#REMforum

10th St. Gallen Forum for Management of Renewable Energies
May 23-24, 2019 - Olma Messen St. Gallen

-> **Room «9.1.2», «Rosso», ground floor**

Workshop 5

Rolling Solar Storage: the Convergence of RE & EV

- Dr. Merla **Kubli**, University of St.Gallen & ZHAW Winterthur (workshop leader)
- Dr. Andreas **Beer**, Expert Product Research and Engineering, RePower AG
- Alain **Brenzikofer**, Head Dept. Decentralized Systems, Supercomputing Systems AG
- Lisa **Oberzaucher**, University of St.Gallen

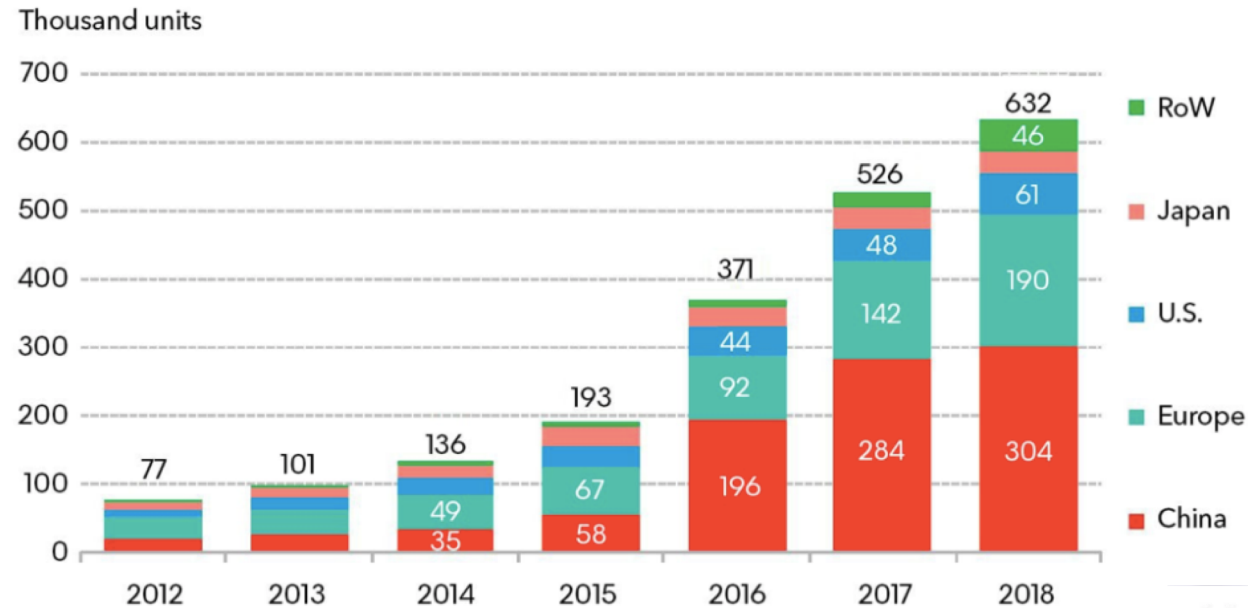# Side Note: Video Recording for REM-Movie

Our film crew will record a few scenes during our workshop for the recap movie of the REM-Forum.

Please get in touch with us in case you have questions or concerns.

energieforum@unisg.ch

EVs are on the rise – and so is EV charging

Public charging outlets installed globally

Thousand units

Year	China	Europe	U.S.	Japan	RoW	Total
2012						77
2013						101
2014	35	49				136
2015	58	67				193
2016	196	92	44			371
2017	284	142	48			526
2018	304	190	61	46		632

Legend: RoW, Japan, U.S., Europe, China

Source: BloombergNEF. Note: Data current as of January 1, 2019. Data will be updated on the BNEF data hub at the end of 1H 2019.

Global long-term passenger vehicle sales by drivetrain

Million vehicles

Legend: ICE, PHEV, BEV
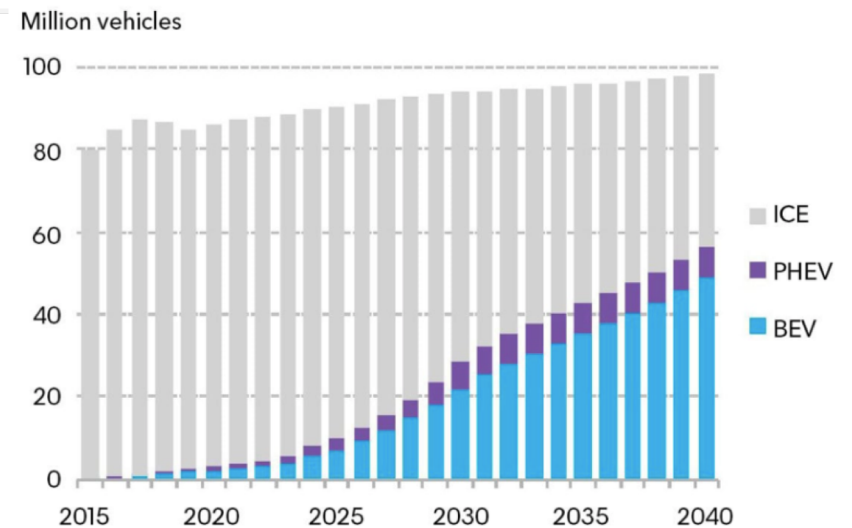
Source: BloombergNEF

... not without impacts on the electricity supply system

Yearly electricity consumption from passenger EVs, commercial EVs and ebuses

TWh

Source: BloombergNEF
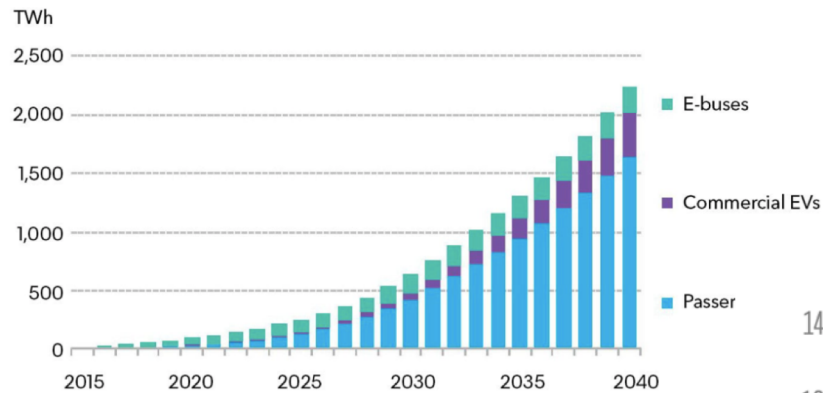
Electricity consumption increases...

... but it is mostly the charging peaks that are the challenge.

% of Charging Events Starting in Each Hour – Weekdays and Weekends

Weekday   Weekend
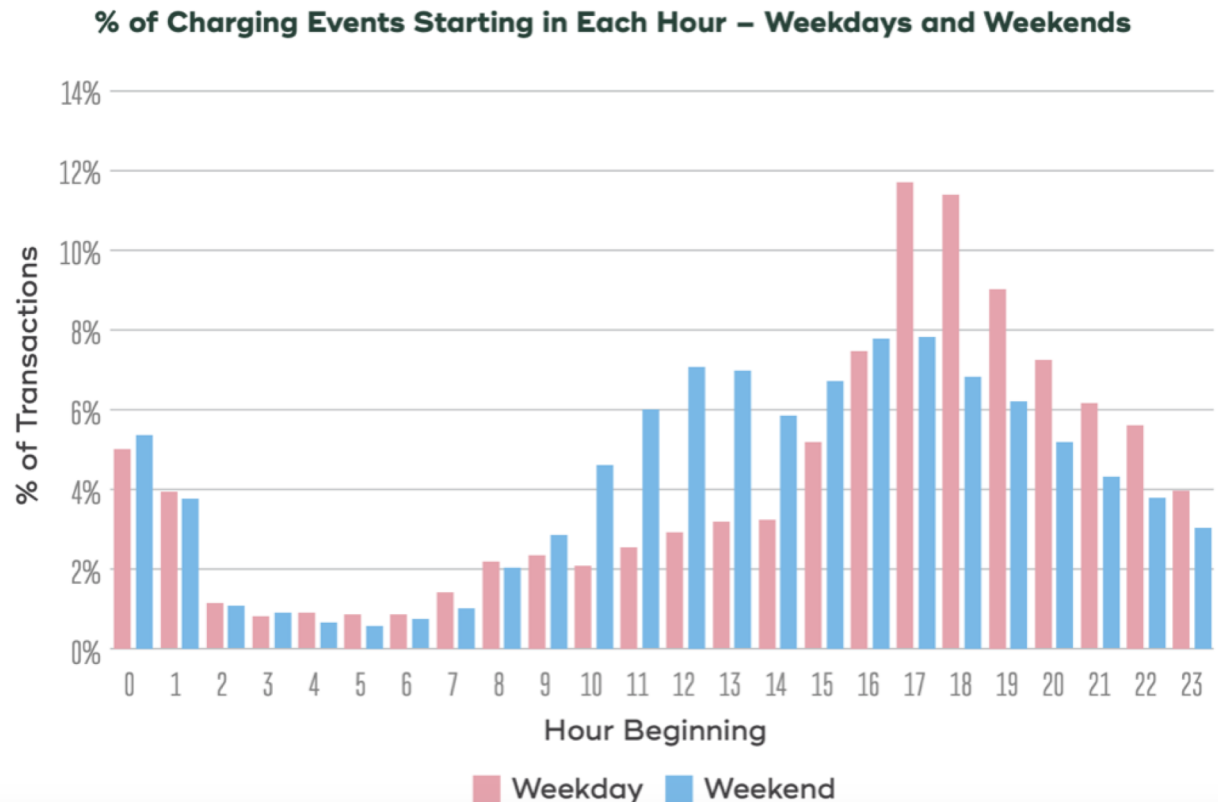
Source: CleanTechnica 2019

Smart (solar) charging as a solution

«**...** almost half of EDSO members respondents believe that applying **smart charging** mechanisms could **help reduce grid peak load at least for 30% or more**.»

13%

27%

40%

20%

- 0% to 10%
- 10% to 30%
- 30% to 50%
- more than 50%
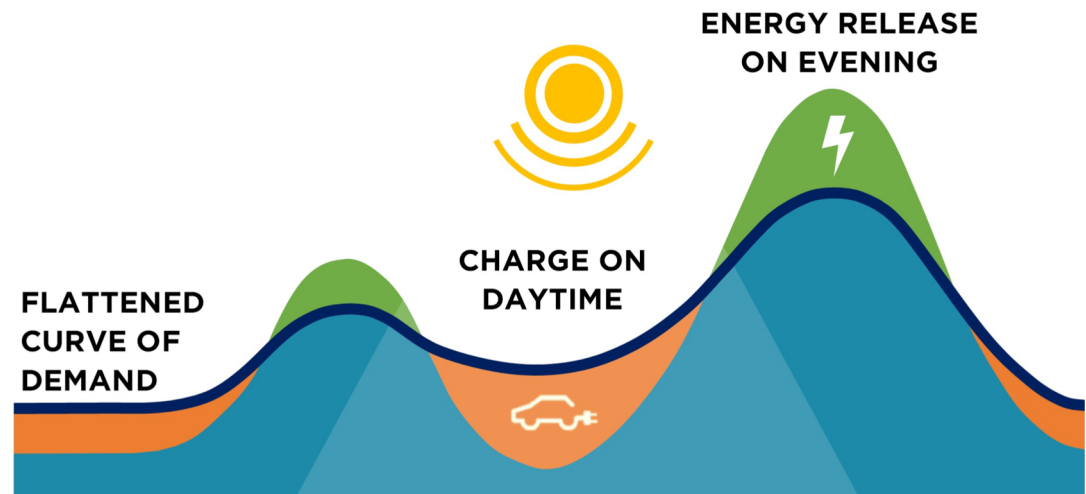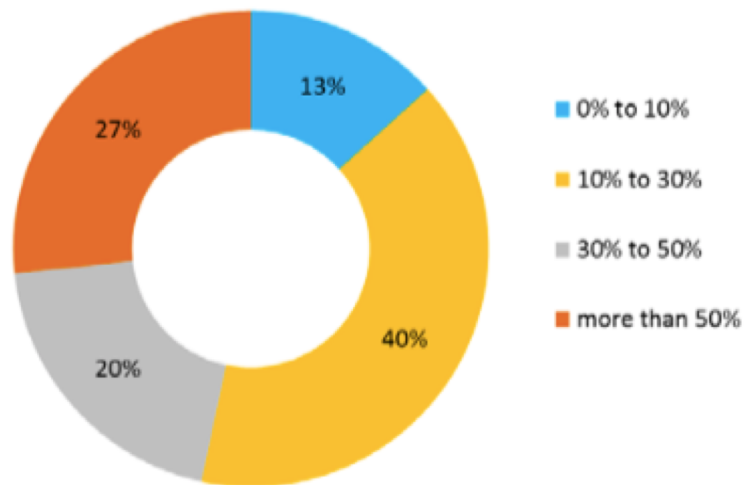
Smart charging potential to reduce peak demand compared to uncontrolled charging (%)

Source: EDSO, 2018

ENERGY RELEASE ON EVENING

CHARGE ON DAYTIME

FLATTENED CURVE OF DEMAND

Source: smartsolarcharging.eu

Timeline

Time	Content
	Introduction
15 min	**Speaker 1: Andreas Beer (RePower)**
15 min	**Speaker 2: Lisa Oberzaucher (UniSG)**
15 min	**Speaker 3: Alain Brenzikofer (SCS)**
50 min	Workshop exercise "Heaven & Hell"
20 min	Concluding round: Defining leverage points

Introduction of the speakers

Dr. Andreas Beer

RePower

Lisa Oberzaucher

University of St. Gallen

Alain Brenzikofer

Supercomputing Systems AG

Workshop exercise "Heaven & Hell"

Time to explore the extremes!

EVs have gained a major share in the passenger transport system.

What conditions are necessary to govern the EV grid integration to a "heavenly" or a "hellish" state?

In this workshop exercise we explore two extreme scenarios for EV grid integration.

Scenario „ Heaven"

EVs have gained a major share in the passenger transport system.

➢ How should elements in the system be coordinated to achieve an "heavenly" outcome regarding the system integration of EVs?

Heavenly =
Renewable, user-centric, efficient, low cost impacts, sustainable, smart, little impacts on the electricity grid…

Scenario „Hell"

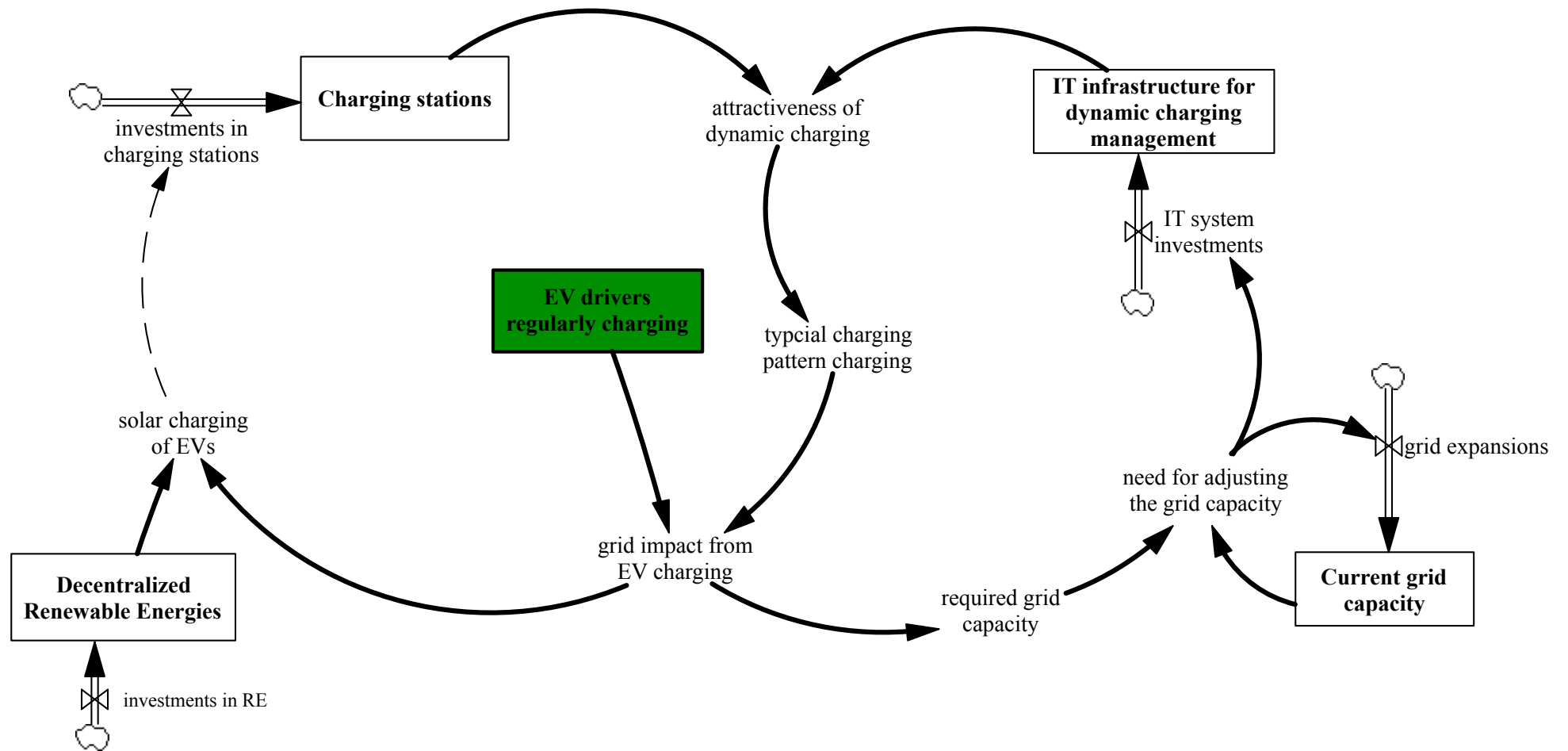EVs have gained a major share in the passenger transport system.

Which constellation of elements in the system lead to a "hellish" outcome of EV integration?
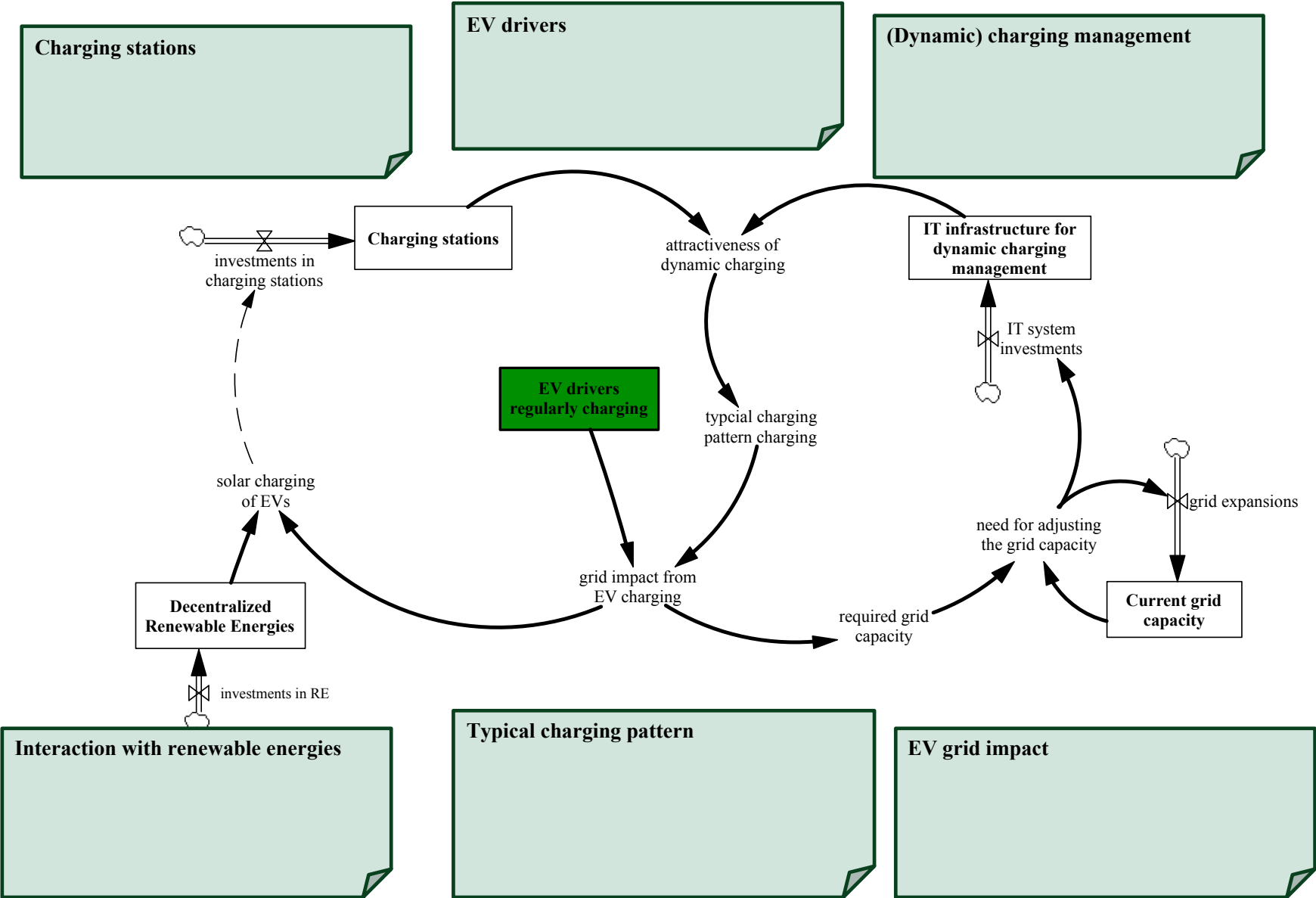
Hellish =
Cost intense, user unfriendly, major impacts on the grid, non-renewable, chaotic,...

Base model for smart (solar) EV charging
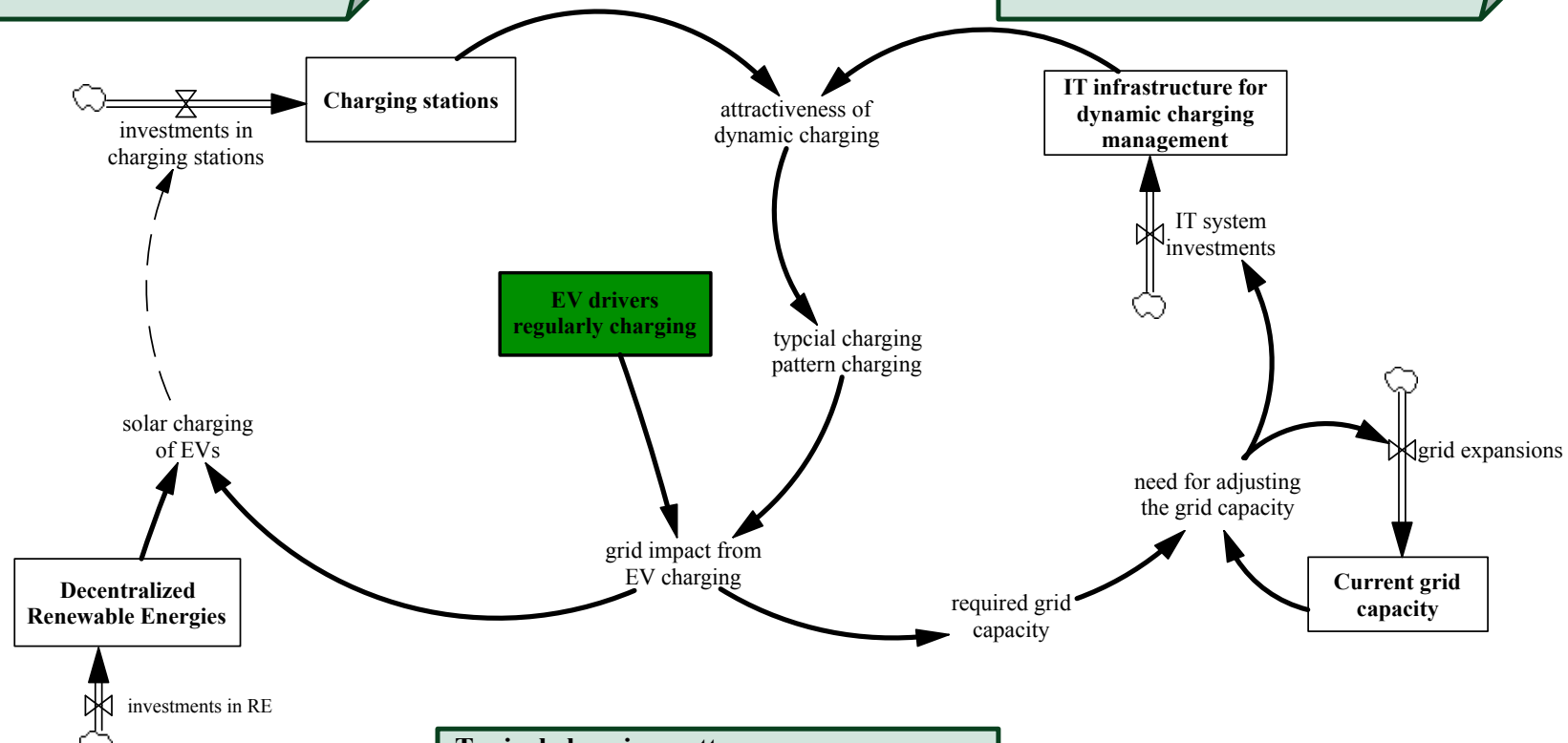
Leverage points

Inspiration for angels and devils...

Charging stations
Where are the charging stations installed? (Home, Company, Public at point of interest,...) Fast or Slow charging? What electricity is used to charge the EVs?

EV drivers
Is it interesting to charge at the locations where there are charging stations? Are they willing to adopt dynamic charging?

(Dynamic) charging management
Is there dynamic charging in place? Along which principles does it function?

investments in charging stations

Charging stations

attractiveness of dynamic charging

IT infrastructure for dynamic charging management

IT system investments

EV drivers regularly charging

typcial charging pattern charging

solar charging of EVs

grid expansions

need for adjusting the grid capacity

grid impact from EV charging

required grid capacity

Current grid capacity

Decentralized Renewable Energies

investments in RE

Interaction with renewable energies
What is the interplay of RE with EV charging? Solar charging? Where are the RE installed? Does generation match with the EV charging pattern?

Typical charging pattern
When do EV drivers charge their car? How fast? To which extend can the charging load be shifted (technically as well as accepted by EV drivers)?
Are EV batteries used as storage for RE?

EV grid impact
What is the impact on the electric grid from EV charging? Is there need for grid expansions? How are grid usage tariffs designed for EV charging?

Workshop exercise "Heaven & Hell"

1. Build 4 groups, one group per table

2. Short introduction round in the group

3. Workshop exercise "Heaven & Hell"

   – Scenario "Heaven" (group 1 and 3)

   – Scenario "Hell" (group 2 and 4)

➢ Scenarios should be extreme, but consistent in itself and within the range what would be possible today or near future.

➢ Speakers are available as experts and can be invited to join the discussion -> make use of it!

Evaluation: Defining leverage points

➢ What are the key leverage points in the system that will govern whether EVs can be well integrated into the system?

➢ Which elements should receive most attention to foster grid integration of EVs?

➢ We will define the leverage points in generic terms, independent of the scenarios, but specific in terms of the element.

Evaluation a long the domains of:

- Charging stations
- EV drivers
- Charging management
- Typical charging pattern
- Interaction with renewable energies
- EV grid impact

Thank you very much for your attention!

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Please return your feedback forms for a free entry in 2020!

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Bulletin
Fachzeitschrift von Electrosuisse und VSE
Revue spécialisée d'Electrosuisse et de l'AES

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ENERGIE & MANAGEMENT

ENERPEDIA
Alles über Energie

neue energie
new energy

Umwelt PERSPEKTIVEN

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16.00 h Panel Discussion II.

Where does the Transformation of Energy System lead us? Imagining the World 10 Years from now

- **Kai Buntrock,** Head International Projects, Energiequelle GmbH, Germany
- **Victor Kristof, President,** Swiss Youth for Climate, Switzerland
- **Christine Lins,** Executive Director, GWNET – Global Women's Network for the Energy Transition
- **Prof. Dr. Sonia I. Seneviratne,** ETH Zurich, Institute for Atmospheric & Climate Science

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