



AlpEnergy

Virtual Power Systems as an Instrument to Promote Transnational Cooperation and Sustainable Energy Supply in the Alpine Space

White Book “Virtual Power Systems Definition Paper”

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Structure for Presentation



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1. Main steps of elaboration of White Book until now



- **Study of AlRI/ USI on VPS (Sep '08) + preliminary version of B.A.U.M.**
- **Discussions at Kick-off Meeting and meeting at Milano on 6 Nov '08**
- **First version prepared by B.A.U.M. dated 5 Dec '08**
- **Collection of contributions on national situations and comments of project partners on first version**
- **Second version prepared by B.A.U.M. dated 19 May '09**



2. Two levels of VPS definition: general and specific



- **General definition:** responds to the question “What is a VPS?” and considers the general debate about VPP, VPS, Smart Grids, Smart Metering, etc.
- **Specific definitions:** respond to the question “Which features of a VPS are relevant in the light of the specific challenges and opportunities of the VPS which will be developed and implemented in the target areas of AlpEnergy?”.



3. Requirements for general definition

A VPS must be something that:

- **Responds to the challenge of global climate change and limited conventional energy sources, i.e. must make use of renewable energies AND contribute to overall energy efficiency and saving.**
- **Allows to bring power generation and demand in line while integrating a large share of intermittent renewable energy sources.**
- **Ensures optimum use of resources: grid infrastructure, generation capacities, (inherent) storage capacities, etc.**
- **Makes use of up-coming ICT technology for power production, transmission, distribution, measurement and use.**

3. Requirements for general definition (cont.)

- The difference to other existing notions such as VPP, Smart Grids, mini-grids, autonomous systems, etc., but also to the existing electric grid, must be clear.
- The difference can concern some or many aspects of the definition.
- The difference to other existing notions must be important at least for some aspects.
- The definition should be “connectable” to other existing notions. I.E. boundary cases of a VPS should correspond to existing notions.

4. Present version of general definition of VPS



A virtual Power System (VPS) contributes effectively to combating climate change, reducing consumption of primary energy from fossil and nuclear sources, and involves actively a larger number of stake-holders in the liberalised energy market. For that purpose, a VPS integrates, manages and controls distributed energy generators, usually making use of renewable energy sources, electricity consumers, as well as storage capacities for achieving a critical mass allowing to act jointly in the energy market. A VPS comprises components at the production AND the consumption side, technical AND commercial elements. It is clearly delimited and usually implemented at small scale.



5. Boundary cases of VPS



- **Virtual Power Plant (VPP):** Same as VPS, but without elements on the demand and use side.
- **Virtual Load Plant (VLP):** same as VPS, but without elements on the generation side.
- **Autonomous mini-grid:** same as VPS, but at very small scale.
- **Existing electricity supply system:** fulfils some function of VPs, but makes only limited use of renewable energies and ICT at distribution level.



6. The definition of SmartGrids



A SmartGrid is an electricity network that can intelligently integrate the actions of all users connected to it – generators, consumers and those that do both – in order to efficiently deliver sustainable, economic and secure electricity supplies.



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7. Features of VPS in comparison with VPP, Smart Grids, etc.



	Existing electricity supply system	Existing electricity supply system + few DES	VPP	Smart grid	VPS	MO M-BO X	Autonomous mini-grid	Existing large consumers	Existing small consumers
Non-limited or large-scale	X	X		X		X		X	X
Limited and usually small-scale			X	(X)	X		X		
Geographically connected area	X	X	X	X	X		X	X	X
Geographically disconnected area			(X)	(X)	(X)	X			
Large generation units involved	X	X	(X)	(X)	(X)	X			
Small generation units involved	(X)	X	X	X	X		X	(X)	
Large loads controlled	X	X		X	(X)			X	
Small loads controlled				X	X	X	X		
Pumped-water storage involved	X	X	(X)	(X)	(X)	X	(X)		
Other storage involved	(X)	(X)	(X)	(X)	(X)	(X)	X	(X)	



7. Features of VPS in comparison with VPP, Smart Grids, etc. (cont.)



	Existing electricity supply system	Existing electricity supply system + few DES ¹	VPP	Smart grid	VPS	MOM-BOX ²	Autonomous mini-grid	Existing large consumers	Existing small consumers
Linked by/ connected to high voltage grid	X	X	(X)	(X)	(X)	X		(X)	
Linked by/ connected to medium voltage grid	X	X	X	X	X	X		X	
Linked by/ connected to small voltage grid	X	X	X	X	X	X			X
Communication between large generation units and/ or in high and medium voltage grid	X	X	(X)	(X)	(X)	X		X	
Communication with large loads	X	X	X	X	X			X	
Communication in distribution grid and/ or with small generation units and loads			X	X	X	X	X		



8. Comparison of intervention options



If one shifts 1 MWh by:	E-cars:	Heat pumps:	CHP coupled to district heat grid:	Cooling of beverages:
	electricity for 500 km distance	shifting 25% of daily demand	modulate temperature by 2°C in a 25km long grid	modulate temperature by 3,3°C for 10.000 hl of beer, juice or milk
Number of households concerned	10	100	1.000	10.000
Number of intervention points	10	100	1-10	1-10



9. Next Steps - Outlook

- **Decide about definition of VPS and delimitate from “SmartGrids”**
- **Comment on second version of White Book**
- **Complete/ modify country specific chapters**
- **Check if specific definitions are necessary**
- **Finally adopt White Book**