Scenario for a city

Before 2030, a city in Scania will build a “Sustainable Biological Recycling System” (SBRS) for 300,000 inhabitants to prevent future losses. Sustainable biological recycling system consists of * 100 biogas plants for the production of biogas that is converted to electricity and heating / cooling as well as biofertilizer that is adapted for cultivation and * 100 plants for biological treatment of greywater from households. 3,000 inhabitants are connected to each facility, including restaurants, schools, etc. that are located within each urban area.

Food and toilet waste are collected hygienically in devices that seal the contents of tightly packed packages of biomaterial foil to avoid losses and contamination. It prevents emissions during the short transport to the local high-tech biogas plants that use "Optimum Solids Anaerobic Digestion" (OSAD). Food and toilet waste are mixed with finely divided drier material. It can be plant waste from parks, cemeteries, residential areas and dry finely ground forest and agricultural residues (wood chips, straw). Greywater from households and the like is purified in local "BIO-H_2O system".

The substrate for methane fermentation consists of food and toilet waste from 3,000 inhabitants mixed with plant residues to get about 30% dry matter in the mixture. In the table below, values for pine pellets with 9% dry matter are used as reference material, in the absence of analyses for various plant residues. 5.8 tonnes of substrate are processed per day per plant. The table below illustrates results per biogas plant and day, when calculating 3 MWh of bioenergy per tonne of Renewable Organic Material in the substrate.

Results from methane fermentation of substrates from 3,000 inhabitants per day				
Substrate	Bioenergy	Biogas 35%	Biofertilizer 35%	Energy losses 30%
5,80 ton	17,40 MWh	6,09 MWh	6,09 MWh	5,22 MWh
		30 % electricity	NPK	
		1,83 MWh	603,20 SEK	
		65 % heat	organic carbon	
		3,96 MWh	562,60 kg	
		5 % energy loss	CO_2	
		0,30 MWh	2 064,80 kg	

Table 1: Assuming that each tonne of Renewable Organic Material that becomes a substrate for methane fermentation contains 3 MWh of bioenergy, an area with 3,000 inhabitants receives 1.83 GWh of electricity and 3.96 GWh of heat daily. The heat can be converted to cooling if necessary. The biofertilizer's content of nitrogen (N), phosphorus (P) and potash (K) corresponds to SEK 603.20 / day in the value of mineral fertilizers (may vary depending on the daily price). Carbon sequestration correspond to 2,064.80 kg CO_2 / day. Environmental economists must calculate values of all other benefits such as recycling of other plant nutrients, positive impact on biodiversity, economy of water, lack of air and water pollution, the value of ecosystem services, etc.

The city's 300,000 inhabitants were previously connected to a sewage treatment plant and a sewage tunnel for SEK 2.1 billion was planned to be dug under the city. To avoid water pollution as well as energy-intensive and costly losses during sludge management, the municipality procured innovation for SBRS, which was built for 7 years. This resulted in resource-efficient management of biological resources before 2030. With sustainable material recycling and energy efficiency, the following future losses are prevented:

* Methane fermentation of substrates from 300,000 inhabitants provides just over 67 GWh of electricity and about 145 GWh of heat per year. The heat is converted to cooling during the summer.
* The energy value of biofertilizer is approximately 222 GWh per year and the carbon storage of biofertilizer, which creates a carbon sink, corresponds to 75,365 tonnes of CO_2 / year.
* The value of plant nutrients NPK in biofertilizer corresponds to just over SEK 22 million / year.
* The costly, chemical dependent and energy intensive method of wastewater treatment is avoided.