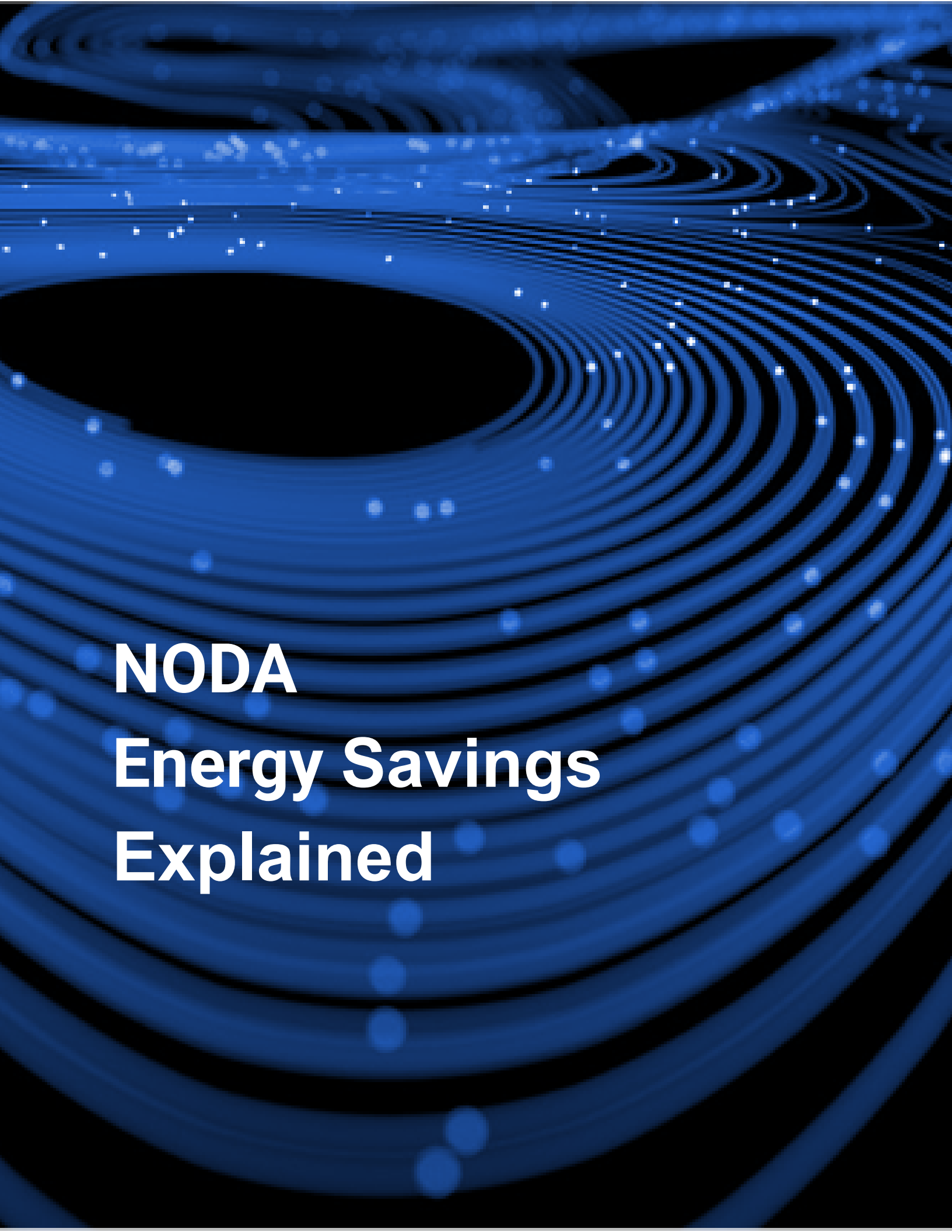

NODA
Energy Savings
Explained

ENERGY SAVING BY NODA

Where are the energy savings coming from?

The NODA impact evaluator analysis savings relating to the amount of energy as well as the cost of using that energy. There is a clear trend towards there being a cost associated with how you use energy, rather than just the amount of energy you use. For example, in district heating this might manifest in costs relating to volume of water or the return temperature of a building. In electricity, it might manifest in higher demand profile costs.

When connected to the NODA system a building will save energy and money through either NODA Building or NODA Network Demand Control, or a combination of these. NODA Building is an active energy service for individual buildings, while NODA Network Demand Control is a solution for distributed demand response.

In the NODA system there are four main mechanisms contributing to savings in heating and cooling within a building:

- Reactive control in relation to internal factors of the building - this usually means standard demand adjustment to measured indoor temperatures in combination with normal control behavior in the substation. Most modern control systems have this functionality and it is also a standard feature in NODA Building.
- Proactive control in relation to internal factors of the building - the NODA system utilizes machine learning technology to model the indoor environment which makes it possible for the system to predict and plan the energy usage beforehand. This provides additional savings compared to normal reactive control as well as improves the indoor climate.
- Proactive control in relation to external factors - this normally relates to electricity spot prices or active price model components in district heating. NODA Building uses proactive modeling to fully utilize the potential of financial savings in relation to such input.
- Active demand response - NODA Network Demand Control can be used in district heating and cooling as well as in power grids. The most common use is active demand profile management but it can also be used for distributed return temperature optimization in district energy systems.

How are energy savings normally calculated?

The most common ways to evaluate energy savings is either through normal year correction using degree days or simply by comparing invoices. It is however challenging to make a valid estimate of energy savings by comparing invoices from year to the next due to variations in outdoor climate and social behavior. Although normal year correction with degree days was originally developed to overcome this on a city-wide scale, the method is not well adapted to individual buildings and error-prone due to requiring several assumptions. However, the method is simple to use and widespread among the property sector.

Normal year correction using the energy signature is a further development of the same concept and it eliminates several of the error sources in degree days. The energy signature is intuitive and easy to use and more appropriate to be used when evaluating savings in individual buildings. However, the energy signature still lacks a direct connection between the energy usage and the individual control system and it is in any case not easily applied for evaluating shorter periods of time.

The main problem with all these methods is that they only focus on the amount of energy being used, while the trend is that energy costs increasingly relate to how energy is being used.

How are energy savings calculated by NODA?

The NODA system has an innovative built-in system that continuously evaluates the impact of every control action in the system, whether they come from local energy services such as NODA Building or from distributed demand response schemes such as NODA Network.

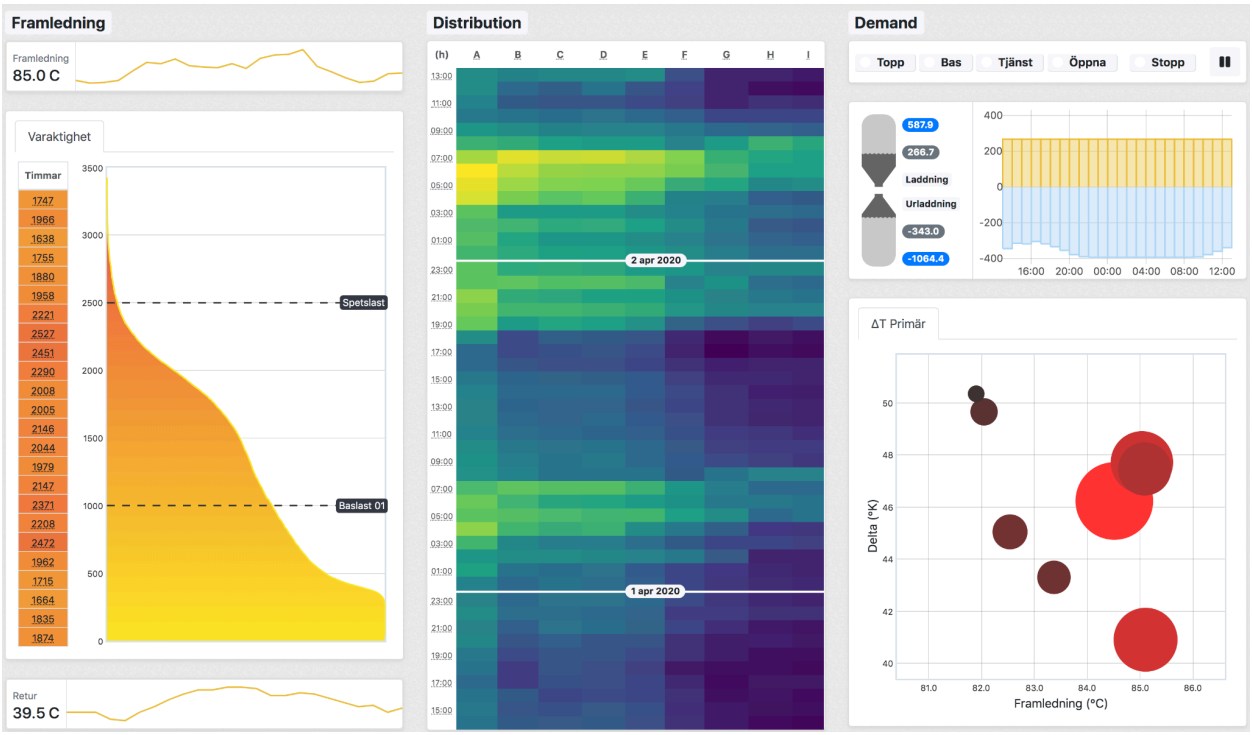
The NODA impact evaluator operates on hourly level, removes error sources from normal correction methods and does not require reference periods. It does this by using data from both the primary and secondary side of the heating or cooling system.

- It is based on the actual control action as a foundation for evaluation
- It works without reference periods
- It can separate between demand response and local control actions
- It can relate to physical as well as monetary values as output

The evaluation of the energy saving is based on three key factors calculated on an hourly basis:

1. Model impact
2. Local correction
3. Global correction

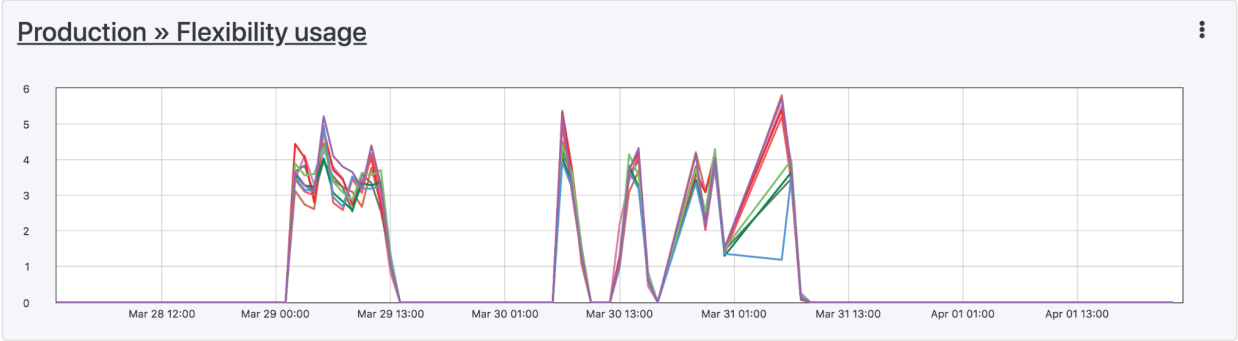
The model impact is generated using machine learning techniques to model the relationship between the control signal and energy usage. The local correction evaluates limitations in the impact during the active hour, for example relating to control periods close to the balance temperature of the building. The global correction uses long term analysis, such as different types of energy signatures if this data is available. The purpose of this is to provide a balancing factor in relation to statistics over time.

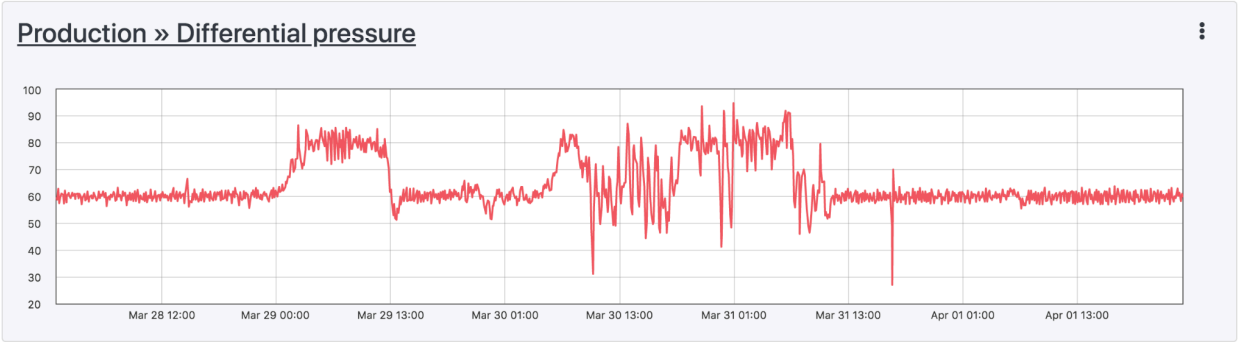


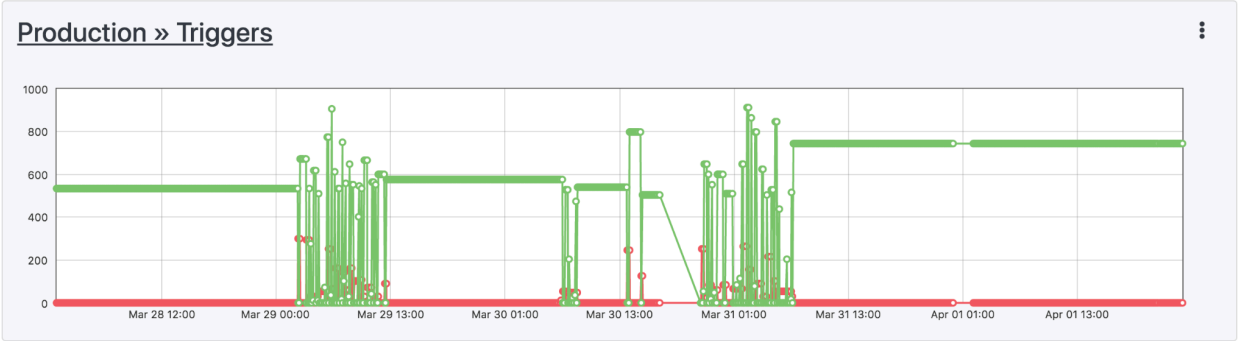
Proven value realization

The unique NODA impact evaluator is fully integrated in all NODA products, such as NODA Building and NODA Network with demand response.

The output of the system is accessible through the general NODA API or through the EnergyView user interface. All communication with the NODA system is encrypted. This means that the output can easily be embedded in external systems, webpages or mobile applications.







The NODA system has been deployed in thousands of buildings and the statistics are clear on the savings. The following five examples are from actual buildings using the NODA Building solution.

Type	Size [m2]	Energy usage [MWh/yr]	Before [kWh/m2/yr]	After [kWh/m2/yr]	Savings [kWh/m2/yr]	Savings [%]
Residential	12605	1193	108,7	94,7	14,0	12,9
Commercial	14000	1269	103,2	90,7	12,5	12,1
Residential	6825	644	107,9	94,3	13,6	12,6
Residential	2880	490	203,2	170,3	32,9	16,2
Commercial	2577	253	109,2	98,1	11,1	10,2

About NODA Intelligent Systems

NODA Intelligent Systems is an innovative deeptech SaaS company with patented technology and proven solutions that accelerate the uptake of digital intelligence on the global energy market.

NODA specializes in district and local energy in heat networks, cooling, HVAC, heat pumps, gas, geothermals and other thermal applications. Our solutions optimize supply and demand of heating and cooling, resulting in substantial financial benefit throughout the value chain while improving quality of service.

Today, NODA solutions are being utilized by energy companies, service and system providers, and property owners throughout Europe, North America and Asia.