



H2FUTURE
Green Hydrogen



H2FUTURE - *Hydrogen from electrolysis for low carbon steelmaking*

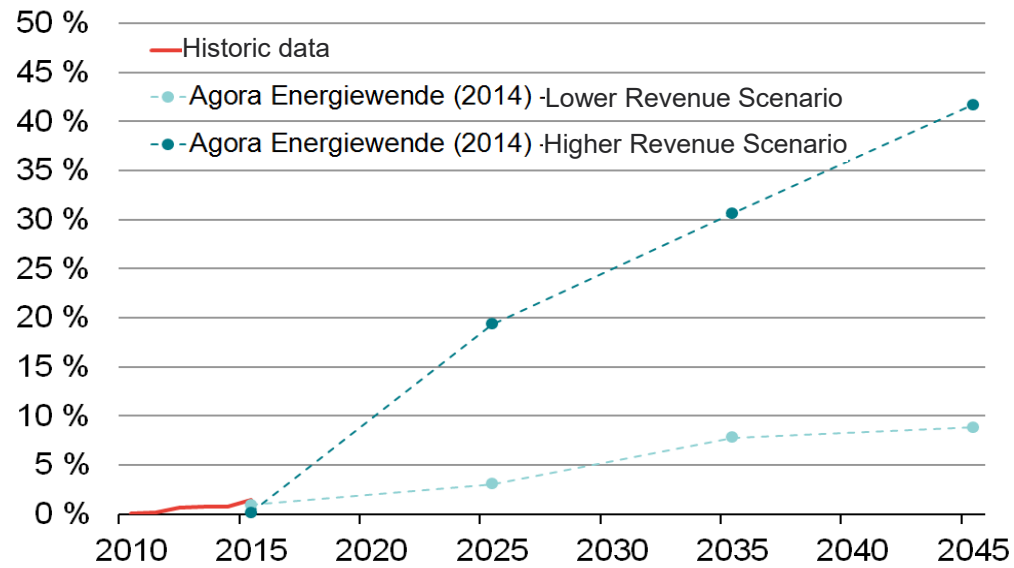
Brussels, 8th February 2018



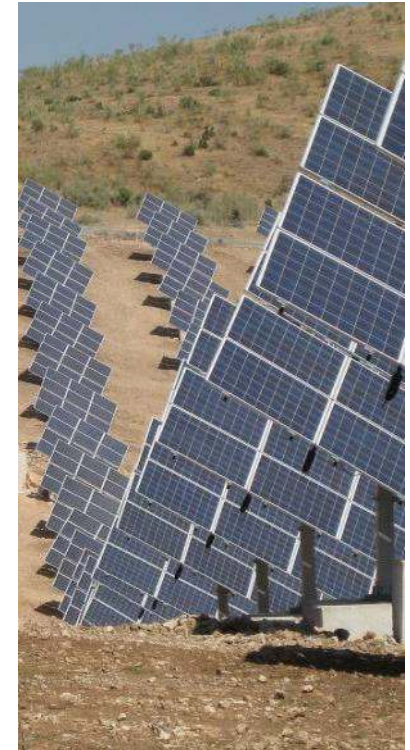
This project has received funding from the Fuel Cells and Hydrogen 2 Joint Undertaking under grant agreement No 735503. This Joint Undertaking receives support from the European Union's Horizon 2020 research and innovation programme and Hydrogen Europe and N.ERGHY



Challenge: Massive Growth in Surplus Electricity and Potential Curtailments



Source: Frontier Economics; Germany

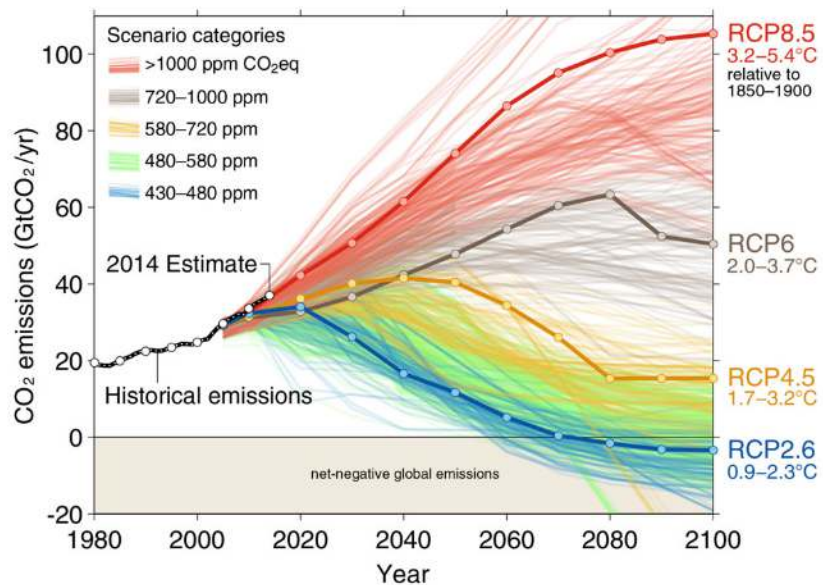




H2FUTURE

Challenge: Decarbonisation

- **Transport sector** / quota for biofuels
- **Industry sector** / alternative processes
- **Heating sector** / renewable gases

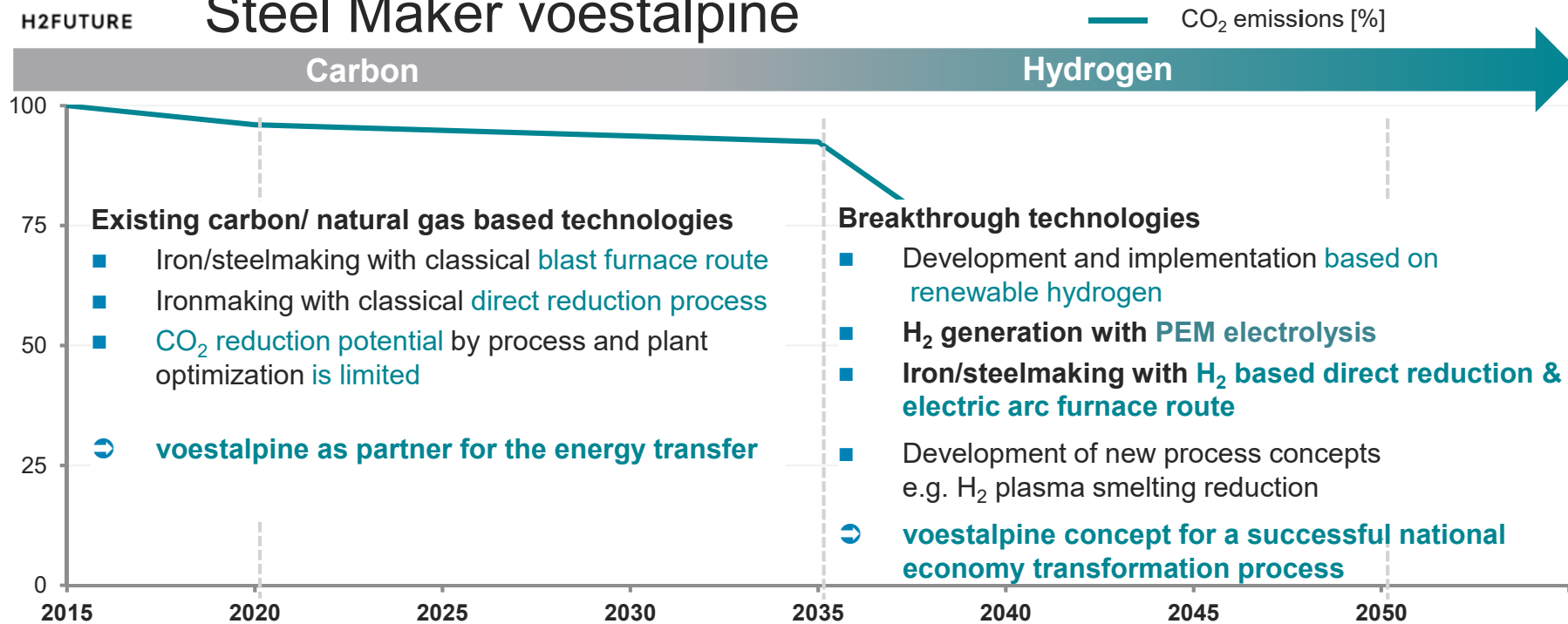


Quelle: http://www.nature.com/nclimate/journal/v6/n1/fig_tab/nclimate2870_F2.html





Scenario for Transformation: Decarbonisation of Steel Maker voestalpine



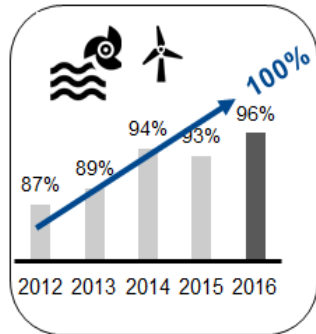
Preconditions: energy, raw materials, global competition, ...



H2FUTURE

VERBUND: At the Forefront of Green Energy

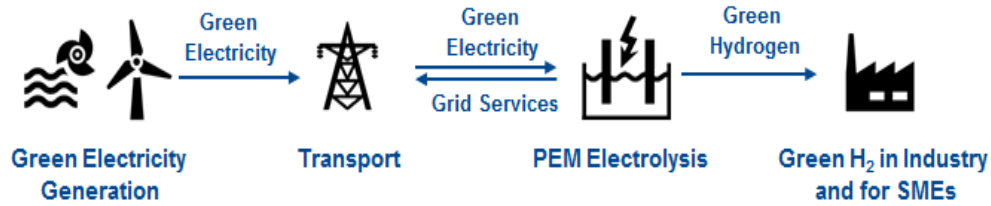
Green Electricity



- **21 pumped storage plants** (3,260 MW)
- **693 million m³ storage volume** (1,800 GWh)

- **Trading** in 12 countries (24/7), electricity / gas → 100 TWh per year

Green Hydrogen





H2FUTURE

Project Overview

- Project Partners:
 - VERBUND Solutions GmbH (project coordinator)
 - voestalpine Stahl GmbH
 - Siemens AG
 - K1-MET GmbH
 - Austrian Power Grid AG (APG)
 - Energy research centre of the Netherlands (ECN)

- Project Budget: **18 million EUR**
- Total Funding: **12 million EUR** by FCH JU
- Project Duration: **4.5 years, starting 1st January 2017**

Verbund

voestalpine

ONE STEP AHEAD.

SIEMENS

K1 MET
metallurgical competence center

APG
AUSTRIAN POWER GRID

ECN



Installation & Operation of an Electrolysis System at the voestalpine Production Site in Linz, Austria



Source: voestalpine



Source: Siemens, Silyzer 200

Key Data

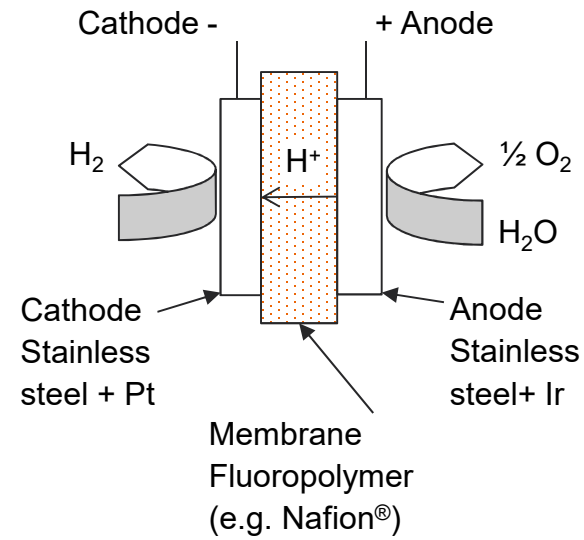
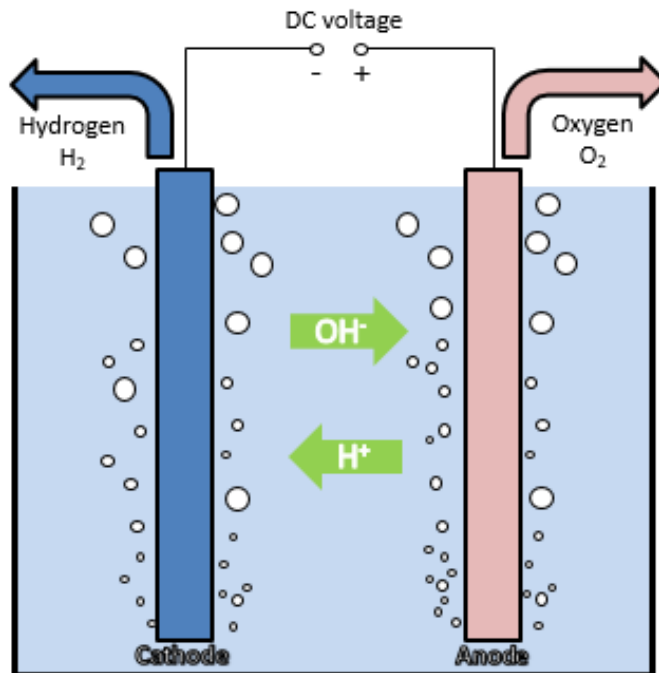
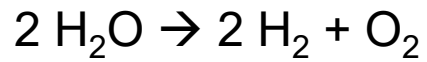
- **6 MW PEM electrolyser**
- **Pilot plant commissioning** end of 2018
- From 2019: **26-month demonstration and quasi-commercial operation**



Source: Siemens AG

Hydrogen for steel making::
Max. pressure 150 mbar
Quality $\geq 98\%$
Dew point $\leq 10\text{ }^{\circ}\text{C}$

How Does a Protone Exchange Electrolyser Work?



H2FUTURE:

- 600 (12x50) cells
- 0.5 m²/cell membrane area
- 2V cell voltage
- 10 kA/m² current density



H2FUTURE

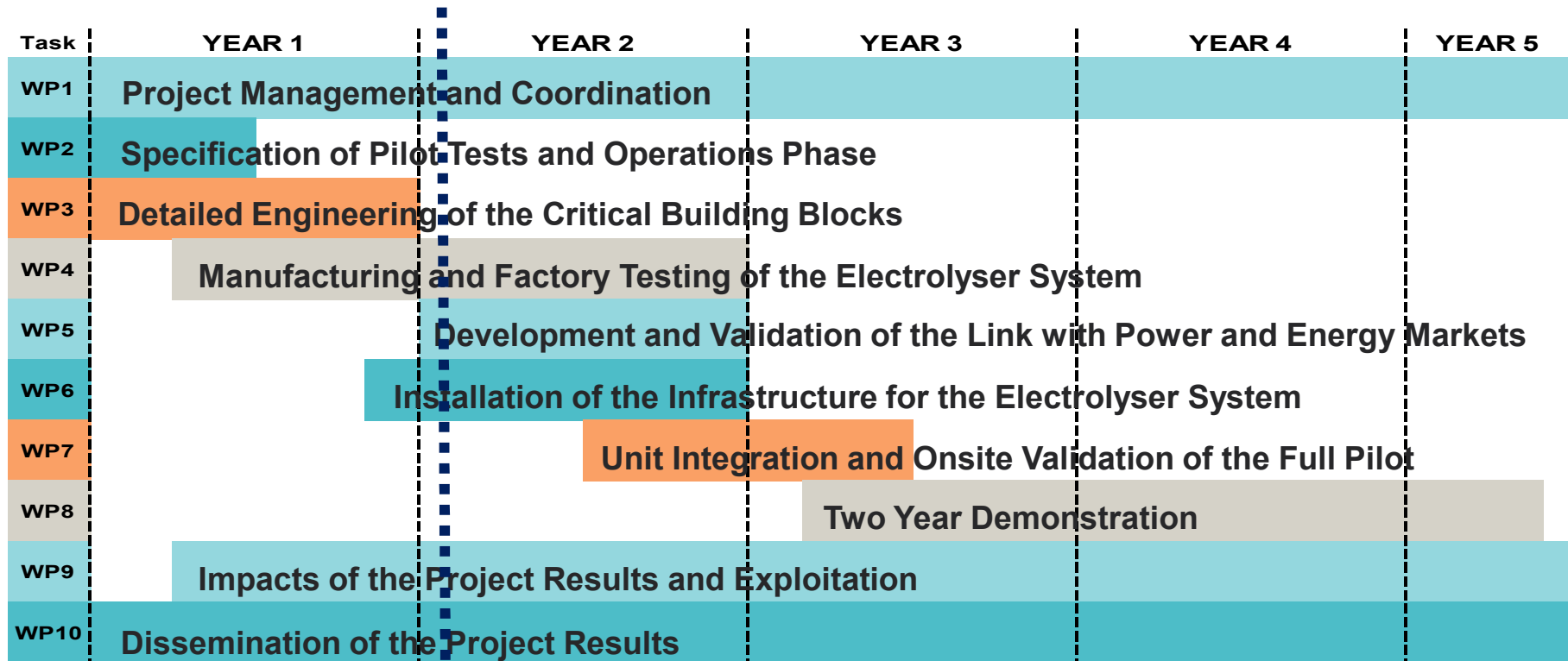
Project Objectives

- **Design and installation of a 6 MW Siemens PEM electrolyser system** at the voestalpine steel plant in Linz, Austria
- **Industrial integration of renewable hydrogen production** in the steelmaking process
- **26-month demonstration** of the electrolyser system
 - Stress tests / continuous operation 24/7
 - Prequalification for power reserve markets (primary, secondary and tertiary control)
 - Integration of the electrolyser system into the steelworks operation
 - Quasi-commercial operation with revenue streams from both hydrogen and power
- **Accompanying analysis** of different operation modes and monitoring of KPIs
- **Continued operation** of the electrolyser after the end of the project



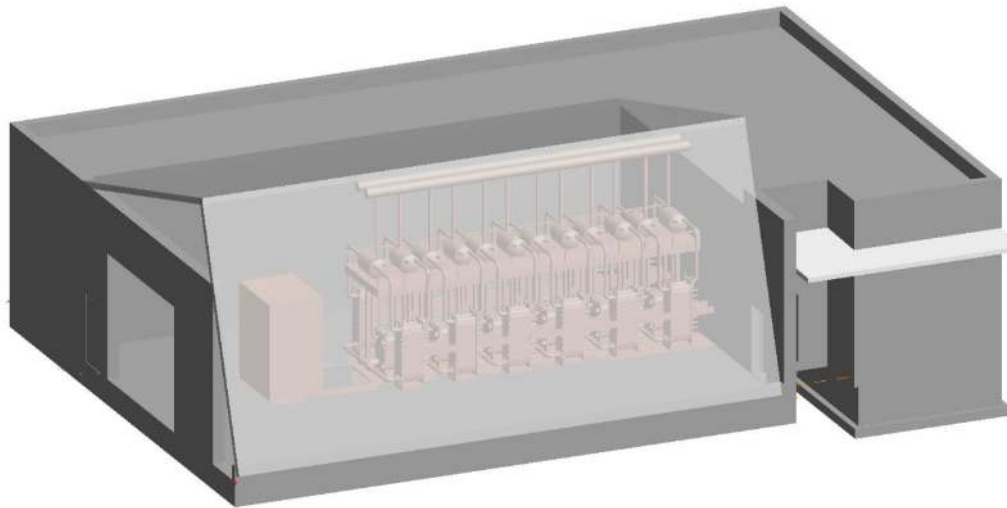
Project Timetable

Overview of Work Packages (WP)





Current Status of H2FUTURE



Source: Siemens

Manufacturing of 6 MW PEM electrolyser (Silyzer 300)

- Already in production

Permitting process

- Permit received at the end of 2017

Engineering documentation and KPIs

- Detail engineering and KPIs have been defined

Start of construction

- Beginning of 2018

FCH JU

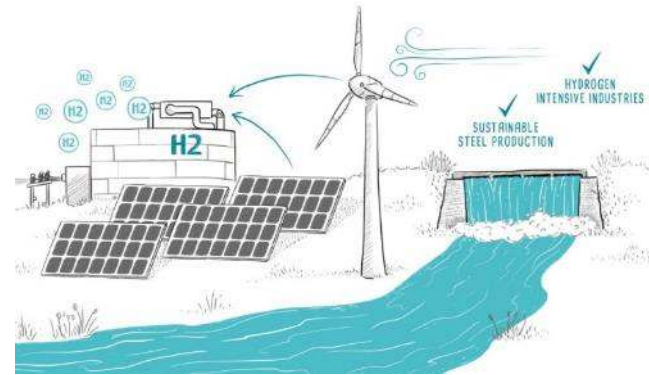
- 19 deliverables submitted



Press Conference at Kick-Off Meeting in February 2017



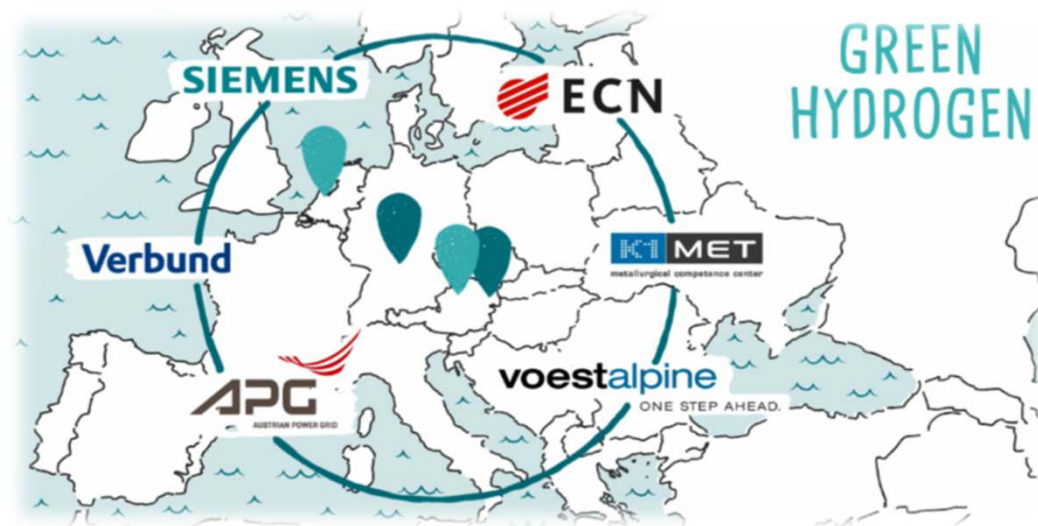
CEOs of voestalpine, Siemens and VERBUND and Executive Director of FCH JU



- Extensive press coverage
- Article in Financial Times
- International attention beyond EU
- European flagship project



H2FUTURE



<http://www.h2future-project.eu>



Contact

Rudolf Zauner
Head of Hydrogen Center

VERBUND Solutions GmbH
Europaplatz 2, 1150 Wien, Austria
T +43 (0)50 313-52 464
M +43 (0)664 828 5946
rudolf.zauner2@verbund.com

