

Green Building Congress || Green Cities Connect Session 3 || 22 October 2022 ||

Green Cities Connect Session 3 : Green Energy & Clean Technology for Smart City Ecosystems for a Net Zero Roadmap

Achieving Sustainability Goals : **Net Zero Targets through Innovative Designs in Air-conditioning Systems**

Presenter:

Gaurav Mathur, Head Area Sales Development – CBS INDO

E-mail: gaurav@grundfos.com

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Possibility in every drop

Agenda

- Global Challenges, Sustainability Goals and Net Zero Targets
- **The outlook:** Temperature optimization
- Air-conditioning Systems & Solutions
- District Energy – Paving the way for a fossil-free future
- Distributed Pumping – An Innovative Design
- Distributed Pumping & Net Zero : A perspective
- Future Design Ideas : Real-time Monitoring & Optimization
- A Case Study and Voice of Our Customer

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Global Challenges

Temperature Rise !!

CLIMATE CHANGES



WATER SCARCITY

GLOBAL WARMING



URBANISATION

Looking towards 2030, accelerating forces will have severe impact on our globe and the human-kind is forced to act.

As our current way of living may be affected beyond what we know today, we need all kinds of opportunities to improve the situation. Especially by applying digitalization, internet of things (IoT), big data and artificial intelligence.

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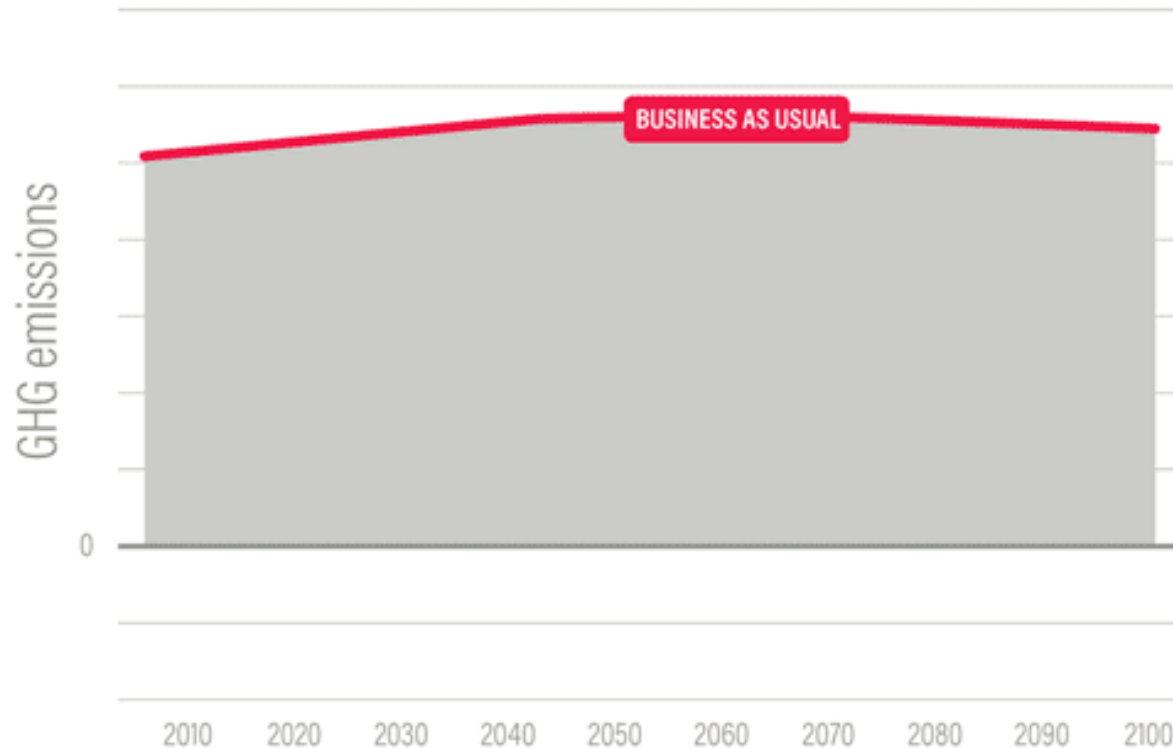
Sustainability Goals



Net Zero Targets

HOW TO GET
TO NET-ZERO

Transition to a low-carbon economy



WORLD RESOURCES INSTITUTE

First and foremost, human-caused emissions – like those from fossil-fueled vehicles and factories – should be reduced as close to zero as possible.



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The outlook: Temperature optimization

Increased focus on temperature optimization



-  Lower supply temperature in district heating
-
-  Higher supply temperature in district cooling
-
- Radiant Cooling technologies in demand side

Reach higher system performance through temperature optimization



- Less heat loss in the total system
-
- More efficient district energy operations
-
- Utilize renewable energy sources
-
- Utilize surplus heating from industry, data centers and similar installations

Focus on temperature based controls leads to energy savings



- Distributed pumping design with temperature-based control improves Δt
-
- Temperature zoning becomes important for optimal performance
-
- Real-time system input and effective pump control becomes critical

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Air-conditioning Systems & Solutions

1. District Energy



Meeting tomorrow's heating and cooling demands

Campus vs. full-scale infrastructure solutions

—
Building higher performance with pump intelligence

2. Distributed Pumping



Easy Commissioning

—
Minimum Pressure Maximum Savings

—
Demand Driven

3. Partner with Grundfos



Rely on 75 years of experience and innovation

—
Get all the tools and support you need

—
Support on network design and intelligent pumping control

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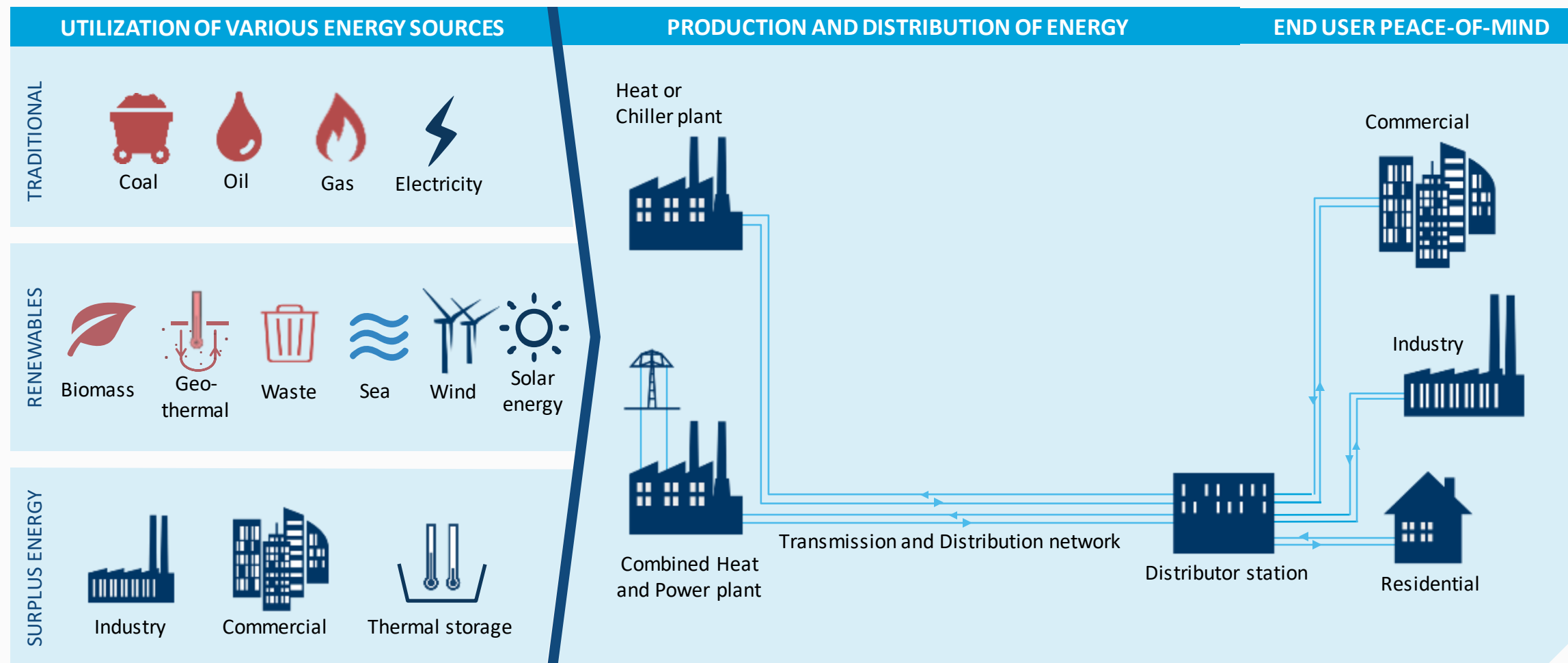
District Energy

Paving the way to a fossil-free future



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Typical district energy layout



Benefits of district energy



WELL PROVEN BENEFITS

- Less installed capacity
- Exploring the concurrency factor in a common system
- No hassle for the end-consumer

NEW BENEFITS

- Exploring local energy sources, i.e. surplus heat or waste incineration
- Large scale use of renewables
- Energy storage



LET THE NUMBERS SPEAK

Cooling: Improve the Coefficient Of Performance

From COP* 2,1 to 5,0



Air Cooling, in building equipment:
0,47 kW/kWr (COP: 2,1)



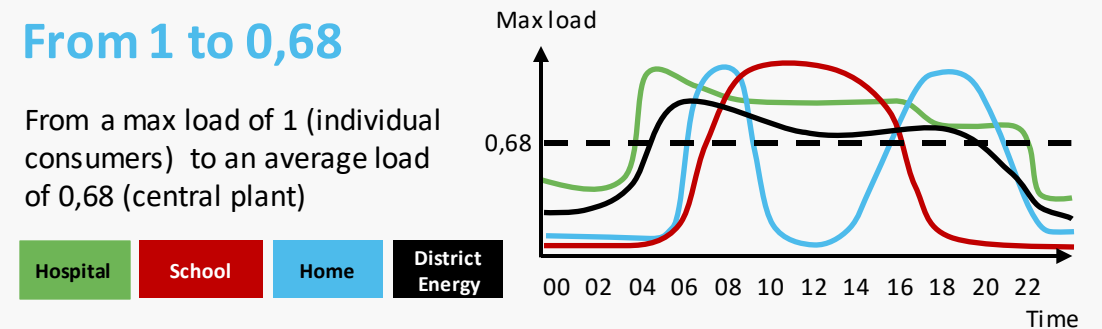
District Cooling, electrical with thermal energy storage
0,20 kW/kWr (COP: 5,0)

COP: The Coefficient Of Performance

Utilize the concurrency factor

From 1 to 0,68

From a max load of 1 (individual consumers) to an average load of 0,68 (central plant)



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The possibilities of smarter district energy

Campus networks



Areas without a developed district infrastructure

—

District energy approached as a localized solution

—

Projects are largely renovations or new developments

Full-scale networks



Areas with a highly-developed infrastructure

—

4th generation solutions are part of large-scale upgrades

—

Infrastructure prevalent in parts of Europe (Scandinavia, Eastern Europe), Russia and China

Distributed Pumping

An Innovative Design

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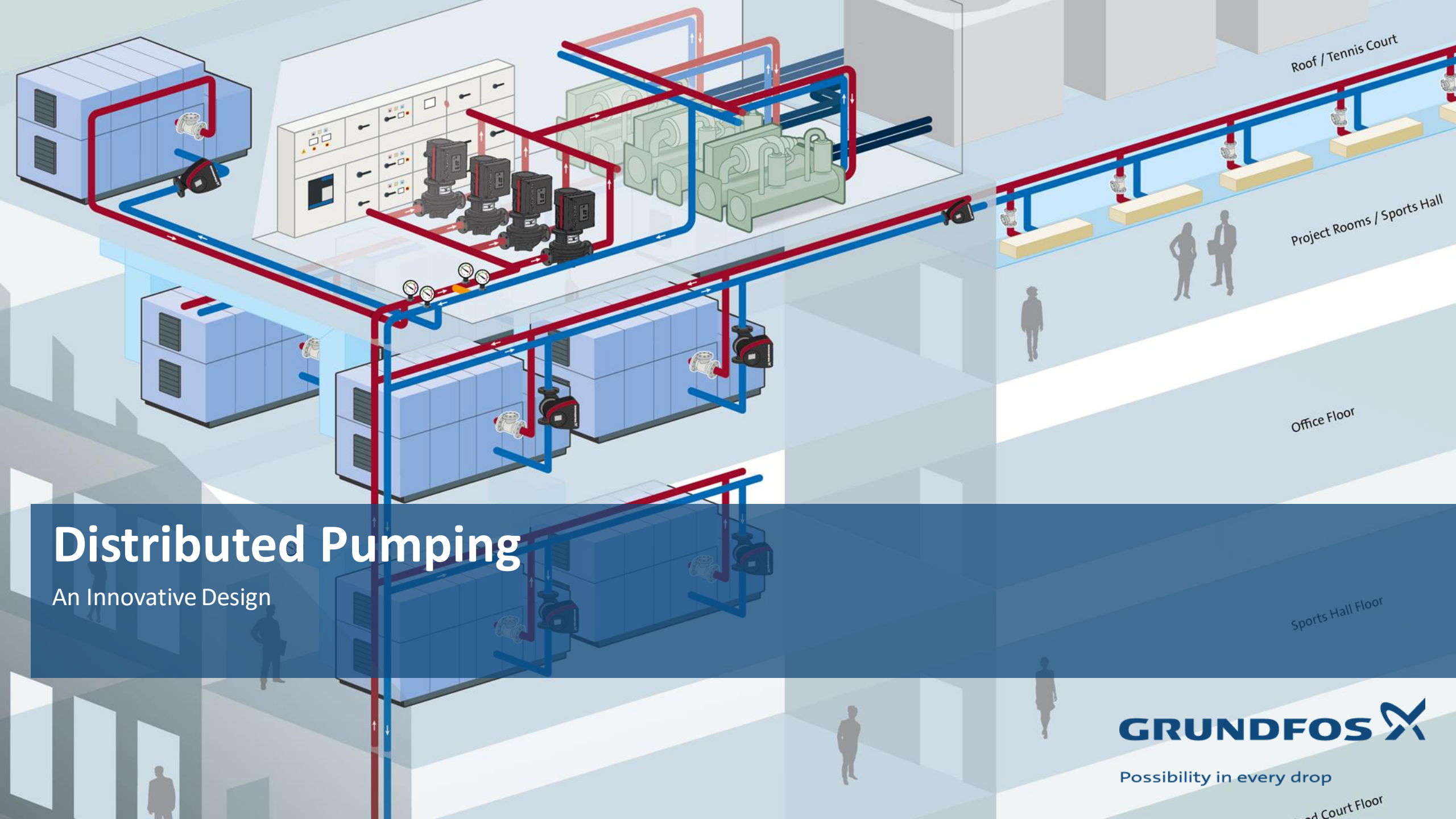
Pool Court Floor

Sports Hall Floor

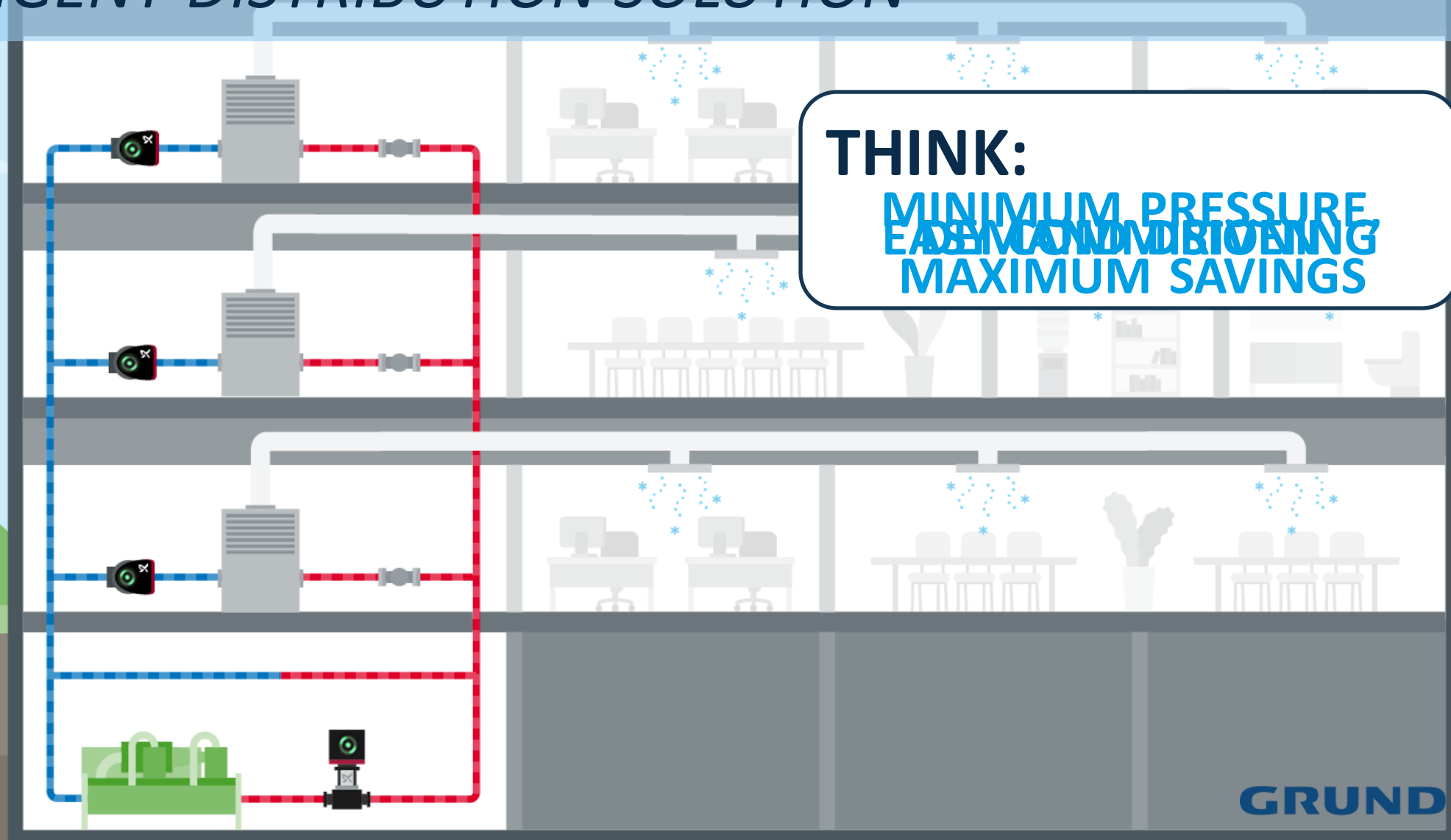
Office Floor

Project Rooms / Sports Hall

Roof / Tennis Court



ENERGY SAVINGS WITH A NEW INTELLIGENT DISTRIBUTION SOLUTION



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Easy Commissioning

No more tedious manual balancing

The Right Pump for your Pumping Needs:

Each Pump is sized for its specific requirements by Grundfos

Control at your fingertips:

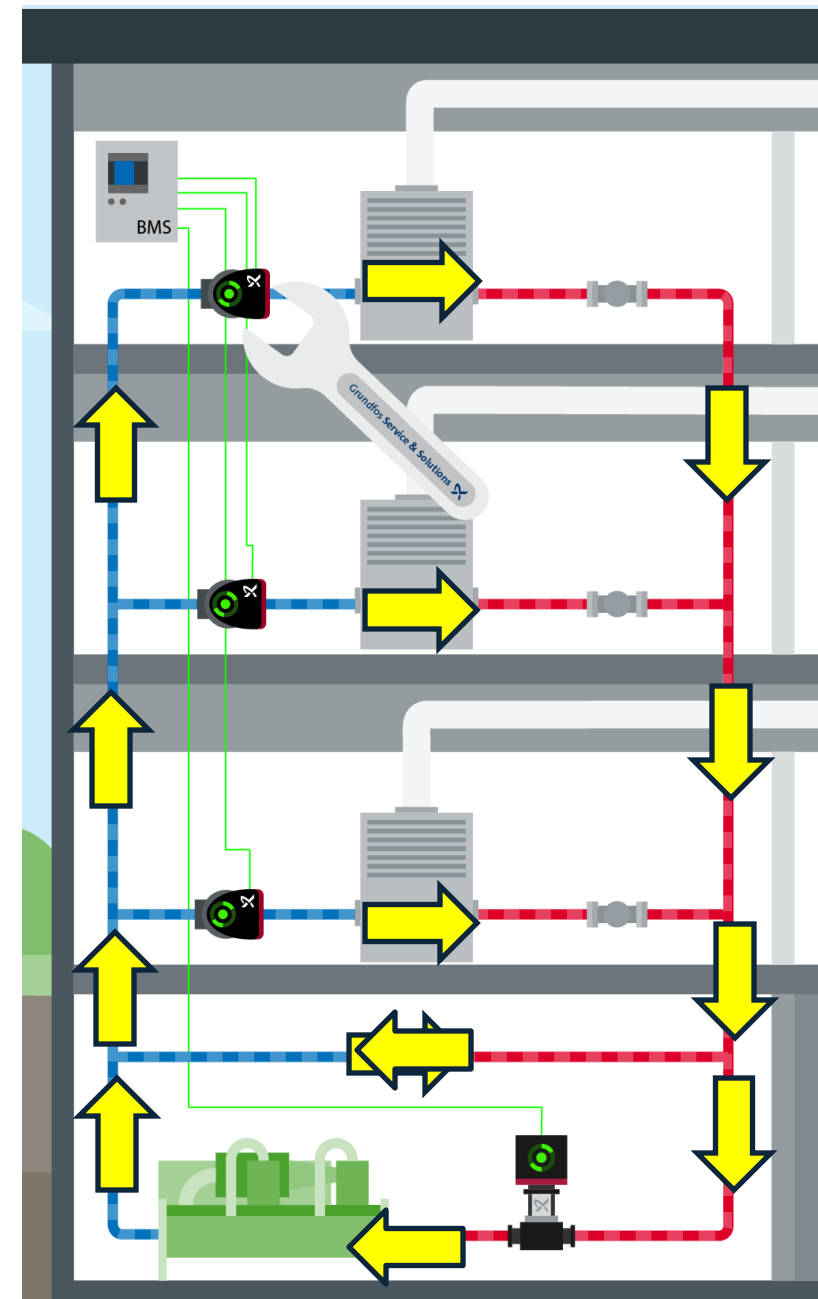
Distributed Pumping easily integrates with your Building Management System

Balance-Free System:

Grundfos Service commissions the pumps and after that, the system is ready!



Possibility in every drop



Minimum Pressure Solution

Decreased Flow and Pumping Energy usage

No need for Supply Pressure:

Every branch is self-supplied by the Pumps

Reduction of Primary Pumps size:

Only circulates water in Primary Side

Tremendous Pumping Energy Savings:

≈ 50% savings compared to Conventional



Demand Driven Solution

Automatic load balancing of branches

Just the Right Flow

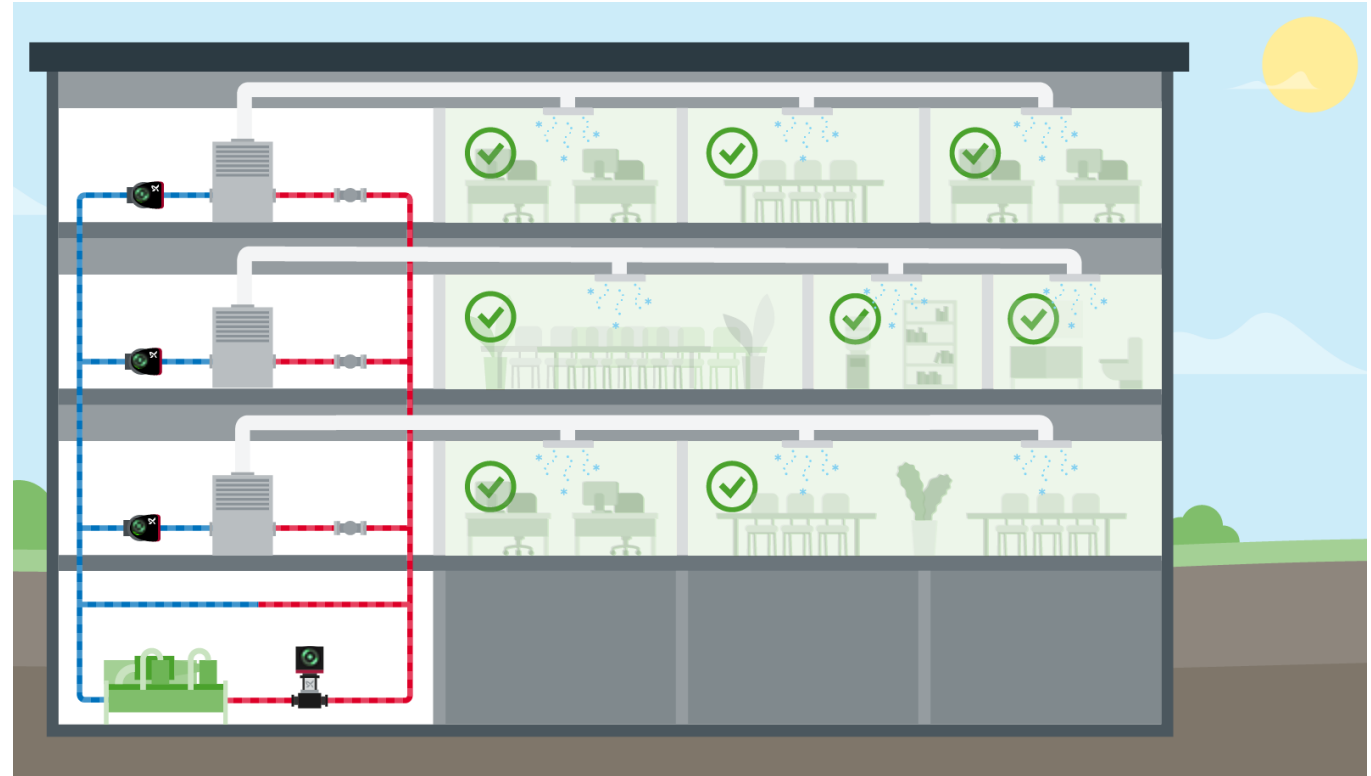
Pump speed is modulated based on branch load

No by-pass Flow:

Primary- and Secondary side's flows are auto balanced

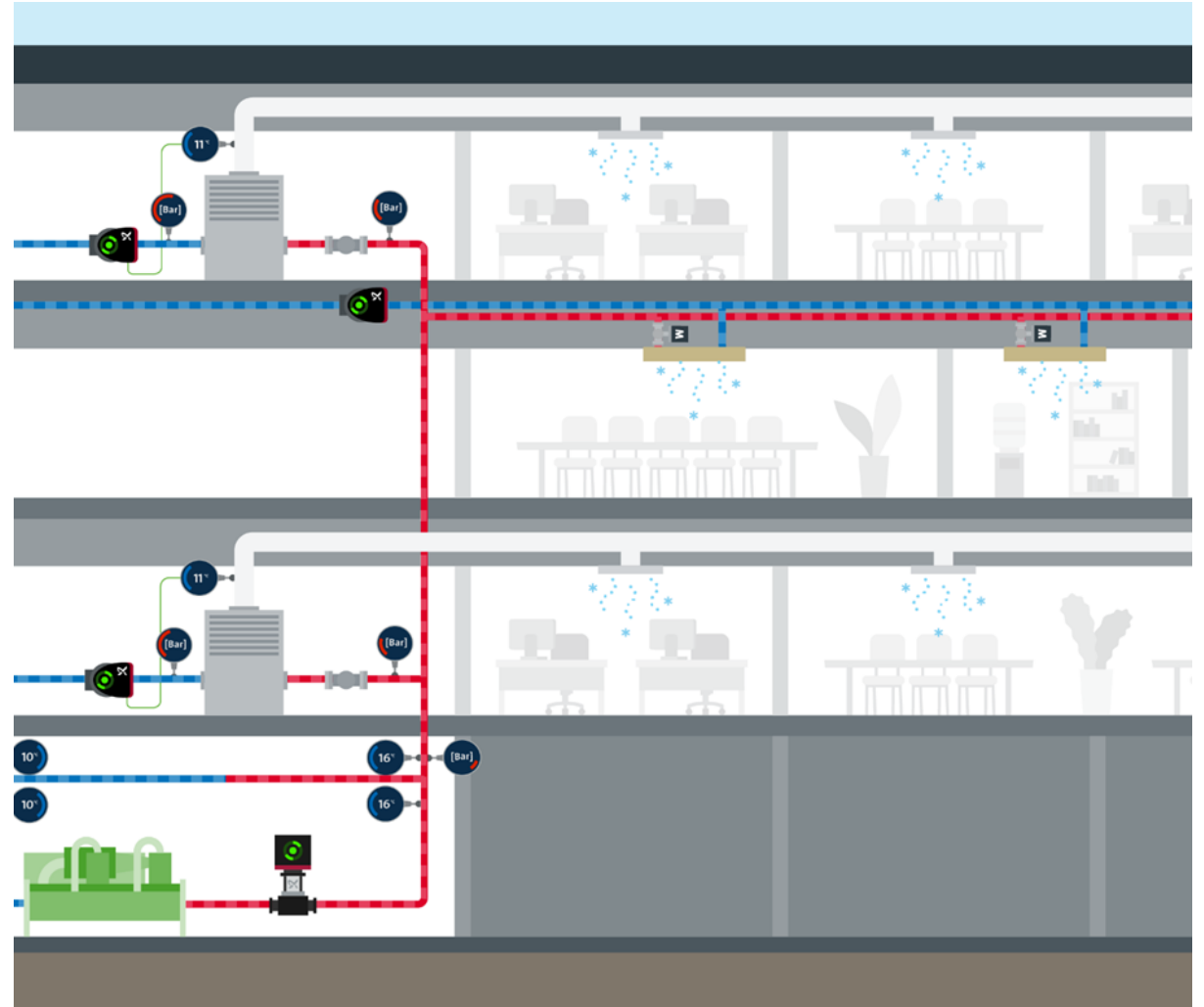
Ensure design Differential Temperature:

No excessive pumping of chilled water!



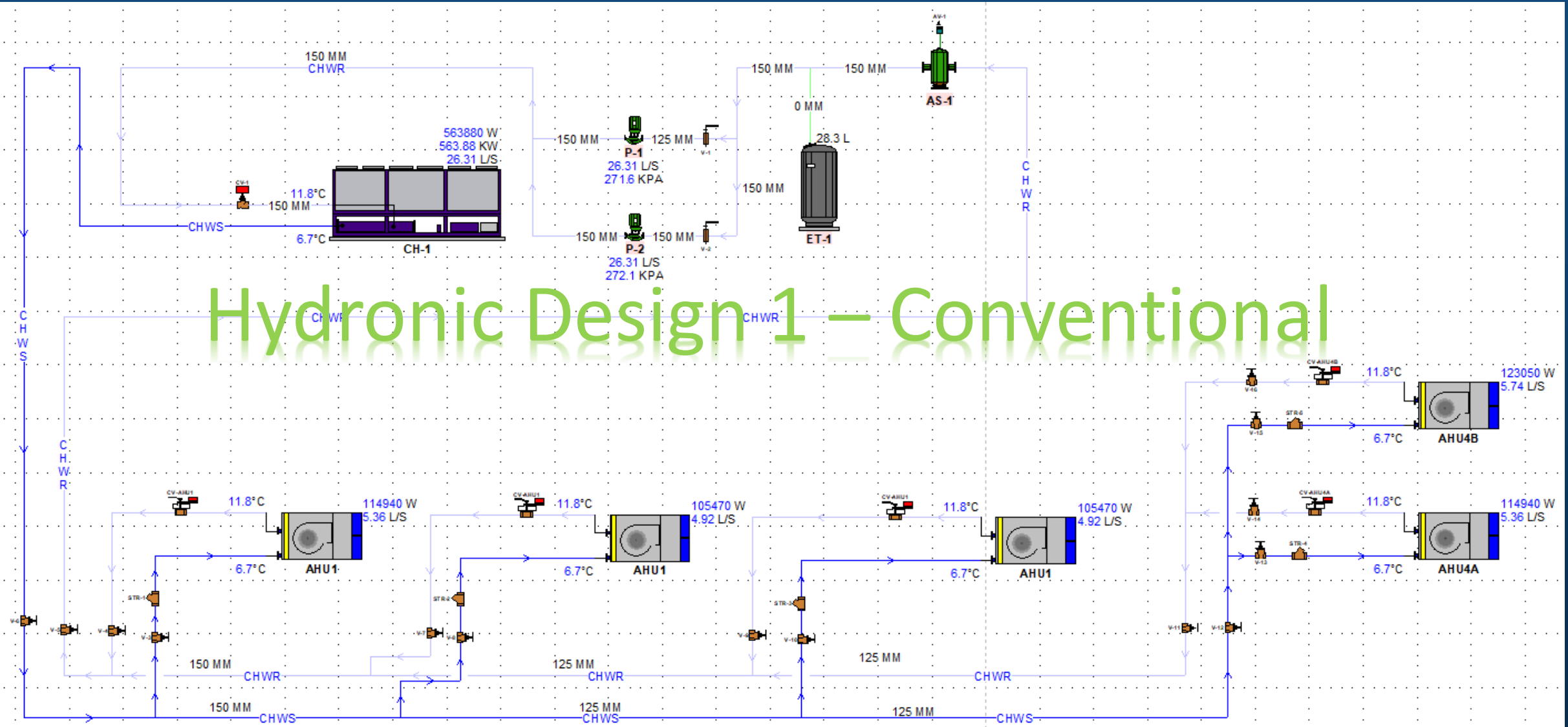
A perspective of Similarity:

>Trendsetting > Enablers > Performance

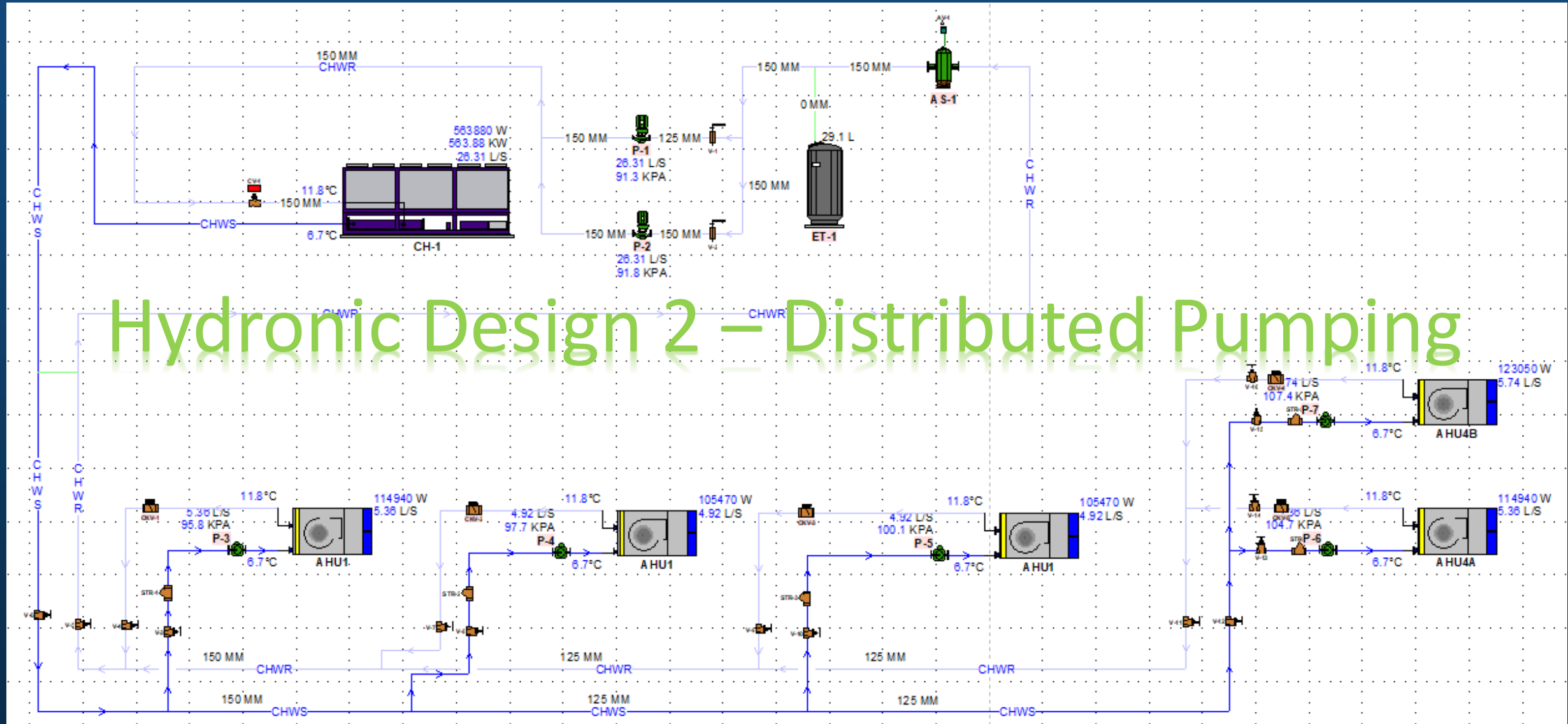


Enablers: Digital Tools for Design Optimization

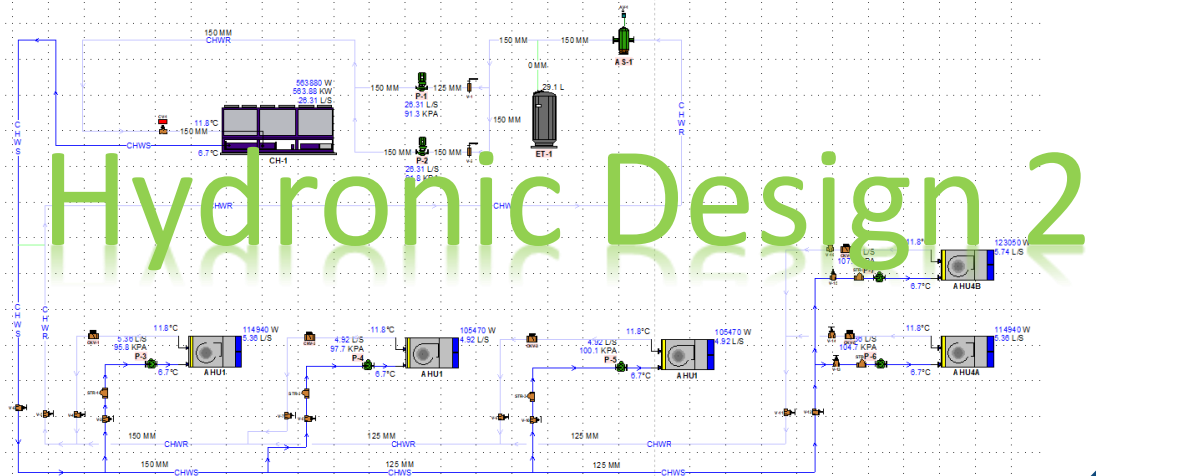
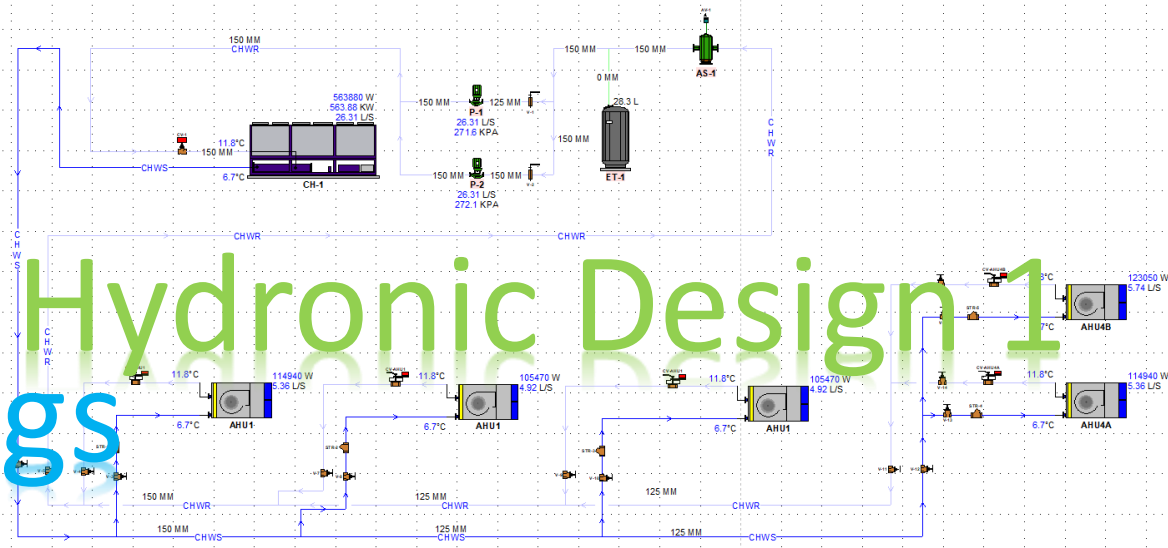
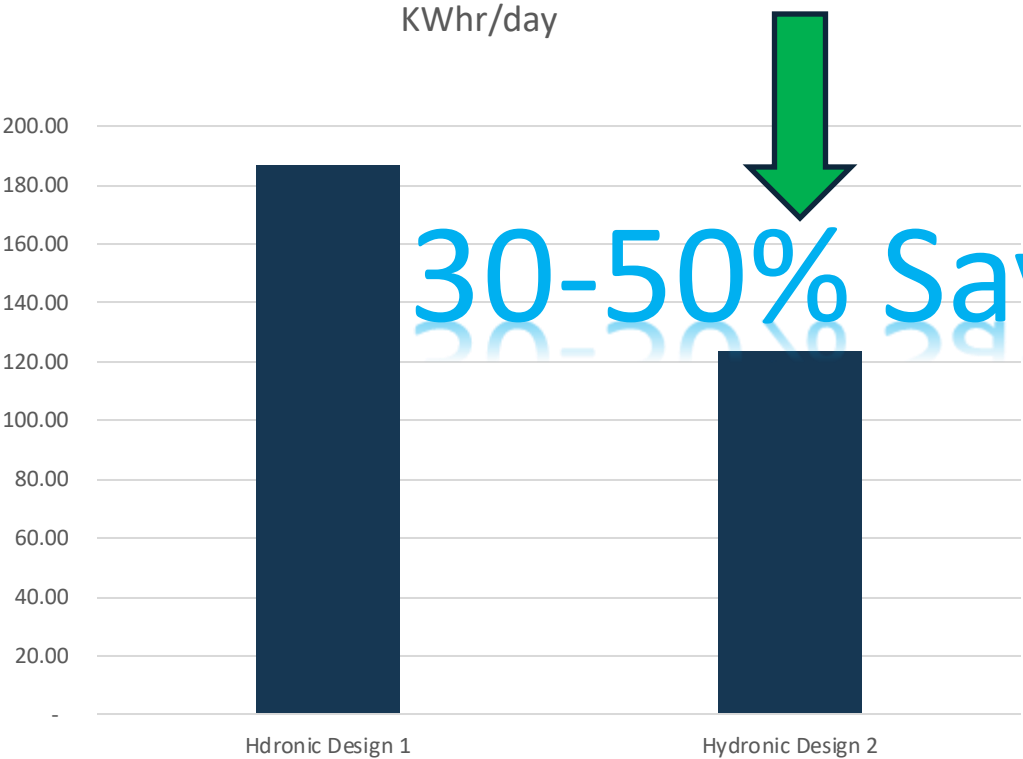
Hydronic Design 1 – Conventional



Enablers : Digital Tools for Design Optimization



Enablers : Digital Tools for Design Optimization



Distributed Pumping & Net Zero : A perspective



Pump Efficiency Requirement for SuperECBC Building	
14.9	W/KWr
52.39	W/TR
0.05	KW/TR
Additonal Savings with Distributed Pumping Design	
0.04	KW/TR



Plant TR	KW in Conventinal Design	KW in Distributed Pumping Design	KW Savings	KW hr (5 hours per day , 280 days)	Reduction in CO2 Emissions (kg of CO2)	kg CO2 Savings/ TR
500	26	18	8	11002	7701	15
1000	52	37	16	22003	15402	
1500	79	55	24	33005	23103	
2000	105	73	31	44006	30804	
2500	131	92	39	55008	38505	
3000	157	110	47	66009	46207	
3500	183	128	55	77011	53908	
4000	210	147	63	88013	61609	
4500	236	165	71	99014	69310	
5000	262	183	79	110016	77011	

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Future Design Ideas: Real-time Monitoring & Optimization

... More than a pump



HIGH-EFFICIENCY
PUMP

PUMP THROTTLING
VALVE

FLOW & HEAT ENERGY
ESTIMATION

COMMISSIONING
ASSISTANT

IE5 Motor

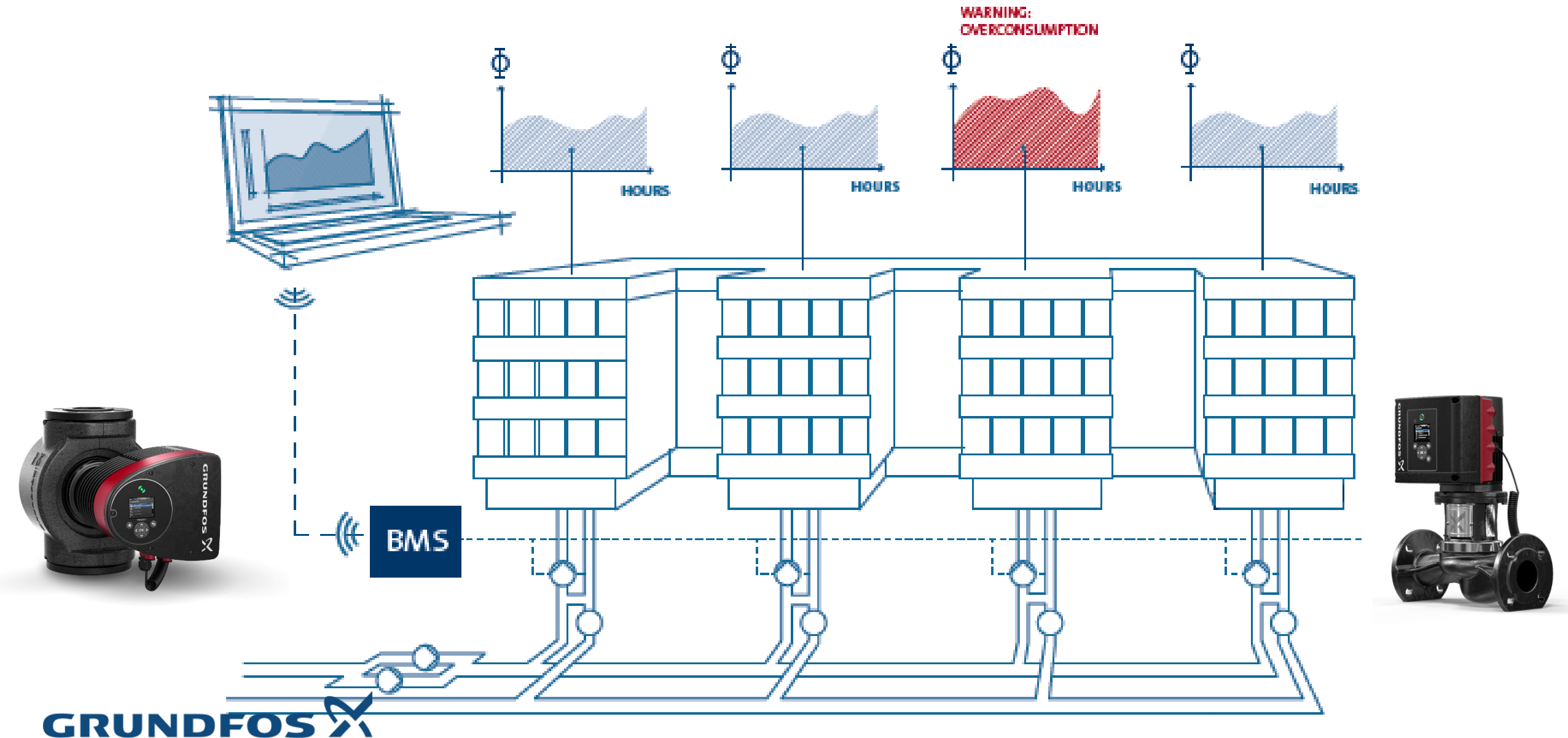
Permanent Magnet Synchronous Motor

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Future Design Ideas: Real-time Monitoring & Optimization



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Shiva Textiles

Salem, Tamilnadu, India



Thank You !

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E-mail: gaurav@grundfos.com, Mobile: +91-9840296788

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