“El mercado PV mundial, el argentino, y sus evoluciones. Barreras y oportunidades. Elementos de políticas de estímulo desde una mirada local”

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Noviembre 26, 2011, Mendoza

MENDOZA SOLAR

“Jornada de la red Ciudades Solares”

World Per Capita Total Primary Energy Consumption

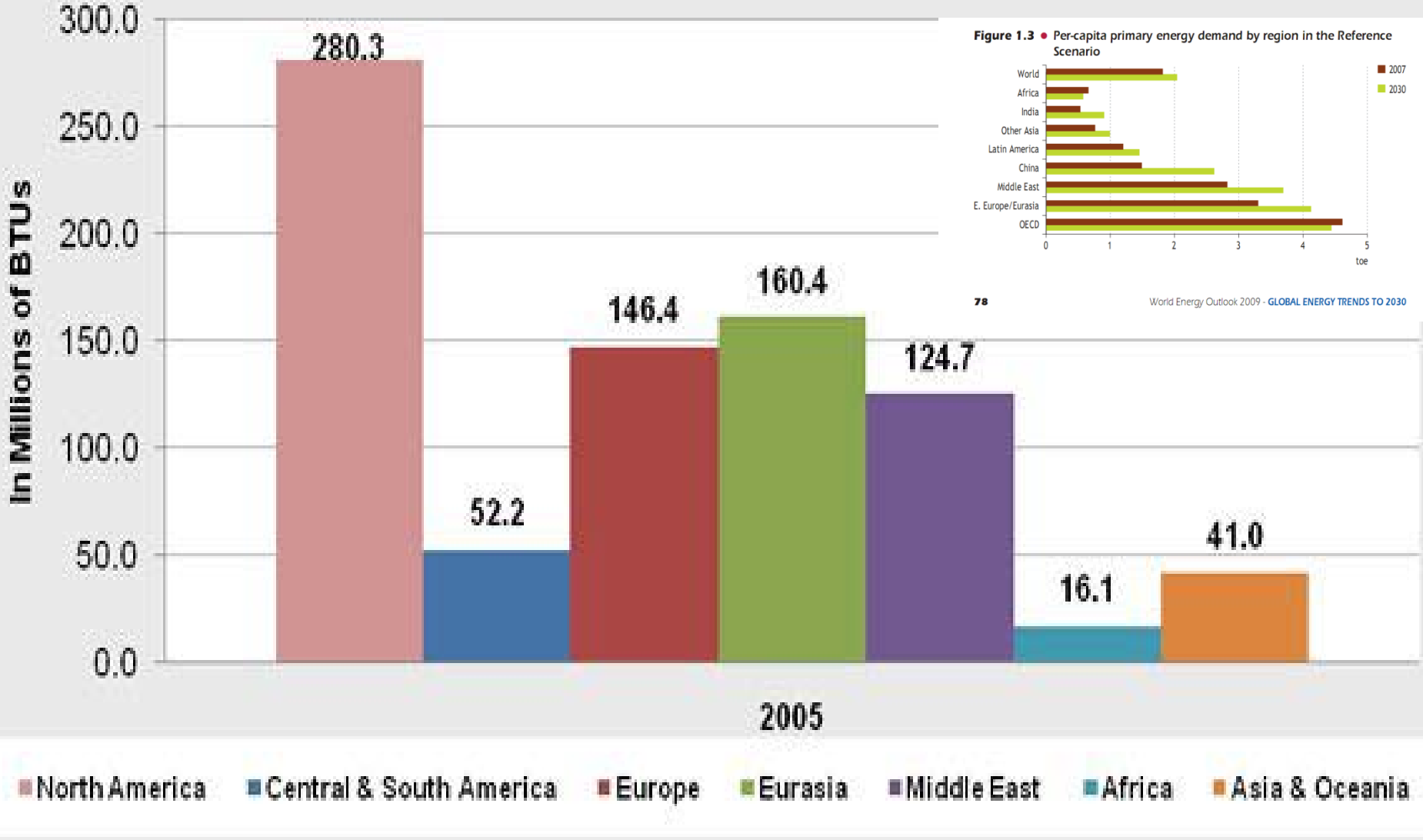
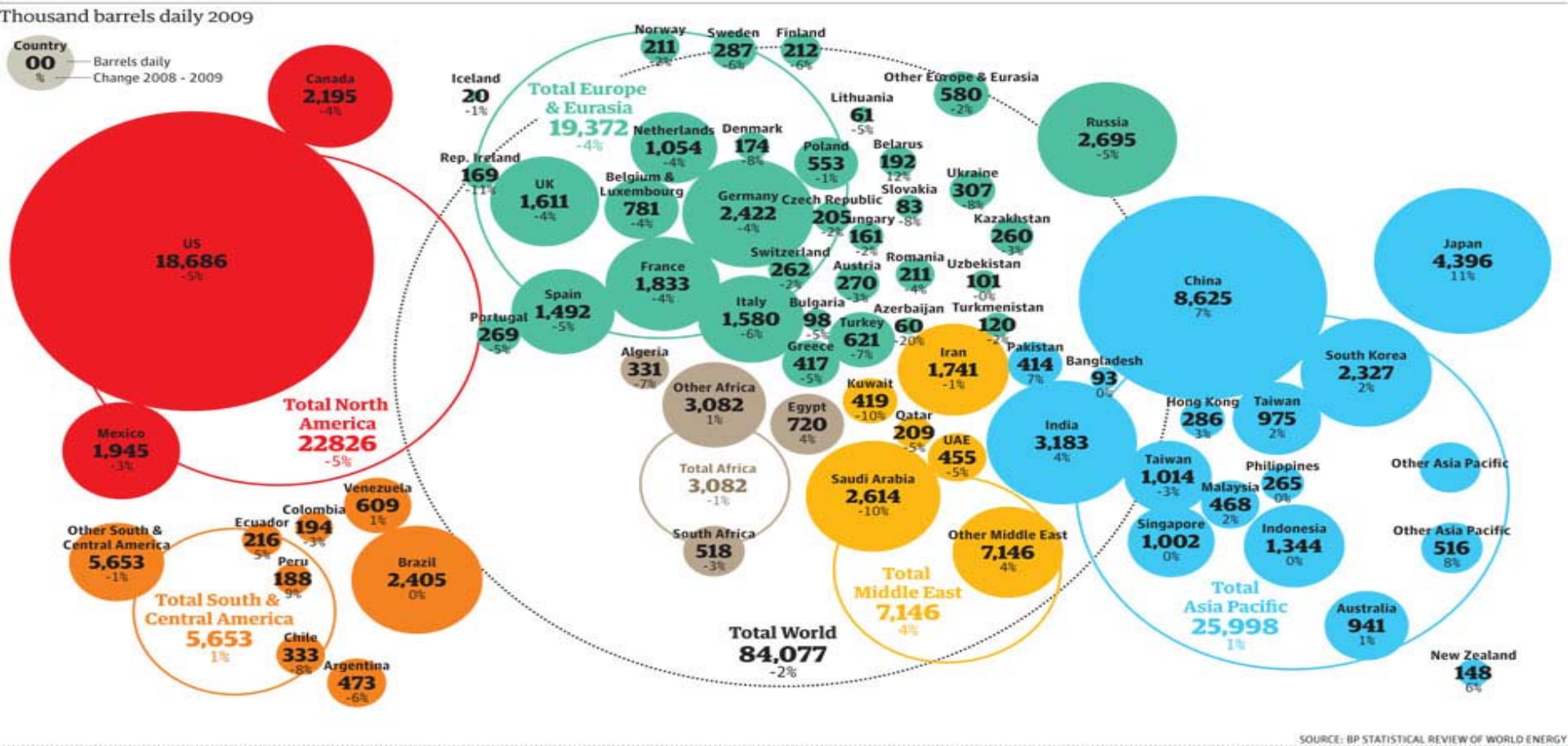


Figure 1.3 • Per-capita primary energy demand by region in the Reference Scenario

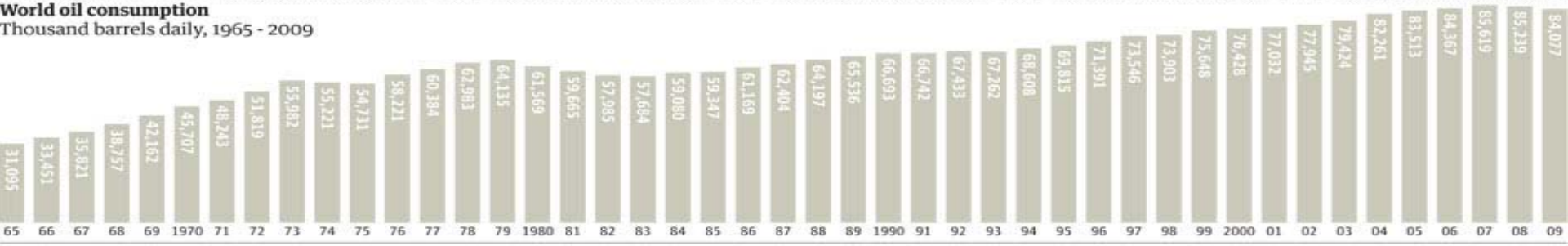
Oil consumption around the world

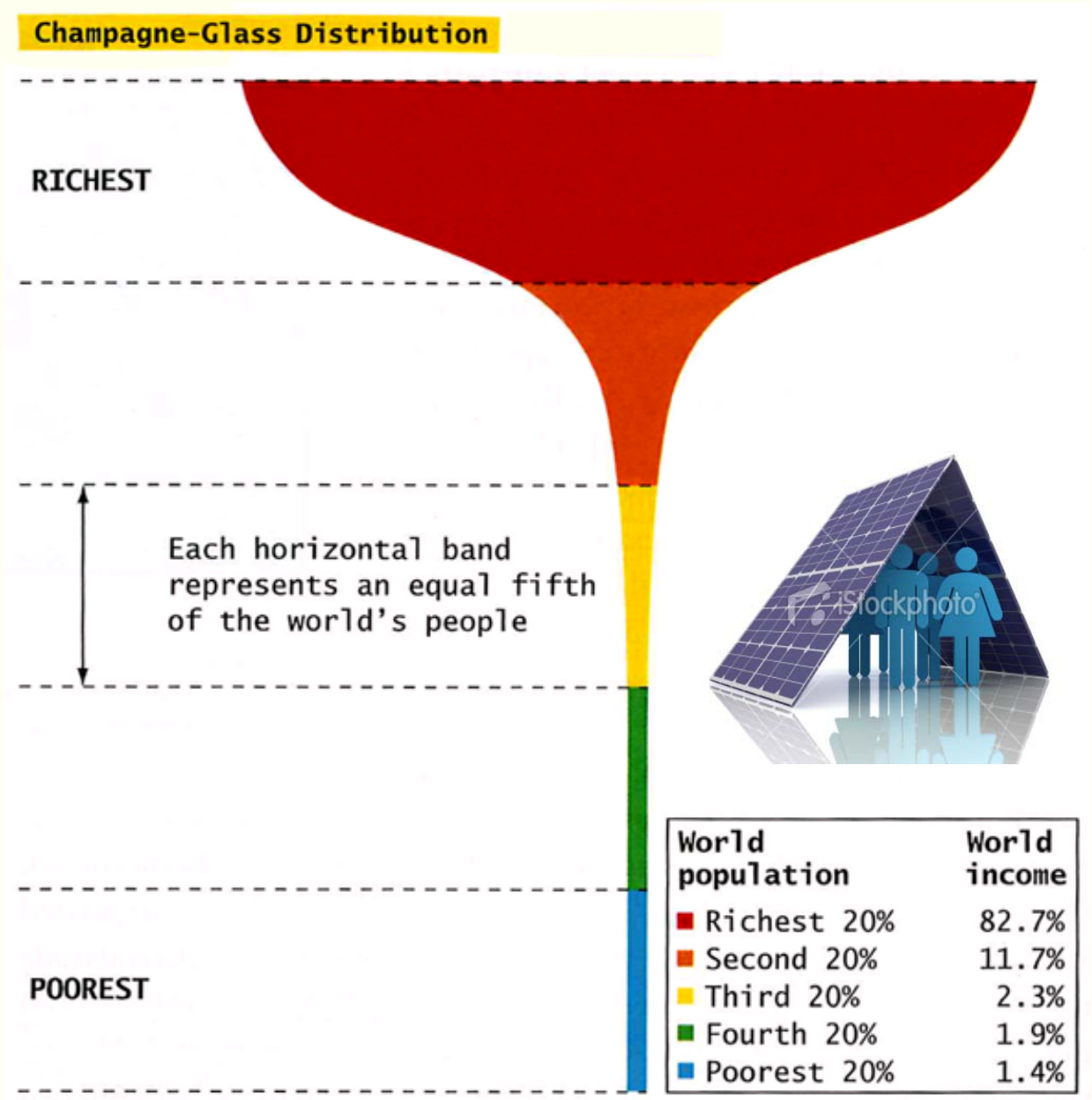


SOURCE: BP STATISTICAL REVIEW OF WORLD ENERGY

World oil consumption

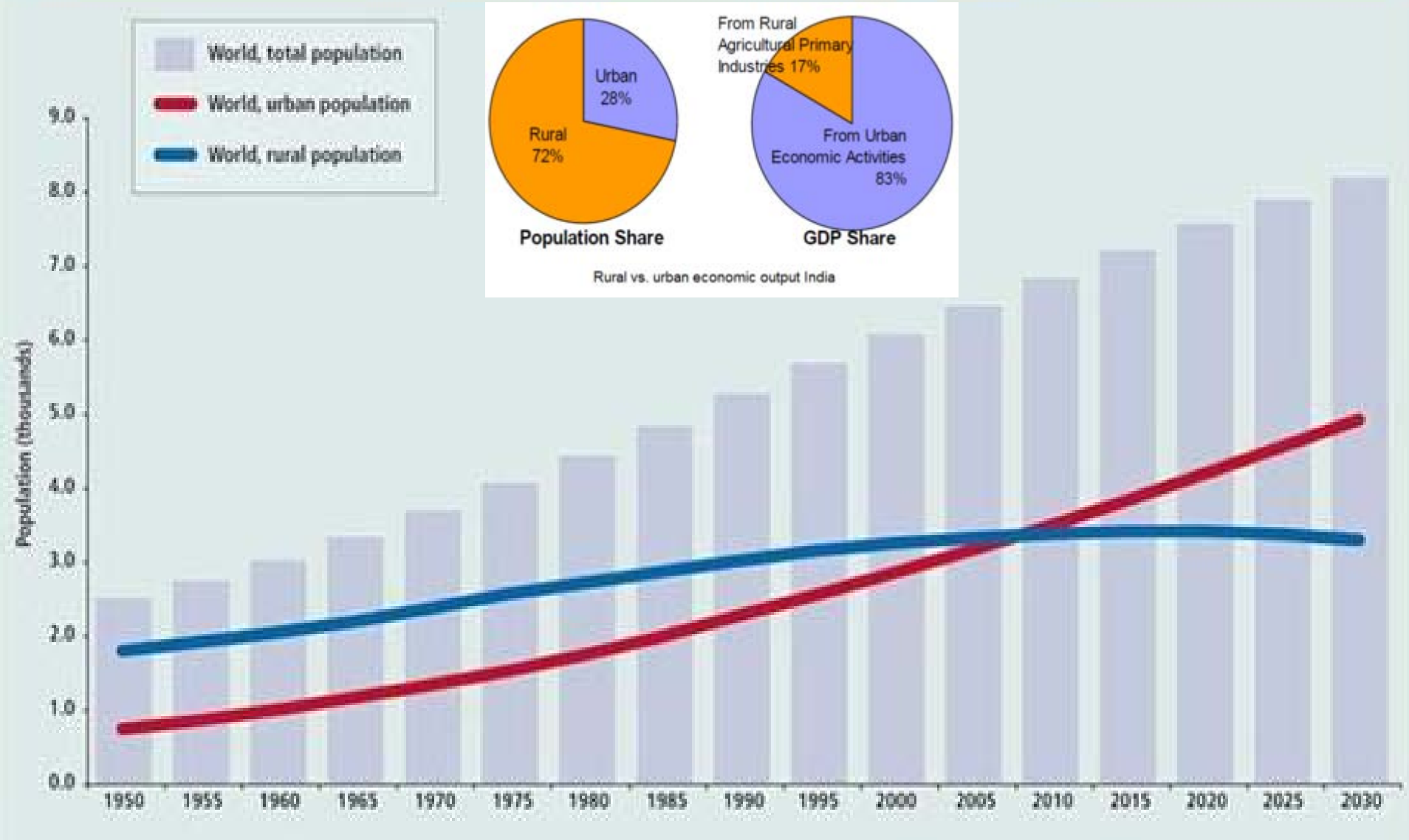
Thousand barrels daily, 1965 - 2009





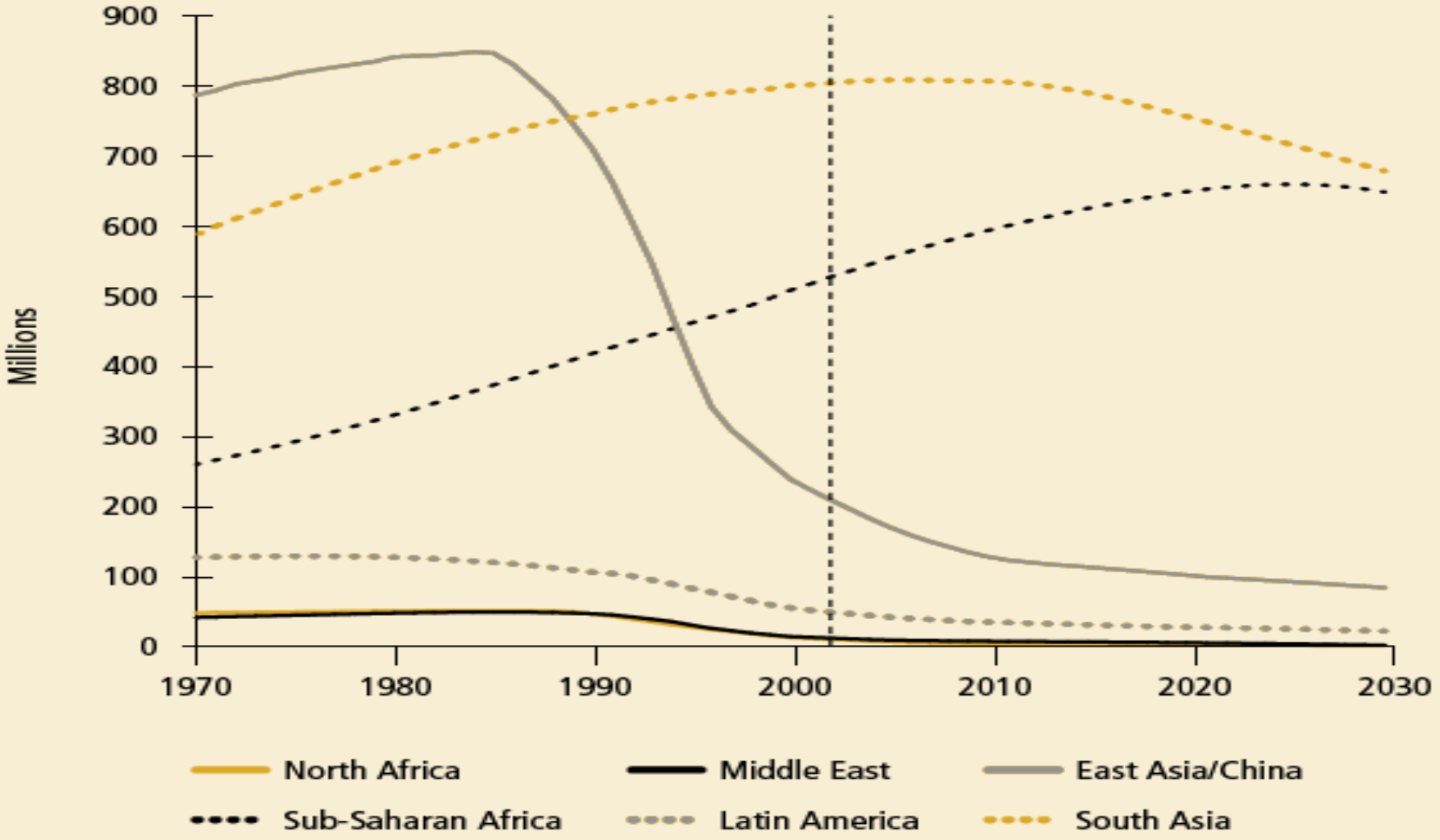
Who benefits from this often impenetrable regulatory regime? From 1983 until 2007, according to a study by sociologist G. William Dumhoff, net worth distribution between the wealthiest quintile (20%) of the population and the other four quintiles combined (80%), changed from 81.3% of the wealth held by the top quintile to 85.1 percent of the wealth. In the same period, the bottom 80% went from holding 18.7% of the wealth to15%.

The urban and rural population of the world, 1950-2030

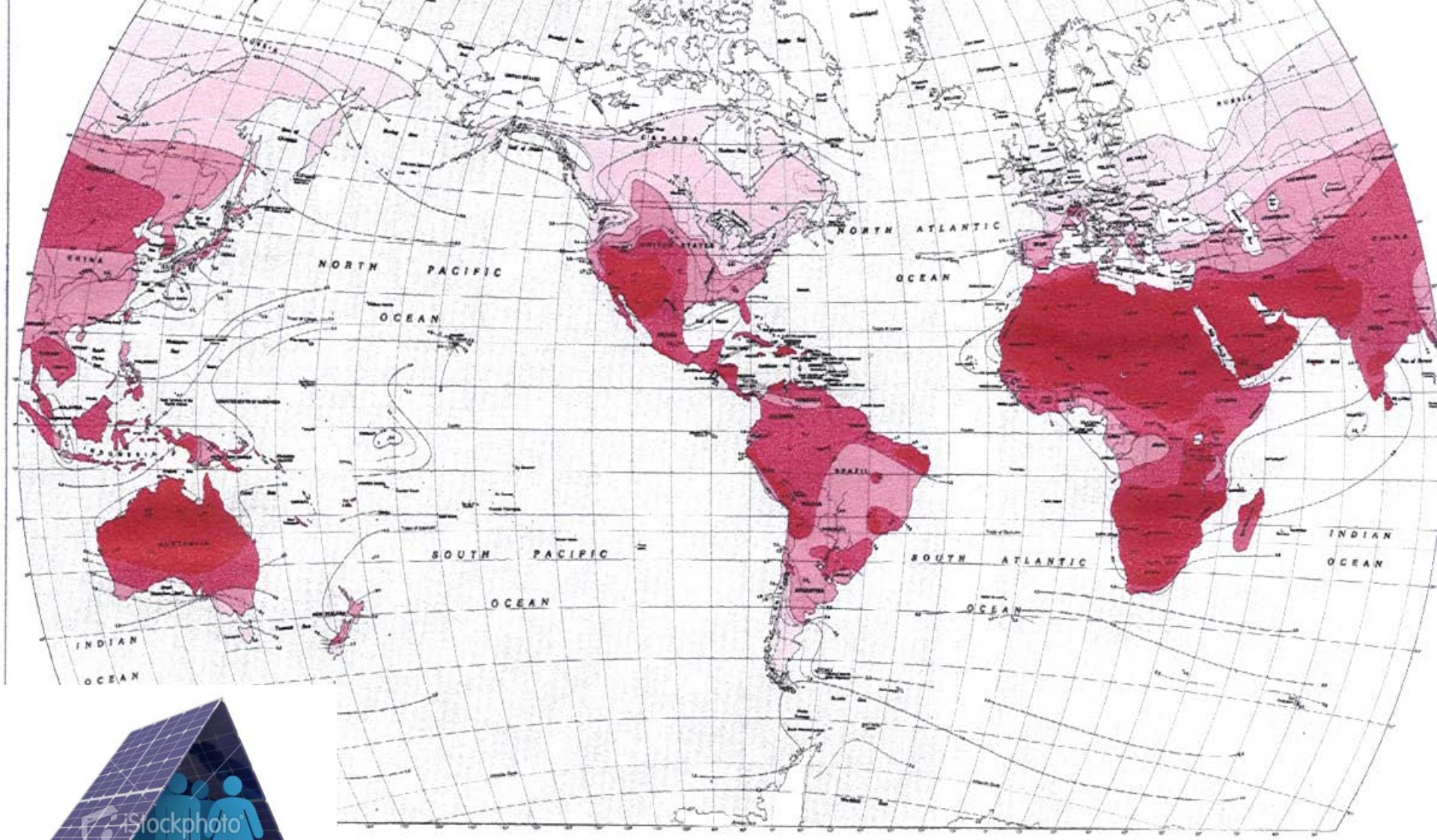


Rural vs. urban economic output India

Figure 1. Population Without Access to Electricity



Source: International Energy Agency (2002b)



WORLD DESIGN INSOLATION

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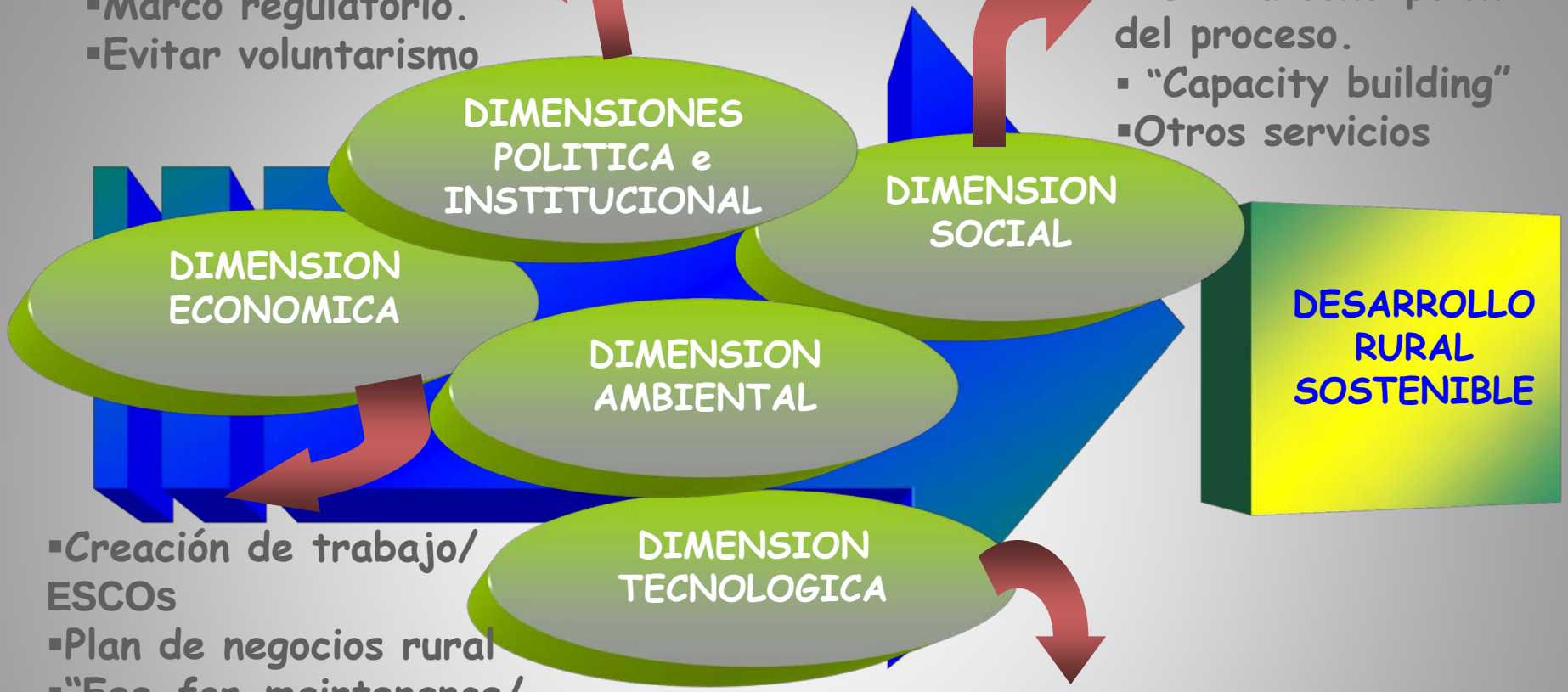
Problema: **Desarrollo** rural Vs. **Electrificación** rural

Tradicionalmente los enfoques más utilizados en los programas de desarrollo rural son aquellos que consideran independientemente la electrificación y el modelo microeconómico. Estos enfoques son muchas veces contradictorios o incompatibles o simplemente no estructurados en un plan con objetivos claros para desarrollar las comunidades rurales aisladas de forma sostenible.

- Administración Local
- Creación de trabajo
- Marco regulatorio.
- Evitar voluntarismo

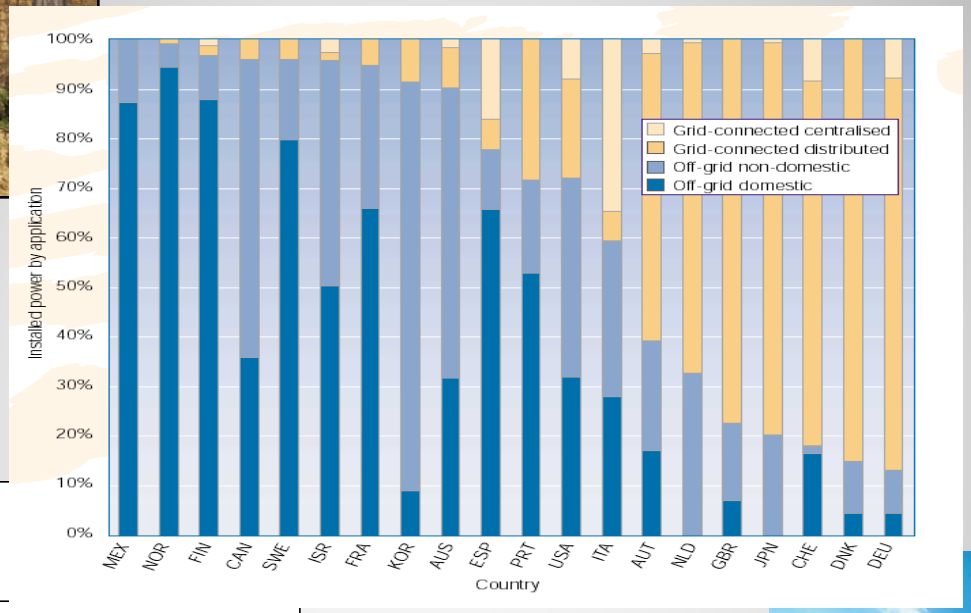
- Participación local desde la concepción del proceso.
- "Capacity building"
- Otros servicios

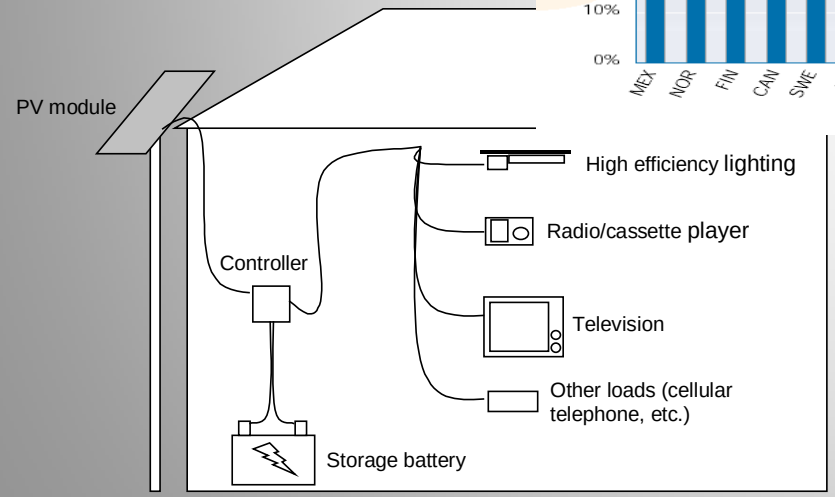


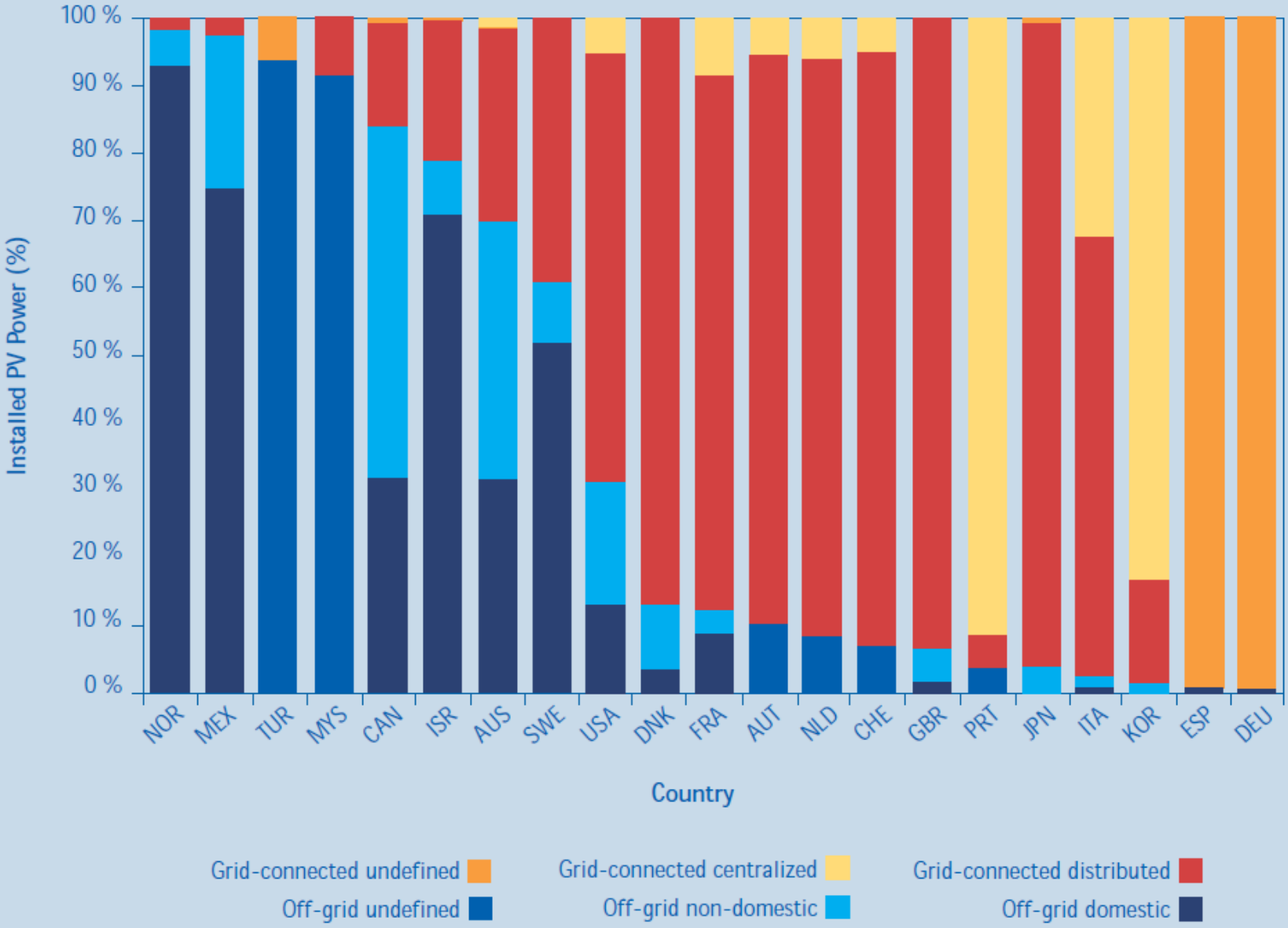
- Creación de trabajo/ ESCOs
- Plan de negocios rural
- "Fee-for-maintenance/ service".
- Financiación
- Inversión inicial
- Subsidios inteligentes

Que tecnología es la más adecuada para cada caso?
Porque?
Escala: Anexo I y Anexo II

DIMENSION TECNOLOGICA






Installed PV Power (%)
100 %
90 %
80 %
70 %
60 %
50 %
40 %
30 %
20 %
10 %
0 %
NOR
MEX
TUR
MYS
CAN
ISR
AUS
SWE
USA
DNK
FRA
AUT
NLD
CHE
GBR
PRT
JPN
ITA
KOR
ESP
DEU
Country
Grid-connected undefined
Grid-connected centralized
Grid-connected distributed
Off-grid undefined
Off-grid non-domestic
Off-grid domestic

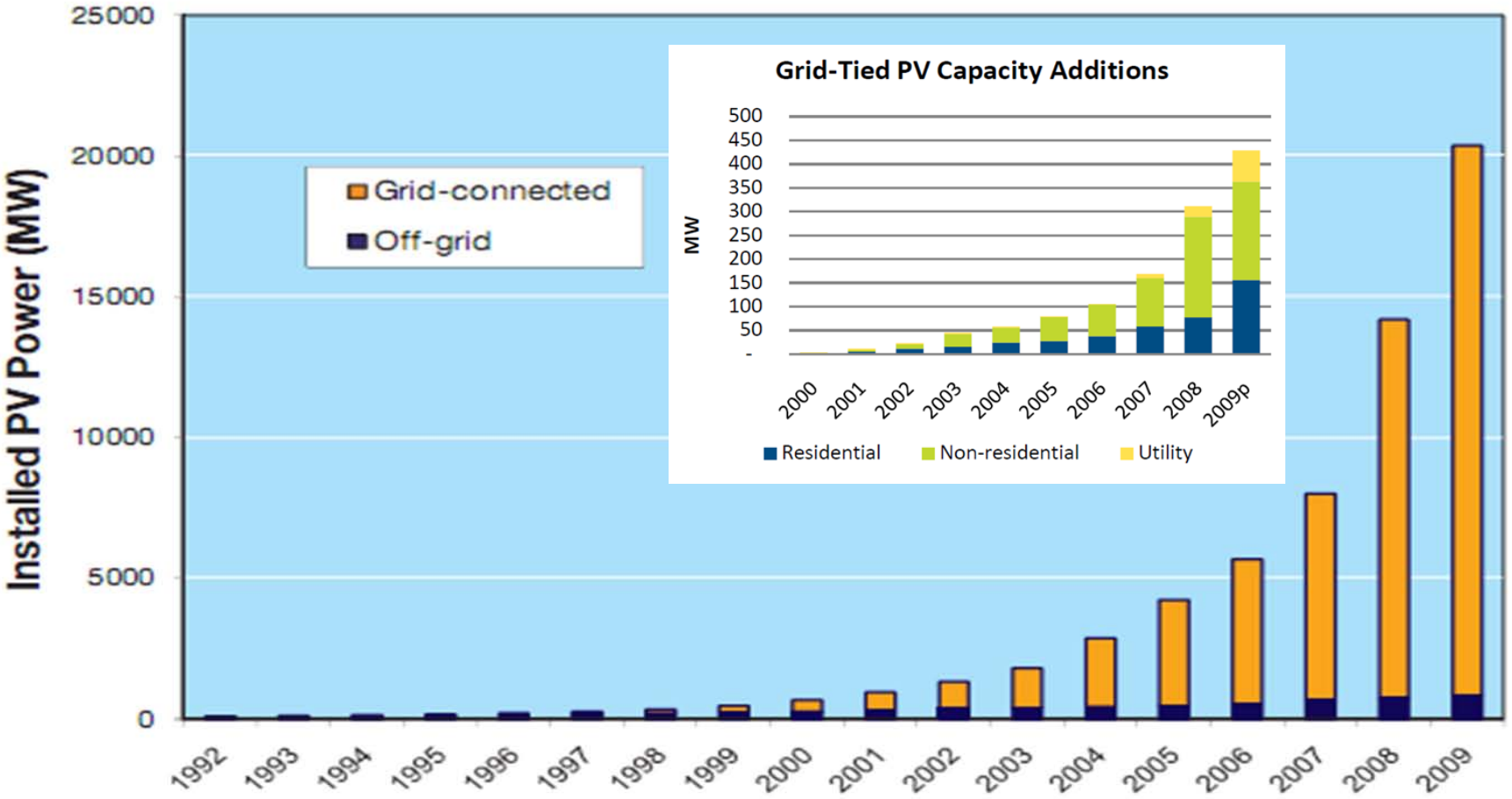


Figure 1 – Cumulative installed grid-connected and off-grid PV power in the reporting countries

Segments and Channels

Residential Retrofit

New Production Homes

Commercial & Public

Power Plants

Mercado PV Alemán

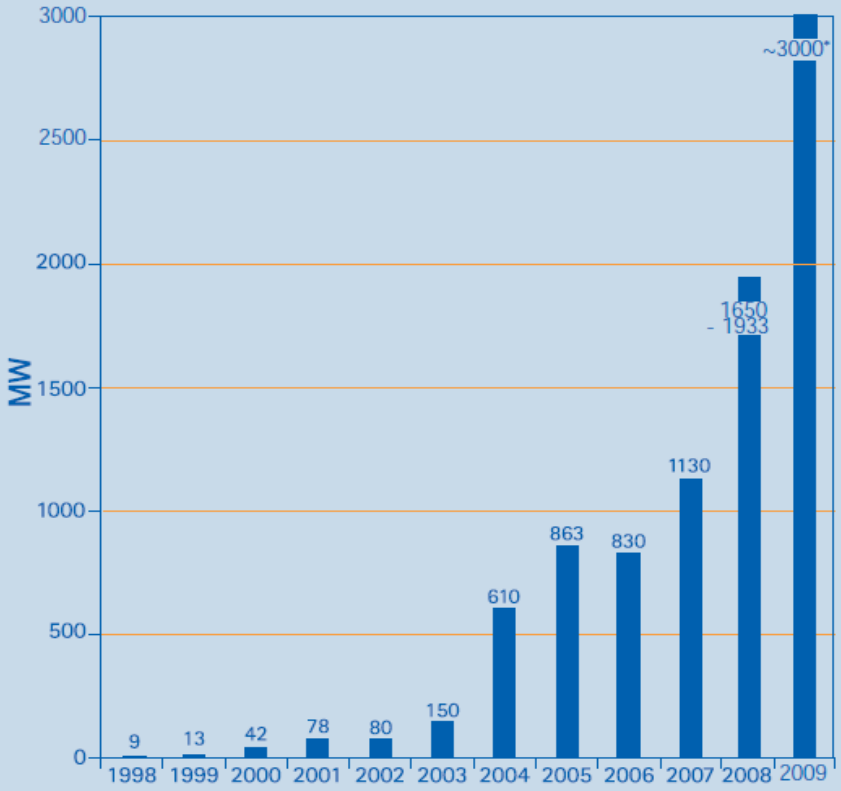


*Fig. 2 - Development of grid connected PV capacity in Germany (for details see text), *first estimate as of January 2010.*

Fig. 1 - The new 4 GW inverter factory of SMA Solar Technology AG was officially opened in July 2009; the plant is designed to work CO_2-free and is therefore equipped with a 1.1 MW PV system and a biogas CHP unit (photo: SMA Solar Technology AG).

Tracking Power Plants

Isla Mayor Spain,
8.4 MW SunPower T0 Tracker

Muehlhausen, Bavaria, Germany,
6 MW SunPower T0 Tracker

Trujillo, Extremadura, Spain-Elecnor
23 MW SunPower T0 Tracker

Jumilla, Murcia, Spain-Elecnor
23 MW SunPower T0 Tracker

Serpa, Portugal
11 MW SunPower T0 Tracker

Lebrija, Spain,
3.84 MW SunPower T0 Tracker

Lista de los Top 10

Ranking de PHOTON: las mayores plantas fotovoltaicas del mundo

Grandes centrales en servicio

Orden	Potencia (MW)	País	Nombre	Tecnología de módulos	Fabricante de módulos
1	92**	Canadá	Sarnia Solar Farm	Módulos de telururo de cadmio	First Solar
2	85	Italia	Solar Power Plant Montalto di Castro	Módulos cristalinos	Sunpower
3	81	Alemania	Solarpark Finsterwalde I, II und III	Módulos cristalinos	Q-Cells
4	70	Italia	Rovigo Solar Power Plant	Módulos cristalinos	entre otros Canadian Solar
5	60	España	Parque Fotovoltaico Olmedilla de Alarcón	n.d.	n.d.
6	55**	EEUU	Copper Mountain Solar Facility	Módulos de telururo de cadmio	First Solar
7	54	Alemania	Solarpark Straßkirchen	Módulos cristalinos	Q-Cells
8	53	Alemania	Solarpark Lieberose	Módulos de telururo de cadmio	First Solar
9	52	España	Puertollano I	Módulos cristalinos	Suntech, Solaria
10	46	Portugal	Amareleja Photovoltaic Plant	n.d.	n.d.

0 100 200 300 400 500

Grandes centrales en construcción*

1	500	India	Charanka Solar Park	n.d.	n.d.
2	334**	EEUU	Agua Caliente Solar Project	Módulos de telururo de cadmio	First Solar
3	166	China	Kunming Solar Park	Módulos cristalinos	Yunnan Tianda Photovoltaic Company
4	84	Tailandia	Lopburi Solar Farm	n.d.	Sharp
5	81	Alemania	Solarpark Briest	Módulos cristalinos	Q-Cells
6	76	Francia	Gabardan PV Power Plant	Módulos de telururo de cadmio	First Solar
7	60	EEUU	Pflugerville Solar Power Plant	Módulos cristalinos	n.d.

0 100 200 300 400 500

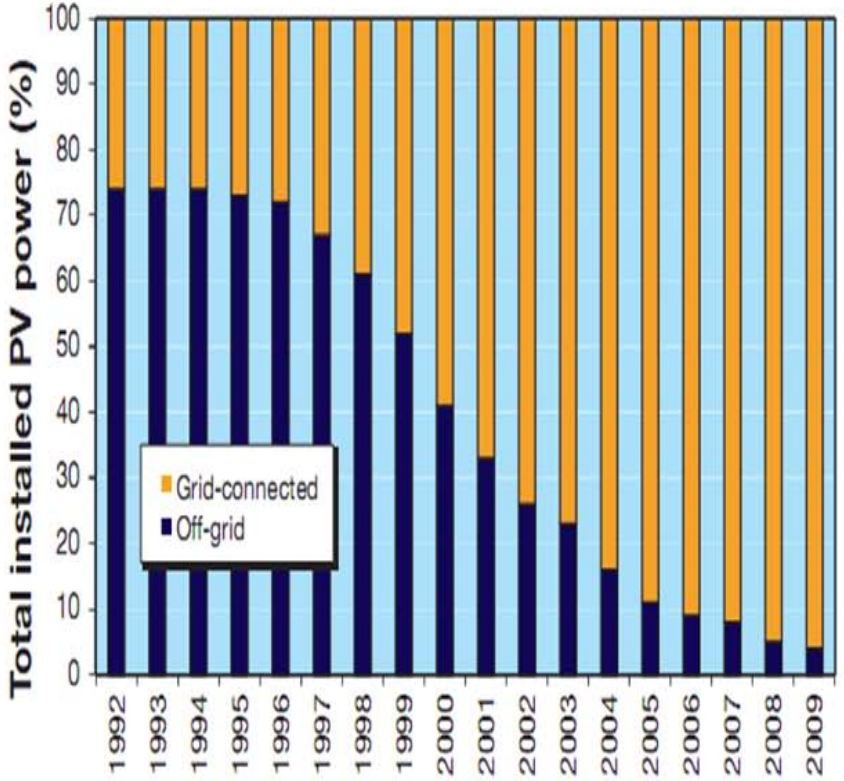


Figure 2 – Percentages of grid-connected and off-grid PV power in the reporting countries

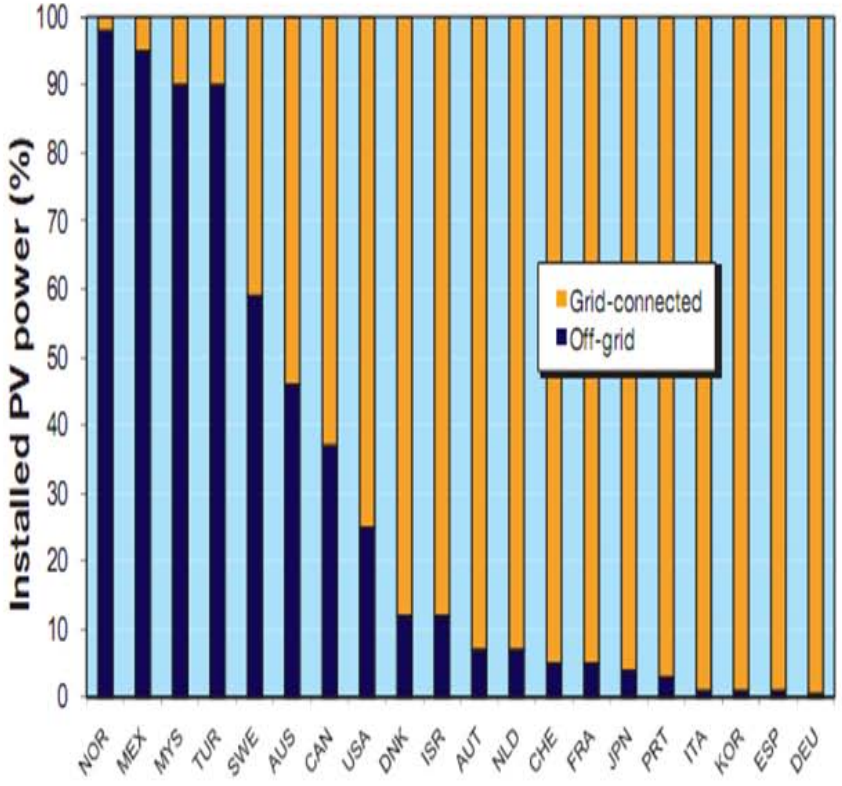
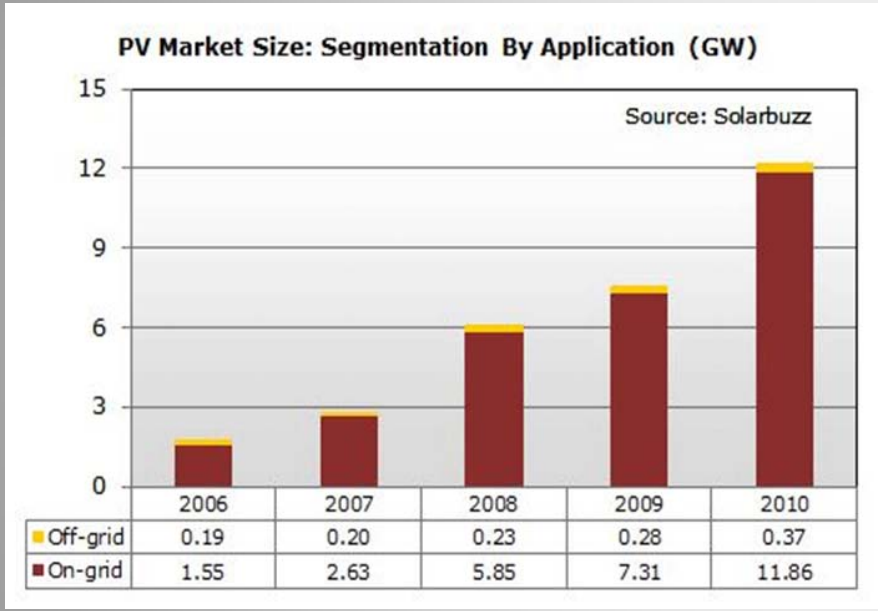


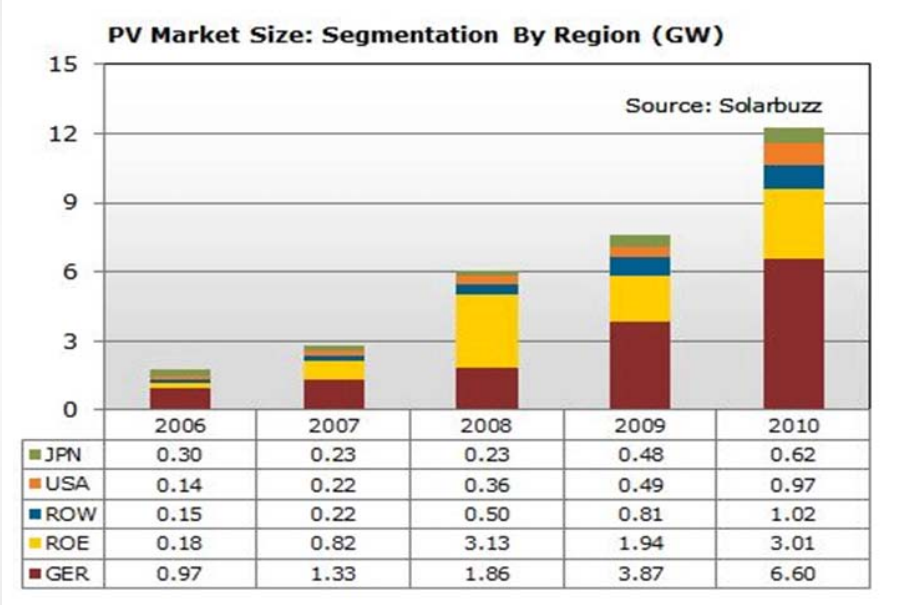
Figure 3 – Installed PV power in the reporting countries by application (%) in 2009

Mercado PV Internacional

Segmentado por Aplicación y Región

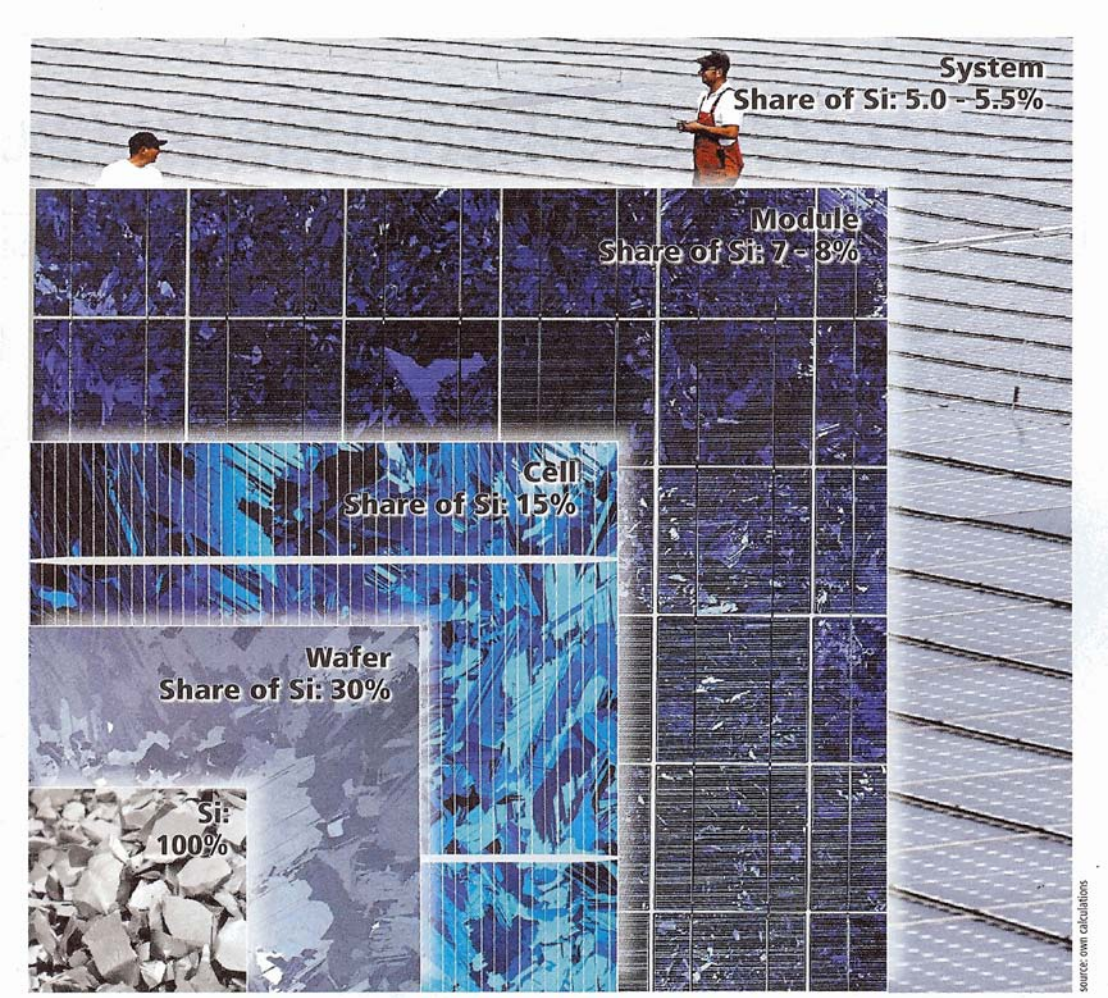


	2006	2007	2008	2009	2010
Off-grid	0.19	0.20	0.23	0.28	0.37
On-grid	1.55	2.63	5.85	7.31	11.86



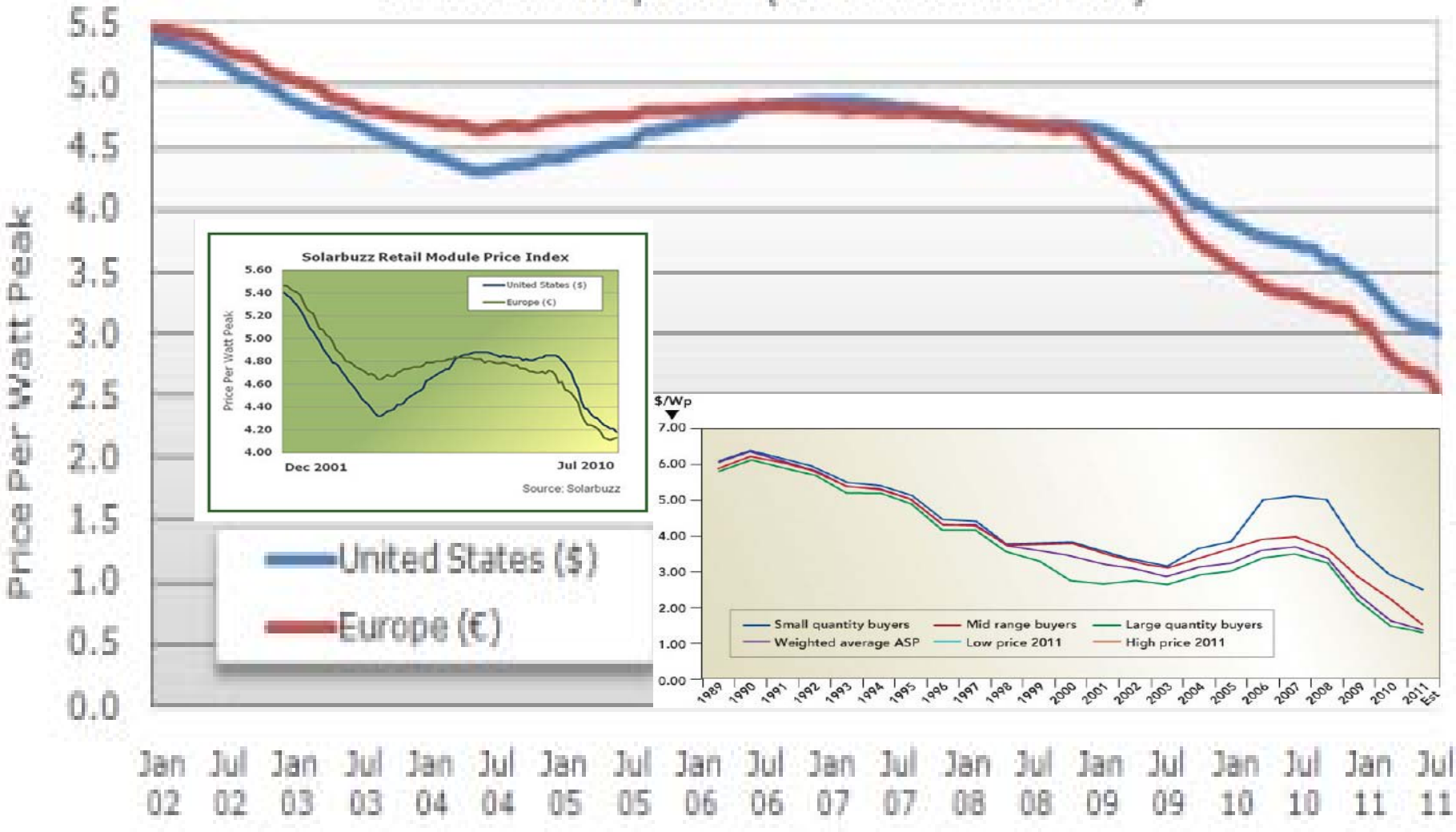
	2006	2007	2008	2009	2010
JPN	0.30	0.23	0.23	0.48	0.62
USA	0.14	0.22	0.36	0.49	0.97
ROW	0.15	0.22	0.50	0.81	1.02
ROE	0.18	0.82	3.13	1.94	3.01
GER	0.97	1.33	1.86	3.87	6.60

Participación relativa del precio del silicio en cada componente del módulo fotovoltaico

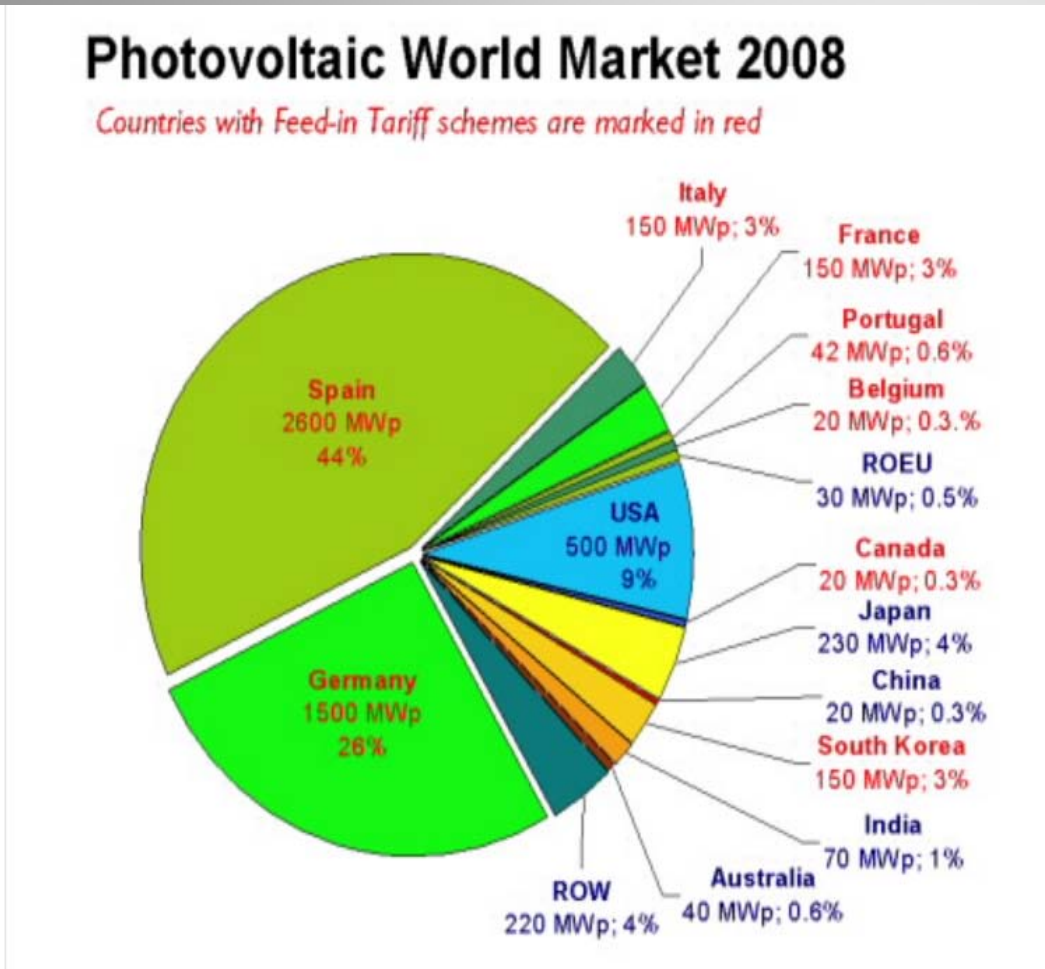


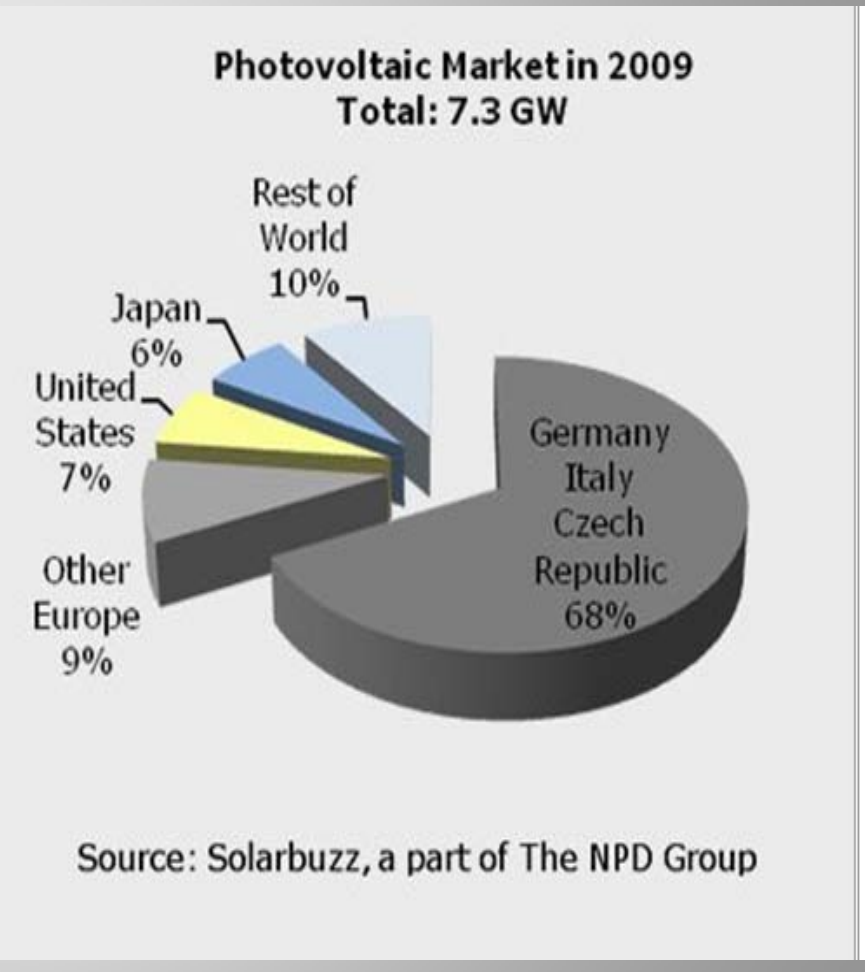
Solarbuzz Retail Module Price Index

Dec 2001-July 2011 (Re-based Oct 2010)

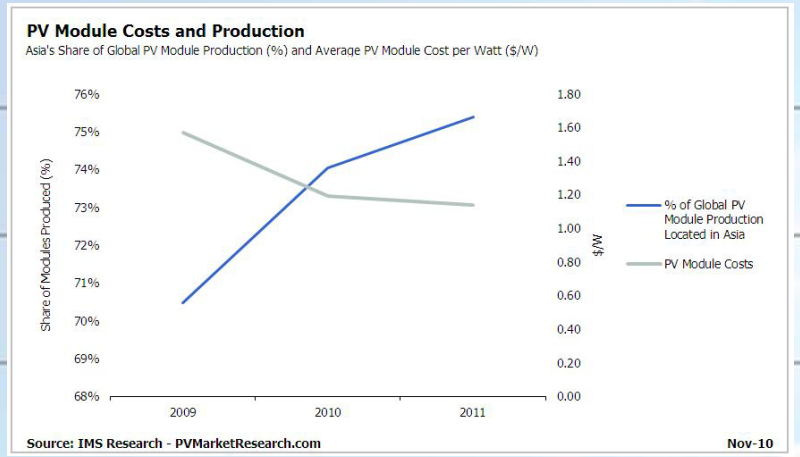


Mercado PV Mundial: Que pasó?





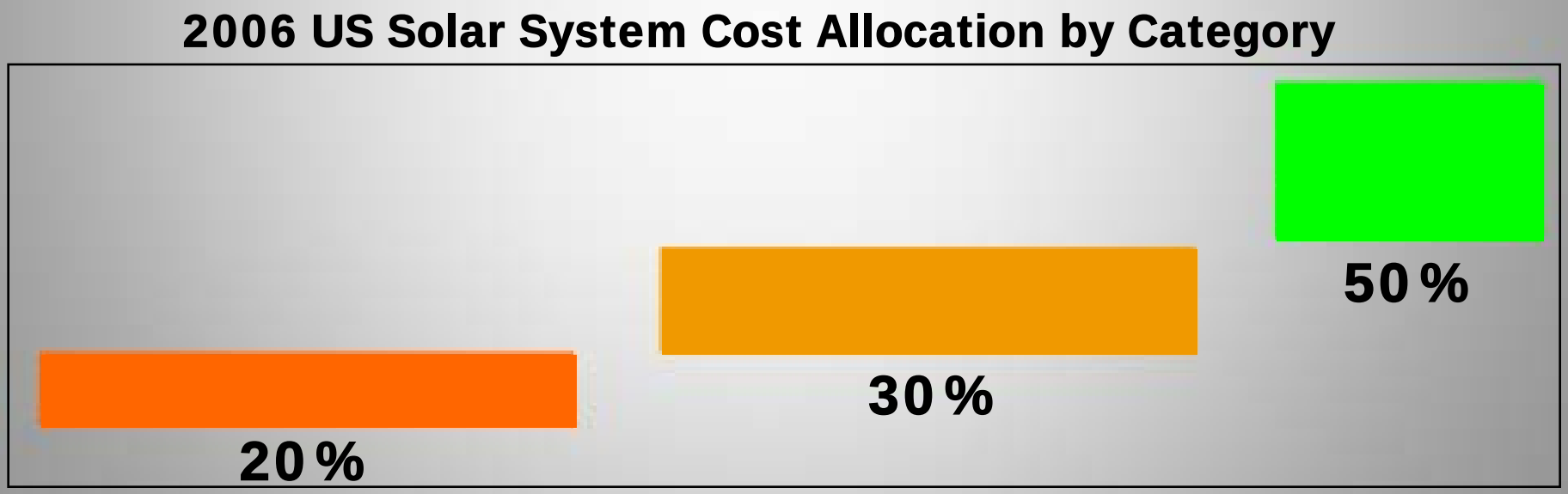
Global PV Module Supply



Source: Paula Mints, Navigant Consulting, Inc.

Value Chain Cost Distribution

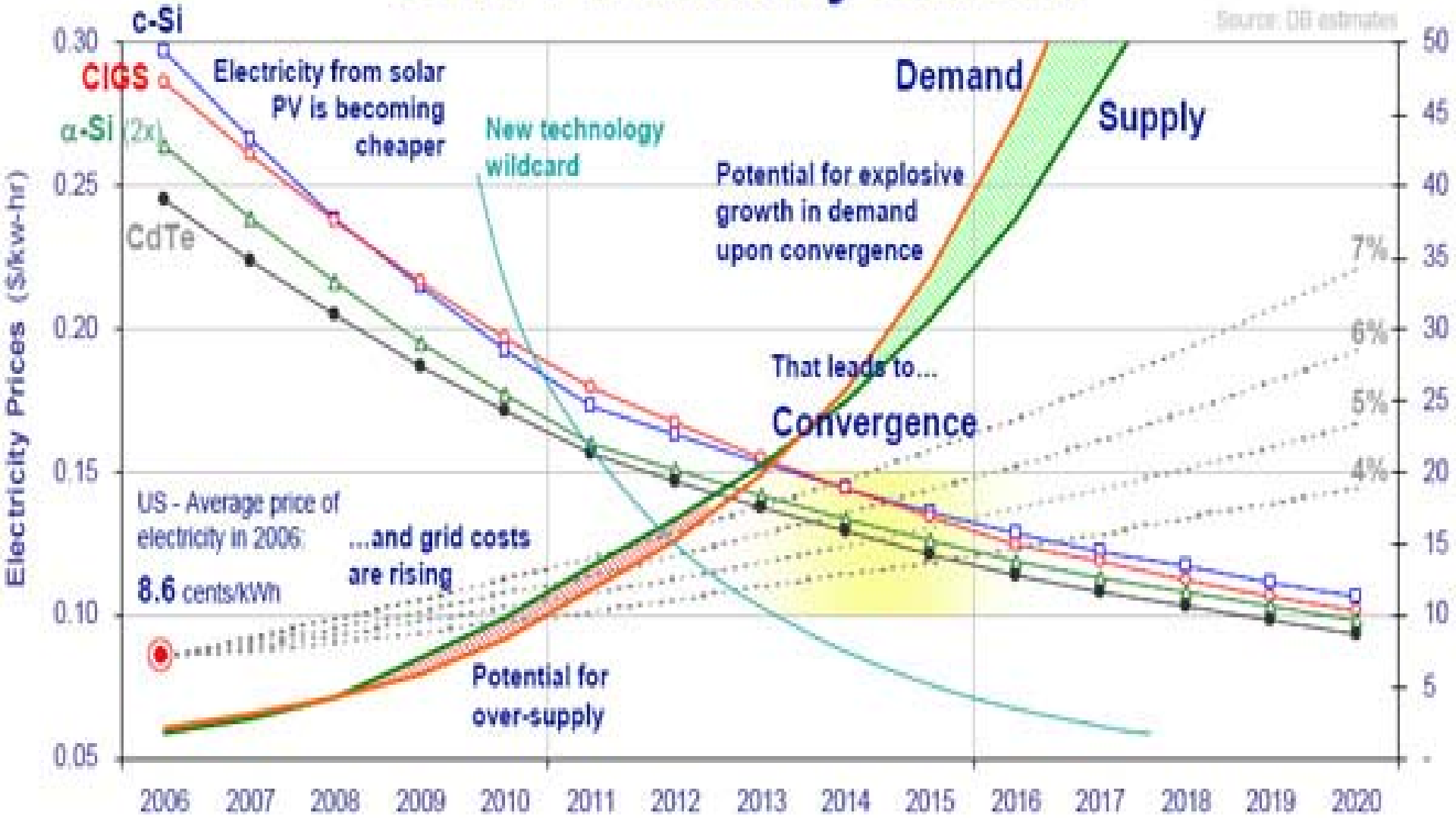
Polysilicon → Ingot → Wafer → Solar Cell → Solar Panel → System $/W



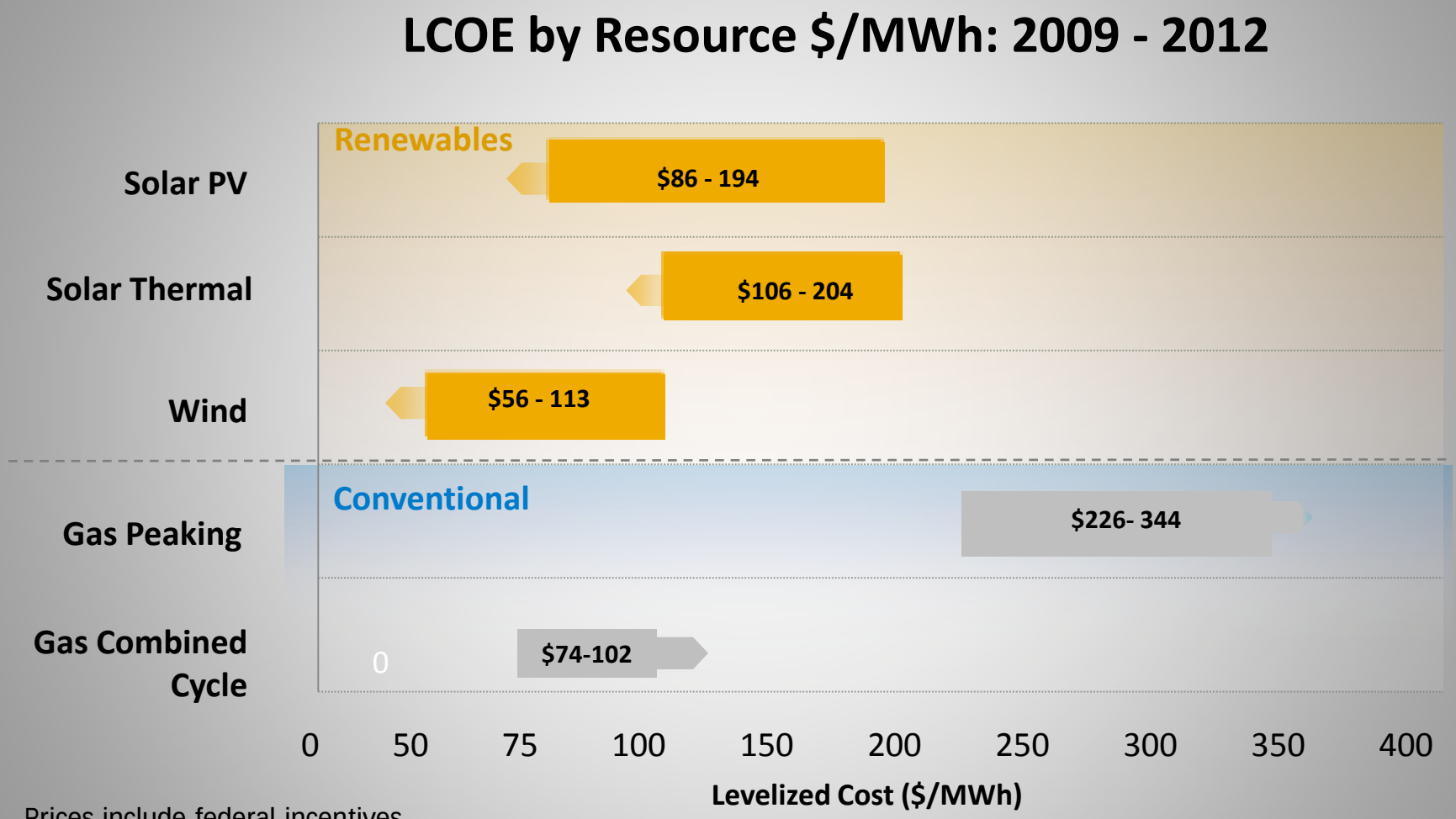
PV Cell evolution (case: Qcells size)

	Multicrystalline Cells		Monocrystalline Cells		Multicrystalline Cells		
	Q5 125x125mm	**Q6** 150x150mm	**Q6M** 150x150mm	**Q6LM** 156x156mm	**Q6LTT** 156x156mm	**Q8TT3** 210x210mm	**Q6LPS** 156x156mm
							
PRODUCT MILESTONES	Q3 2001	Q2 2002	Q4 2003	Q3 2004	Q2 2004	Q2 2005	Q1 2006
POWER PER CELL	2,4 Wp	3,3 Wp	3,64 Wp	3,88 Wp	3,65 Wp	6,62 Wp	3,65 Wp

Solar PV industry outlook

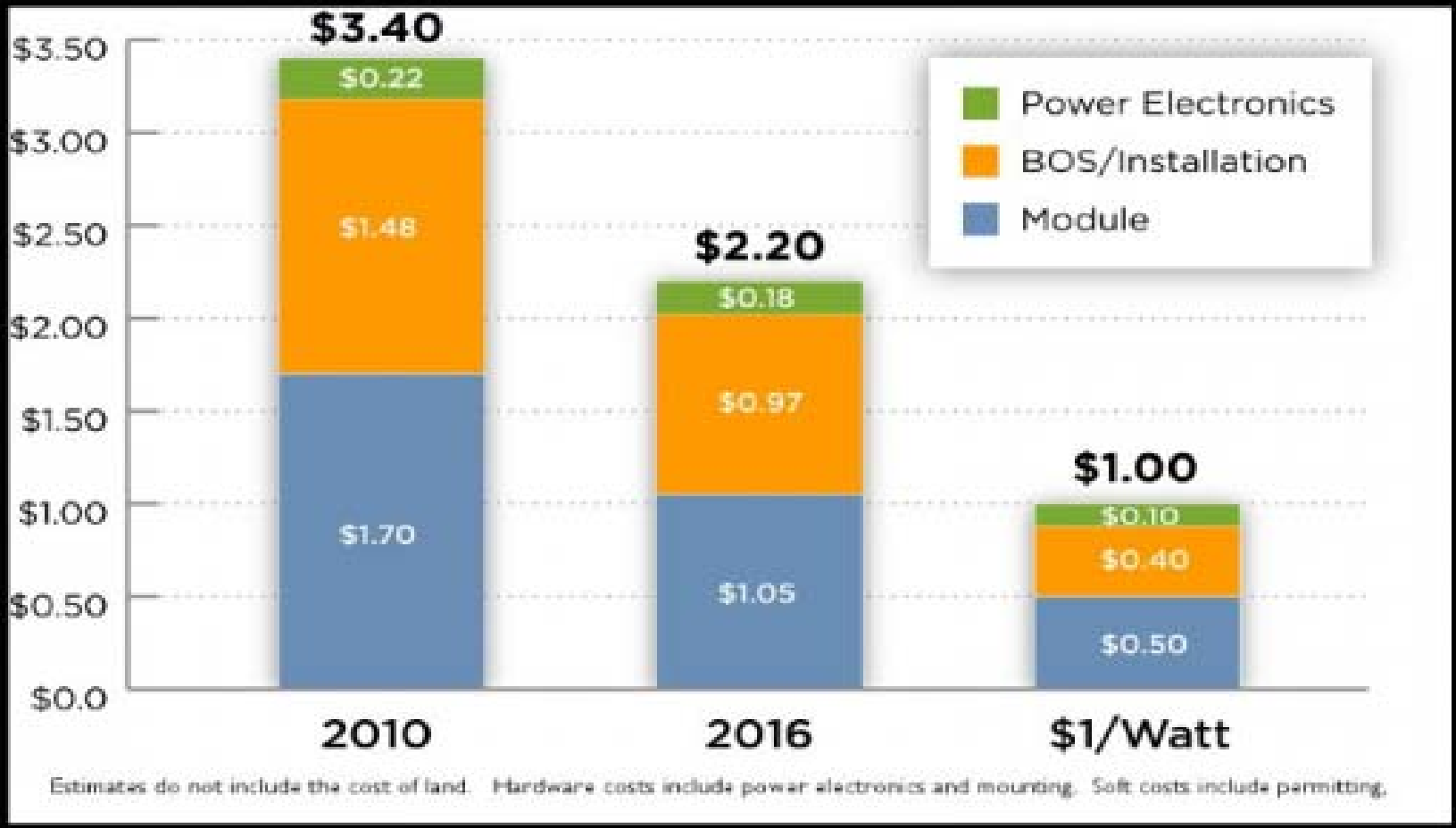


Solar PV Is Cost Competitive



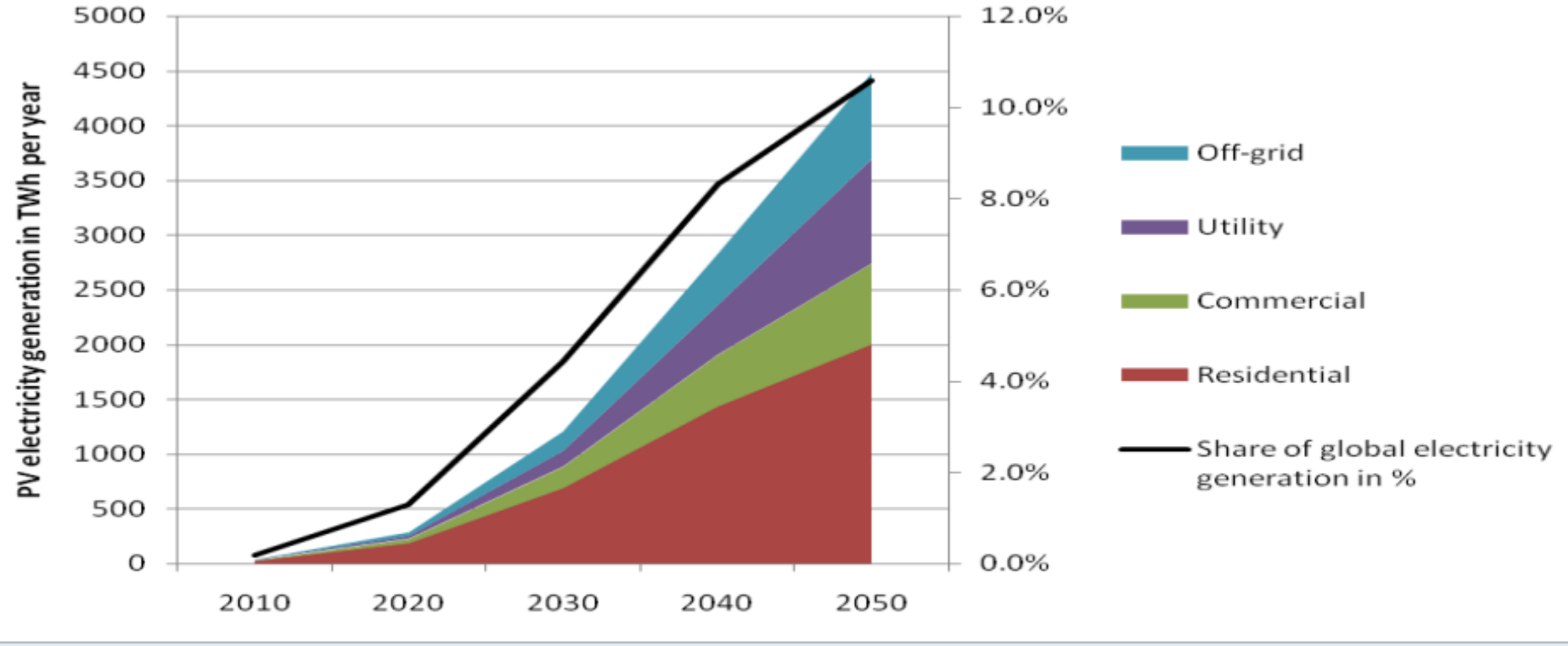
Prices include federal incentives
Source: Lazard Capital Markets 1/9/2009

Utility System with $1/W Price Goal



SunShot
U.S. Department of Energy

Solar PV Targets



If sound policies are put in place,
PV can provide 5% of global electricity generation in 2030, 11% in 2050

PVPS

International Energy Agency

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San Juan: primera planta de 1.2 MWp conectada a la red en Argentina

1,260 MWp instalados

Tres tecnologías

Diferentes de módulos:

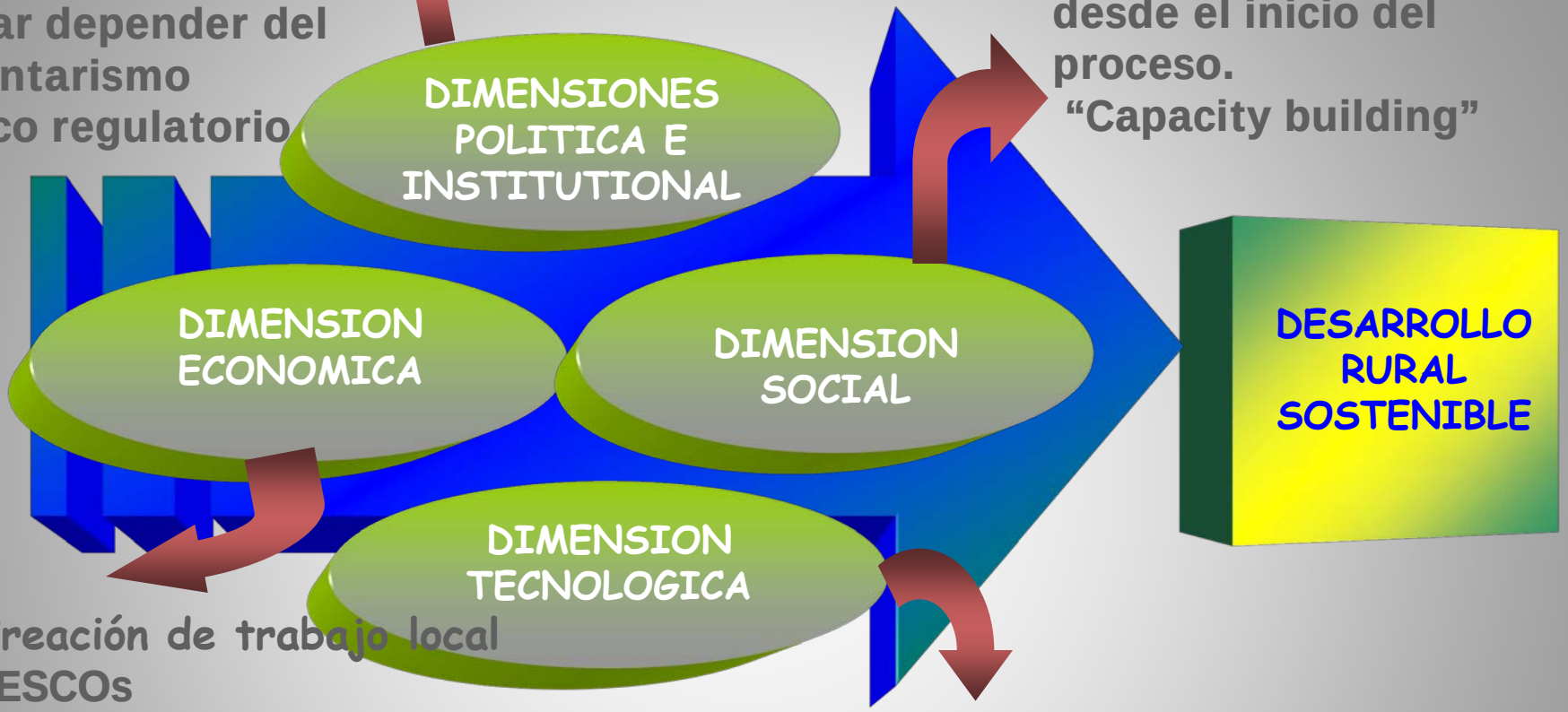
Mono / poly / capa delgada

Seguidores de uno y dos ejes

En operación

Administración local
Creación de empleo
Evitar depender del voluntarismo
Marco regulatorio

Participation local desde el inicio del proceso.
"Capacity building"



- Creación de trabajo local / ESCOs
- Planes de negocios rurales
- "Fee-for-maintenance/ service".
- Financiación
- Inversión Inicial
- Subsidios inteligentes

Que tecnología se ajusta más a cada caso? Porque?
Escala: Mercado en los países Anexo I Vs. Mercados en países Anexo II (Kyoto)

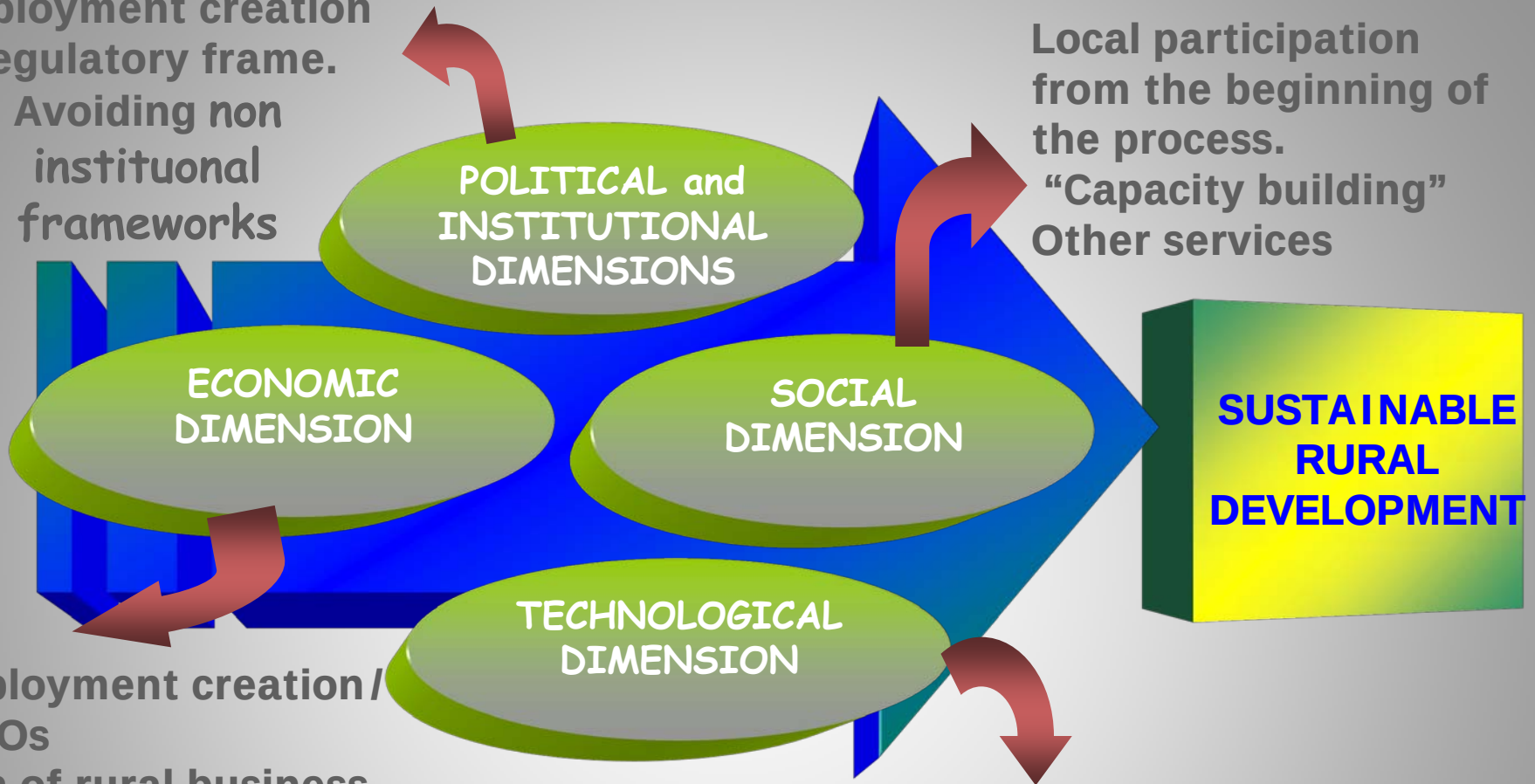
ECONOMIC DIMENSION

Mexico, Productive Uses.
Systems of water pumping Fideicomiso de riesgo compartido (FIRCO) [Trust of Joint Venture]

FIRCO: Productivity Indicators

Parameter	Previous	After
Milk Production (litres/cow/day)	6	7
Lactation Duration (days)	260	280
Profits of weight in bullocks (grams/day)	230	250
Adults' Mortality (%)	3	2
Weaning (%)	60	65

Local Administration
Employment creation
Regulatory frame.
Avoiding non instituonal frameworks

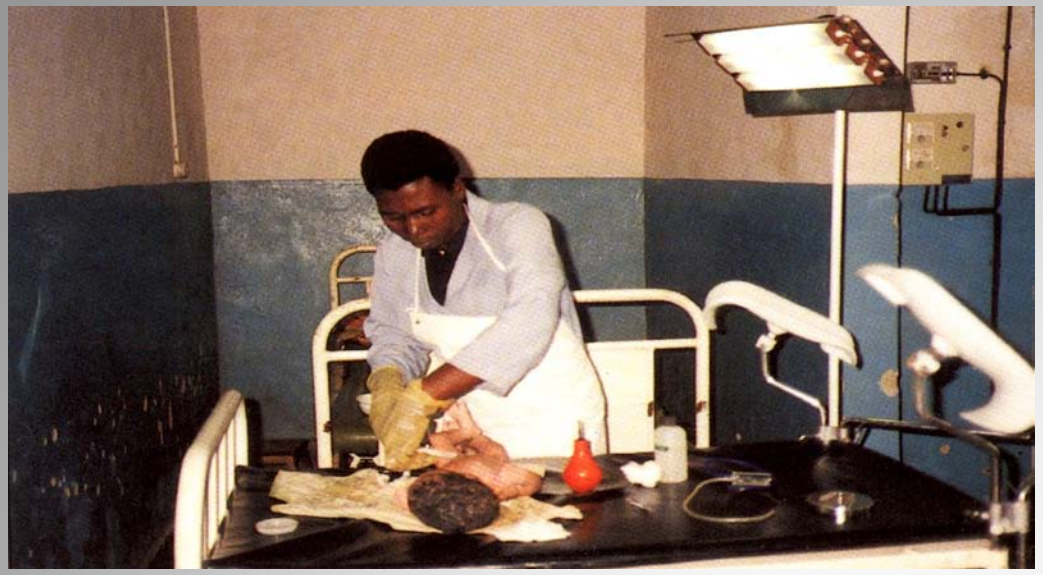


Local participation from the beginning of the process.
"Capacity building"
Other services

Employment creation / ESCOs
Plan of rural business
"Fee-for-maintenance / service".
Financing. Initial investment
Intelligent subsidies

Which is the most appropriated technology for each case? Why?
Scale: Attachment I and Attachment II

SOCIAL DIMENSION



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Aspectos Ambientales

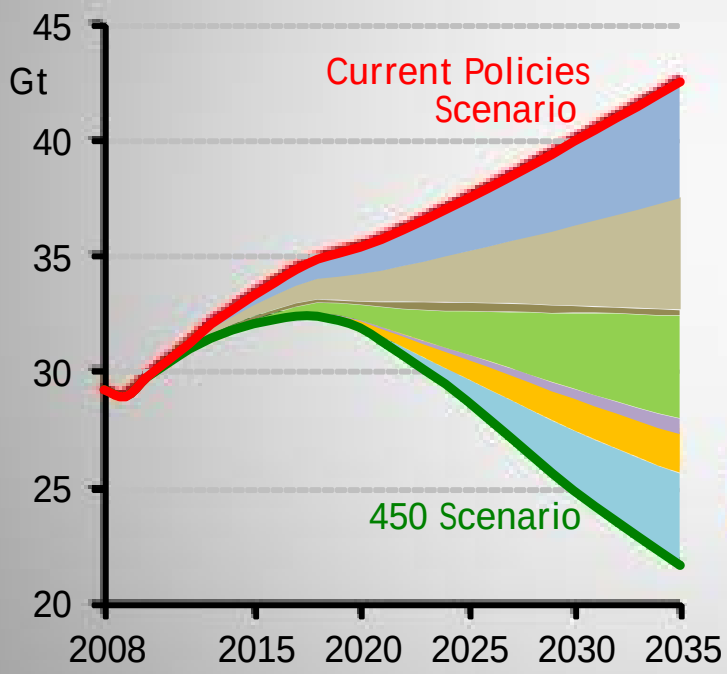
Además del desarrollo económico de zonas hasta ahora postergadas que acompañan a estos programas, debe destacarse los aspectos ambientales asociados a estas tecnologías y de entre ellos la opción de mitigación de CO2. Algunos números significativos que surgen de proyectos ya implementados en la región son:

Se considera que cada Kwh en promedio reduce:

- *0.6 Kg para sistemas conectados a red*
- *1 Kg cuando reemplaza a un Diesel autónomo*
- *10 Kg cuando reemplaza Kerosene (valor adoptado por el GEF para el PERMER) .*

Energy efficiency & renewables are key to abatement in the 450 Scenario

World energy-related CO_2 emissions savings in the 450 Scenario compared with the Current Policies Scenario, by measure



	Abatement		
	2020	2030	2035
Efficiency	71%	49%	48%
– *End-use (direct)*	*34%*	*24%*	*24%*
– *End-use (indirect)*	*33%*	*23%*	*23%*
– *Power plants*	*3%*	*2%*	*1%*
Renewables	18%	21%	21%
Biofuels	1%	3%	3%
Nuclear	7%	9%	8%
CCS	2%	17%	19%
Total (Gt CO_2)	3.5	15.1	20.9

24 % renewables – on top of BAU renewables share rise

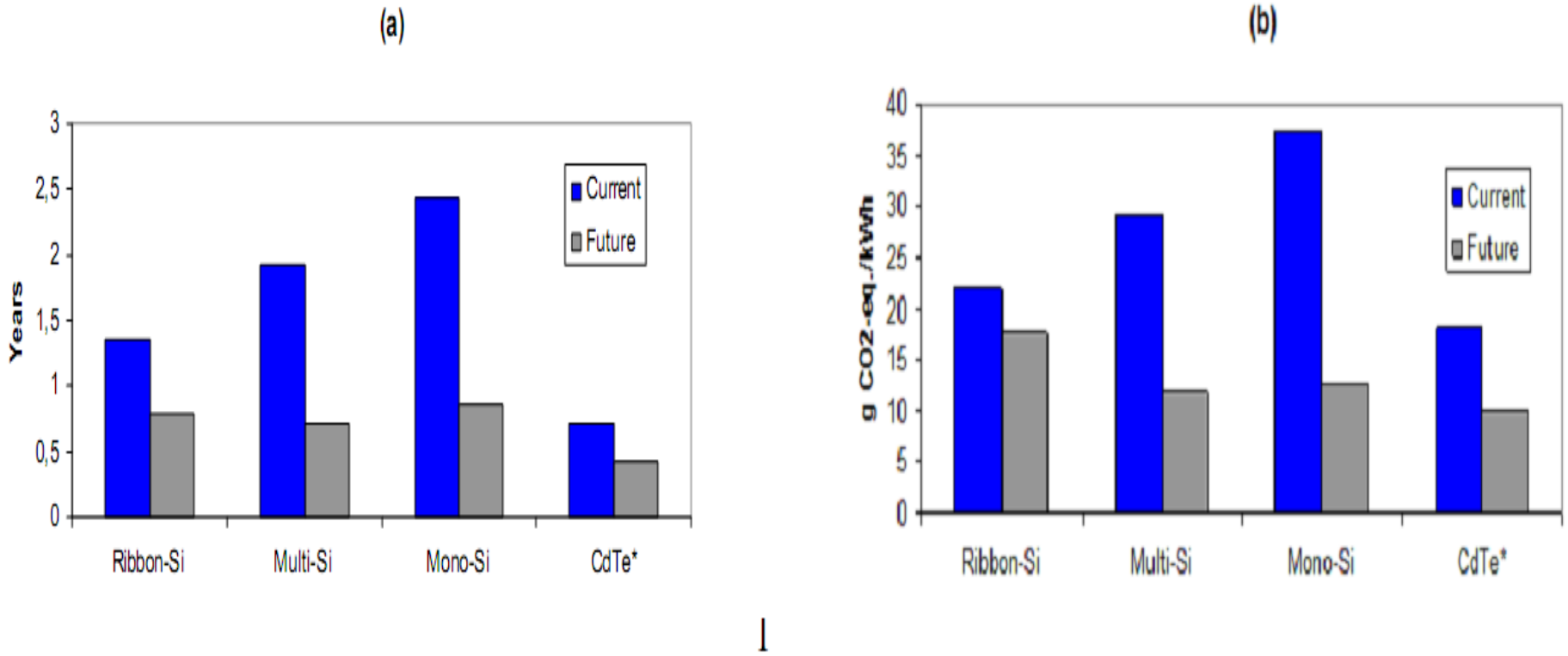


Figure 3.24: Future forecast for energy payback time and GHG emissions from the life cycles of PV modules. Estimates are based on the Southern European irradiation level, 1700 kWh/m^2/year, a performance ratio of 0.75, and lifetime of 30 years (* Based on the average U.S. irradiation level of 1800 kWh/m^2/year and a performance ratio of 0.8) (Fthenakis and Kim, 2010).

MINIREDES JUSTIFICACION

-Comunidades Aisladas sin oportunidad de Interconexión.

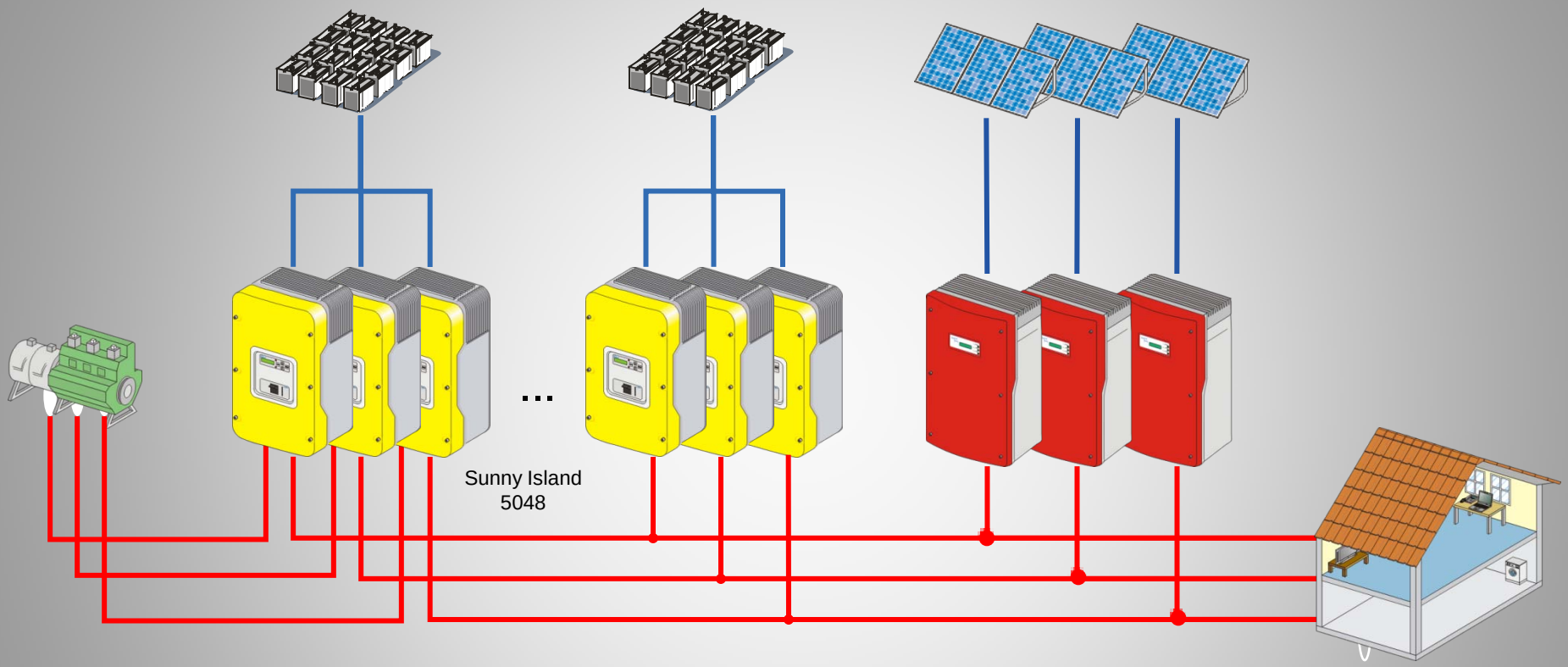
-Comunidades actualmente abastecidas con Plantas Diesel (atienden mayoritariamente las poblaciones no interconectadas)

-Baja Calidad de Servicio, afectada fundamentalmente por Discontinuidad de Servicio.

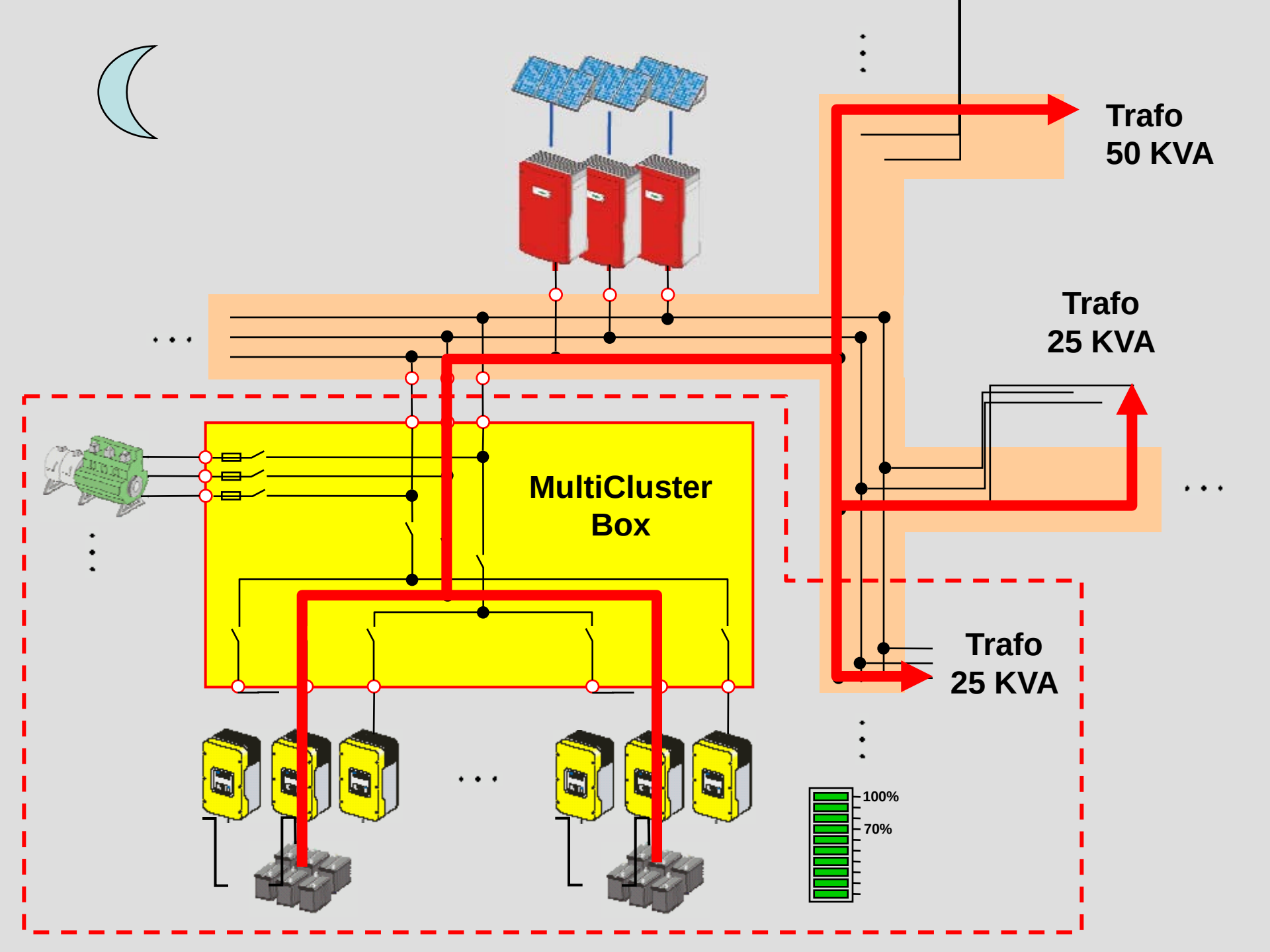
-Alta dependencia del suministro de combustible, afectado por diversos motivos (presupuesto, accesibilidad, orden publico, etc.)

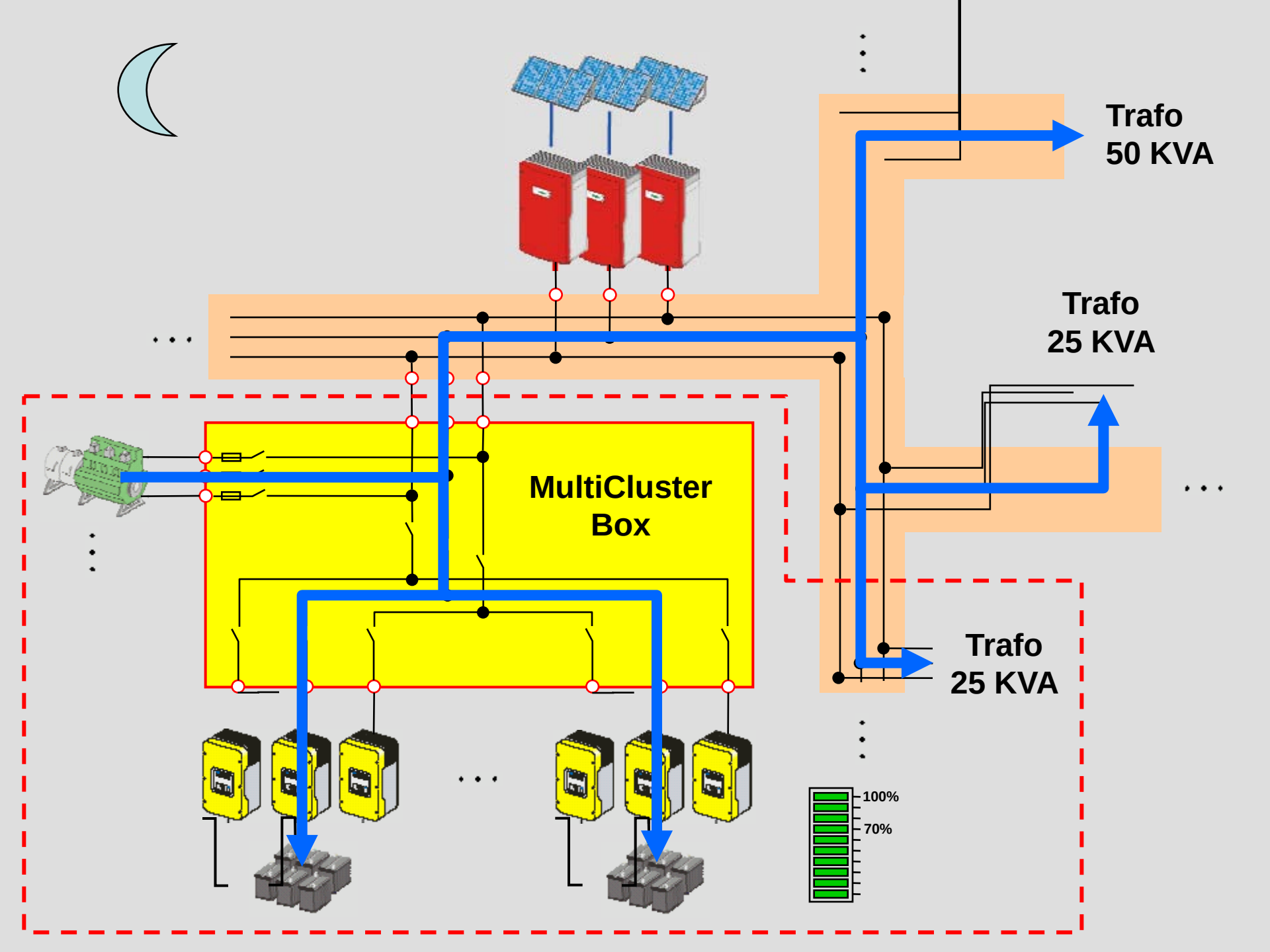
-Ineficiencia Energética (alto consumo, perdidas elevadas, plantas diesel funcionando fuera del rango de máximo rendimiento, etc.)

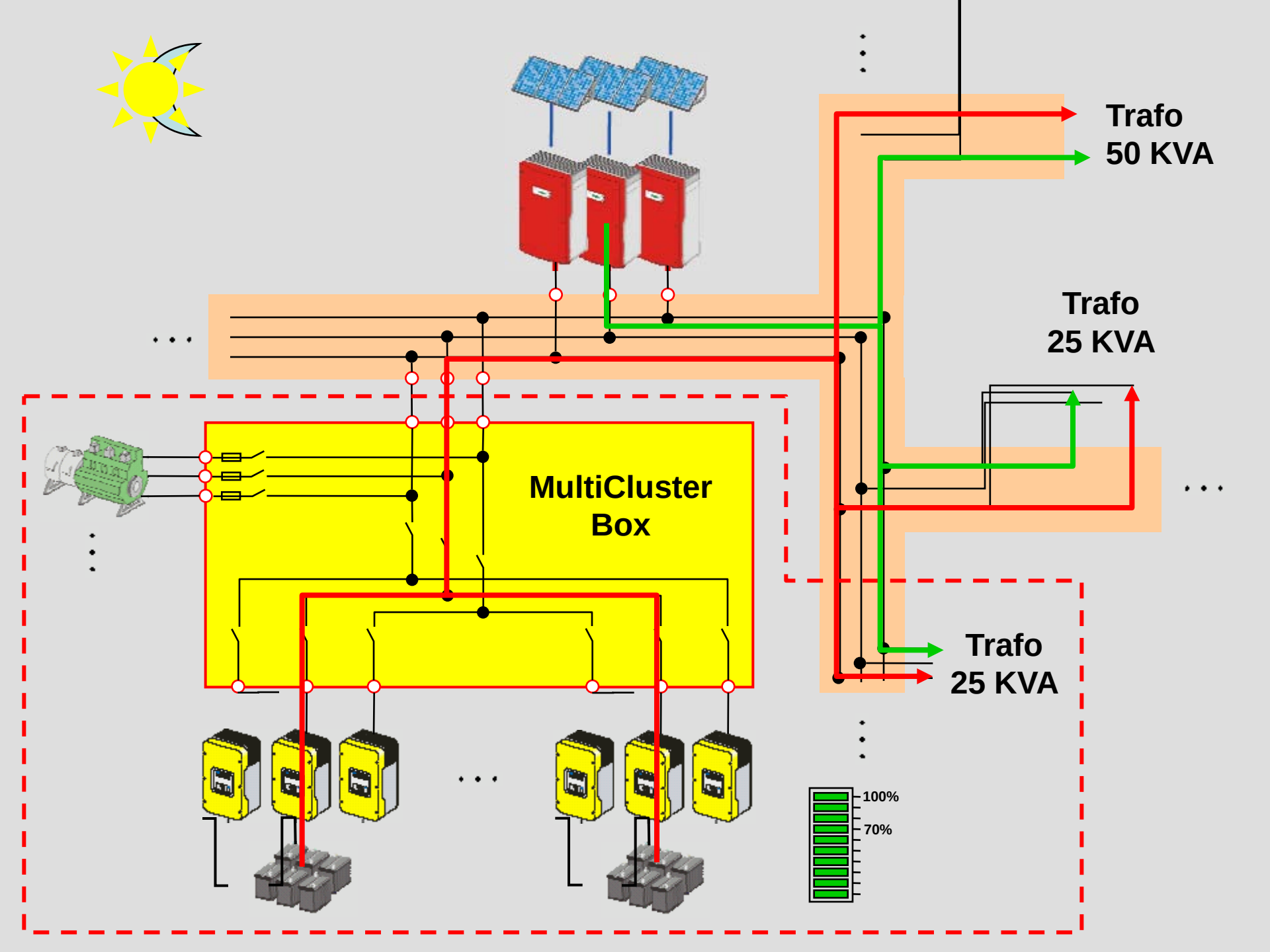
Sistema trifásico

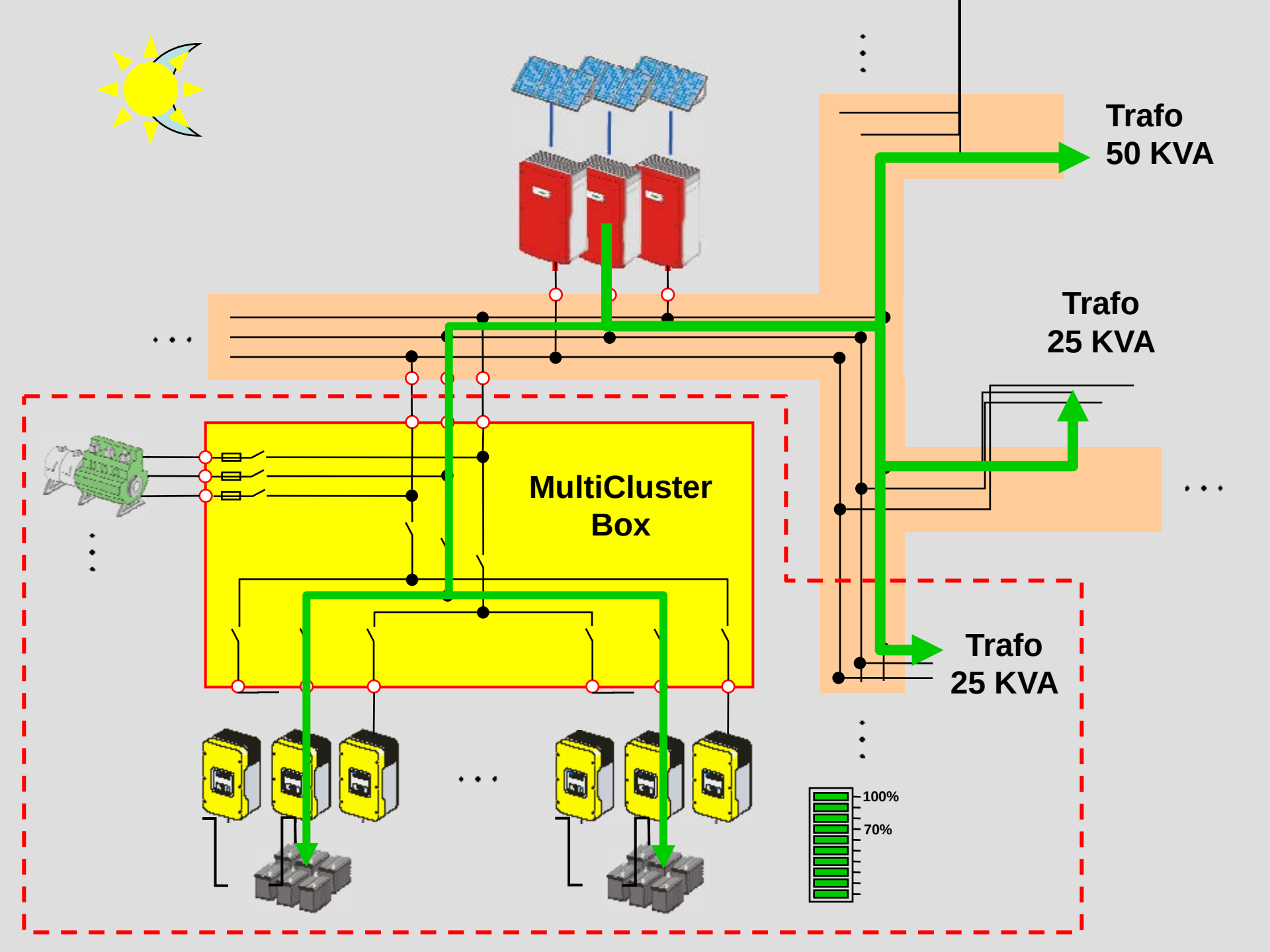


...para sistemas de hasta 100 kW


Trafo
50 KVA
Trafo
25 KVA
MultiCluster
Box
Trafo
25 KVA
100%
70%


Trafo
50 KVA
Trafo
25 KVA
MultiCluster
Box
Trafo
25 KVA
100%
70%


Trafo
50 KVA
Trafo
25 KVA
MultiCluster
Box
Trafo
25 KVA
100%
70%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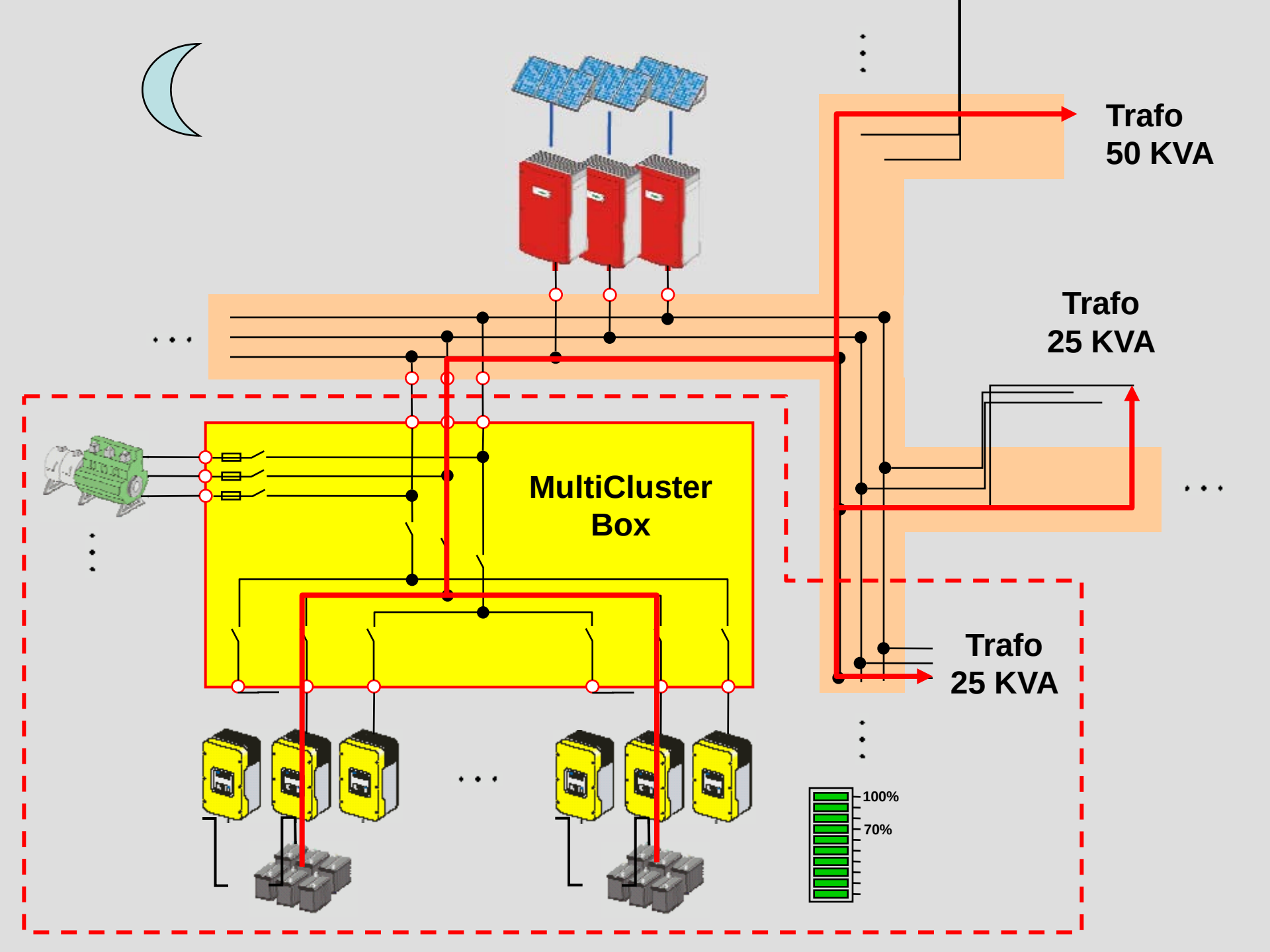
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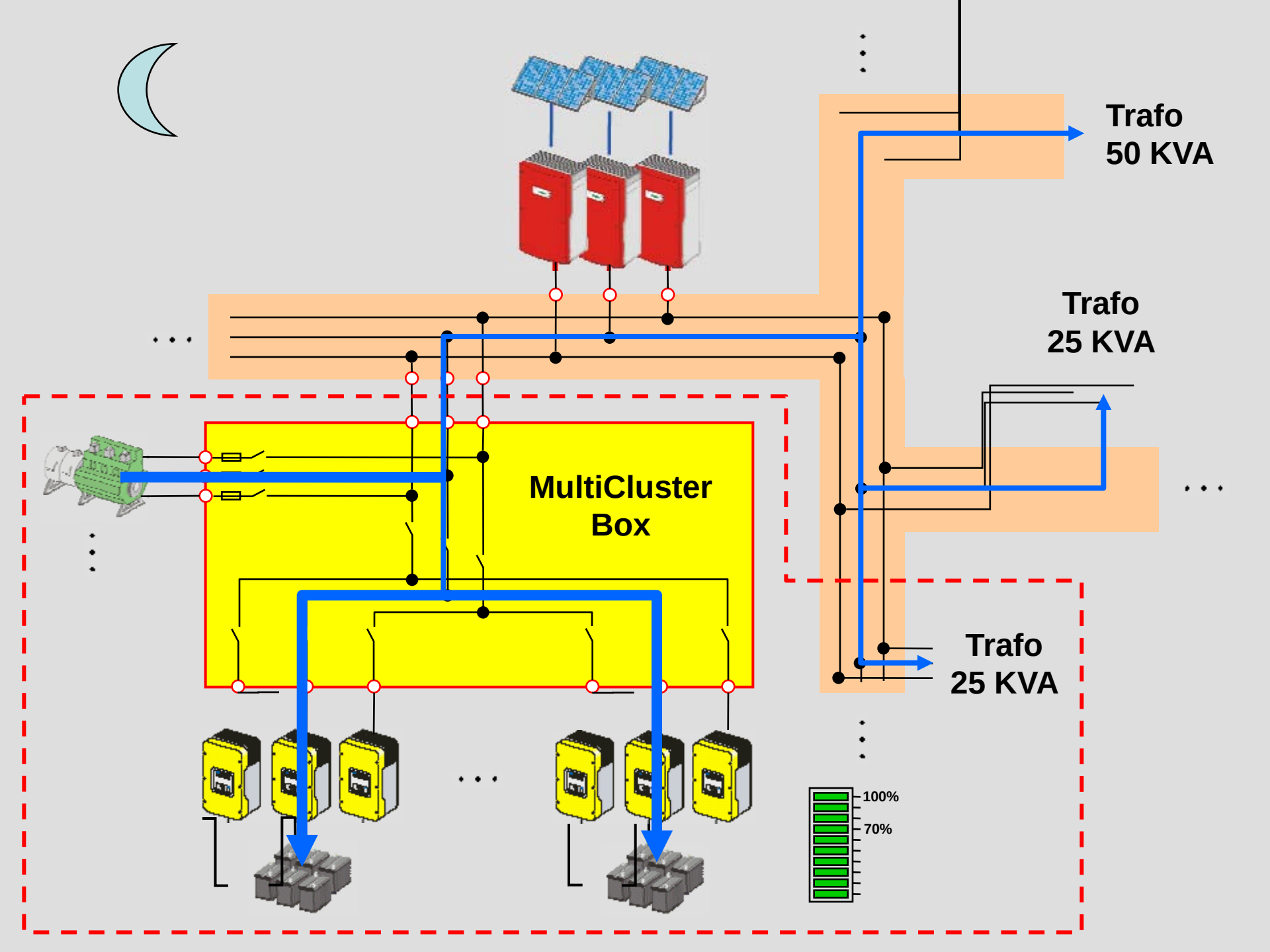
Trafo
50 KVA
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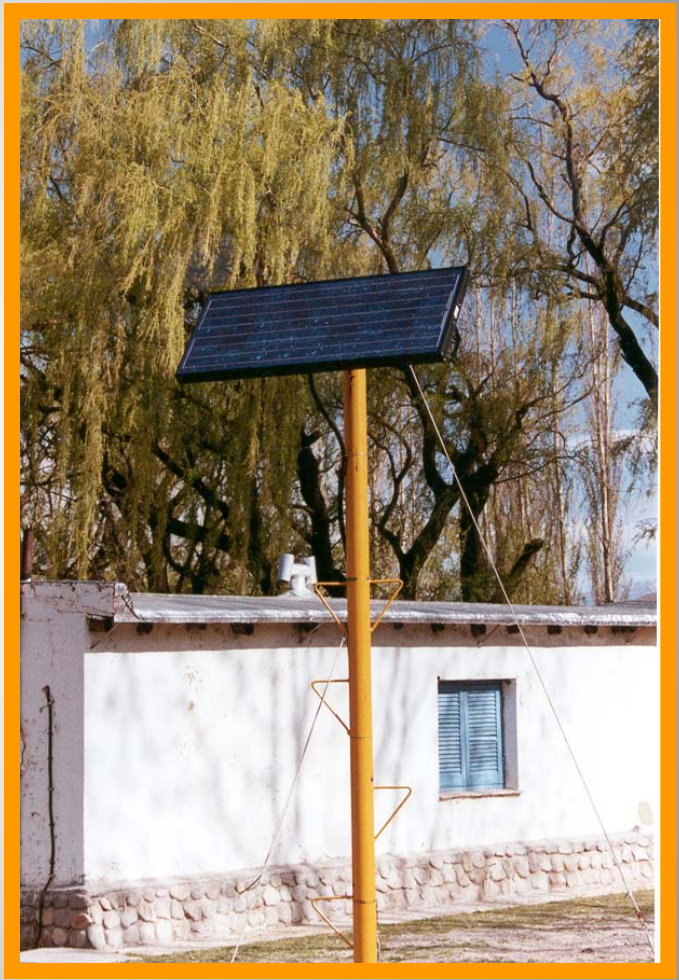
MultiCluster
Box
Trafo
25 KVA
100%
70%

Rural Lighting
(Uspallata - Mendoza , Argentina)

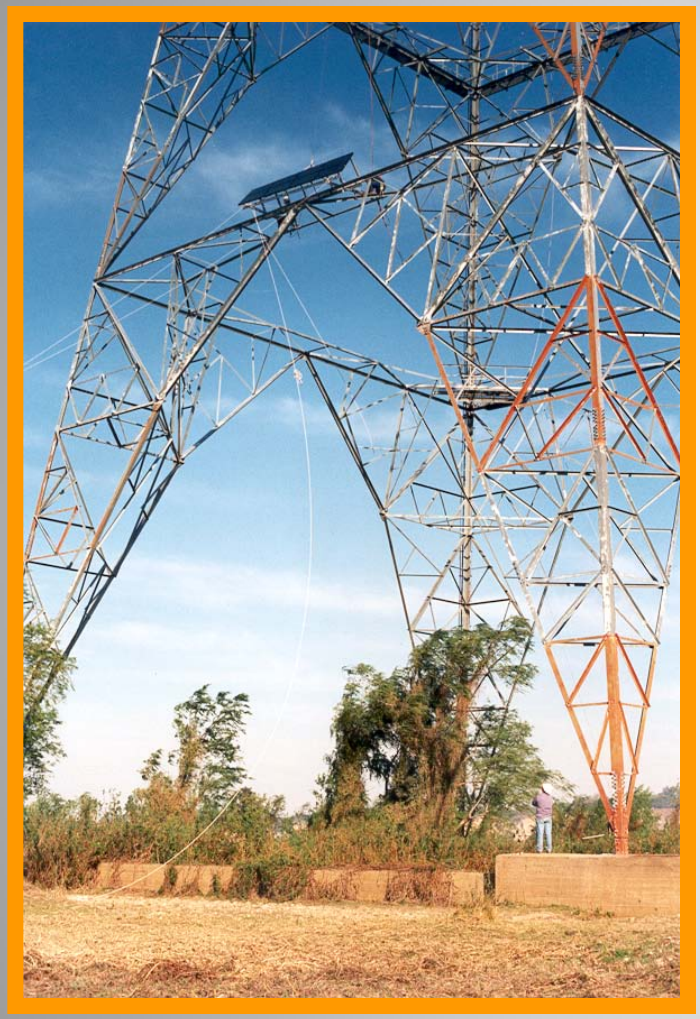


Rep. Cº CHURBATAL

(Jujuy , Argentina)

Sistemas Energéticos S.A. [Corporation of Energetic Systems]

Satellite Telemetry in Gas Pipelines



Beacon lighting Tower 500KV

(Santo Tomé - Santa Fe , Argentina)

Transener S.A.

Rural Schools

- Name: PERMER (Argentina)
- More than 1500 Solar Systems for schools, gendarmerie posts and private homes.
- Custom: Provincial and National Governments
- Budget: USD 4 millions
- Funds: WB y GEF
- Date: April 2003/7

Rural Schools (II)

- Name: EADE – Programme of Rural Electrification in Educational Centres. Antioquia, Colombia.
- 92 systems of energy. 58880 Wp (640Wp per Centre).
- 92 shelters of batteries of 330Ah/24V
- Customer: Empresa Antioqueña de Energía [Energetic Company of Antioqueña]
- Budget: USD 1400 k
- Funds: Government of Antioquia
- Date: February-October 2006
- Contractor: TENESOL

Rural Tele centres

- Name: Telecentros Compartel (COLOMBIA)
- 54 hybrid Solar Systems/ Diesel, Total 160 Kwp
- 108 Benches of Batteries of 740Ah/48V
- Customer: Gilat
- Budget: USD 1,8M
- Funds: Private
- Date: April 2005
- Contractor: TENESOL

Rural Health Centres

- Name: Mayapo (Colombia)
- Health Centre, 520Wp
- One (1) battery bank of 500Ah/24V and one (1) bench of batteries of 200Ah/12V
- Customer: Chevron Texaco
- Budget: USD 10 k
- Funds: ChevronTexaco
- Date: November 2005
- Contractor: TENESOL

BRAZIL

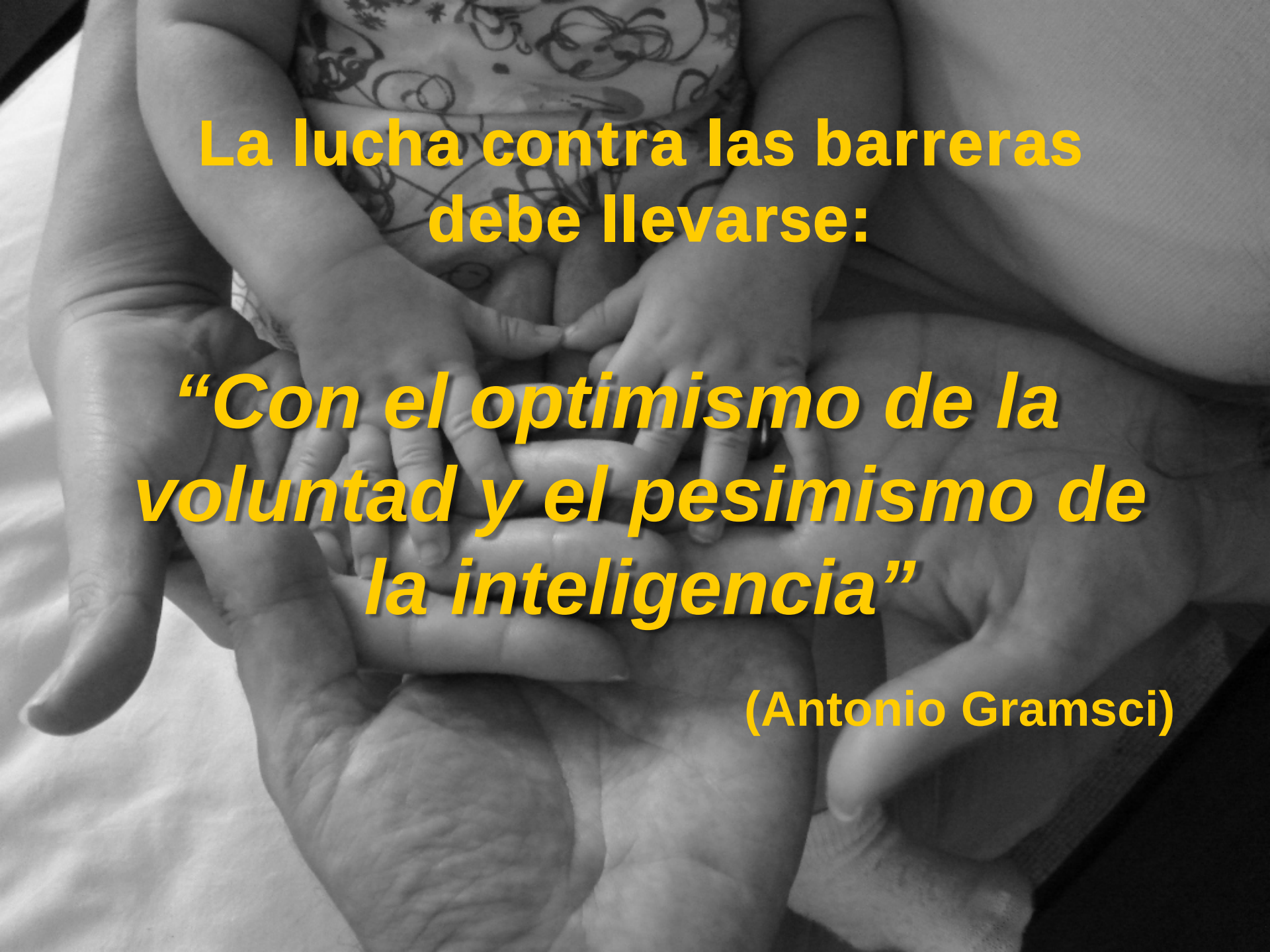
- Name: PRODEEM V
- 1900 Rural Schools, Total 1,4MW
- Customer: MME
- Budget: USD18 M
- Funds: Federal Government
- Date: October 2003
- 1900 schools with refrigeration, lighting and satellite communication
- Contractor: BP Solar Brazil

COLOMBIA

- Name: Acueducto Puerto Murillo (Puerto Berrío – Ant) [Aqueduct of Murillo Port (Berrio Port – Ant)]
- 1 system of direct solar pumping. 2970 Wp (Production 35 m^3/day).
- Customer: Aguas del Puerto [Port Waters]
- Budget: USD 46 k
- Funds: Government of Antioquia
- Date: April 2007
- Contractor: TENESOL

ARGENTINA

- Primeros sistemas conectados a la red sin sistema de acumulación en la región.
- Un nicho que comienza a crecer
- Unilever, Corrientes,
- Argentina



La lucha contra las barreras debe llevarse:

"Con el optimismo de la voluntad y el pesimismo de la inteligencia"

(Antonio Gramsci)

La lucha contra las barreras

"No hay cosa más difícil de tratar ni más dudosa de conseguir, ni más peligrosa de conducir, que hacerse promotor de la implantación de nuevas instituciones. La causa de tamaña dificultad reside en que el promotor tiene por enemigos a todos aquellos que sacaban provecho del viejo orden y encuentra unos defensores tímidos en todos los que se verían beneficiados por el nuevo. ……"

Fragmento de: "El Príncipe" (Maquiavelo)

Debo citar y agradecer a varias fuentes de información de donde he extraído algunos de los datos presentados aquí (IEA, WB, PNUD, EPIA, Photon, GVEP, SMA, Sunpower, Qcells, Schott solar, UTN, IPCC, Navigant consulting,Solarbuzz, entre otros)

Usted puede encontrar mucha más información sobre nuestra empresa, sus proyectos y sus productos en nuestro sitio en Internet (www.aldar.com.ar) O si lo prefiere, contactarme en forma directa:

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Tel/ fax (54 11) 4963 7433

Muchas Gracias !!!