

SAM Virtual Conference 2019 – NREL
August 28

The background of the slide features a large, circular image in the center. This circle is filled with a blue-tinted photograph of a landscape with solar panels in the foreground and wind turbines in the distance. The rest of the slide background is a light blue gradient with a faint grid pattern.

Hydrogen Production from vRE using SAM

Yassine Ennassiri

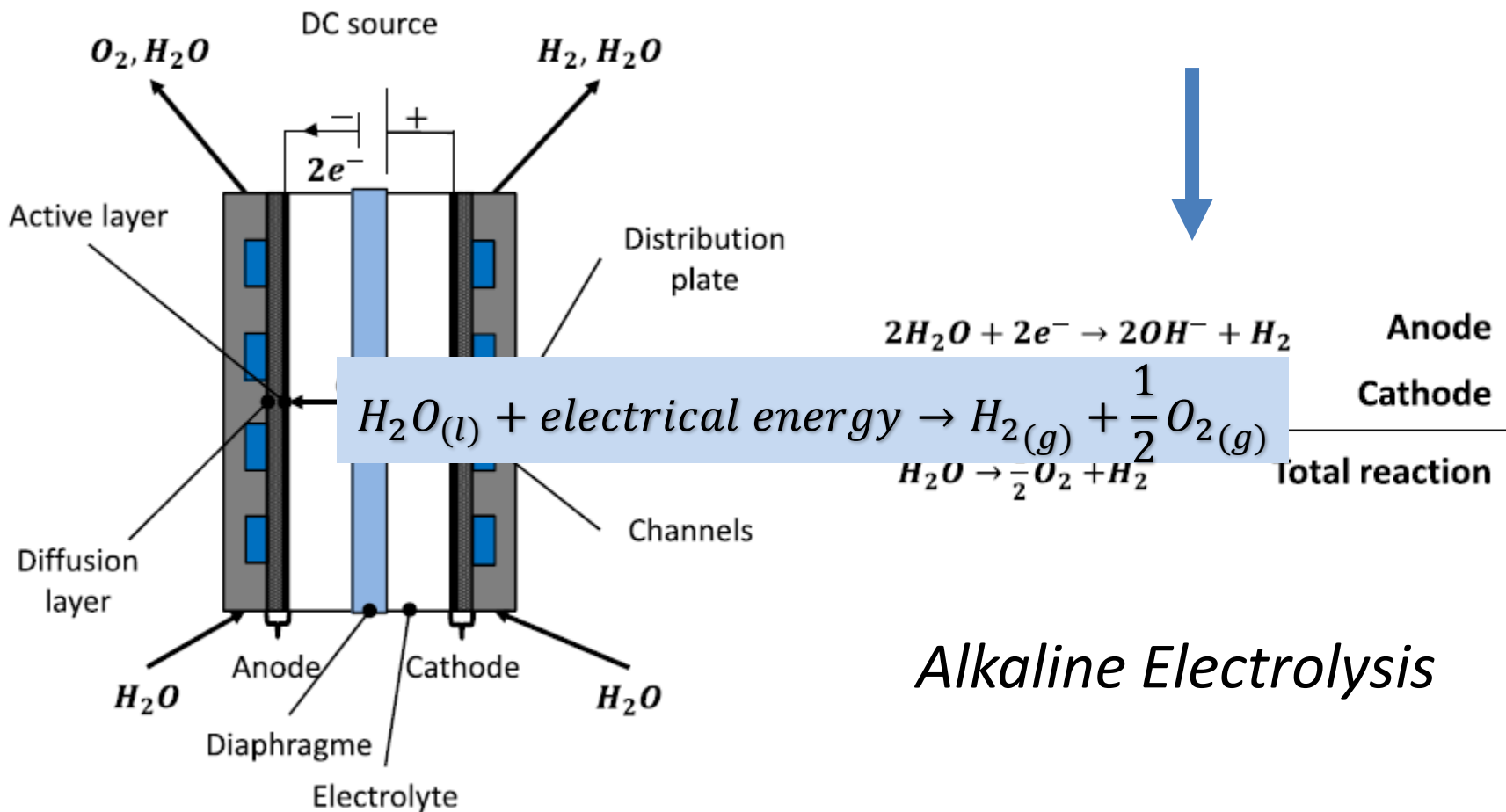


28/08/2019

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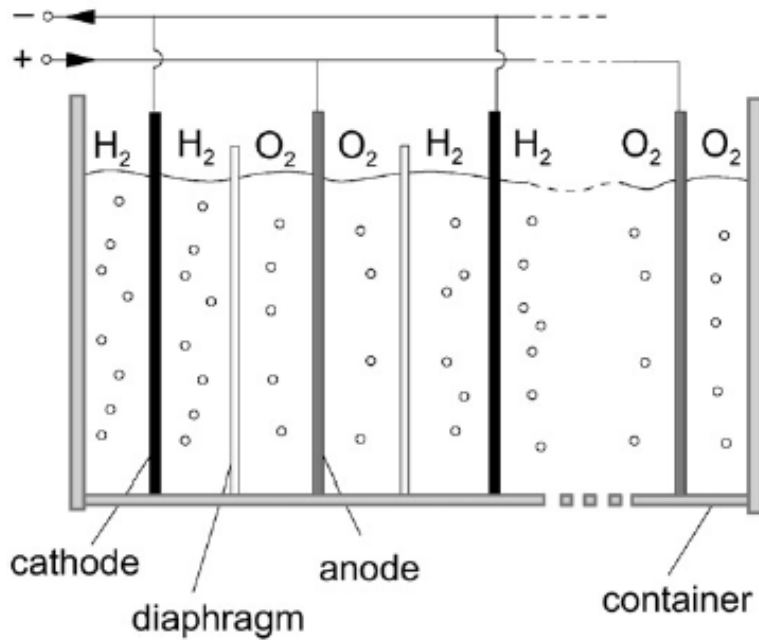
- *Introduction*
- *Model description*
- *Implementation in SAM*
 - *Technical Model*
 - *Economic Model – LCOH (USD/kg)*

Alkaline Electrolysis

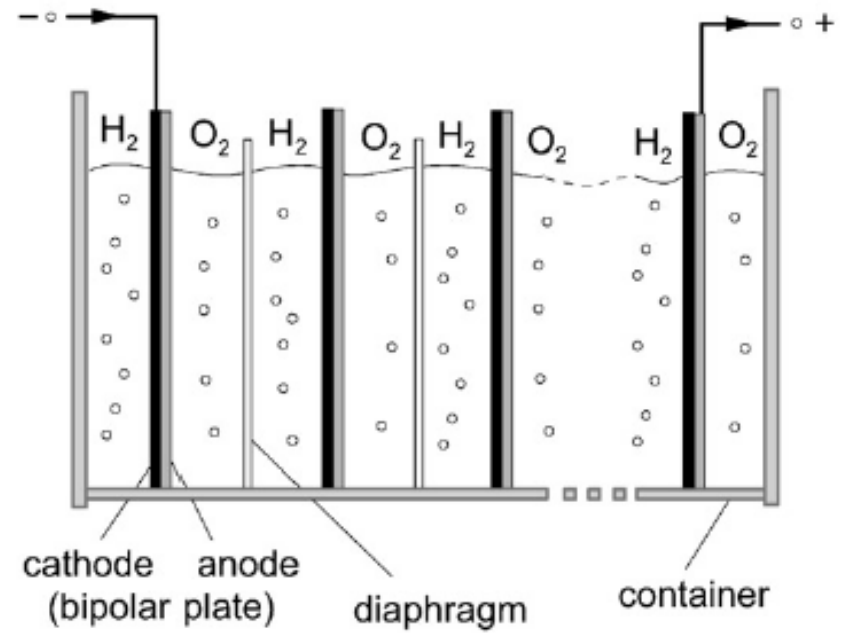


Alkaline Electrolysis

Alkaline Electrolysis – Design of Cells Assembly

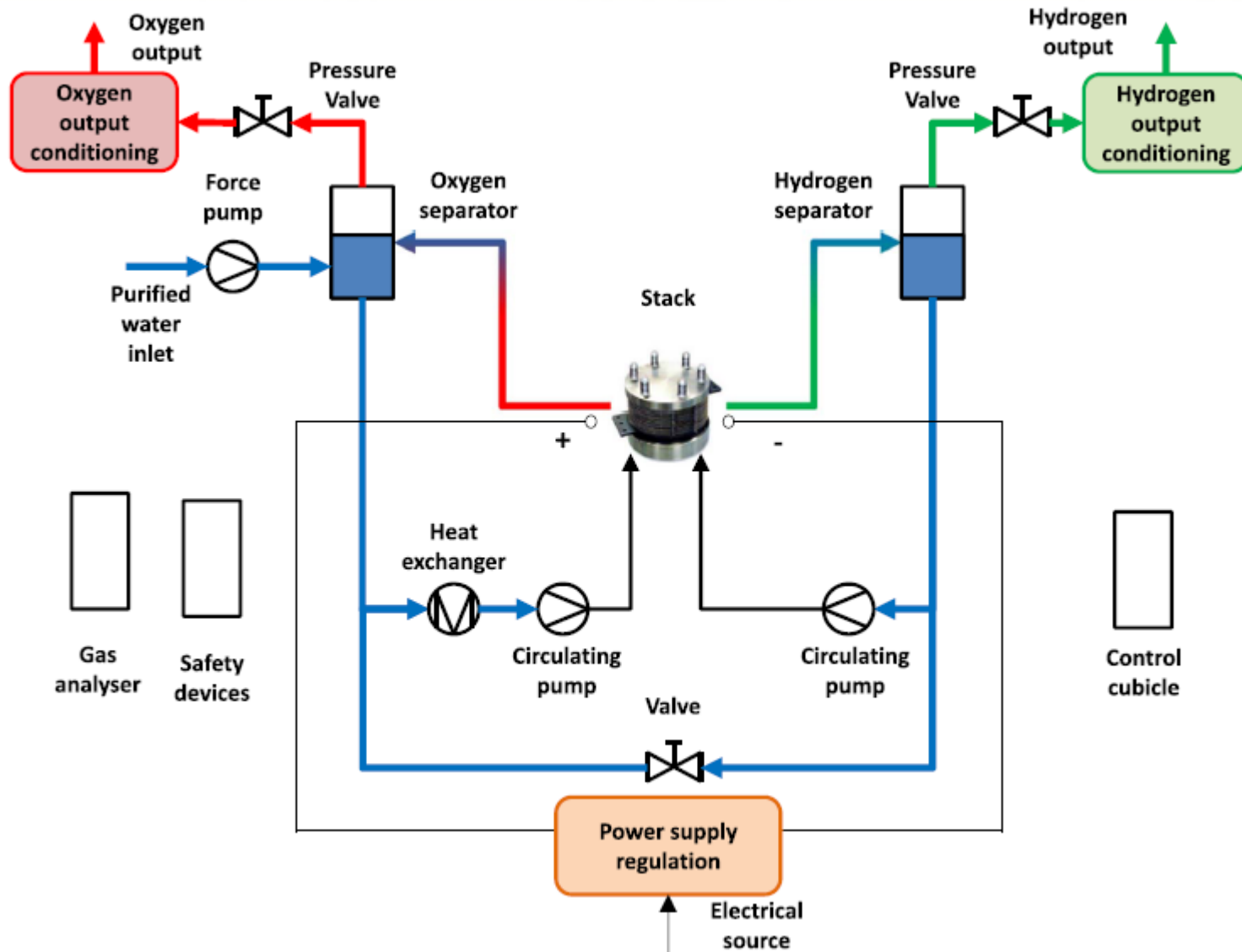


Monopolar Design

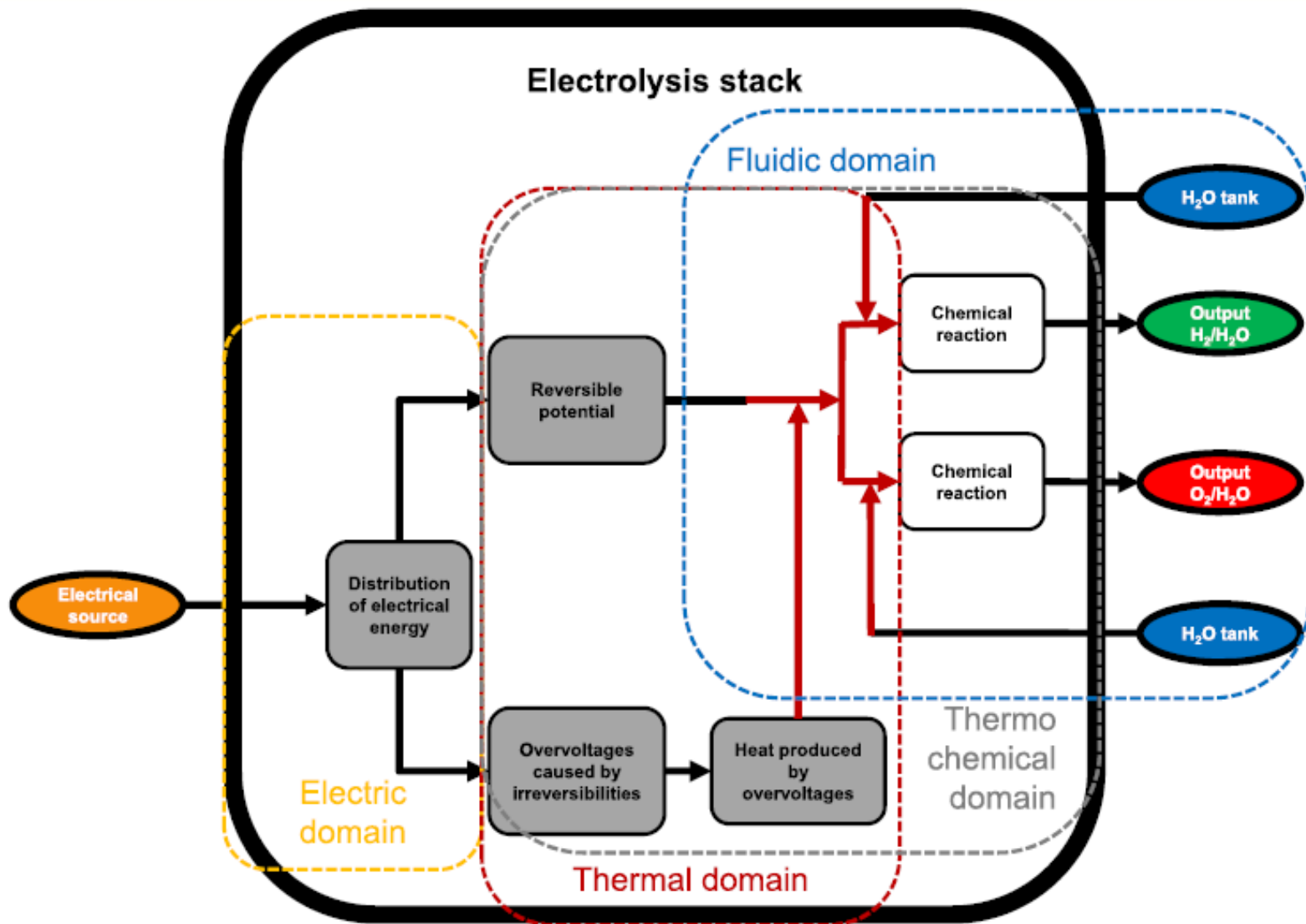


Bipolar Design

Electrolysis system - auxiliary components



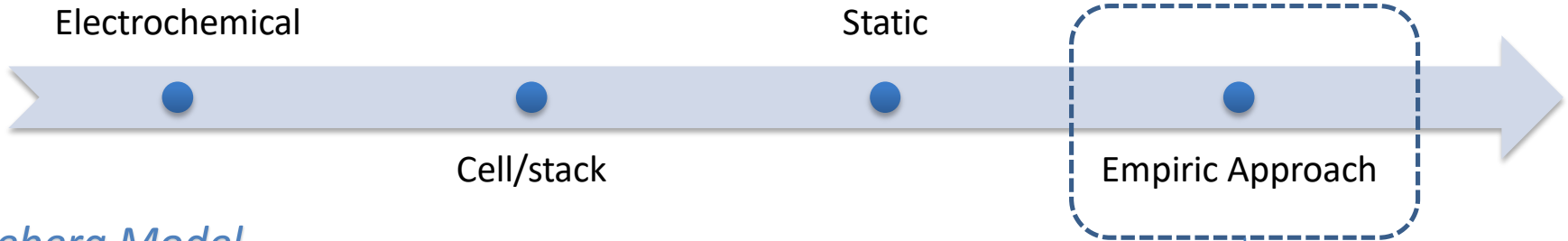
Model description



Modeling Alkaline Electrolysis

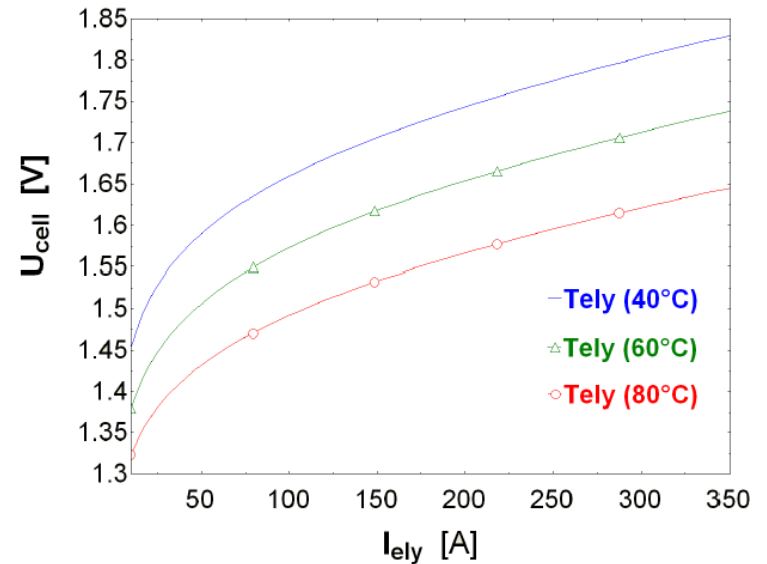
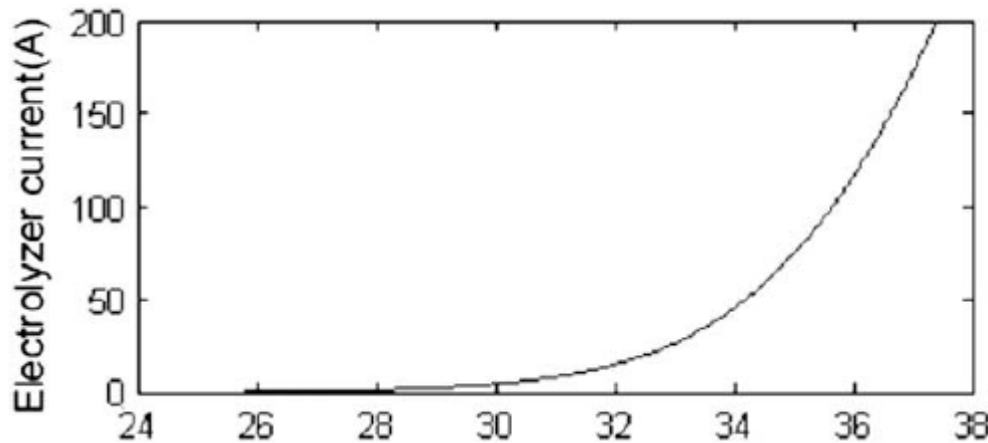
Physical Domain	Modeling Approach	Dynamic Behavior	Modeling scale
Electrochemical Model	Analytic/Empiric	Static/Dynamic	Cell/Stack
Thermal Model	Analytic	Dynamic	System/Cell/Stack
Mass Transfer Model	Analytic	Dynamic	Cell/Stack
Fluidic Model	Analytic	Dynamic	System/Cell/Stack

Electro-chemical Model

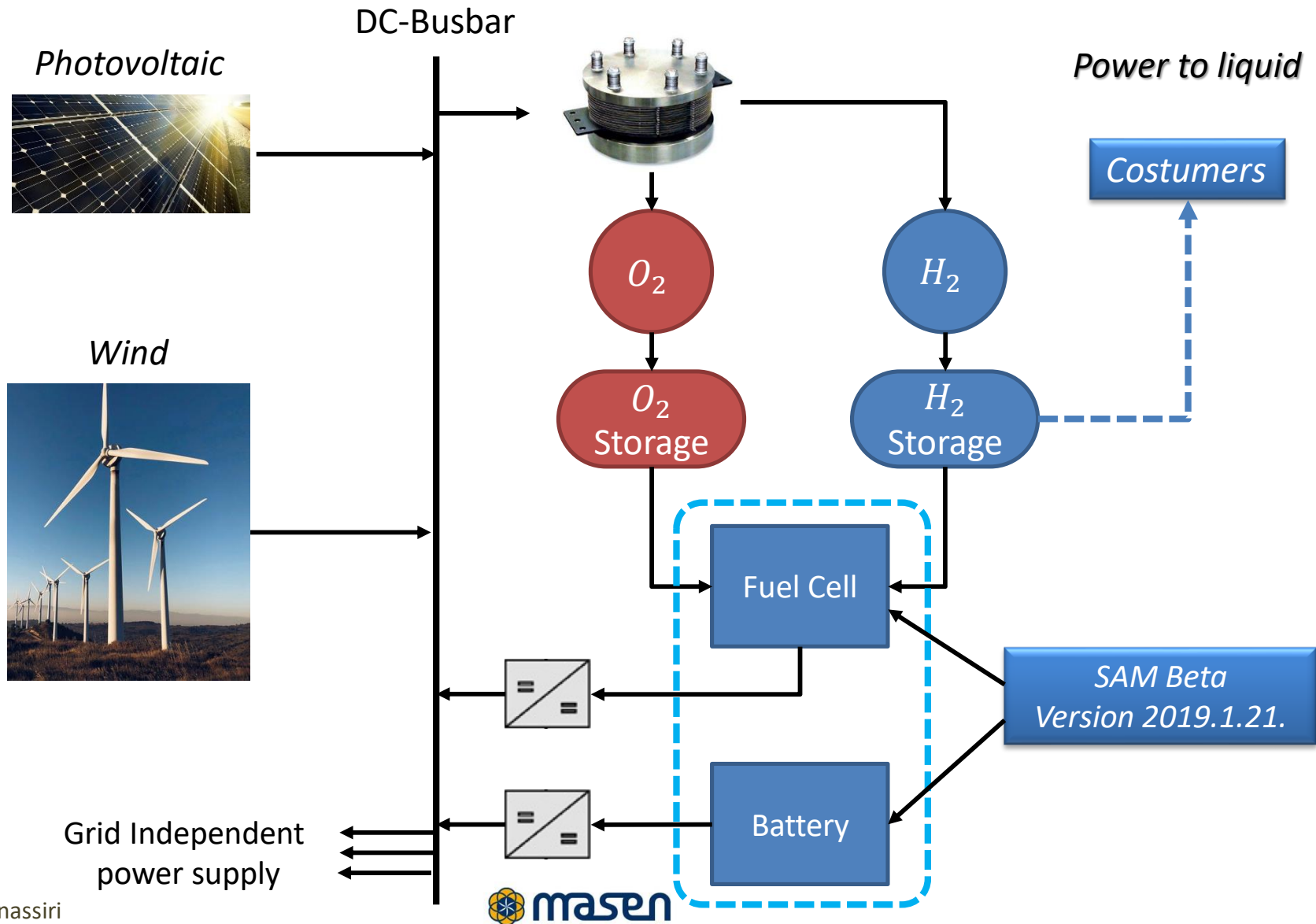


Ulleberg Model

$$U_{cell} = U_{rev} + \frac{r_1 + r_2 T}{A} I + s \cdot \log \left(\frac{t_1 + t_2/T + t_3/T^2}{A} I + 1 \right)$$



Implementation in SAM – operation strategies



Implementation in SAM – Technical Model

SAM PV Model

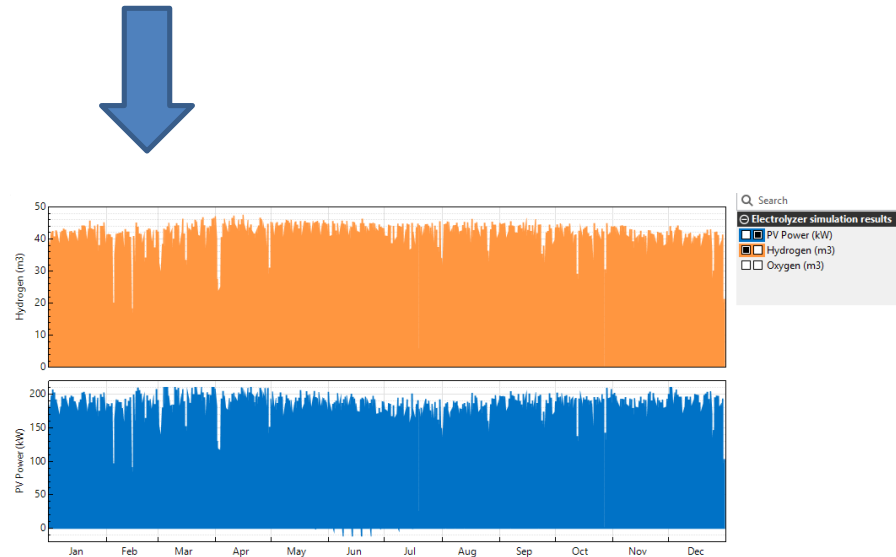
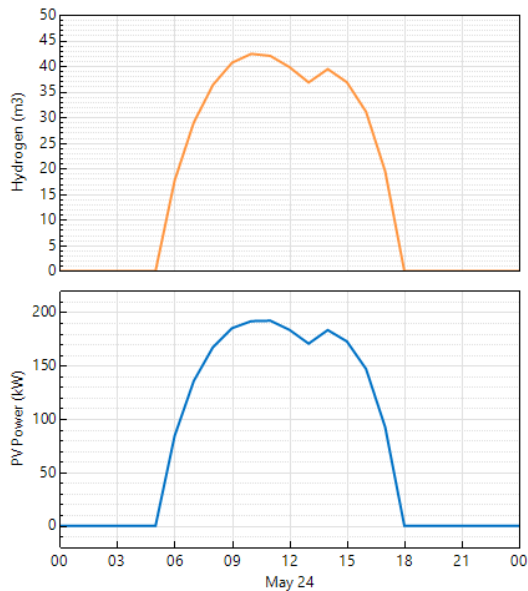
Hybrid plant

SAM Wind Model

Modeling hydrogen production from PV and/or Wind

LK scripting language

Technical Model - Ulleberg



Implementation in SAM – Economic Model

SAM PV Model

Hybrid plant

SAM Wind Model



Estimation of LCOH (USD/kg)



*SSC Library in Python
Economic Model*



- *LCOH calculation*
- *LCOH sensitivity analysis*
- *Etc...*

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