



让我们共同打造气候中和的未来
Building a climate-neutral future together



中华人民共和国
住房和城乡建设部



Schweizerische Eidgenossenschaft
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intep
skat

Swiss Resource Centre and
Consultancies for Development

中瑞零碳建筑研讨会——运营监测：以瑞士弗里森贝格低温 能源网络为例

ZEB Talk – Monitoring during Operation: Use case Anergy Network Friesenberg

2025年09月23日

September 23th 2025

Jakob Scherer, Anex Ingenieure AG

01

弗里森贝格低温能源网络

The Project: Anergy Network Friesenberg

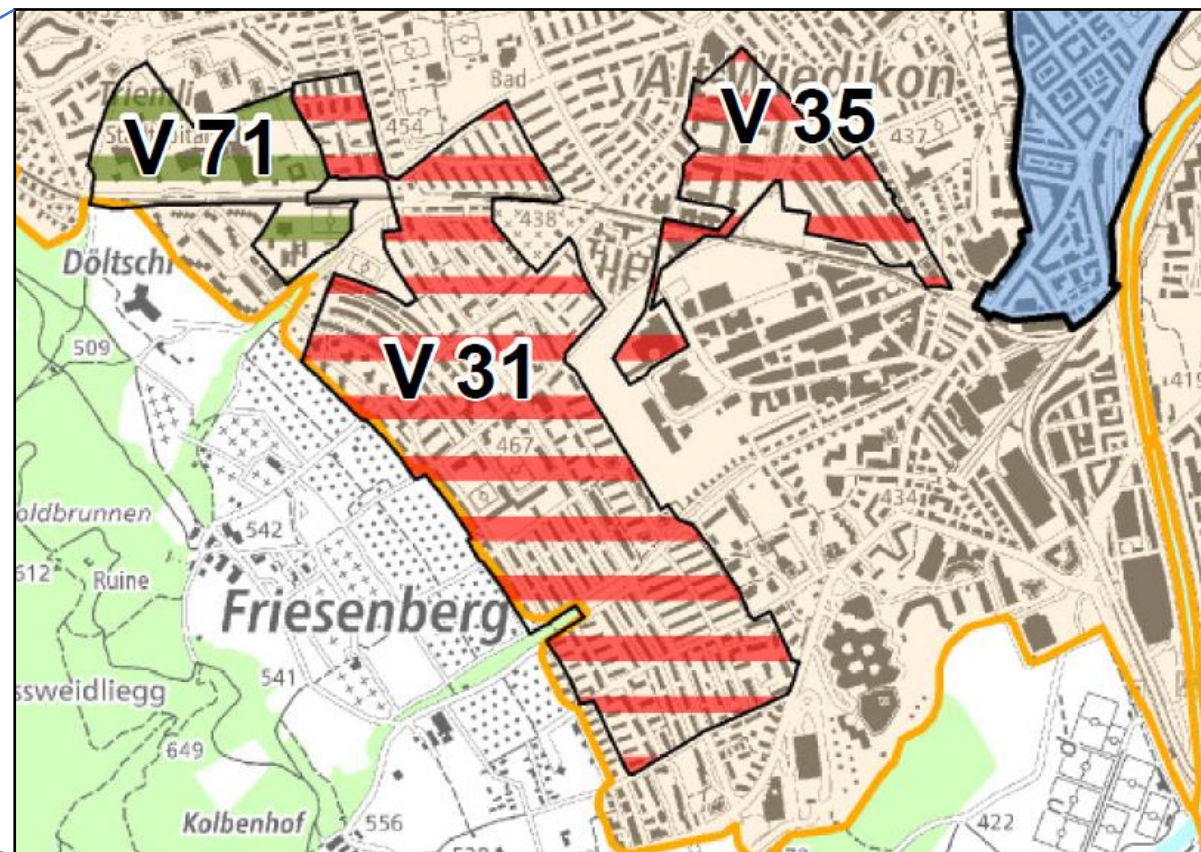
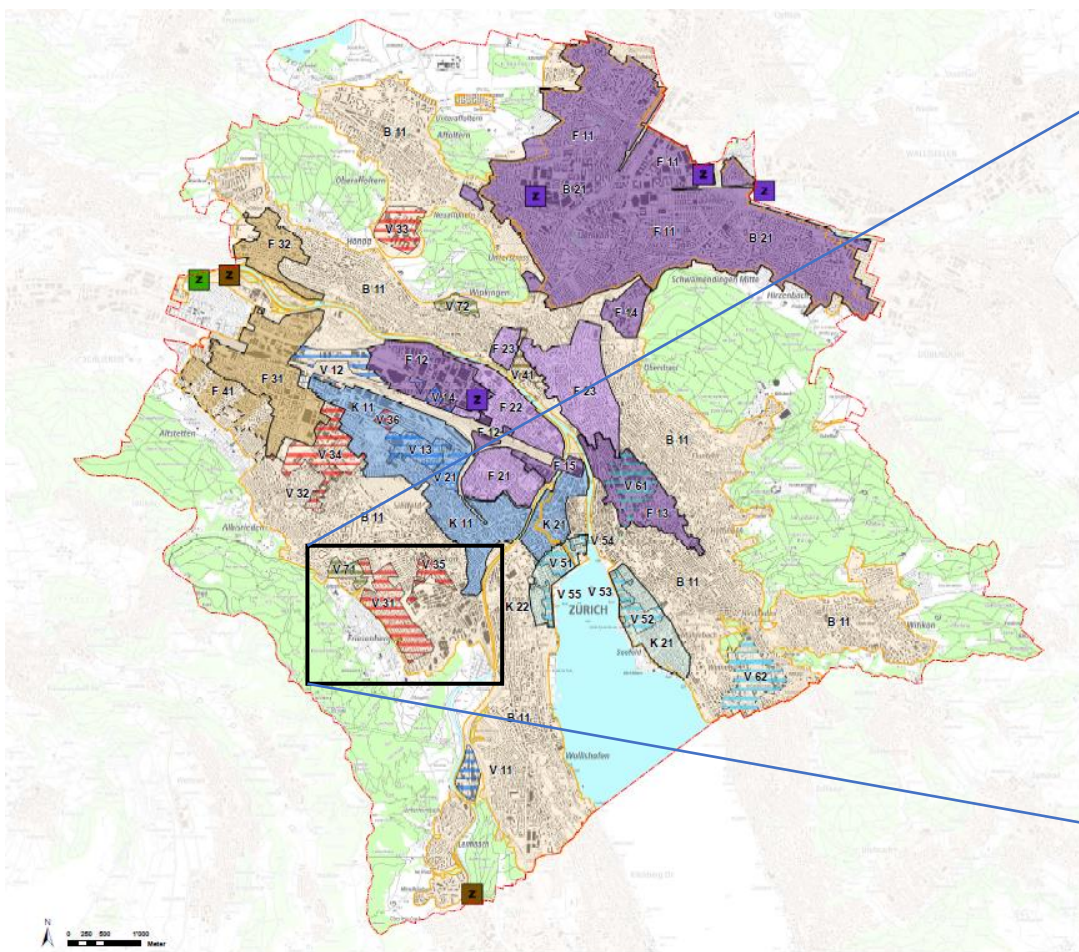


Introductory Short Film: https://youtu.be/DhGk2vA_vHQ?si

01

项目：苏黎世能源规划图——弗里森贝格低温能源网络（V31）

The Project: Energy planning map Zurich with Anergy Network Friesenberg (V31)



01

弗里森贝格低温能源网络

The Project: Anergy Network Friesenberg



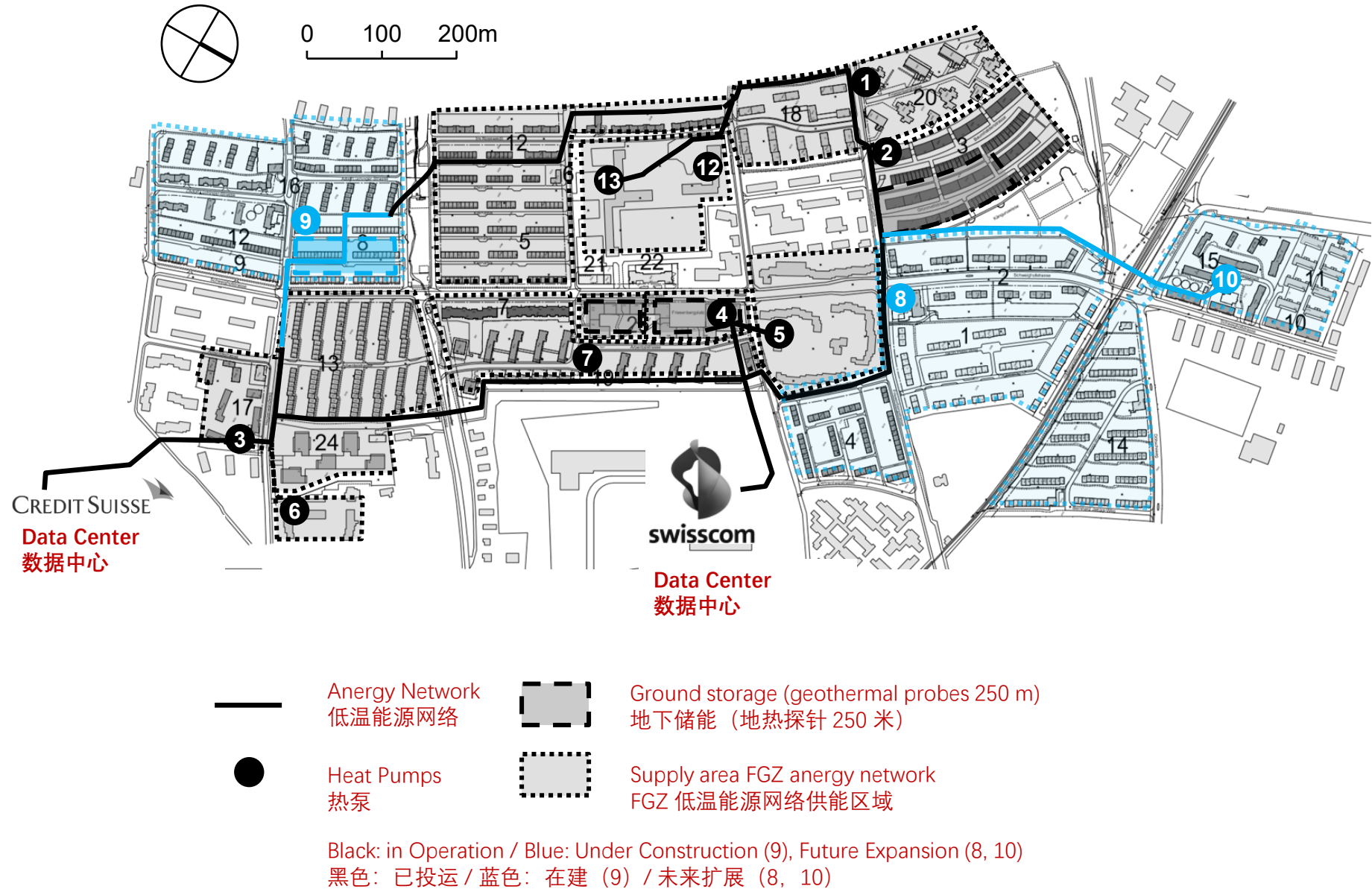
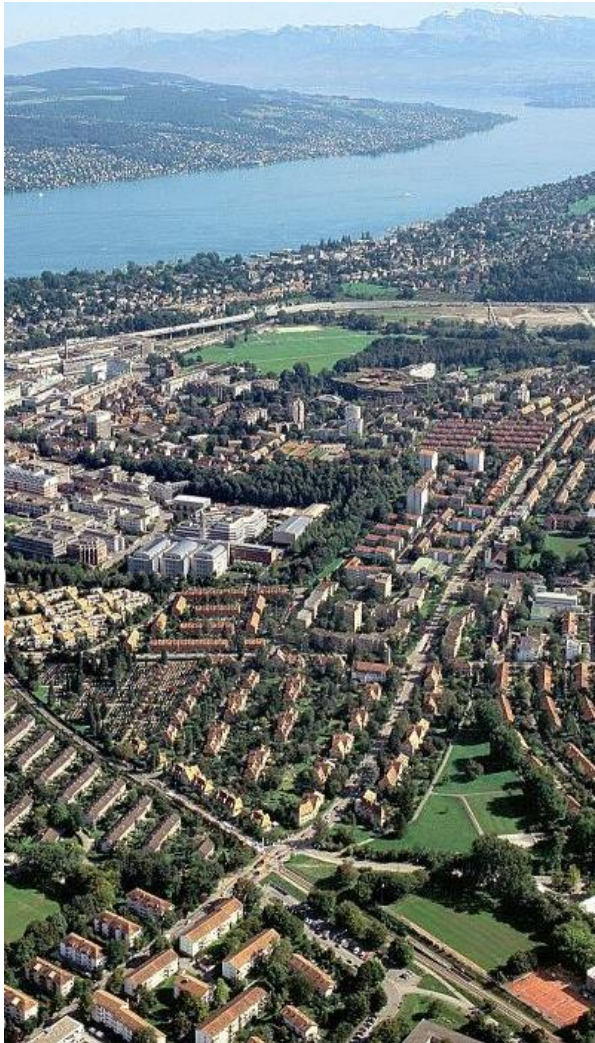
Zurich Family Housing Cooperative (FGZ)
5'500 inhabitants
2'300 housing units (row houses / apartments)
190'000 m2 energy reference area
35 GWh/a heat demand

苏黎世家庭住房合作社 (FGZ)
5,500 名居民
2,300 套住房 (排屋 / 公寓)
190,000 平方米能源参考面积
每年 35 吉瓦时的供热需求

01

弗里森贝格低温能源网络概览

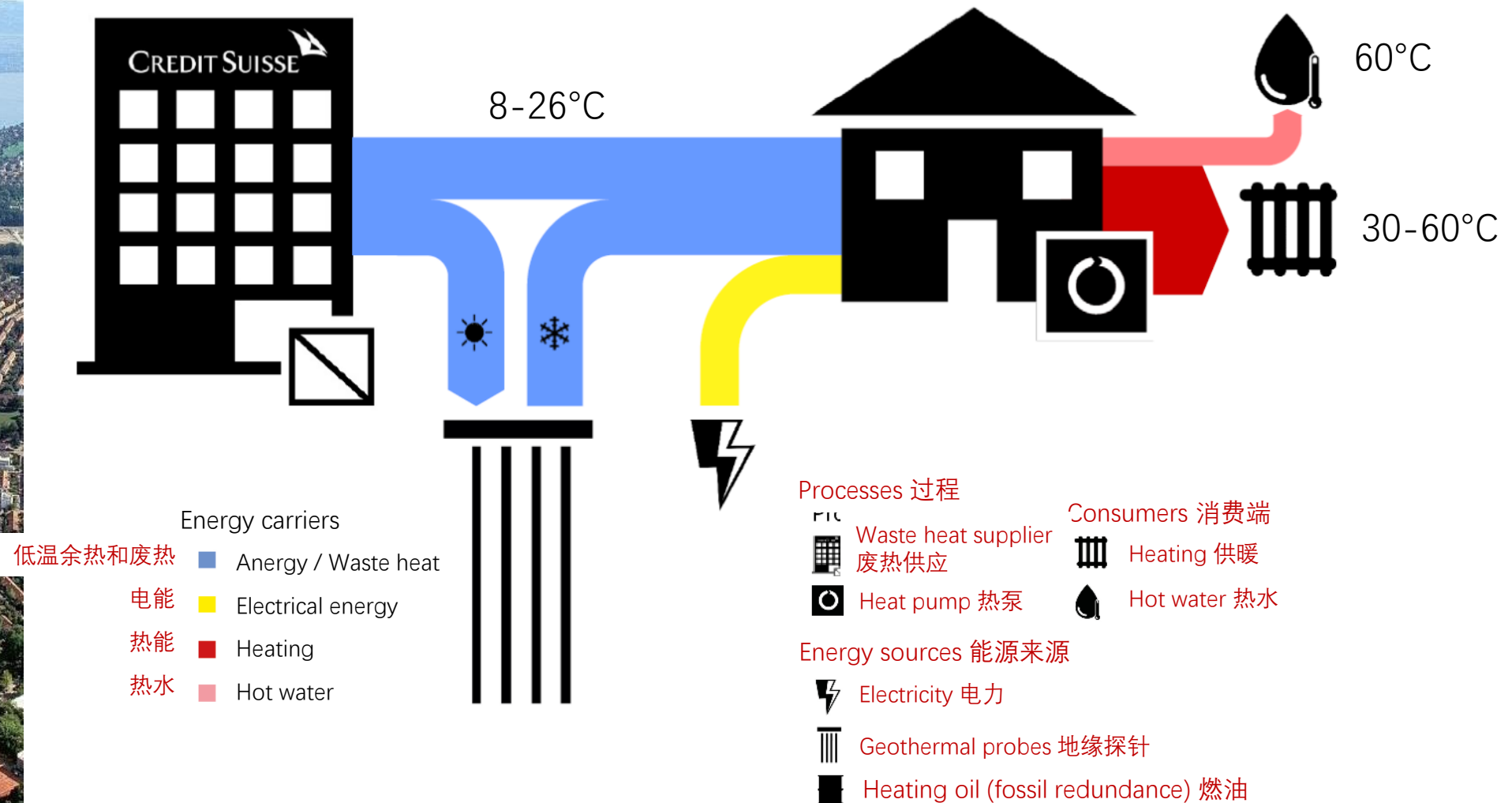
The Project: Network Overview



01

弗里森贝格低温能源网络工作原理

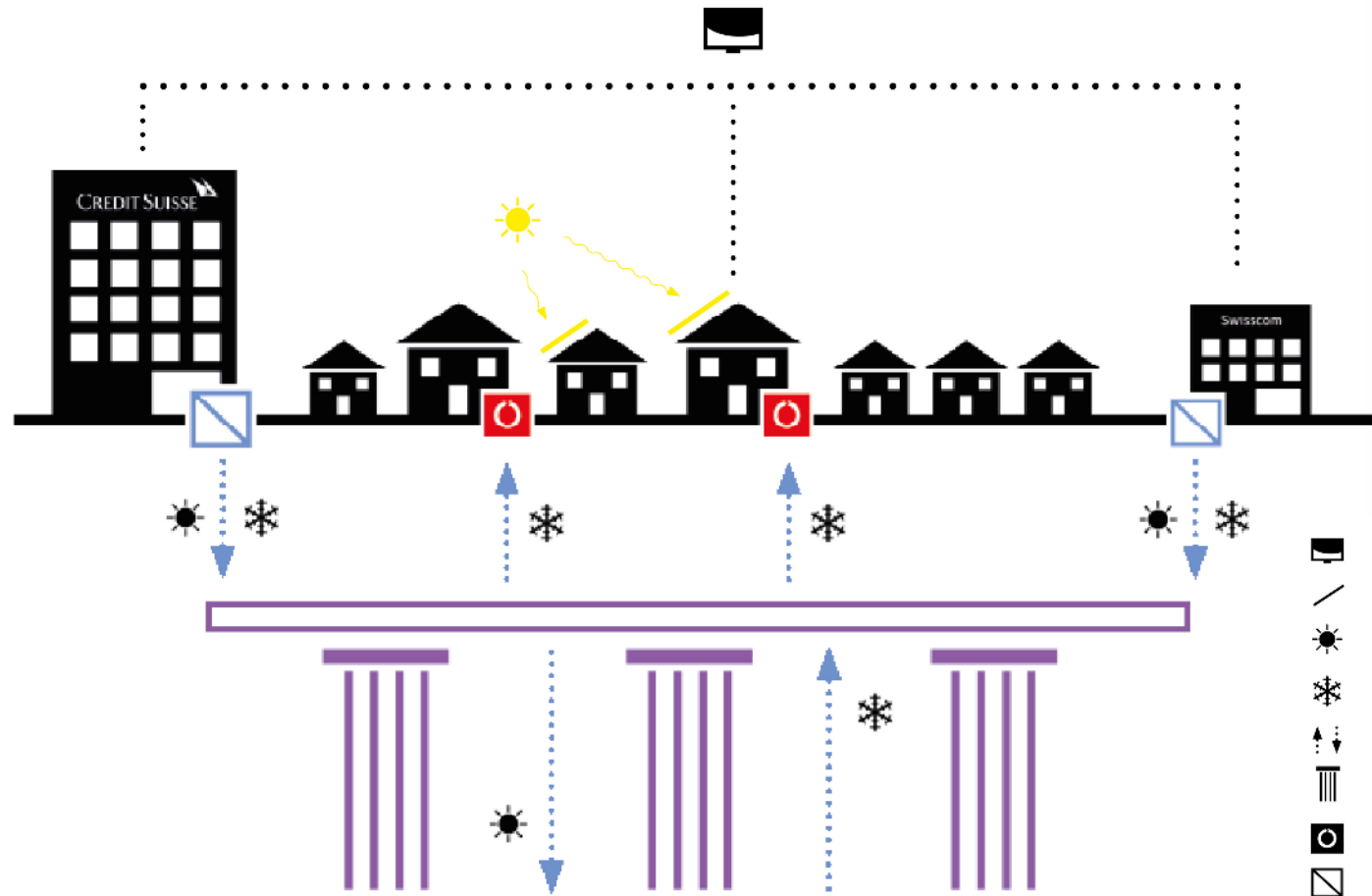
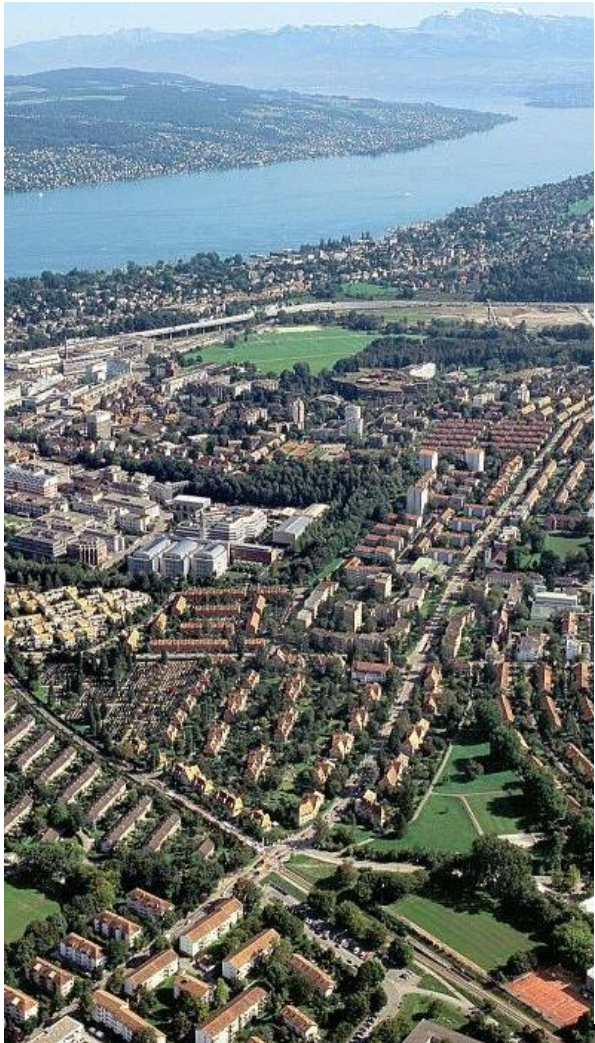
The Project: Functional principle



01

弗里森贝格低温能源网络工作原理

The Project: Functional principle



- Digital monitoring 数字化监控
- PV system 光伏系统
- Summer 夏季
- Winter 冬季
- Heat flow 热流
- Geothermal probes 地热探针
- Heat pump 热泵
- Heat exchangers 热交换
- Energy network (water circuit)
低温能源网络 (水循环)

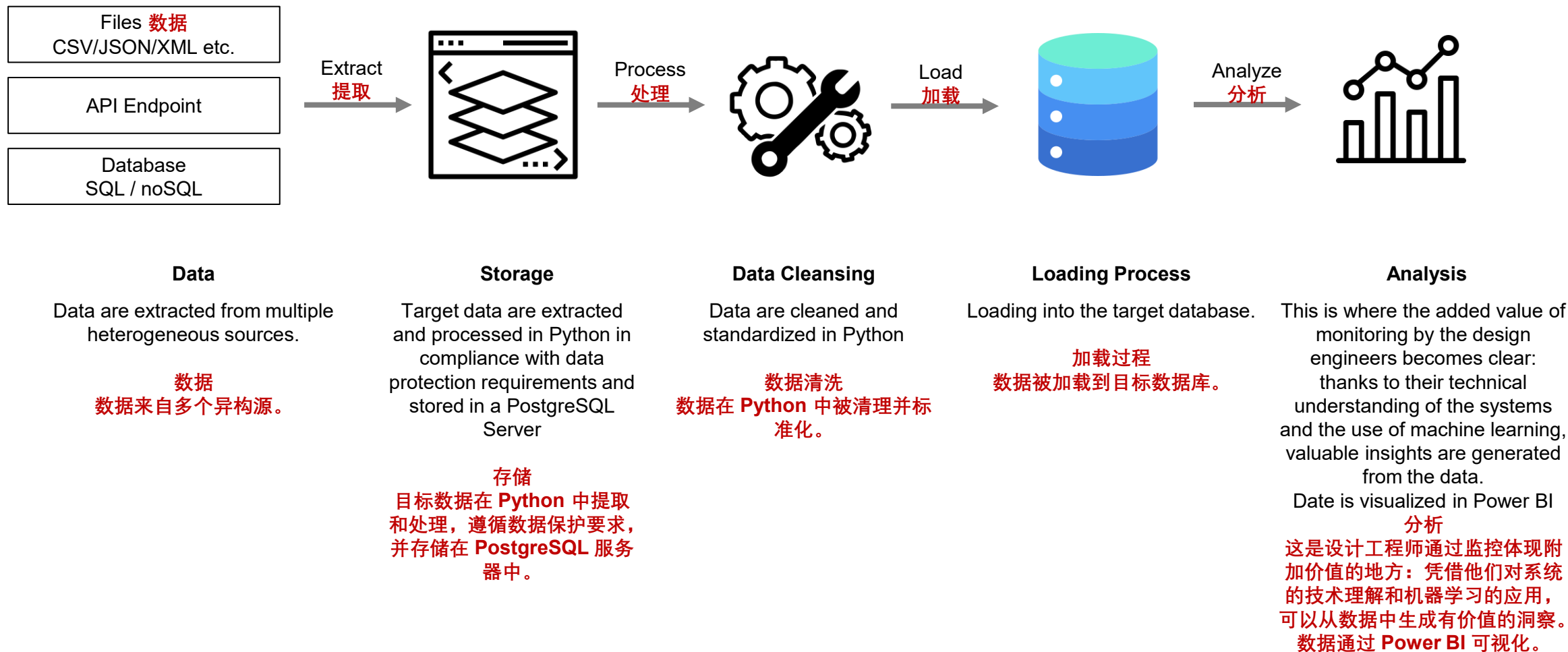
02

监测：建立框架体系

Monitoring: Setting up the Framework

Der Weg zu wertvollen Energie-Analysen

能源分析路径



Übersicht Monitoring FGZ

Übersicht
Übersicht Anergienetz
Heizgradtage
Transformationspfad - Endenergie
FGZ:Energie
Absenkpfad - CO2
FGZ:Primärenergie
FGZ:Treibhausgasemissionen
FGZ:Anergienetz
FGZ:Anergienetz
FGZ:Erdspeicher
FGZ:Erdspeicher Temperaturen
FBH:Friesenbergthalde
FBH:Wärmepumpe
FBP:Zentrum Friesenberg
FBP:Wärmepumpe
HEG:Hegianwandweg 41
HEG:Wärmepumpe
GRU:Grünmatt
GRU:Wärmepumpe
ARB:Arbentalstrasse
ARB:Wärmepumpe
SWI:Swisscom
CS:Credit Suisse
SWI/CS
Aufteilung Eigenverbrauch
BOR: Borweg / Kinderreiche
BOR:Wärmepumpen
Energieflussdiagramm

Key Performance Indicator

Emission [Tonnen CO2 eq./m2a]

19.51!

Ziel: 19.32 (+0.98 %)

Emission [Tonnen CO2 eq./m2a]

3'886✓

Ziel: 4056 (-4.17 %)

Endenergie [MWh/a]

27'043✓

Ziel: 29'500 (-8.33 %)

Anteil Fossile [%]

55✓

Ziel: 75 (-26.4 %)



Datenzeitraum

01.07.2010 00:00:00

30.08.2025 23:00:00

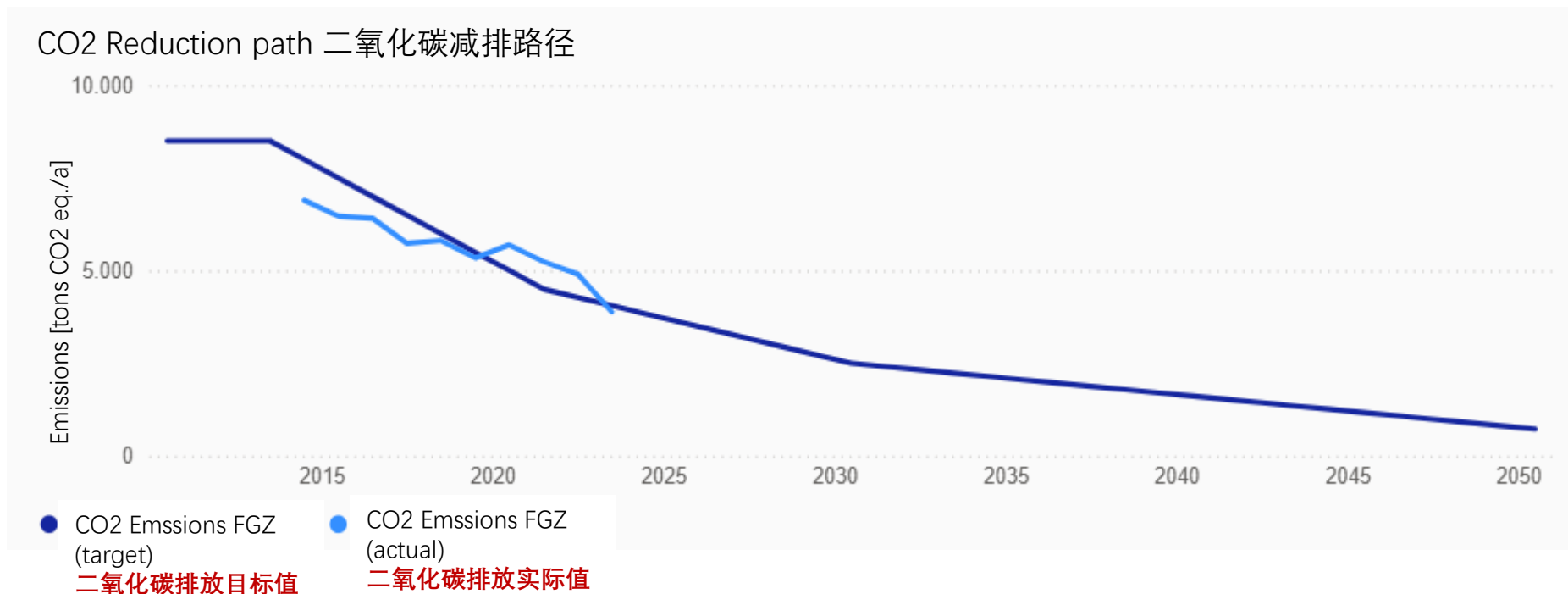
- Key Performamce Indicators (KPIs) at a glance
- In detail Analysis at hand
- 核心性能指标概览
- 详细分析

02

监测：持续跟踪核心性能指标

Monitoring: Keeping track of Key Performance Indicators

- The housing cooperative has committed itself to a CO₂ Reduction Path, which is closely monitored
- 住房合作社已承诺遵循一条二氧化碳减排路径，并对其进行严格监测。



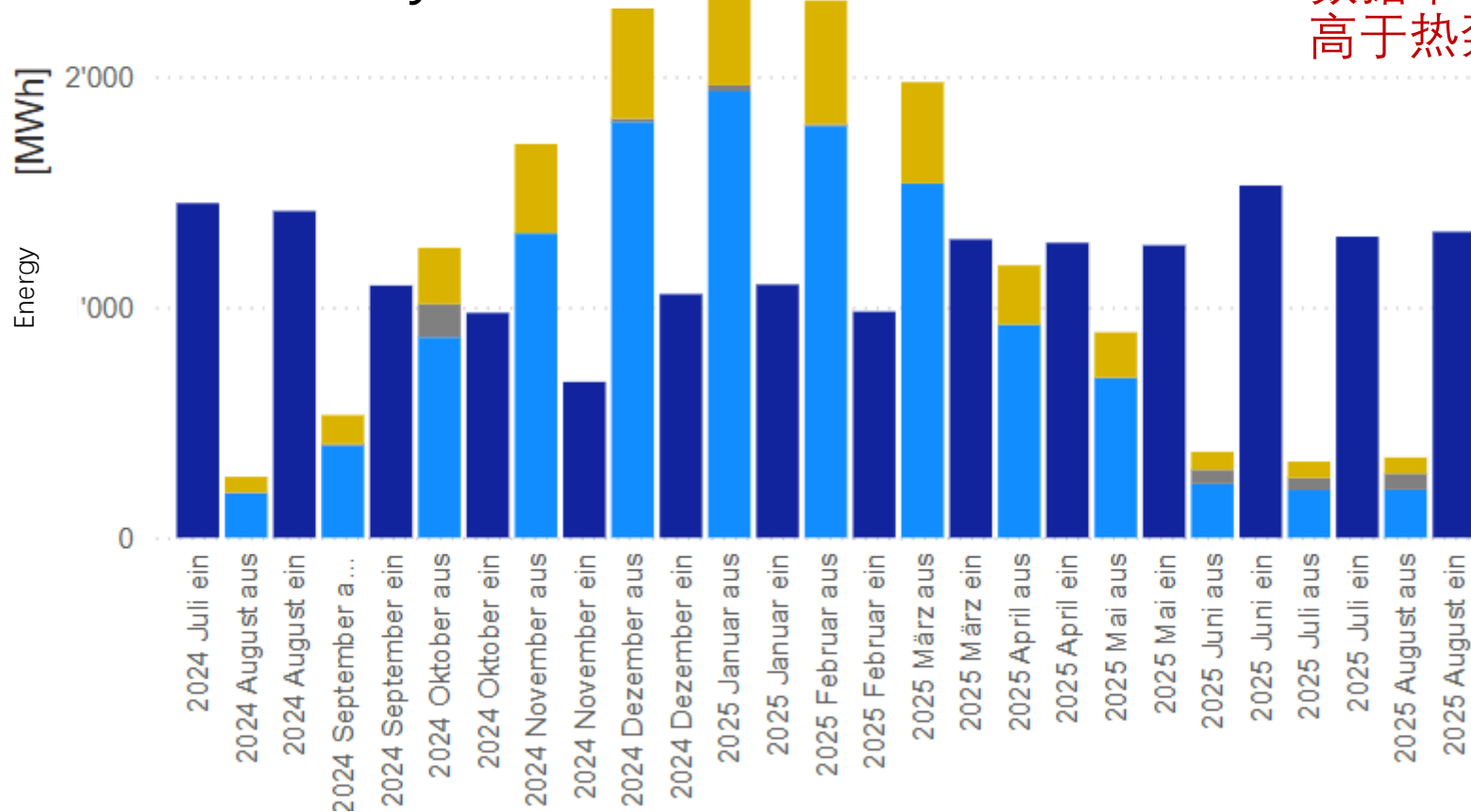
02

监测：能源平衡调查

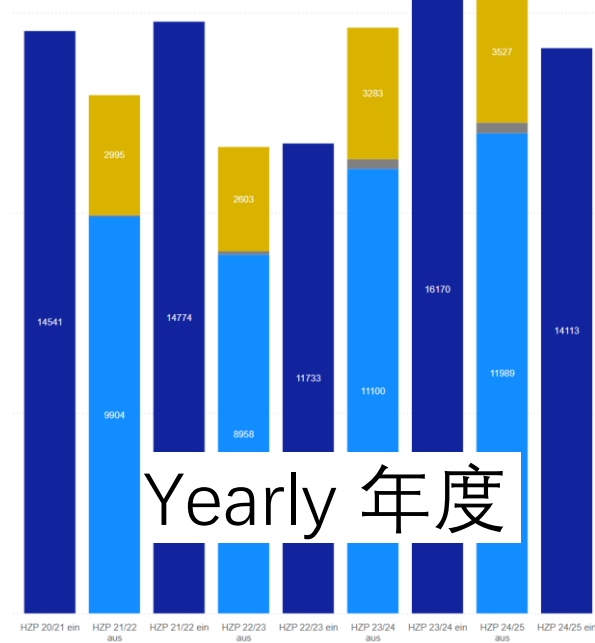
Monitoring: Surveying the Energy Balance

Waste Heat 废热
Anergy 低温网络
Oil 燃油
Electricity 电力

Monthly 月度



- The amount of Waste Heat from the Datacenters should preferably be higher than the anergy consumed by the heat pumps on a yearly basis
- 数据中心产生的余热量在年度基础上最好高于热泵消耗的低品位能源。



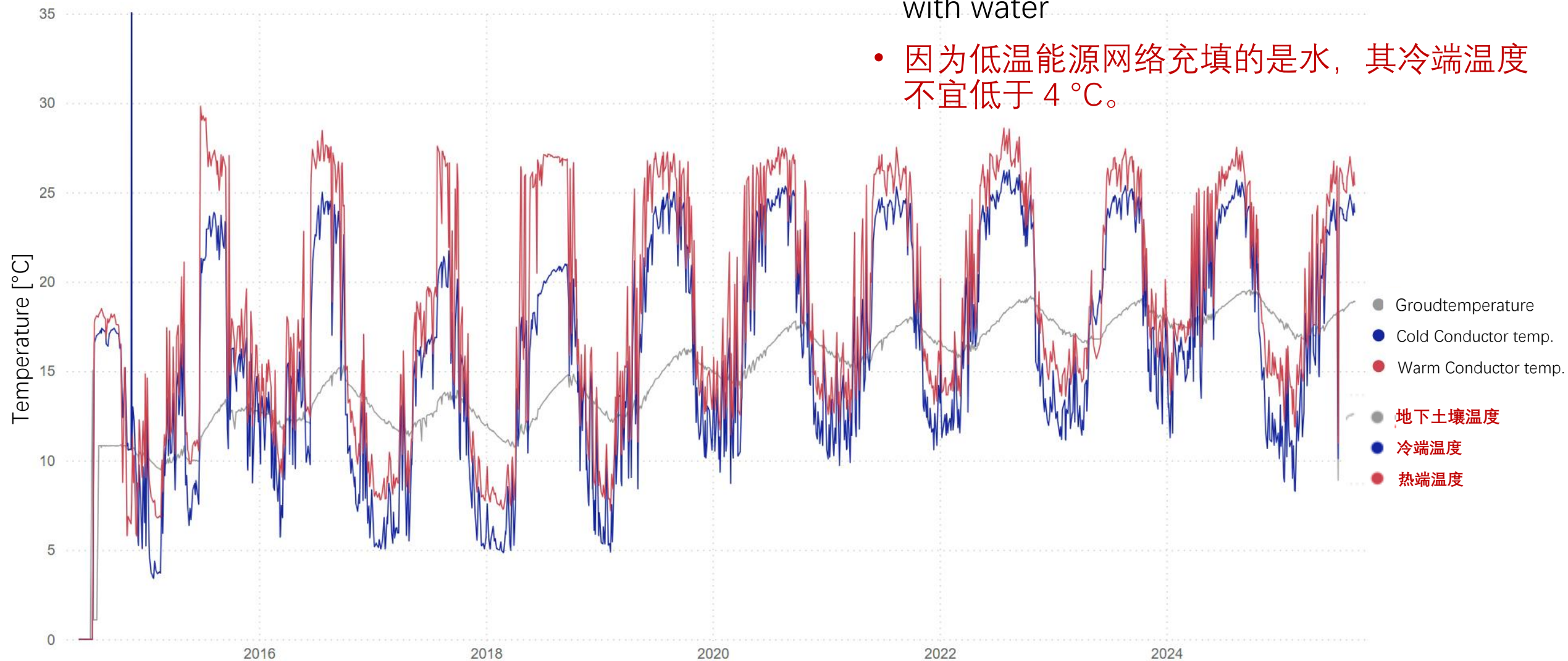
02

监测：保持网络温度在合理范围内

Monitoring: Keeping the network temperatures in range

- The cold conductor temperature should not fall below 4 °C, as the anergy network is filled with water

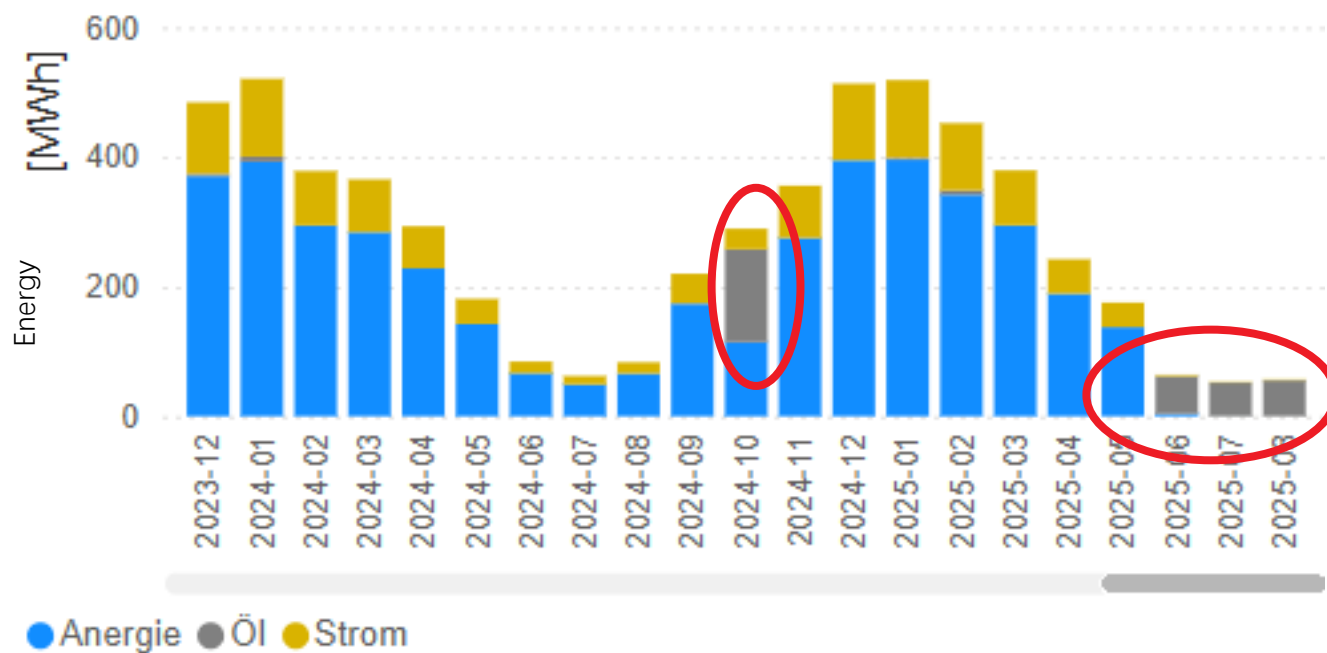
- 因为低温能源网络充填的是水，其冷端温度不宜低于 4 °C。



02

监测：识别异常

Monitoring: Identifying anomalies

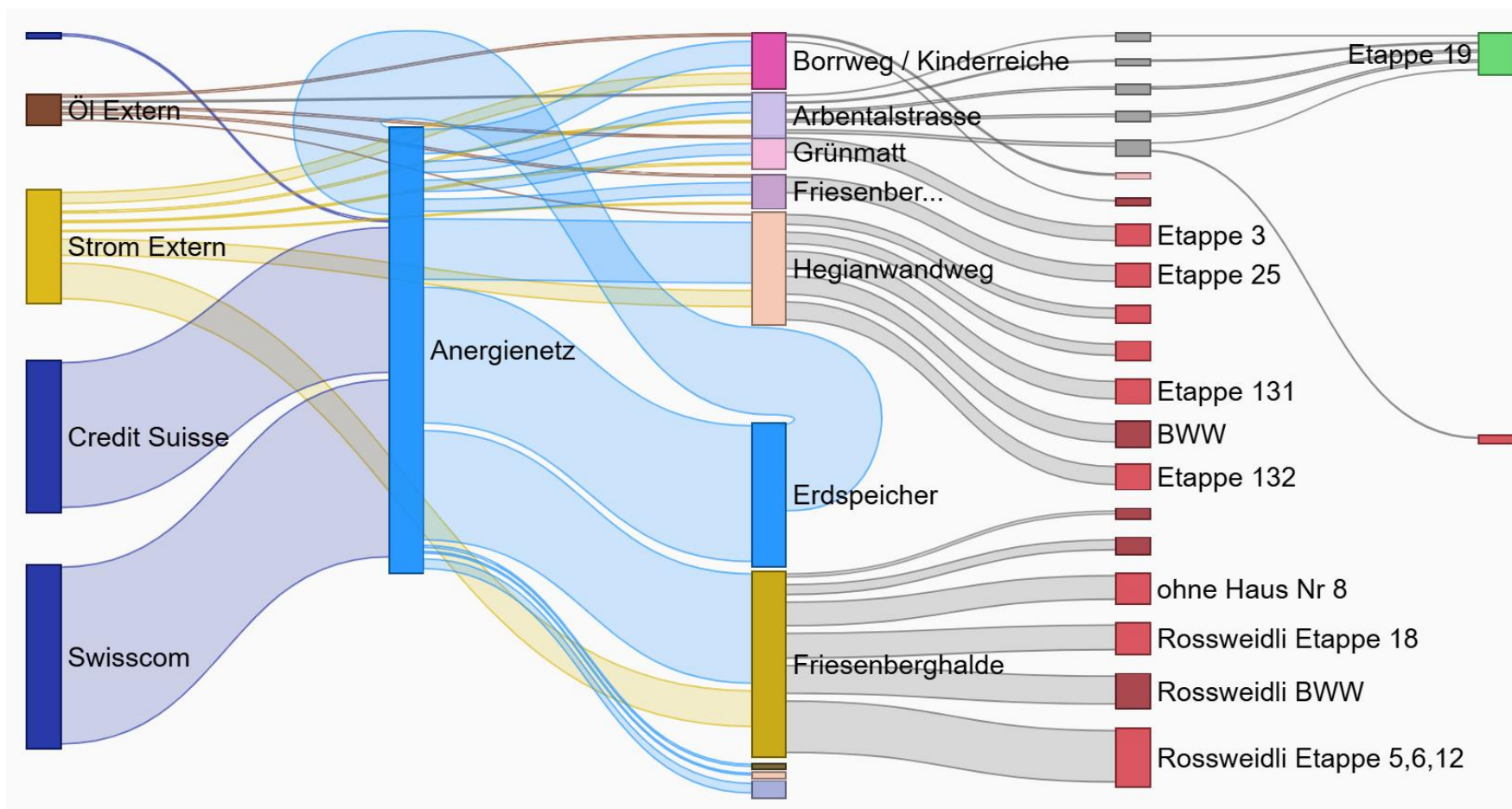


- Monitoring allows to identify machine and man-made anomalies in operation.
- 监控可以识别操作中的机器和人为异常。

02

监测：实操仪表盘演示

Monitoring: Identifying anomalies





让我们共同打造气候中和的未来
Building a climate-neutral future together

«An area offers greater efficiency potential through networking than the sum of the individually considered buildings.»

一个区域通过网络连接所提供的效率潜力，超过了单独考虑各个建筑物的总和。



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住房和城乡建设部



Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

intep
skat Swiss Resource Centre and
Consultancies for Development

感谢您的关注!

THANK YOU!

提问环节

YOUR QUESTIONS?

