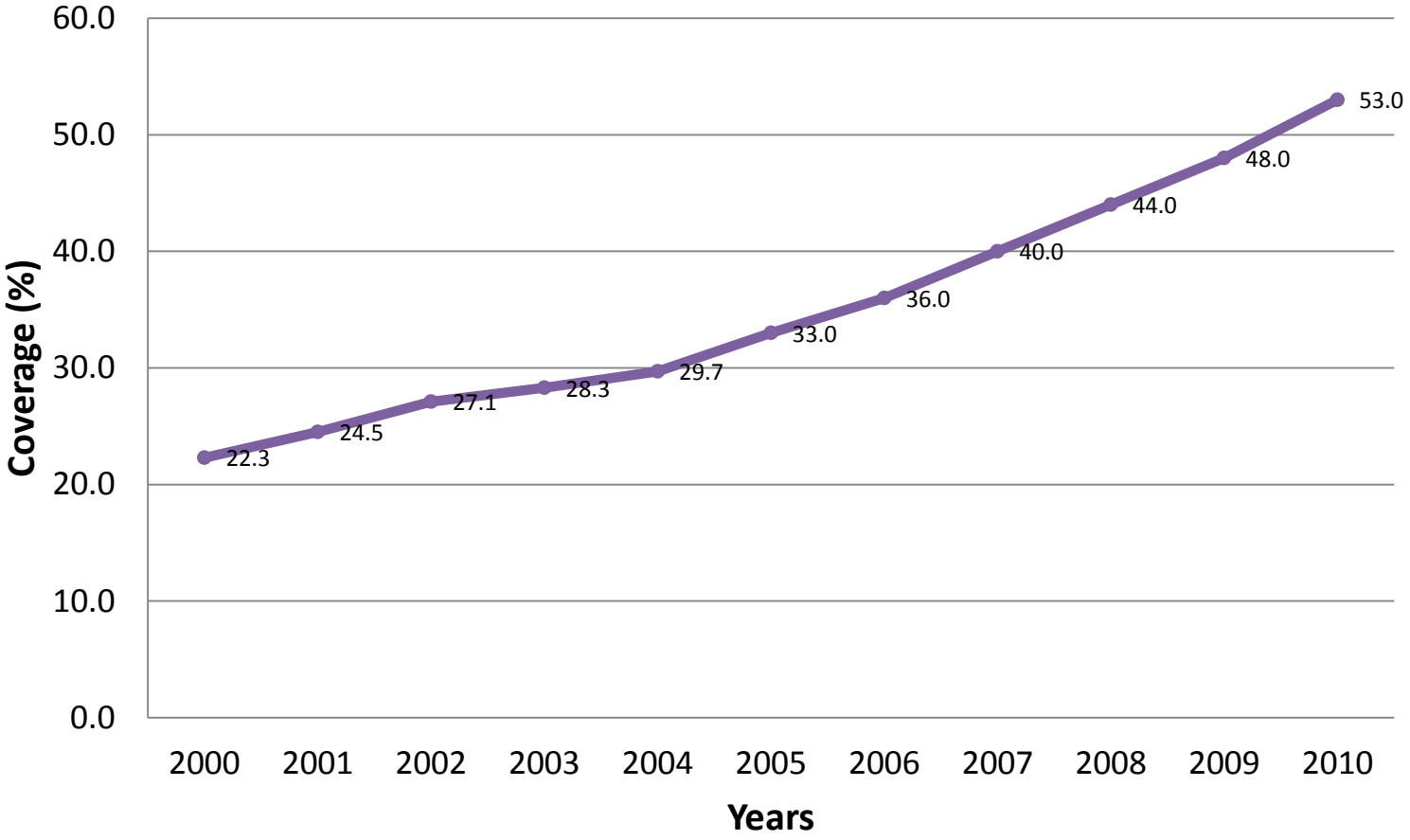
Population 2012: 10 MM
Urban population: 63%
Rural population: 37%

Electricity national coverage: 77%
Urban: 93%
Rural: 53%

Area: 1´100.000 km2

Population without access to electricity:
2,3 MM = 580 M families (75% in rural areas)

Evolution of rural electrification coverage 2000 - 2010



Universal Access and RE

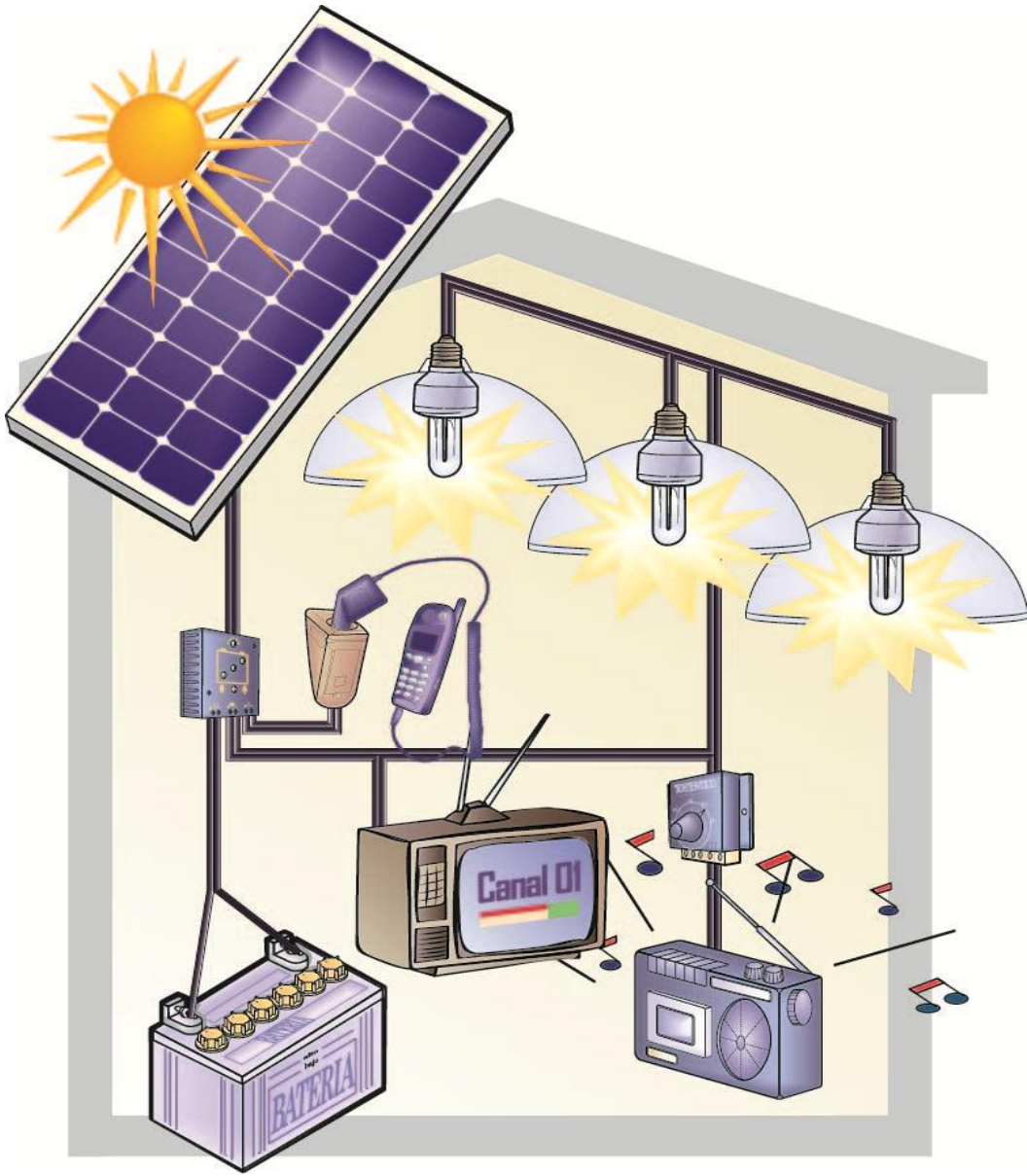
- In 2025 Bolivia is expected to achieve Universal Access to Electricity
- Near to 400.000 families will be connected to the grid
- In 2010 estimate that at less 200.000 systems of Renewable Energy will be installed in the next years
- During the last 6 years 20.000 PV Systems was installed with projects of the government

Bolivia, SHS Experience

- Mechanism to finance: a combination of grant and micro credit for the initial investment: 60% Government; 40% end user.
- Mechanisms of O&M: after sales services of 2 to 4 years included in all the projects.
- A network of local technician must be developed, building local capacity
- The property is transferred to the end user, and also the responsibility for the O&M and replacement
- Is relatively successful. It is a good effort but not enough.

The SHS 50 Wp.. A classic model..

- The 85% of total PV systems in Bolivia
- Solar panel 50 Wp
- Electronic Regulator
- Battery lead acid 100 Ah
- Adaptor DC-DC
- Cellphone charger
- Lamps CFL 7 – 11 W
- Installation according whit norm NB 1056



The problem

- With a good planning is possible to achieve 5000 installations per year
- A this rate, need 36 years to supply electricity to the people will never have access to the grid
- The current supply model is very slow
- Additionally, the technology have limitations (price, weight, installation relatively complex)
- The technology require special skills for maintenance and replacement and the component cost are very high
- The replacement of the battery is the main problem

It should:

Change the technology

Change the supply model

Technological innovations in the last 10 years

- Batteries: from the lead acid battery to rechargeable lithium batteries (or NiCd)
- Lamps: from fluorescent TL to compact efficient lamps, but now is present the LED technology
- Charge regulators: from the external electronic regulators to microelectronic regulators incorporate into the loads
- The concept of PORTABILITY is present in many electronic equipment
- These innovations provide integral solutions to the lighting, education, communication, and entertainment

The new PV systems

Incorporating the innovations now!

- Use LED
- Lithium batteries, not necessary exist a central storage
- There is no central regulator, loads have their own regulators with microelectronics
- PV panels can be placed in parallel, different sizes and voltages (is possible by microelectronics)
- They have a universal hub connections
- Portable, modular
- May be coupled to existing systems
- And as a result of efficiency, they are smaller for the same services that a conventional

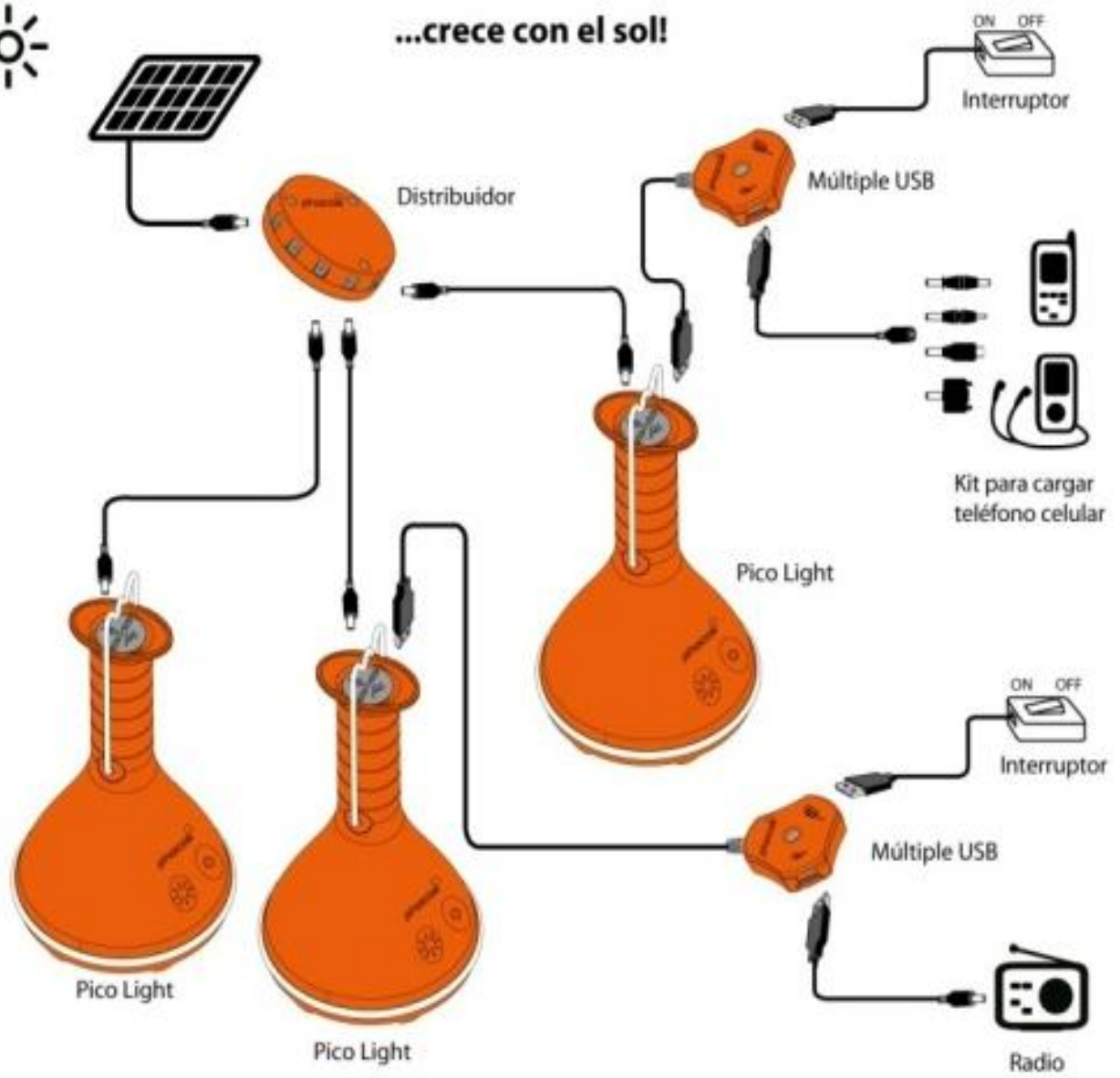
Mini SHS: 5 a 10 Wp

Lighting

Charge of cellphone

Access to radio

Easy to install (plug and play logic) and use connectors unsophisticated



No exist a central electronic regulator, no exist a central battery storage energy

Small SHS: 10 a 30 Wp

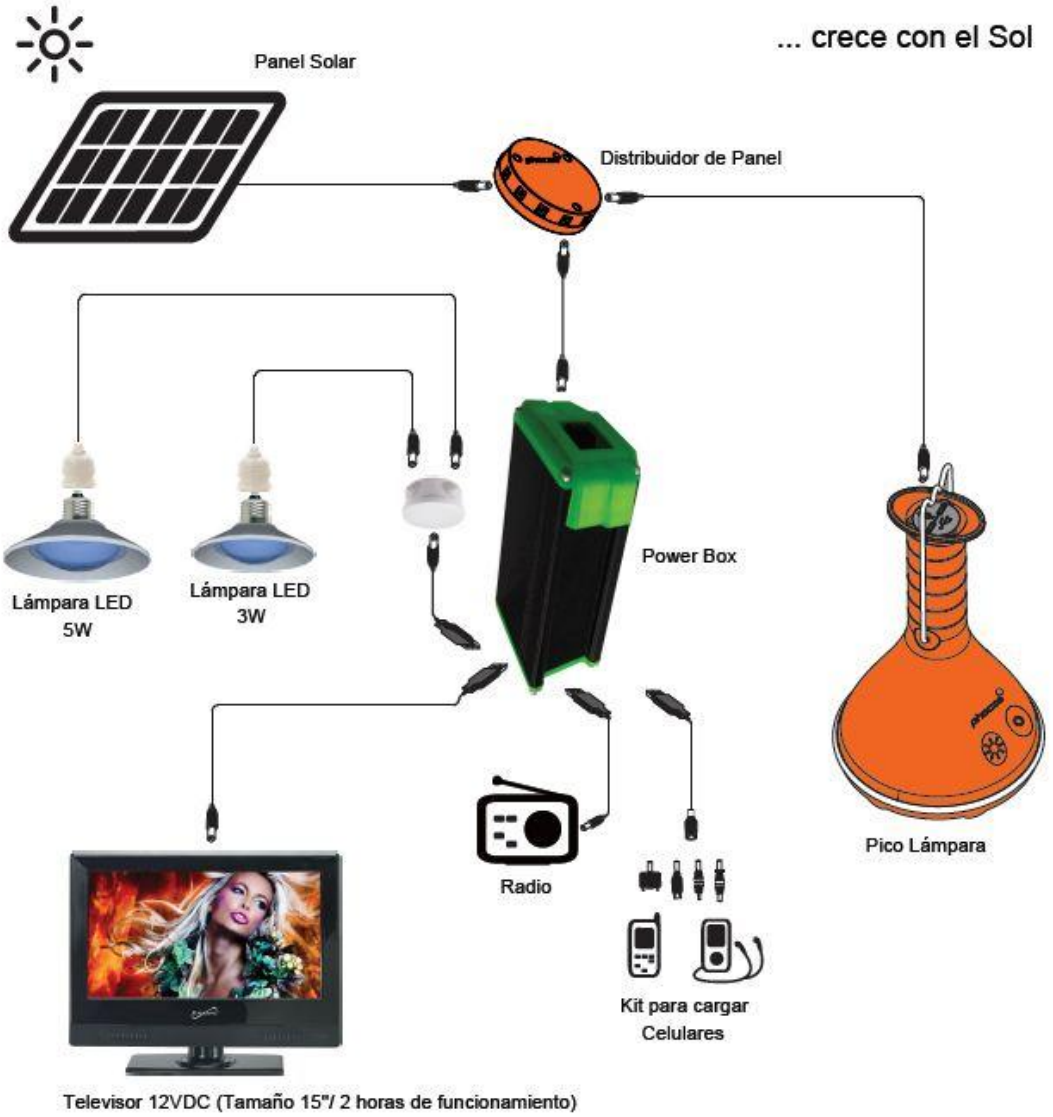
Lighting

Charge of cellphone

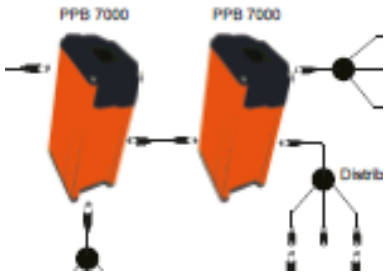
Access to radio

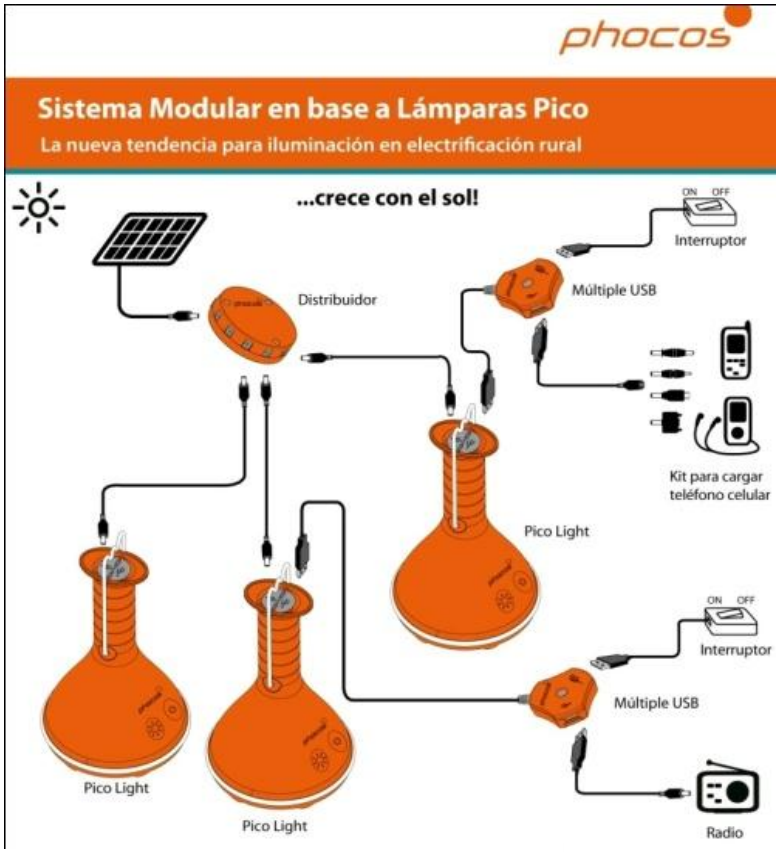
Easy to install (plug and play logic) and use connectors unsophisticated

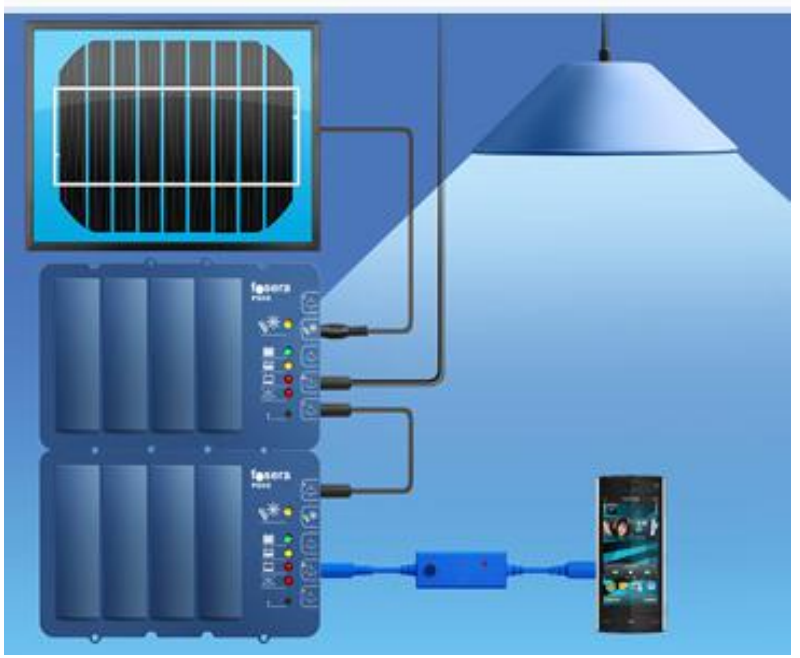
Use a lithium battery for loads like a TV



Is possible connect batteries in parallel for increase the storage capacity




phocos
Sistema Modular en base a Lámparas Pico
La nueva tendencia para iluminación en electrificación rural
...crece con el sol!
ON OFF
Interruptor
Distribuidor
Múltiple USB
Kit para cargar teléfono celular
Pico Light
ON OFF
Interruptor
Múltiple USB
Pico Light
Pico Light
Radio




Modules
Hub4 Junction Box
STV
Ultium 200

Advantages of new PV systems

- More economical systems (30% to 50% of cost of conventional PV). Is appropriate for a wide range of rural population
- Easy and quick to install
- Lightweight: 6 Kg vs. 50 Kg of a classic SHS
- Easy to transport
- Portability + Modularity is concept present
- One possible pre-electrification solution that offer a integral services

Disadvantages

- A technology under development
- The offer products as too diverse
- There are no standards that facilitate selection for intensive and reliable rural use (in opposite to classic SHS technology).
- Designs with exclusive specifications (voltages, currents) in case of failure is complicated the local repair or replacement
- Not use universal components to simplify the connect and the replacements

Conclusions

- No doubt, the new generation of PV systems are ready like a solution to the lack of electricity
- New technologies can accelerate universal access targets in Bolivia, LAC, and all the rural areas
- Need build criteria for standardization and certification these new PV systems and interchange experiences on the ground
- Supply model will have to consider the new PV systems and characteristics (prices, use life..)
- Is necessary the active Government participation for the up scaling projects, if not is impossible achieve the universal access.

Thanks for your attention

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