Building Net Zero Energy Supply Chains

November 12, 2021

Clean Energy Business Council
مجلس صناعات الطاقة النظيفة
Middle East & North Africa
الشرق الأوسط وشمال افريقيا

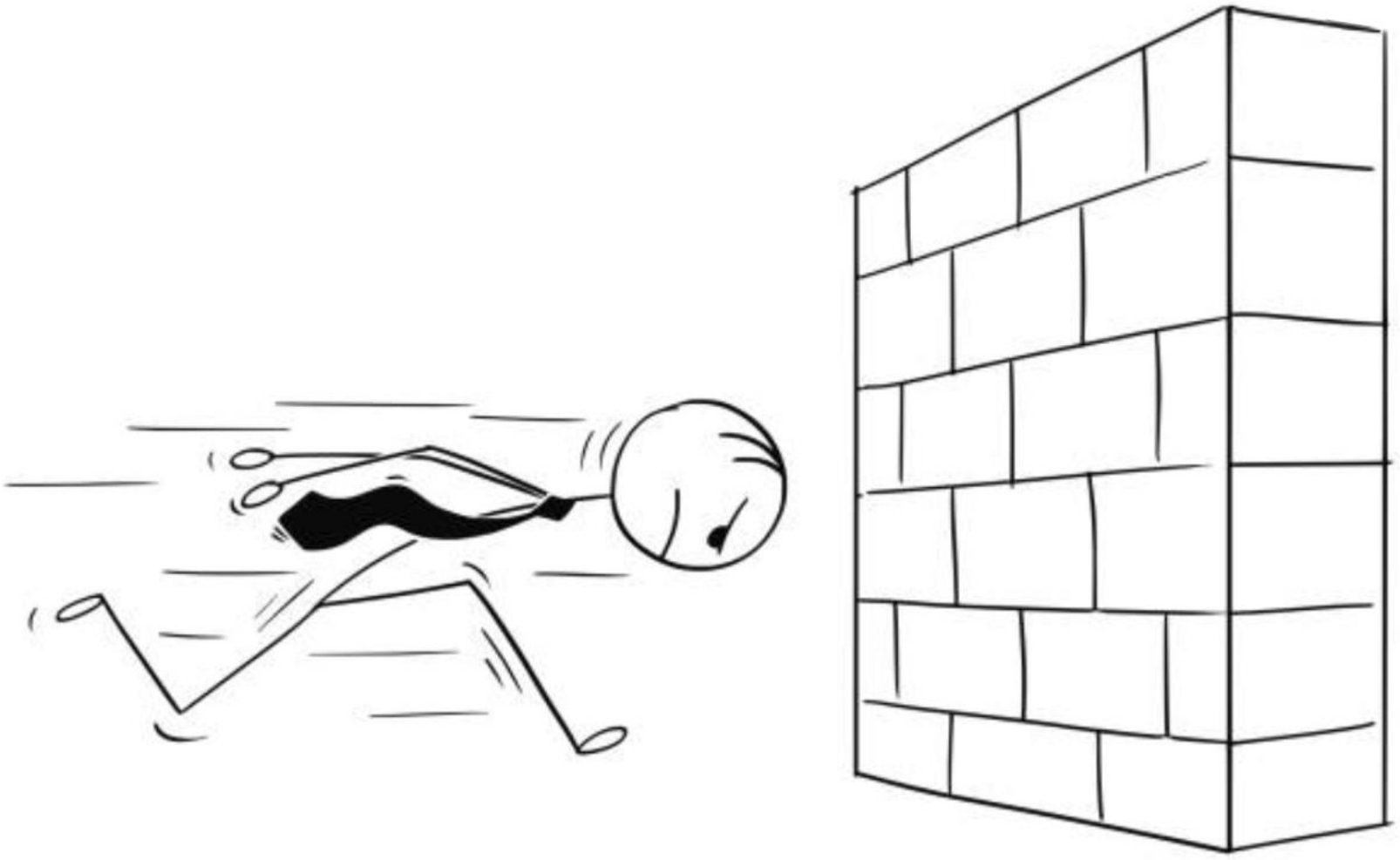
BU Institute for Sustainable Energy

REINVENTING THE ENERGY VALUE CHAIN

Beijing | Boston | Dammam | Delhi | London | New York

BU Institute for Sustainable Energy

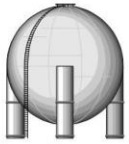
Intention



Purpose

Power


Oil

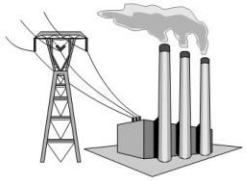

Gas

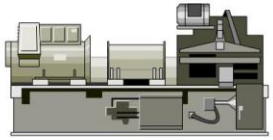

Coal

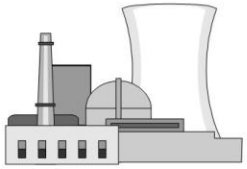

Rail (oil, gas, coal)

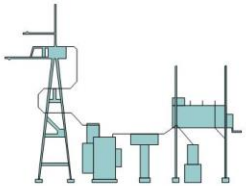

Pipeline (oil, gas)


Ship or Barge (oil, coal)


Thermal (Fossil) Power Plants

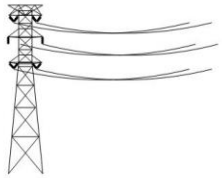

Cogeneration


Integrated Water and Power

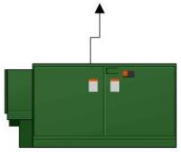

Substations

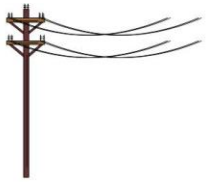

Transformers

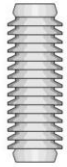

Switchgear


Power Lines and Towers


Transformers


Switchgear

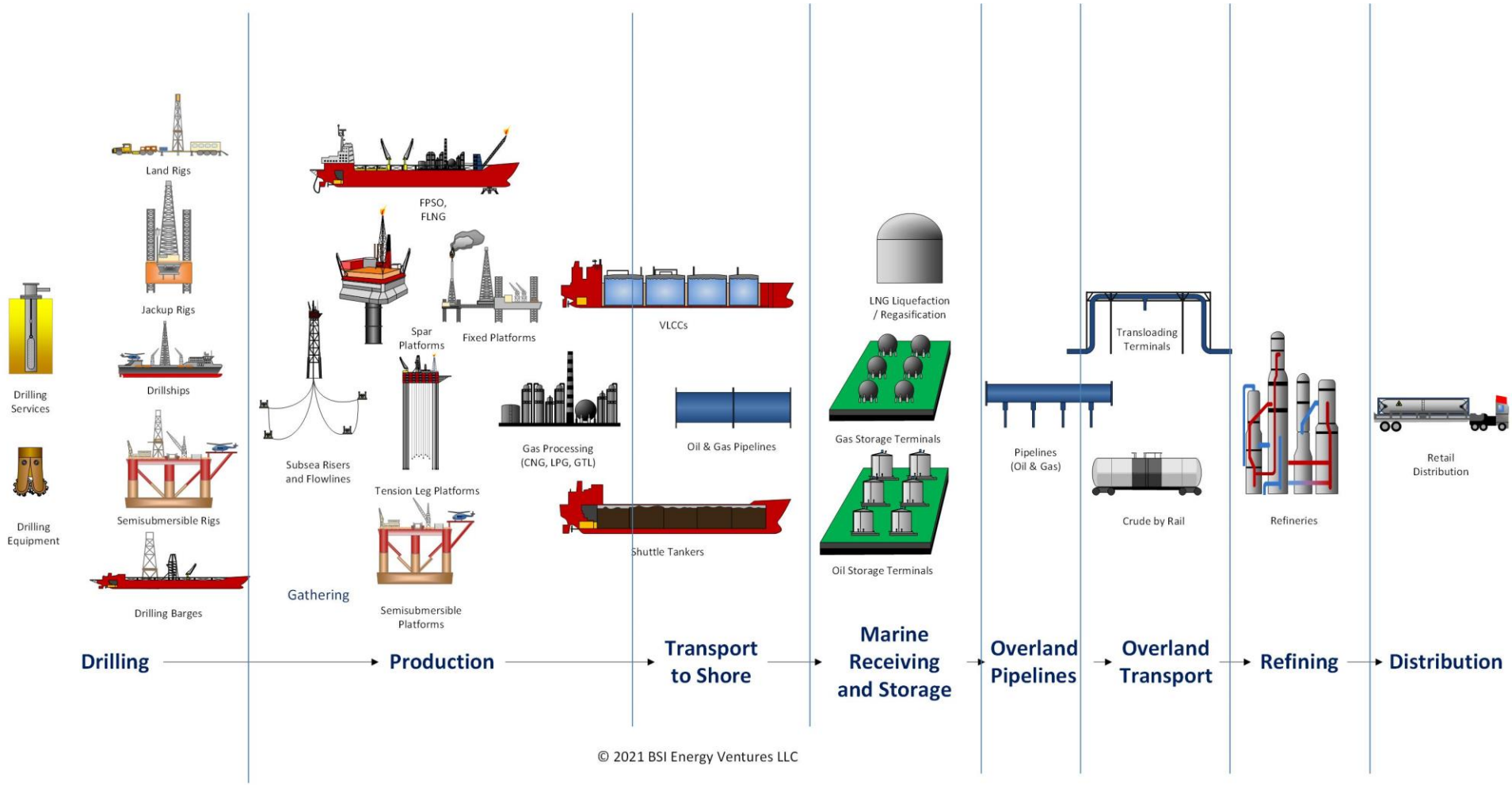

Power Lines and Poles


Insulators


Capacitors

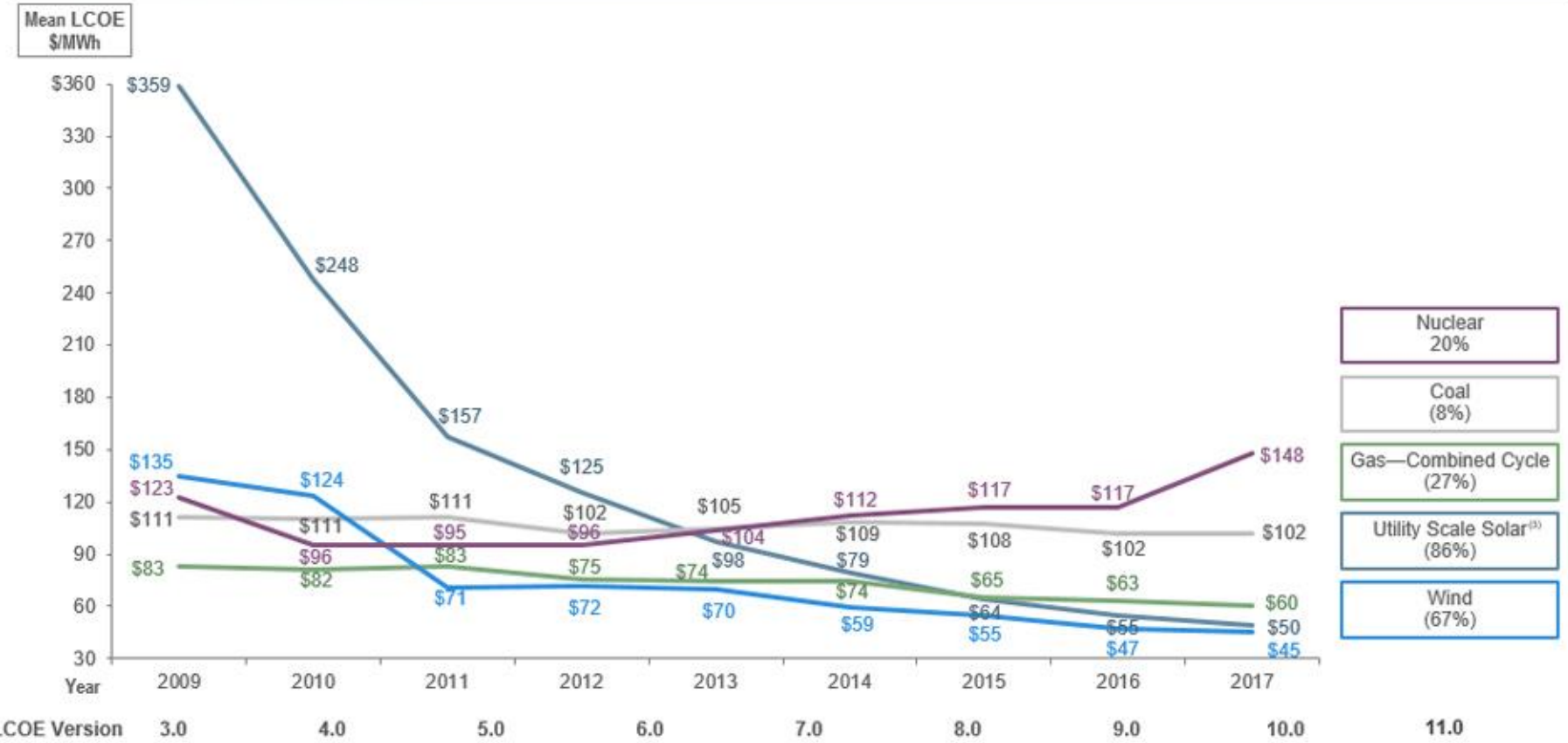
Fuel Delivery → **Generation** → **Transmission** → **Distribution**

Oil & Gas



Summary Findings of Lazard's 2017 Levelized Cost of Energy Analysis[1]

Selected Historical Mean LCOE Values[2]



LCOE Version	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0

Source: Lazard estimates.

Note: Reflects average of unsubsidized high and low LCOE range for given version of LCOE study.

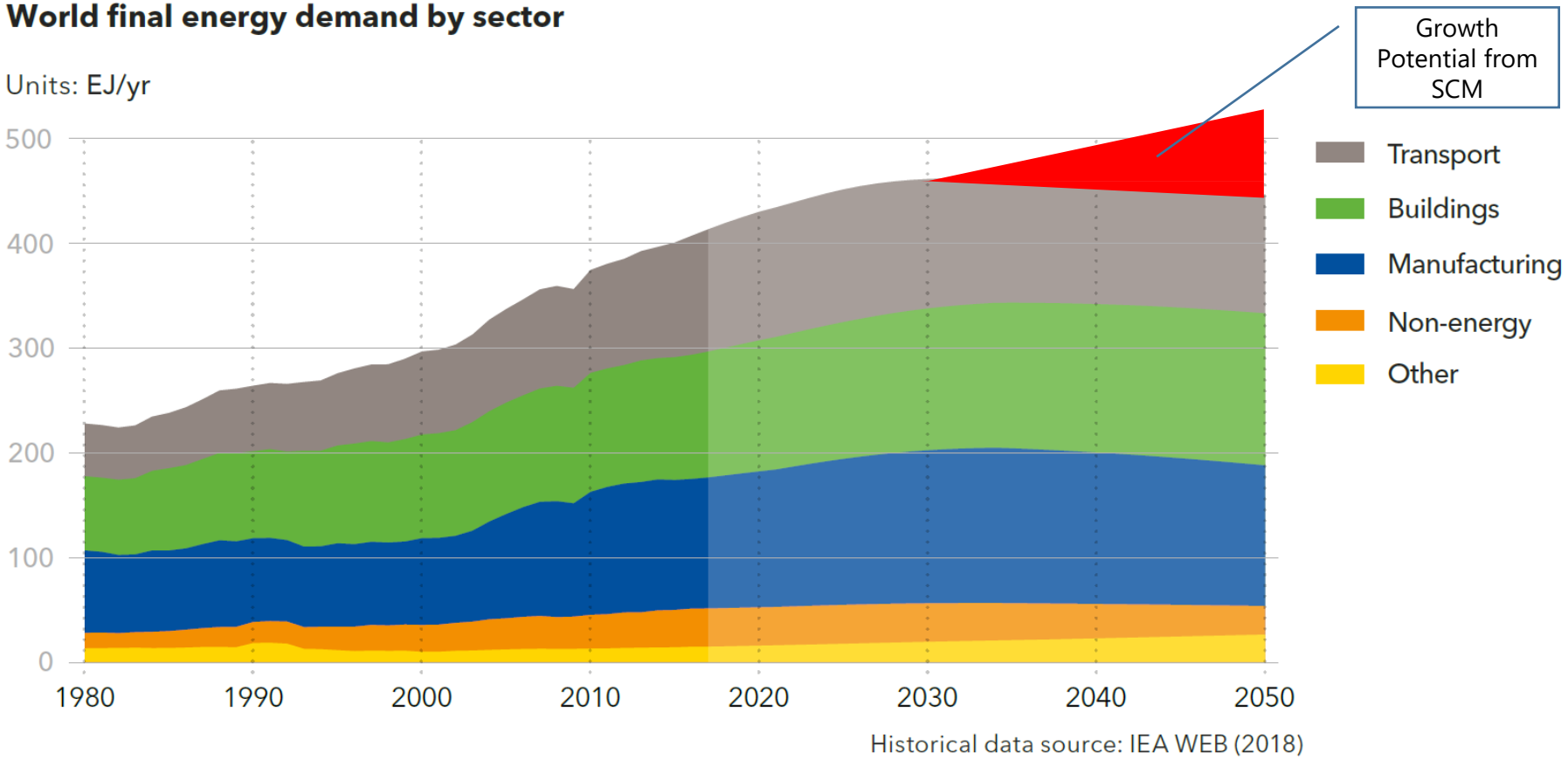
(1) Primarily relates to North American alternative energy landscape, but reflects broader/global cost declines.

(2) Reflects total decrease in mean LCOE since the later of Lazard's LCOE—Version 3.0 or the first year Lazard has tracked the relevant technology.

(3) Reflects mean of fixed-tilt (high end) and single-axis tracking (low end) crystalline PV installations.

Source: Lazard Levelized Cost of Energy 2017

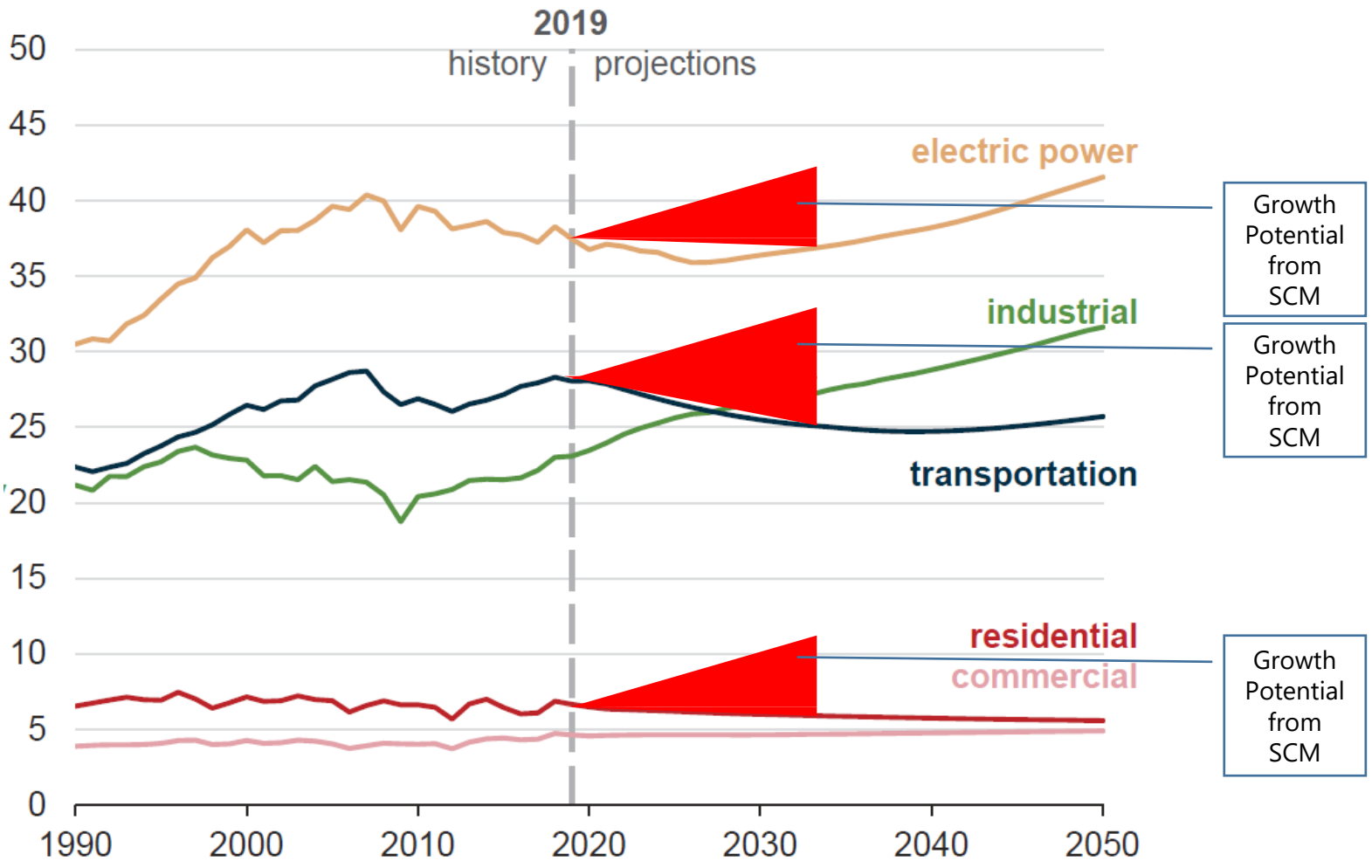
World final energy demand by sector



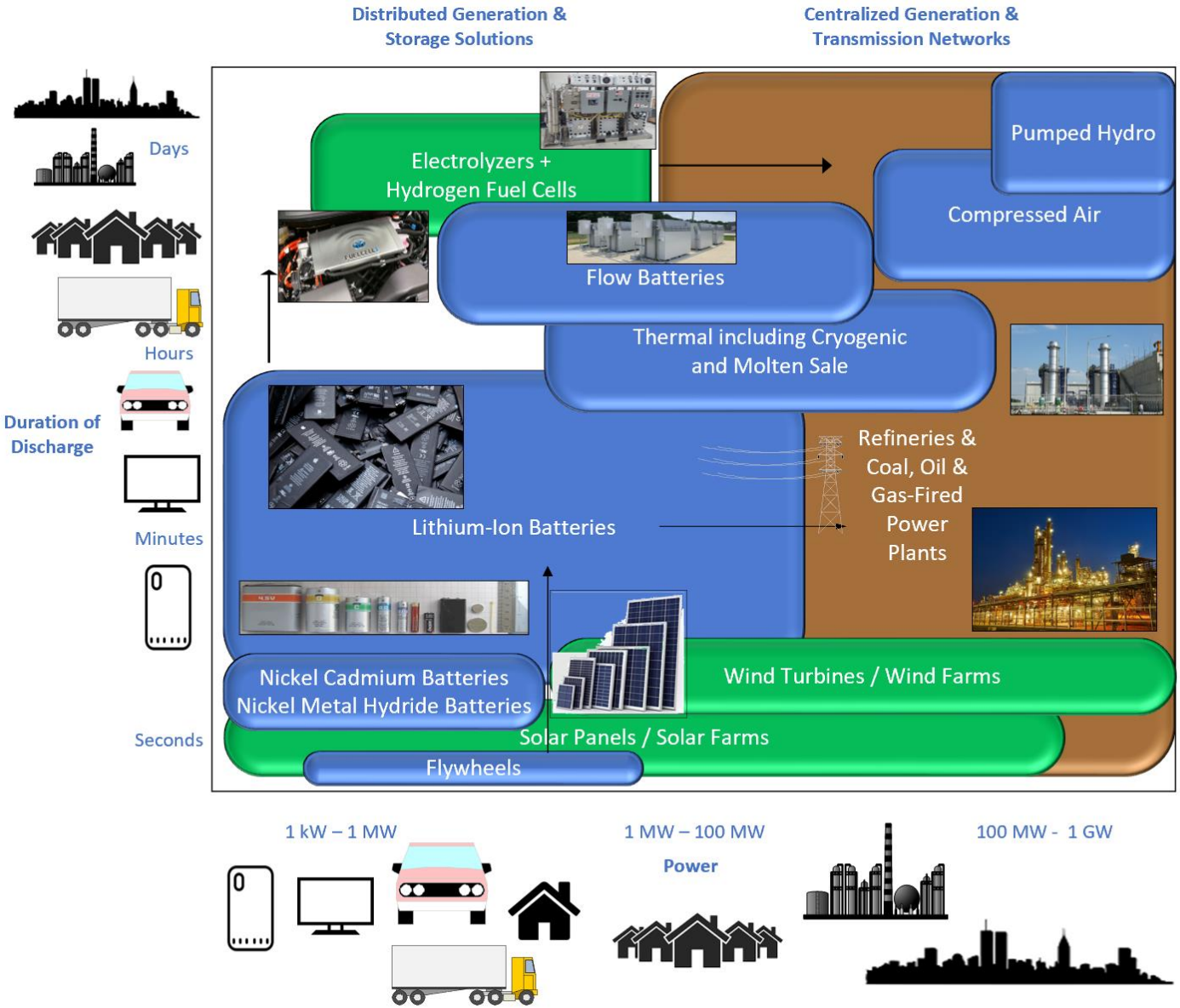
Source: DNV GL Energy Transition Outlook 2019, Boston Strategies International

Energy consumption by sector (AEO2020 Reference case)

quadrillion British thermal units

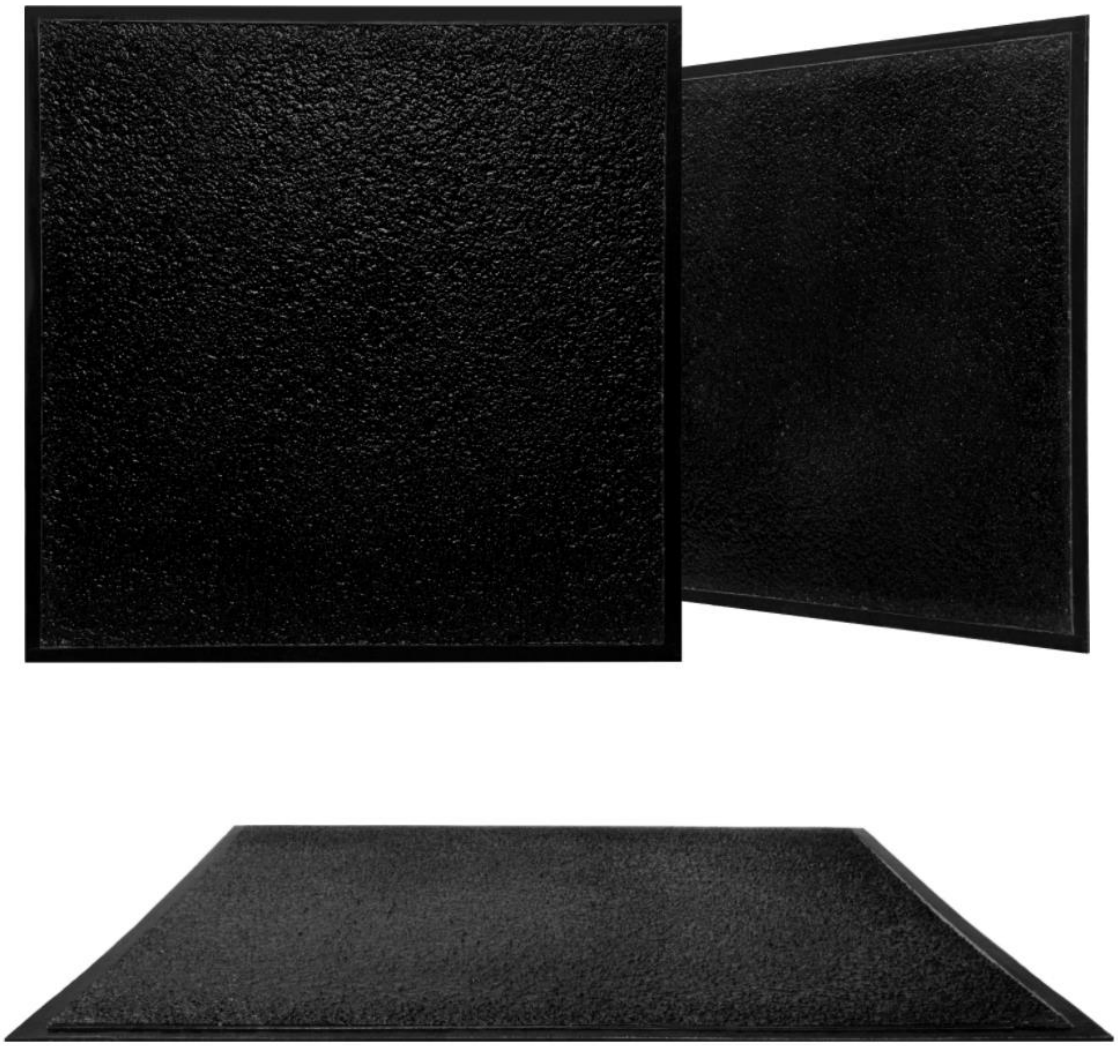


Source: EIA Annual Energy Outlook 2020, Boston Strategies International



Source: Jacoby, David Steven, and Gupta, Alok Raj: Reinventing the Energy Value Chain: Supply Chain Roadmaps for Digital Oilfields through Hydrogen Fuel Cells. PennWell Books, 2021.

Source: Solar Earth

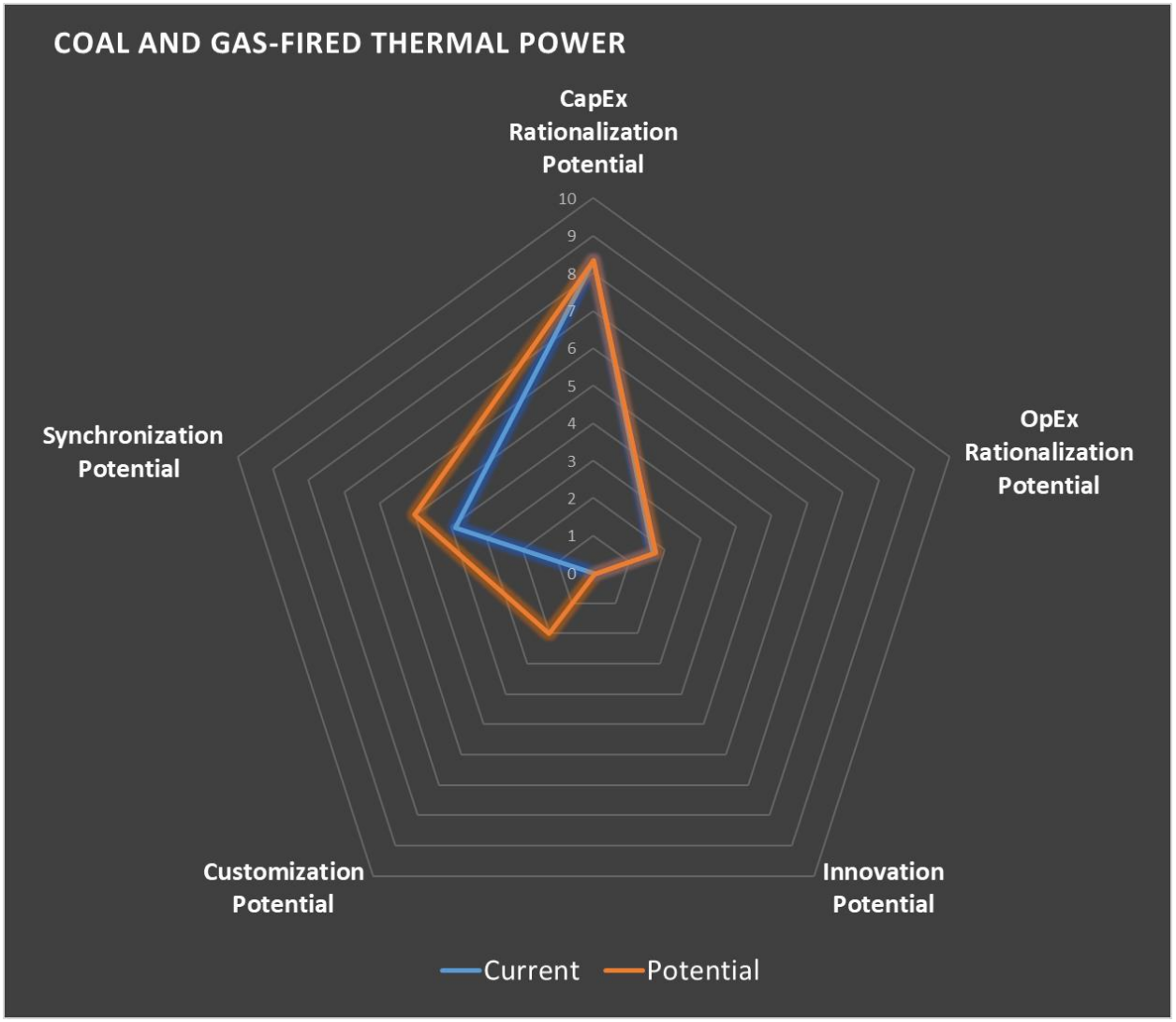


Source: Solar Earth

Source: Science Daily (Researchers tailor power source for wearable electronics)

Source: Indra

Source: Electrek



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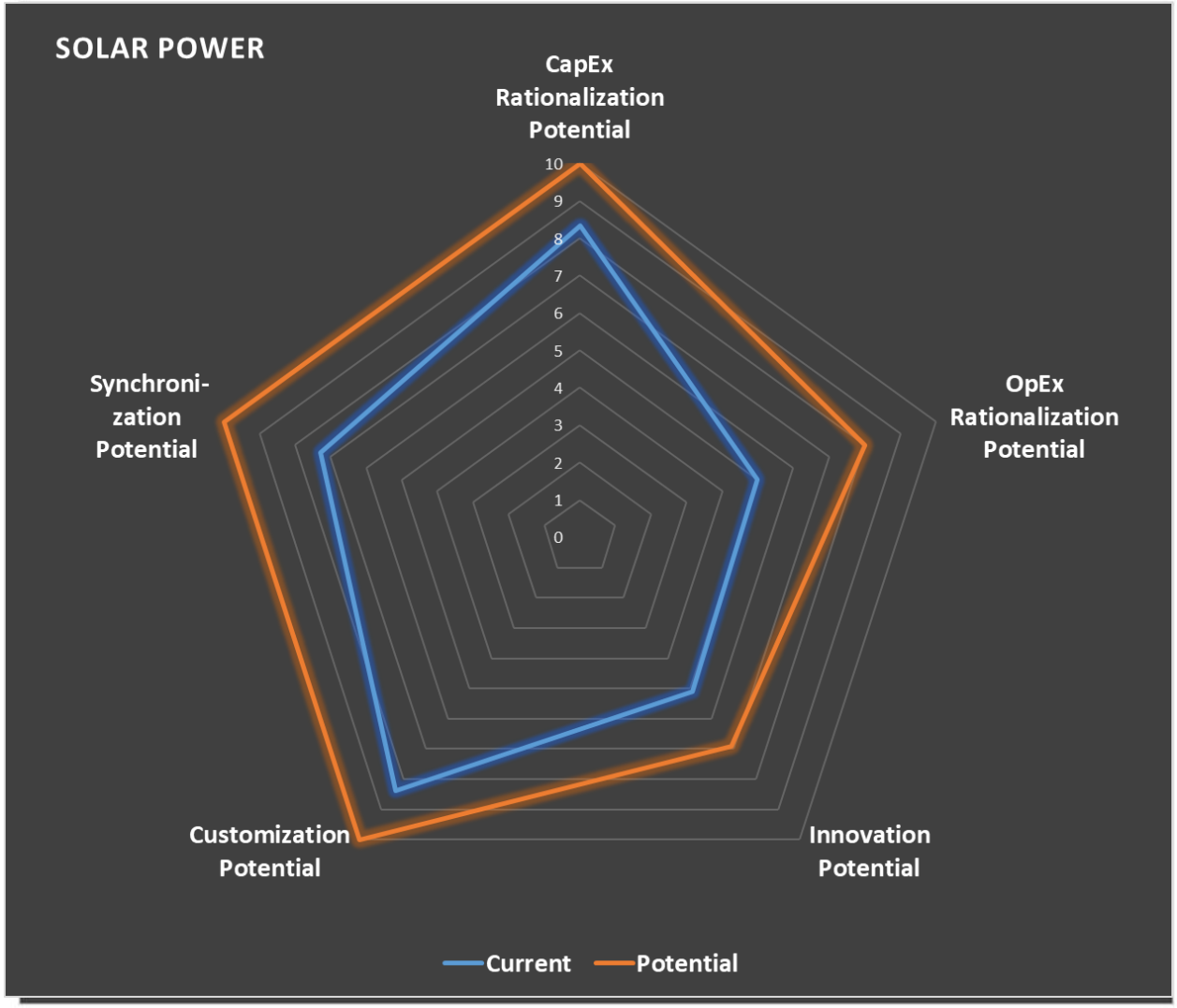

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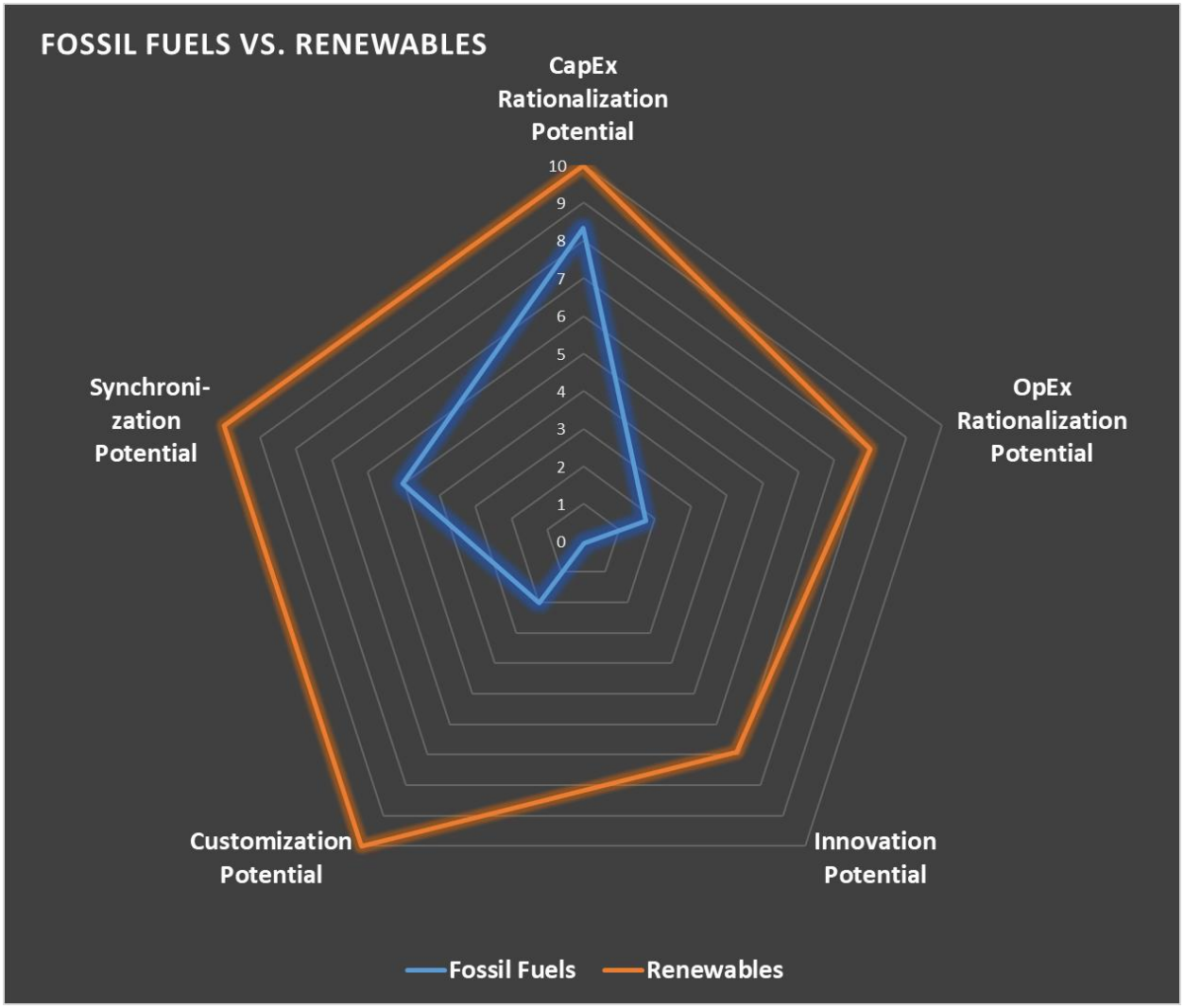

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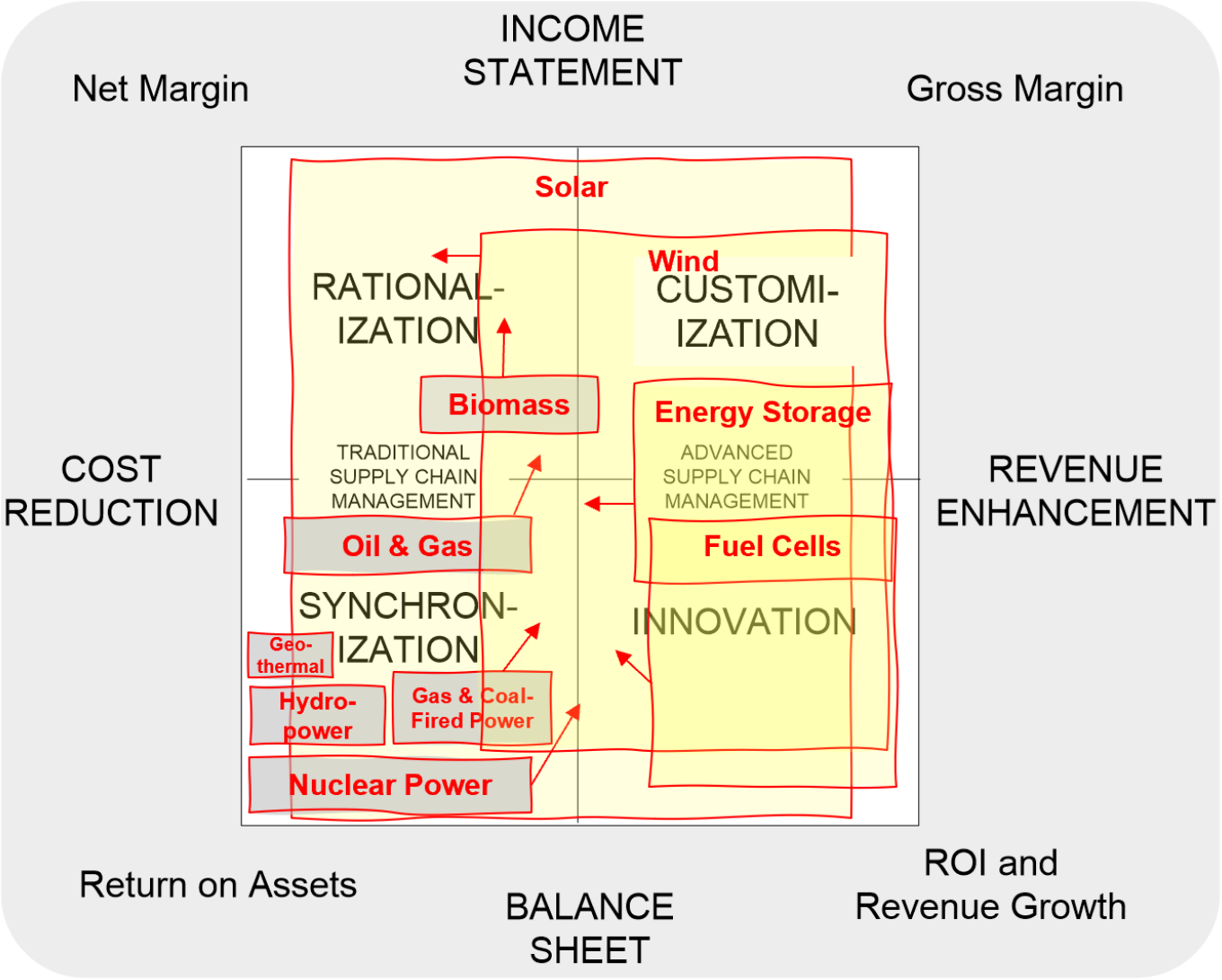
Shifting Supply Chain Strategies



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One Ongoing Research Project at Boston University

Study Objectives

1. Will, battery, fuel cell, and other alternative energy commercial vehicles reduce the industry's carbon footprint enough to meet climate change targets?
2. Which clean vehicle technologies will prevail, and in which vehicle segments?
3. Will the base of technological competence and cost leadership gravitate regionally (toward Europe, Asia, or the US)?

Scope

- Road
- Warehouses and terminals
- Rail (Locomotives)
- Marine & Intermodal
- Air

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