



Better Together: Fuel Cell & Engine Hybrid Systems

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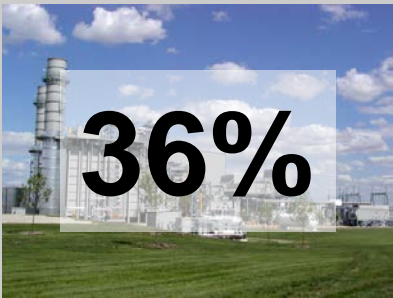
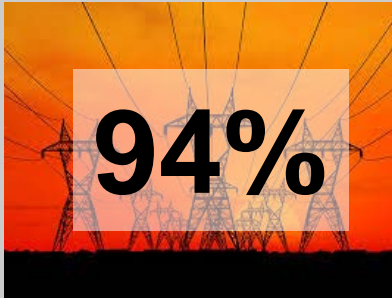

Program Director

February 27, 2017

Objective

Lower the cost & emissions associated with electricity generation



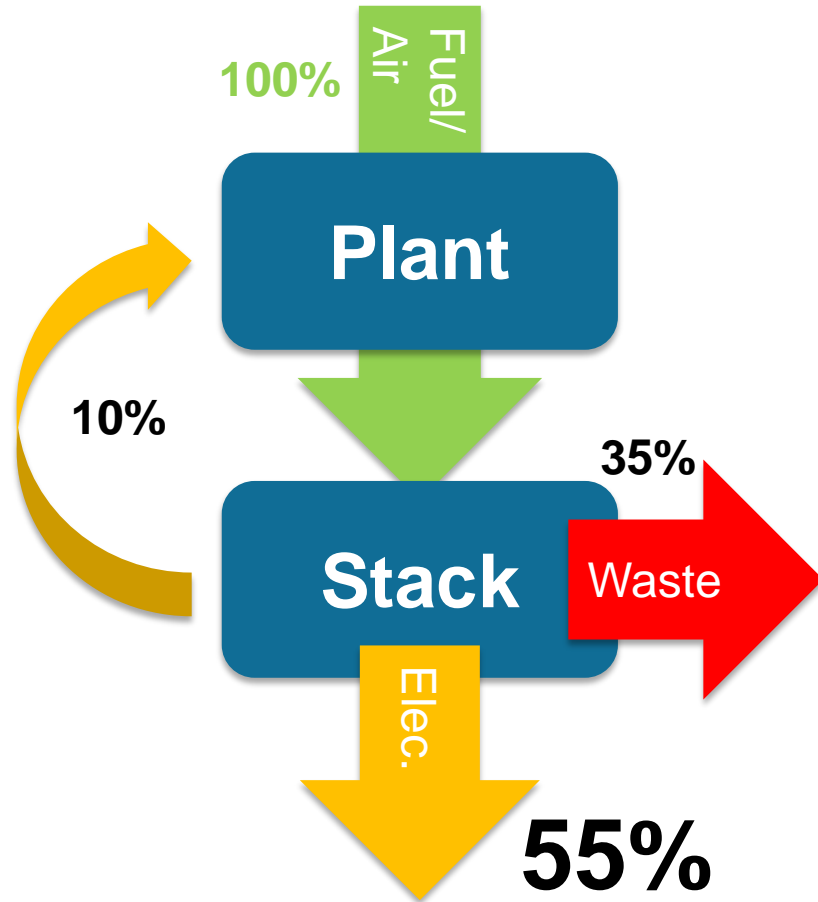
Gen η	T&D η	Net η
 36%	 94%	 34%



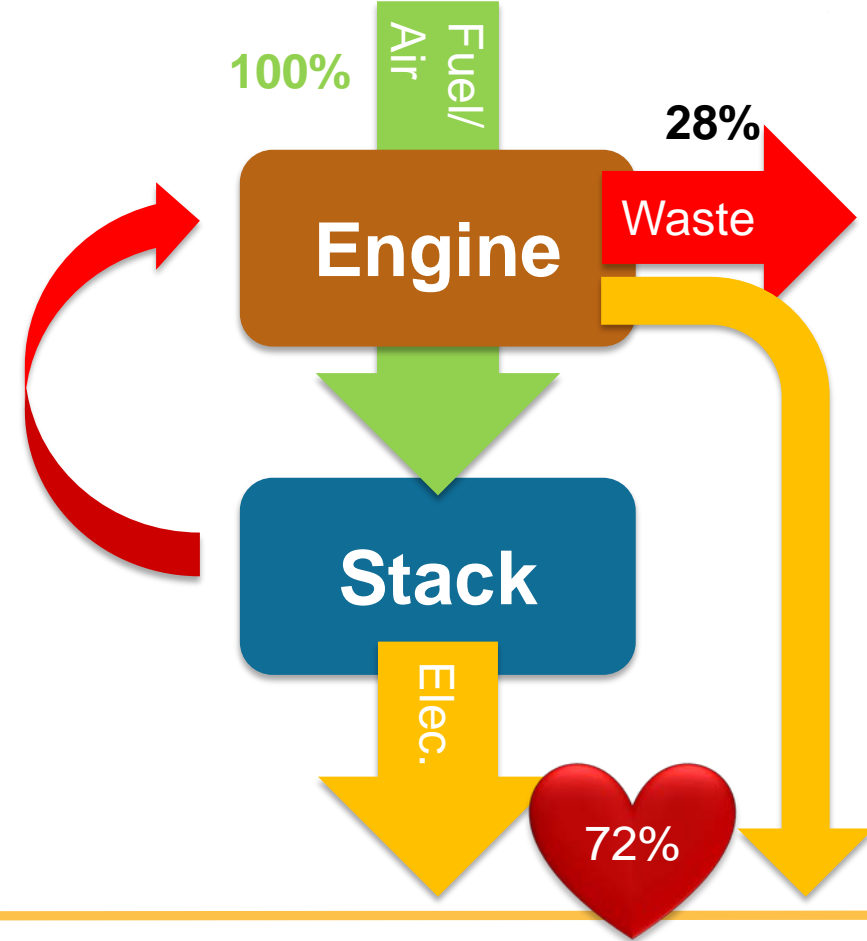
Approach

Leverage thermo-economic synergies between engines & fuel cells

Fuel Cell System

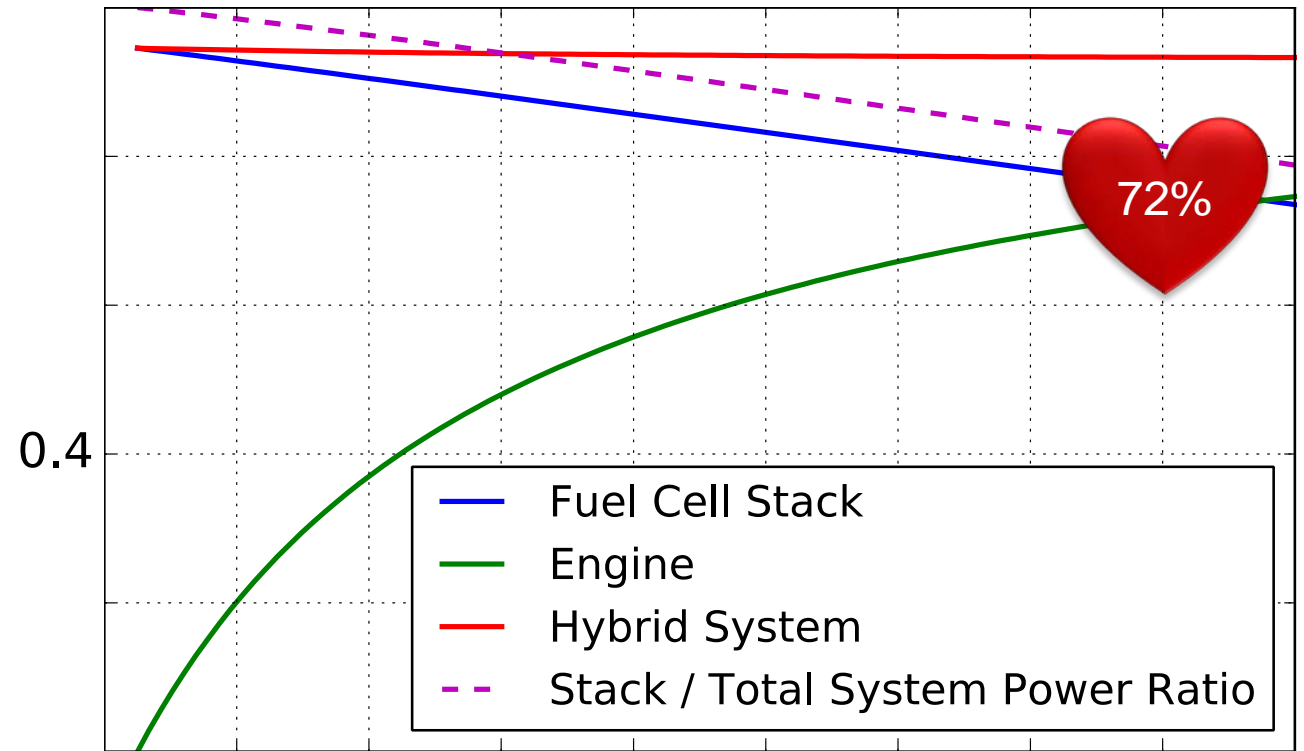
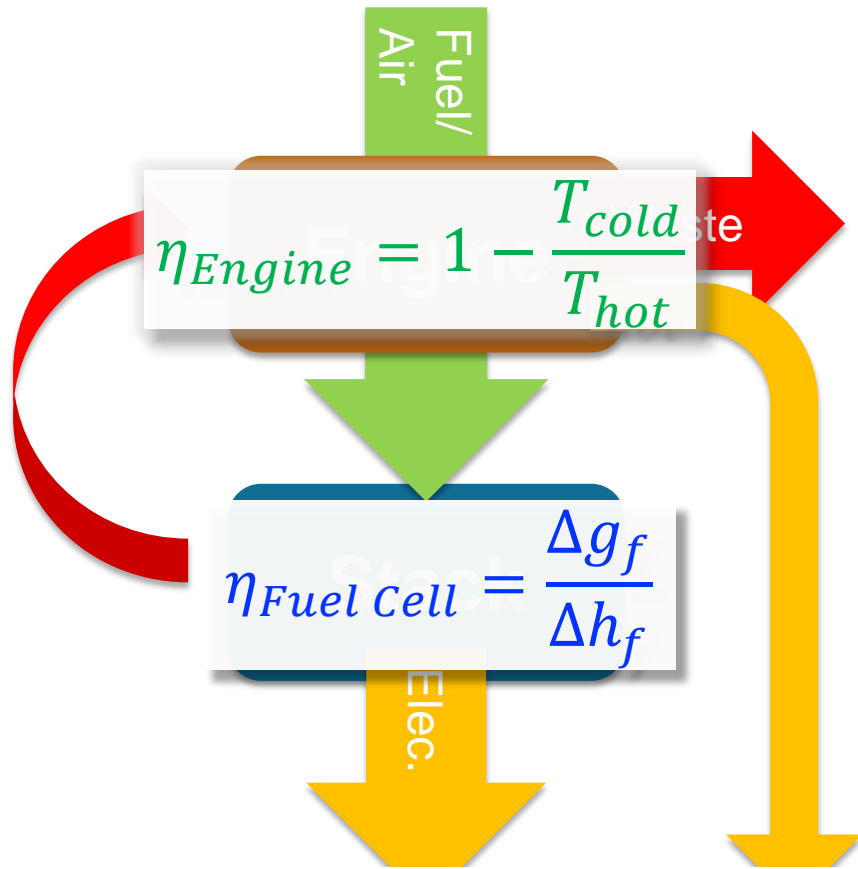


Hybrid System



Synergies

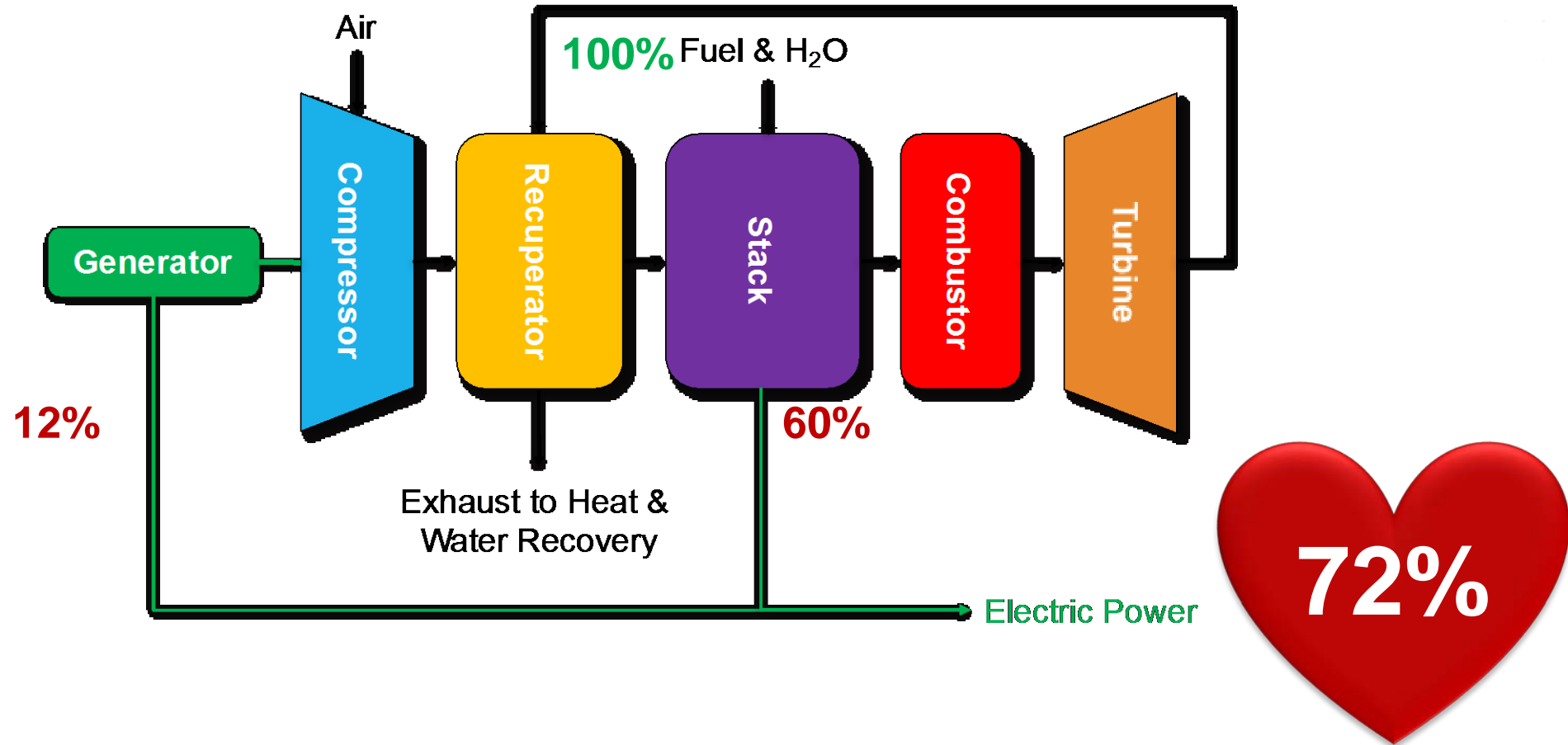
Ideal Illustrative Example



$$\eta_{Hybrid} = \eta_{Fuel Cell} + \eta_{Engine} (1 - \eta_{Fuel Cell})$$

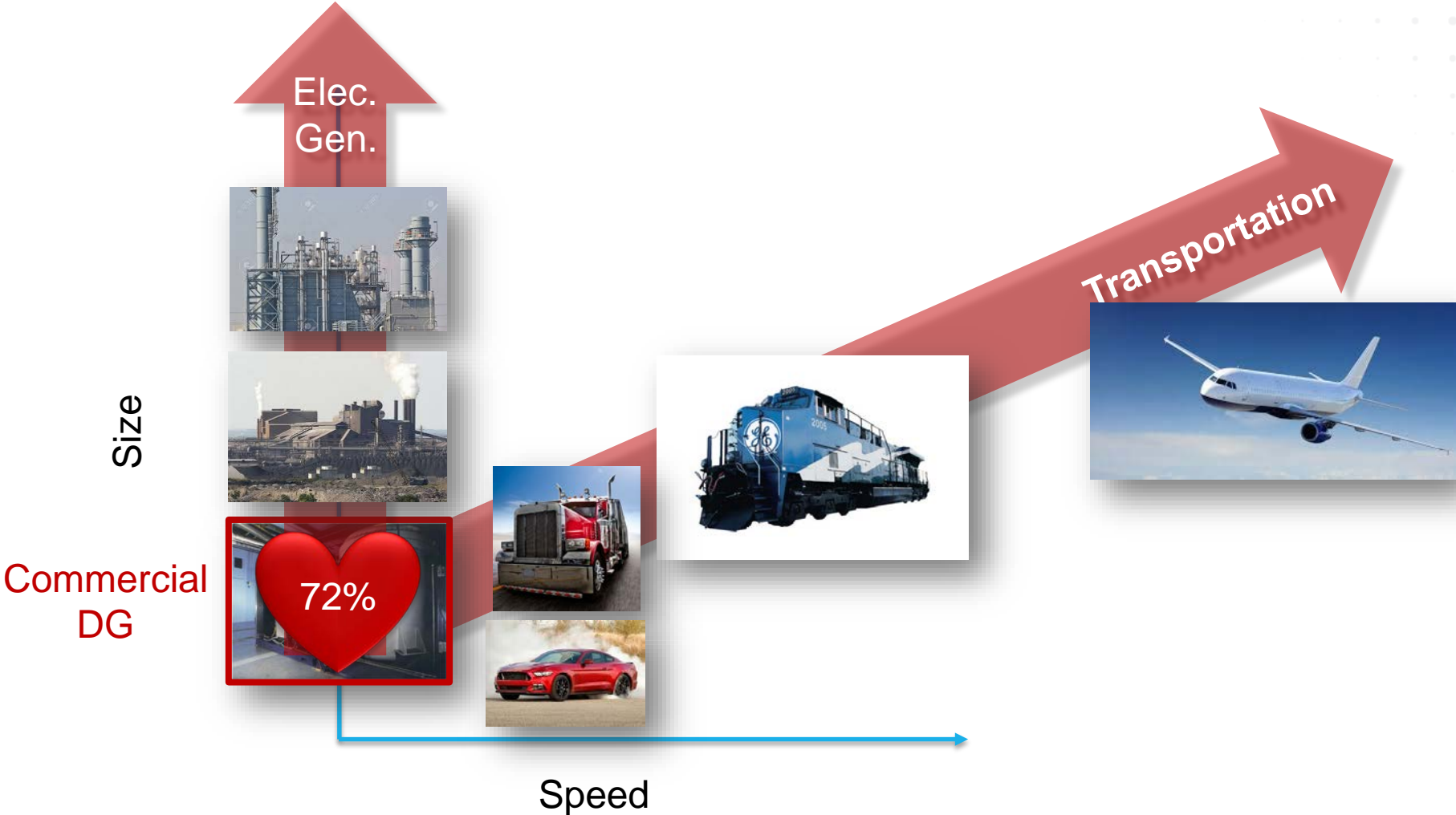
Example

Solid Oxide Fuel Cell / Recuperated Gas Turbine Hybrid



Markets

First Market: Commercial-Scale (100 kW → 2 MW) Distributed Generation



Suggestions Welcome!

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