TRIMET Aluminium SE

Aluminium Reduction –

Challenges and Opportunities under changing market conditions

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TRIMET Aluminium SE

Global aluminium market

trimet

Current market situation – the bad

Preisverfall: Ex-Siemens-Chef schließt größte Alu-Hütte in den USA

Mit Aluminium lässt sich kaum noch Geld verdienen, das zwingt den US-Konzern Alcoa zu einer Schrumpfkur: Das größte Werk in den USA muss dichtmachen, ein deutscher Manager wickelt es ab.

Spiegel.de, 8.1.2016

38% of Chinese smelters bearish toward aluminium prices this week, SMM survey

38% of the 42 Chinese aluminium smelters surveyed by SMM are bearish toward this week's aluminium prices .Those pessimists fear that LME aluminium will fall below USD 1,500/mt and that SHFE 1603 aluminium will drop below RMB 10,500/mt. They argue ...

Aluminium futures weaken on overseas cues, shed 0.10 per cent

Aluminium prices were down 0.10 per cent to INR 100.70 per kg in futures trade today as investors cut down their bets amid weak Asian cues and sluggish demand in the domestic spot market.In futures trading at the Multi Commodity Exchange, alumini ...

AlCircle Newsletter 29.12.2015

Rio Tinto to reconsider sale process for its Australian aluminium smelter assets

CATEGORY

DETAIL

Metal and Mineral giant Rio Tinto is re-considering sale of its aluminium assets at three of its Australian smelters- Tasmania's Bell Bay, Queensland's Boyne and New South Wales' Tomago and is seeking buyers for the same. The dual-listed miner has engaged an investment bank to handle the entire selling operations.

AlCircle.com 23.8.2016

Bosnian govt to resume sale of Aluminij d.d. Mostar

The government of Bosnia and Herzegovina announced its plans to offer stake in Aluminij d.d. Mostar aluminium smelter, which will be put up for sale by end of 2016, reported Goran Djukanovic on Aluminium Insider. The sale process forms a part of a pr ...

AlCircle.com 25.8.2016

Marktbericht

Industriemetalle schwächeln zu Jahresbeginn

Zum Jahresauftakt ziehen die schwachen chinesischen Aktienmärkte nicht nur die anderen asiatischen Aktienmärkte mit nach unten, sondern wirken sich darüber hinaus auch negativ auf die Metallpreise aus. So wurden teilweise Kursverluste in Höhe von mehr als 3% verzeichnet.

Trimet Newsletter 5.1.2016

Alcoa Portland smelter under threat of closure as power subsidy axed by Victorian Government

By Bridget Judd

Posted 30 May 2016, 11:06am

The end of a decades-long power subsidy is threatening the future of Portland's smelter, putting at risk the Victorian coastal community's economy.

Abc.net.au – 30.05.2016

Current market situation – the good

Russia's RUSAL to start Boguchansk aluminium smelter in H1

Russia's Rusal Plc plans to start its new Boguchansk aluminium smelter in the first half of 2016, the company said on Wednesday, after reporting a 53 percent slide in its fourth-quarter core profit. Rusal, the world's largest aluminium producer, h ...

ALCircle 10.3.2016

Vietnam looks to build 300,000-tpy aluminium smelter by 2016

Vietnam is building a 300,000-tpy capacity aluminium smelter in Dac Nong province that is expected to come online next year, Murray Lines, ceo, Stratum Resources Australia said at a conference last week.

MetallBulletin 26.10.2015

Alba sees Line 6 expansion project on track

BAHRAIN, December 14, 2015

Aluminium Bahrain (Alba), one of the world's largest aluminium smelters, said that work on its Line 6 expansion project, estimated to cost $3.5 billion, was on track for completion by January 2019.

Trade Arabia 14.12.2015

China unstoppable at 2.69mt; August aluminium output continue growing

China is simply not showing any signs of slowing down. The momentum at which the country has been churning out aluminium in the last several months is still continuing. Analysts at the Shanghai Metals Market (SMM) are of the opinion that aluminium pr ...

AlCircle.com 24.8.2016

London Metall Exchange

Finanzen.net 15.8.2016

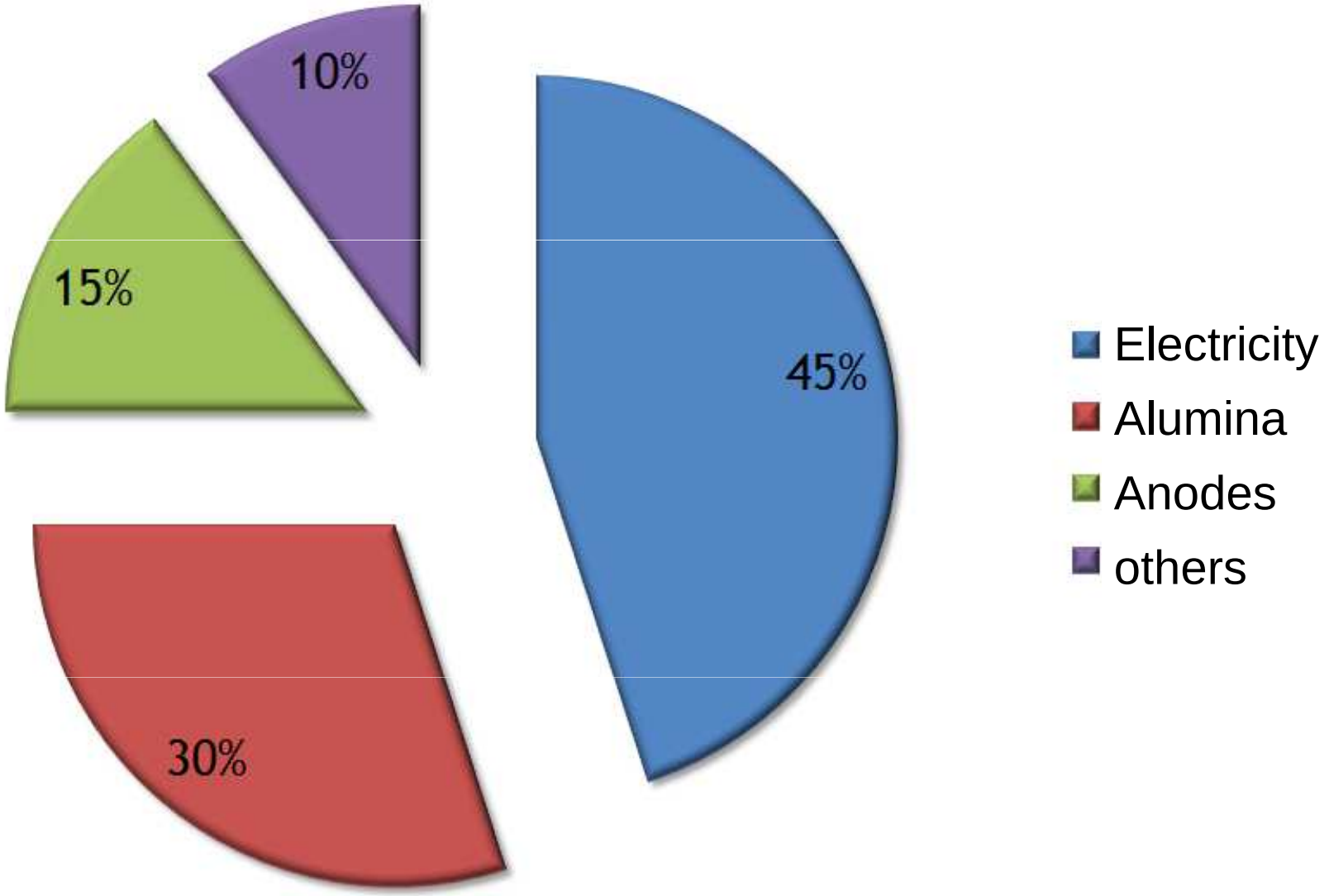
London Metall Exchange

Finanzen.net 15.8.2016

Compared to main energy carriers

Finanzen.net 12.1.2015

Cost structure for primary aluminium production



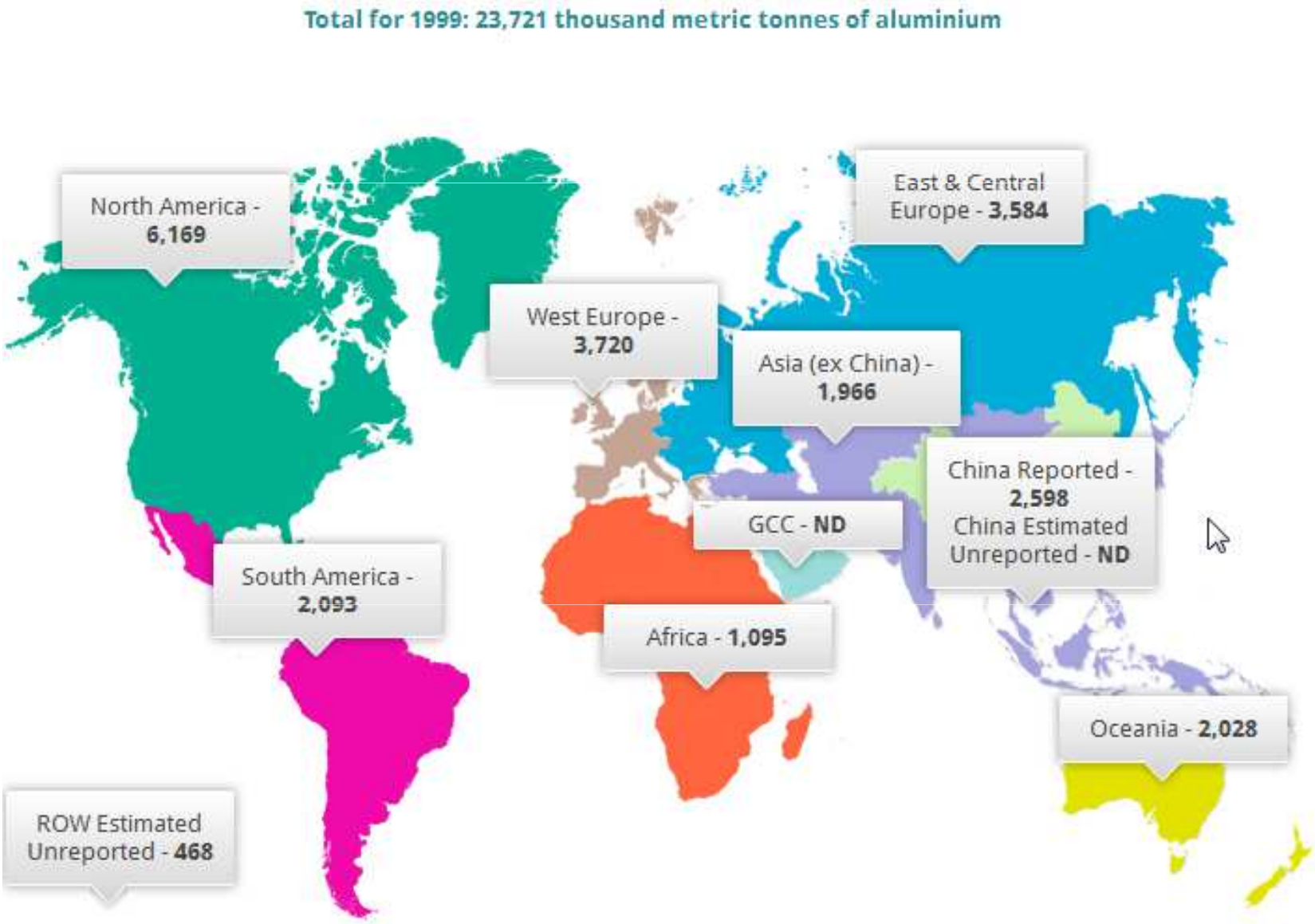
German Energy Market

LME and Phelix Baseload follow the same trends at the moment,
Resulting in acceptable conditions

Finanzen.net 12.1.2015

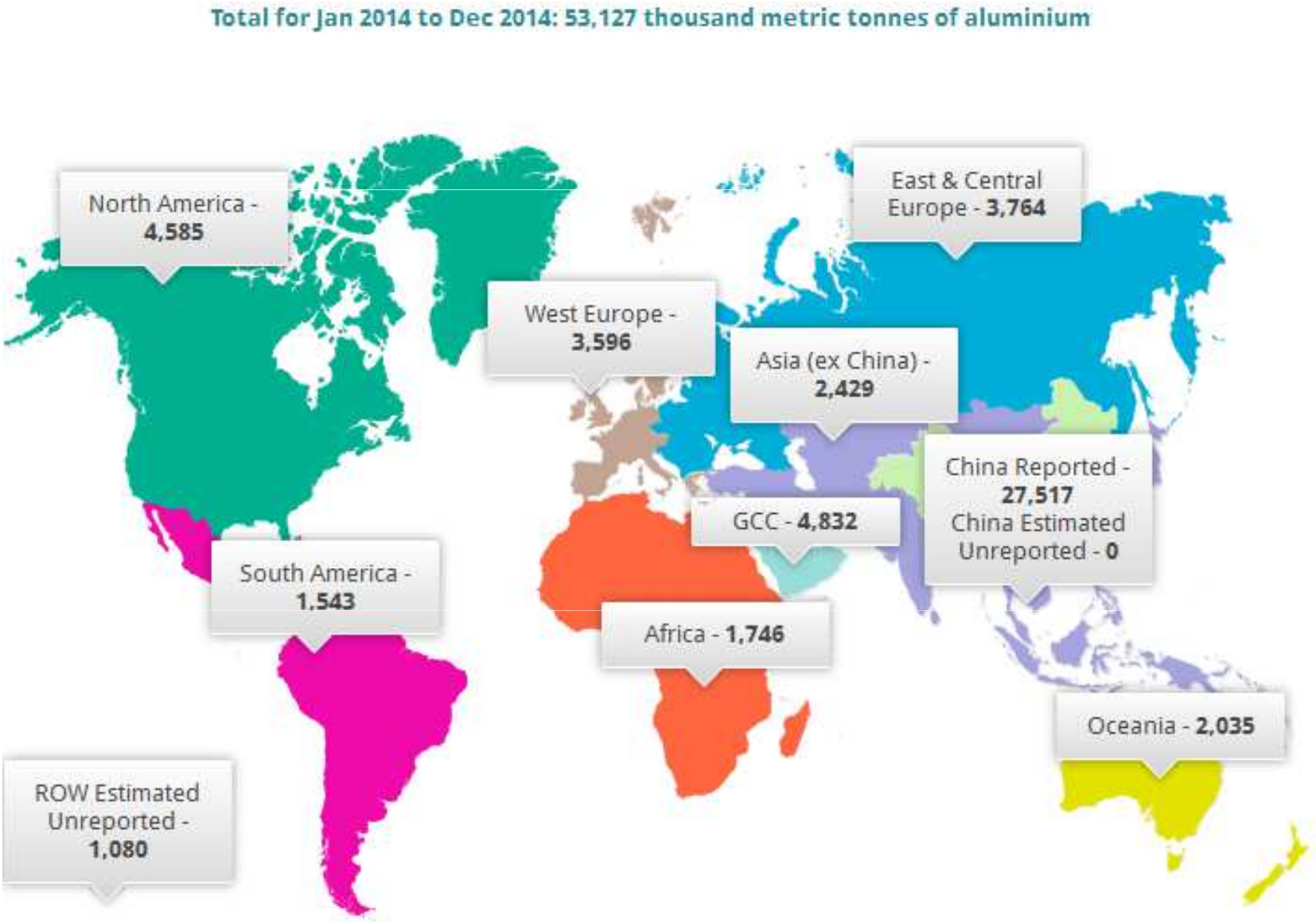
Globale Produkion

Aluminium production 1999



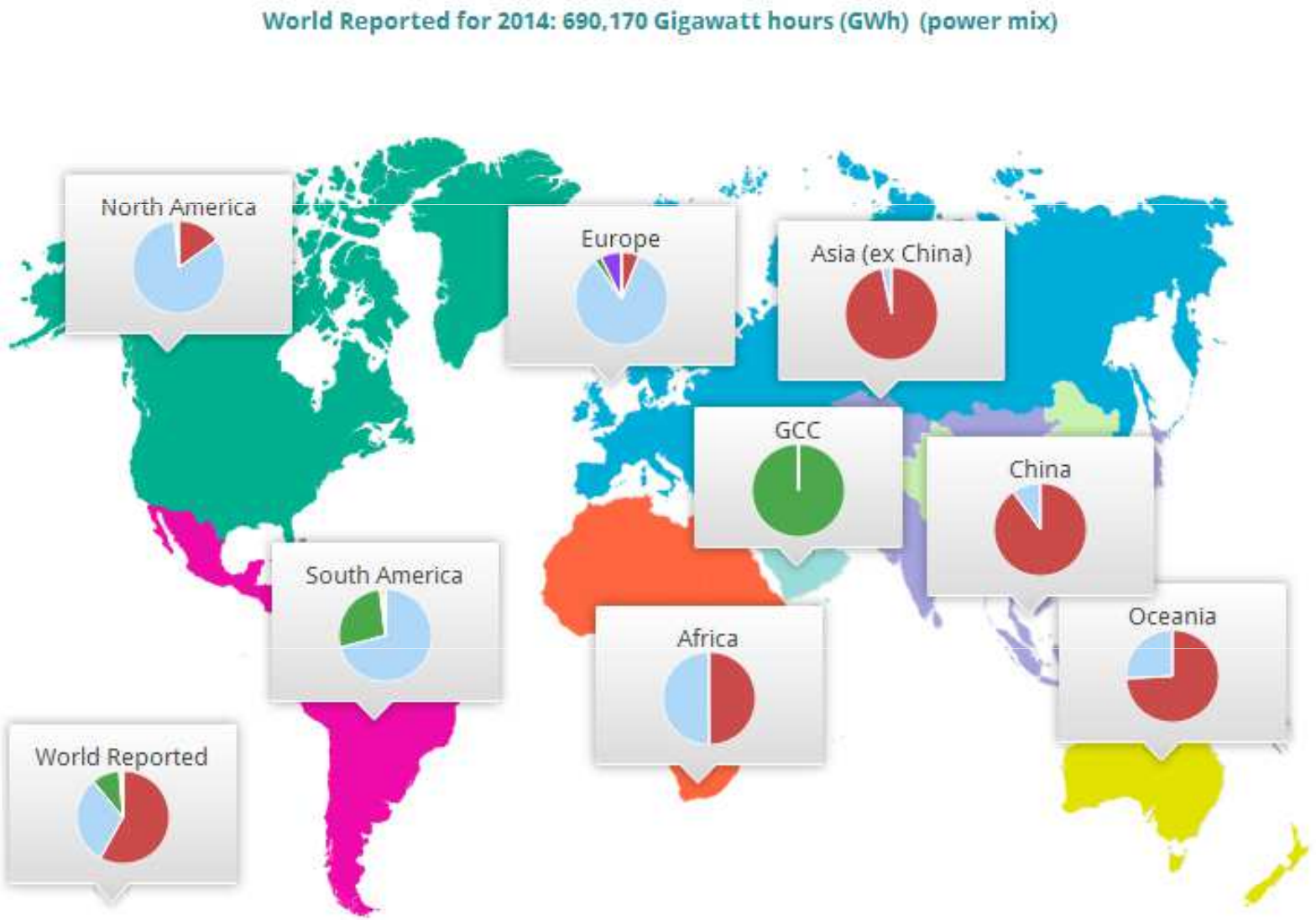
World-aluminium.org (IAI) 12.1.2015

Aluminium production 2014



World-aluminium.org (IAI) 12.1.2015

Energy source for alumionium production (2014)

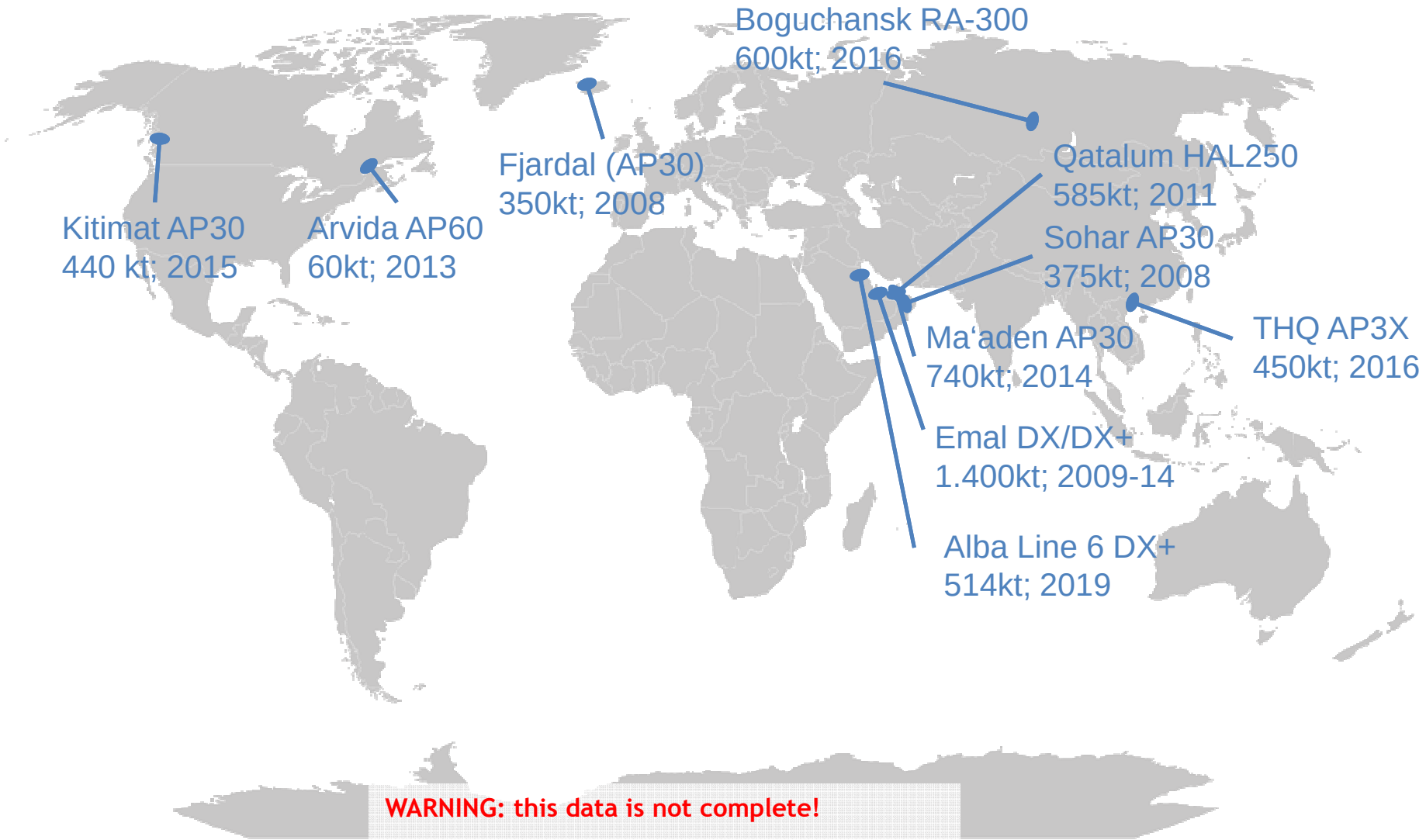


Hydro coal gas nuclear

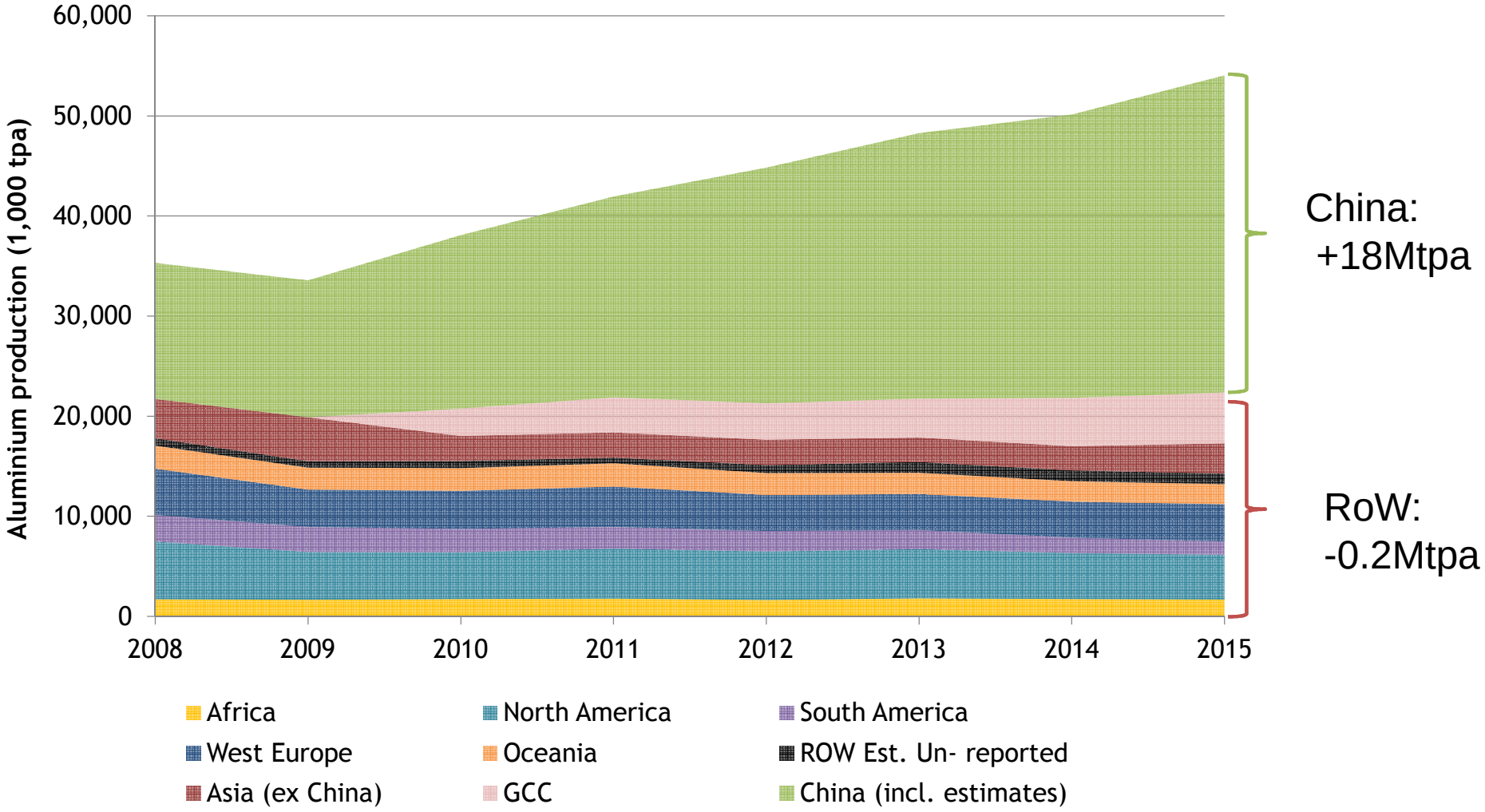
World-aluminium.org (IAI) 12.1.2015

Latest potroom projects (excluding China)

since 2008



Quantative development of Al production



World-aluminium.org (IAI) 15.8.2016

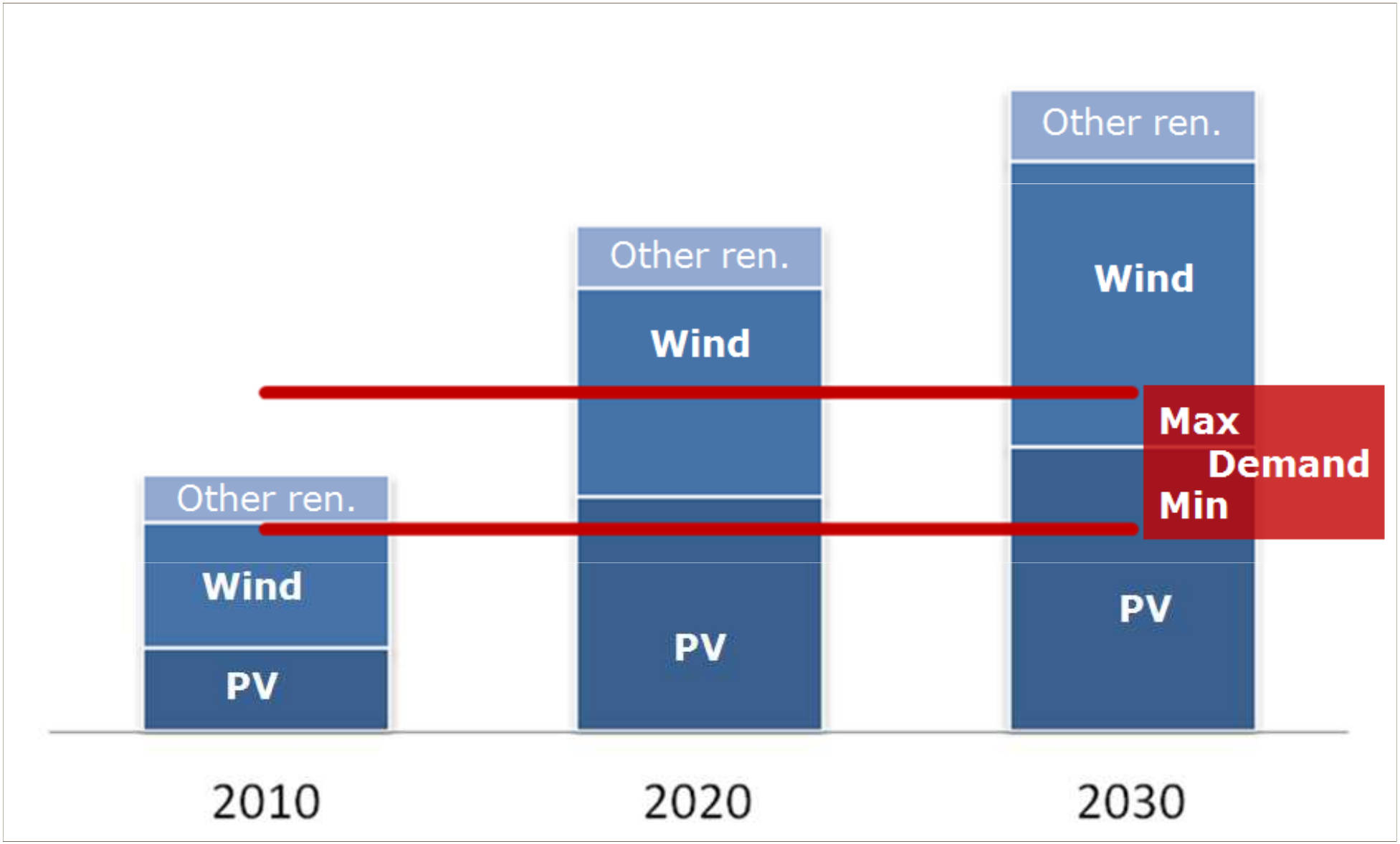
Content

The „Virtual Battery“

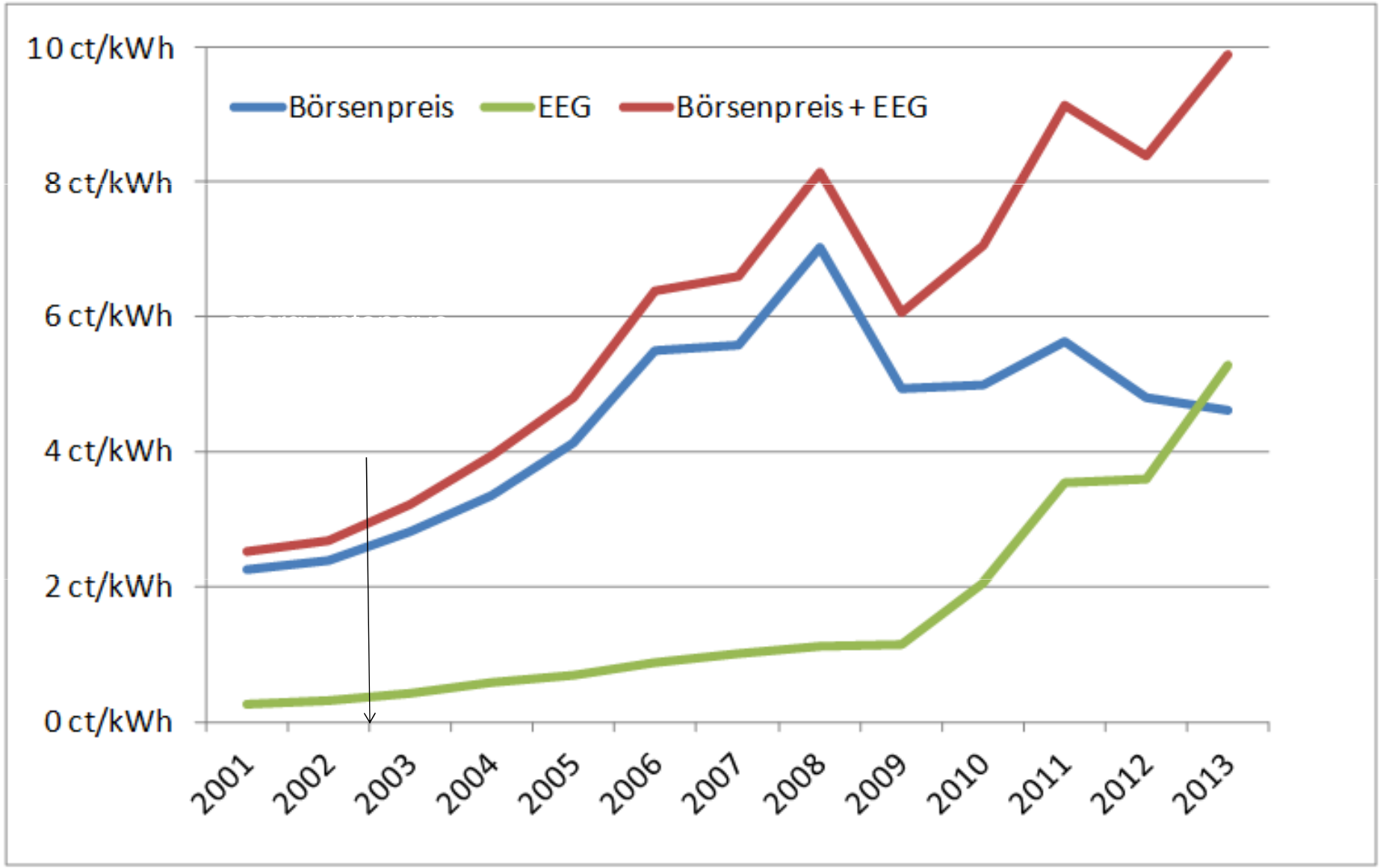
- Why
- What
- How

Virtual Battery – Why?

Installed capacity renewable energies Germany



Consequence for total energy price

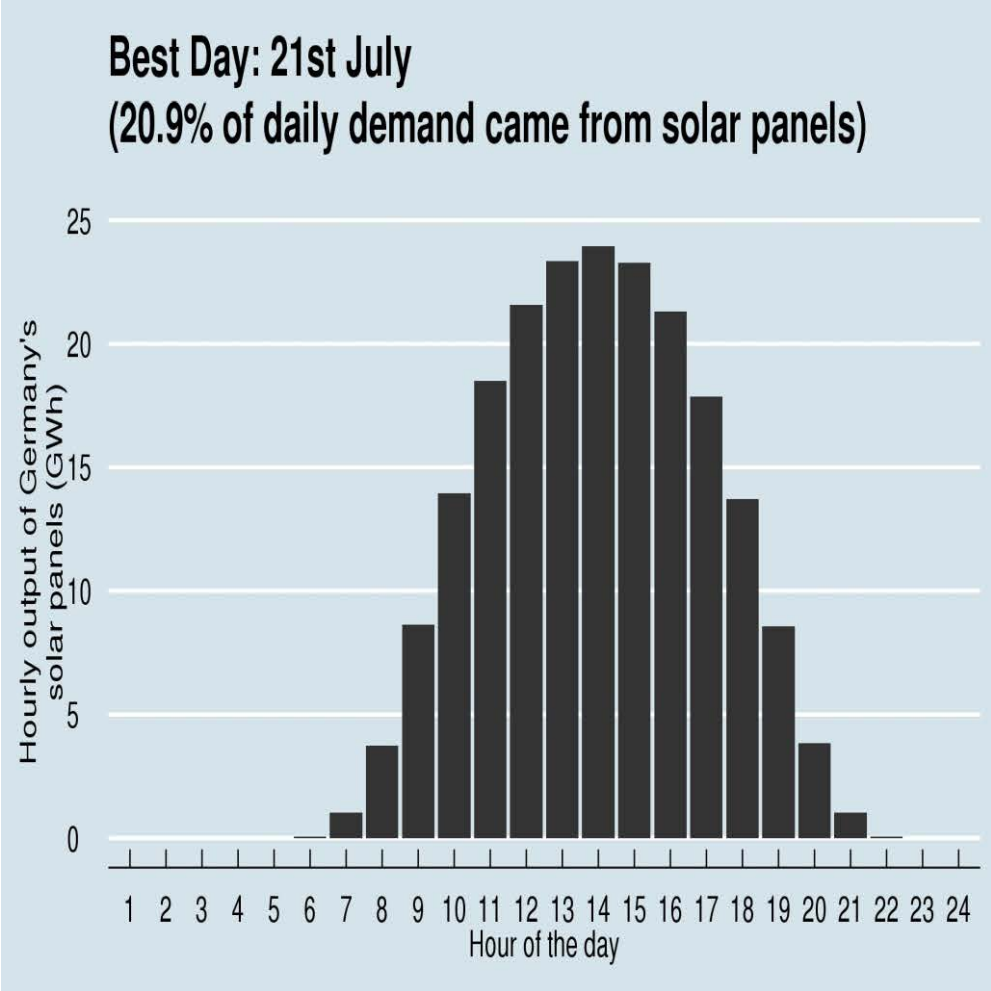


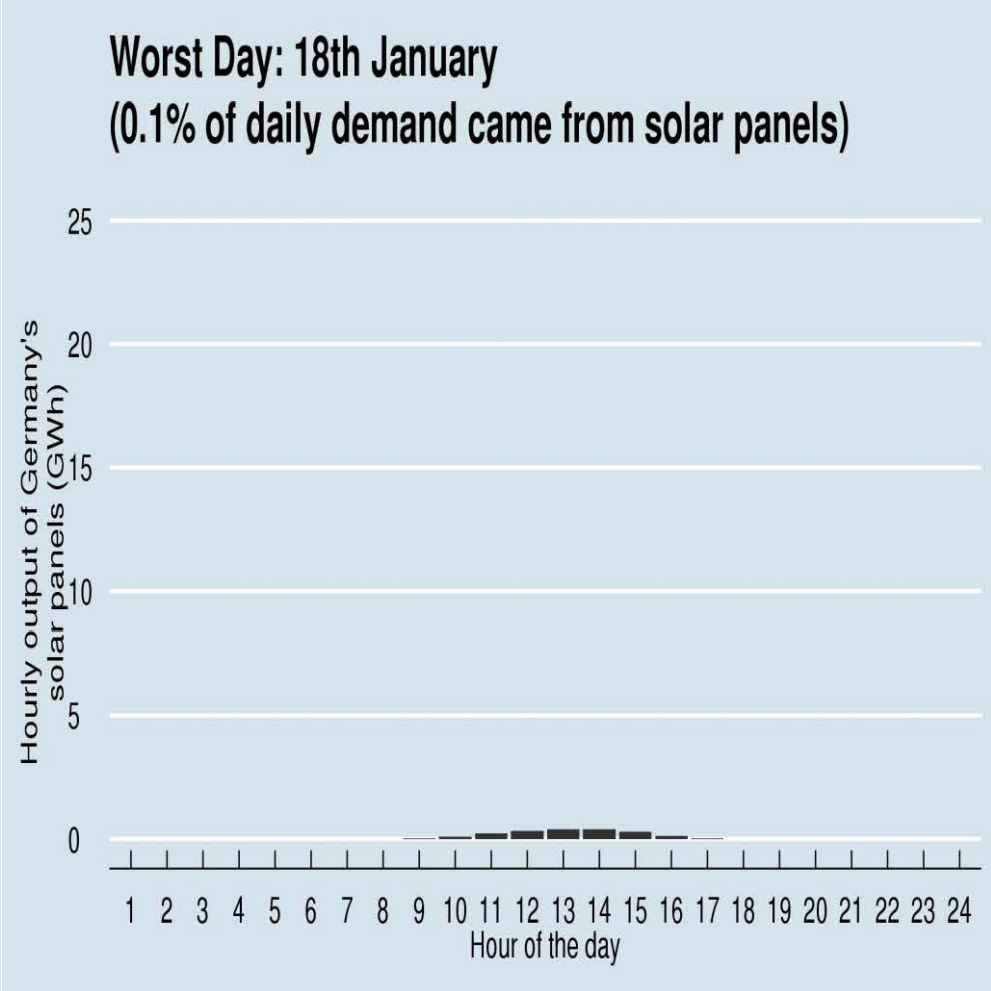
Energy politics

The Biggest Challenge:

How to keep the power grid stable?

Volatility – an example from 2013





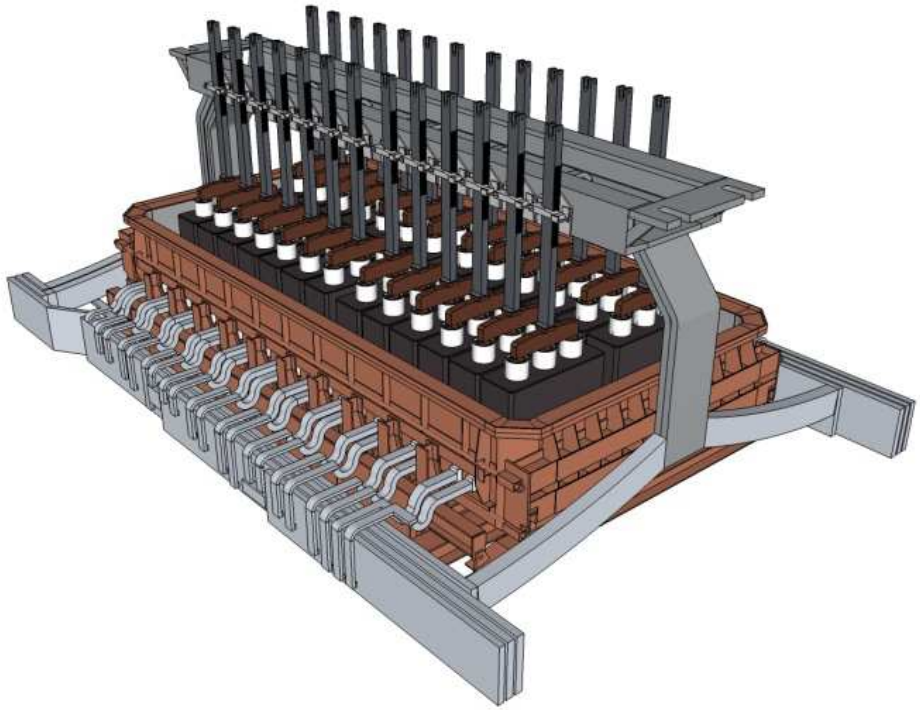
Public view of industry has changed

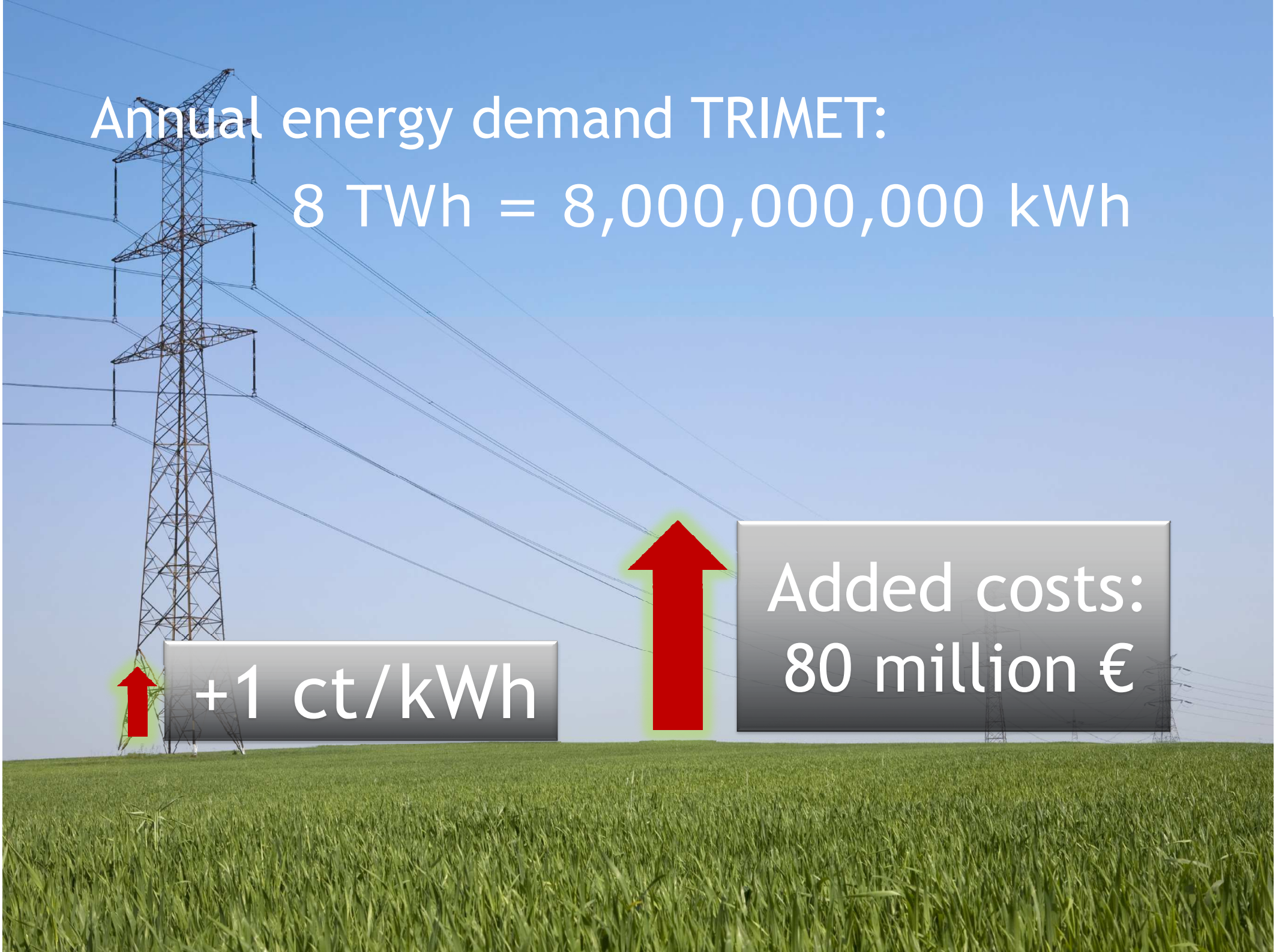
but everyone wants a car likes this

2 Questions

How do we survive financially?

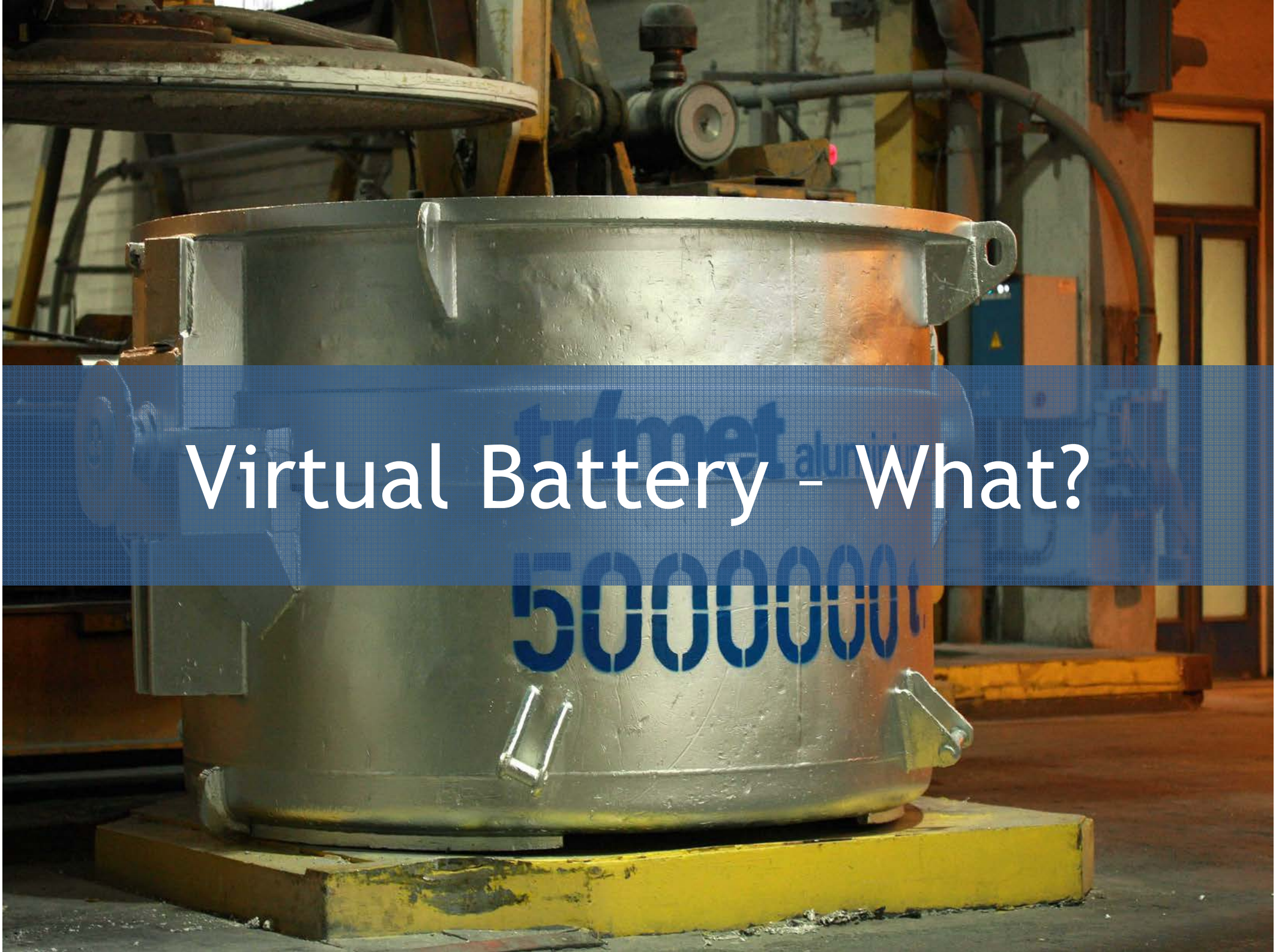
How do we survive socially?




Annual energy demand TRIMET:
8 TWh = 8,000,000,000 kWh
+1 ct/kWh
Added costs:
80 million €

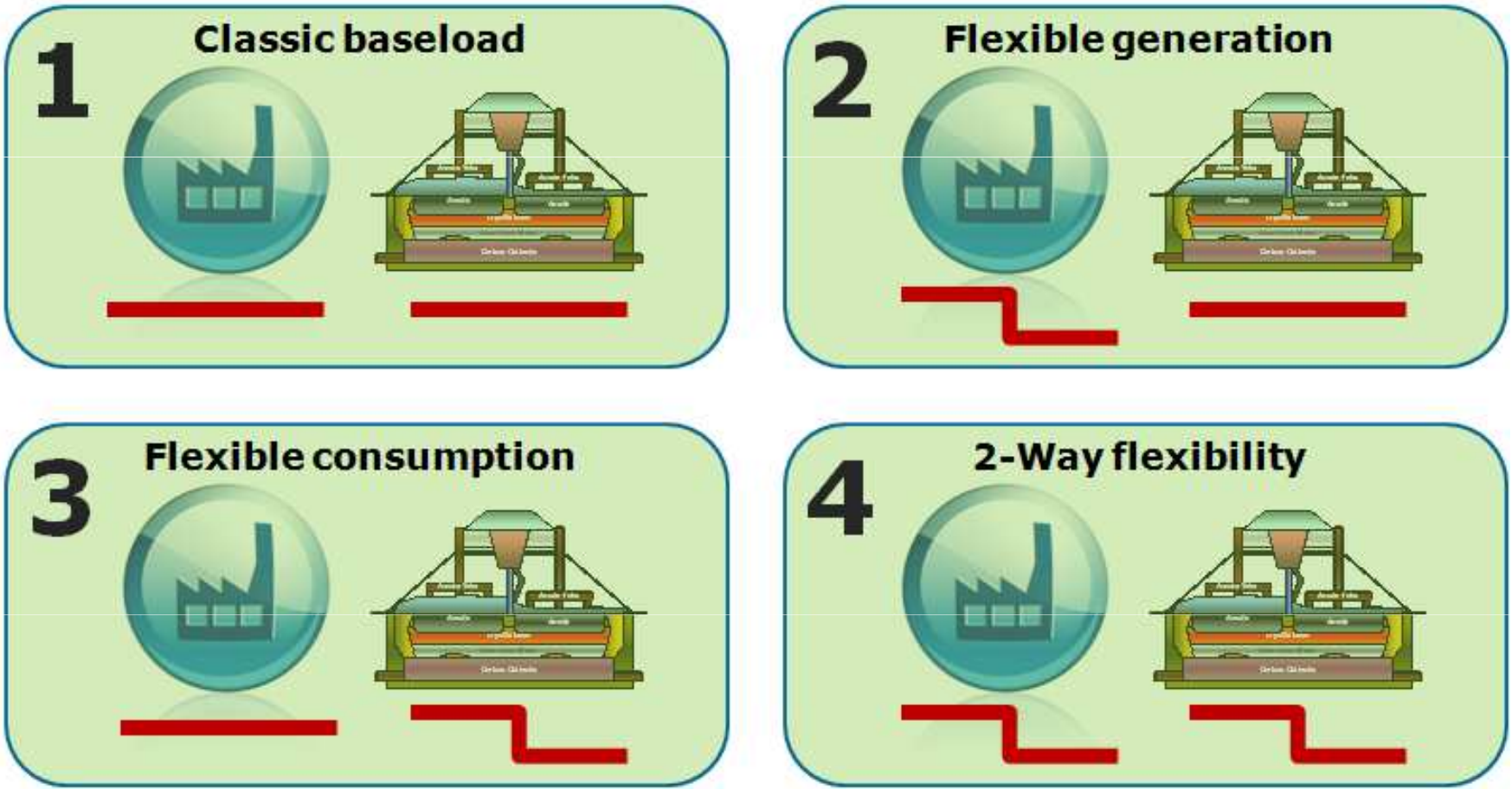
What‘s next?

„Marriage“ of Industry and Energy Transition

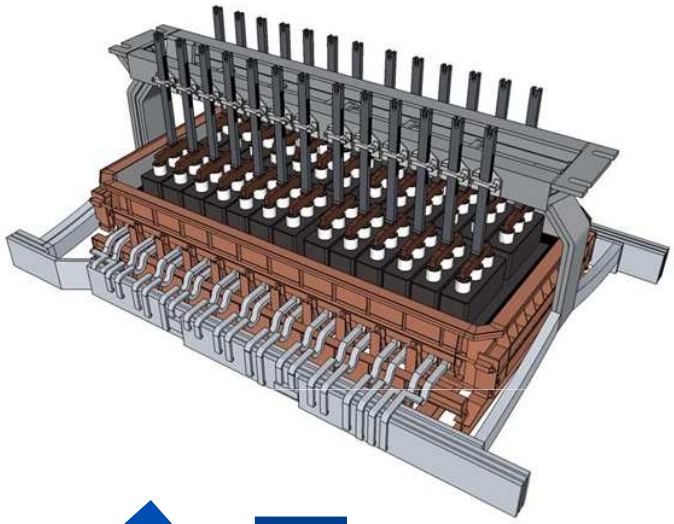


Virtual Battery – What?

Generation & consumption



Energy-intensive industry as a buffer between volatile energy generation & variable demand



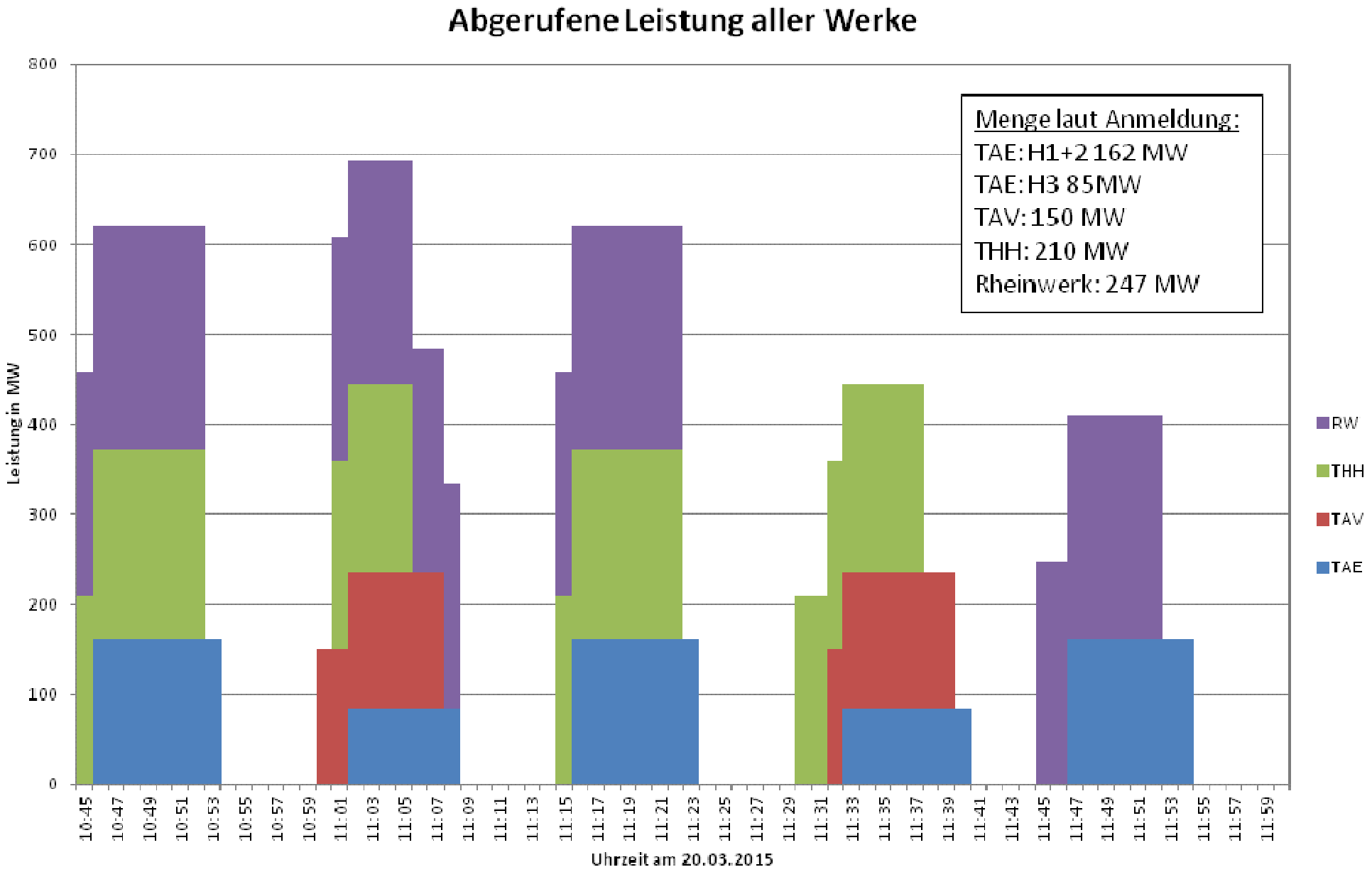
Potential contributions by the energy intensive industry

- ***Standard Energy Reserve mechanisms***
  - Primary & secondary reserve
  - Interruptibility (e.g. requested during the 2015 solar eclipse!)

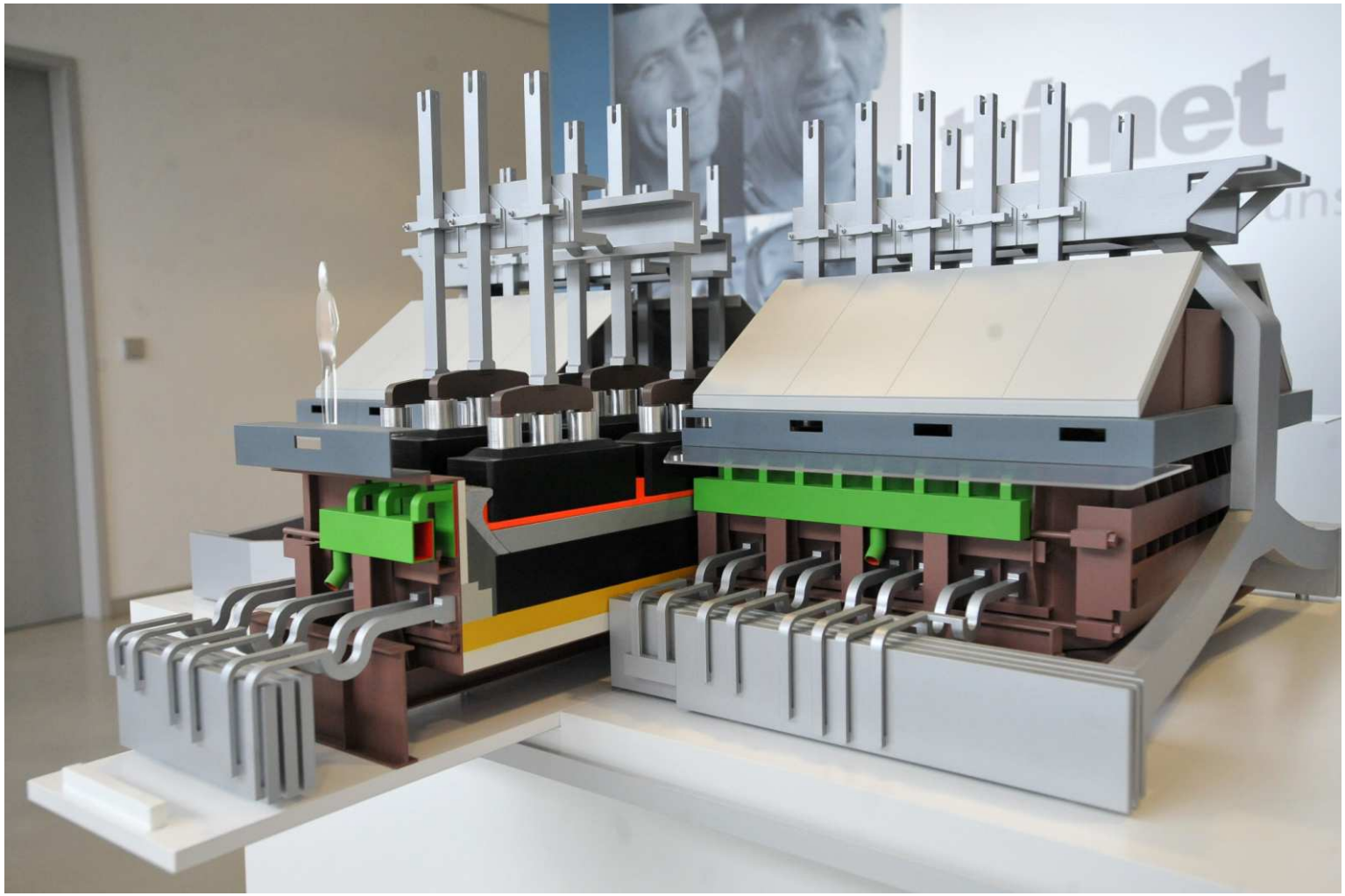
- ***Black Start support (after blackout)***

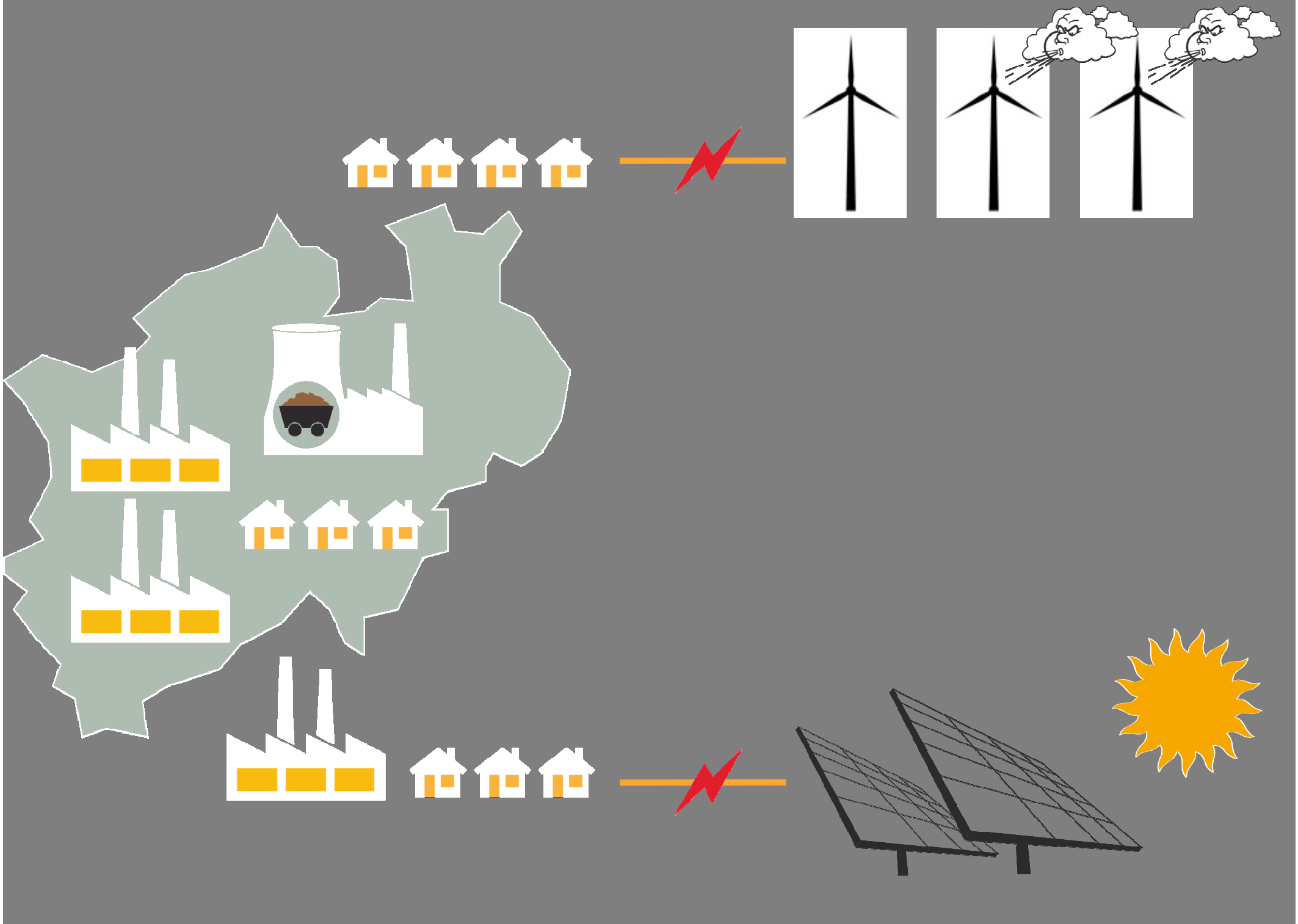
- ***Demand-Response mechanisms***
  → „Virtual Battery“ for the integration of volatile generation capacity

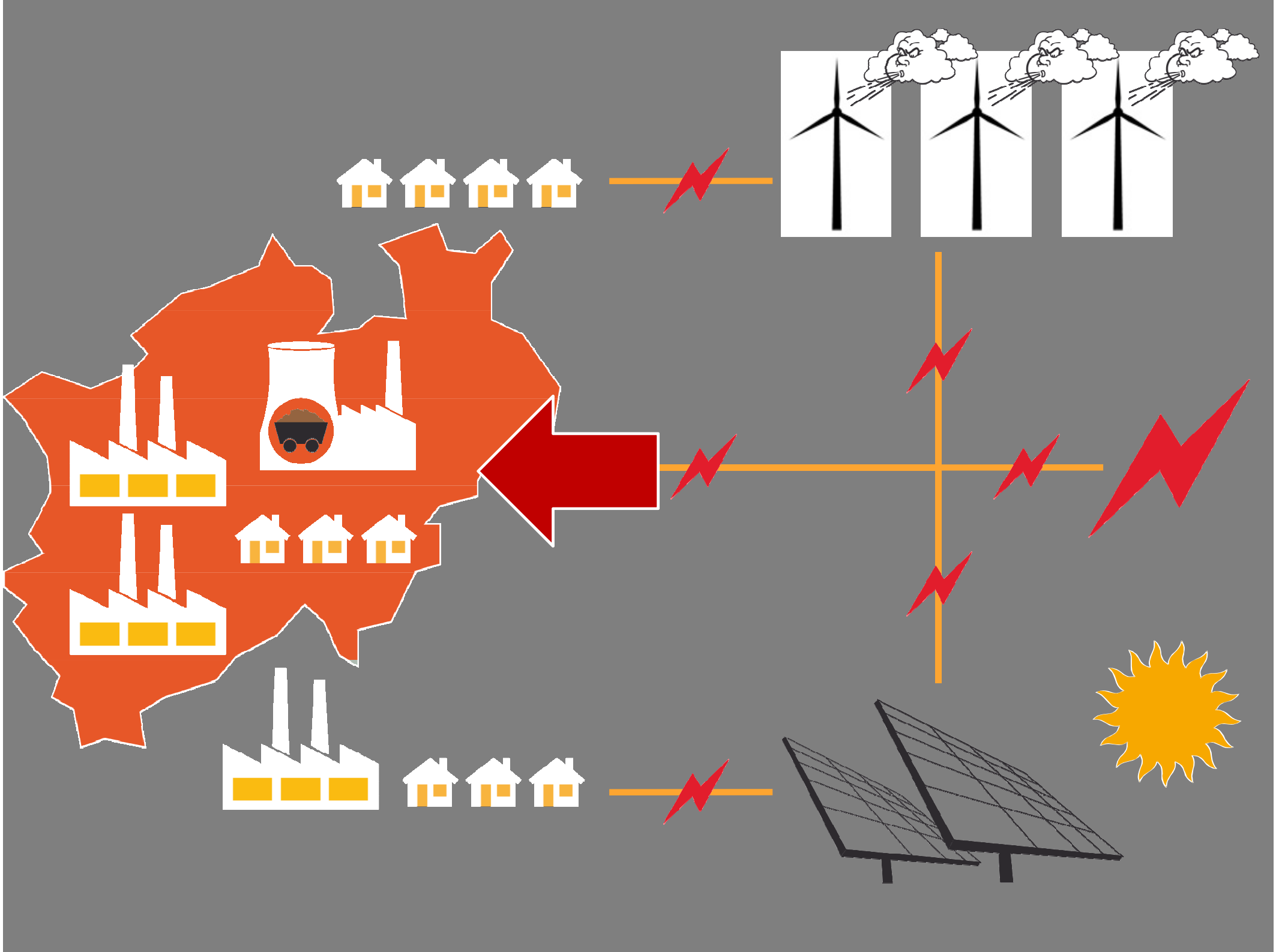
Best example: Solar Eclipse 20.03.2015

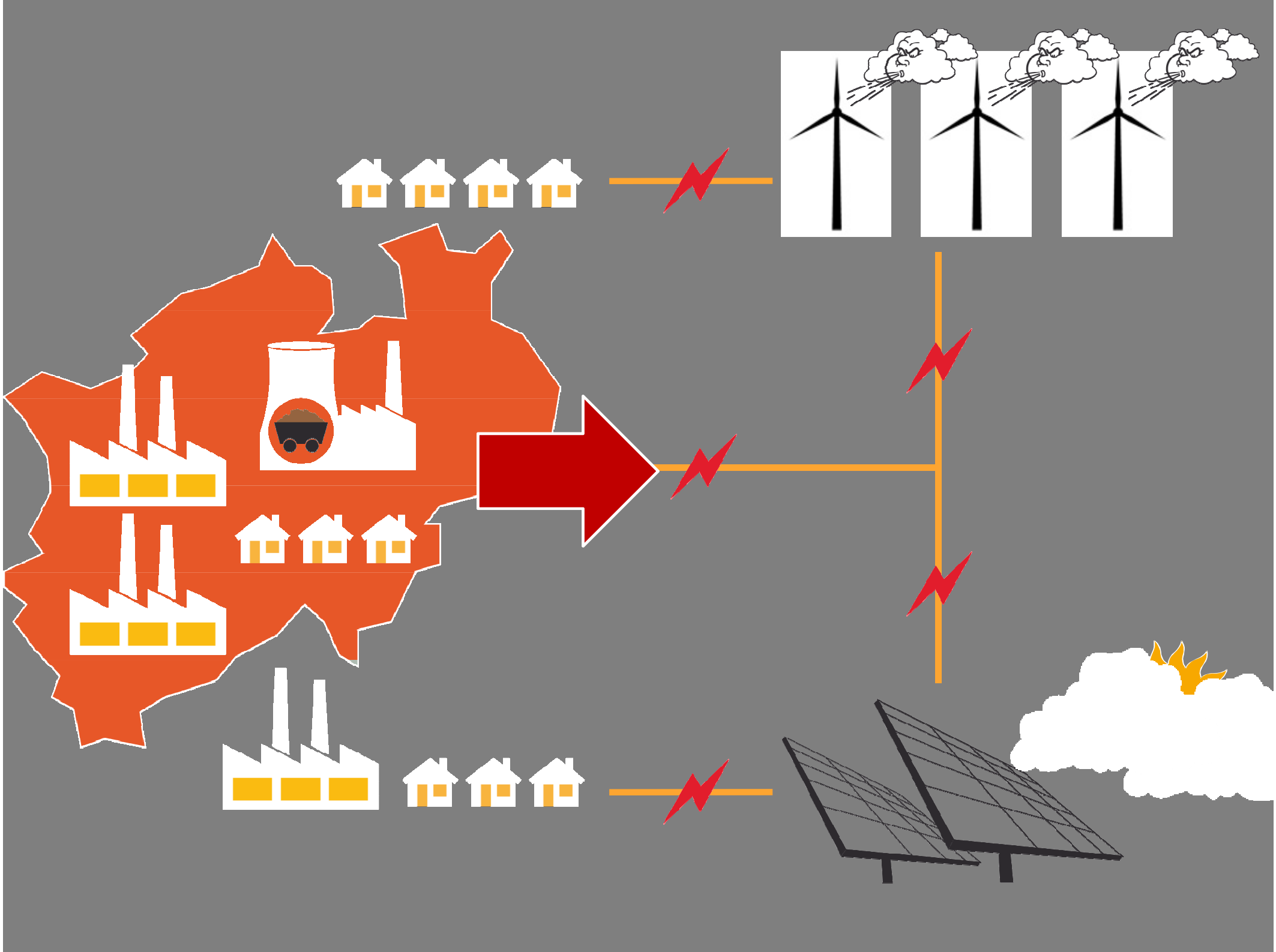


The „Virtual Battery“



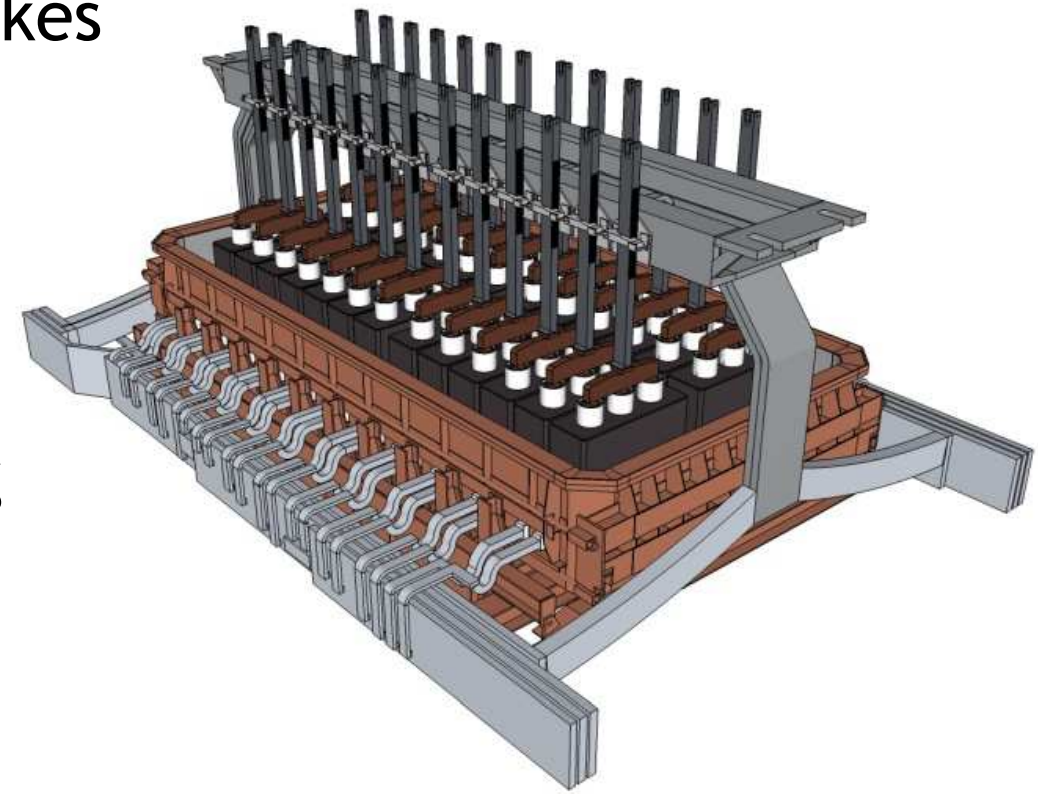






Why is that a Challenge? - Temperature

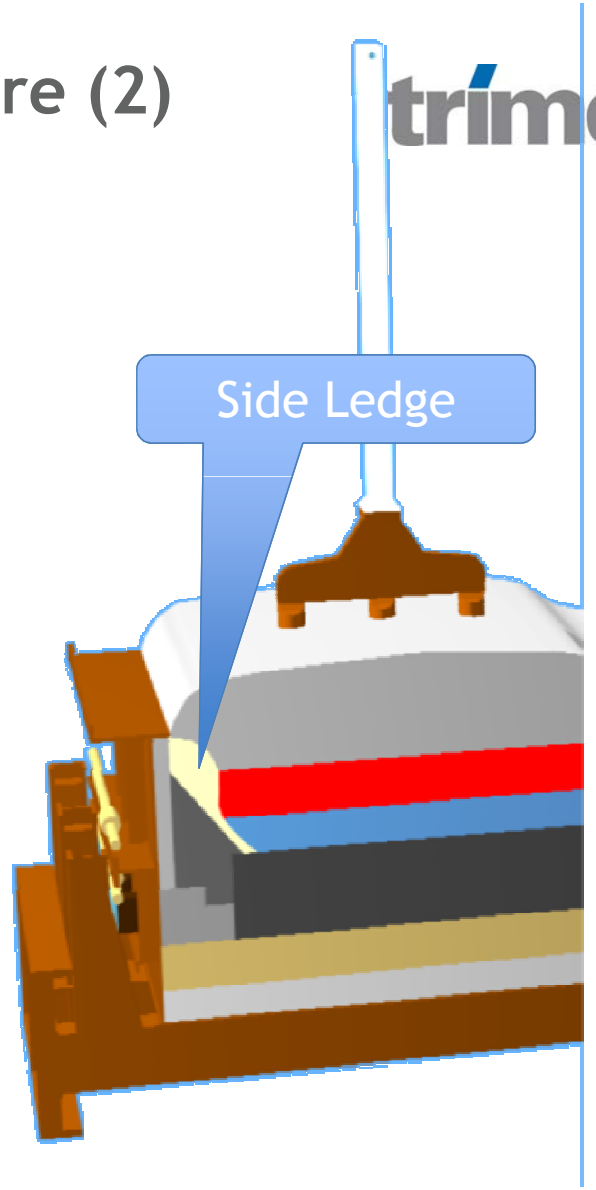
- Aluminium electrolysis takes place close to 1000 °C
- The electrolyte is a molten salt
- Sole heating is by the electrical current passing through the cell



→ Lowering energy input will lead to partial or total freezing of the electrolyte inhibiting electrical current flow

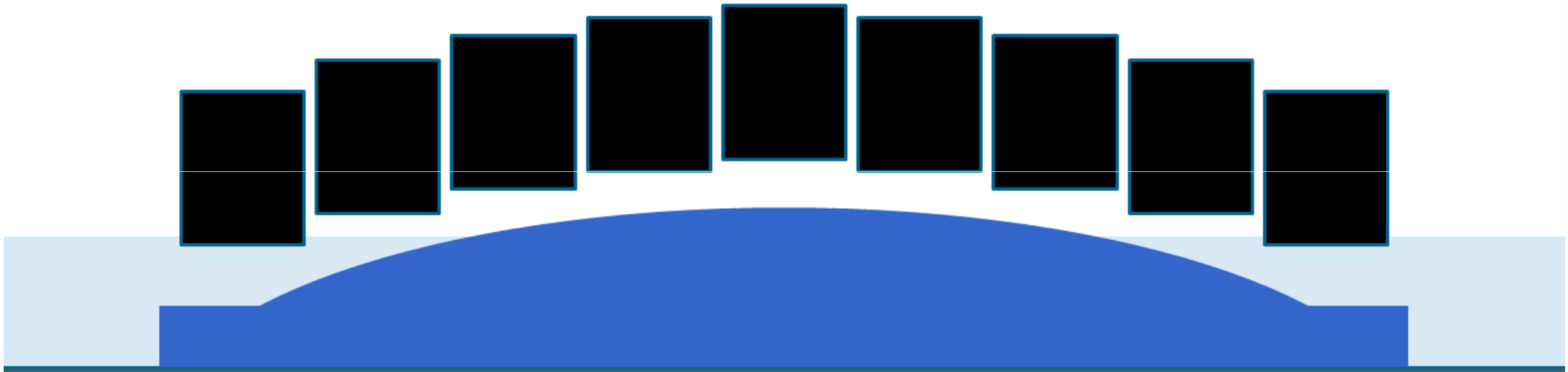
Why is that a challenge ? - Temperature (2)

- The molten salt can also dissolve the refractory
- Thus, the electrolyte is only slightly above melting point (<10 °C)
- A protective ledge froms on the refractory



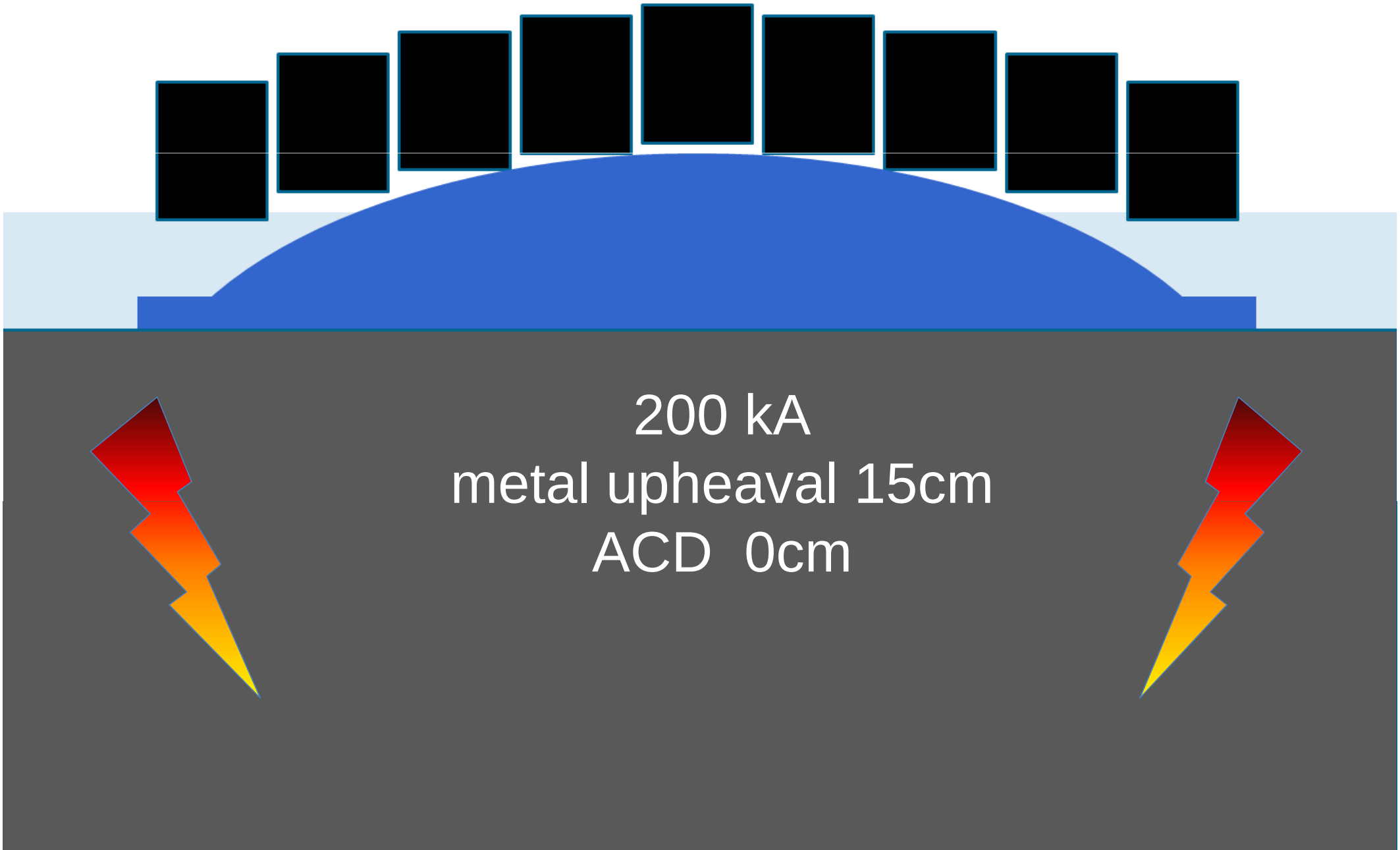
→ Increasing the heat input will dissolve the side ledge, damaging the cell lining and eventually leading to leakage

Why is that a challenge ? - Magnetic field



160 kA
metal upheaval 10cm
ACD 5cm

Why is that a challenge ? - Magnetic field (2)



The potentails of the Virtual Battery

trimet

Current (conventional) operation:
95 MW Baseload per potline,
constant during 8,760 h p.a.

Future:
Flexible Operation within +/- 25% Band for 48 h

Flexibility: +/- 25 MW
Storage capacity: 25 MW x 48h = 1.200 MWh

Storage capacity is equal to that provided by a pump storage!

More than 50% already achieved!

Advantages / disadvantages

trimet

+	-
Attractive specific storage costs	Financing added operational costs
No acceptance issues in society	Funding of requried investments
No added environmental impact	
No long approval procedures	
High storage efficiency	
No added land usage	

Energy efficiency & energy storage

trimet

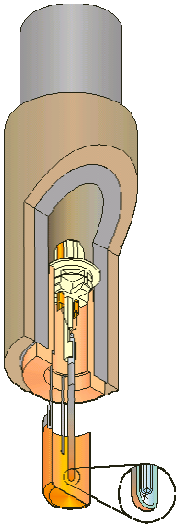
Building bridges to help make Germany‘s Energiewende a success!

Virtual Battery – How?

Operational challenges

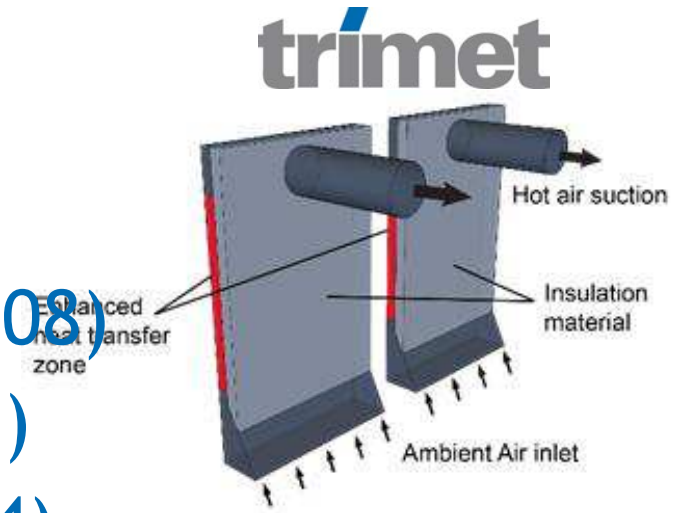
1. Thermal
   - i. Short term changes
   - ii. Long term changes

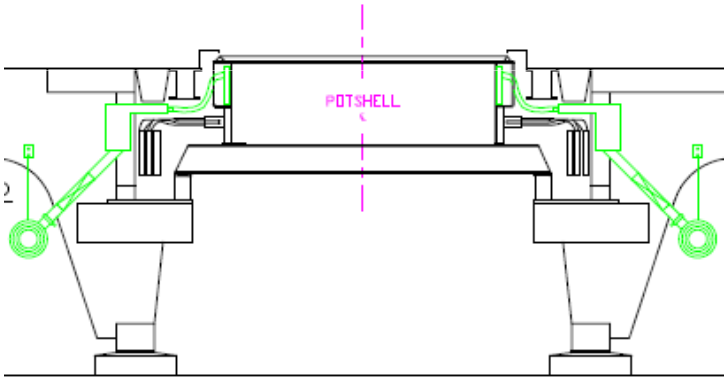
2. Magnetic
   - i. Short term changes
   - ii. Long term changes

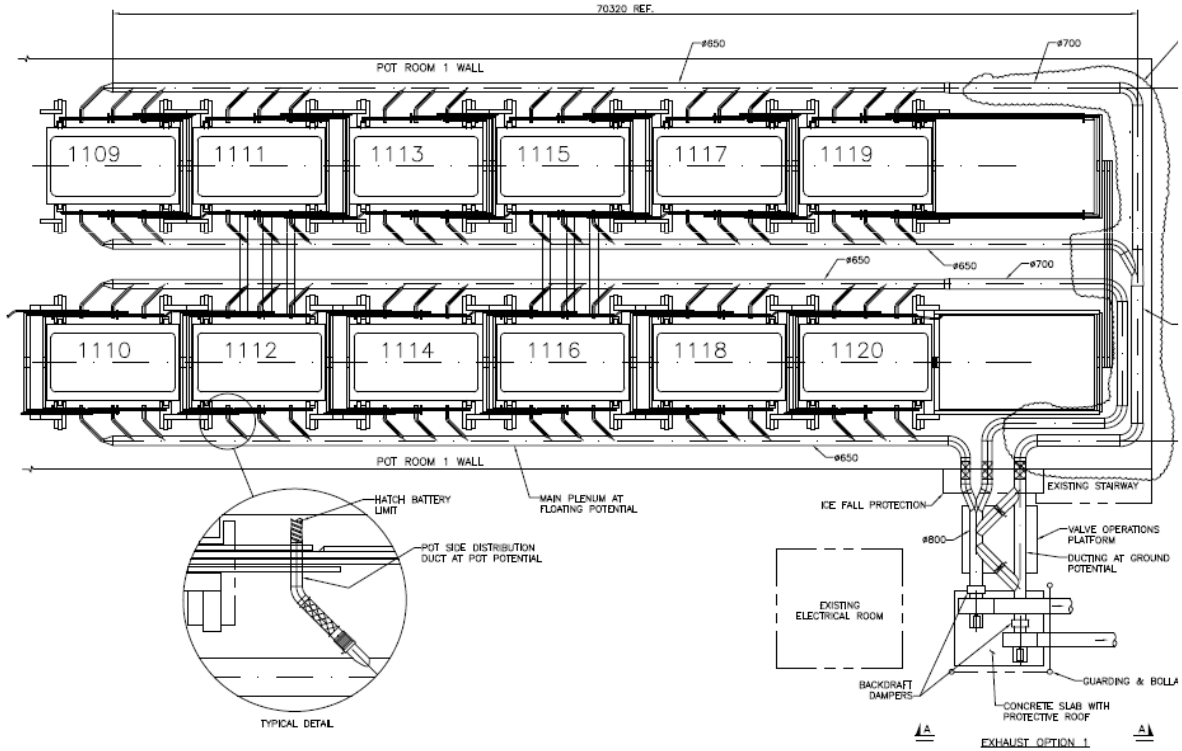


Stages in the project

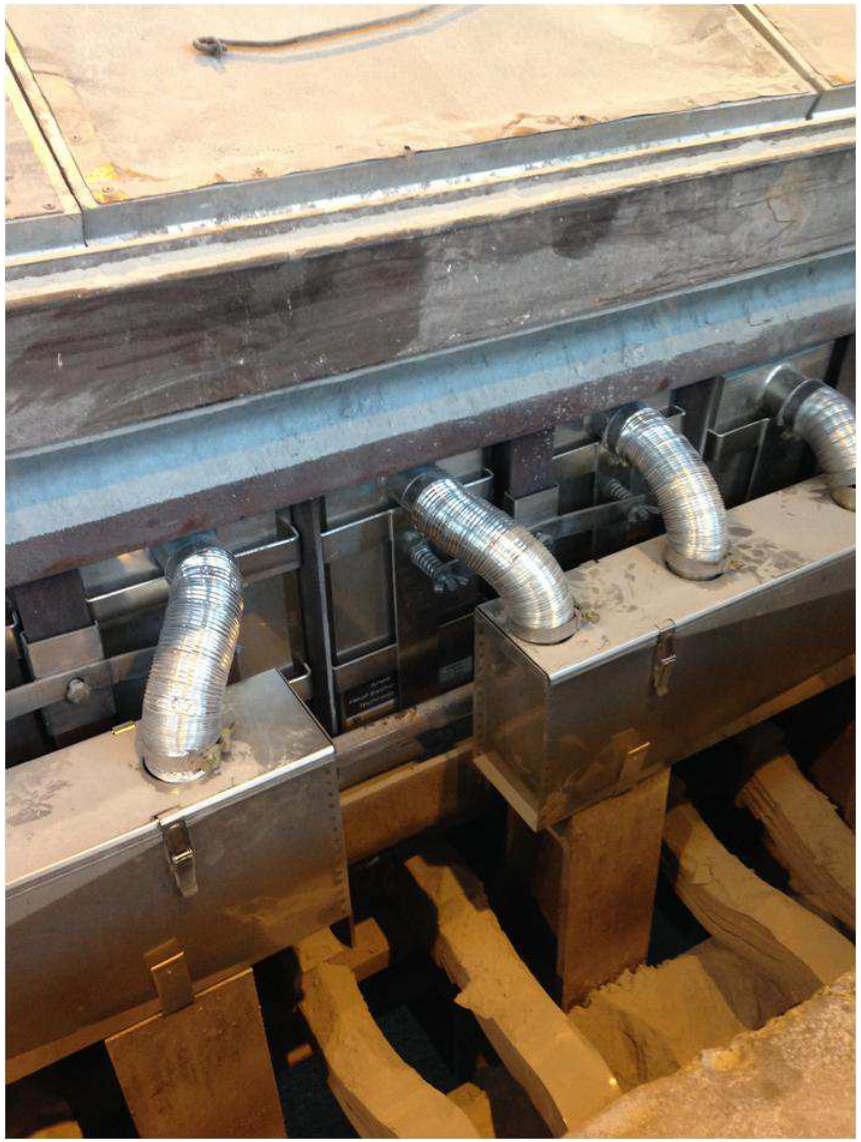
1. Peak shaving (2003)
2. Modulation without modification (2008)
3. First prototype SHE developed (2013)
4. SHE roll-out to 12 Booster cells (2014)
5. Magnetic compensation (2015)





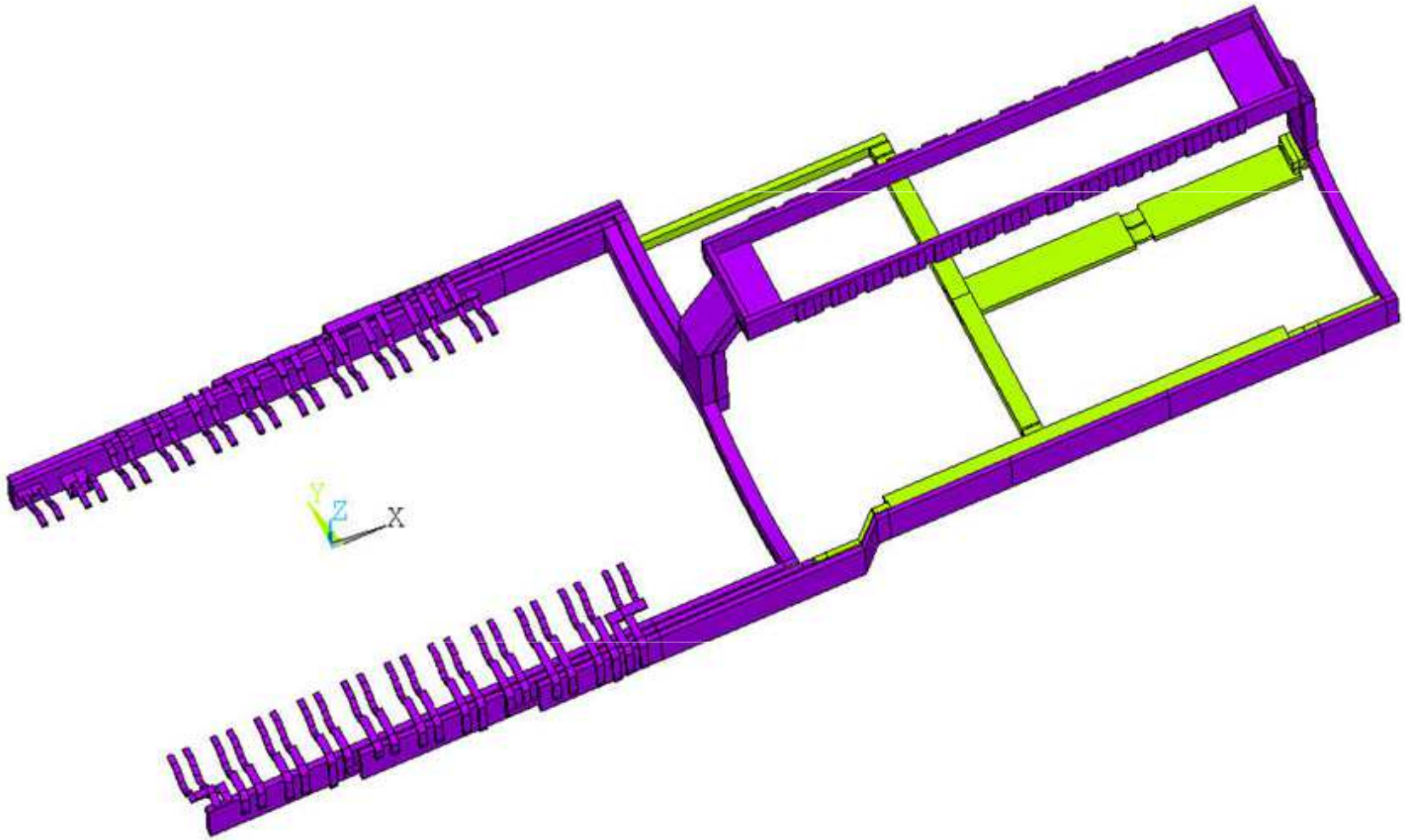


Shell heat exchangers („SHE“)



Duct & fan system for SHE

Magnetic Field Compensation



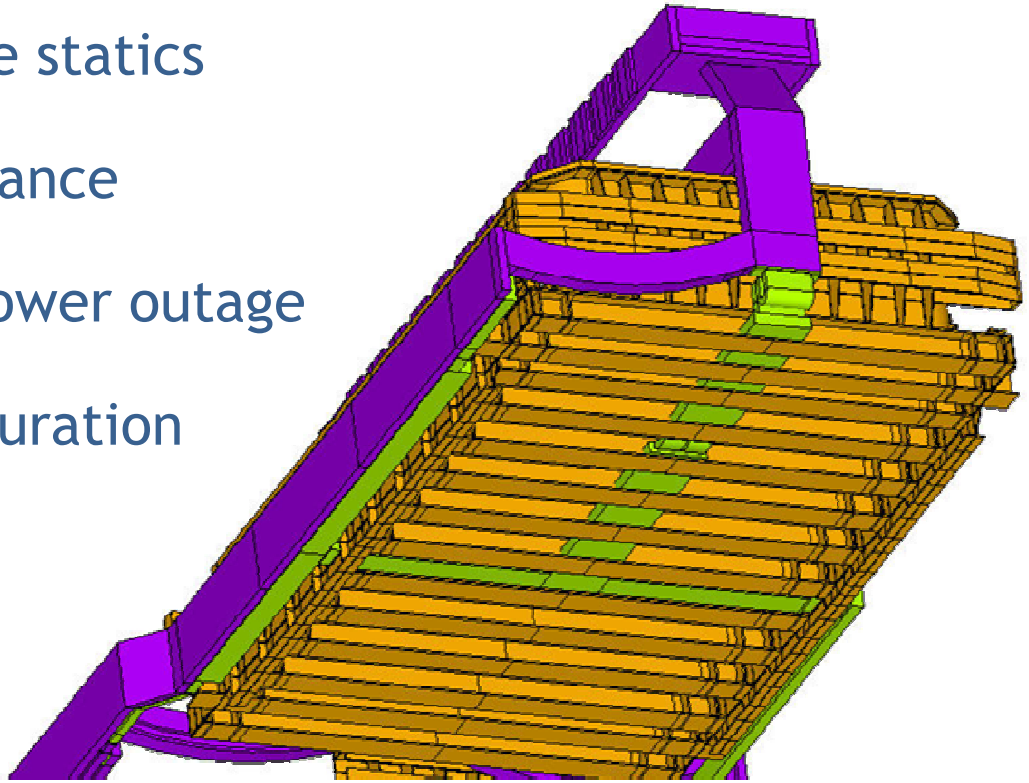
Magnetic compensation


116
118
120

Challenges of install additonal bus bars

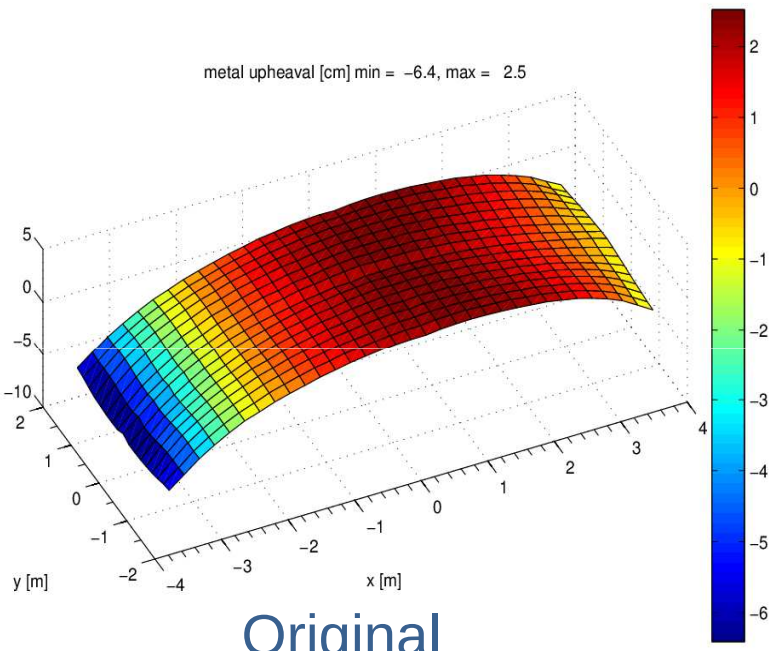
About 6t of additonal bus bar were installed per cell

- Steel sheel and potline statics
- Minimal contact resistance
- Welding only during power outage
- Limited number and duration of power outages
- Continued operation
- Time constrains

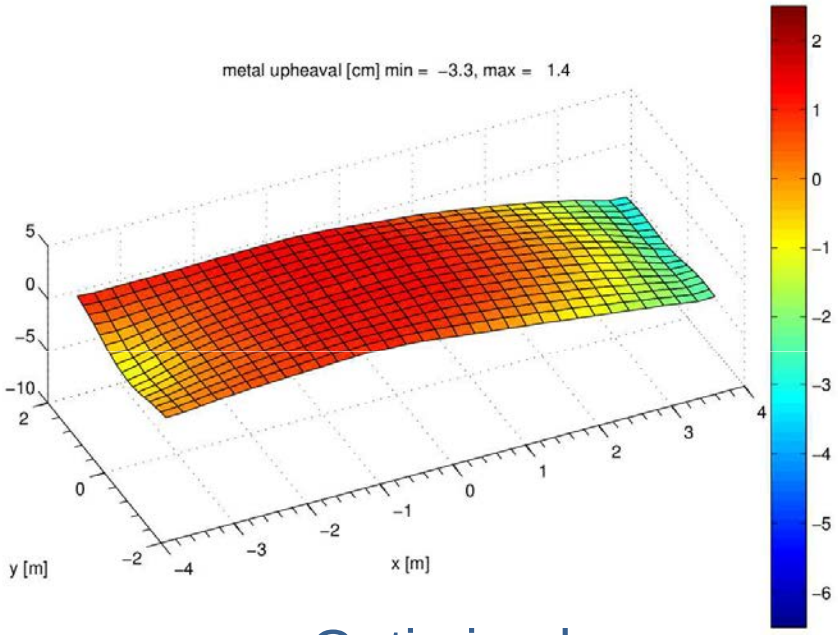


Magnetic compensation – the results

- Reduce metall upheaveal from ~9cm to ~4cm
- Reduce ohmic resistance of the bus bars
- more uniform current distribution in the lining

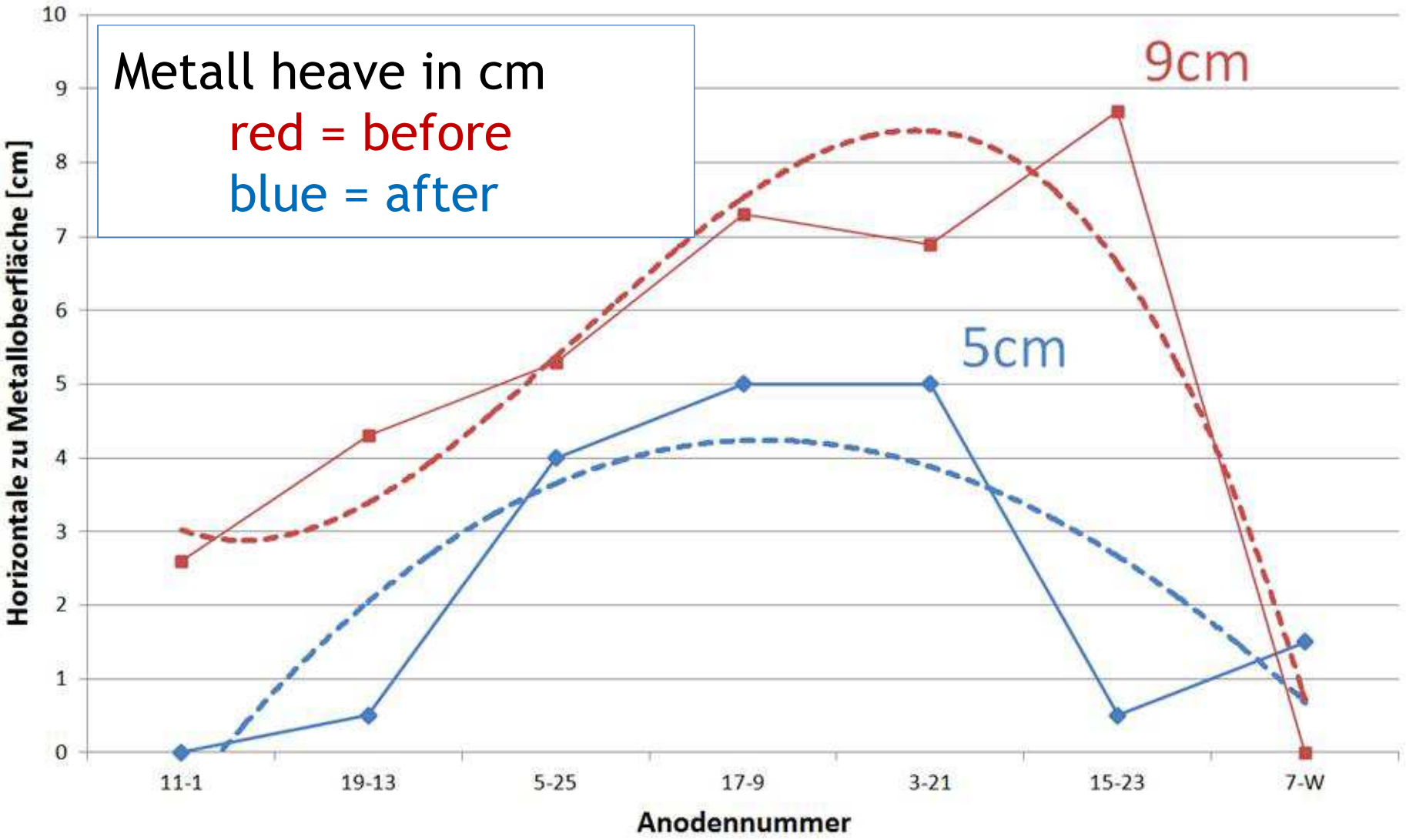


Original upheavel

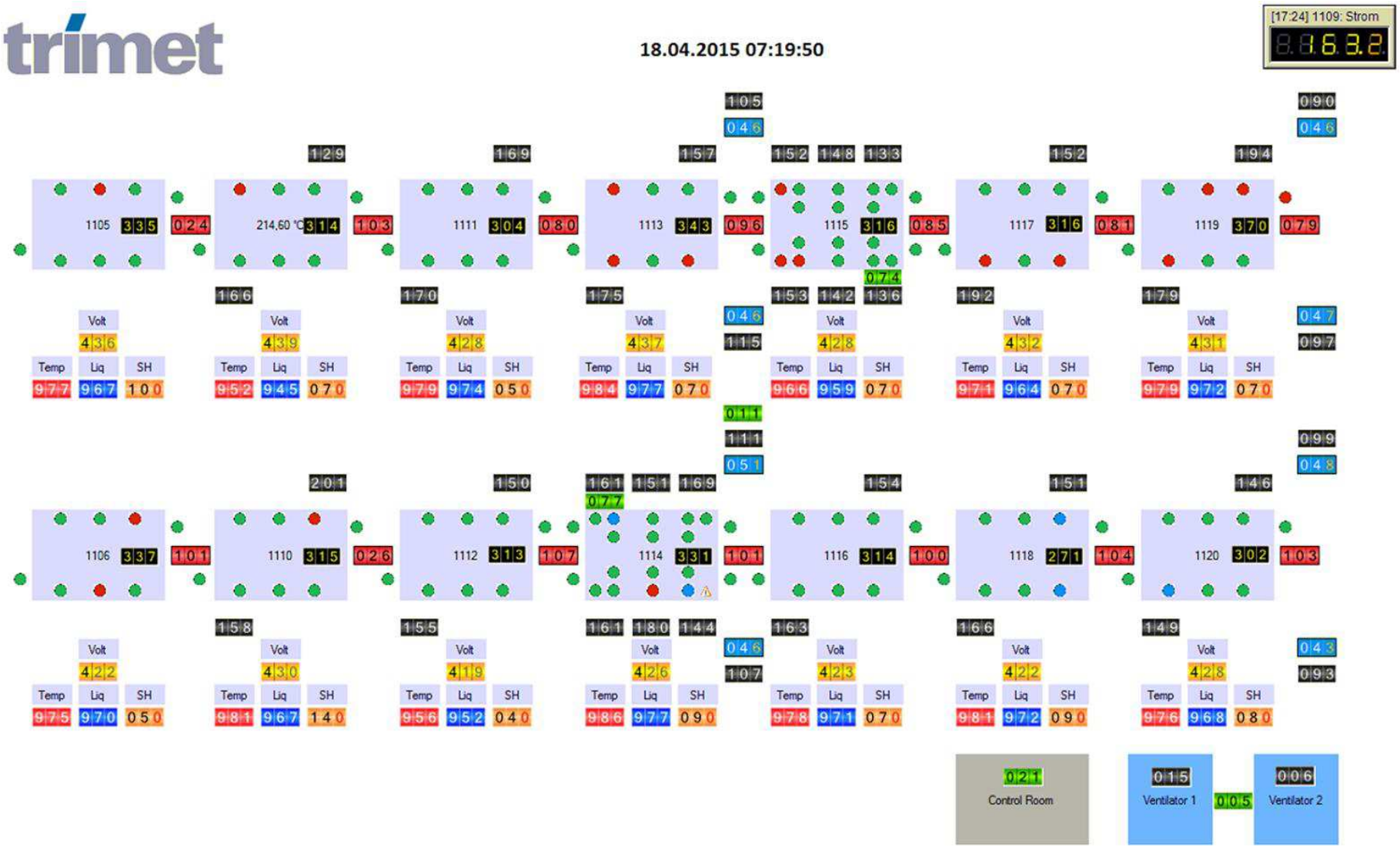


Optimized upheaval

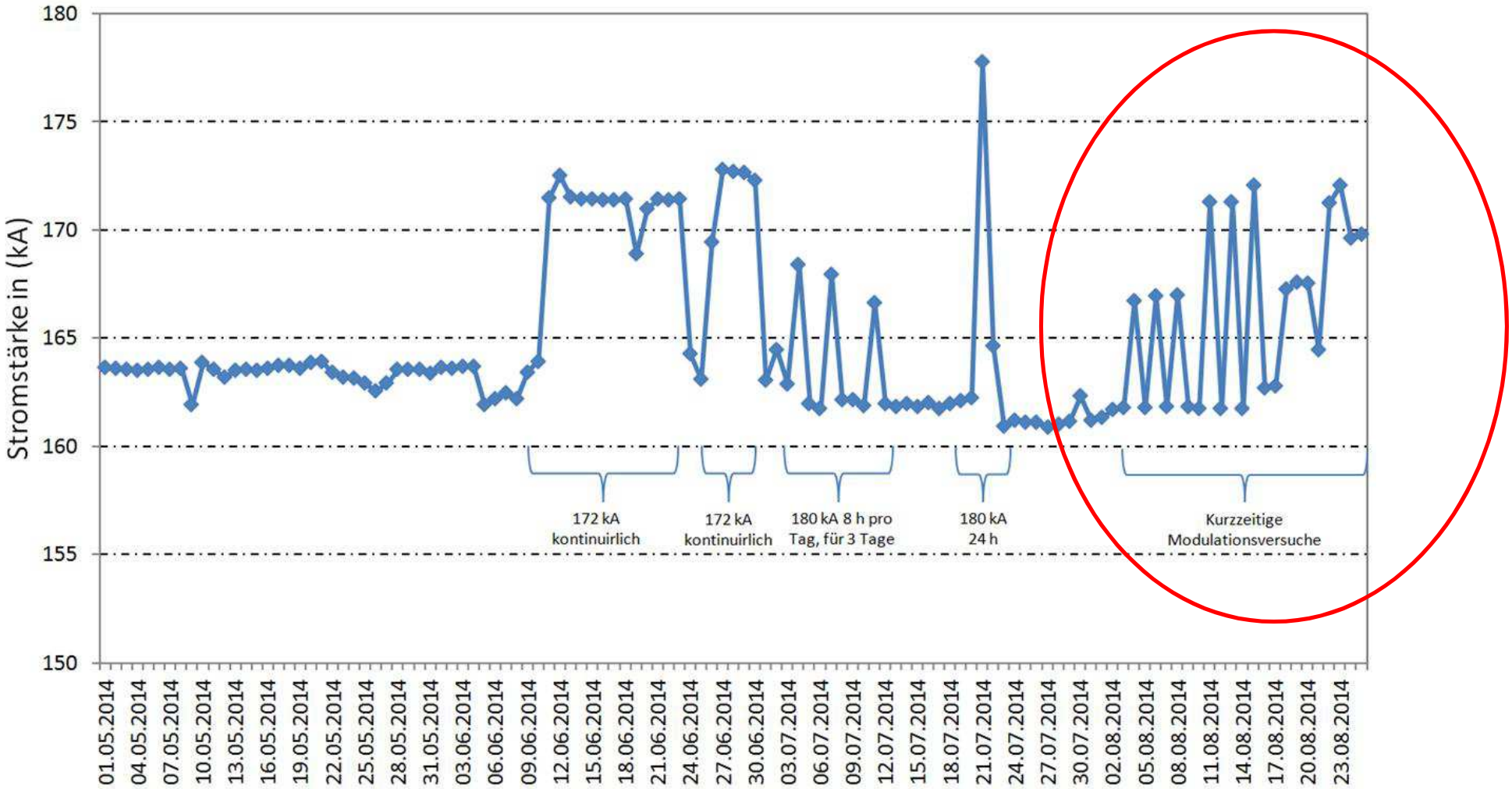
Change in metal heave due to compensation



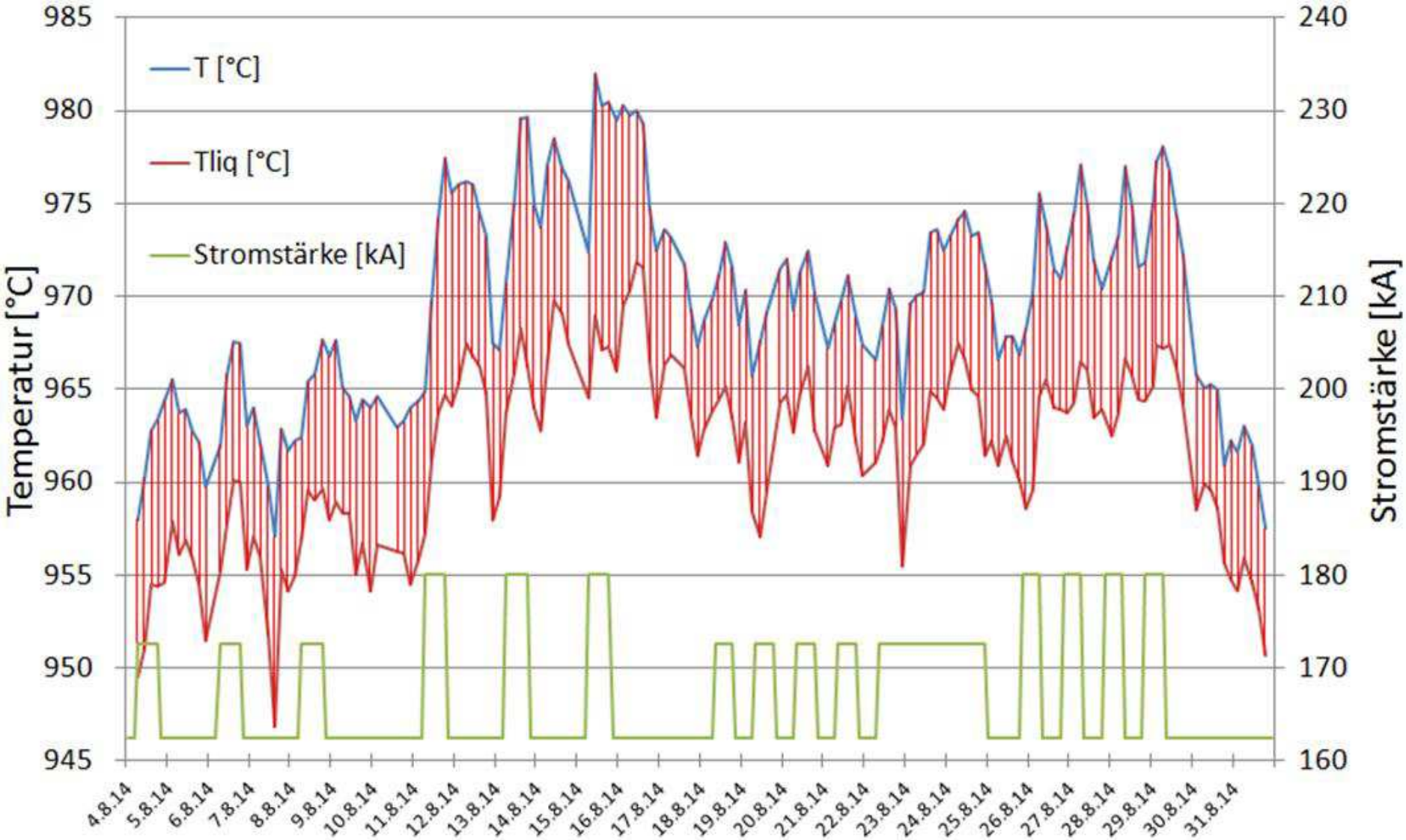
Cell control system



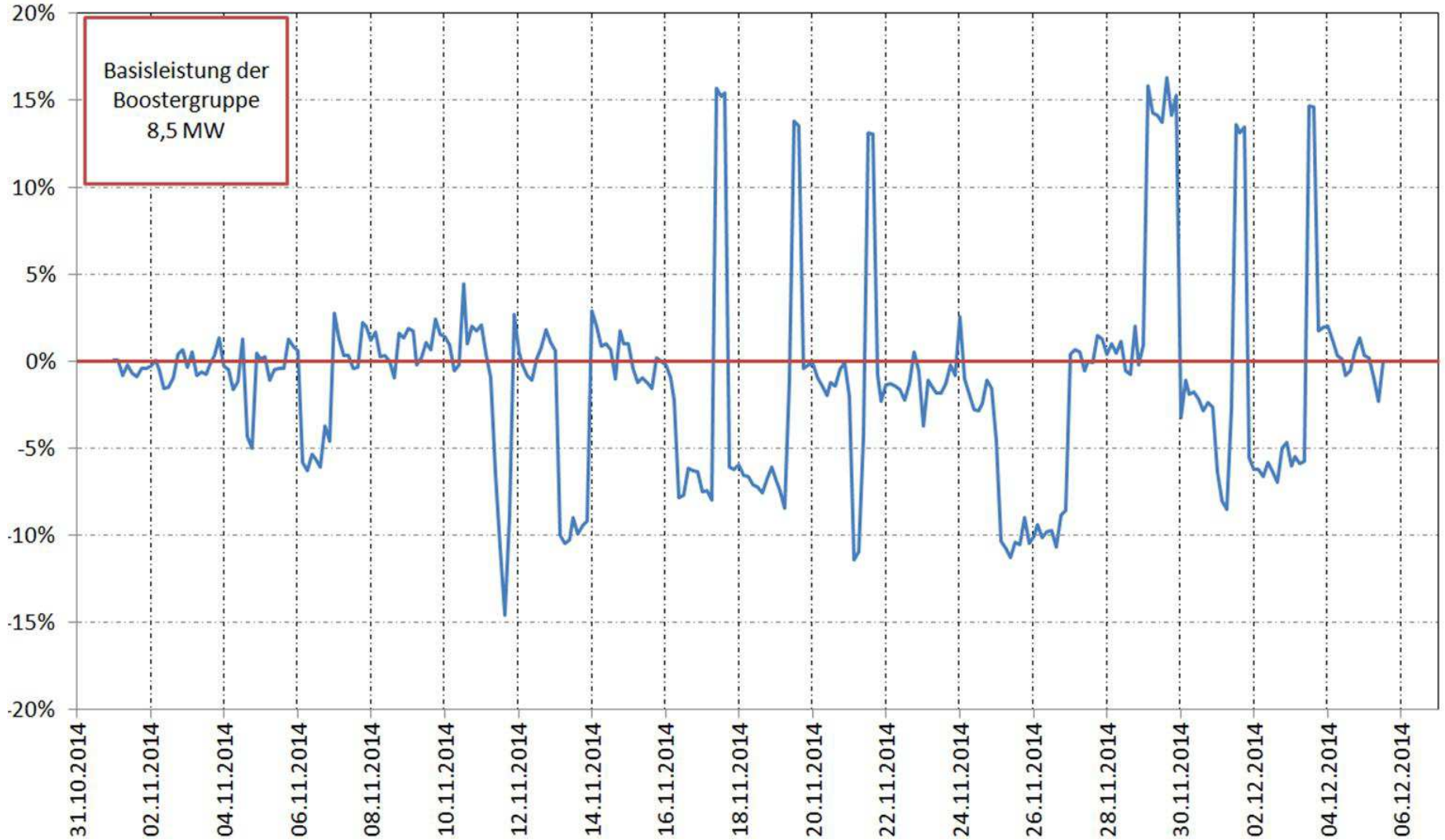
Early trials



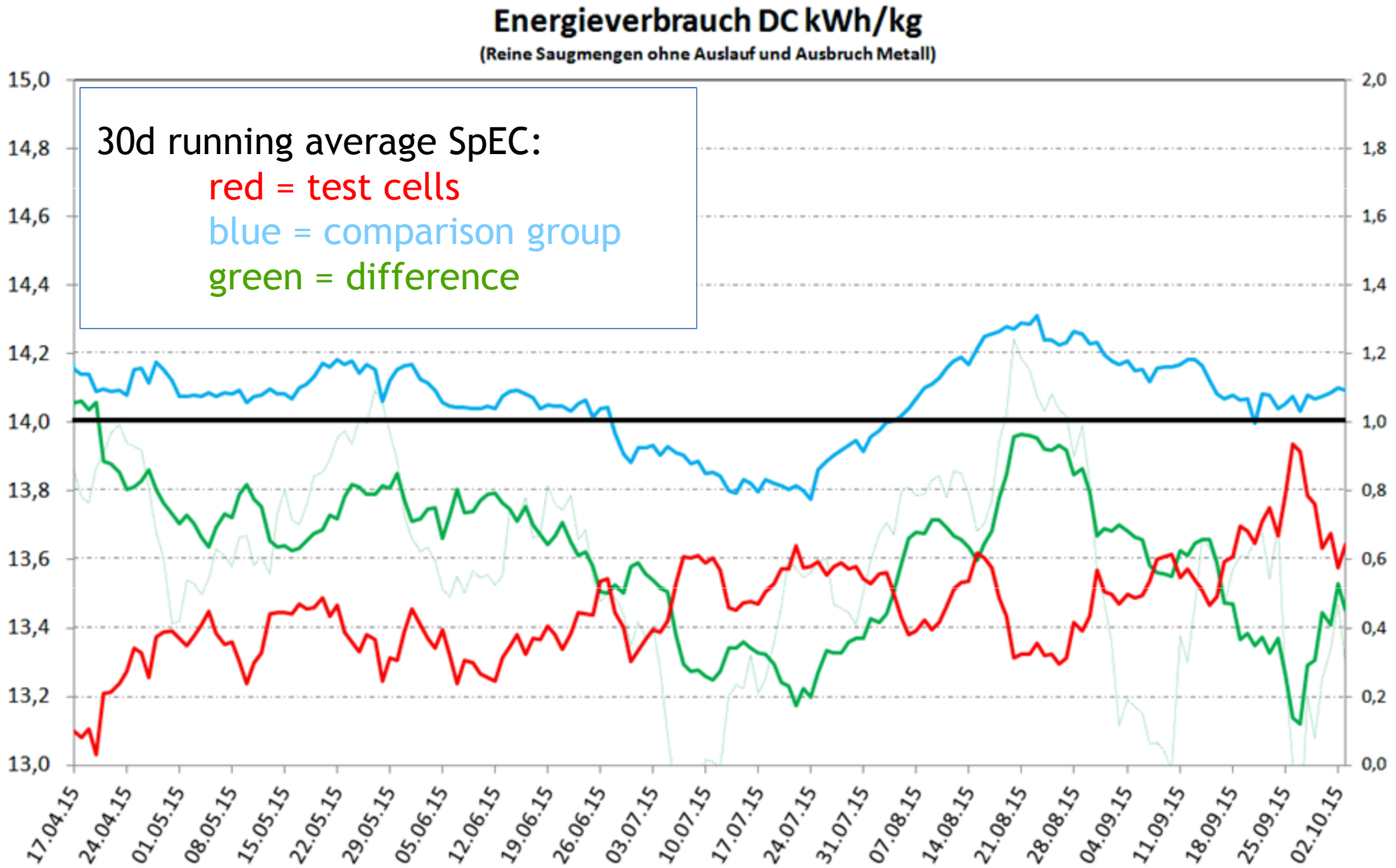
Reaction of temperature & liquidus



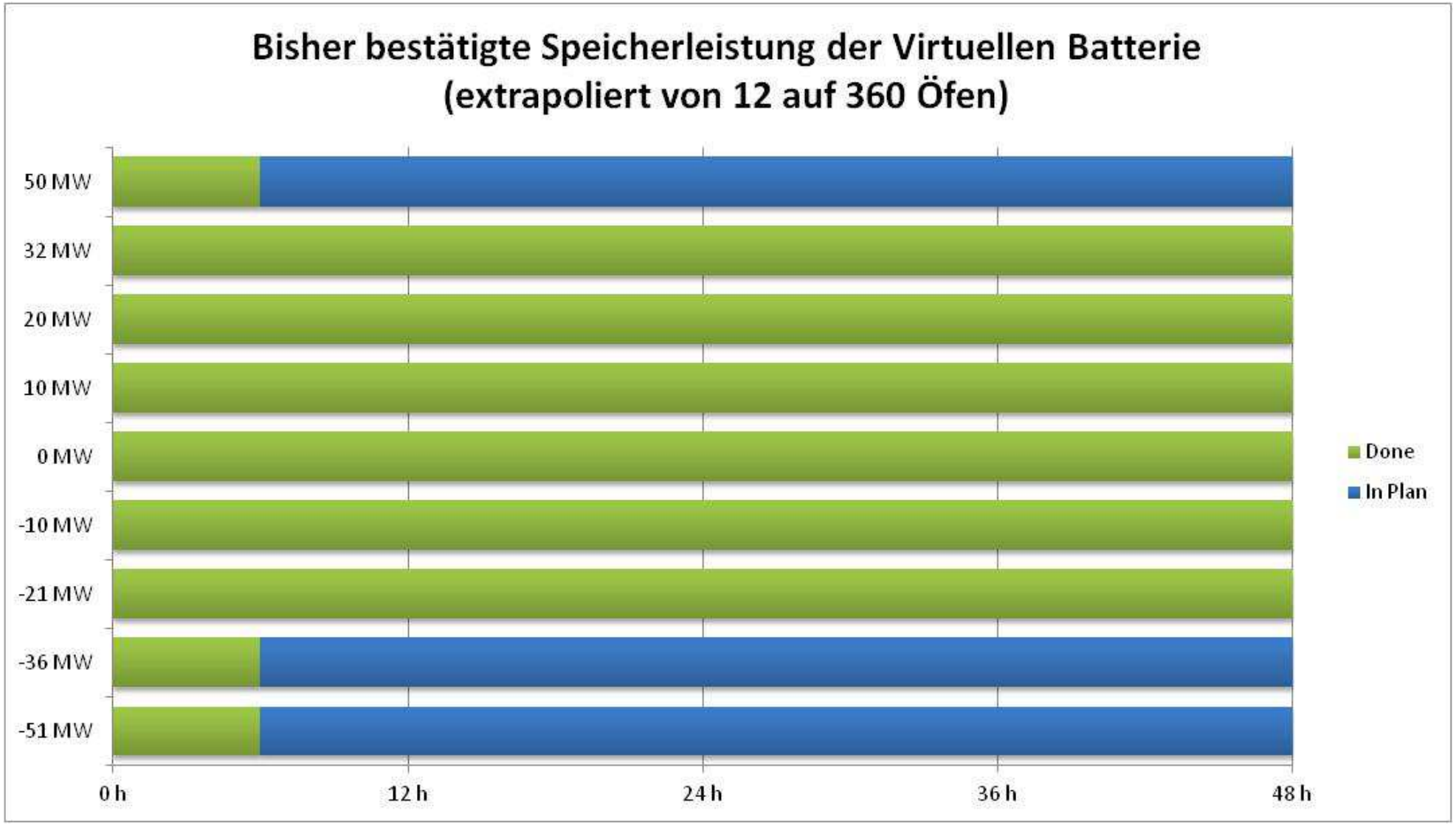
Proven modulation capability



Effect of magnetic compensation



Status of trials (July 2016)



Next steps

- Push the boundaries to +/- 25% modulation, after confirmed good performance at -13/+25% so far.
- Implement Energy Counter to keep track of cell heat status and improve cell control when modulating.
- Improve bath chemistry control.
- Align work practices with modulation.
- Optimize cell lining design.
- Explore how to make use of extracted heat.
- Roll-out to full potline

"It's not the strongest of the species that survives, nor the most intelligent. It is the one that is most adaptable to change"

Charles Darwin

Thank you for your Attention!

Dr. Till Reek
till.reek@trimet.de