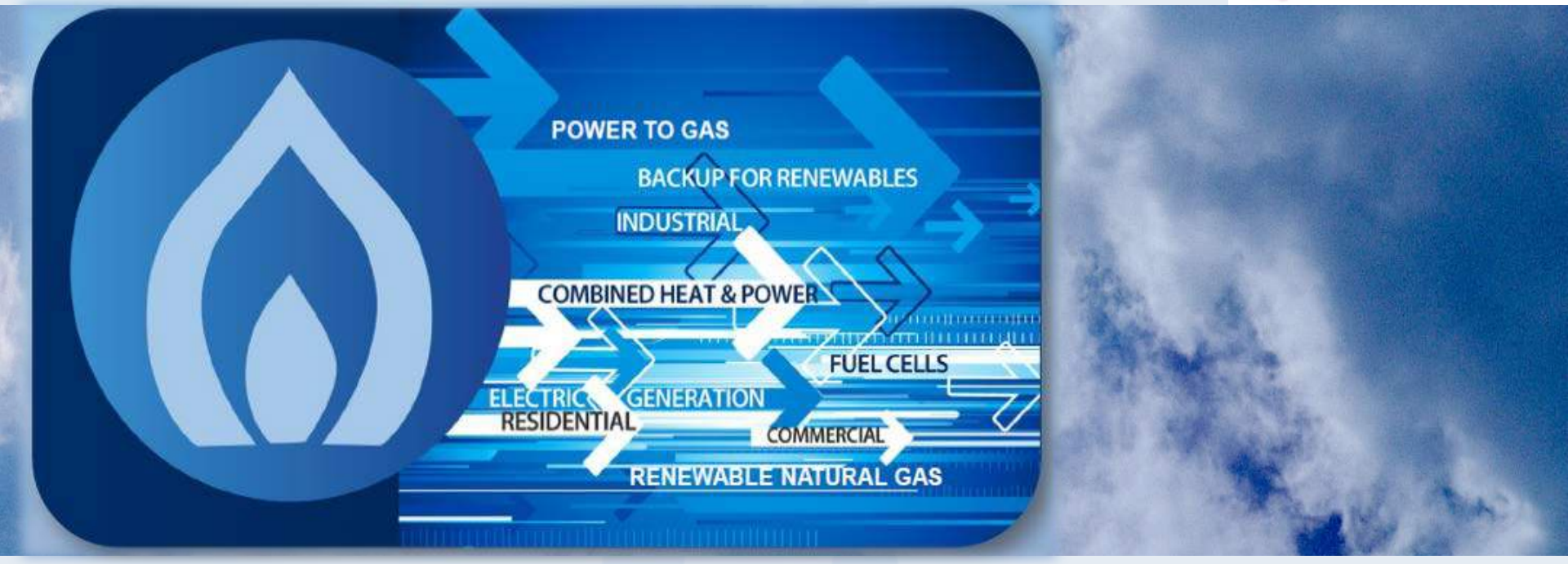

Natural Gas Pathways:

Towards a Clean and Renewable Energy Future for California

Southern California Gas Company
2018

SoCalGas A Sempra Energy utility

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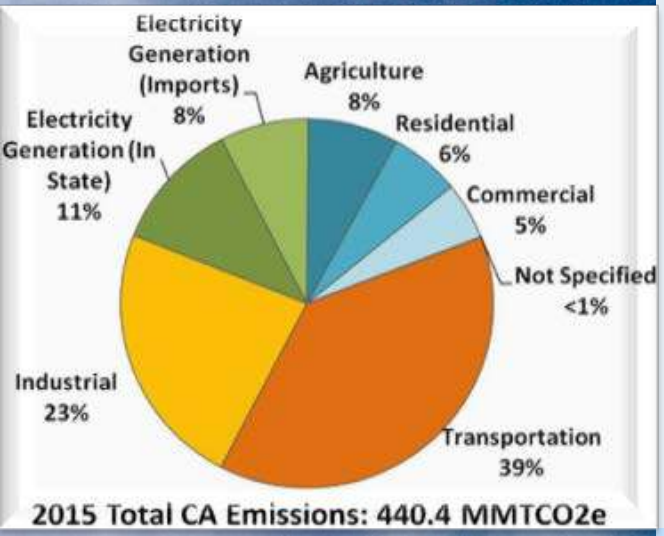
California Climate Change Policy

Need for "Near-Zero" End Uses and Low Carbon Gas



Where do emissions come from?

California focused on electrifying end uses; and "de-carbonizing" electricity

- De-carbonize generation
- Electrify transportation
- Electrify energy end uses

SoCalGas focused on "near-zero" end use technology -- "electric equivalent" ; and "de-carbonizing" the pipeline

- Develop Near-zero gas technology
- Develop Near-zero NGV's
- Decarbonize gas supply

It's *NOT* Either/Or.

It's *BOTH*!

SoCalGas A Sempra Energy utility

De-Carbonizing Energy:
Natural Gas Pathways

Low carbon gas technology focuses on:

- HD Transportation
- Distributed Energy Resources
- Small-scale, Fast-ramping Generation Matched with Renewables
- Power Generation with Carbon Capture

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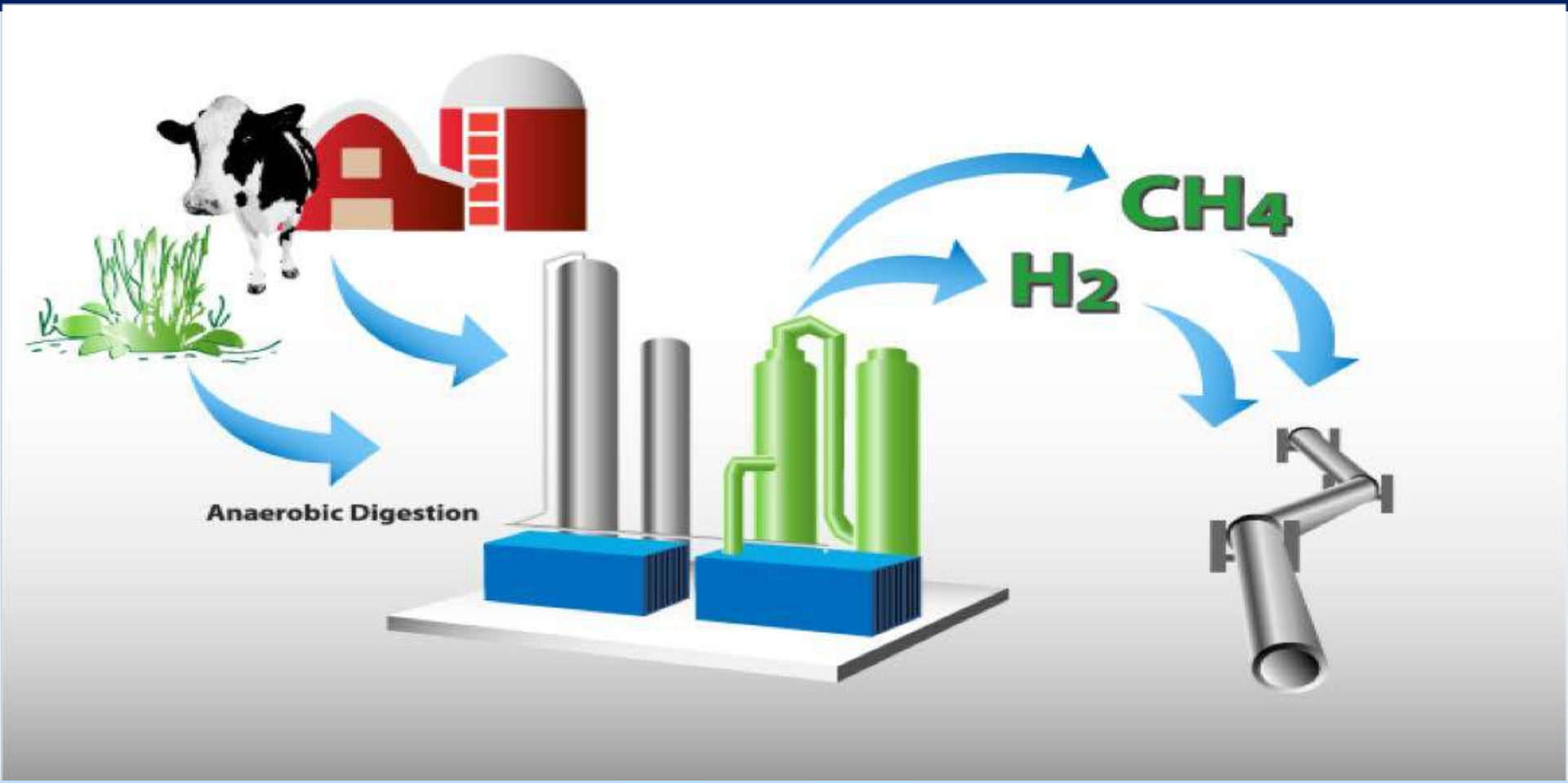
DER:

Not just Solar and Wind…

- **Fuel Cells**
- **Micro-turbines**
- **Combined Heat & Power**

De-Carbonizing the Pipeline:

Waste or Biomass: Biomethane to Renewable Gas

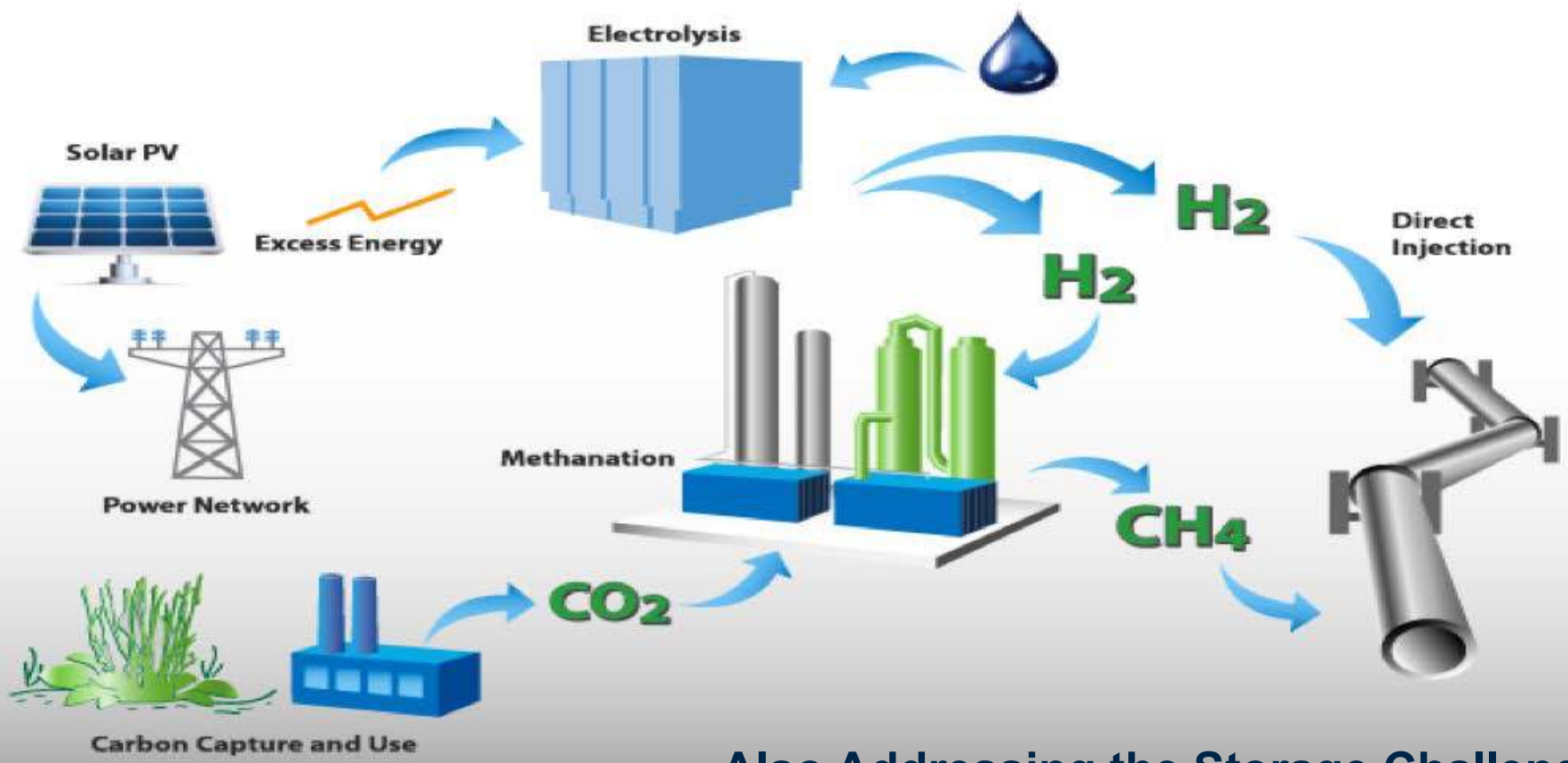


Renewable Gas Development

- State organic waste reduction goals support RNG development
  - 50% reduction in the statewide disposal (landfilling) of organic waste from the 2014 level by 2020 and a 75% reduction by 2025.
- Short Lived Climate Pollution Plan -- reduce methane by 40%
- SB 1383 -- ARB, CEC and CPUC to develop policies to support market:
  - Establish energy infrastructure development policies
  - Procurement policies
  - Encourage biomethane market development.
  - 5 dairy pilots by utilities

De-Carbonizing the Pipeline:

Power-to-Gas: Excess Renewable Electricity to Renewable Gas

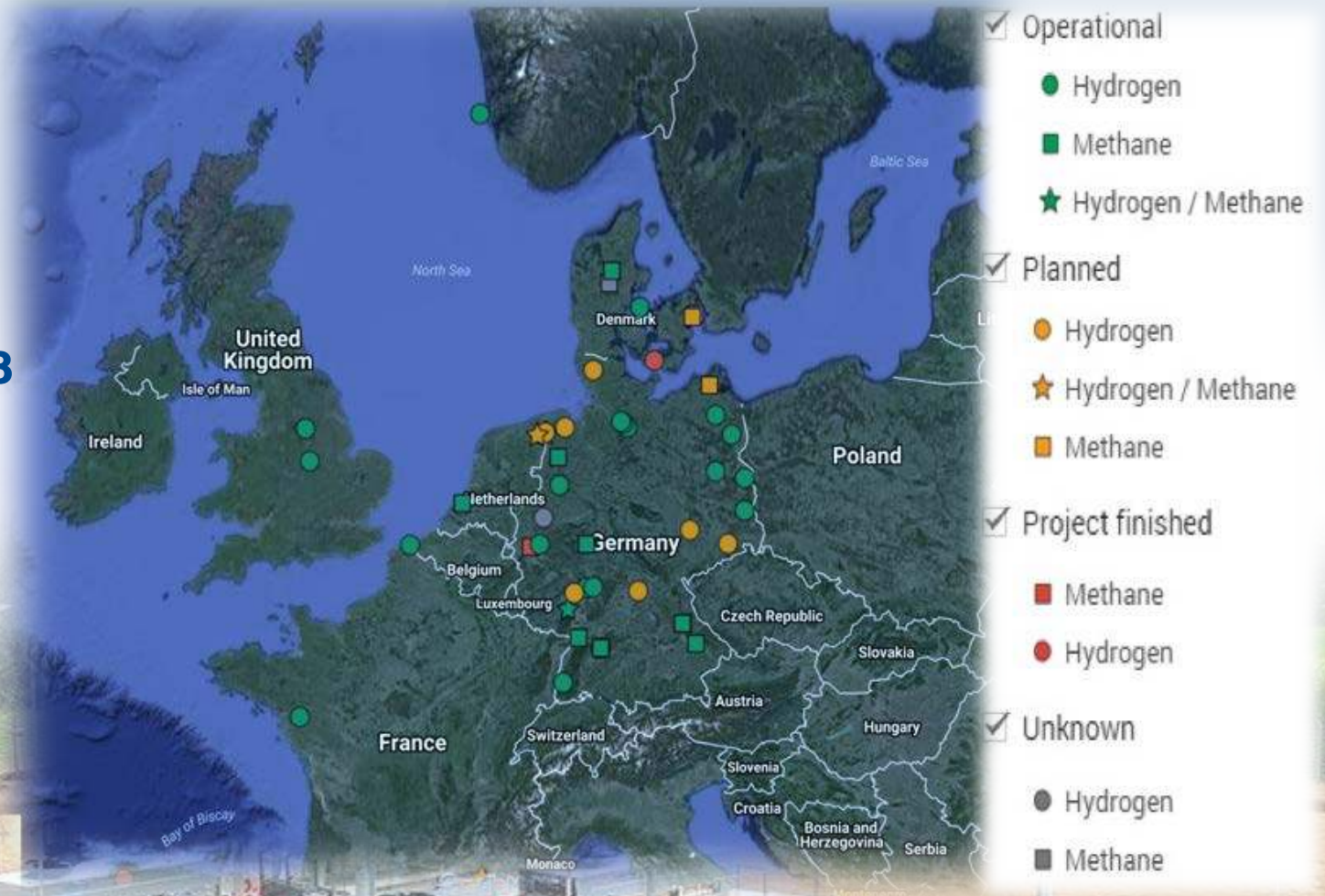


Also Addressing the Storage Challenge

Power-to-Gas Projects:

Provides green hydrogen pathway and grid storage

- **30 Projects Now Launched In Europe**
- **20 Projects Launched in Germany in last 8 years, with at least 5 more in development**



SoCalGas
Sempra Energy utility

First in US:

P2G Facility at UCI

April 15, 2015

Bloomberg Business

California Utility to Make Gas From Solar for Pipeline Storage

U-T San Diego

UTILITY TO TEST ENERGY STORAGE

Southern California Gas looking at pipelines for excess solar power

By Naureen S. Malik BLOOMBERG NEWS 5:06 A.M. April 15, 2015

NEWS RELEASE

SoCalGas Launches First Power-to-Gas Project in U.S.

Converts Electricity from Renewable Sources to Hydrogen and Methane; and Tests Use of Existing Natural Gas Pipelines to Store Surplus Power

THE ORANGE COUNTY

REGISTER

UCI tries solving this problem:

We have sun and wind for power, but how do we store it?

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E3 Study:
Integration of New Low/Zero Carbon Options

Energy+Environmental Economics

Strategic use of gaseous fuels supports near- and long-term goals

- **In nearer term, opportunities for efficiency, "near zero" technology and new uses for natural gas (transportation)**
- **In medium- to long-term, new low-carbon sources of gas need development and introduction**

- **Pipeline de-carbonization works together with electrification towards Climate Change objectives**
- **Pipeline de-carbonization offers Cost Effective and Resilient Pathways**
- **De-carbonization can play an important role Integrating Variable Renewable Generation Resources**
- **Pipeline de-carbonization reduces emissions in sectors that are otherwise difficult to electrify, including heavy duty vehicles; residential and commercial end uses, and industrial end uses**
- **Managing "Energy Grid" (gas and electric together) = efficiency and cost avoidance**

Electrify Everything?

Some Advocate:

- **Decarbonize Electricity, then Electrify All Uses:**

  Transportation Electrification
  - *Data show LD sector for electrification; but HD sector for RNG and LoNOx engines*

  Building Electrification
  - *Gas highly efficient for end uses, for-kind replacement not beneficial until 50% RPS. RNG superior in reducing GHGs.*

- **Pass New Legislation and Regulation:**

  Mandate New Homes be All Electric
  - *Builders need to meet consumer demand*

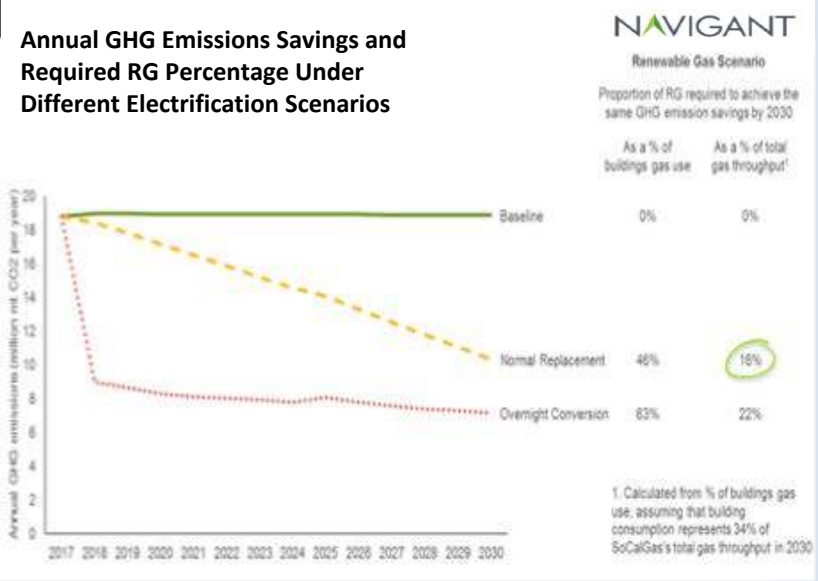
  Retrofit All Homes by 2030
  - *Consumer choice?*
  - *Massive and expensive equipment changeouts, installation costs and increased monthly operating costs.*

Navigant Study:

RNG Beats Building Electrification

GAS STRATEGIES FOR A LOW-CARBON CALIFORNIA FUTURE

Annual GHG Emissions Savings and Required RG Percentage Under Different Electrification Scenarios



- **16% rate of RNG throughput meets or exceeds GHG reductions from 100% electrification of building sector by 2030. Mandatory building electrification unneeded. SCE goal (30% de-carb) achieved at less than 5% rate.**
- **Avoids massive change out of equipment, high purchase and installation costs, and long term operating costs.**
- **Renewable gas re-uses California's waste streams as energy, achieving climate change objective proposed by those seeking to eliminate all use of gas.**
- **Can ensure success of SLCP. Law requires 40% capture of methane from CA waste stream – sewage, landfills, dairies and agriculture. Capture of "SLCPs" is 30% of all GHG reductions needed in ARB Scoping Plan to reach 2030 goals.**

Navigant Study:
Building Electrification Costs

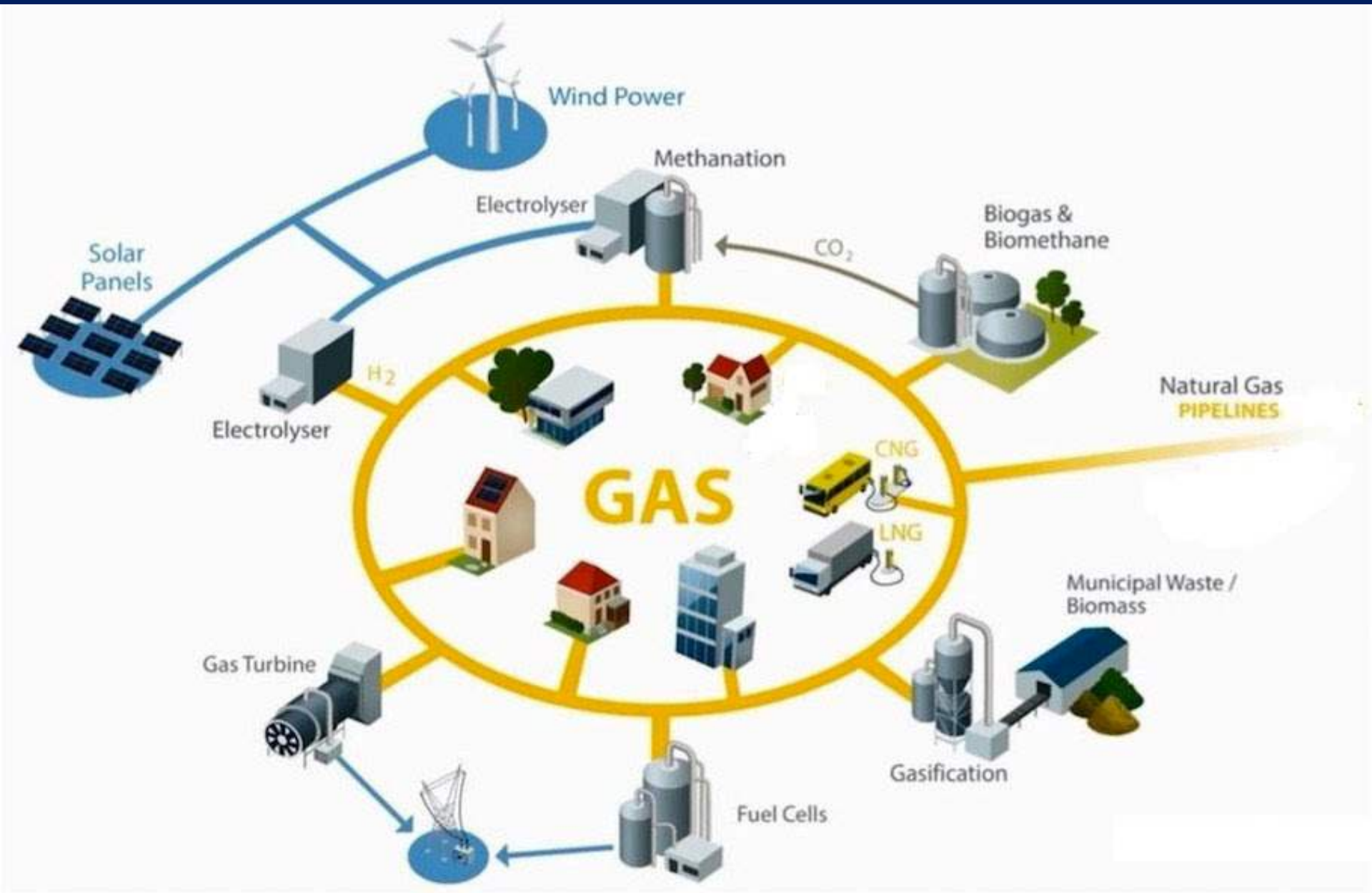
The cost to upgrade wiring and electrical panels plus the cost of purchasing new electric appliances is more than $7,200 per home. Phase 1 (Existing Single-Family Homes)

- **Electrifying a typical SoCal single-family home could cost the homeowner almost $900 per year.**
- **This could mean roughly $2,600 for new appliances and roughly $4,600 for new wiring/electric panel upgrades.**
    - **This would result an annual cost increase of $4.3 to $6.1 billion across California's 7 million single-family homes.**
- **Electrifying a home reduces its GHGs by 35-39% in 2020 or only 2.3% of the state's GHG emissions.**

*According to the California Air Resources Board, residential buildings in California account for about 6% of the state's total GHG emissions today.

Consumer Survey: 3000 California Voters.

Voters prefer the use of natural gas for heating and cooking all over the state. Results also demonstrate that voters overwhelmingly oppose any electrification mandate.

- **Voters like gas -- strong majorities choose gas for their home appliances, especially cooking. Nearly 80% of CA voters want gas for their stove tops. Less than 10% of voters would choose an all-electric home.**
- **In terms of cost, nearly 2/3 (62%) of voters believe gas is cheaper than electricity. And, in terms of monthly budgeting, the electric bill is voters' top concern – beating out the cable bill by more than a 2 to 1 margin. Less than 4% have concerns with their gas bill.**
- **2/3 of CA voters oppose eliminating the use of gas, and 2/3 of voters also agree that gas should continue to be a future energy choice to keep "utility bills affordable".**
- **Importantly, 80% of voters oppose prohibiting use of gas appliances, especially if gas could no longer be used for cooking (80%), or if it increases energy bills (80%).**

Natural Gas Pathways of Tomorrow