



Task 9 - Deployment of Photovoltaic Technologies: Co-operation with Developing Countries



IEA International Energy Agency



The Regional Solar Pumping Programme in the Sahel and Community Applications

INSTITUTIONAL & FINANCIAL issues

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Innovation Energie Développement
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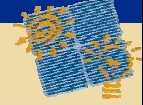
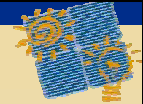


Illustration through the Regional Pumping programme funded by the EC

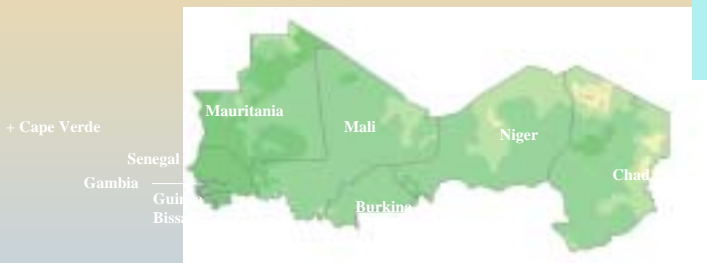


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Location of the programme : The 9 CILSS Countries



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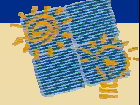
626 pumping systems (95% of installed capacity)

644 community systems (5% of installed capacity)

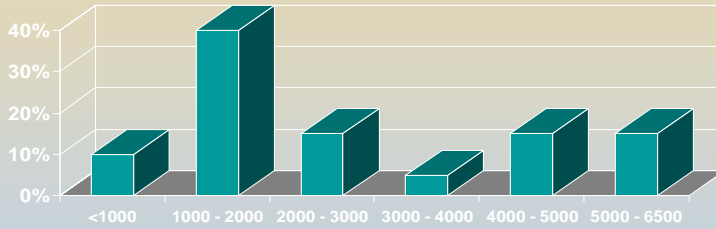
For a total of 1.3 MWp installed

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Range of village population size



Population size of the villages

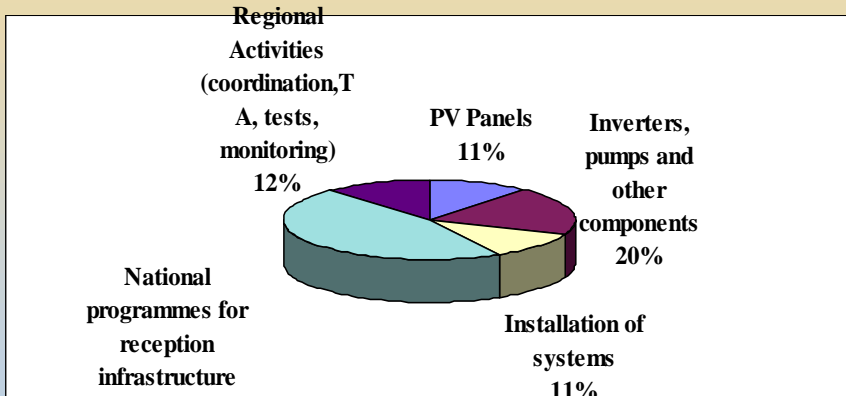
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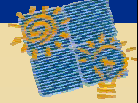
Breakdown of RSP budget (63 M€)



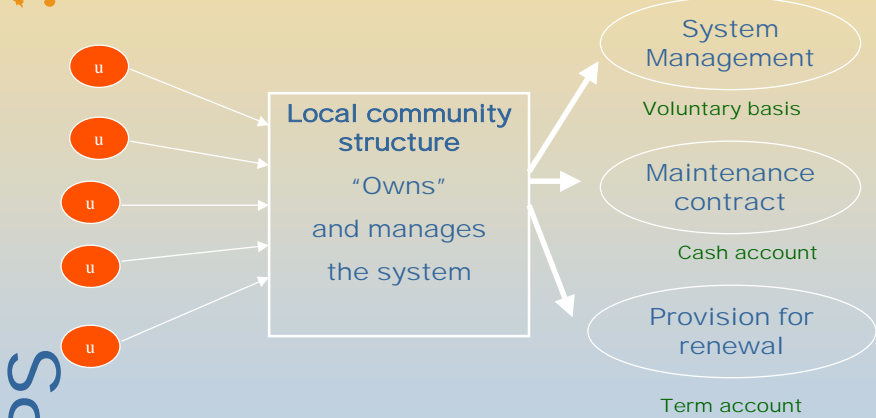
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Initial RSP institutional scheme



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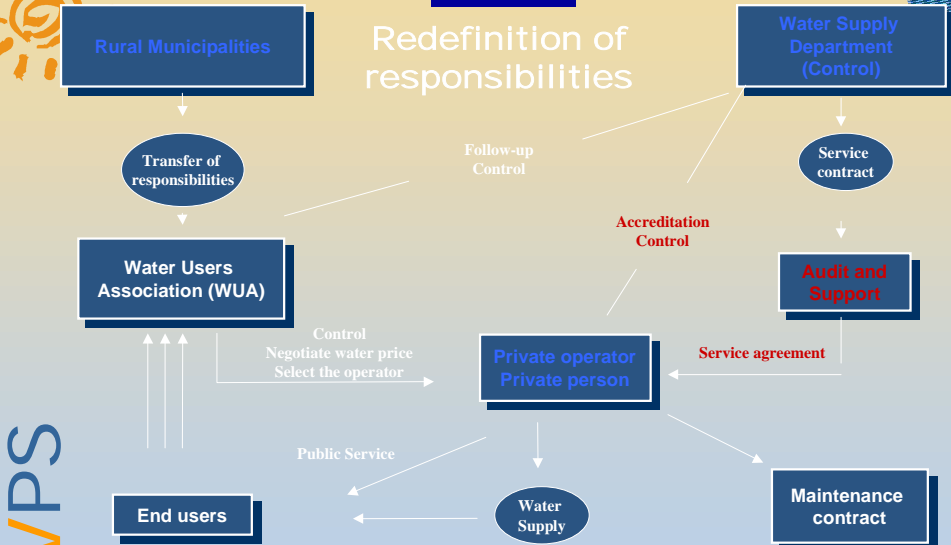
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Redefinition of responsibilities

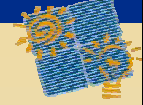


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RSP experience on Investment costs Economic viability

- ↪ Cost per Wp :
 - Average 20 €/Wp against 17 planned
 - For phase 2, should be between 9 and 15 €/Wp ,depending on system size

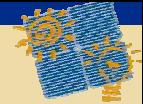
- ↪ Cost per person :
 - 50 €/person
 - To be compared with 20 to 50 € for hand pumps projects : a much better service for an equivalent investment cost

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RSP initial financial rules

- ↪ End-user contribution covers :
 - operating costs
 - maintenance contract
 - provision for renewal of pump and inverter (but not the PV panel or the water tank and tubes)

- ↪ 40% to 60% recovery on total water production potential ensures sustainability

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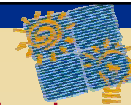
Payment for water :

- ↪ fixed fees or per quantity.
- ↪ Typical water price : 250 FCFA/m³ (0.38 € / m³)

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Initial rules have been adapted to national context

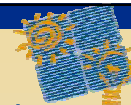
Countries	Organisation for the management of the revenues from water sales	Modality for water pricing	Water price in local currency	m ³ price for domestic use	ASS cost	P3 700-800 Wp	P4 1300- 1500 Wp	P5 2300- 2500 Wp	P5 3600- 3800 Wp
Burkina Faso	Village Water Point Committee.	Consumed volume billing (Sourou, Yatenga et Passore) • Yearly fee (Sissili)	250 FCFA per m ³ • 3500 FCFA per family per year	• 0.4 €/m ³ • 0.1 €/m ³	€/year in % of the system cost	232 1,5%	316 1,5%	319 0,8%	325 0,6%
Cape Verde	private concession, Agence communale de production et gestion d'eau (APDA)	Consumed volume billing in both cases	40 to 100 CUE/m ³ for domestic uses, • 30 CUE/m ³ for irrigation	• 0.4 to 1 €/m ³					
Gambia	Village Water Point Committee	Yearly fee	• 50 à 125 Dallasis per active person and per year	• 0.13 to 0.33 €/m ³	€/year in % of the system cost	359 1,5%	438 1,3%	491 1,0%	571 0,9%
Guinee Bissau	Village Water Point Committee	Yearly fee	• 3000 Pesos / person/ month	• # 0.2 €/m ³					
Mali	Village Water Point Committee	some cases of consumed volume billing, • fees on irregular basis	depends on the villages : • 200 FCFA /family/month • free for domestic use and 6000 FCFA/year for each 0.5 ha (CMDT zone)	• 0.08 €/m ³	€/year in % of the system cost	384 2,2%	398 1,5%	523 1,3%	554 1,0%
Mauritania	Private concession.	consumed volume billing, • some rare cases of fees.	75 to 100 UM / m ³ for drinking water	• 0.42 to 0.56 €/m ³	€/year in % of the system cost	315 2,2%	393 1,5%	433 1,1%	512 1,0%
Niger	Village water point committee	Consumed volume billing	Details not available	• 0.19 €/m ³	€/year in % of the system cost	202 0,9%	219 0,7%	232 0,5%	250 0,4%
Sénégal	Village water point committee	monthly fee, except for the case of m ³ billing.	500 to 1000 FCFA /family/month	• 0.21 to 0.42 €/m ³	€/year in % of the system cost	213 0,9%	261 0,8%	293 0,6%	341 0,6%
Chad	Community management with a Water Point Committee (CPE) • semi-urban management with a committee for water management (CGE)	CPE : monthly fee consumed volume billing • CGE : monthly fee consumed volume billing	• CPE : 150 to 350 FCFA /household/month • CGE : 250 FCFA per m ³	• CPE : 0.06 to 0.15 €/m ³ • CGE : 0.38 €/m ³	€/year in % of the system cost	127 0,7%	333 1,2%	519 1,2%	912 1,6%

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But financial viability is not guaranteed for all systems

	Number of pumps of the sample	Percentage of villages of the sample vz financial objectives for maintenance and renewal of equipment			
		> 100 %	66 à 100 %	33 à 66 %	< 33 %
Burkina Faso	55	49%	25%	20%	5%
Gambia	47	6%	11%	17%	66%
Mauritania	20	25%	35%	15%	25%
Senegal	38	45%	26%	21%	8%
Total sample	160	33%	23%	19%	26%

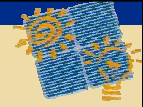
As of end '98

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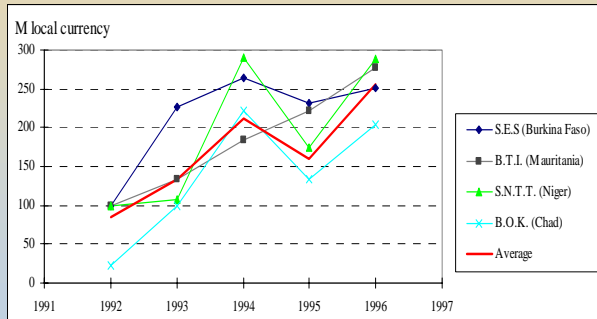
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Turnover of local companies: x 2,5 to 4 from 1992 to 1996
Stable to diminishing since; now phase 2



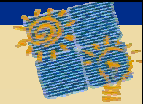
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Turnover of local operators of RSP

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Challenges for the future

- Continuation of the decentralisation process and clarification of roles and responsibilities : need for institutional clarification
- Emergence of private operators : time, resources, continuity are needed
- Build-up audit, control, financial management and support capabilities. Related costs should be included in the price of water

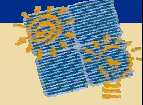


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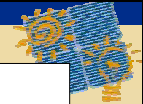


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2. Philippines : SPOTS project

- Objectives : provide electricity to 40 ARC in 15 provinces in Mindanao
- Characteristics : multiagency undertaking DAR (leader) + DOE + NEA + Rural Electr. Coop., ANEC's, NGO's, LGU's, People Organ. Coop.
- Financing : by Spain (50 millions USD)

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Project components and Solar Packages :

- Agribusiness development : water pumping systems and AC Power Bloc
- Community facilities & Social infrastructures : Health Centre, School, Barangay Hall, Community Lighting systems and Potable Water supply. (Additional SHLS)
- Institutional Development : community support and training on technical, credit management, agribusiness development.

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Main observations (positive) :

- + High quality of design; high quality of products
- + Effective local technician training and capacity building (need strict supervision!)
- + High quality installations by local technicians
- + Orientation courses on O&M for users & operators
- + Monthly collective information meeting for users
- + Reproducibility of the O&M scheme (modular approach with individual operator (teacher, clinic staff) for each solar package
- + No tariff for community packages but O&M in charge of LGU's (MOA).

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Main Difficulties observed

- Large range of components (different batteries, BCR, inverters, ...)
- Many actors involved generating inter-relation problems (public/private, central/regional)
- Lack of experience of DAR (lead implementer)
- Complicated and costly organisation of O&M
- RESCO's are not involved
- High investment cost (high quality and sophist.)
- Strong government involvement for long-term sustainability.

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Conclusions :

- Globally too early to evaluate the PV component of SPOTS.
- Project has paid attention to many critical issues to avoid failures.
- Short-term consequences are :
 - Project management & organisation seem tricky and fragile;
 - Project cost is pretty high with unclear financial setup.
- Project formulation allows regular adaptation.

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Technological Issues

- PV system quality (component and service)
- PV system design :
 - Car batteries vs. deep cycle batteries
 - AC vs. DC supply
 - Hybrid systems vs. pure PV systems
 - Prepayment technology
 - Anti-theft devices
 - Various technologies for pumping and water treatment

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Non-technological Issues

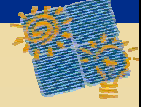
- Commercial service or not?
- Pre-electrification or real electrification?
- Initial investment : credit schemes, ...
- O&M : management models, costs
- Tariffs and subsidies – financial viability
- Ownership
- Key actor selection for implementation
- Capacity building and local training

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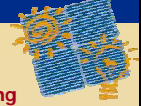


Challenges...

- Do the agents and stakeholders exist? Building the delivery chain (requires appropriate frameworks)
- With the required technical, financial, contractual and managerial capacity? (requires to make players and skills available)
- Ensure that over the long term, maintenance costs are properly factored in: **over 50%** of the system lifetime cost
- Are there enough projects / concessions / incentives to entice potential entities to become energy service providers -> project bundling (appropriate financial and contractual instruments)
- Issue of enforcement in weak legal contexts

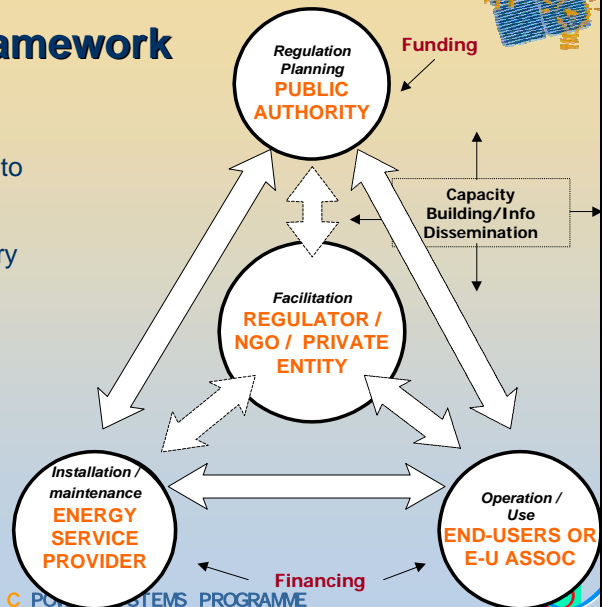
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Institutional Framework

- **Fundamental Functions** to be performed
- The **Agents** needed to carry them out
- **Relationships:** contract / code of conduct needed between the agents
- **Financing and funding**



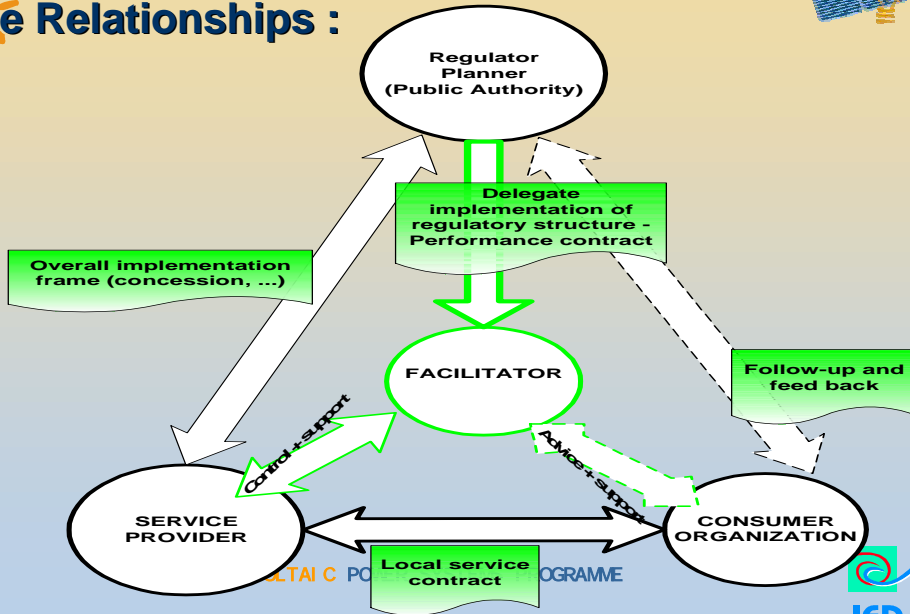
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The Relationships :



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LESSONS FROM EUROPE

European Photovoltaic Industry Association

Annual General Meeting



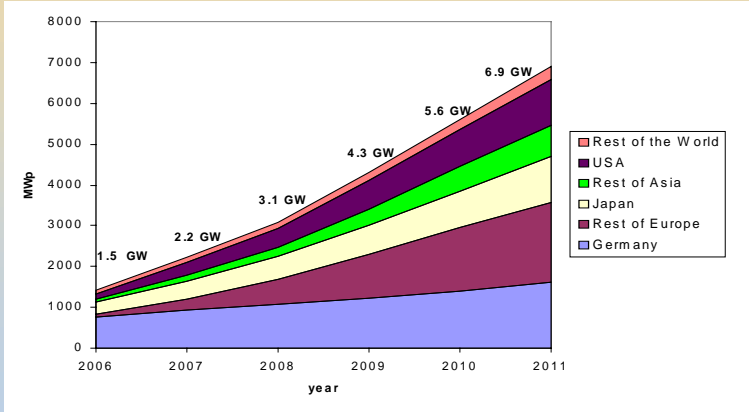
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CTO Applied Materials
President of the European Photovoltaic Industry Association (EPIA),
President of the German Solar Economy Association (BSW) and member of the Scientific Board of FhG-ISE and ISFH

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Regional Development until 2011 (Annual Installations – Policy Driven Scenario)



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European Market Support Programs

Country	Feed-in law			yearly market [MW]	
	Tariff [€ct/kWh]	Duration [a]	Cap [MW]	2005	2006 (est.)
Germany	30 – 40 BIPV + 5ct	20	-	750	750
Italy	30 – 40	20	1,200	5	12
Portugal	31 – 45	-	-	1	1
Spain	22 – 41	25	400	20	63
France	30 – 40 BIPV + 15-25	20	-	5	12
Greece	40 – 50	20	-	1	1
other countries	Feed-in Laws: Switzerland (2001), Denmark (2002), Sweden (2002), Norway, Slovenia (2003), Latvia (2003), Austria, Czech Republic, Lithuania (2002), Cyprus, Estonia, Hungary, Slovak Republic (2003), Turkey, Ireland (2005)				

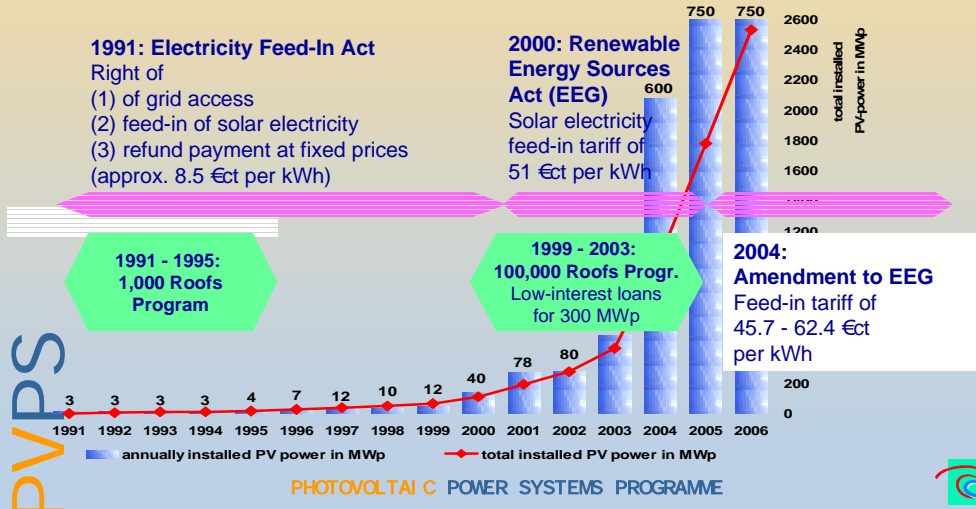
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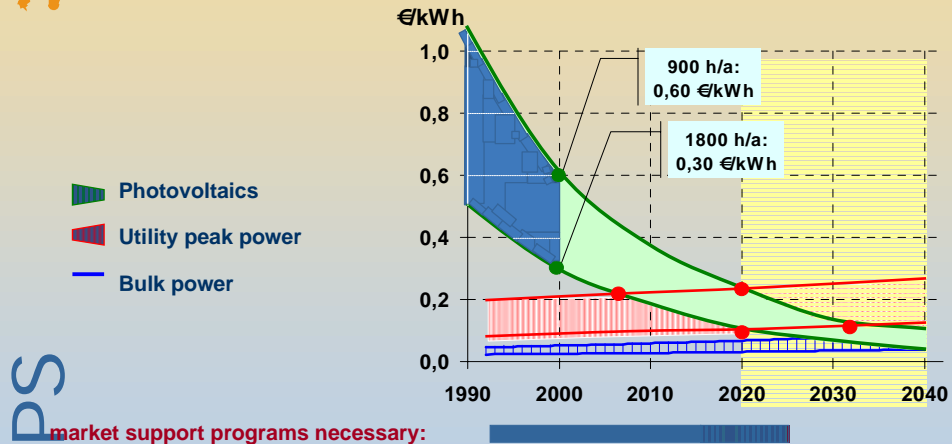
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Development of the German PV-market



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Competitiveness between Electricity Generating Costs for PV and Utility Prices



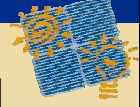
Sources: RWE Energie AG and RSS GmbH

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Market support programmes are needed



- Without storage, cost of PV is between 20 and 45€ cents / kWh
- Need for long term targets and policies: cooperation between actors (utilities, water / education ... end-user departments)
- Regulatory frameworks: long term contracts, awareness
- Financial support schemes: long term funding, tax breaks, end user subsidies

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