



ÉCOLE POLYTECHNIQUE
FÉDÉRALE DE LAUSANNE



Integration Aspects of Solar-Fuel Generators

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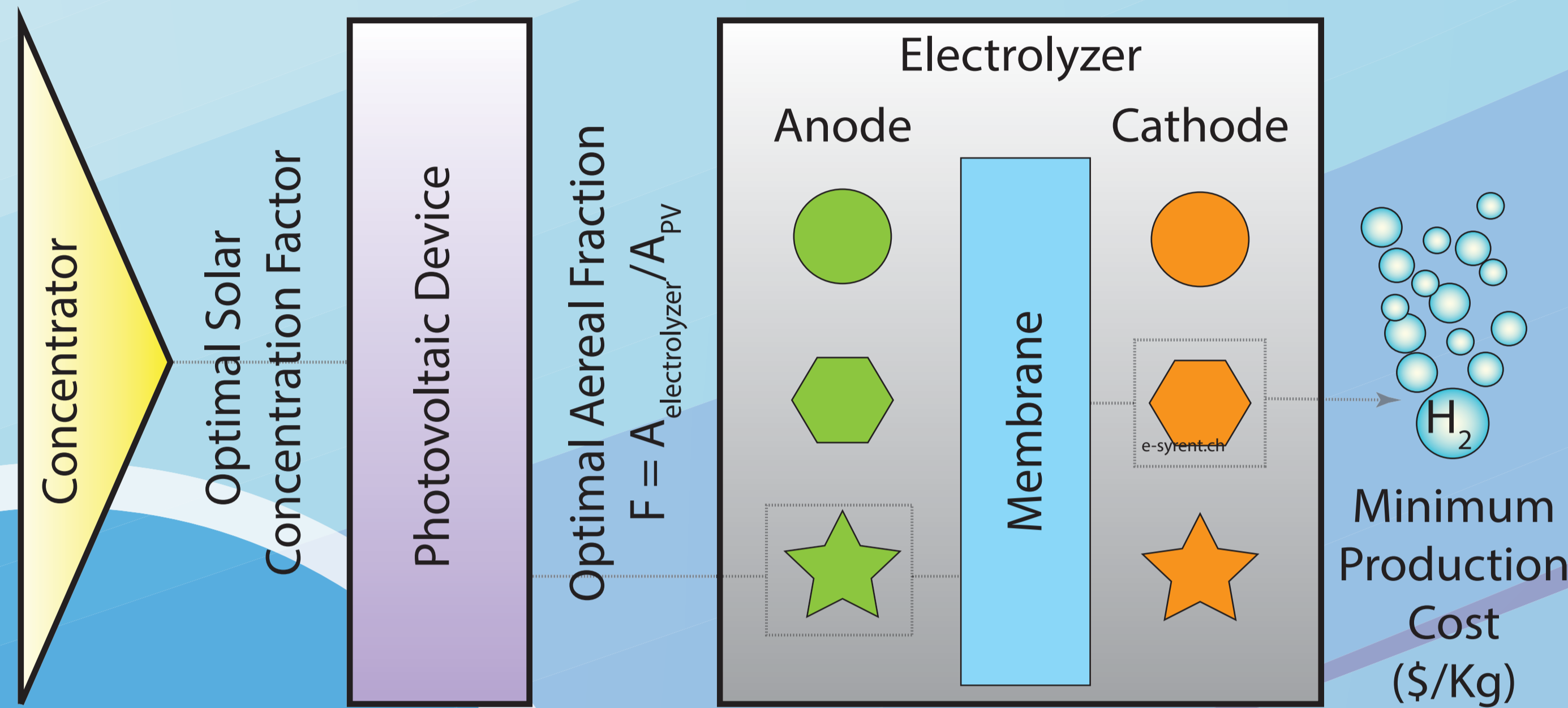


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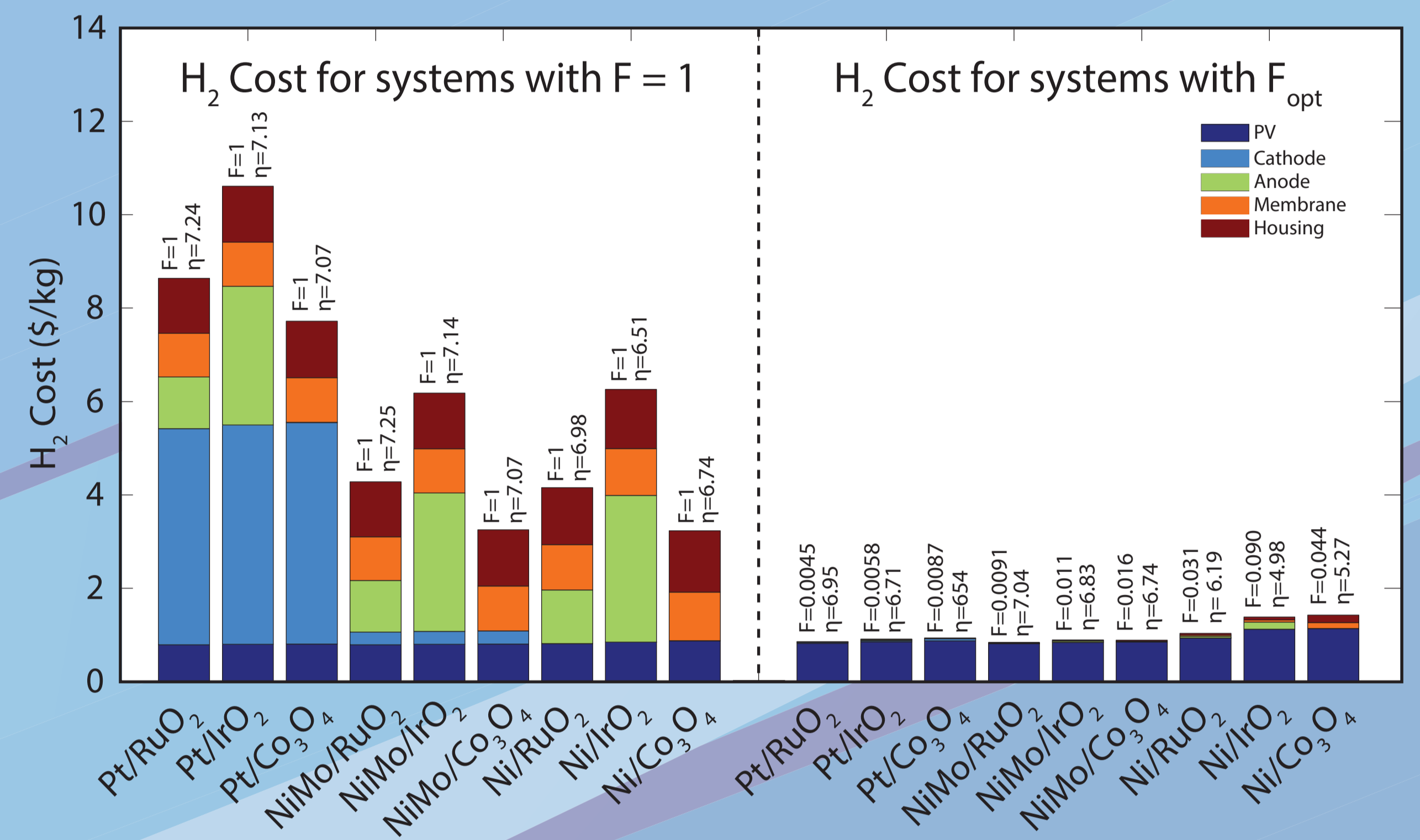


Directives for the design of cost-effective solar-fuel are required for deploying solar based technologies. Our first study considered systems which consisted of a photovoltaic device electrically connected to an electrolyzer, with the possibility of having a concentrator. Cost optimal geometries were identified for different material combinations, leading to a practical cost of solar-hydrogen (\$/H₂ Kg).

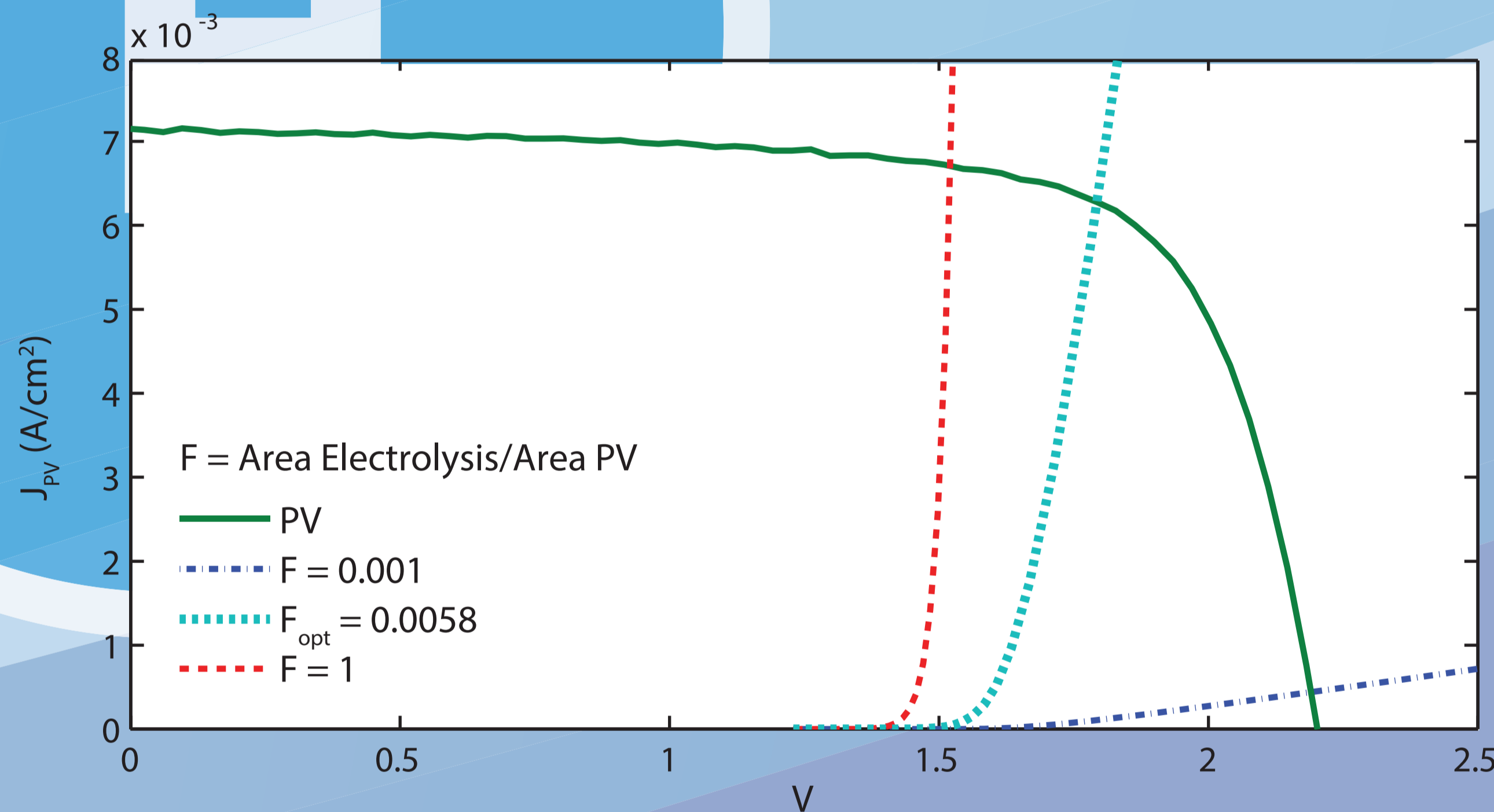
Generalized component topology of solar-hydrogen generators



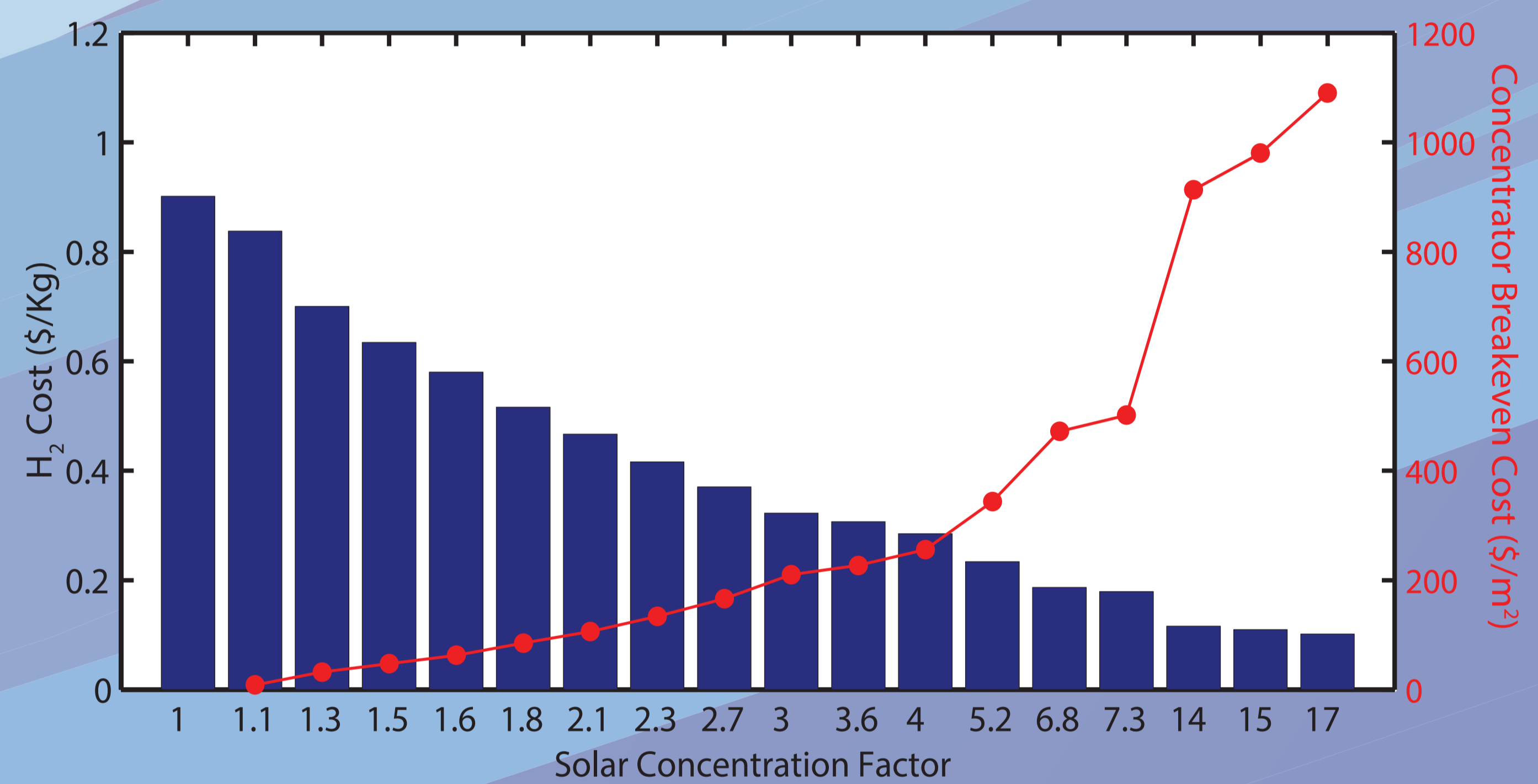
Geometry and materials systems affects H₂ production cost



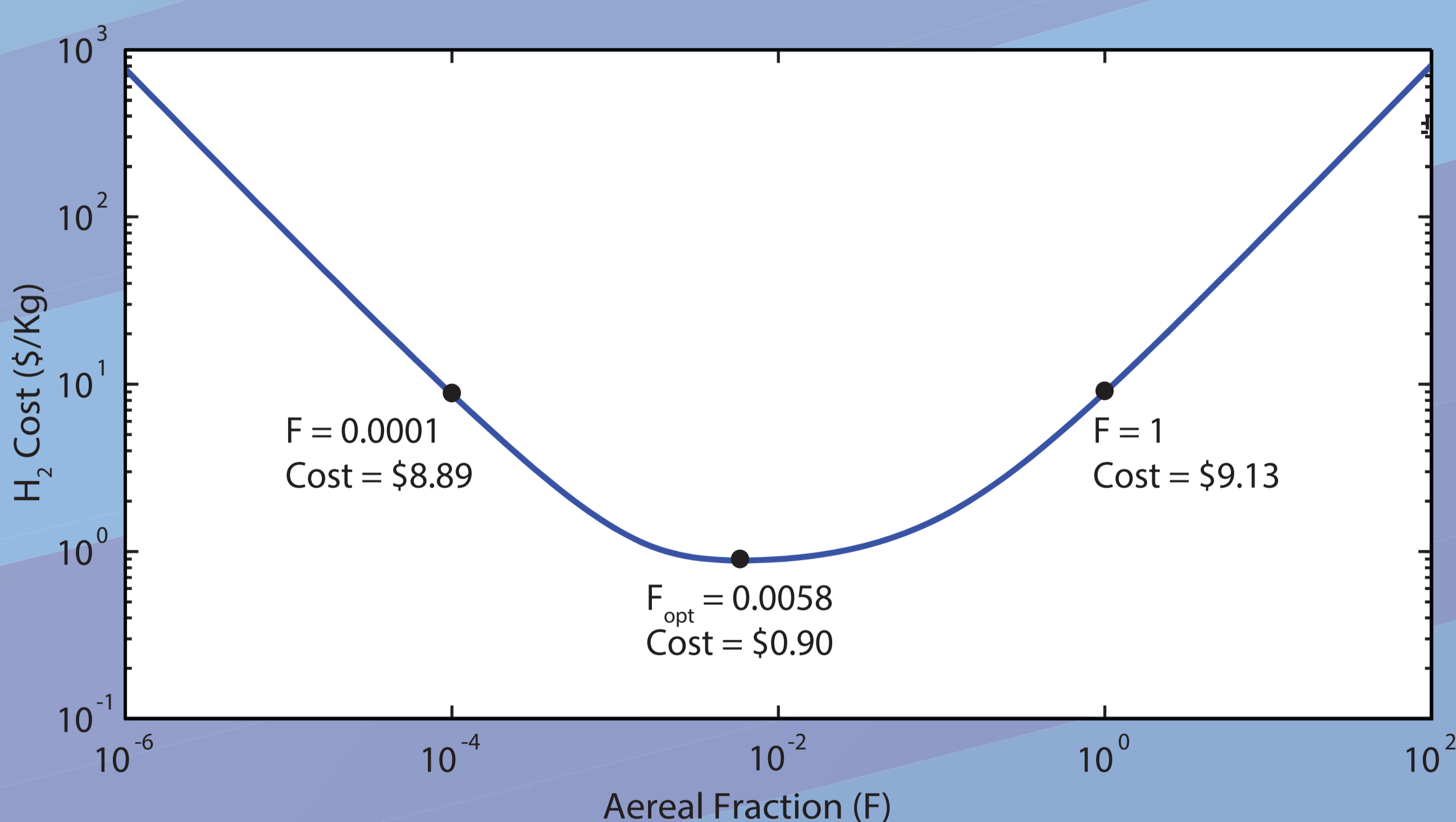
Effects of geometrical integration on electrolysis I-V characteristics



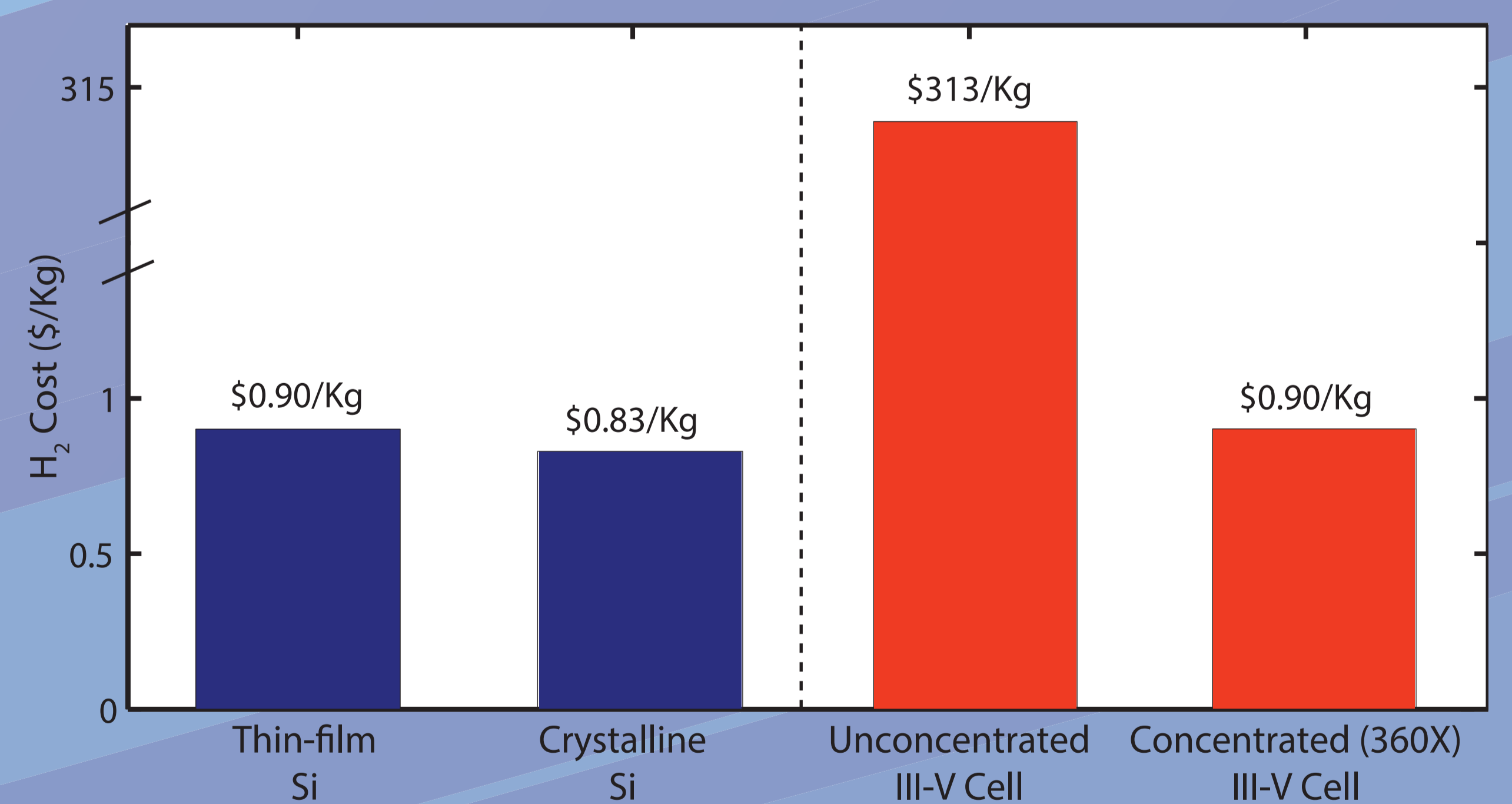
Solar concentration can lead to further cost reductions



Effects of geometrical optimization on H₂ production cost



Various PV technologies can lead to comparable H₂ costs



Conclusions:

- (1) The PV dominates the price scheme for optimized PV/Electrolysis systems, accounting for 59-97% of the overall cost.
- (2) Materials selection for the electrolyzer components does not significantly affect the cost of hydrogen production.
- (3) The implementation of solar-concentrators can provide additional cost savings, if their base capital cost is lower than the cost reduction achieved by the reduction in PV area.

Next Steps: evaluate different levels of integration

