

# Natural Gas/CAPER Power Plant efficiency increase

## Grimes Carbon Tech (GCT)

A net negative green technology company changing the world

September 2024



### **CAPER (Caustic, Aqueous-Phase, Electrochemical Reforming)**

Distributed CAPER systems using low-grade waste heat to produce hydrogen on-site & on-demand with a zero or negative carbon footprint

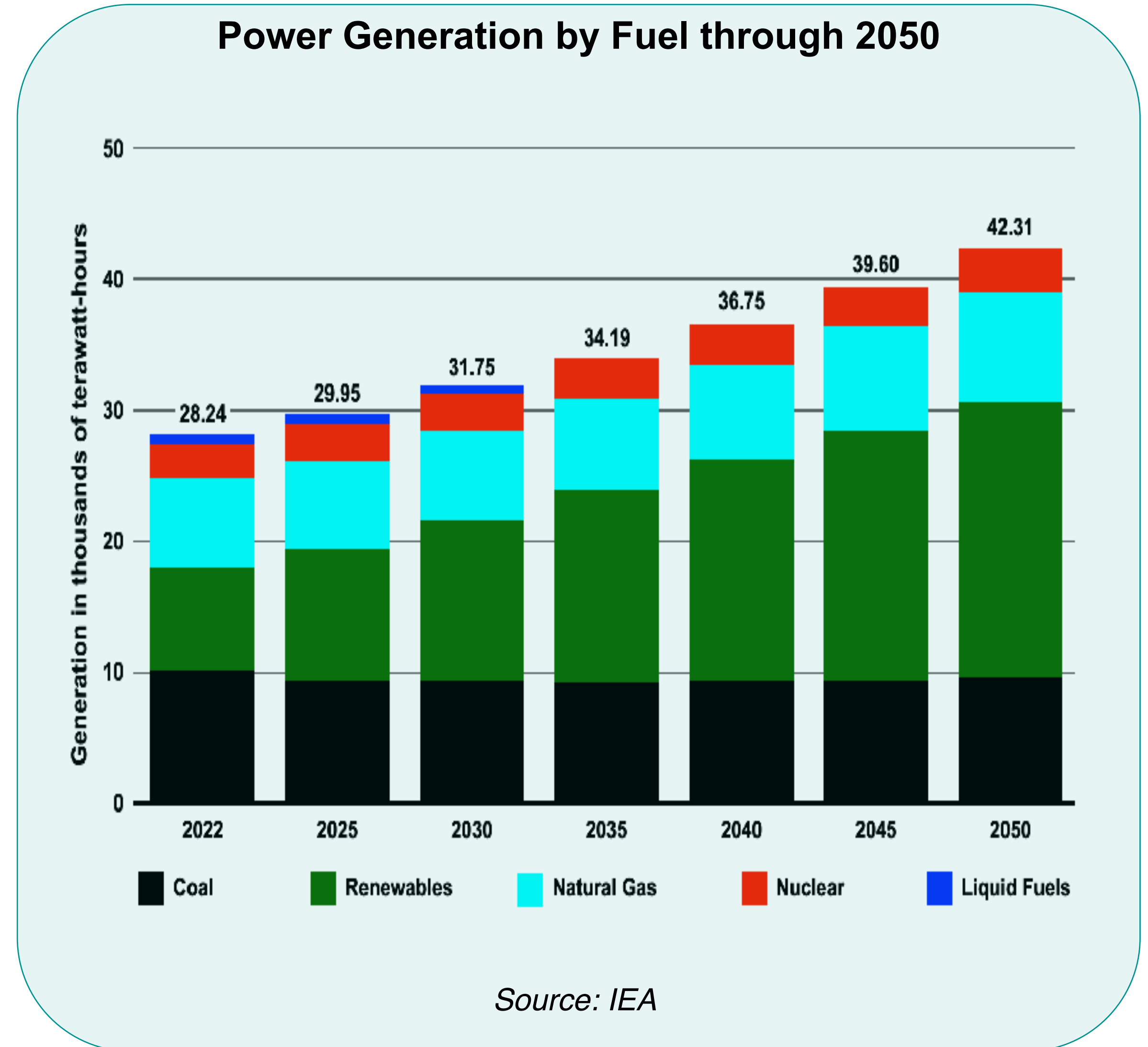


# 🌱 Natural Gas will be a major energy source for the foreseeable future

World electricity demand will grow by 50% through 2050

## Renewables aren't growing fast enough

- Renewable electricity is already the lowest cost in much of the world, however, it is intermittent & is not projected to be able to meet projected demand growth.
- Although the percentage of natural gas generation will shrink, due to demand growth, the actual amount will stay virtually constant through 2050.
- Natural gas currently emits ~ 7.5 billion tons of CO<sub>2</sub> annually & power generation is ~ 33% of the total, emitting ~ 2.5 billion tons.
- Even with this being the case, natural gas power generation is still the cleaner alternative to coal needed to provide baseload capacity.
- Conventional carbon capture actually increases the energy consumption per kWh generated, increasing the CO<sub>2</sub> emissions proportionally.

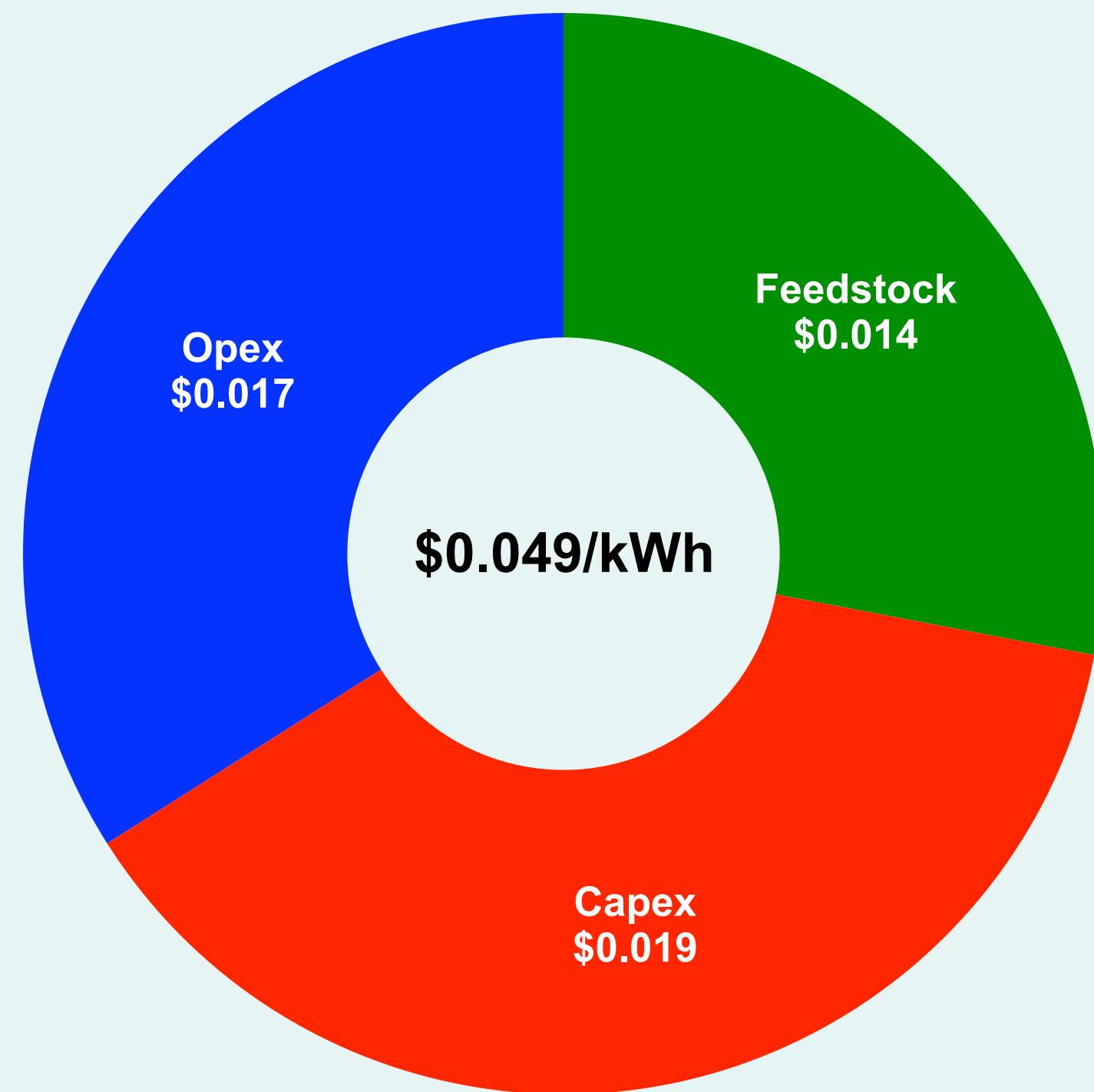


# GCT has the *only* method of making Blue H2 & electricity from waste heat

## Converting natural gas to H2 increases chemical potential & plant efficiency

### Cost of Blue Electricity & Efficiency Comparison

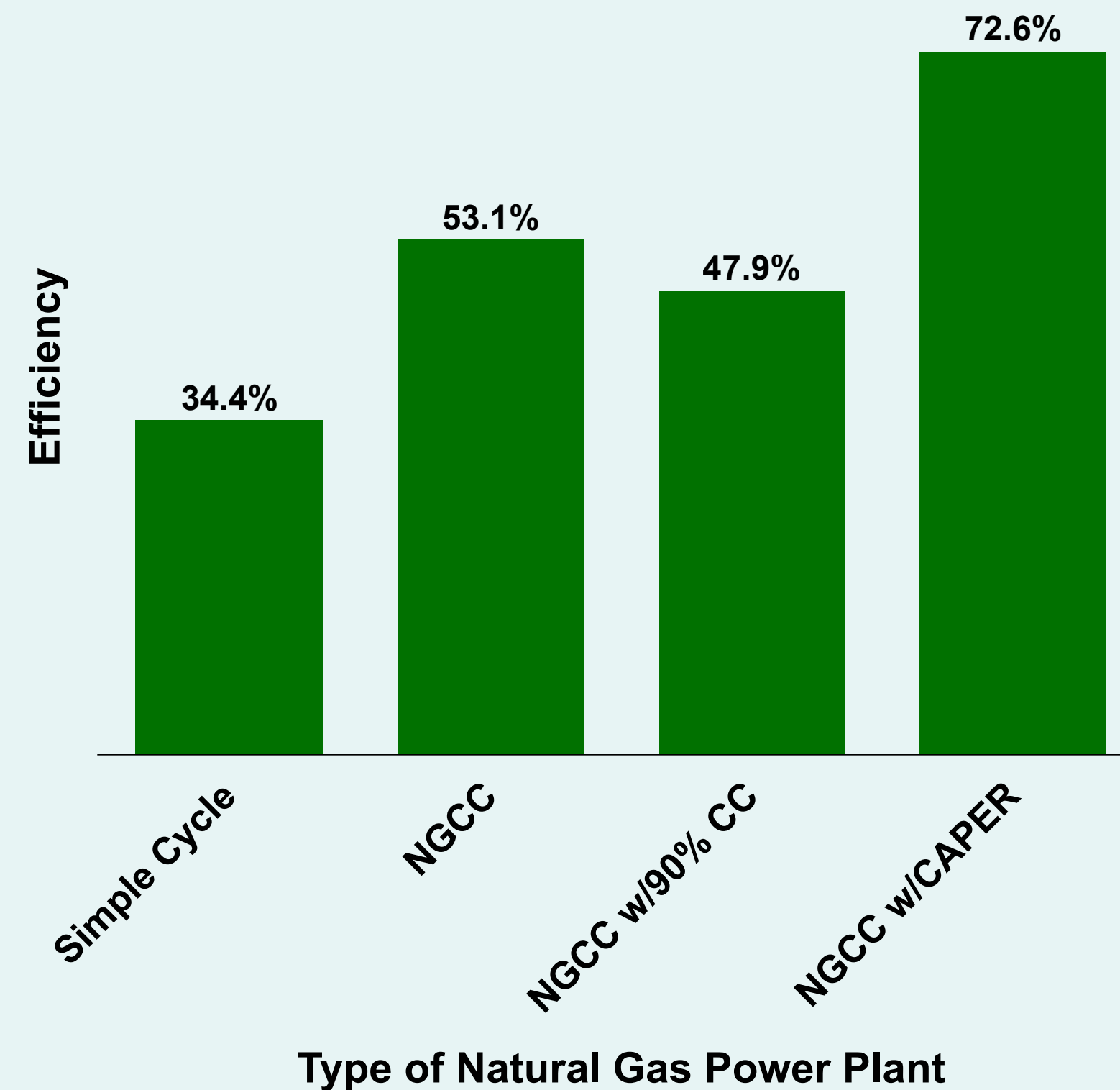
Cost of Electricity from Blue H2 (\$/kWh)



**Assumptions:**

- Natural Gas @ \$3.00/MMBTU
- 100% debt over 10 years @ 7%/year
- 53% efficient NGCC power plant

Power Plant Efficiency Comparison



### GCT CAPER process:

- Converts 100% of input natural gas to hydrogen, on-site & on-demand.
- All input carbon is captured exothermically in the electrolyte.
- Waste heat can also be used to convert captured carbon to pure CO2 for sequestration or renewable electricity can be used for conversion into methane or other liquid fuels.
- These fuels can be cost-effectively produced by a dynamic CCR system mated to intermittent wind & solar.
- Will increase the efficiency of a typical NGCC plant by 36.7%, reducing natural gas needed and CO2 emitted
- Factory-built and tested modules can be deployed as needed at whatever scale a client requires.



# CAPER of natural gas creates affordable electricity from Blue H2

Electrical efficiency can increase as much as 55% over conventional plants

## Inputs



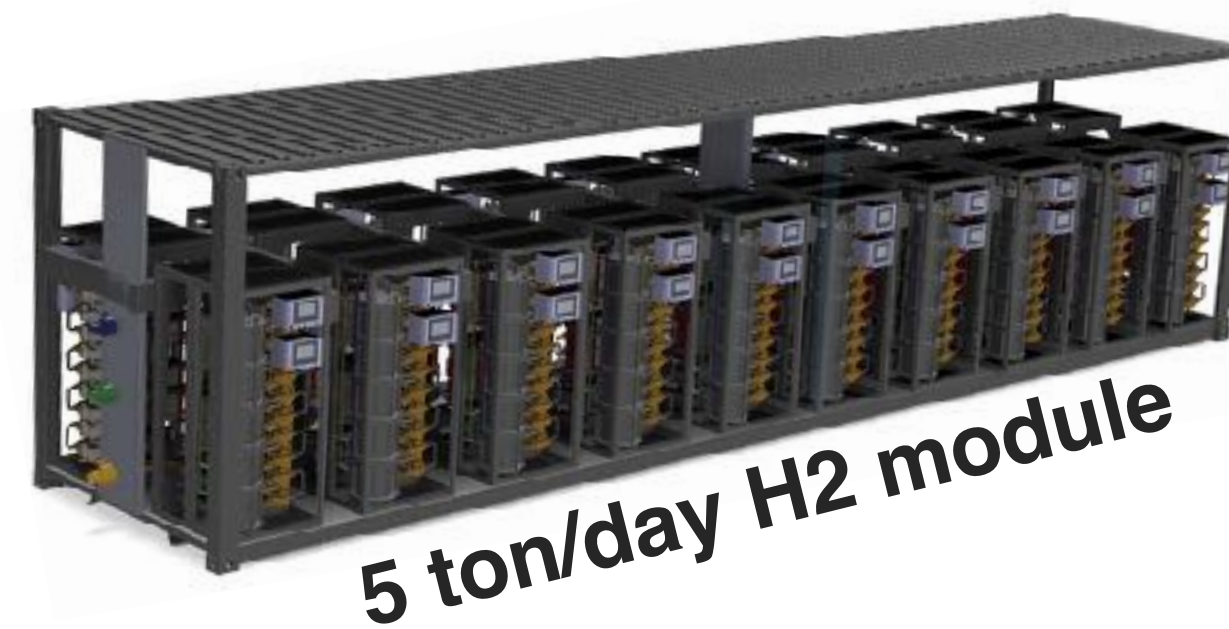
## CAPER Cost ~\$100,000/TPD



### Modular, flexible and distributed

GCT's CAPER converts natural gas in factory-built shipping containers that eliminate the need for H2 pipelines. The CAPER can be operated alone or integrated with a CCR system to produce fuels.

Natural Gas



H2



### Increasing energy efficiency

The total conversion of natural gas to hydrogen & carbonized electrolyte in a CAPER system is driven by the waste heat of the power plant. This increases the energy efficiency in a conventional plant by about 37%. If fuel cells are used, with their higher conversion efficiency, the savings can climb to as high as 55%.

## Outputs



Fuel Cell Power Plants



Gas-Fired Power Plants



Distributed Gensets