Hydrogen –
new city energy concepts

Balance Drive Ltd.

Jürg Fürst,

Derap AG

Peter Keller

Ways to produce hydrogen

from fossil fuels
(e.g. natural gas)

steam reforming
(natural gas or biomass)

from water
(e.g. electrolysis)

Ways to produce hydrogen

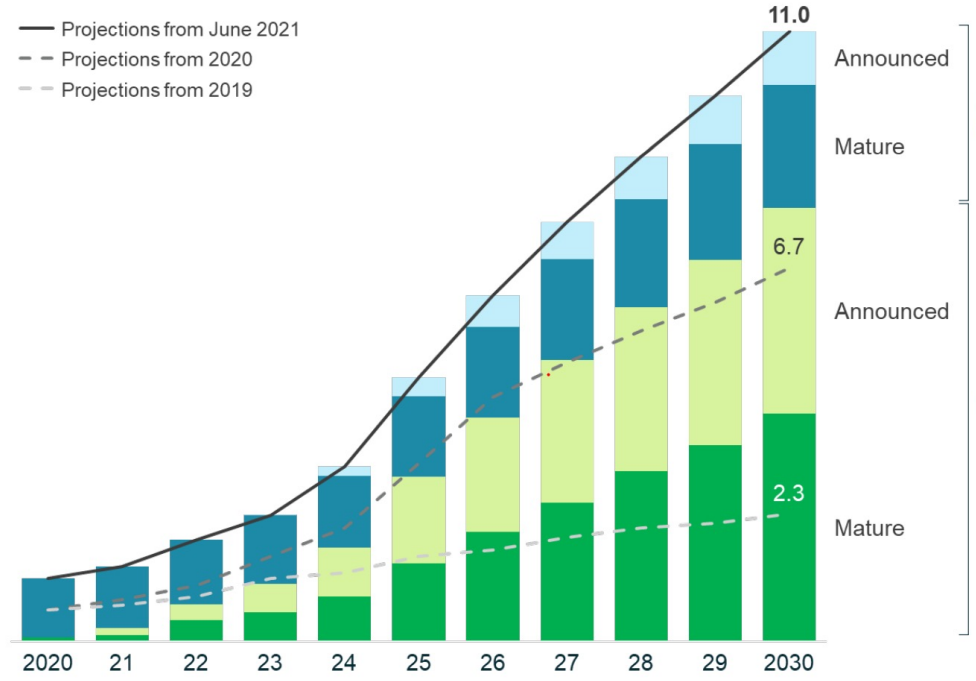
from fossil fuels
(e.g. natural gas)

steam reforming
(natural gas or biomass)

from water
(e.g. electrolysis)

Exhibit 2: Announced clean hydrogen capacity through 2030

Cumulative production capacity, Million tons p.a.



>60%
increase in capacity
announced in the past 5 months

69 GW
clean hydrogen capacity
by 2030 announced

+7.7 Mt
additional capacity
(low carbon and renewable)
announced for post-2030

Source: hydrogen council, insights hydrogen July 2021

Hydrogen storage

Compressed hydrogen

Hydrogen gas is compressed.

- 500…700 bar in vehicles
- 30 bar to transport in tanks

Liquid hydrogen

The hydrogen is liquified by reducing its temperature to -253°C.

As a solid

In metal storages, hydrogen is chemically bonded with metals or alloys to form metal hybrides.

Ways to use hydrogen

Converting to electricity and heat

Fuel cells produce electricity and thermal energy

Feeding into a natural gas grid

In EU the natural gas grid can be fed with up to 5% H2

Source: Energie Park Mainz

Energy source

Energy source for vehicles
- Public transport
- Truck
- Cars

For buildings
- Converting to electricity and heat

Production of synthetic fuels

Synthetic fuels (petrol and diesel) made from H2 and CO2.

Green hydrogen

Definition

Green hydrogen is produced out of water with electricity from low-carbon sources.

The most common way of production is with electrolysis, whereby electricity from photovoltaic systems or hydropower plants is used.

Combination with other energy sources

Incineration plants have high energy resources that could be used to produce hydrogen.

- energy storage
- feed of H2 into natural gas grid
- production of methanol or synthetic fuels with H2 and CO2 from the thermal process in the plant

Hydrogen as energy for public transport

Nowadays

Todays public transport is mainly driven by electricity.

Vehicles are running with:

- Battery
- Overhead lines or current lines
- Hybrid vehicles (combustion engine and battery)

Problems:

- Maintenance
- Current peaks
- Lines without electricity grid
- Charging stations

Hydrogen as energy for public transport

New ways with hydrogen

- Fuel cell vehicles using hydrogen as energy source
- Vehicles in public transport can also transport hydrogen from A to B and are a part of the hydrogen supply chain
- The city infrastructure becomes more connected. Waste treatment plants, natural gas grid, wind and photovoltaic plants, electrical grid, public transport and individual transport are all connected and support each other
- Hydrogen production is used to stabilize the electrical grid
- The electrical grid of public transportation will be used for decentralized hydrogen production, right at the place where the hydrogen is needed (fuelling station for Monorail, Bus, Cars, Truck….)
- Sun and wind energy will be stored as hydrogen

Jungfraupark

The “Jungfrau Park” located in Interlaken CH is in need of new activities and attractions due to low attendance figures. It offers an excellent location and infrastructure.

- Near the Interlaken Ost railway station
- Near the freeway entrance
- Large parking
- More space to expand

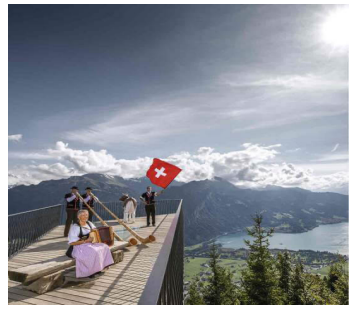
DERAP
SWISS ENGINEERING SOLUTIONS

BALANCE DRIVE
SWISS MOTION

New project

The idea is to add a Clean Energy Resort to the existing pavillions :

- With a hotel for visitors
- With a clean energy Swiss Chalet hotel
- With restaurants and shops
- With pavillions for the touristic spots in the surrounding region
- With a development centre for clean energy and new transport systems (Monorail, Busses, etc.)



DERAP SWISS ENGINEERING SOLUTIONS

BALANCE DRIVE SWISS MOTION

Attractions

We are in the heart of exciting attractions such as:

Jungfraujoch, Schilthorn, Harder, Giessbachfalls, St. Beatus caves,

Ballenberg museum, town and lake of Thun, lake of Brienz and Interlaken.

DERAP
SWISS ENGINEERING SOLUTIONS

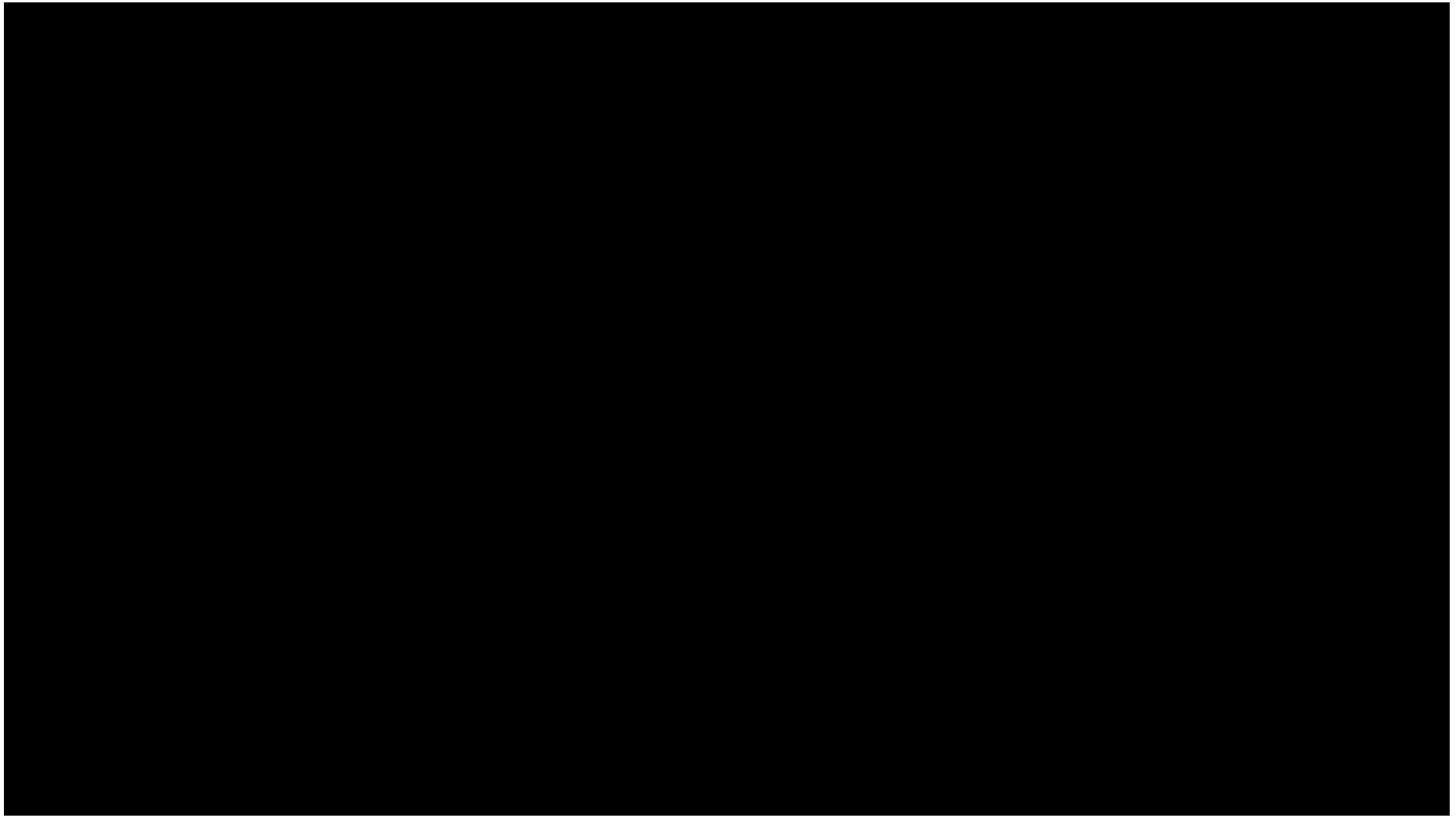
BALANCE DRIVE
SWISS MOTION

Monorail MRST

DERAP
SWISS ENGINEERING SOLUTIONS

BALANCE DRIVE
SWISS MOTION

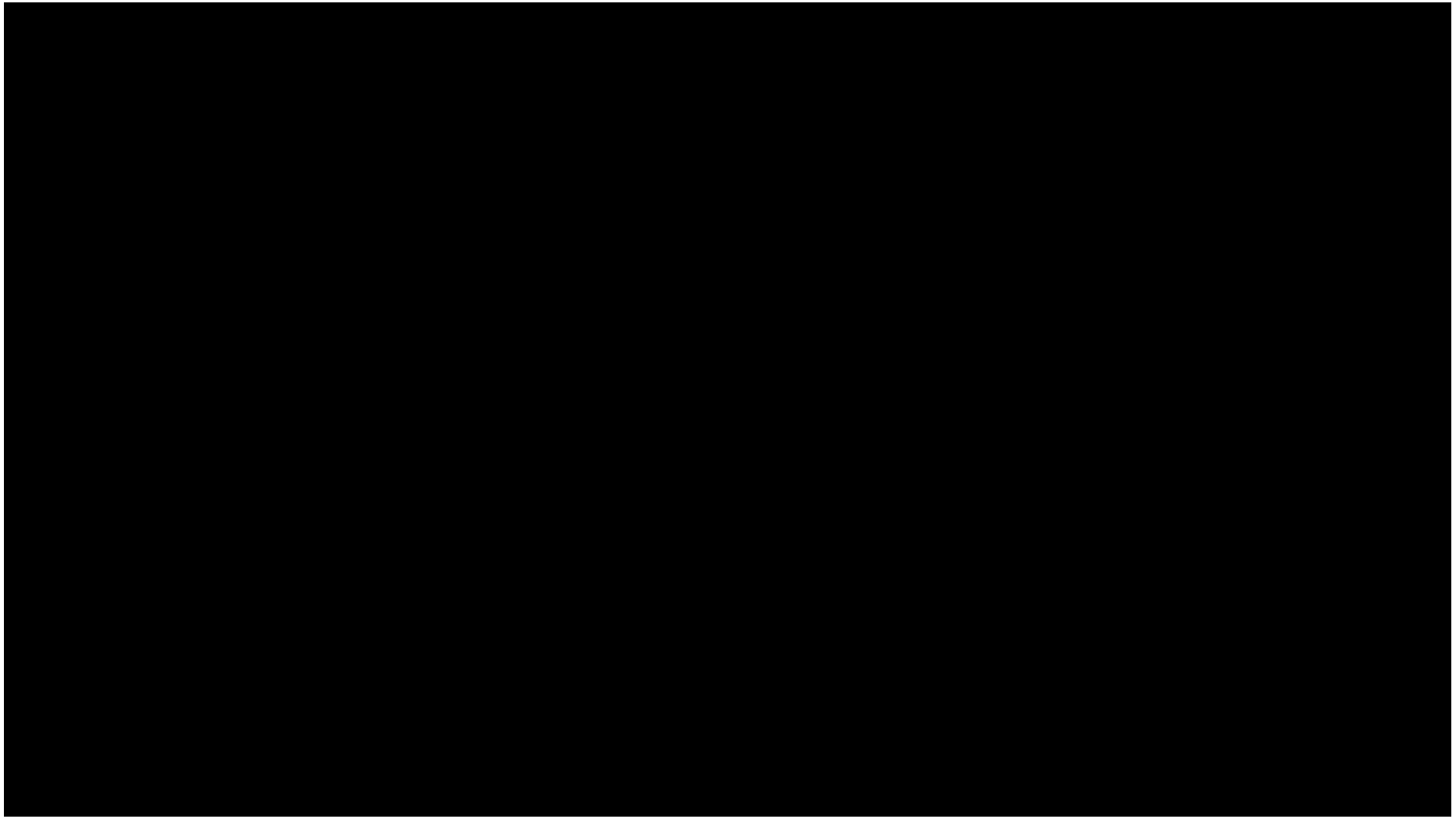
Bus SRT Vehicle



DERAP
SWISS ENGINEERING SOLUTIONS

BALANCE DRIVE
SWISS MOTION

City Cable Car - CCC



DERAP
SWISS ENGINEERING SOLUTIONS

BALANCE DRIVE
SWISS MOTION

Jungfraupark Clean Energy Resort (CER)

Business park for new transport projects

- Electric drives for different projects
- Hydrogen for different transport systems
- Development centre and test field
- Visiting centre and presentation platform for students and companies

DERAP
SWISS ENGINEERING SOLUTIONS

BALANCE DRIVE
SWISS MOTION

Summary

- Hydrogen offers complete new possibilities to store energy and connect different infrastructures
- Public transport running with hydrogen could support the supply chain and help to stabilize the electrical grid
- H2 production can help to reduce CO2 emissions in the industry – synthetic fuel or methanol production
- The Clean Energy Resort Jungfrau Park will be a combination of touristic infrastructure and new technology development
- The resort is also a good opportunity for education, research and technology events

DERAP
SWISS ENGINEERING SOLUTIONS
BALANCE DRIVE
SWISS MOTION

Balance Drive AG
Bodenmattstrasse 5
CH-3185 Schmitten

Tel. +41 26 497 92 92
info@balance-drive.ch
www.balance-drive.ch

Derap AG
Schützenstrasse 19
CH-3627 Heimberg

Tel. +41 33 439 80 85
info@derap-ag.ch
www.derap-ag.ch

Thank you for your attention!