



UNIVERSITY OF TARTU



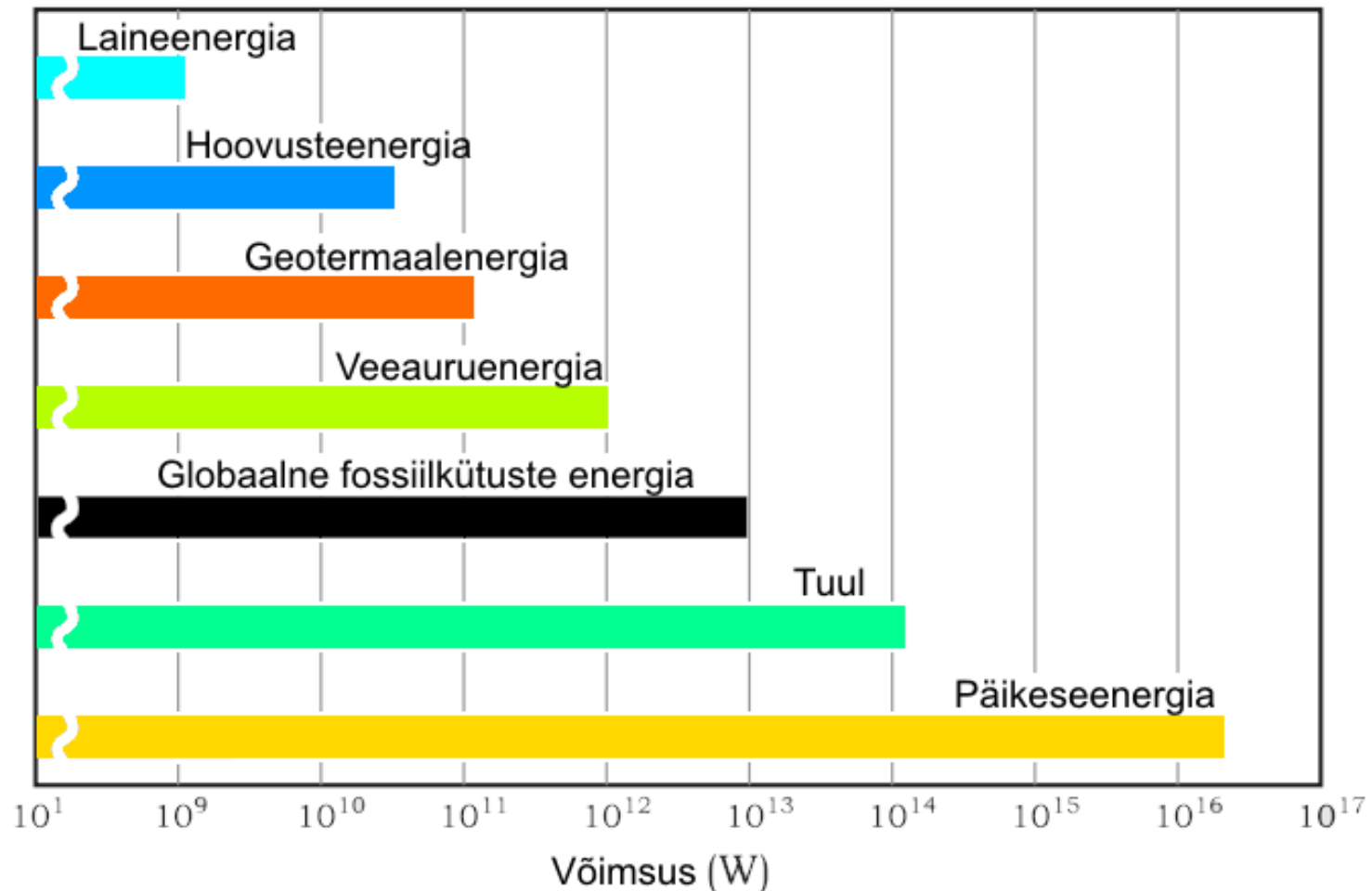
# *Jätkusuutlikud rakendused energiatehnoloogias*

PhD Ove Oll

[ove.oll@ut.ee](mailto:ove.oll@ut.ee)

*Keemia Instituut, Tartu Ülikool*

# Mis on taastuvenergia?



# 100% tuulel, veel ja päikeseenergial põhinev energiasüsteem 139 riigis

## 100% IN 139 COUNTRIES

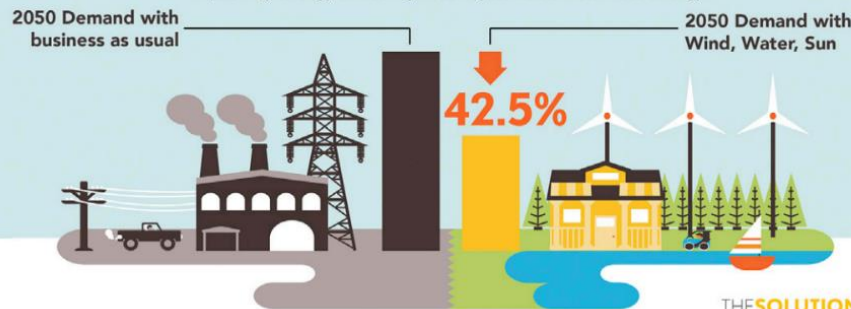
Transition to 100% wind, water, and solar (WWS) for all purposes (electricity, transportation, heating/cooling, industry)



**JOBS CREATED 52 MILLION**

**JOBS LOST 27.7 MILLION**

Using WWS electricity for everything, instead of burning fuel, and improving energy efficiency means you need much less energy.



THE SOLUTIONS PROJECT

Eesti jaoks optimaalne jaotus (2017):

43,85% Meretuulepargid

36,54% Maismaatuulepargid

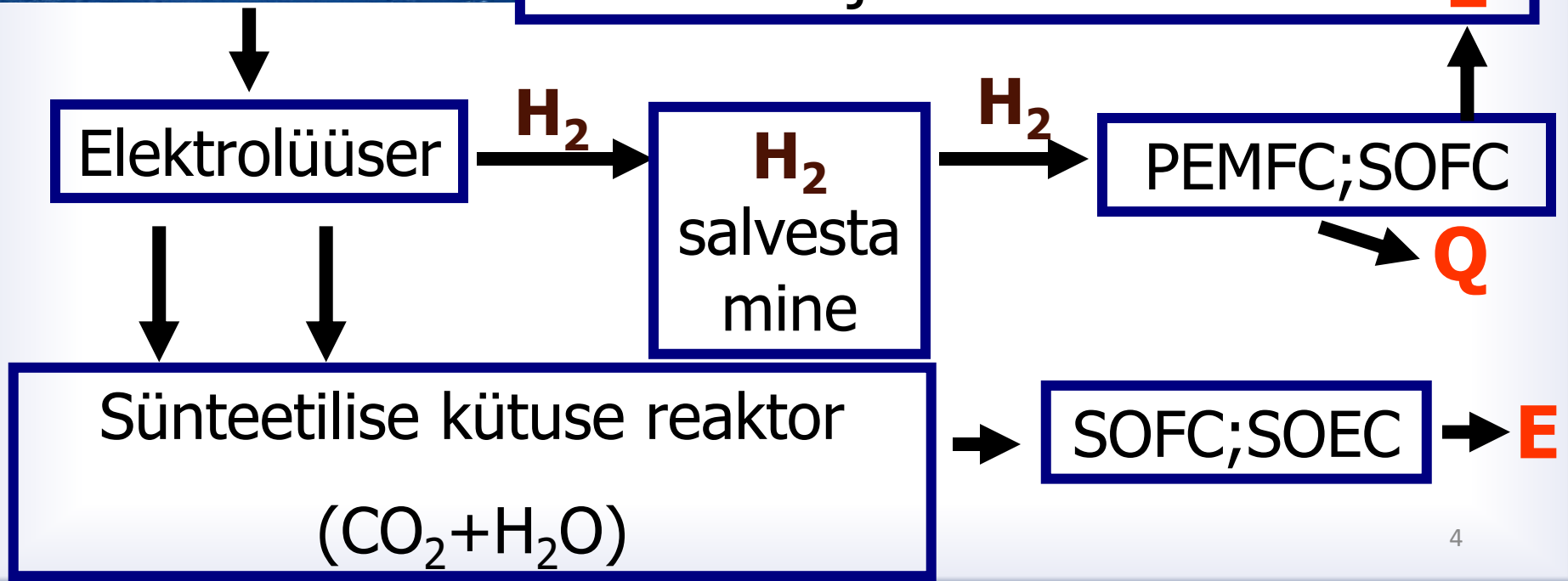
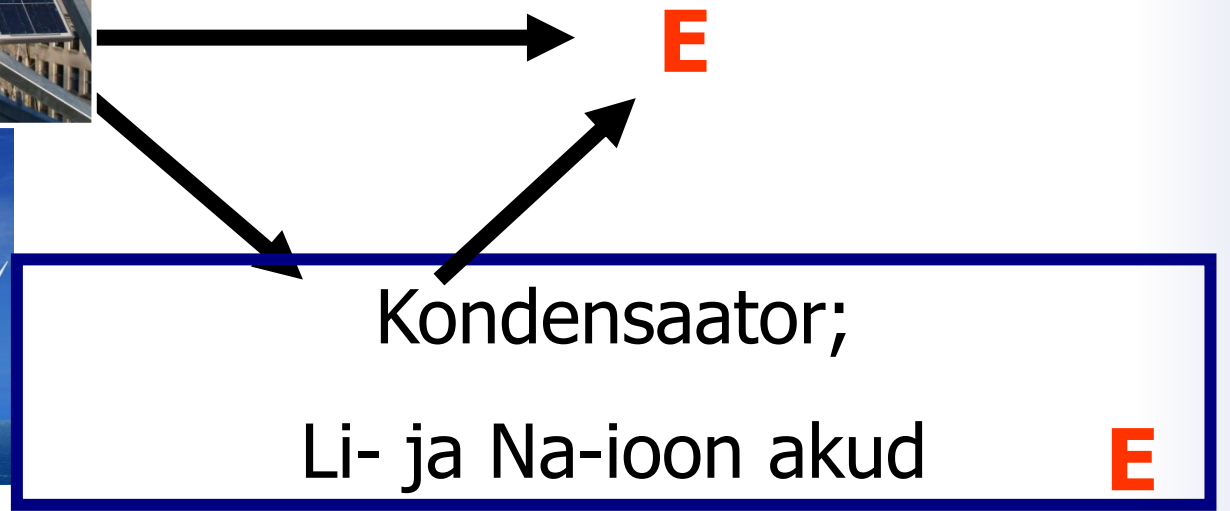
4,83% Elumajade päikesepaneelid

3,43% Kommertsiaalhoonete

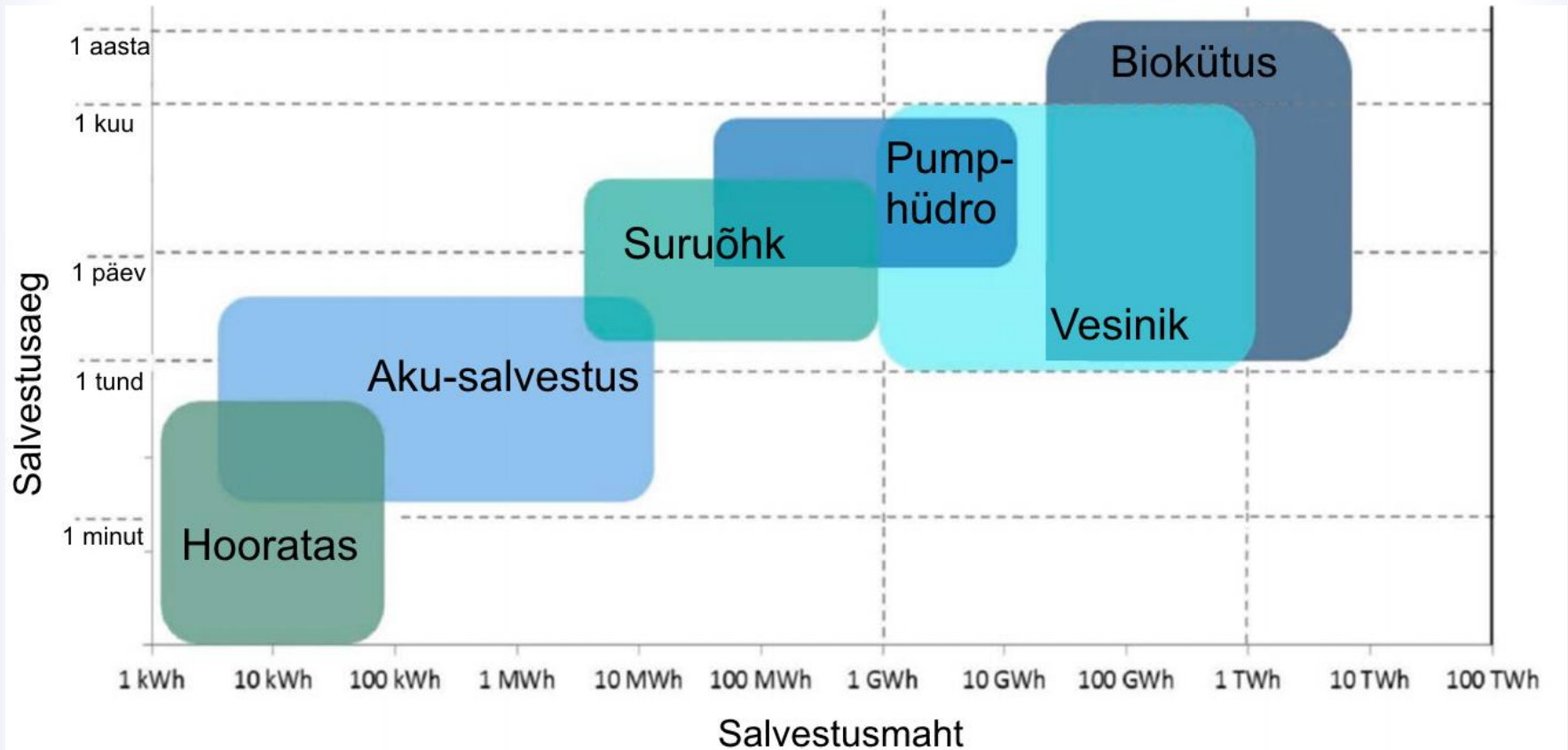
päikesepaneelid

10,96% Tööstuslikud päikeseväljad

# Tuule ja Päikeseenergia muundamine ja salvestamine

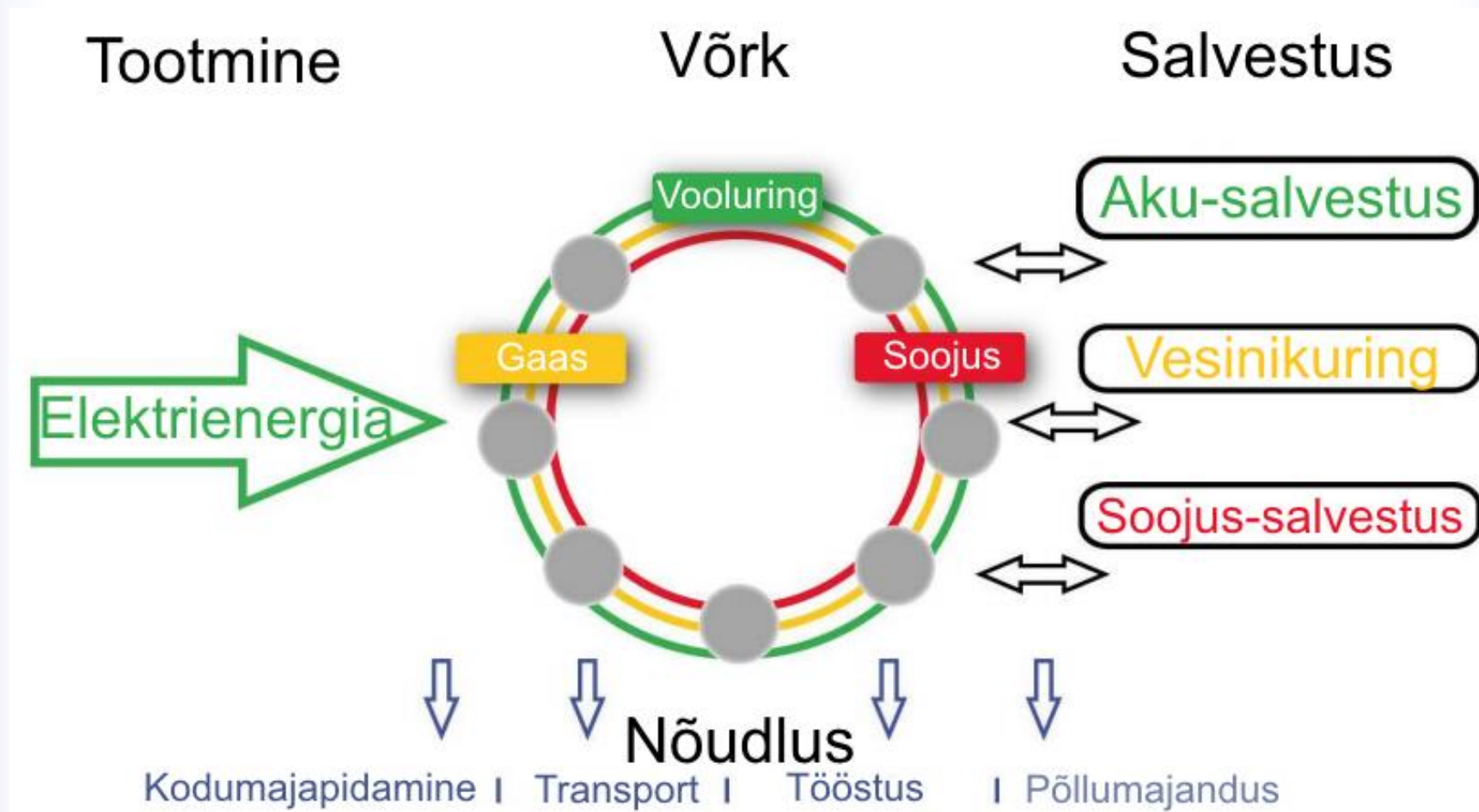


# Energia salvestamine



Source: School of Engineering, RMIT University (2015)

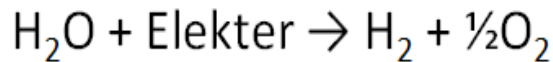
# Energiavõrgud



# Vesinikutehnoloogiate kaart



# Elektrolüüseri kasutatavus elektrienergia kiireks salvestamiseks vesinikuna või sünteeskütusena



Ideaalsel juhul: 39 kWh elektrienergiat = 1 kg H<sub>2</sub>

- PEM elektrolüüserid reageerivad väga kiiresti voolu kõikumistele → seega võimaldavad võimsuste juhtimist
- Iga kuupmeetri vesiniku tootmisel toodetakse ka pool kuupmeetrit hapnikku
- Toodetavad H<sub>2</sub> ja O<sub>2</sub> on väga suure puhtusega ja sobivad kütuseelementides kasutamiseks

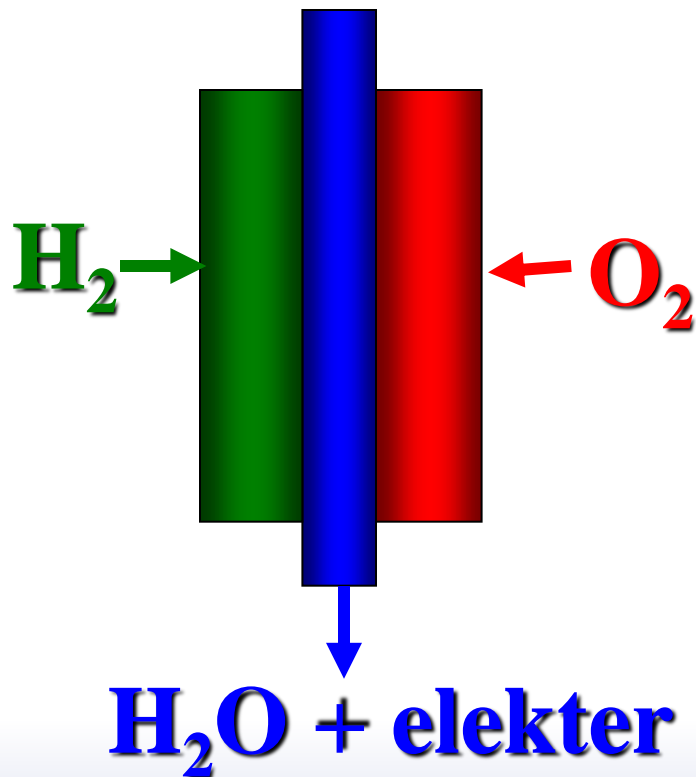
1 kg vesinikku → 33,5 kWh elektrit



Kütuseelemendid Sir W.Groove, 1839;  
teoreetiliselt alustanud W.Ostwald, 1896.

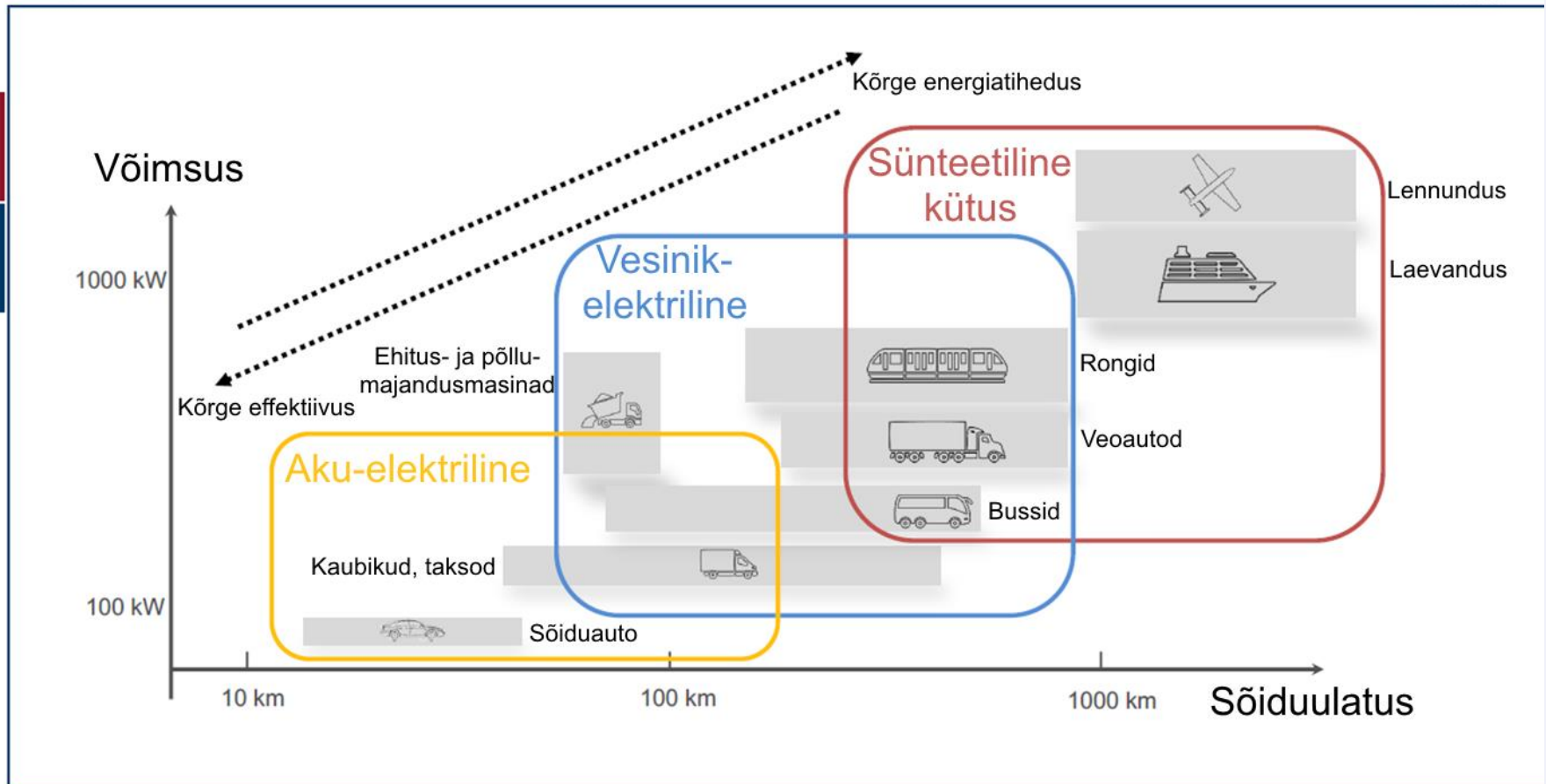
$$\Delta E^0 = -\Delta G/nF = (RT/nF)\ln K_a$$

$$\Delta G = \Delta H - T\Delta S$$



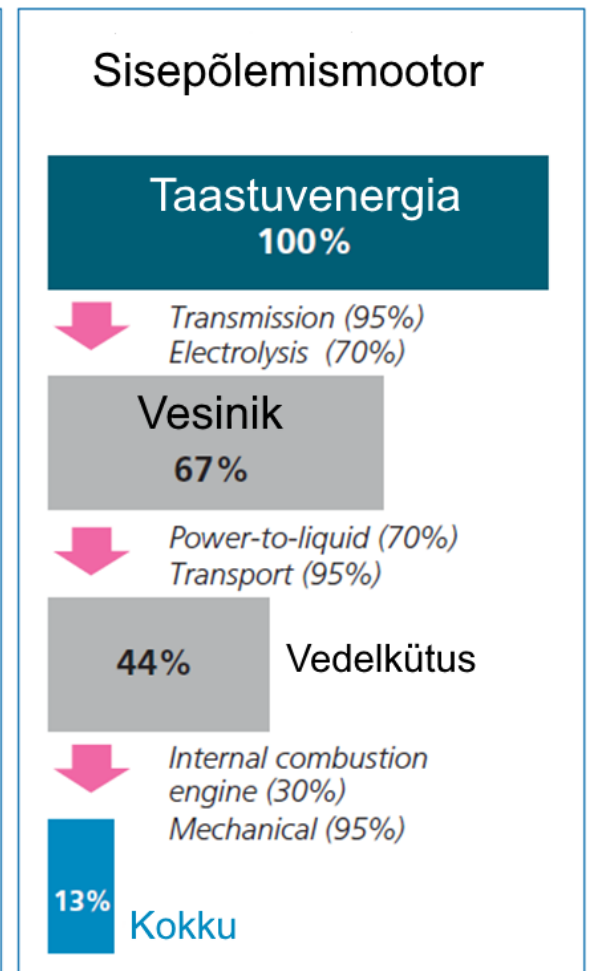
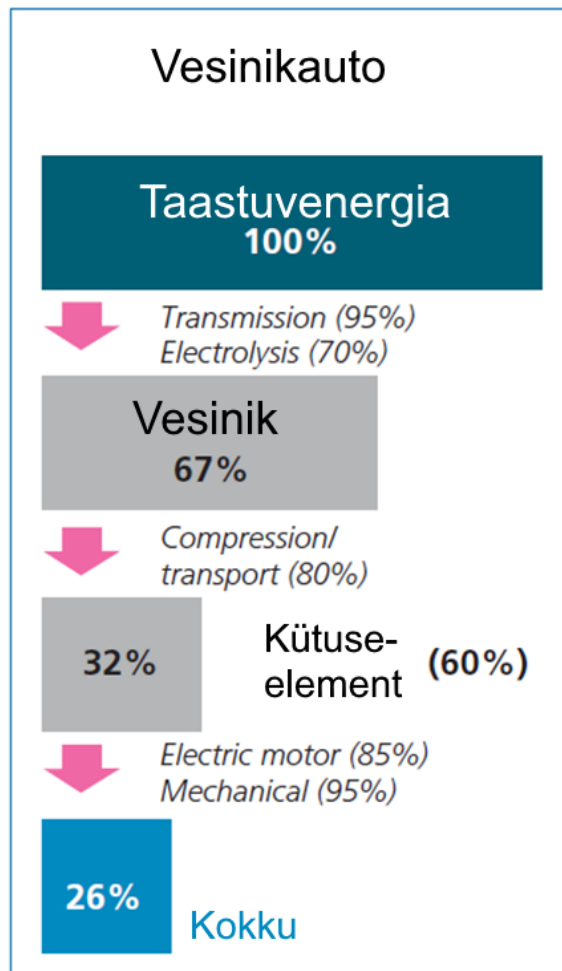
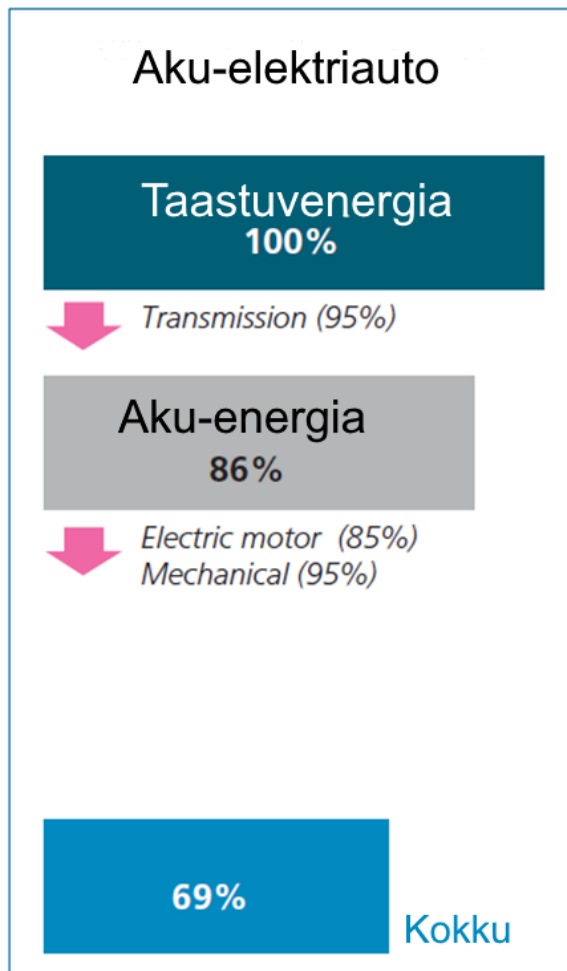
Fuel cell  
die Brennstoffzelle  
ТОПЛИВНИЙ  
ЭЛЕМЕНТ

# Eri transpordivahendid

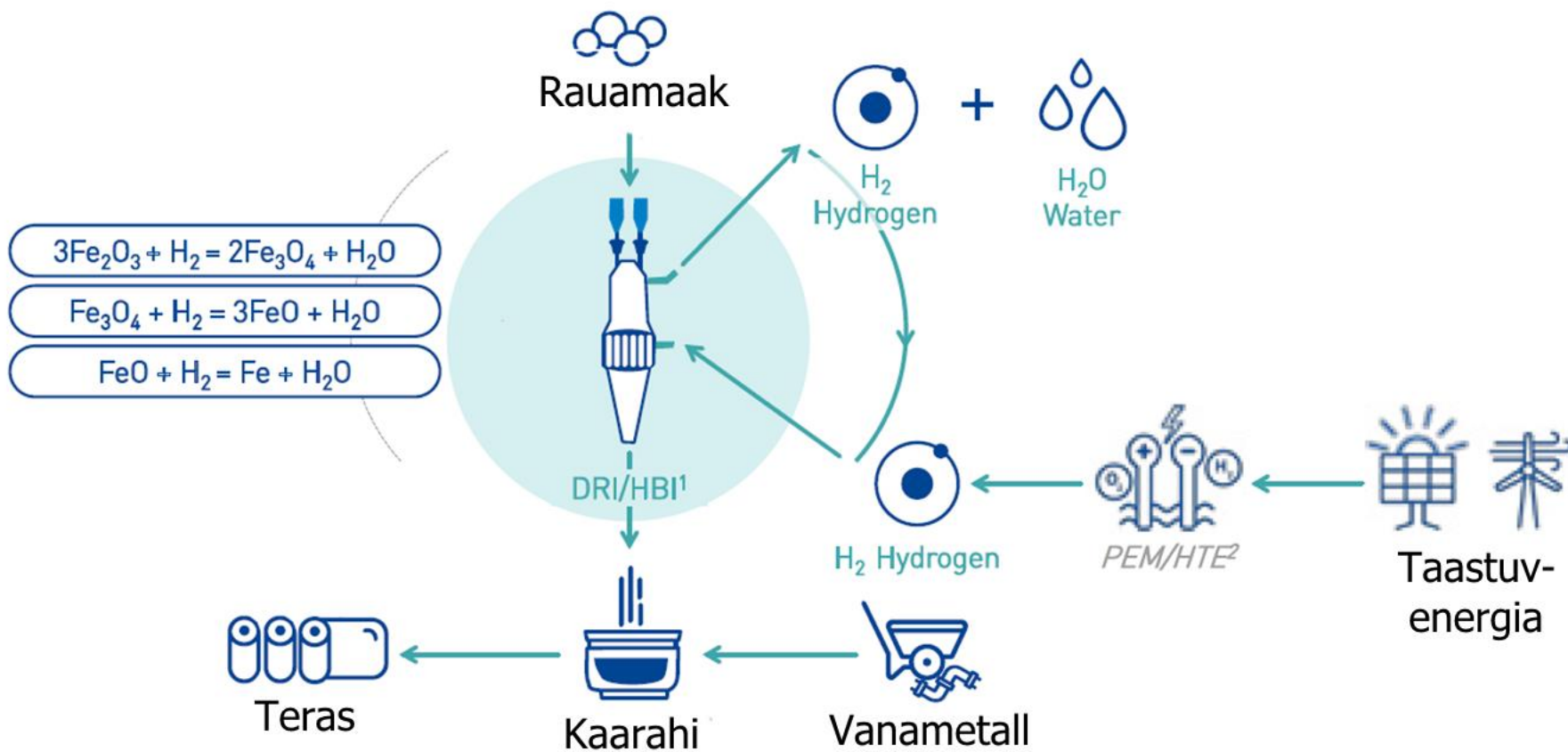


Veronika Grimm, FAU Erlangen-Nürnberg and Energie Campus Nürnberg (EnCN)

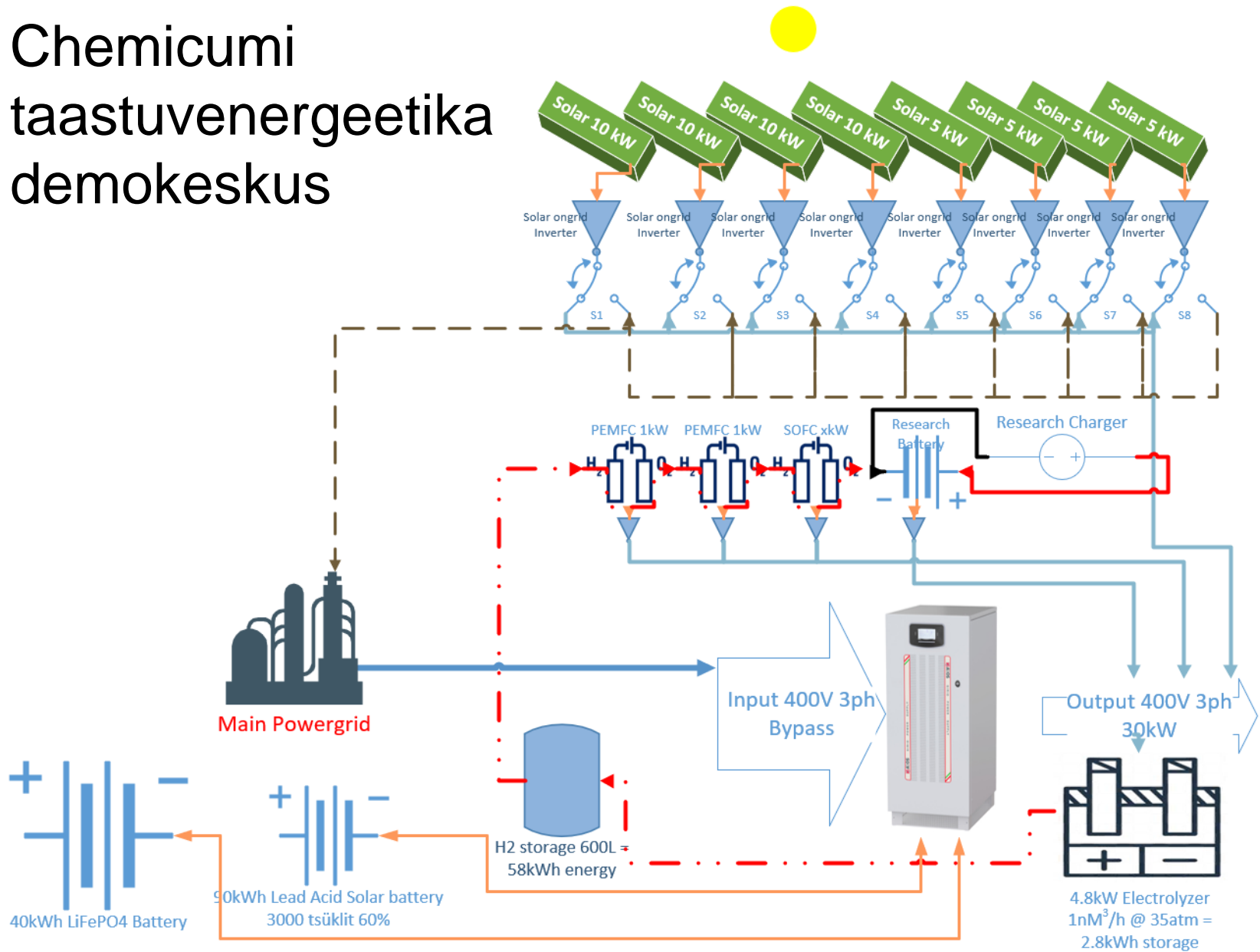
# Effektiivsus



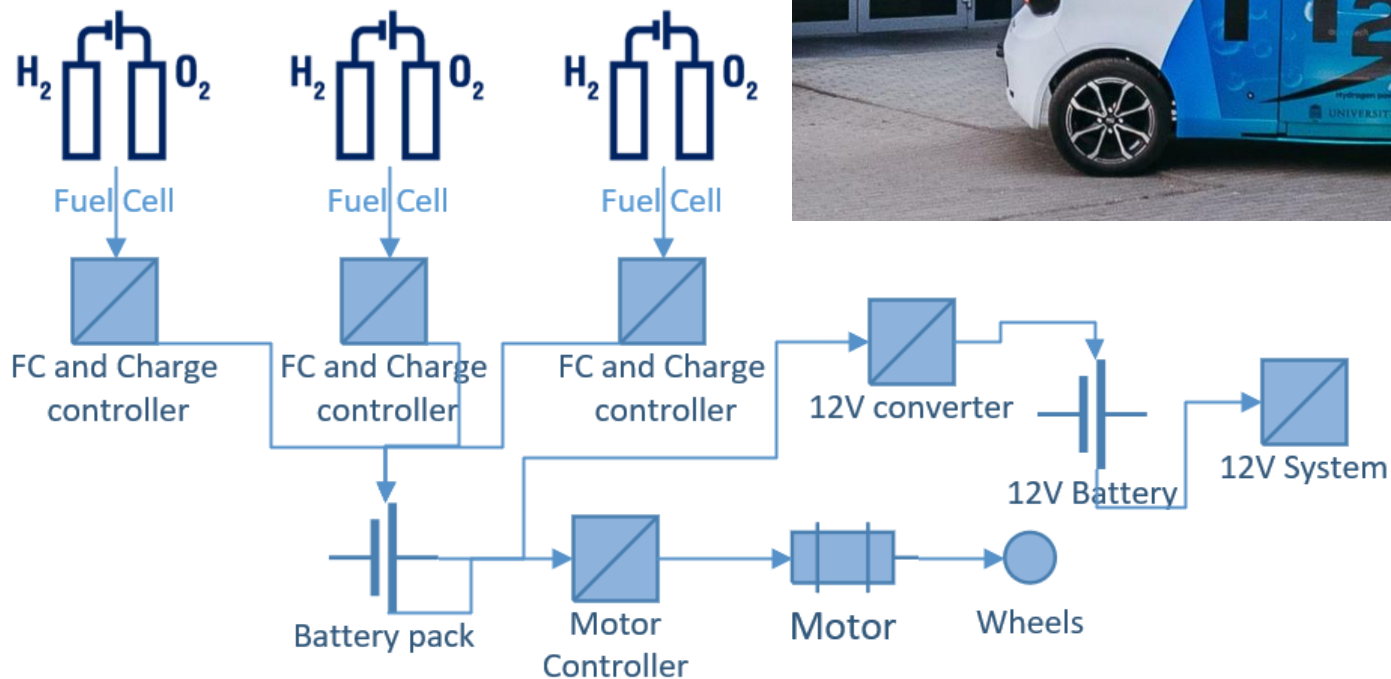
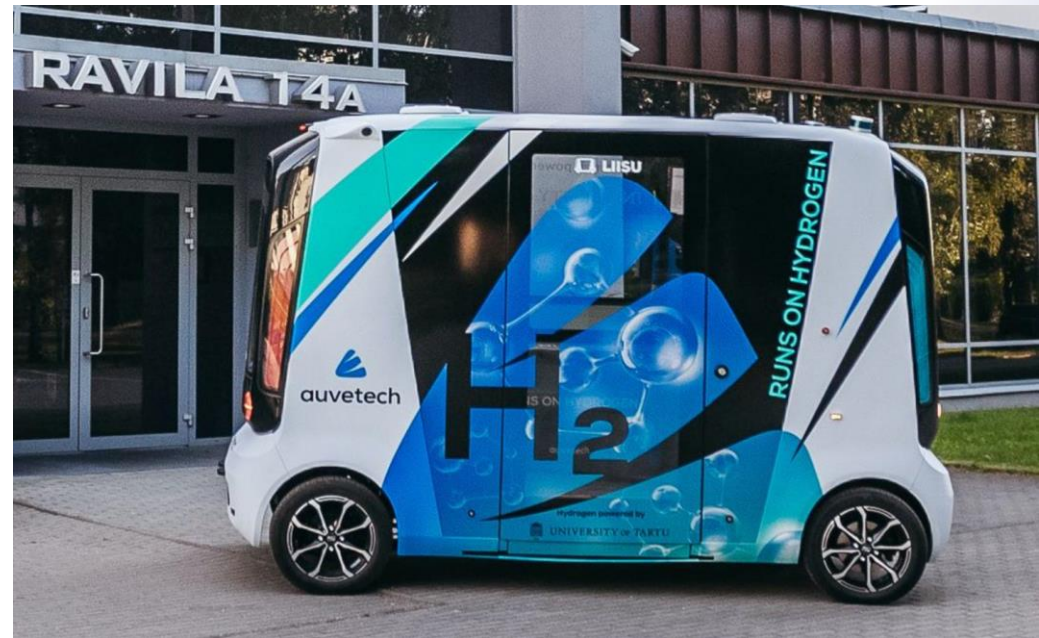
# Pulbermetallide tööstuslik tootmine



# Chemicumi taastuvenergeetika demokeskus



# Iseauto kütuseelement





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*Täna tähelepanu eest!*