

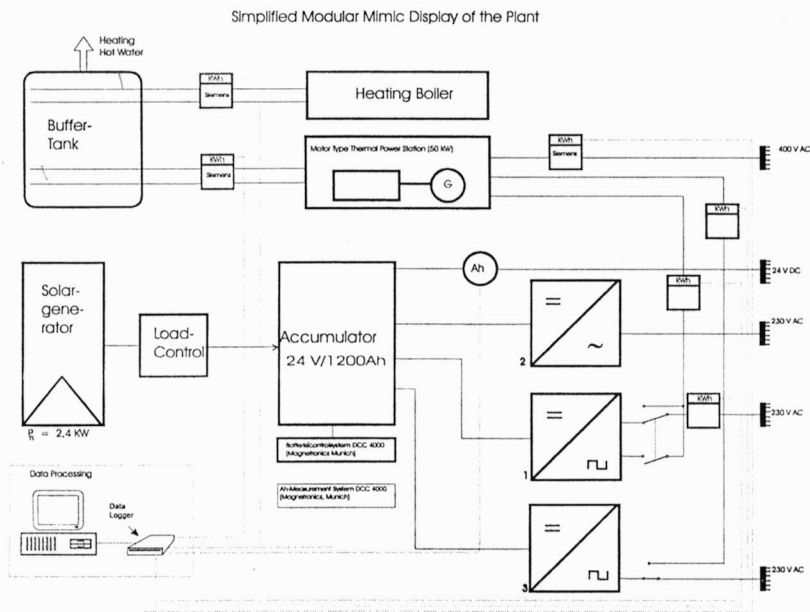
## Autonomous PV-Hybrid Systems Nearing Economic Efficiency

The combination of PV Systems with conventional technology based on fossil fuels creates new ways onto the market

C. Walter, Walter & Partner Ltd, Zwickauer Str.8, 92318 Neumarkt, Tel/Fax.:09181-4773-0/-22

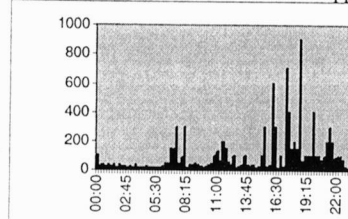
Nowadays autonomous PV plants in hybrid energy supply systems, connected with motor type thermal power stations reach interesting amortization times. From realised projects (compare examples) important data about electrical and thermal capacity and energy may be obtained e.g. in housing areas or industrial production. The economic projection of future systems is based upon this data. Especially in housing areas, the combination "of least cost planning" for electricity supply and hybrid systems lead to interesting economic solutions. Considering todays low electricity prices photovoltaic systems can only be integrated step by step.

Within the framework of a paper (diploma) by the Fachhochschule Nürnberg a flexibel data logging and processing system was developed to determine electrical and thermal power consumption or energy consumption of reference projects. Diagram 1 shows the measuring unit for an energy supply system in an autonomous metal working factory with a residential and industrial building.

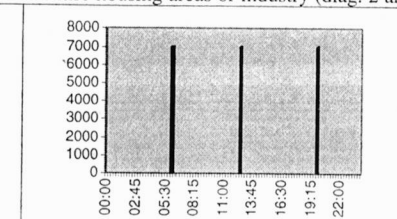


Diag.1: Block diagram and scheme of the the measuring unit of an autonomous metal working factory  
The aim of the paper currently being worked on, is on the one hand to take up various data from standard measurement systems like industrially manufactured thermal- or electricity meters for

alternating and direct current, and on the other hand the uptake of analogous data. Typical daily power consumption of optimized electricity supply in single households or industrial production gives basic information wich can be applied for entire housing areas or industry (diag. 2 and 3).

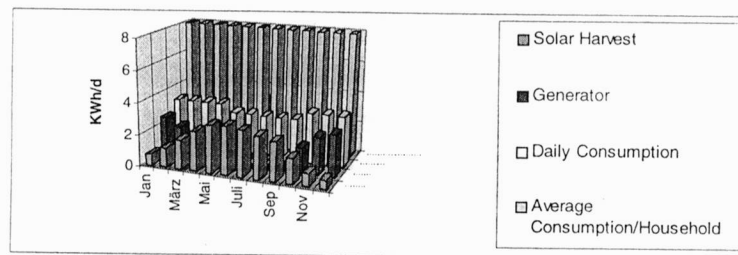


Diag.2: El. power consumption of an autonomous detached family house in summer [Watt]



Diag.3:Thermal power consumption of an autonomous detached family house in summer [Watt]

The data obtained on typical days can be used to optimally calculate an autonomus system. This is the basis for an economically efficient operating mode. In addition to that the relation between the drawing and feeding of electricity can be determined in a plant with a parallel working network. A flexibly built up evaluation programm takes over the data of the typical days and calculates the total yearly costs ( capital, consumption, operating) for different types of systems e.g. autonomous or network parallel plants. In this way the economic efficiency can be compared. If "least cost planning" for domestic buildings is applied (use of electricity only where necessary) one discovers that for example in combination with power management a very low electricity supply is needed and the electrical energy consumption can be reduced drastically. Diag. 4 shows the yearly energy consumption for a detached family house.



Diag.: 4: Energy Data of an Autonomous PV-Household

A battery system (later possibly a fuel cell ) with a dc-ac converter and a motor type thermal power station are the basic components for the supply system which can be operated to nearly reach economic efficiency, considering today's energy prices. Due to the low daily electricity consumption of approximately 3 Kwh /day reached by optimizing the consumers, small solar arrays are sufficient to meet the requirements. Considering the legal situation concerning energy or the monopolistic supply structure with bad electricity feeding conditions, plants in a parallel network often cannot be operated economically. The purchase of energy saving equipment is usually blocked by the price structure of the Central Electricity Generating Board. The aim is to use optimized hybrid autonomous energy systems and to include the consumers (least cost planning) for different supplier groups to find considerably more environmentally beneficial and at the same time economical solutions. In this way a market can be created for energy supply which shows increased consideration for efficient and regenerative energy such as photovoltaik.