

Energy Monitoring and Management System (EMMS) at DESY

POCPA6 Workshop
Campinas - Brazil

Narcisse Ngada
DESY Hamburg
24.09.2018

Agenda

DESY energy
consumption

EMMS
at DESY

EMMS
Tools

Achievements

Outlook

Next...

DESY energy
consumption

EMMS
at DESY

EMMS
Tools

Achievements

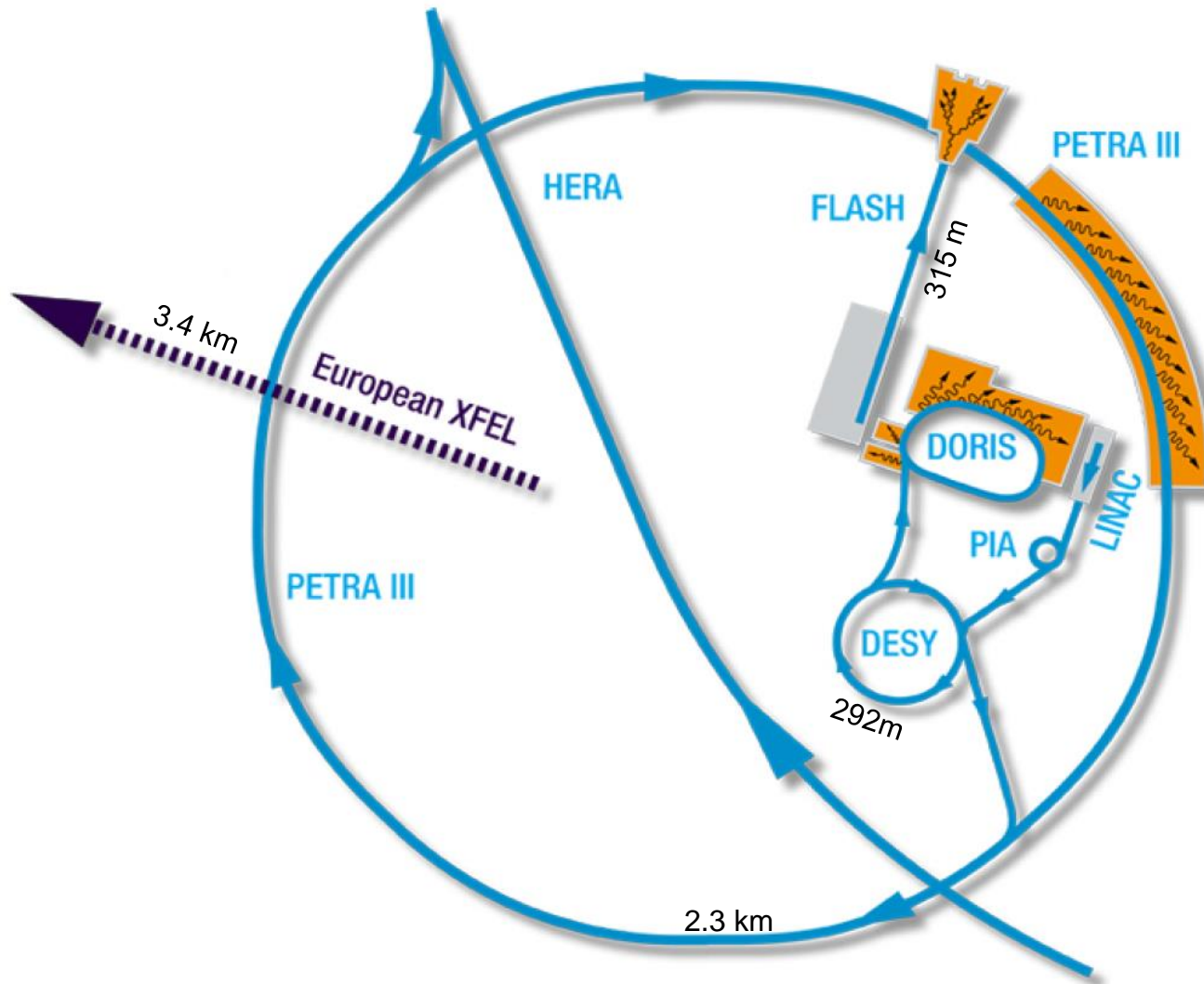
Outlook

About DESY

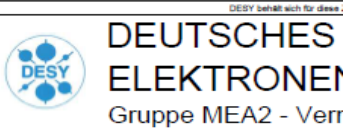
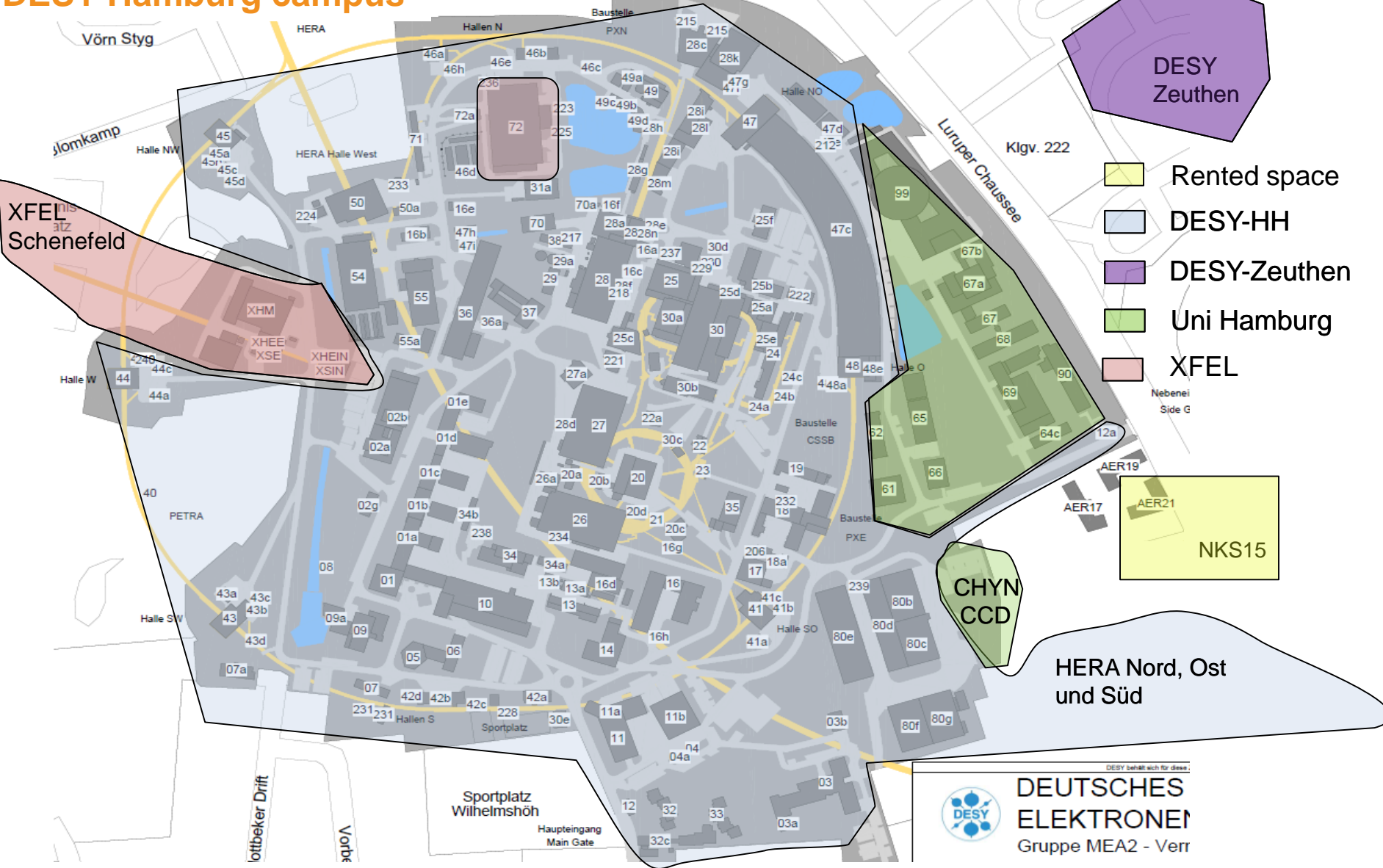


- DESY is the largest German research center for particle and high energy physics.
- Was founded in December 1959 in Hamburg with sites in Hamburg and Zeuthen.
- **Functions:**
Development, construction and operation of particle accelerators for research purpose with photons as well as particle and astroparticle physics.

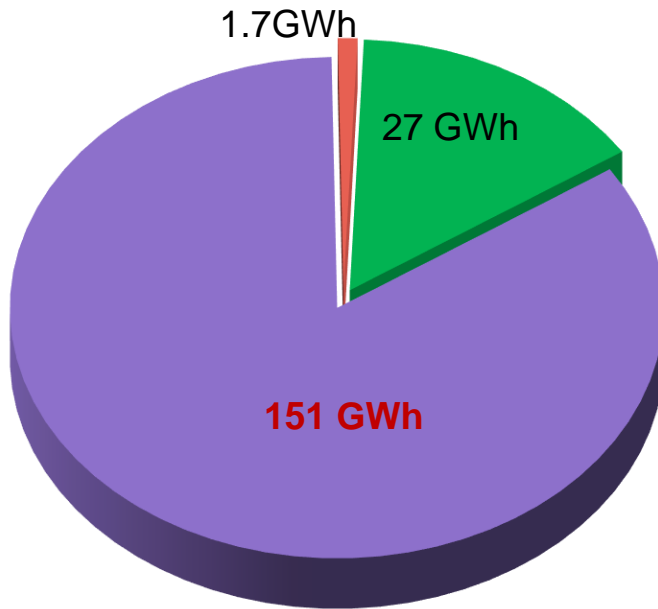
Accelerators operated at DESY Hamburg



DESY Hamburg campus



DESY Hamburg energy consumption in 2017



- Natural gas
- Heating
- Electricity



City of about 60,000 inhabitants

Next...

DESY energy
consumption

EMMS
at DESY

EMMS
Tools

Achievements

Outlook

What is Energy Monitoring and Management?

- **Energy Monitoring**

The purpose of energy monitoring is to collect data about when and how the energy is consumed in an company. These data are then provided for energy management.

- **Energy Management**

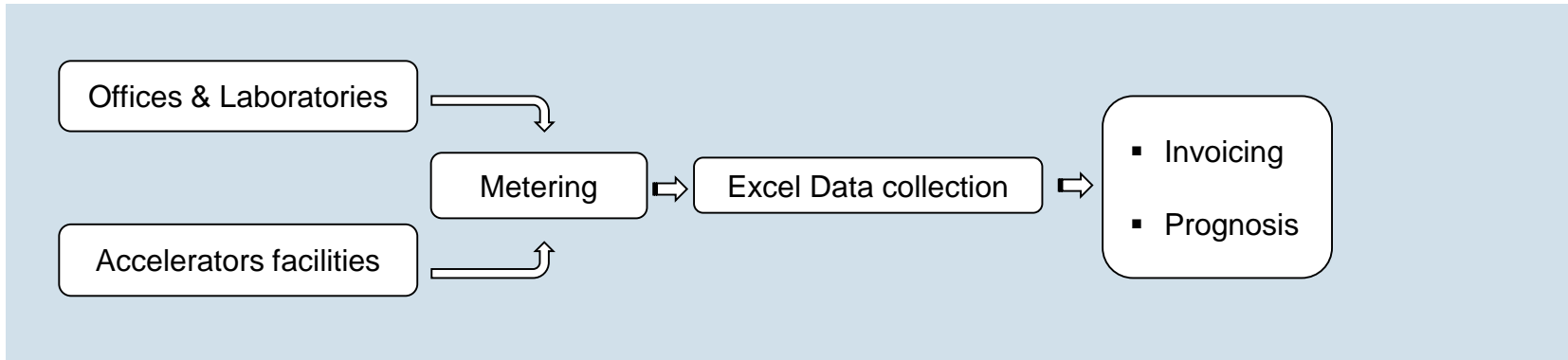
Energy management is the process of **efficient** monitoring and controlling of the company's energy needs, in order to reduce consumption, costs as well as CO2 emissions.

Why Energy Monitoring and Management at DESY Hamburg

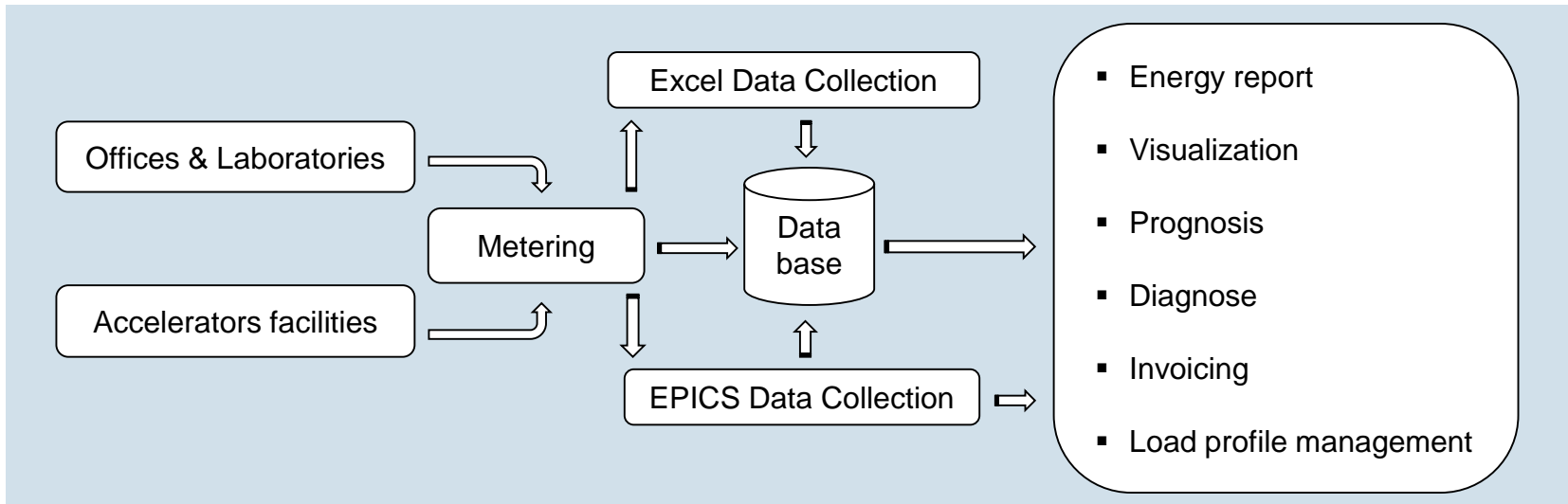
Year	Total energy consumption	Emission
2017	179 GWh	83,000 TCO ₂

- (1) DESY energy consumption remains high over many years.
- (2) Energy costs will continue to rise in the future.
- (3) Very complex energy flows structure of DESY.
- (4) Reduce network charges for electricity by load profile management
(*German regulation*).
- (5) Improve our research center image.
- (6) As tool for **efficiency and integration** with other systems.

EMMS (status 2013)



EMMS (status 2017)



Overview energy meter (status 2013)

Media	Electricity	Heating	Water	Gas
Total	93	41	40	4
Manually	90	40	30	4
Automatically	3 meters (Load profile)	1	10	-
Read-out	quartal	quartal	monthly	quartal

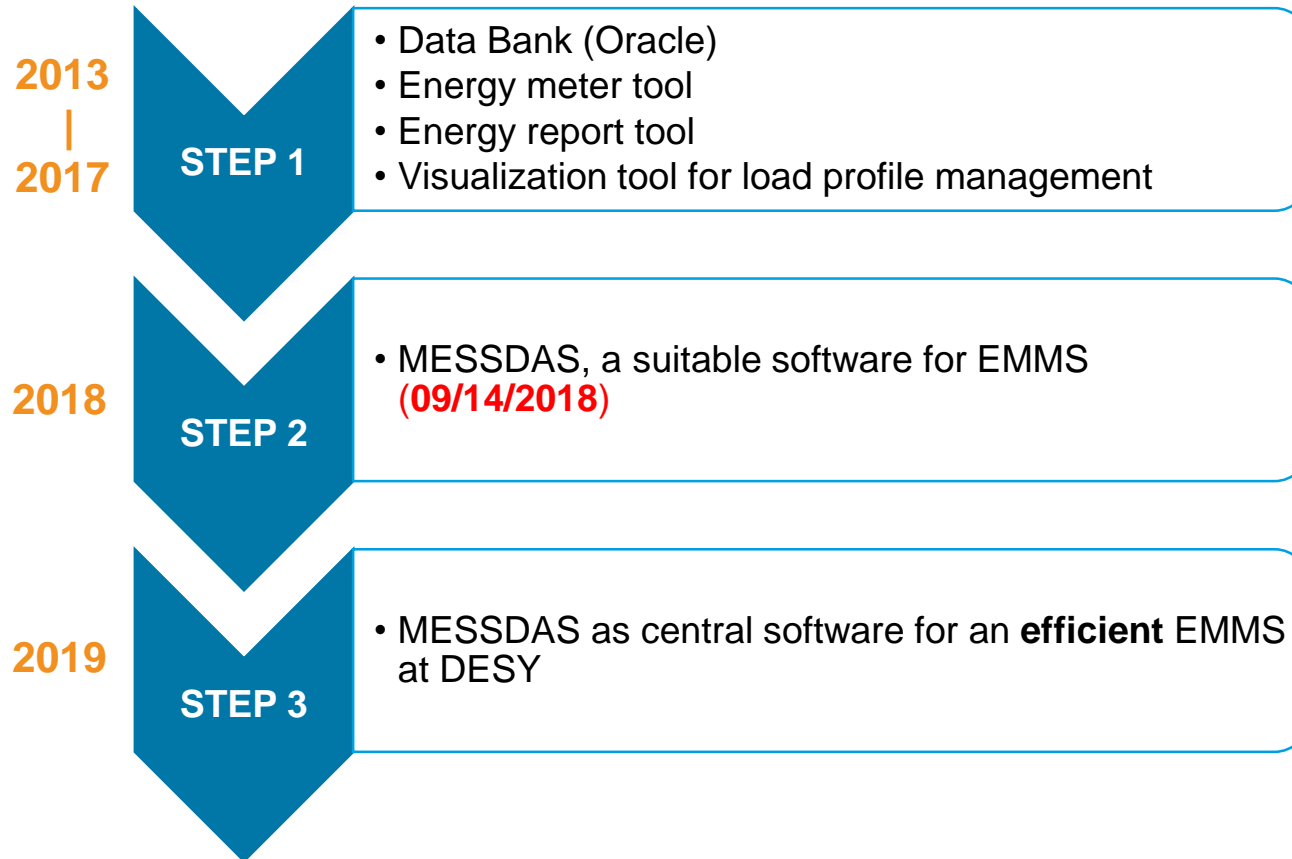
Overview energy meter (status 2017)

Media	Electricity	Heating	Water	Gas
Total	553	53	71	5
Manual	171	50	61	4
Automatically	382	3	10	1
Read-out	monthly	monthly	monthly	monthly

Next...



An overview of implemented tools for EMMS



1) Central database (Oracle)

☰ Zahler

MKK Zähler

Zähler

Zählernamen: Zählernummer: Alter Name:

erstellt durch
leister 25-MAR-2015

Zählernamen	Zählernummer	Alter Name
AW-16D-1	A50A9G19000	
AW-24-1	A50A9C19000	Kühlturm LINAC II
AW-42B-1	DA173E19000	
AW-47D-1	A50A9B-19000	Kühlturm PETRA Nord
BW-16D-1	5013687	
BW-25-1	9827287-06	Brunnen 1
BW-25F-1	675154	Brunnen 4
BW-29-1		Enteisung
BW-30-1	613131	DORIS RO Anlage Geb. 30

Zählerinfo | Zähler Eigenschaften | Zählerwerte | History

Stammdaten

Medium:

Zählerfabrikat:

Einbaudatum:

Herstelldatum:

Einbauort Gebäude:

Zugehörigkeit: Digital Zahlwerk

DESY XFEL

Ablesung erfolgt manuell

Abrechnung durch Dritte

Eichstempel/MID-Konformität datum:

Ablauf der Eichfrist:

Verbraucher

Einbauort Raum / Standortbeschreibung

Bemerkung

2) Energy meter Tool (manually)

Zählertool

Eingabepanel

Zählerliste anzeigen

Verbraucherliste anzeigen

V1 Ablesung-Liste ausblenden

Verwaltung

1

Eingabepanel für die Energiezähler

Eingabepanel

Einbauort Gebäude: **Alle Gebäude** | Ablesedatum: **05.09.2018** | Aktueller Zählerbestand: **682** **Anzeigen**

Energiemedien: **Alle Medien** | Zählerstand: | Einheit: **kWh** **Speichern**

Zählernamenliste:

- ST-10-2
- ST-16-1
- ST-16-10
- ST-16-14
- ST-16-2
- ST-16-20
- ST-16-21
- ST-16-22
- ST-16-24
- ST-16-25
- ST-16-26
- ST-16-27
- ST-16-3
- ST-16-6
- ST-16-8

Einbauort Gebäude: **10**

Einbauort Raum: **EG00 101 (Empore in der Lötfofenhalle)**

Zählernamenfeld: **ST-10-2**

Energiemedium: **Strom**

Zähler suchen: | **Suchen** | **Weitere Infos über den Zähler** | **Schließen**

2

Verwalten

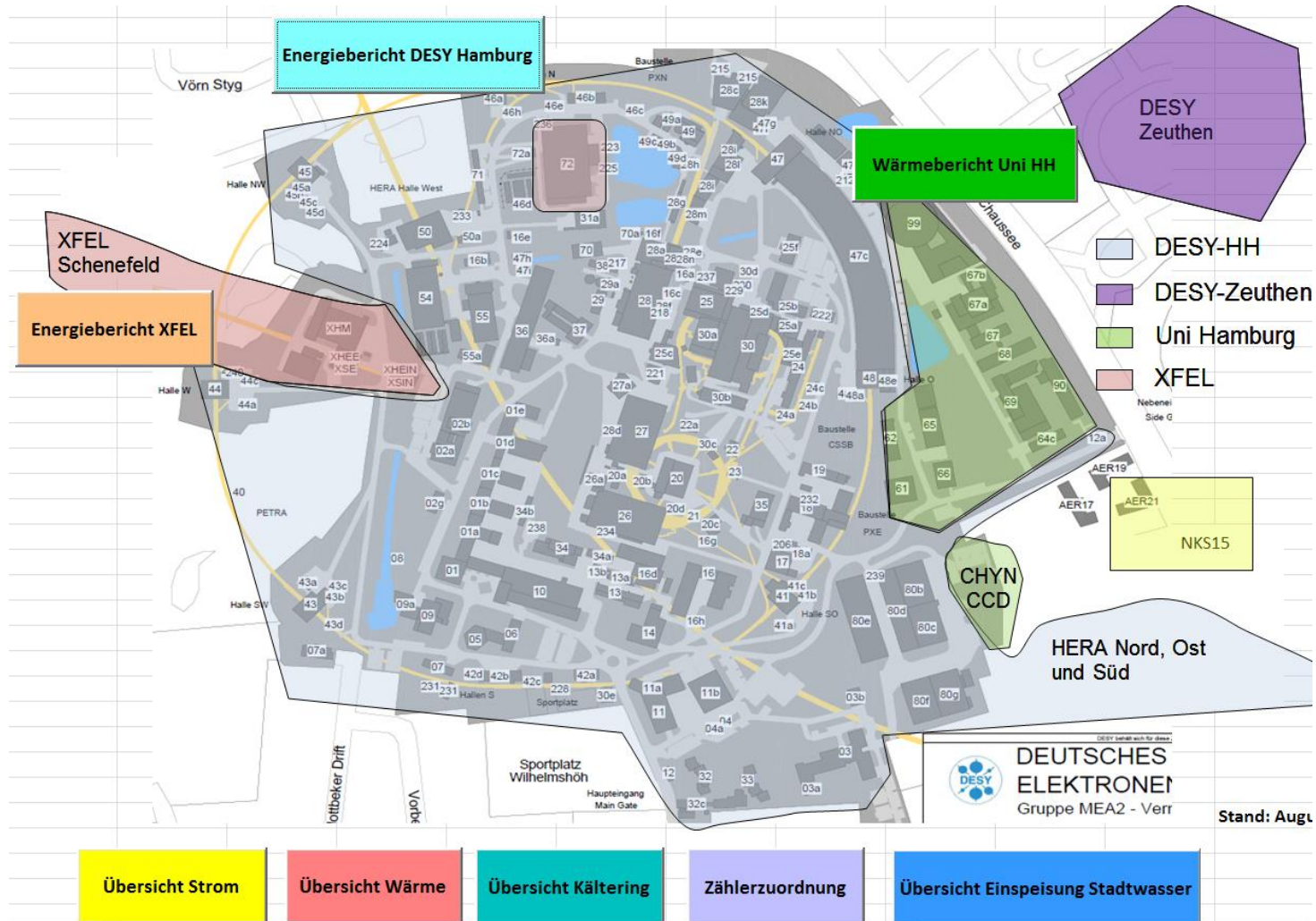
Importieren im Excel

Exportieren nach Oracle

Schließen

3

3) Energy report Tool



3) Energy report Tool



3) Energy report Tool

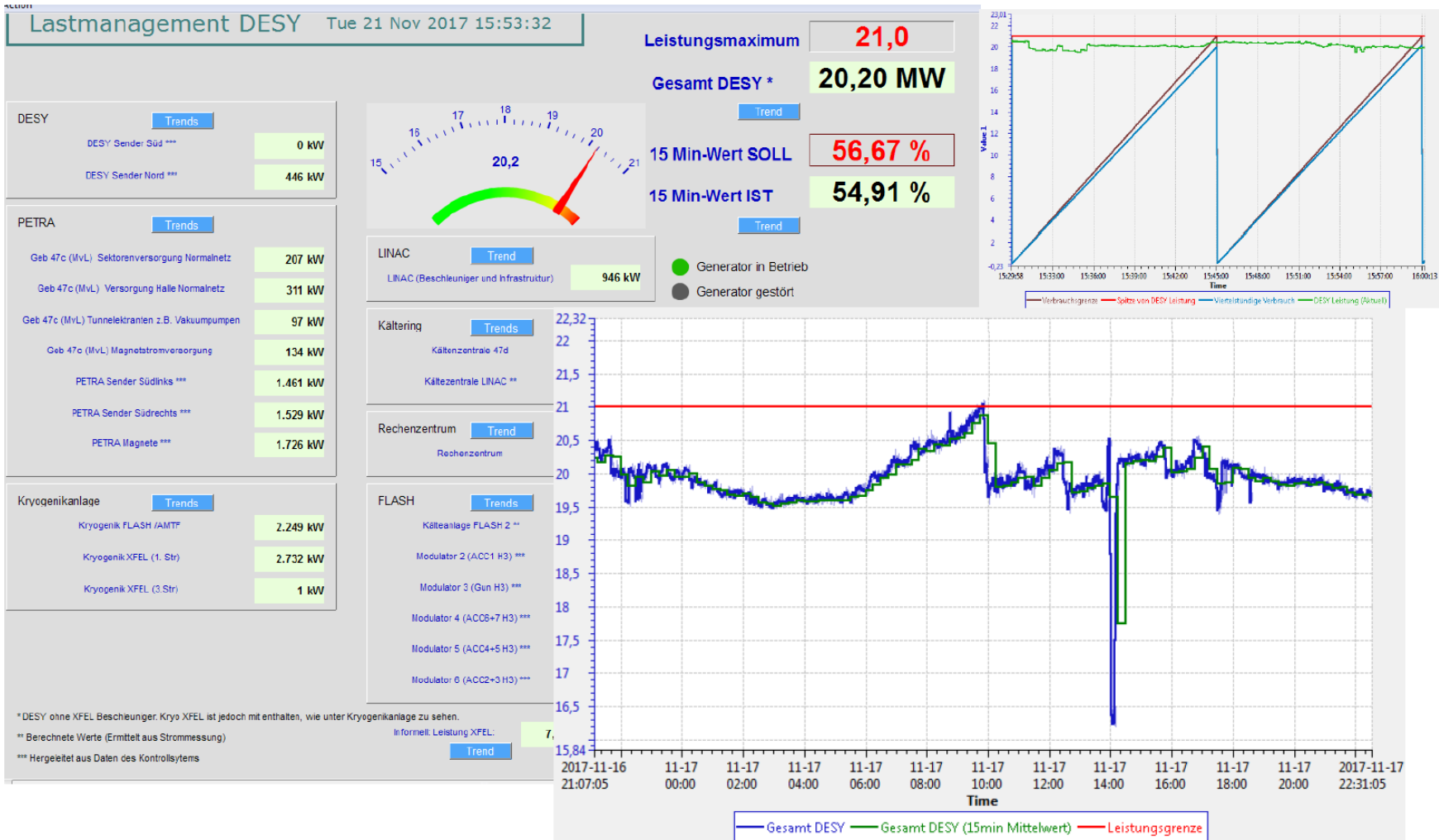
DESY gesamt

	Verbraucher	Medium	Verbrauch		Bemerkung	Durchschnittliche		%
100	DESY Gesamt (Campus)	Strom	12.381.424	kWh	Bilanzraum DESY Hamburg (bis 31.12.15 lief die Stromversorgung des XFELs auch über den Zähler; seit 1.1.16 wird diese separat erfasst, s. Bericht XFEL)	16.642	kW	100%
101		Wärme	2.351	MWh	Bilanzraum DESY Hamburg (hier wird neben der Versorgung mit Fernwärme und Gas auch die Wärmerückgewinnung der Kryogenanlage berücksichtigt); ausgenommen AER 21	3.160	kW	100%
102		Stadt-wasser	Keine Daten	m3	Bilanzraum DESY Hamburg + XFEL Bahrenfeld (aktuell noch keine Unterzählung) ; ausgenommen AER 21	Keine Daten	m3/h	

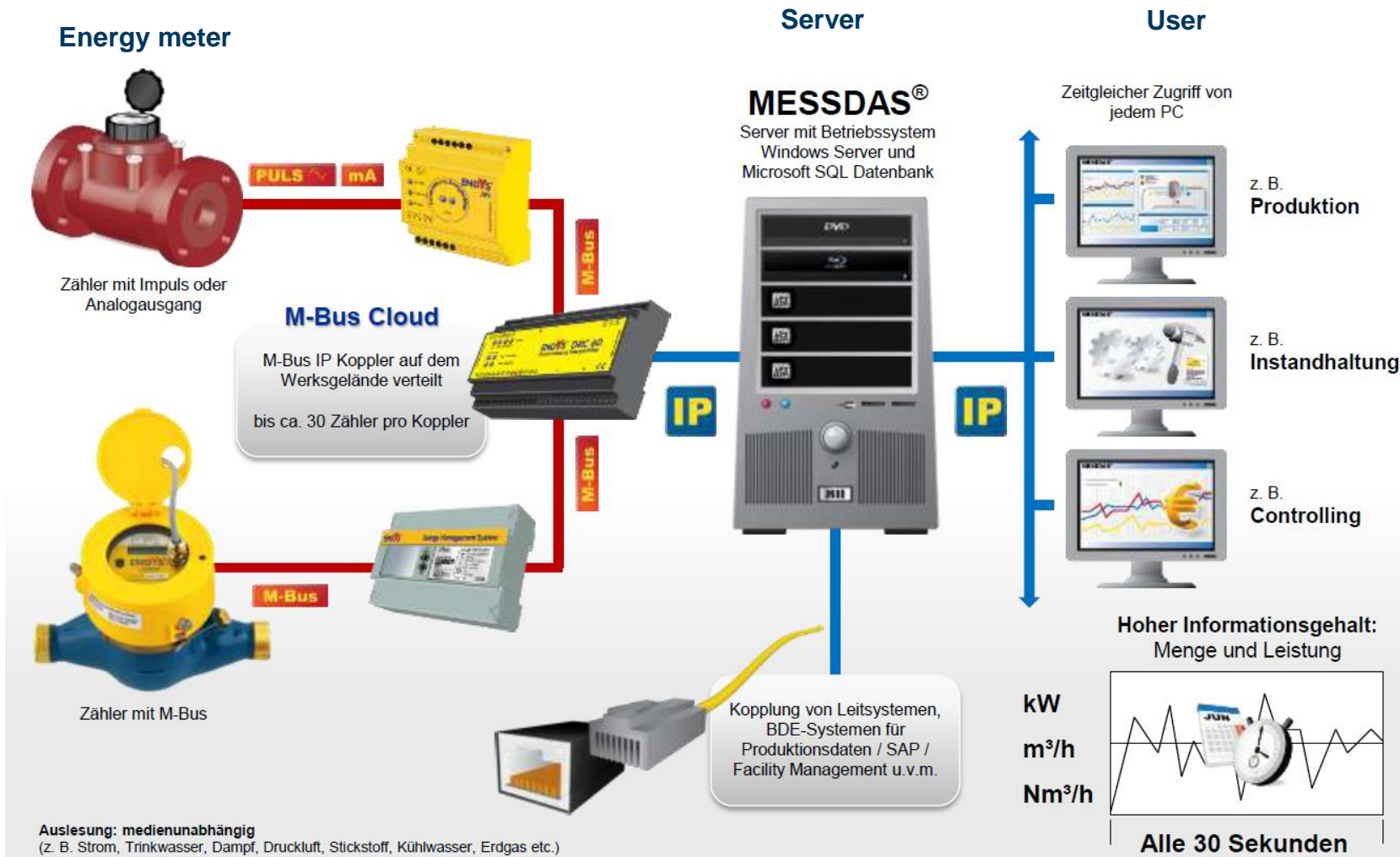
Gebäude

200	Geb 1,1a,b,c,d,e	Strom	63.153	kWh		85	kW	0,51%
201	Geb 3,3a,b	Strom	63.258	kWh	Gesamtes Gebäude inkl. 3a und 3b und UV 3-33; ohne Mobilfunkantenne	85	kW	0,51%
202		Strom	4.202	kWh	UV 3-33 (AMDS)	6	kW	0,03%
203	Geb 3	Wärme	77	MWh	unklar ob nur Gebäude 3 oder gesamte UST inkl. Geb 3a; Im Dez 16 stehen geblieben; Neuer Zähler in der Beschaffung	103	kW	3%
279	Geb 6	Strom	302	kWh		0	kW	0,002%
280		Wärme	28	MWh		38	kW	1%

4) Visualization tool for electrical load profile management



5) MESSDAS (09/14/2018)



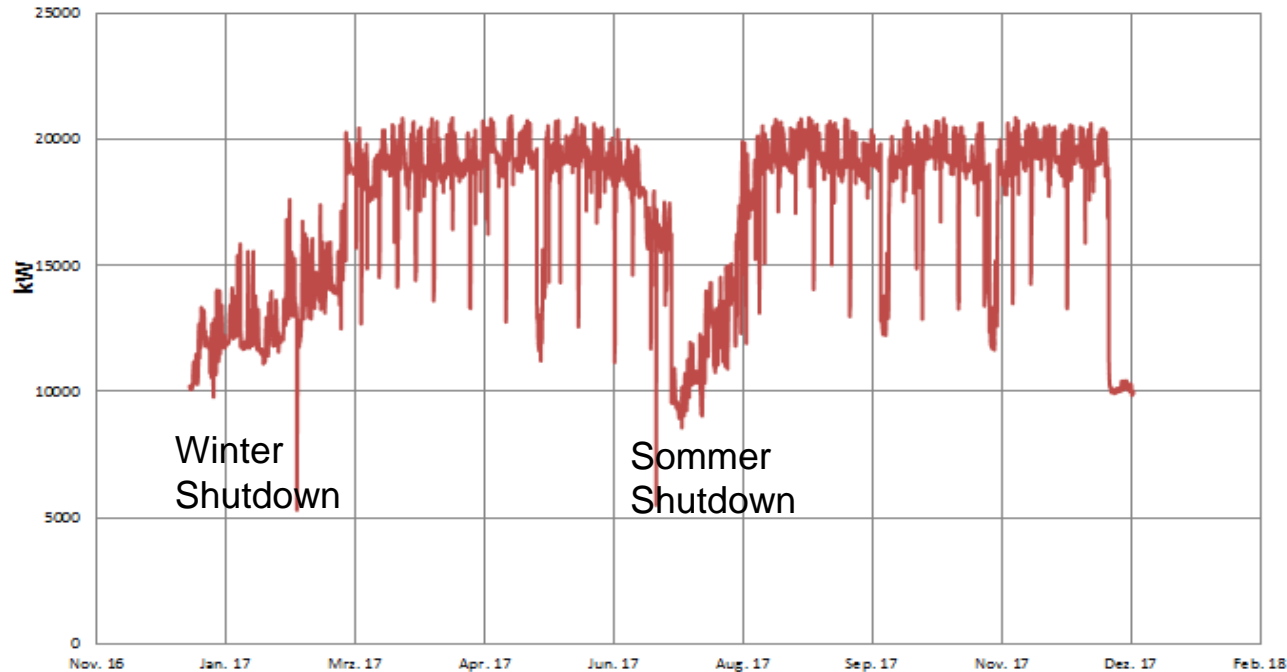
5) MESSDAS (09/14/2018)



Next...



1) Electrical load profile management for network charges reduction (2017)



- 20.95 MW Power Peak
- 7,146 operating hours
- Investment 200 k€
- 1 FTE



**appr. 1.5 Mio €
saving**

2) Cryogenic waste heat recovery

- Invest costs: 450,000 €
- Energie saving: 7.5 GWh / year
- Saving costs: 200,000 €/ year

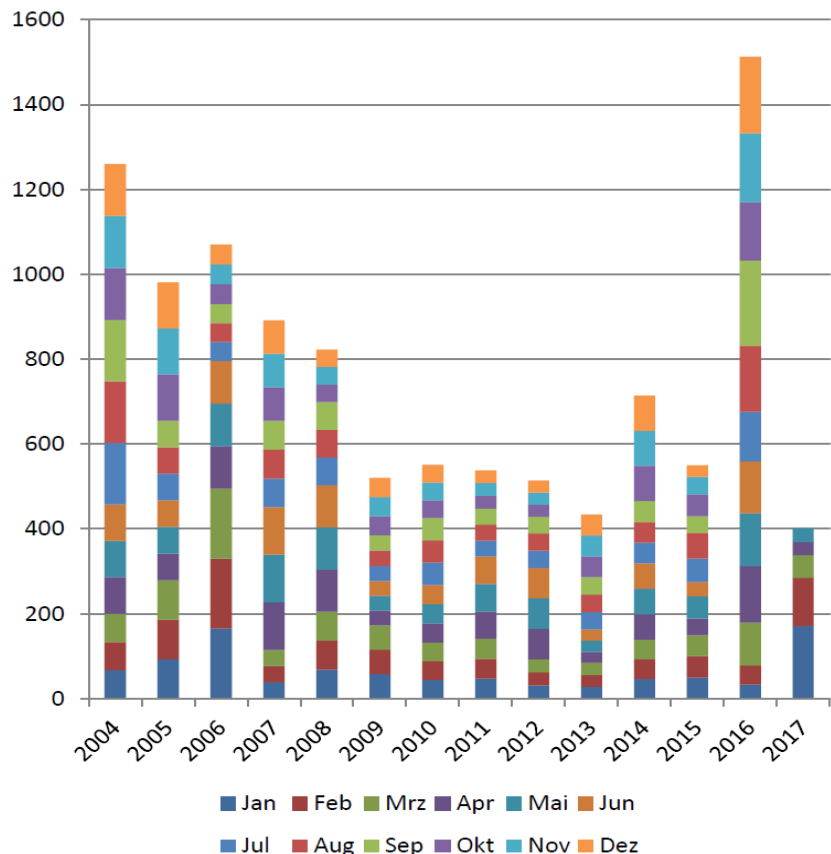


Pumping unit

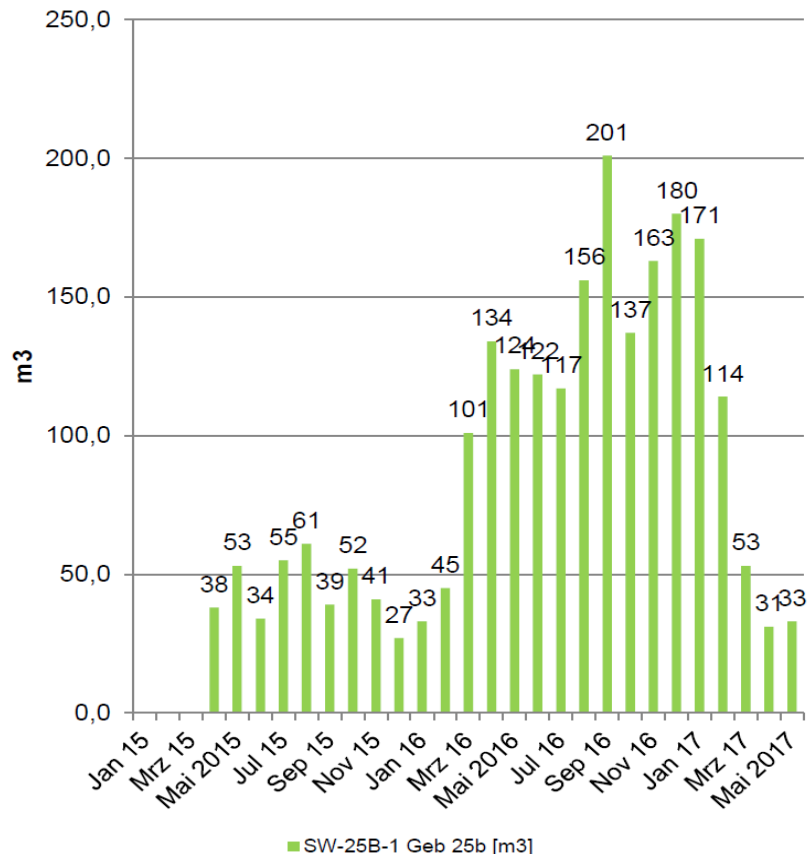


Oil-water heat exchanger

3) Identify inefficient working equipments

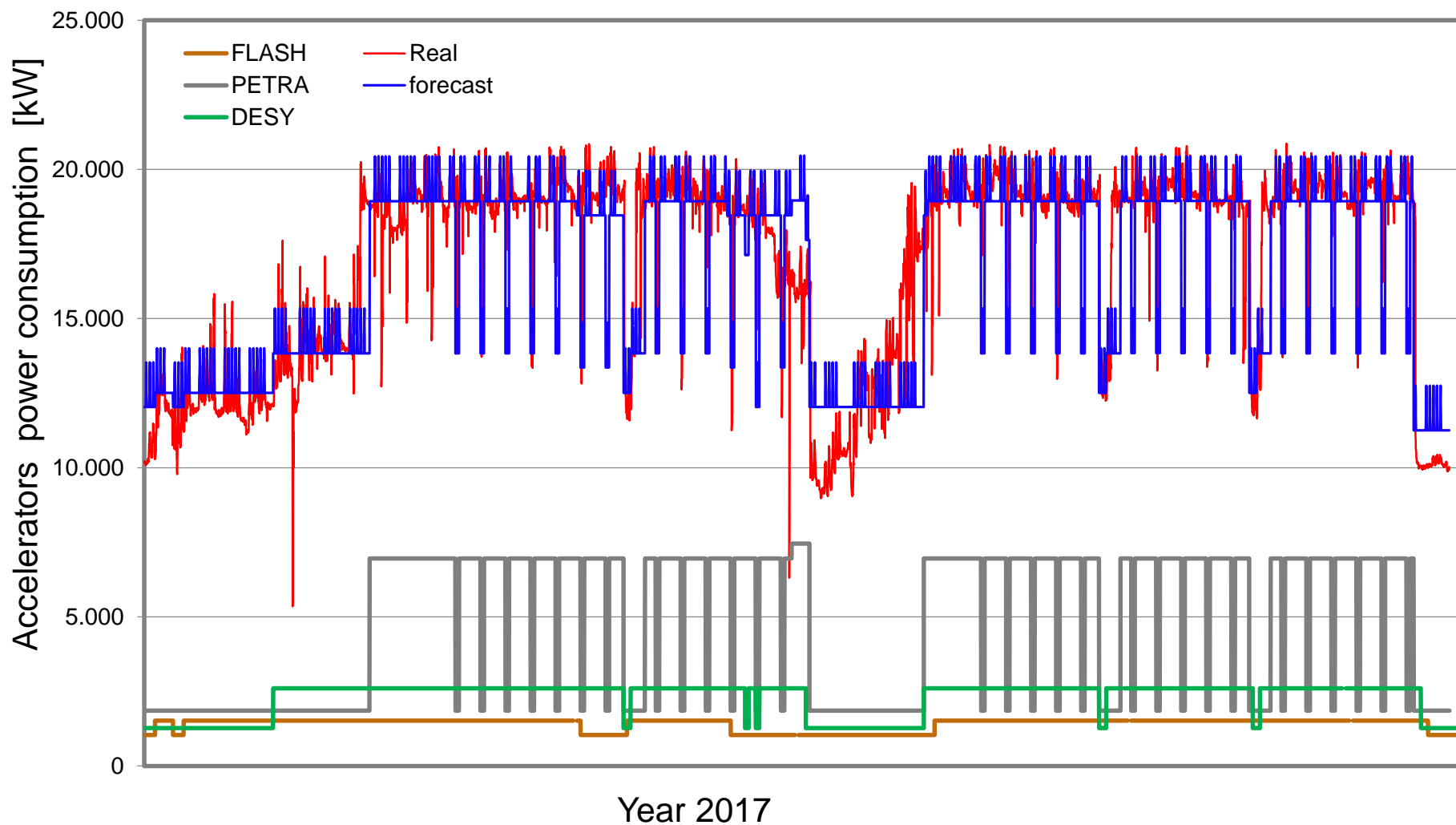


1

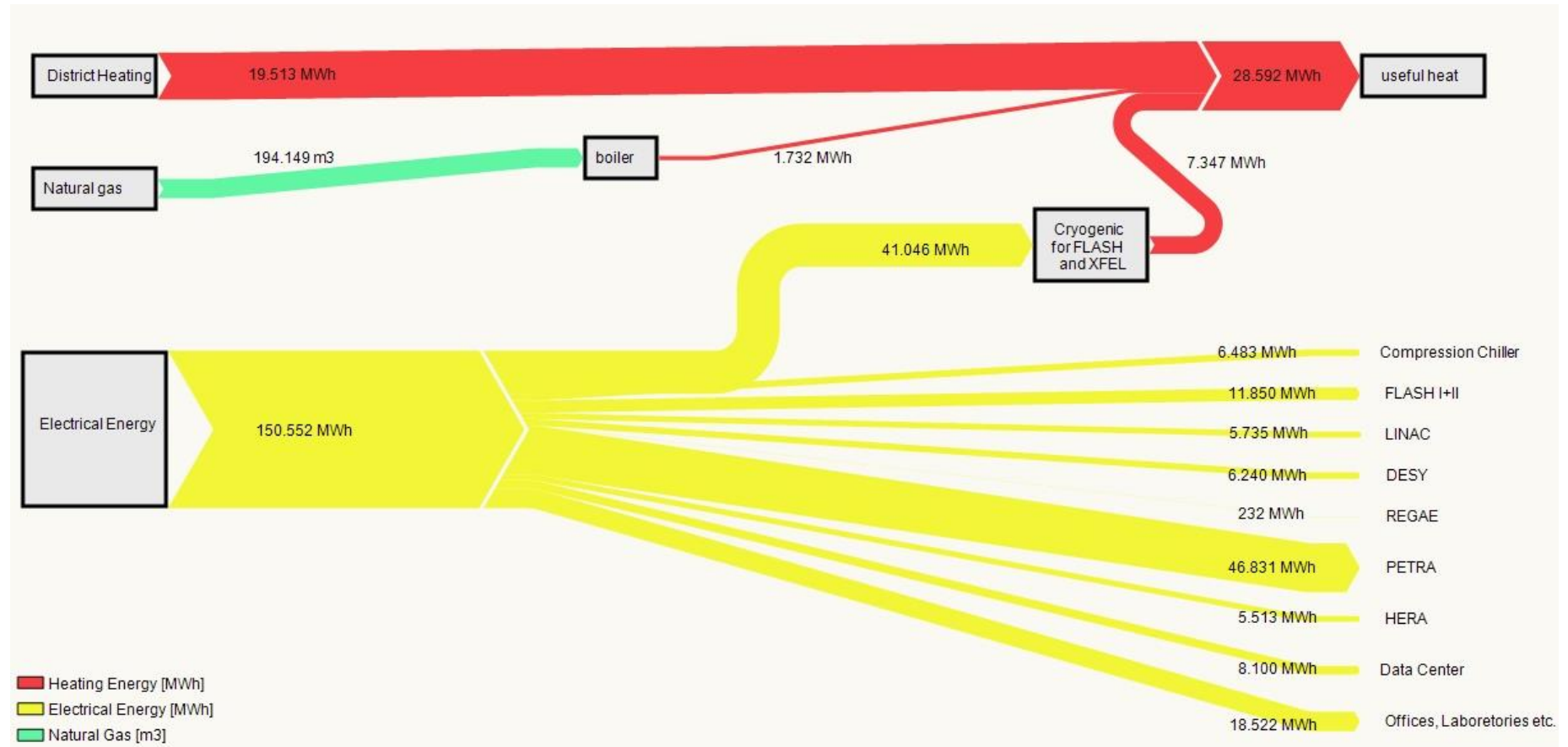


2

4) Reliable data base for energy consumption forecasting



5) DESY Hamburg energy flow in 2017



Next...

DESY energy
consumption

EMMS
at DESY

EMMS
Tools

Achievements

Outlook

Next steps...

- Integrate all counters in the new MESSDAS software for automatic data collection at short and regular intervals.
- Installation of news meters over the next 5 years.
- Detailed metering of buildings and large facilities.
- Investigation for more opportunities to save energy.
- Energy efficiency through process optimization.
- Raising the energy awareness of employees.
- More FTEs for the project.

Some sticking points...

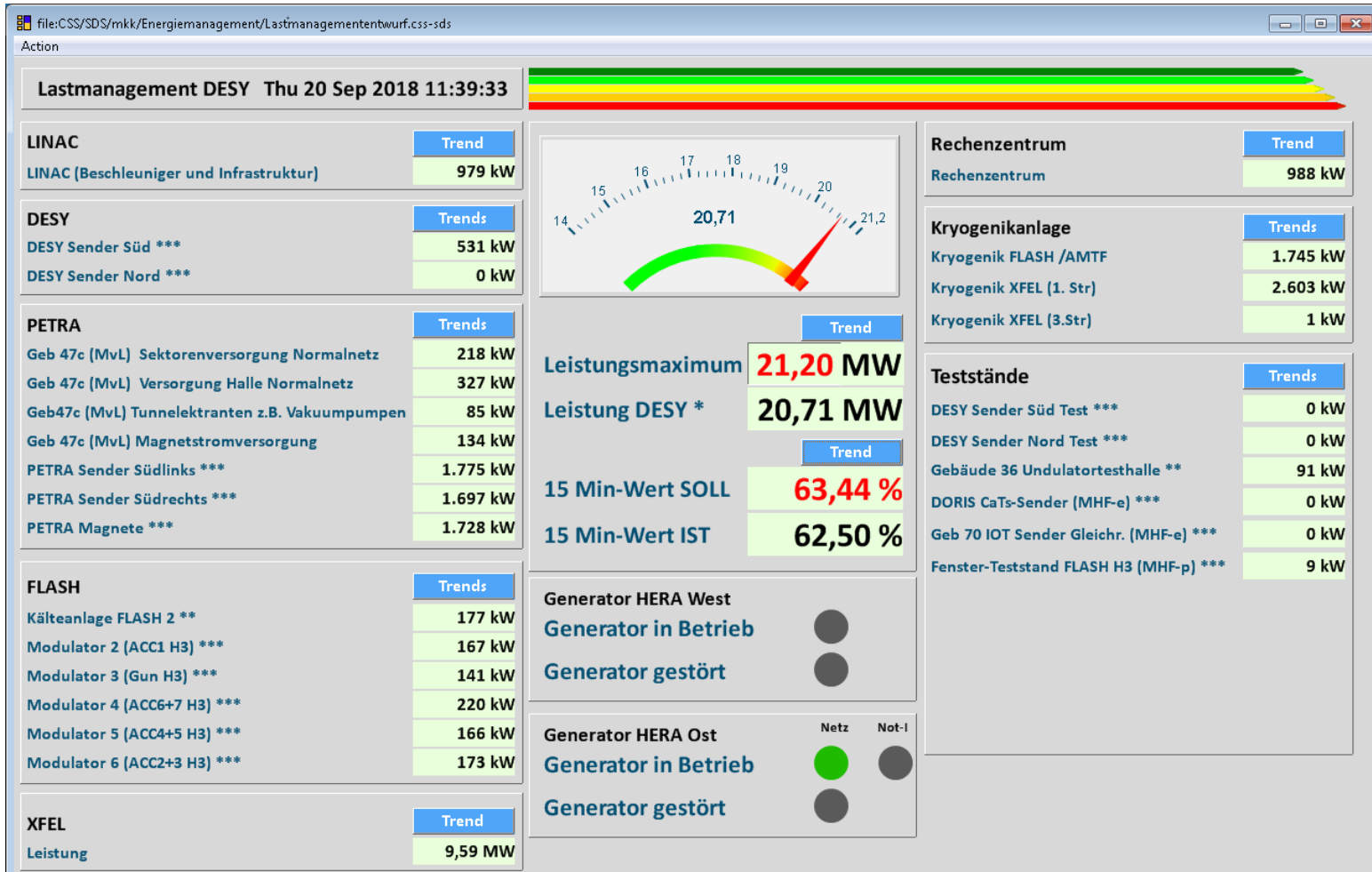
- Better communication between departments (behavioural, technical and organisational obstacles).
- Automatic load profile management.
- Data exchange with existing process control systems.
- Visibility of energy data across the organization.

Nevertheless...

- **Only who knows his energy flows, can control them!**
- **Only who knows his energy consumption structure, can find savings potential!**

Some sticking points...

- Better communication between departments (behavioural, technical and organisational obstacles).



Some sticking points...

- Better communication between departments (behavioural, technical and organisational obstacles).
- Automatic load profile management.
- Data exchange with existing process control systems.
- Visibility of energy data across the organization.

Nevertheless...

- **Only who knows his energy flows, can control them!**
- **Only who knows his energy consumption structure, can find savings potential!**

Many thanks to...

- Eva Leister (**Head of EMMS team – DESY Hamburg**) for her nice pictures and contribution to this presentation,
- Jörg Eckoldt (**Head of magnets power supplies department – DESY Hamburg**) for his suggestions to this presentation,
- You for listening.

End