

Short Introduction of ZSW – Electrochemical Energy Technologies Division, Ulm

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DOLPHIN 1st Public Workshop





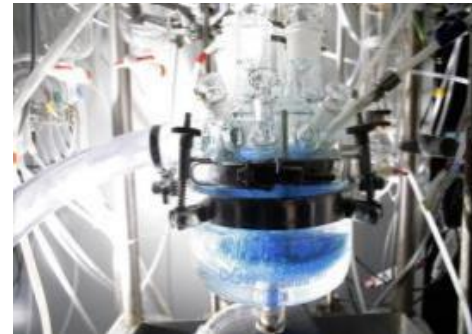
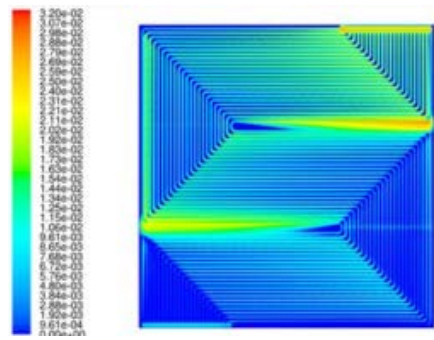
ZSW INTRODUCTION

ZSW – At a Glance

A non-profit organization - 300 employees - 85% external funding

Applied Research & Development on New Energy Technologies:

- Batteries & Supercapacitors: materials, production technologies, systems, qualification
- Fuel Cells: technology, systems, production technologies, test-center
- Photovoltaic: thin film technologies (CIGS) & application systems
- Renewable Fuels: power-to-gas, biomass gasification
- Energy politics & economics, wind energy



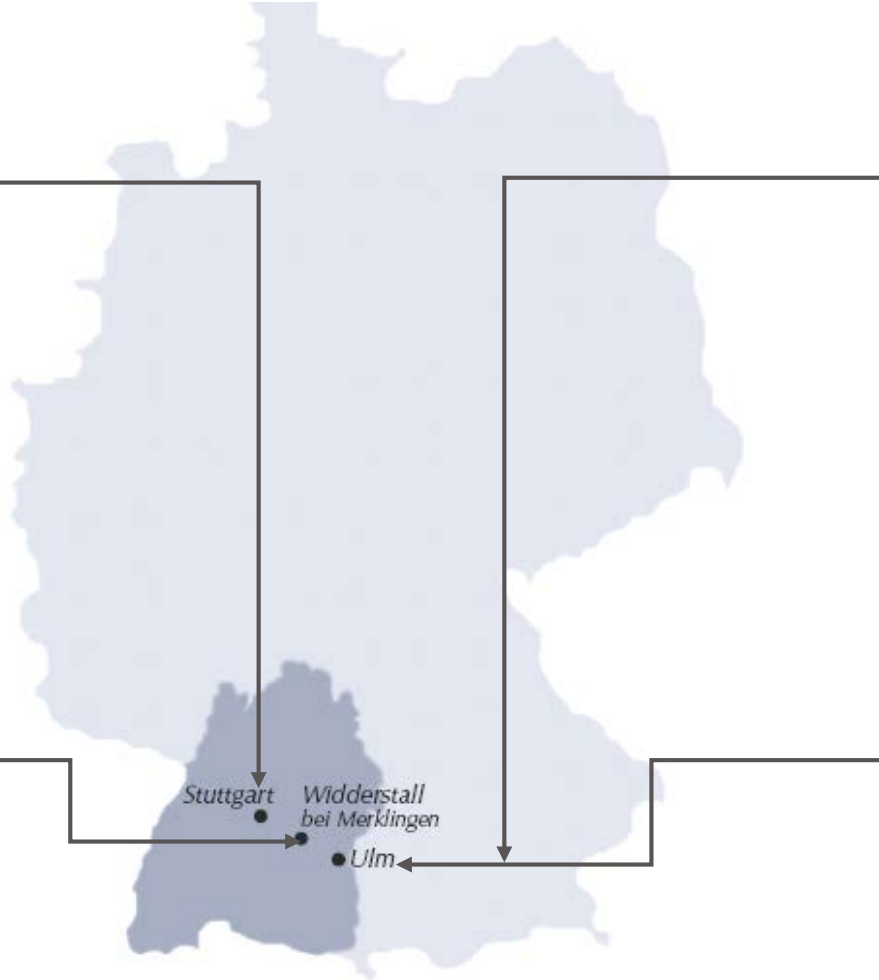
ZSW Locations



Stuttgart:
Photovoltaics (with Solab), Energy Policy & Energy Carriers, Central Division



Widderstall: Solar Test Facility

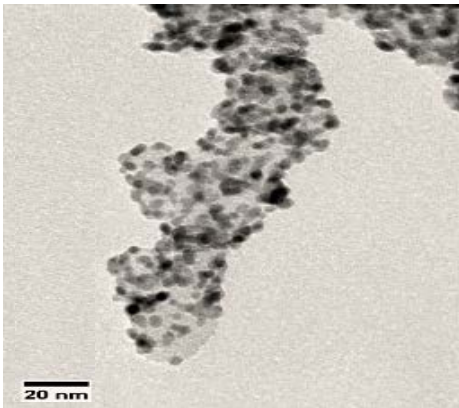


Ulm:
Electrochemical Energy Technologies with ZSW Laboratory Battery Technologies (eLaB)



Hydrogen & Fuel Cells

- Catalysts & Membrane-Electrode-Assemblies (MEAs)
- Stack-technology, modelling and simulation, stack integration
- Fuel cell test centre & fuel cell systems
- Electrolysis & hydrogen for mobility
- New energy storage concepts

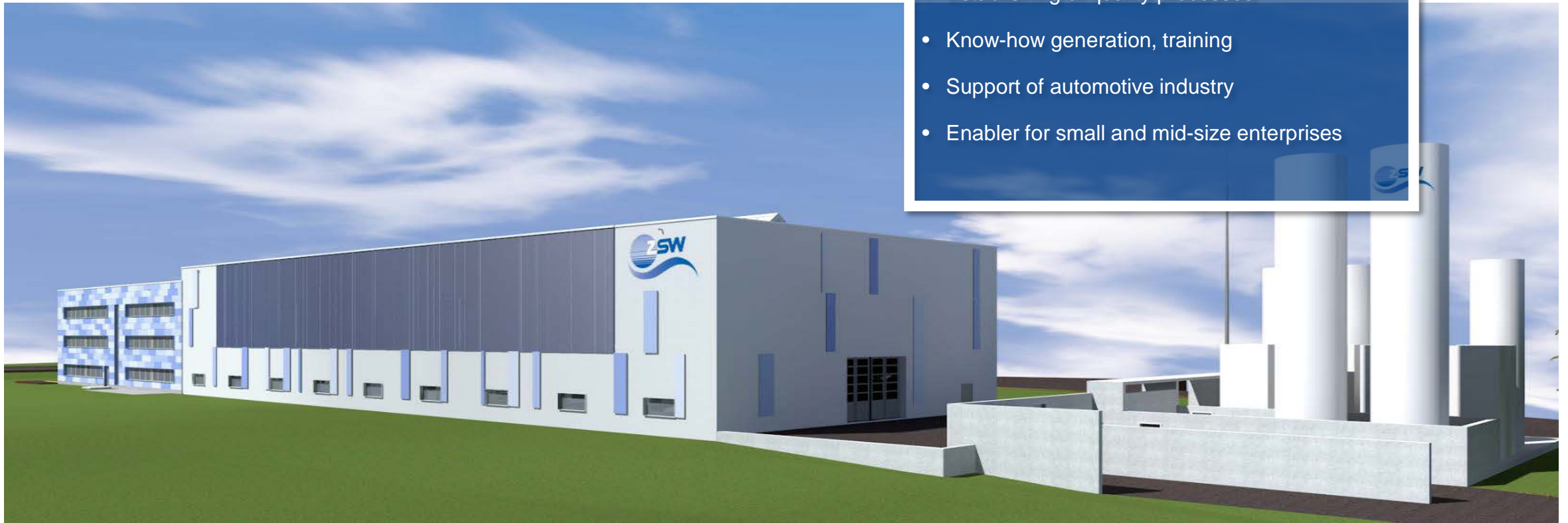


HyFaB-Building - Lise-Meitner-Straße - Ulm

Construction in 2021



- Open source manufacturing platform
- Development of high-speed manufacturing processes
- Establishing of quality processes
- Know-how generation, training
- Support of automotive industry
- Enabler for small and mid-size enterprises

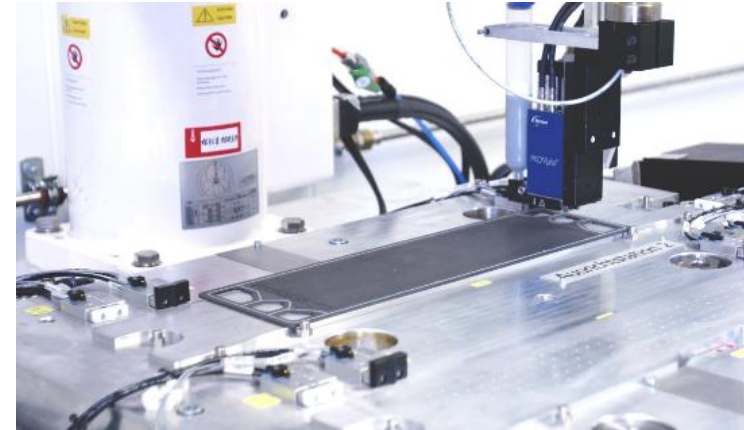


Fuel Cell Stack Development and Manufacturing

- Component characterization laboratory
- CAD construction and CFD & FEM modelling for components, cells and stacks
- Innovative joining technologies and manufacturing processes
- Robot based stack assembly and testing
- Stack power range from 50 W up to 100 kW
- Experience with more than 1,200 fuel cell stacks



Components Quality assurance



Automated seals applying with dispenser



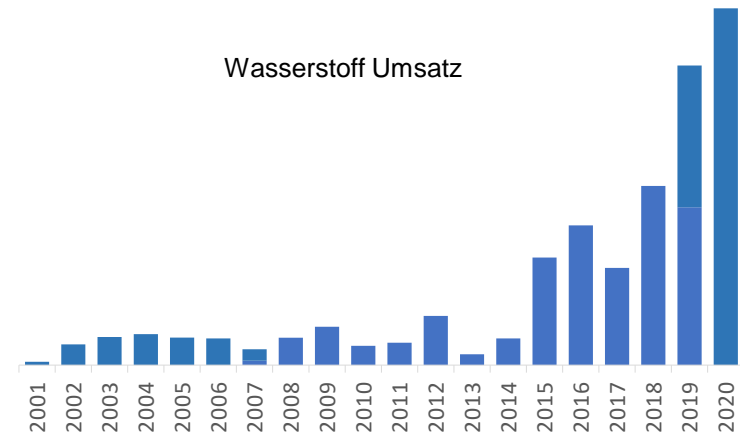
Robot based stack assembly and testing

Fuel Cell Test Centre

- Full-size automotive stacks and systems (from Milliwatt to 160 kW)
- 34 fully automated, 24/7-operation fuel-cell test benches
- Covering full DIN IEC 62282-2 test regimen
- Accelerated aging tests
- Wide range of reactant supply lines (H₂/O₂, H₂/Air, Reformate/Air)
- 25+ years of test experience, 250 kg Hydrogen storage capacity
- Pollutant gas tests



100 kW automotive fuel cell stack on ZSW test bench



H₂ consumption in 2020 was 317.450 m³ or 26,7 tons.



ZSW CONTRIBUTION TO DOLPHIN

ZSW Contribution to DOLPHIN

- CFD modelling including electrochemical reactions and all other relevant processes
- Contribution to component, cell and stack designs
- Contribution to laser milling and additive manufacturing technology pathways
- MPL / protective diffusion layer development
- Contribution to single cell and stack assembly and testing
- Contribution to cost analysis tasks
- Dissemination and communication activities

THANK YOU FOR YOUR ATTENTION!

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Stuttgart



Widderstall



Ulm



Ulm eLaB