**Renewable Energy in Smart Cities**

ABSTRACT:

Energy systems for smart cities will require on the one hand a much higher share of renewable energy sources for heat and electricity and on the other hand a high standard of integration of industry and utilities supplying households and business. New technological options such as passive buildings, bio-methane injection into grids, small scale CHP with heat storage and PV driven heat pumps for heat provision alter common strategies to supply larger settlements.

As energy options become more diverse, heat integration of industry into cities becomes important from economic and ecological considerations. Stabilising distribution grids in the face of diverging supply and demand profiles will further complicate planning of smart city projects. In the face of these challenges, innovative planning tools will gain importance.

This paper will discuss using the P-Graph method in its application to sustainable technology systems. This method will be used to generate optimal energy systems linking industry to smart cities and to integrate innovative energy technologies into such systems. The Sustainable Process Index will be used to evaluate these systems from the ecological sustainability point of view. This sustainability measure is particularly well suited to differentiate between conventional fossil based and renewable source based energy systems.

A real life case study of the application of these methods to the challenge of designing the optimal energy system for a smart city will be discussed in the paper. The case study deals with a green field development in a medium sized city in Austria (Graz). This project includes different energy provision sources (e.g. excess heat from industry, ground water energy), low energy buildings and innovative storage and energy provision technologies.