/// EnergyOptima 3

Digitalization – Total Economic Optimization of Energy Systems

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Optimize Your Energy.

Facts about the company

- Founded in 1989 – Know-how since more than 30 years
- Delivers software with newest technology for energy companies
- Large base of satisfied customers (more than 50 in Europe)
- Big international partners for deliveries and local service, like:
- 25 specialists in Lund, Sweden
- Dedicated, personal service, single-point-of-contact

- ISO 9001:2015 certified

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Why are digital tools nedded?

Complex solution

zero-one combinations

- **2** production units
- **3** h production plan
- **0** = unit not operating **1** = unit operating

Possible combinations:

2 (Production units) x (Hours) **3 hours** = 2^{2x3} = **64** (see above)

6 hours

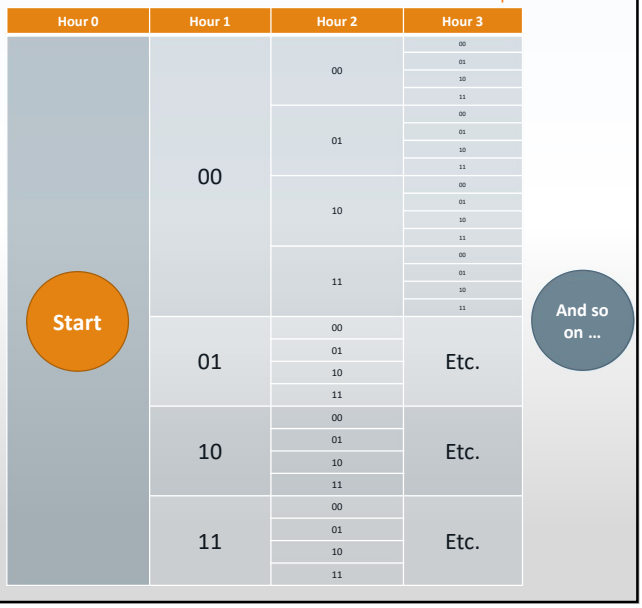
= 2^{2x6} = **4 096**

12 hours

= 2^{2x12} = **16 777 216**

24 hours (10 production units)

= 2^{10x24} = **$1.8 * 10^{72}$**



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Possible reduction of variable production costs

Economical Production Optimization

Economical Production Optimization

12%

Each year

Economical Production Optimization
+ Smart Optima Heat Network

15%

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Economic Total Optimization of Energy Systems

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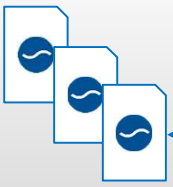
Trading
Electricity & Gas

Production

District heating network



Spot trading
Flexibility

Forward
temperature

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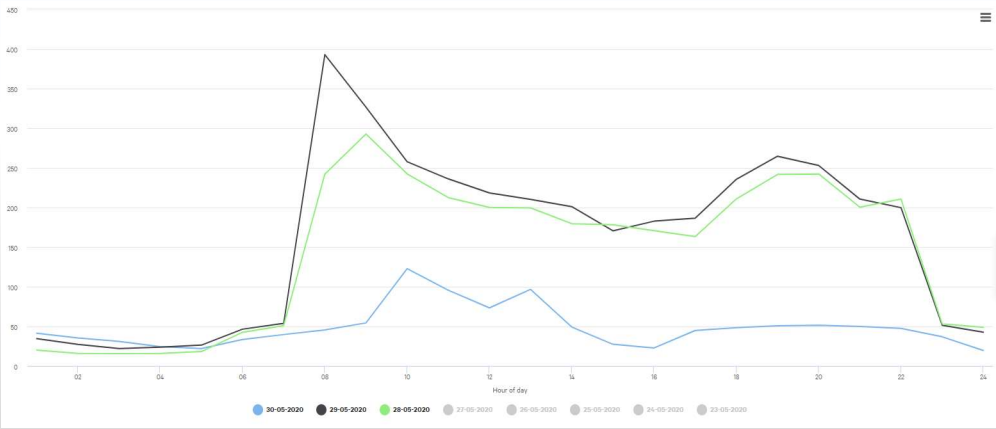
Spot day-ahead prices at Nordpool

Fluctuating prices on the electricity market

Thursday – Saturday week 22, 2020



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Trading
Electricity & Gas

Production

District heating network

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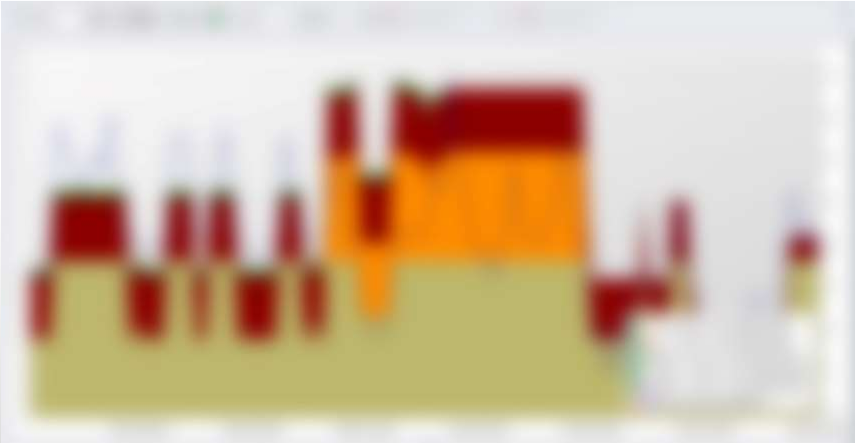
Optimized Cogeneration Production

Optimized production with trading



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Optimization potential of the energy production

Production questions

Examples of decisions that can improve the economy of the energy companies:

Short-term optimization (for the current time, day-ahead and current weeks)

- Optimized **start** or **stop** of production units
- The most economical **fuel choice**
- Planning of the **electricity production** according to the market

Long-term optimization

- **Contracts** for fuel and energy supply
- Planning of **revisions** and **maintenance**
- **CO_2** planning
- **Calculation** and **investment** choices

Reduce **up to 15%** of the variable production costs

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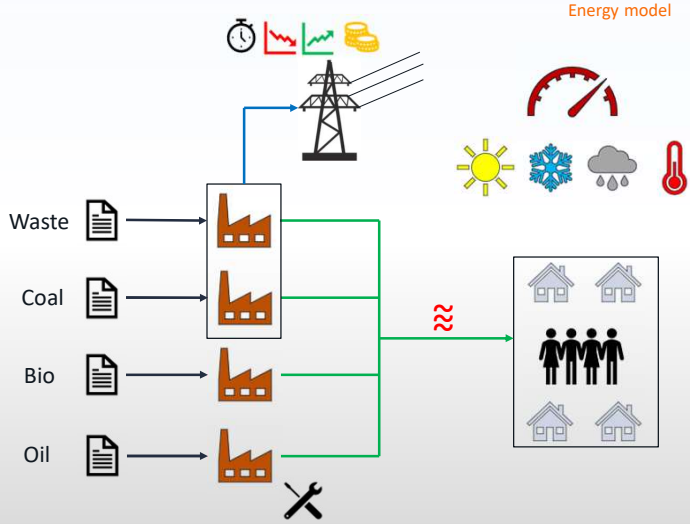
Optimization Principle

Energy model

1. There is a need
2. There are energy producing units with technical limitations
3. There are economic advantages
4. Let the optimization find the most economic andvantageous production plan.
5. Follow-up and learnings



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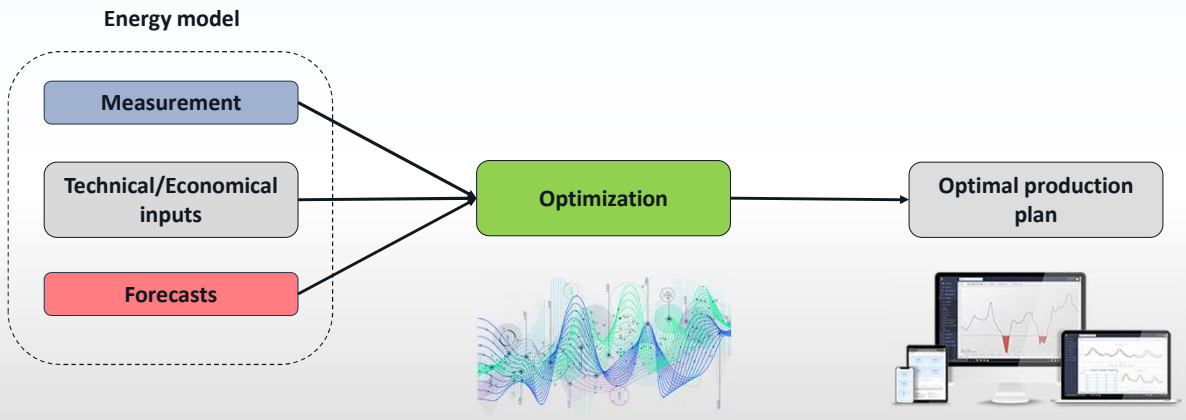
Optimization Basics Summarized

Overview



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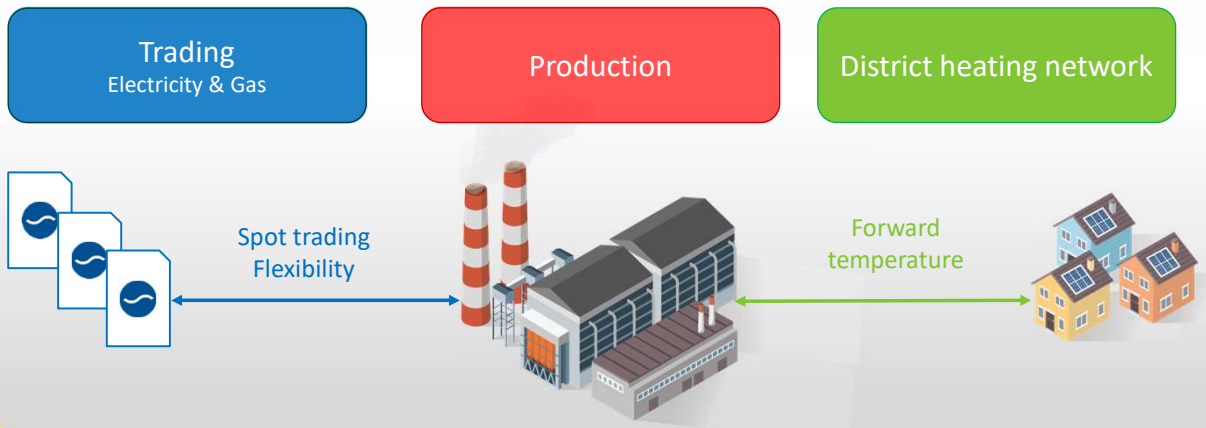

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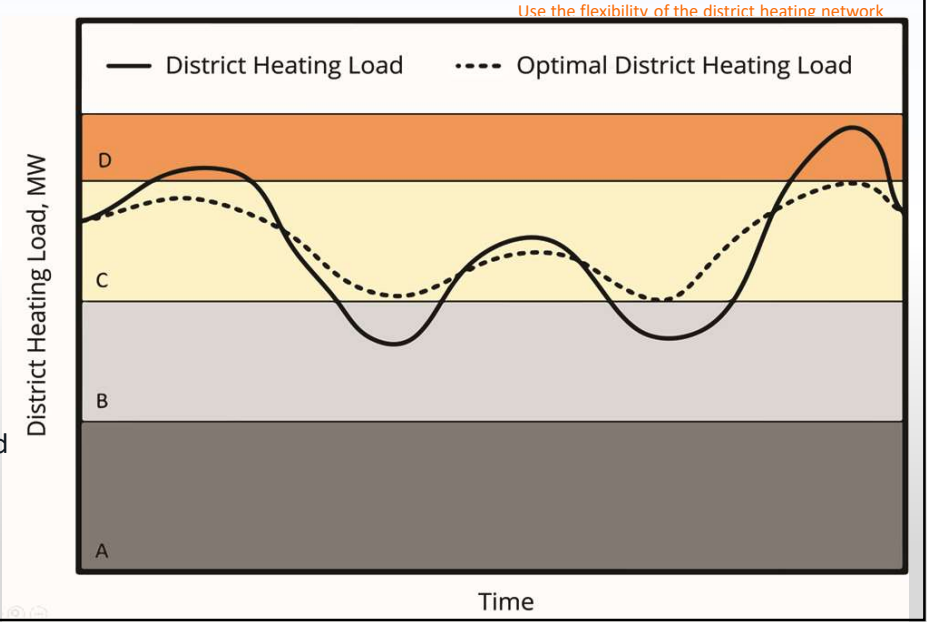
Optimization of the Forward Temperature (SOHN)

Use the flexibility of the district heating network

- ✓ Load peaks
- ✓ Transfer limitations
- ✓ Temperature dependency limitations and efficiency
- ✓ Distribution losses
- ✓ Lowering the forward temperature



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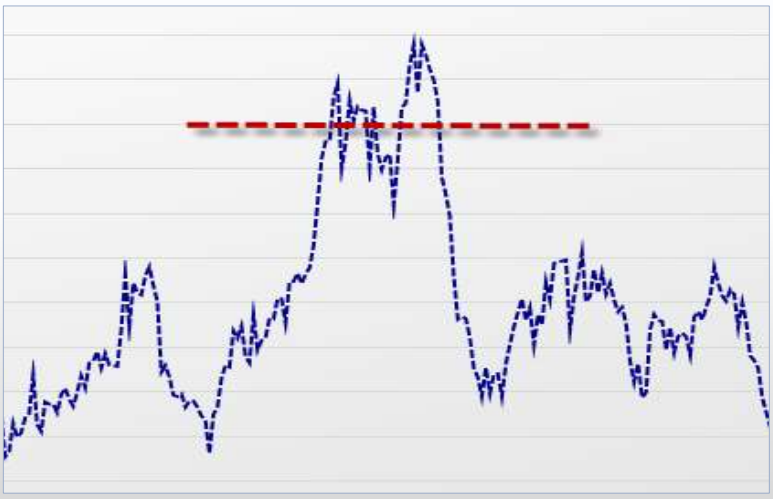
Demand Side Management – SAM (Smart Asset Management)

Use the flexibility of buildings

- ✓Use the thermic properties of the buildings as a heat storage
- ✓"Peak shaving" – even out peak loads
- ✓Lower forward temperature in the network
- ✓Lowered production- and transfer costs
- ✓Avoid possible transfer limitations
- ✓Possibility to connect more customers without extending the network



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Case study: Kraftringen, Sweden

Production Optimization, SOHN & Forecasts.

The Challenges

- Decrease **production costs**
- Lower the **forward temperature** in the DH network
- **Co-optimization** of the Evita DH pipeline **between 3 cities**
- Reduce dependency of **fossil fuels**

The System

- **Production system:** 4 production sites. Bio-fueled CHP plant. Heat produced with bio-oil, wood pellet and geothermal energy.
- **DH grid length:** 1050 km
- **Heat prod./year:** 1,100 GWh
- **Electricity prod./year:** 1435 GWh

"During the two first months (with SOHN) in operation, the forward temperature was in average lowered with 2 degrees and with an achieved savings of about 20,000 Euros."

David Edsbäcker, Project Leader for Smart Cities Accelerator, Kraftringen

Our Solution

- **Economic optimization** of the energy system, Evita pipeline and the DH network
- **DH load forecast**, adjusted to the constraints/availability of the units
- Optimization of **electricity contracts** (purchase and supply)

The Results

- Lower **production costs**
- Increased **grid knowledge**
- Reduced **grid temperature**
- **Proactive** instead of reactive **measures**
- **Economic** and **environmental** benefits
- **100 % renewable goal** reached 2 years earlier

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Thank you for your attention!

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