

US Energy Futures

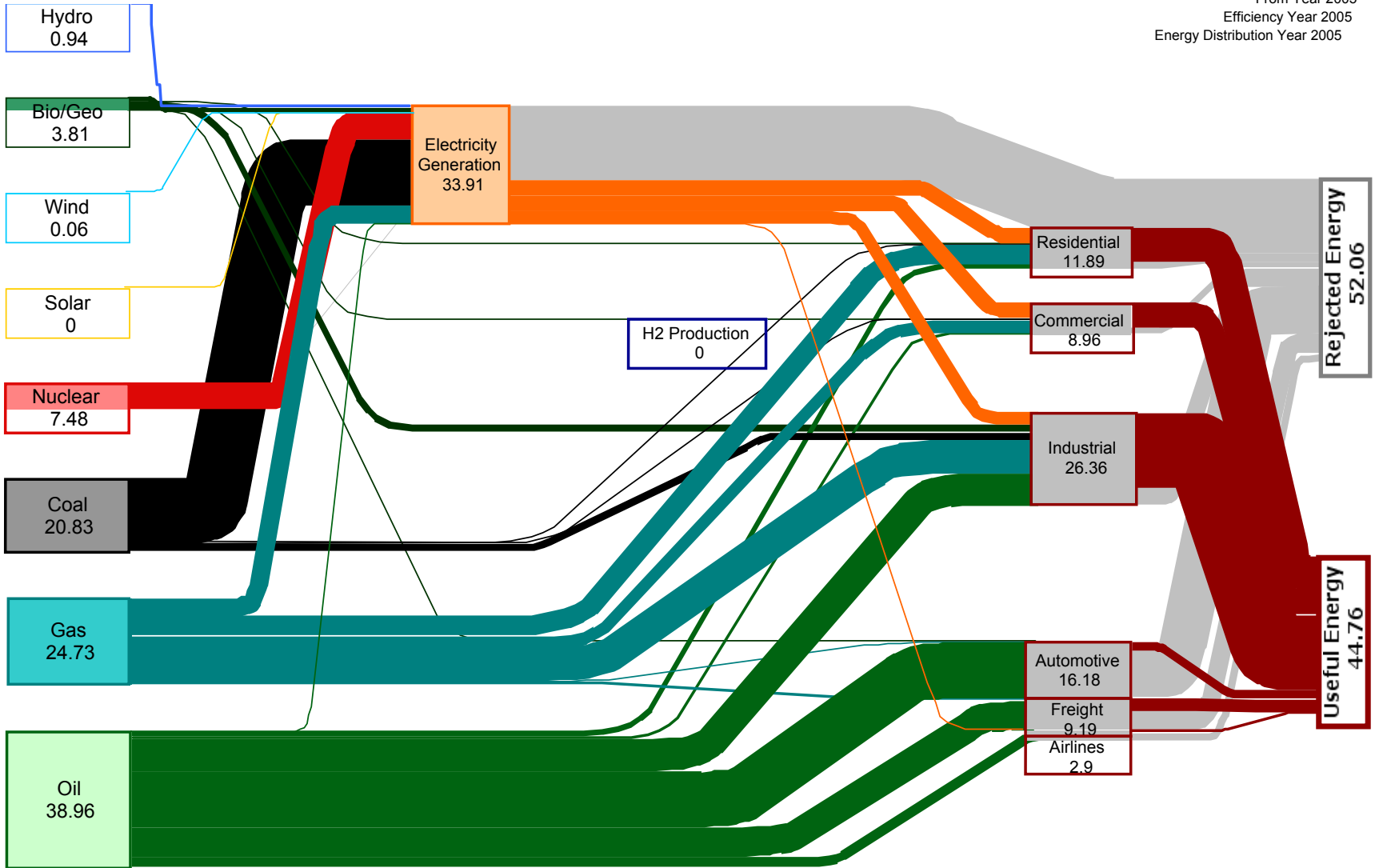
Presented by Ray Smith, LLNL
(Based on work by Gene Berry & Bill Daily III)



Estimated 2005 US energy use

Estimated Future U.S. Energy Requirements - 96.8 Quads)

Projection Year 2005
From Year 2005
Efficiency Year 2005
Energy Distribution Year 2005



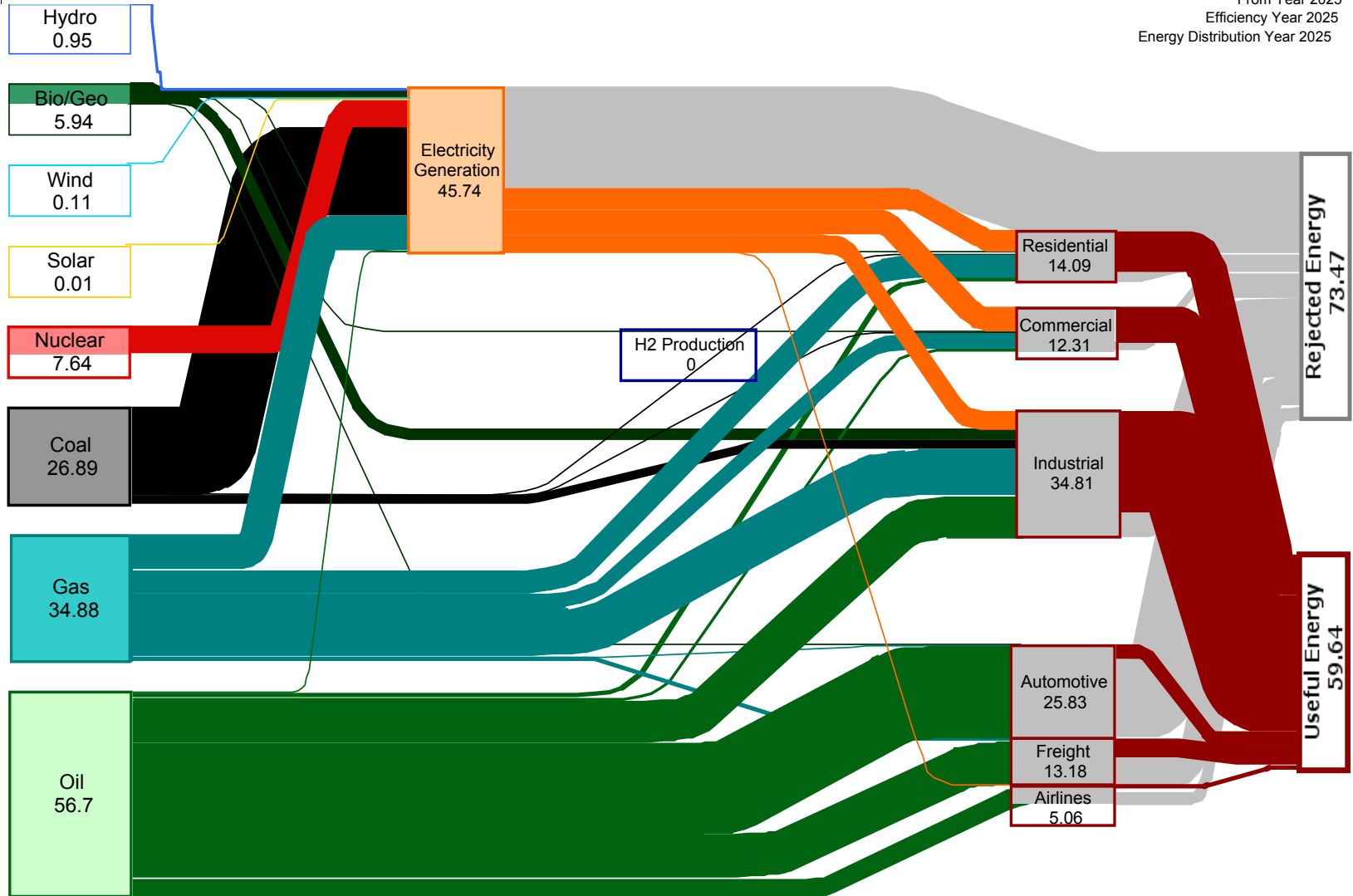
Why this primary energy portfolio?

- Answer: ACE
- Availability: can't use it if not available
- Cost: always choose the cheaper one
- Emissions: must meet regulations

EIA estimated 2025 energy use

Estimated Future U.S. Energy Requirements - 133.1 Quads)

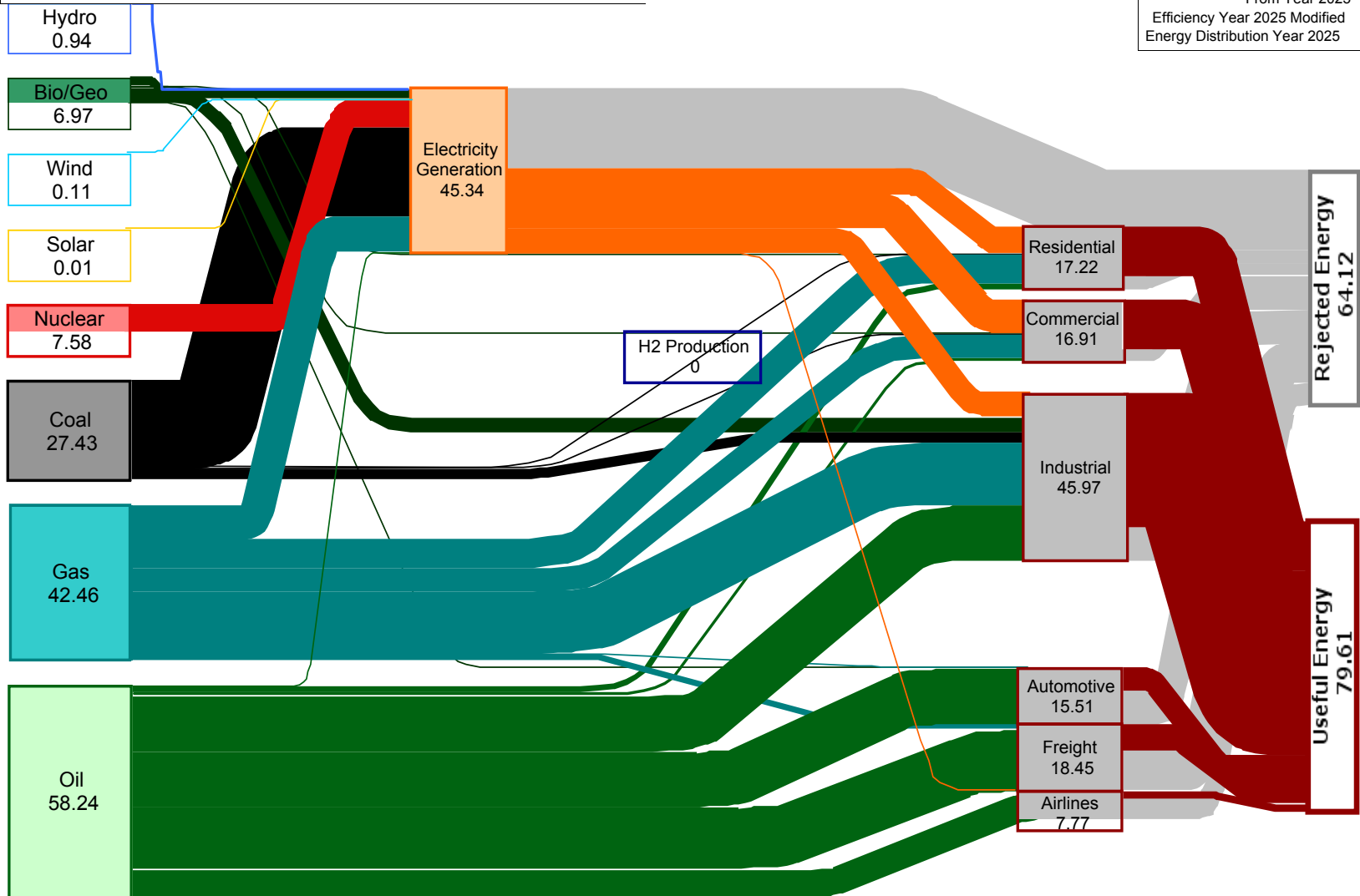
Projection Year 2025
From Year 2025
Efficiency Year 2025
Energy Distribution Year 2025



Estimated 2050 energy use (50 mpg hybrid, 50% efficient grid)

Estimated Future U.S. Energy Requirements - 143.7 Quads)

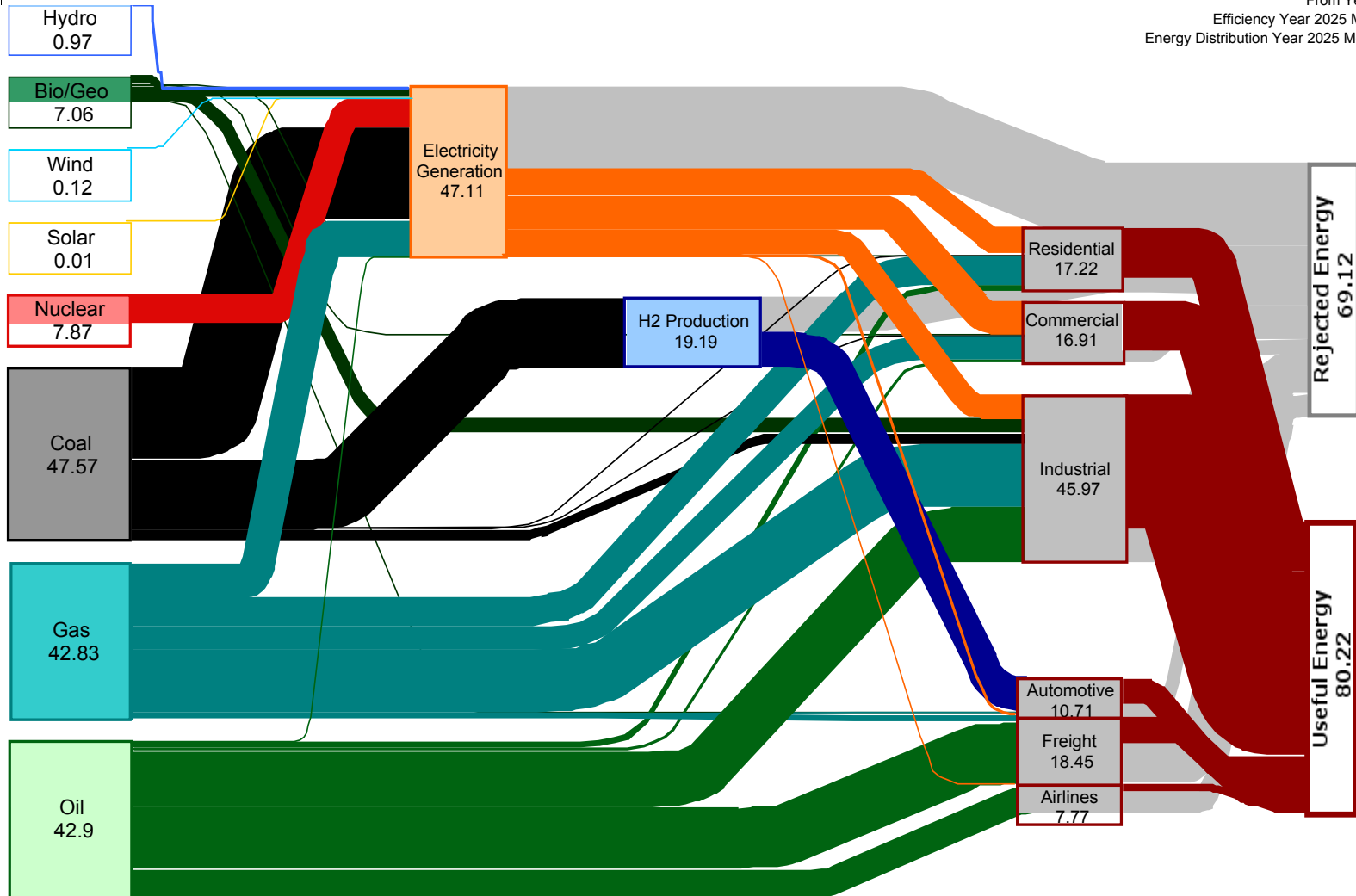
Projection Year 2050
From Year 2025
Efficiency Year 2025 Modified
Energy Distribution Year 2025



Estimated 2050 energy use (H₂ fleet using coal gasification)

Estimated Future U.S. Energy Requirements - 149.3 Quads)

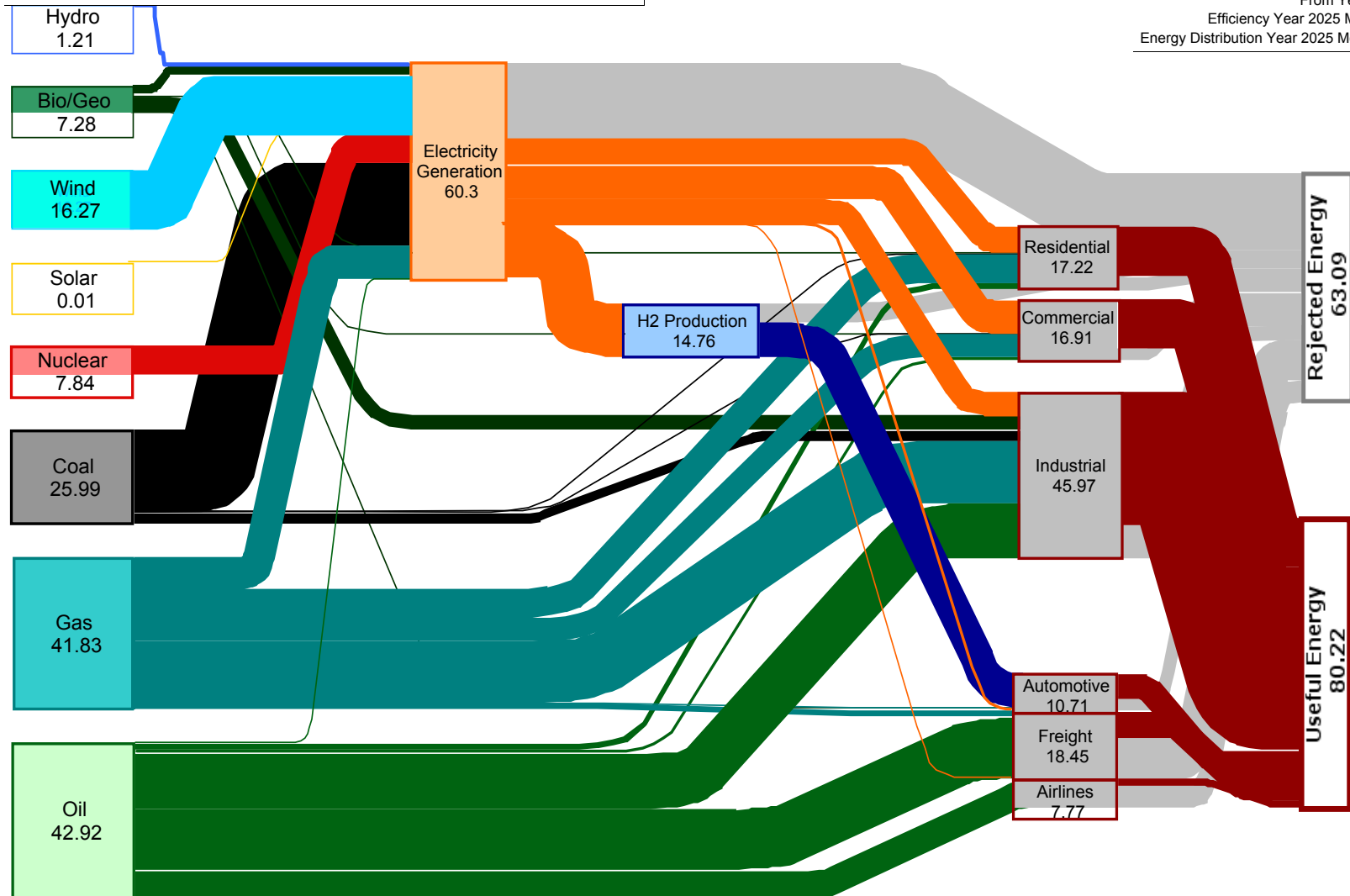
Projection Year 2050
From Year 2025
Efficiency Year 2025 Modified
Energy Distribution Year 2025 Modified



Estimated 2050 energy use (H₂ fleet using wind electrolysis)

Estimated Future U.S. Energy Requirements - 143.3 Quads)

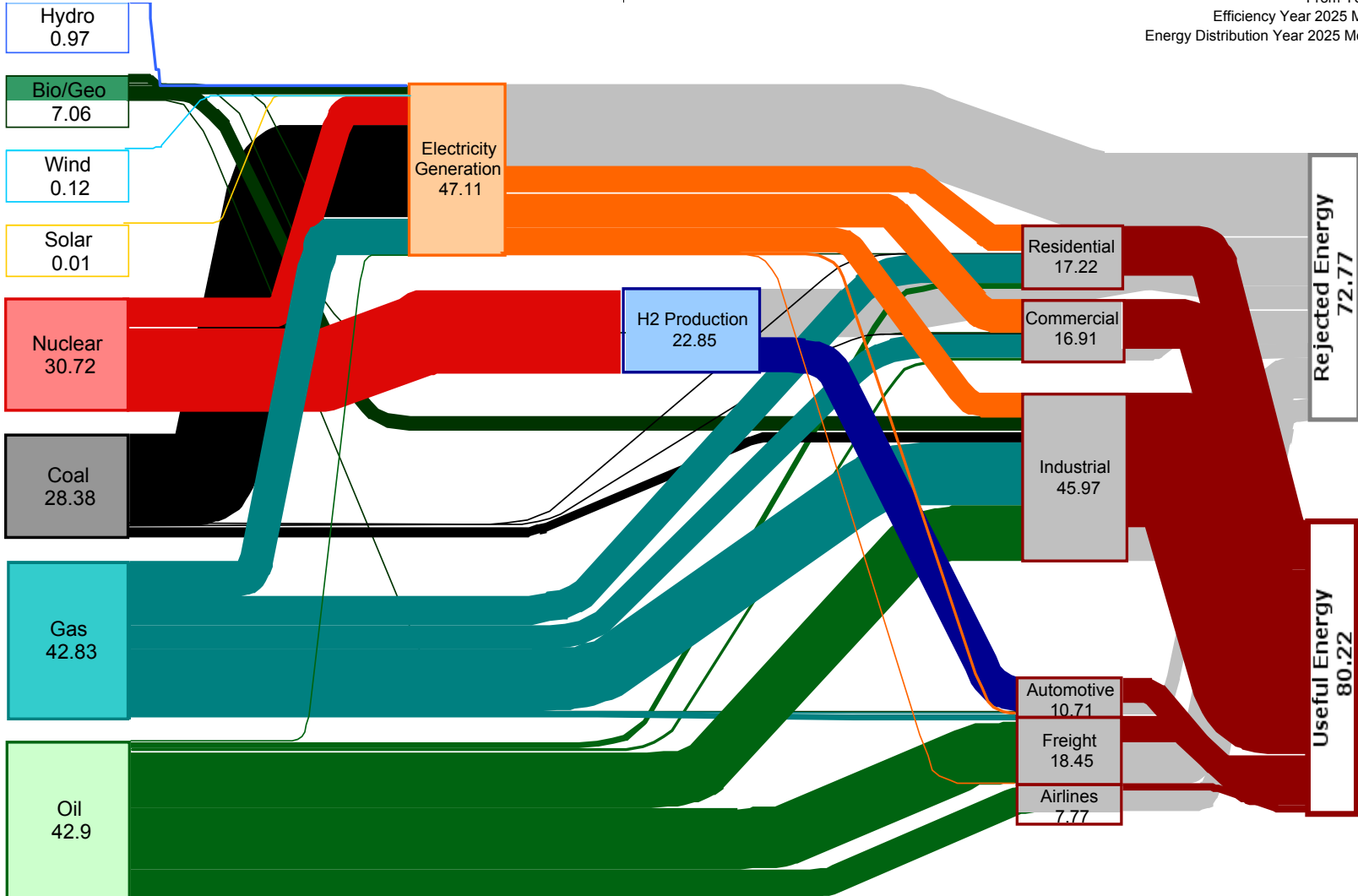
Projection Year 2050
From Year 2025
Efficiency Year 2025 Modified
Energy Distribution Year 2025 Modified



Estimated 2050 energy use (H₂ fleet using nuclear thermochemical)

Estimated Future U.S. Energy Requirements - 153 Quads)

Projection Year 2050
From Year 2025
Efficiency Year 2025 Modified
Energy Distribution Year 2025 Modified



Summary of good news bad news

<u>Future</u>	<u>Good News</u>	<u>Bad News</u>
High Fossil	Lowest cost	Carbon + regulated emissions
High Nuclear	Low mass waste	Waste longevity
High Wind	No carbon	Intermittent, visual “blight”

How do we get what we want?

Answer: Level the playing field with policy!

- Market pull (create markets for emissions or energy)
 - ❖ Carbon trading and/or auction (fixed quantity)
 - ❖ Renewable energy generation credits
- Market push (reduce the value of emissions)
 - ❖ CO₂ tax (fixed price)
 - ❖ Clean energy subsidies
- Technology pull (create need for technology)
 - ❖ ZEV mandate, CAFÉ standards (fixed market share or performance)
 - ❖ Renewable portfolio
- Technology push (improve technology value)
 - ❖ Raise technology performance with research & development
 - ❖ Lower technology cost (economies of scale) with buydown programs