Intelligent Energy in agricultural Farms

Shifting loads of a dairy farm by using photovoltaic power plants in combination with an ice-storage-system

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About the project - Introduction

Analyse the consumption of agricultural farms with smart meter measuring systems to define potentials for load shifting and energy savings.

Project partners are:

- TH-Köln
- NaRoTec e.V. [1]
- Maschinenring Höxter-Warburg [2]
- Landwirtschaftskammer NRW (department of agriculture State of NRW) [3]

The project is funded by department of environment protection of the state NRW in Germany [4].

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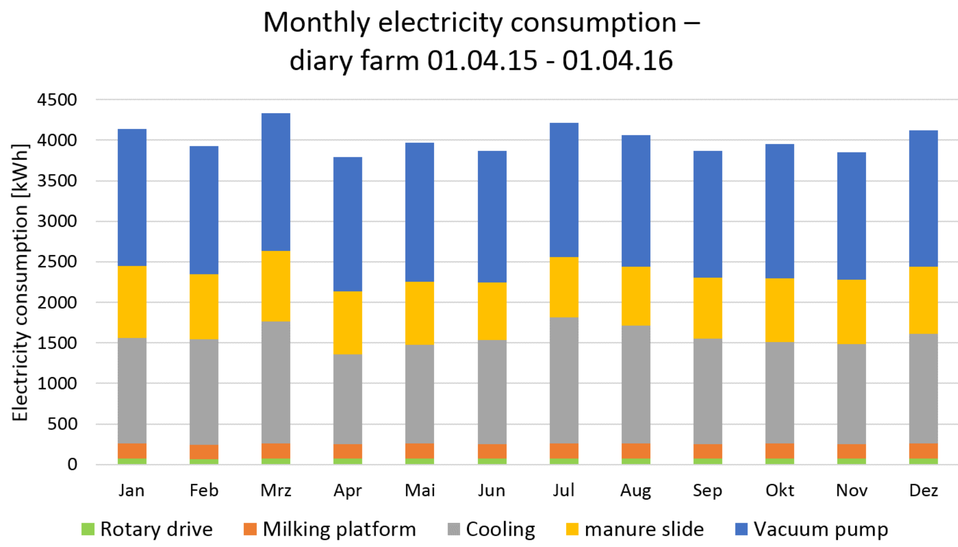
Our approach

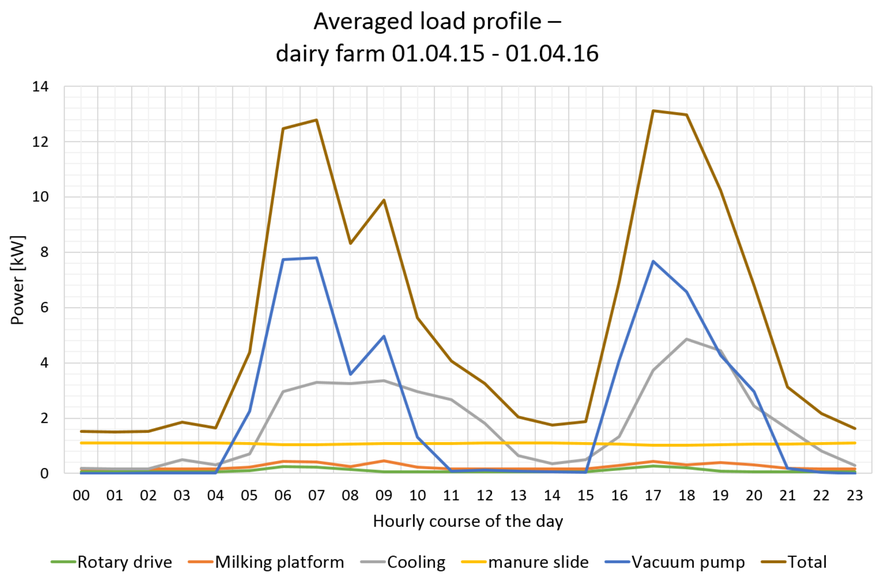
1. Choose an agriculture farm with the most reliable data of the energy consumption from the smart meter measuring data
2. Analyse the smart metering data
3. Create a load profile



Daily load profile

Identify daily load profiles peaks

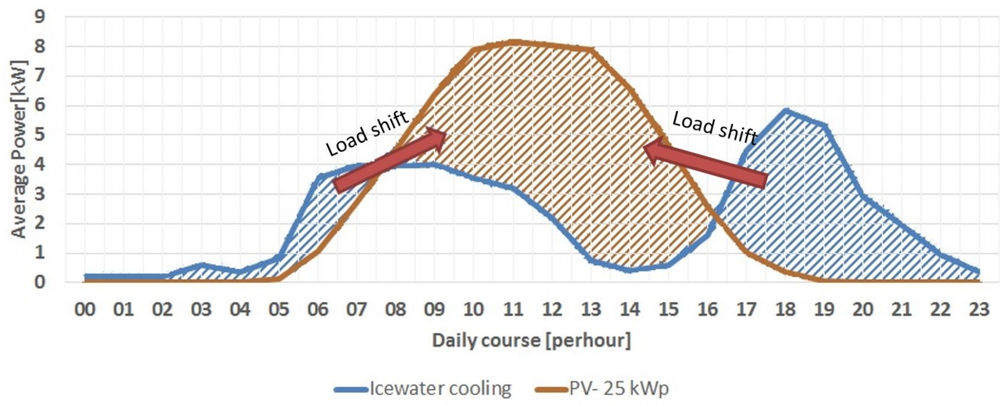
Locate shiftable loads -> highest shifting potential is the cooling component



Potential Ice-Storage

Combine ice-storage-systems with photovoltaic power plants to implement the load shift

Source: www.packocooling.com

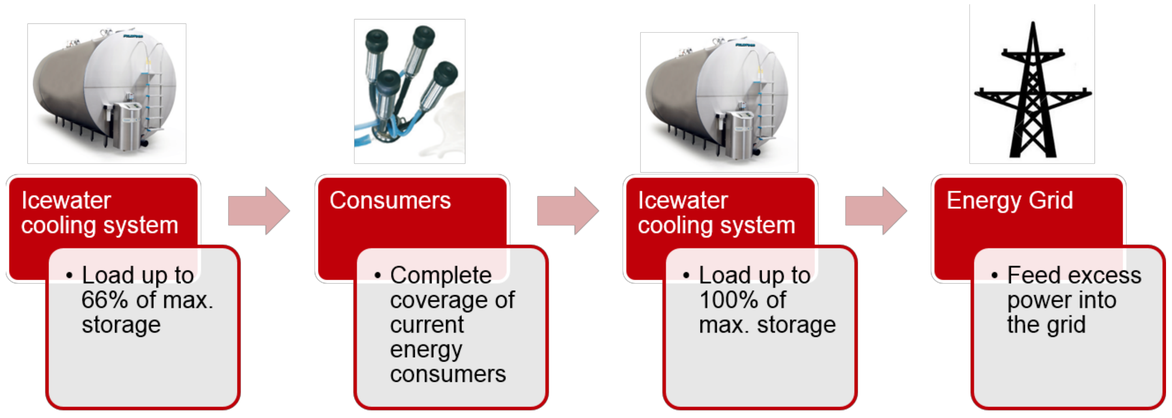


Photovoltaic-Simulation and parameters

Boundary conditions for simulation with "*PV-SOL*" (PV planning program):

- Different sizes of simulated power plants according to cover different energy consumers (Cooling system coverage always 100%)
- Total load profile of the farm is a combination of measured load profile and standard load profiles for missing components

Priority order to optimize degree of self-sufficiency:



Conclusion and remaining work

Results so far:

PV-System	Direct cooling - Consumption share [%]	Direct cooling - Degree of self- sufficiency	Ice-water cooling - Consumption share [%]	Ice-water cooling - degree of self- sufficiency
25 kWp	52,07	18,15	66,43	22,08
50 kWp	35,96	25,07	45,9	30,50
250 kWp	11,27	39,29	13,87	46,09

Ice-water-cooling in combination with the photovoltaic-system can increase the self-sufficiency by up to 7 %

Remaining workload:

- Optimize size of photovoltaic power plant
- Verify results
- Profitability analysis

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cire Cologne Institute for Renewable Energy

NaRoTec e.V. Haus Düsse [1]

MR [2]

Landwirtschaftskammer Nordrhein-Westfalen [3]