Calculation of time and power consumption for 1 Nm^3 H_2 production.

Assuming the overpotential at 5mA cm^{-2} on the HER side is 10mV as the state-of-the-art conditions.[1]

1 Nm^3 H_2 is equivalent to 44.587 mol H_2 (data from NIST database)[2].

Amount of charge transferred is:

$$Q = 2Fn_{H_2} = 2 \times 96485 \times 44.6 \approx 8.6 \times 10^6 C$$

Energy consumption is:

$$E_{5\ mA\ cm^{-2}} = Q \cdot U_{cell\ @\ 5\ mA\ cm^{-2}}$$

Whereas:

$$U_{cell\ @\ 5\ mA\ cm^{-2}} = E\ @\ 5\ mA\ cm^{-2} + HER\ overpotential\ @\ 5\ mA\ cm^{-2}$$

Time consumption is:

$$t = \frac{Q}{A \cdot J\ @\ 1.23V\ vs.\ RHE}$$

Where A is assumed to be 1 m^2.

Calculation of anode product value

Calculations are based on prices provided by chemAnalyst.[3]

O_2 price:	345 $/MT	0.345 $/kg
H_2O_2 price:	410 $/MT	0.410 $/kg
CH_3OH price:	315 $/MT	0.315 $/kg

Amount of anodic product is estimated with faradaic efficiency of 1:

O_2 amount:	22.3 mol	0.71 kg
H_2O_2 amount:	44.6 mol	1.51 kg
CH_3OH amount:	44.6 mol	1.43 kg

Value of anodic product is:

O_2 amount:	0.25 $

H_2O_2 amount: 0.62 $

CH_3OH amount: 0.45 $

References:

1. H. Zhang, K. Chi, L. Qiao, P. Gao, Z. Li, X. Guo, Z. Li, D. Cao and D. Cheng,Boosting Acidic Hydrogen Evolution Kinetics Induced by Weak Strain Effect in PdPt Alloy for Proton Exchange Membrane Water Electrolyzers, *Small*, 2024, **20**, e2406935.
2. NIST, NIST Standard Reference Database Number 69, https://webbook.nist.gov/chemistry/, (accessed 13/01/2026).
3. ChemAnalyst, Chemical Prices, https://www.chemanalyst.com/Pricing/Pricingoverview, (accessed 13/01/2026).