Hydrogen challenges

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Challenge nr. 1

For green hydrogen production we need enough green power

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Hydrogen targets of EU and Estonia

	EU 2030 (EU H_2)	ESTONIA 2030 (Civitta)
	EU TARGETS 2030	**ESTONIAN DIRECTION 2030**
HYDROGEN PRODUCTION		
Production of green and low CO2 hydrogen	**10 000 000 t**	**40 000 – 70 000 t**
Electrolysers	**40GW**	**250 – 500 MW**
HYDROGEN IN TRANSPORT		
Buses and trucks	45 000	3 700 – 7 400 tk
Cars	3,7 milj	45 000 – 90 000 tk
Trains	570	12 – 25 tk
Ferries		1 – 2 tk

Allikas: Hydrogen Roadmap Europa, FCH JU, 2019

2030 green electricity target with hydrogen production

6,3 TWh

2030 Estonian wind energy production forecast (REKK):

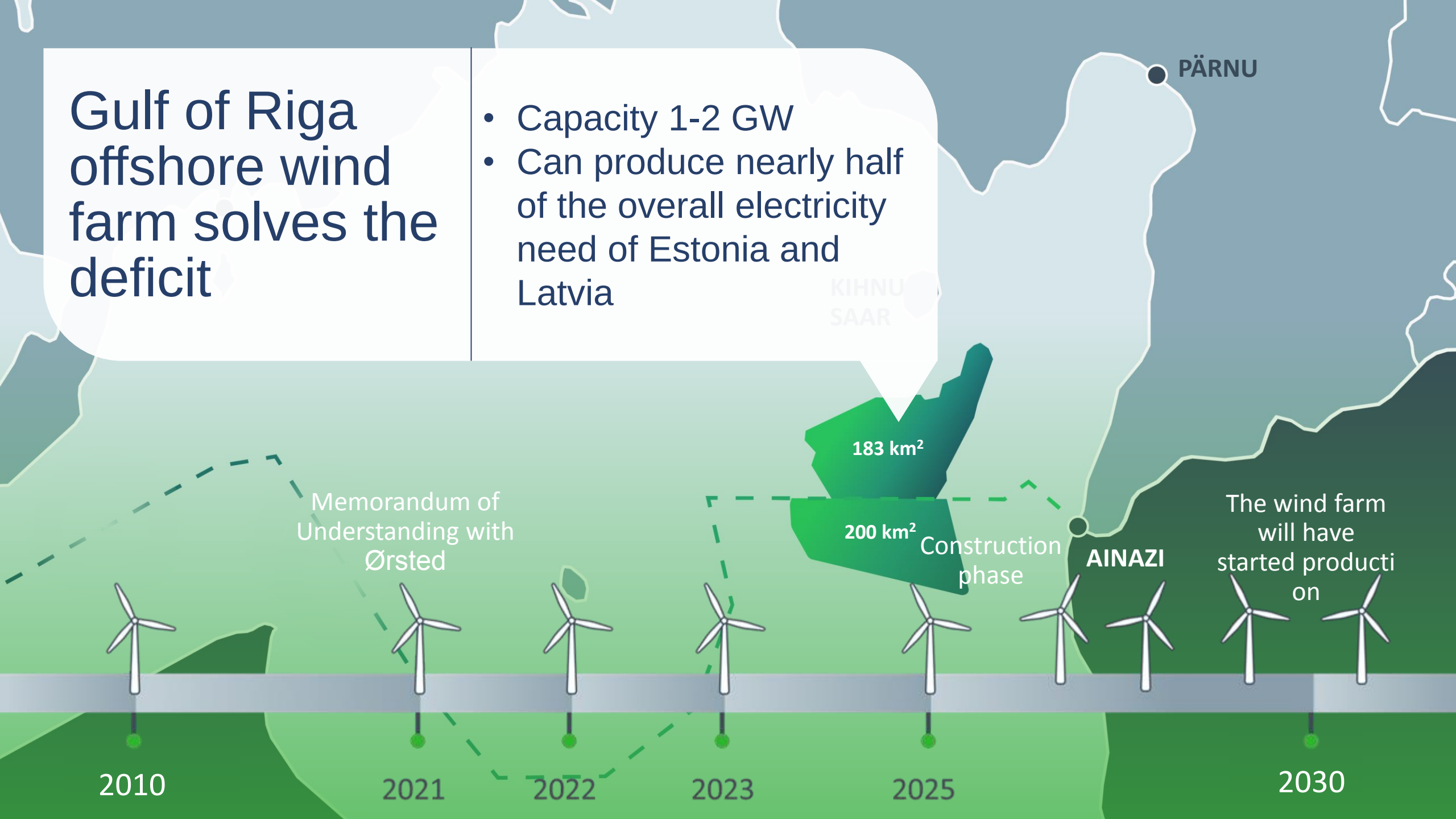
2,5 TWh

Missing: **4 +** **TWh**

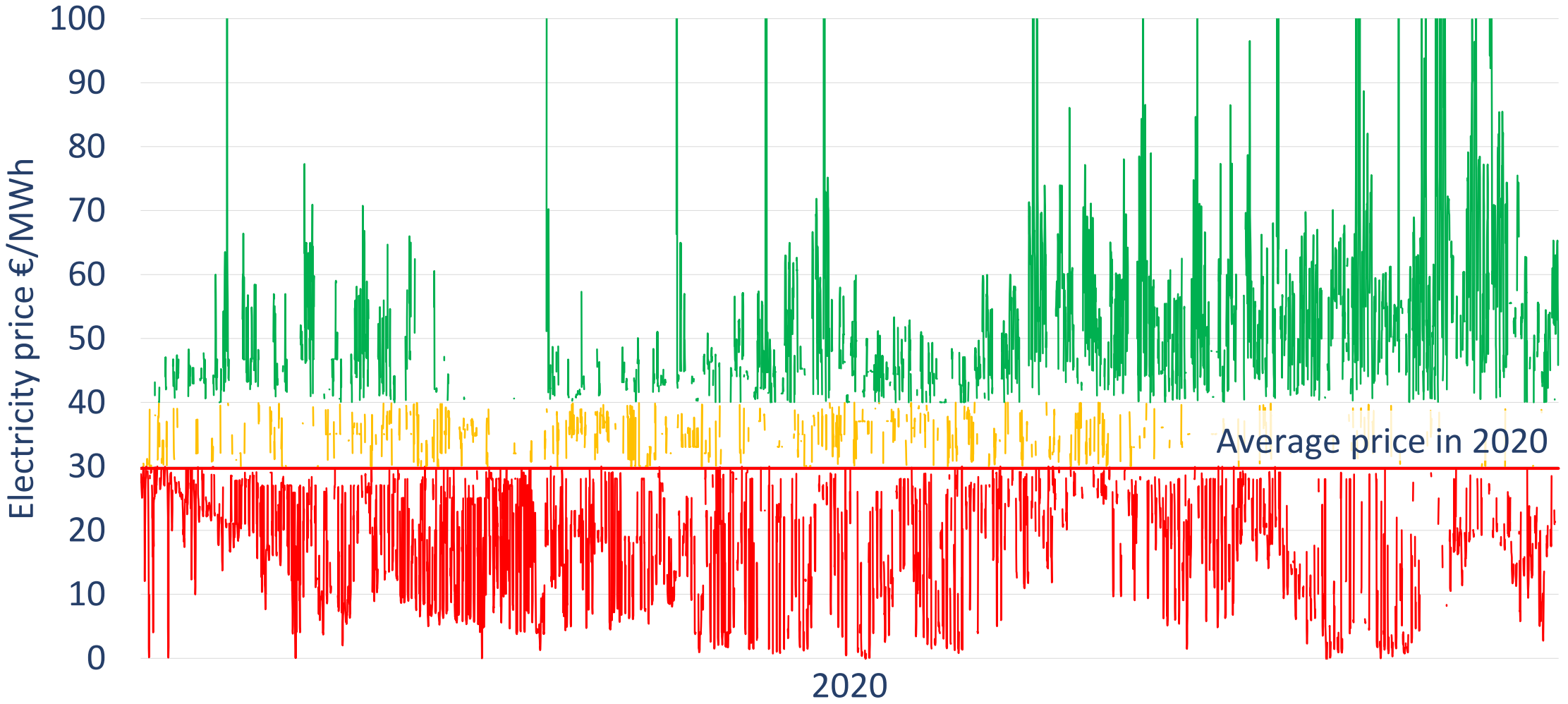
or 1000 MW offshore wind farm

Gulf of Riga offshore wind farm solves the deficit

- Capacity 1-2 GW
- Can produce nearly half of the overall electricity need of Estonia and Latvia



When is it wise to store hydrogen?



Challenge nr. 2

Efficiency of hydrogen production

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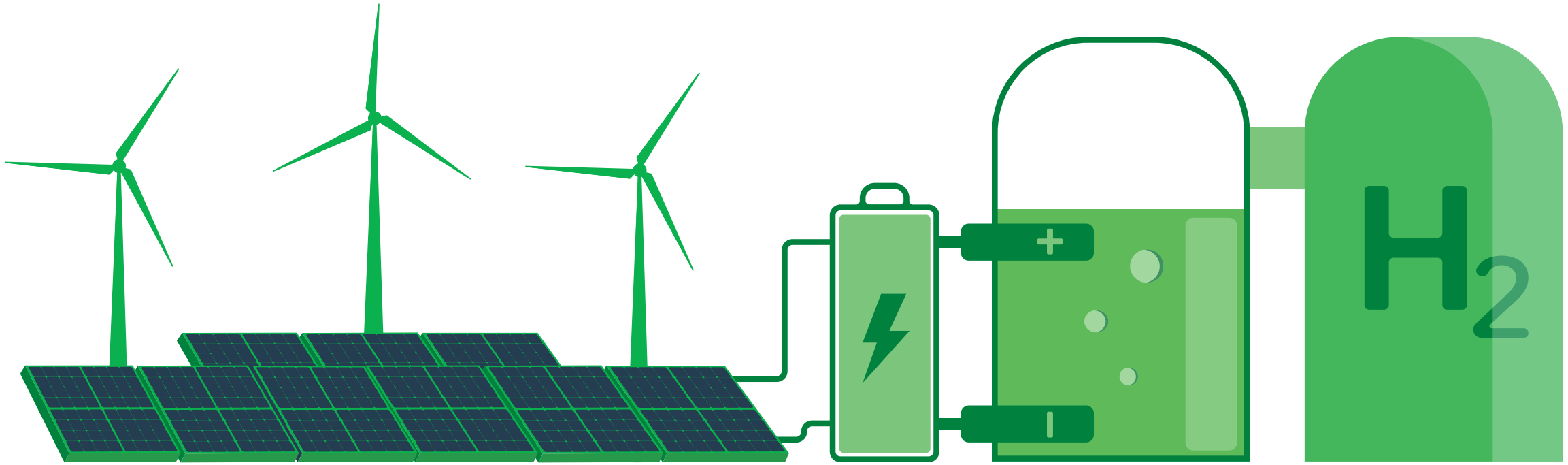

Energy loss on hydrogen production - 40%

Expectations for science:

- Increase the efficiency of the electrolyser
- Increase the flexibility of the electrolyzer, which can be quickly adjusted according to the wind
- Reduce the cost of the electrolyzer

Challenge nr. 3

Use of hydrogen needs to be made more effective

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Advantages and disadvantages of hydrogen in transport compared to electricity

ADVANTAGES:
- Hydrogen is lighter
- Hydrogen refueling is 10-15 times faster

PROBLEM:
- Efficiency of hydrogen is lower

EXPECTATION:
- Efficiency to be increased

	ELECTRICITY	HYDROGEN
	800 km	800 km
	Truck 40 t	Truck 40 t
KG	**4 200** kg (electric motor + batteries)	**2 000 kg** (electric motor + fuel cell + hydrogen + small battery)
	1230 kWh (green electricity)	**2 340 kWh** (green electricity)
	~8 hours(150kW) ~3,5 hours (350kW)	**10-20 min**

Expectations for science:

- How to store energy for longer period in hydrogen without major losses?
- How to upgrade existing gas infrastructure for hydrogen use?
- How to make hydrogen easier to transport?
- How to liquefy with lower energy consumption?
- What are the other end products from the green hydrogen?

Expectations for policy makers:

- Infrastructure is needed for hydrogen to be used in transport

We are ready to be be pioneers with our partners

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Eesti Energia produces hydrogen today

Hydrogen production capacity today

~30

t/H_2 year

Existing Potential of EE wind farms

10 000

t/H_2

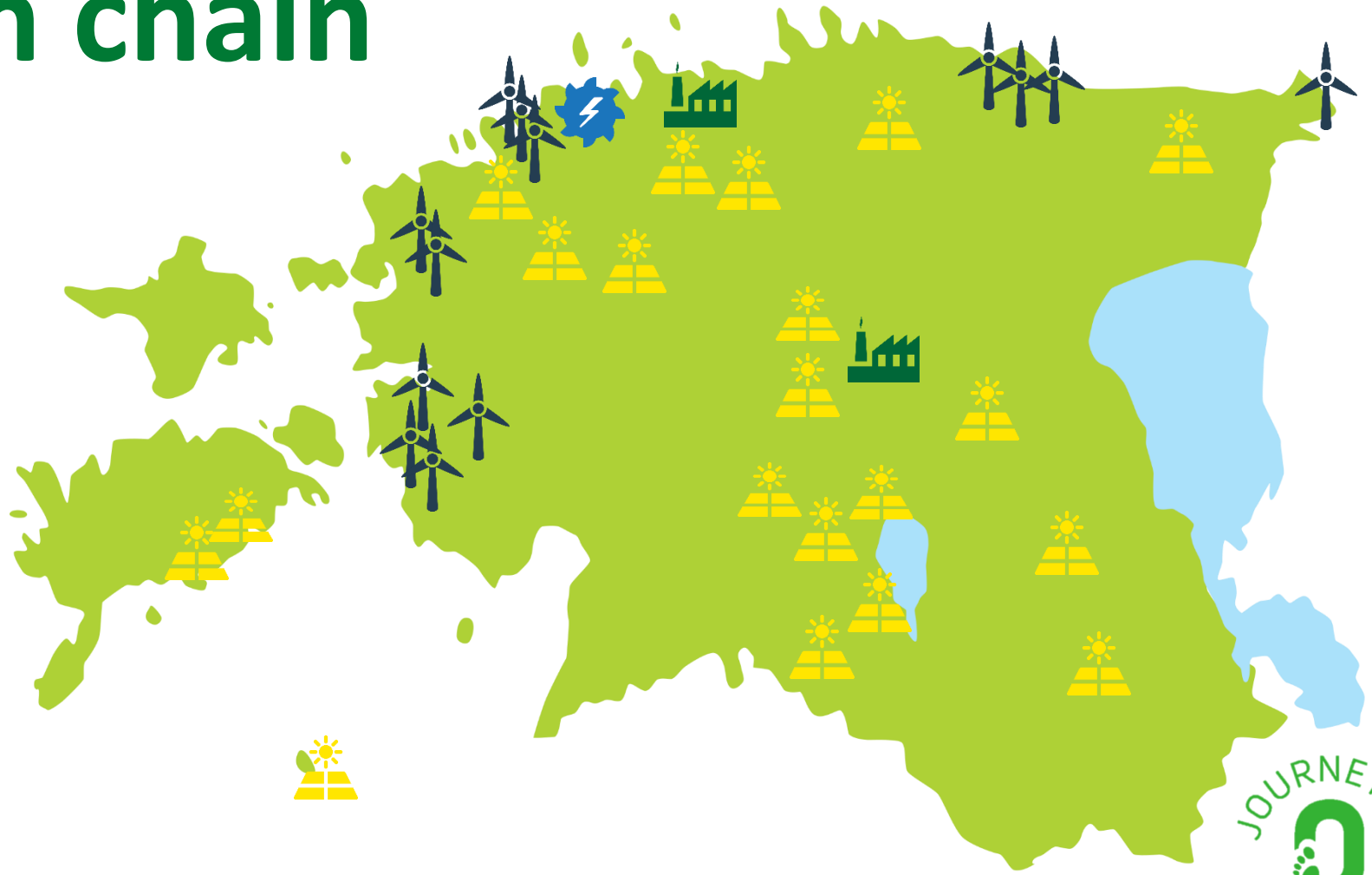
Potential of the Gulf of Riga offshore wind farm up to

80 000

t/H_2 year

JOURNEY TO ZERO

Our aim is to pilot the entire hydrogen chain



JOURNEY TO ZERO


JOURNEY TO ZERO
We are waiting for you on the journey to zero
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