Autonomous Power Management	
Multi-Agent System Adequacy Synthesis	Date: July 29, 2014

Multi-Agent System Adequacy Synthesis

A statement of the adequacy of a MAS approach to the development of the product.

Global Level

1. Is the global task completely specified? Is an algorithm a priori known	Yes X	No
Comment Task is specified, algorithm is unknown		

2. If several components are needed to solve the global task, do they need to act in a certain order?	Yes	Χ	No
Comment Predictions and schedule fulfillment are completely parallelized			

3. Is the solution generally obtained by repetitive tests, are different attempts required before finding a solution?	X Yes	No
Comment		

Scheduling is continuously performed to accommodate constantly changing env. parameters

4. May the environment of the studied system be dynamic?	X	Yes	No
Comment			

The power grid the system is located in has to adapt to a constantly changing environment, including changing loads and changing feed-in from stochastic power consumers.

5. Is the system functionally or physically distributed? Are several physically distributed components needed to solve the global task? Or is a conceptual distribution needed to solve it?	X	Yes	No
Comment Distributed power infrastructure, generators, and consumers			

6. Is a large number of components needed?	X	Yes	No
Comment Minimum of one agent per power plant, thousands of deployed power plants.			

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7. Is the studied system nonlinear? May a little modification of a local behaviour have a great impact on the global result?	Yes	X	No
Comment Due to the large scale of the system small deviations have no global impact.			

8. Finally, is the system open or evolutionary? Can new components appear or disappear dynamically?	X	Yes	No
Comment New power generators and consumers come offline often, deactivation is less co must be accounted for.	ommo	n but also)

Local Level – AVPP

The local level has to be examined to know whether some components require being recursively designed as adaptive multi-agent systems.

1. Does a component have a rationality based only on a local perception of its	Yes	X	No
environment only?			

Comment

An AVPP uses data collected from other power plants to make decisions about the schedule. Therefore, a regional perception is available.

2. Is the component "big" or not? Is it able to do many things, to reason? Does it need complex abilities to perform its own task?	X	Yes	No
Comment Subsumes several power plants and other AVPPs Scheduling only possible if predictions are available			

3. May the behaviour of a component include complex learning and adaptation?	X	Yes	No	5
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Comment

An AVPP can adapt to the number and type of power plants available to it and learn about the prediction errors they make.

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Local Level – Power Plant

The local level has to be examined to know whether some components require being recursively designed as adaptive multi-agent systems.

1. Does a component have a rationality based only on a local perception of its environment only?	X	Yes	No
Comment Power Plants only use weather data and their own status for their decisions.			

2. Is the component "big" or not? Is it able to do many things, to reason? Does it need complex abilities to perform its own task?	Yes	X	No
Comment			

3. May the behaviour of a component include complex learning and adaptation?		Yes X	No
Comment			
Power Plants exhibit limited adaptivity as they only react to changes in the wea	ther a	nd their	

Power Plants exhibit limited adaptivity as they only react to changes in the weather and their status.