

Statewide Energy Efficiency Forum

Biomethane @ PG&E

David Lewis

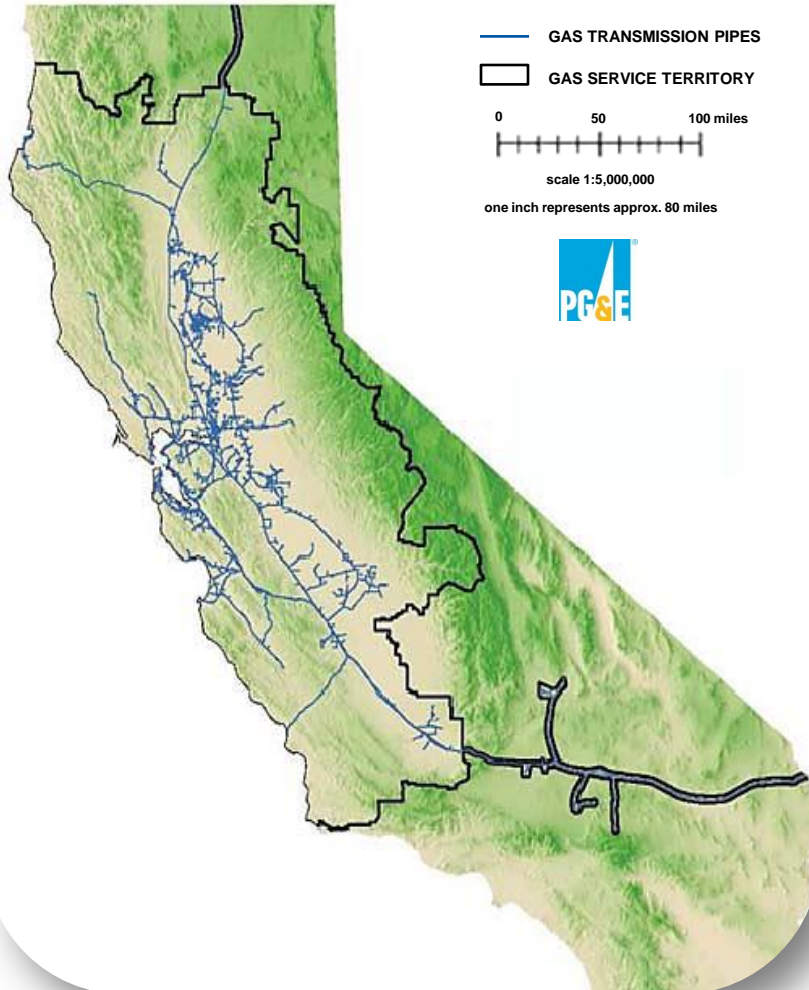
Director – Wholesale Marketing & Business Development
Gas Operations

June 20, 2018



Together, Building
a Better California

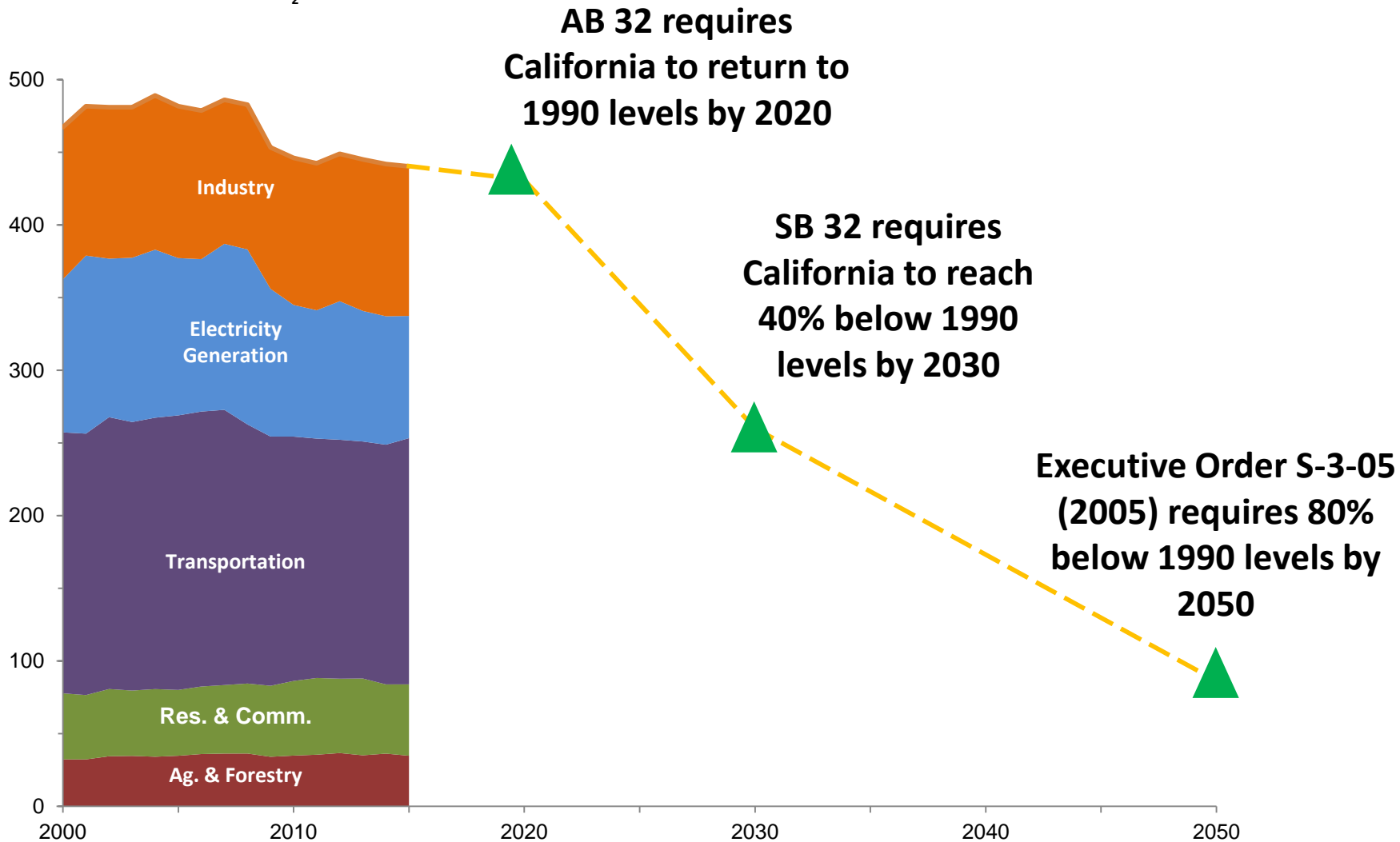
PG&E GAS TRANSMISSION PIPES

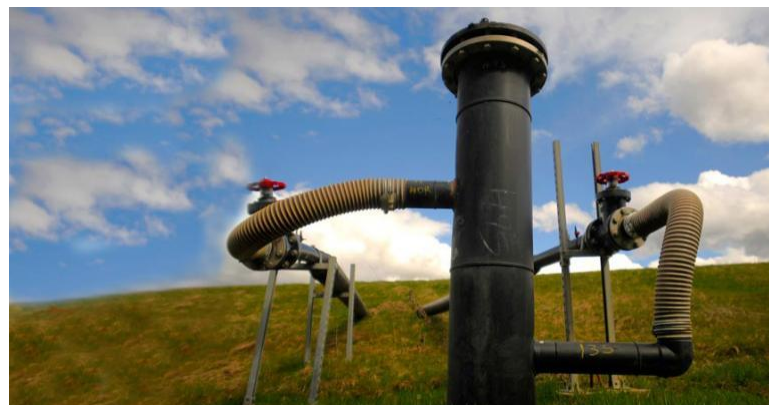


- Serves nearly 16 million people throughout a 70,000 square-mile service area
- Operates approximately 6,700 miles of gas transmission pipeline and ~ 42,800 miles of gas distribution pipeline
- 4.4 million natural gas customer accounts
- Delivers approximately 1 trillion cubic feet (Tcf)/year (2.8 billion cubic feet (Bcf)/day, and 5.0 Bcf/day peak)
- Approximately 105 Bcf of gas storage
- Gas System Operations – Safe and reliable operations of Transmission and Distribution 24x7

California Greenhouse Gas Reduction Goals and Historic Emissions

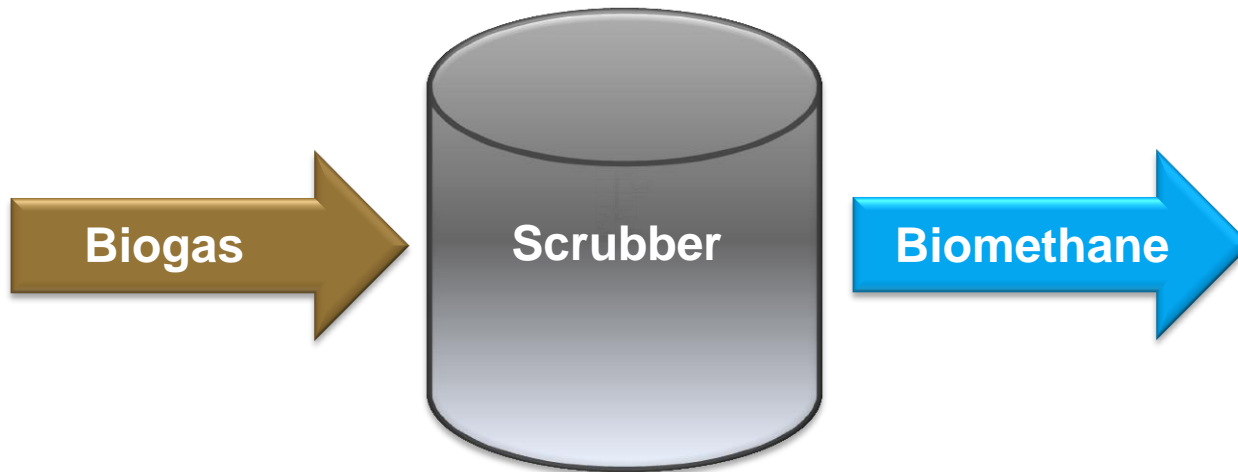
Million metric tons CO₂e





Biogas is not Biomethane

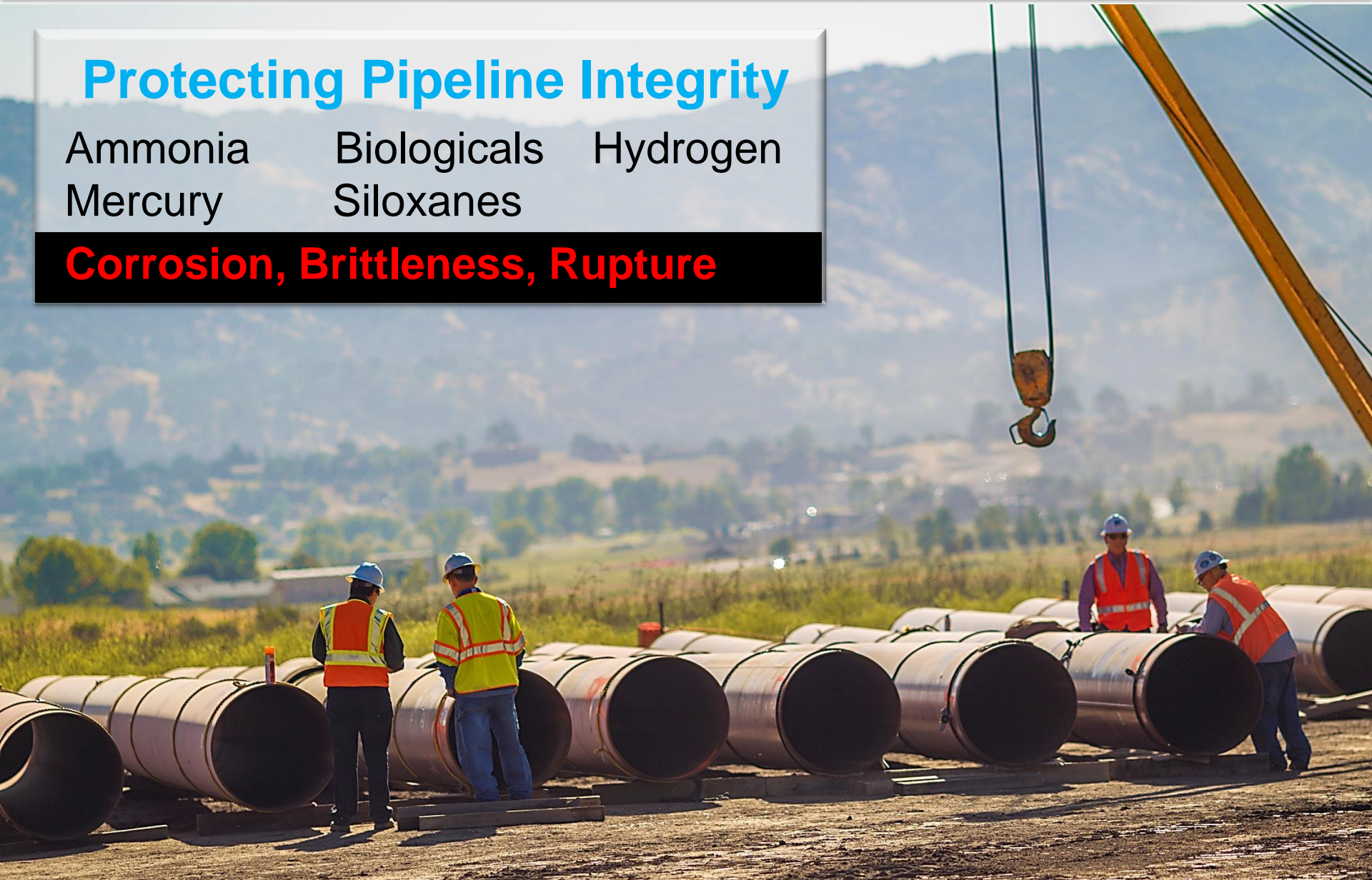
Biogas MUST be treated to meet pipeline quality specifications in PG&E's gas Rule 21 as approved by the CPUC and BEFORE it can be transported through the utility pipeline system



Protecting Pipeline Integrity

Ammonia Biologicals Hydrogen
Mercury Siloxanes

Corrosion, Brittleness, Rupture




Protecting Our Health

- Arsenic
- p-Dichlorobenzene
- n-Nitroso-di-n-propylamine
- Vinyl Chloride
- Antimony
- Copper
- Hydrogen Sulfide
- Lead
- Methacrolein
- Toulene

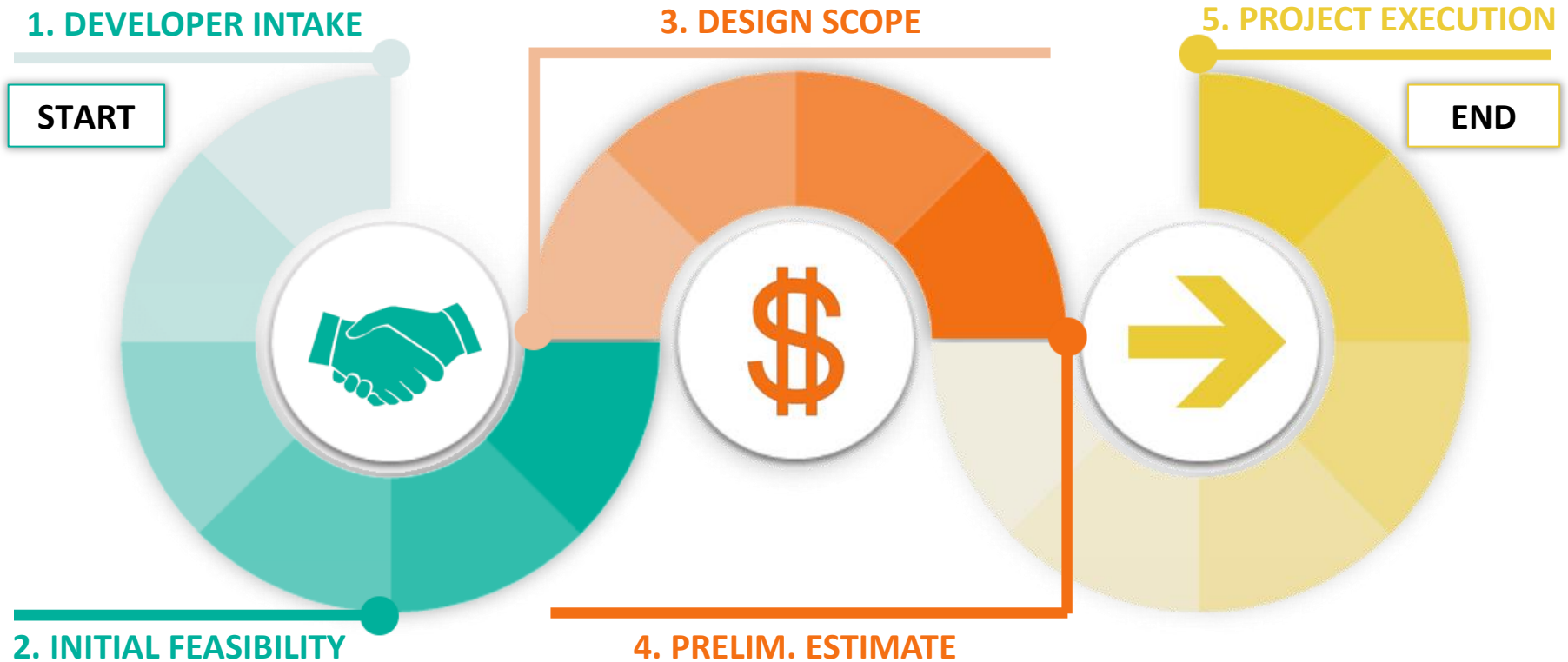
Exposure to Toxins, Cancer



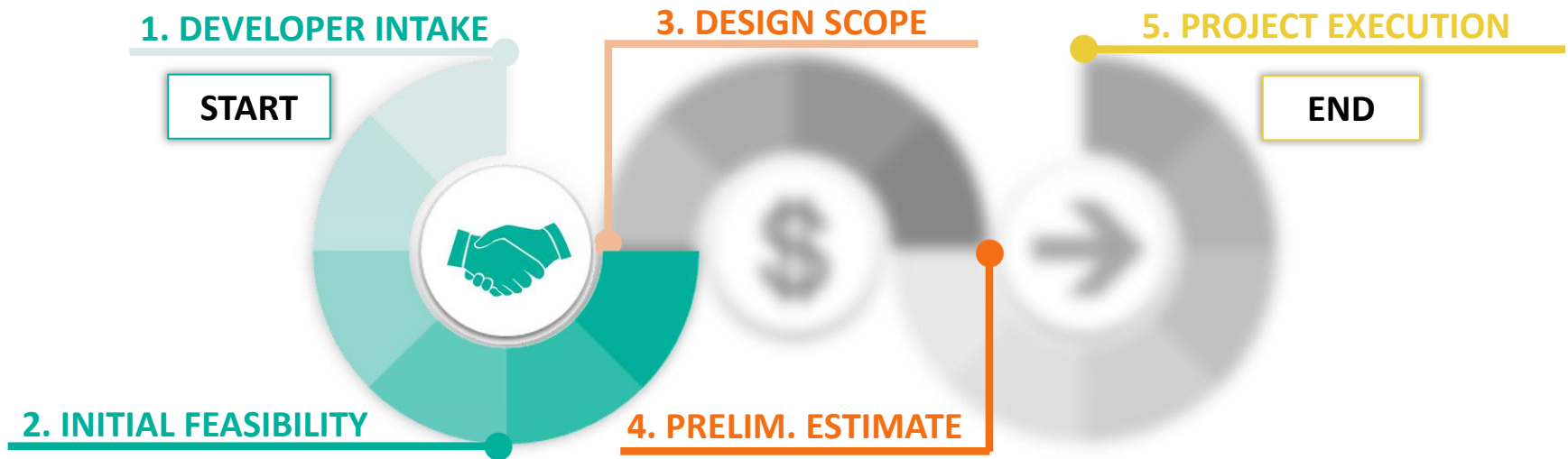


Key Factors	
LOCATION	<ul style="list-style-type: none">• Location of a biomethane plant relative to existing gas lines plus environmental complexities
CAPACITY	<ul style="list-style-type: none">• Whether existing natural gas lines have the capacity to receive biomethane amounts produced by developers.
PRESSURE	<ul style="list-style-type: none">• Pipeline pressure at site of potential injection point.
DEMAND	<ul style="list-style-type: none">• Whether gas demand (volume and load profile) downstream of the point of injection is sufficient to match supply.

Pipeline Interconnection Process



Pipeline Interconnection Process



INITIAL FEASIBILITY STUDY

1. **Developer Intake:** First PG&E contact and project interconnection request form
2. **Initial Feasibility:** System Planning determines injection location

CURRENT TIMEFRAME

~3 Weeks

CURRENT AVERAGE DEVELOPER COST

No cost

Pipeline Interconnection Process



DESIGN SCOPE & PRELIMINARY ESTIMATE

- 3. **Design Scope:** High level site, route, land and permitting assessment
- 4. **Preliminary Estimate:** High level project cost analysis

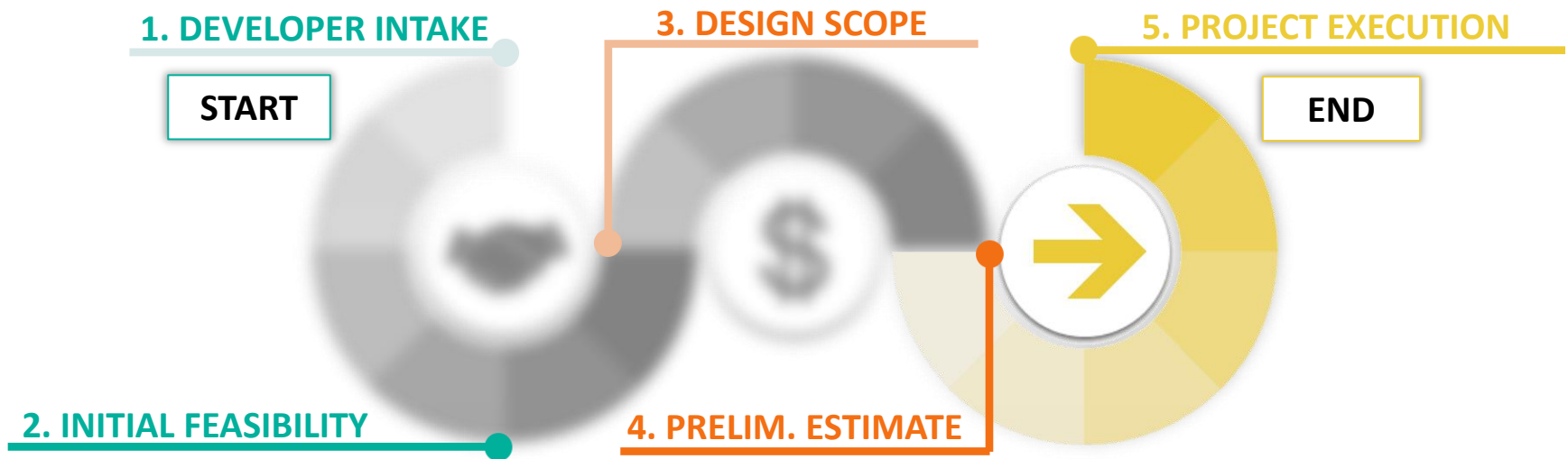
CURRENT TIMEFRAME

~20 Weeks

CURRENT AVERAGE DEVELOPER COST

\$50K

Pipeline Interconnection Process



CONTRACT & EXECUTION

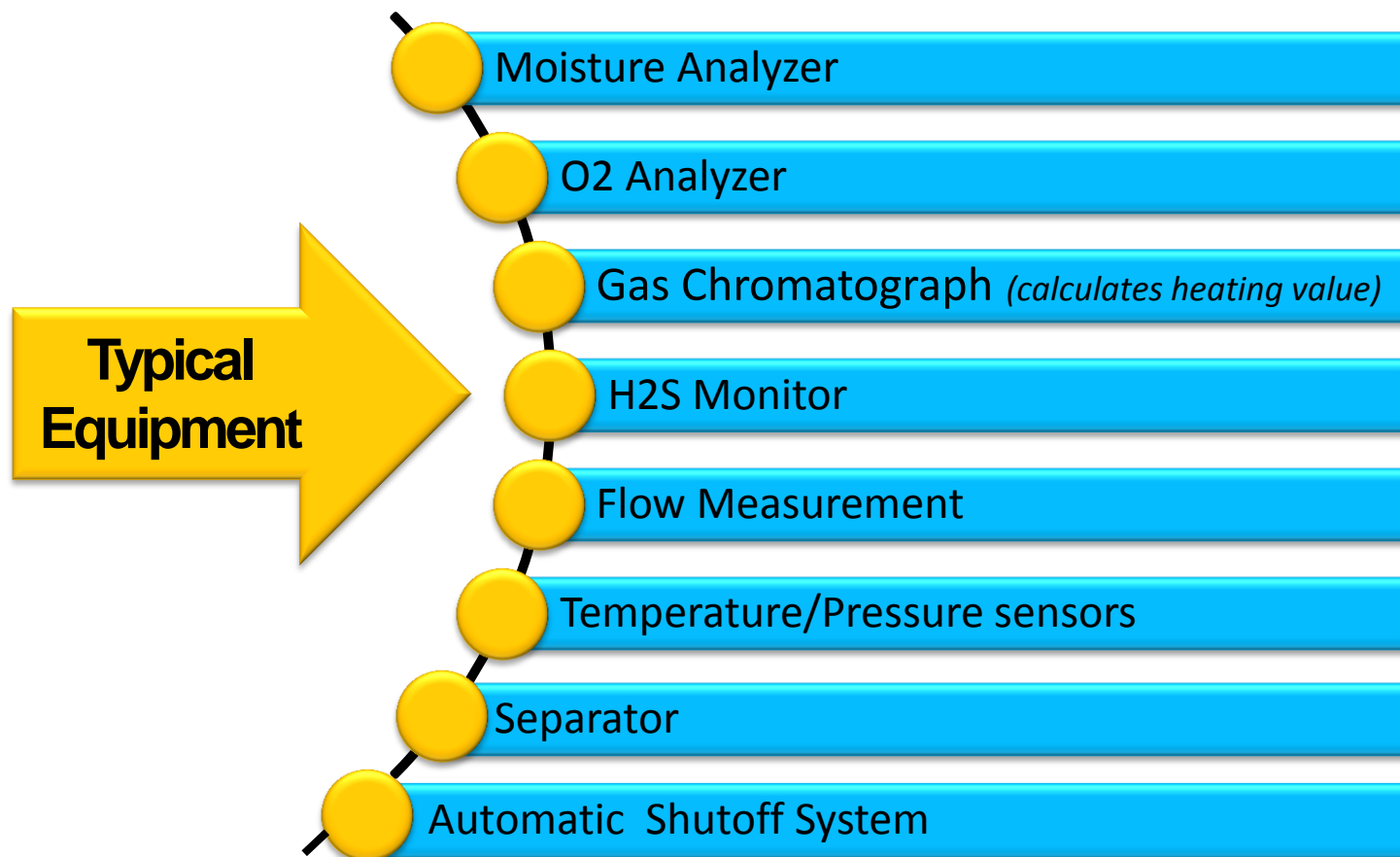
5. Project Execution: Formal project design and construction

CURRENT TIMEFRAME

12-24 Months

CURRENT AVERAGE DEVELOPER COST

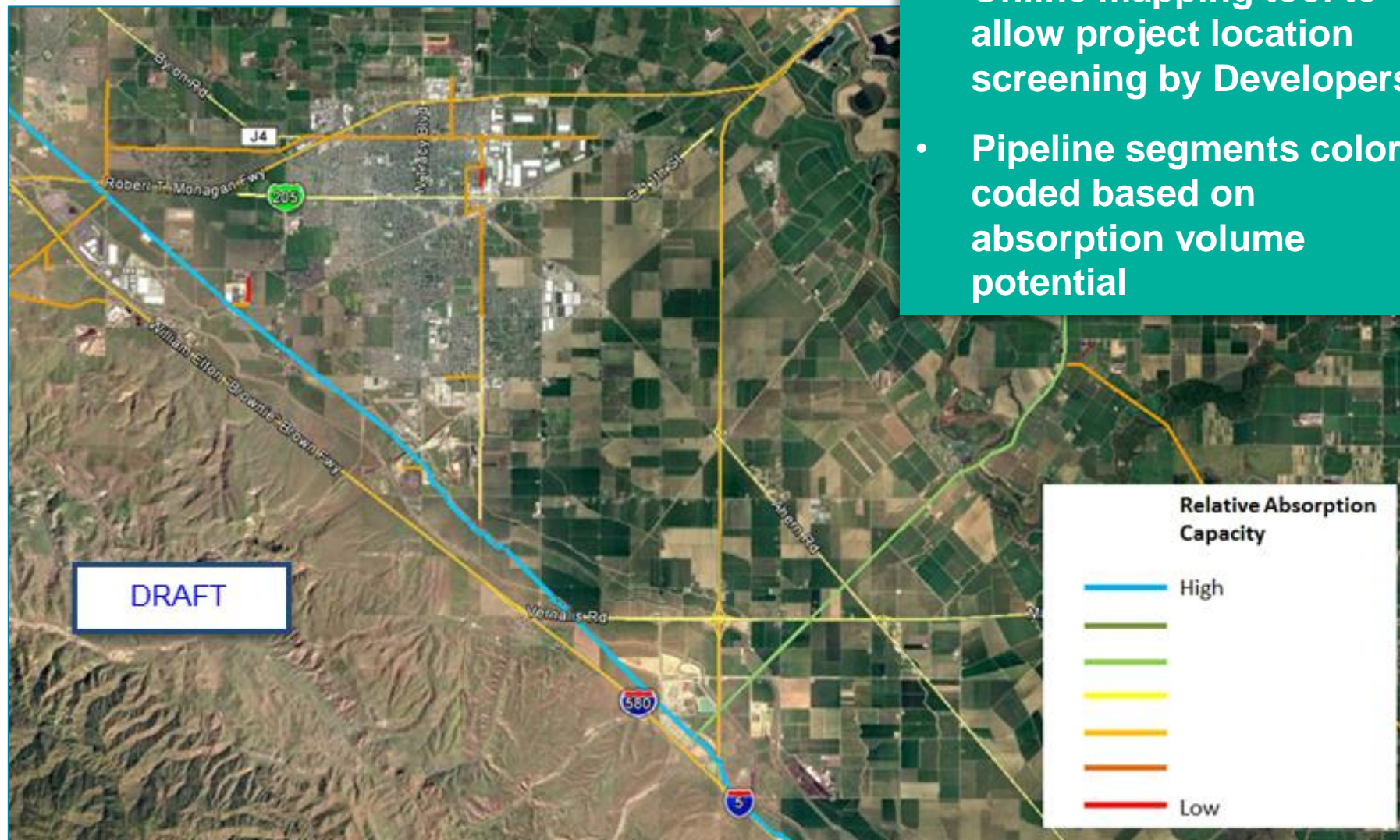
\$2-6M



The source and volume of the gas will dictate exactly what type of monitoring equipment is required

Public Supply Capacity Absorption Map

- Online mapping tool to allow project location screening by Developers
- Pipeline segments color coded based on absorption volume potential



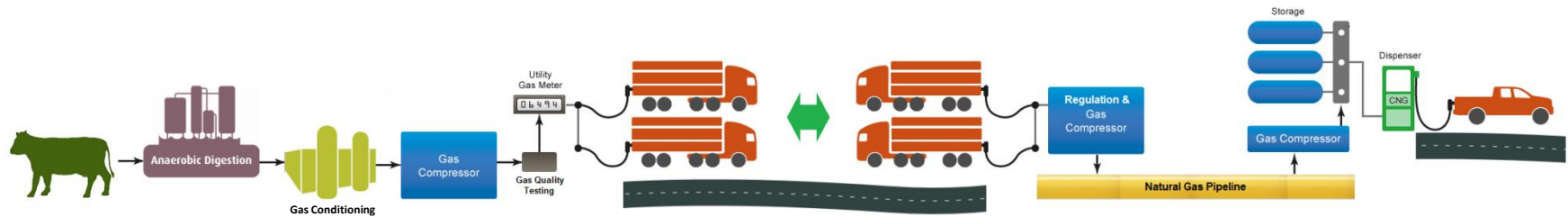
Raw Biogas

Biomethane

BioCNG

Biomethane

BioCNG



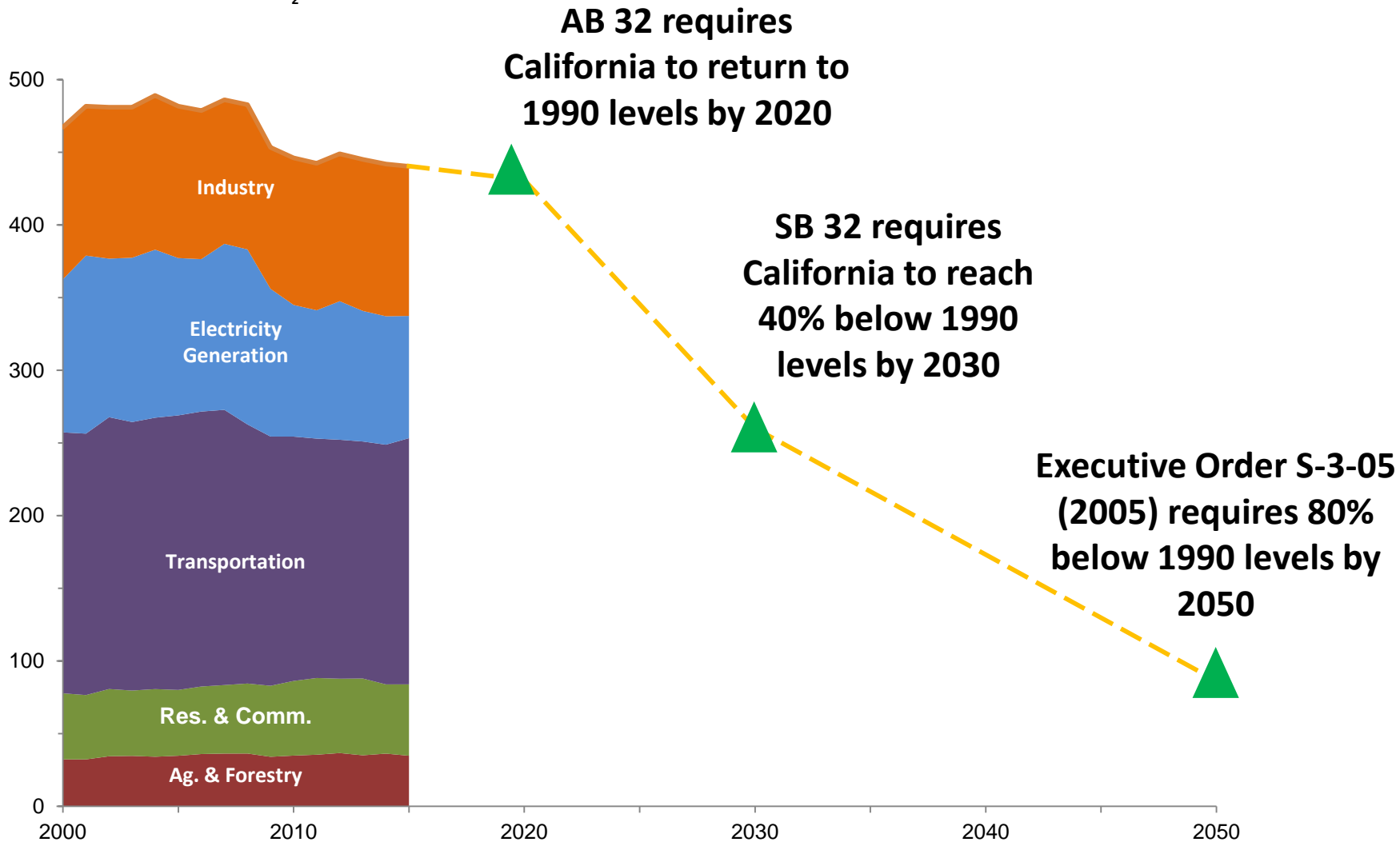
Producer Owns & Operates

PG&E Owns & Operates

PG&E or 3rd
Party
CNG Station

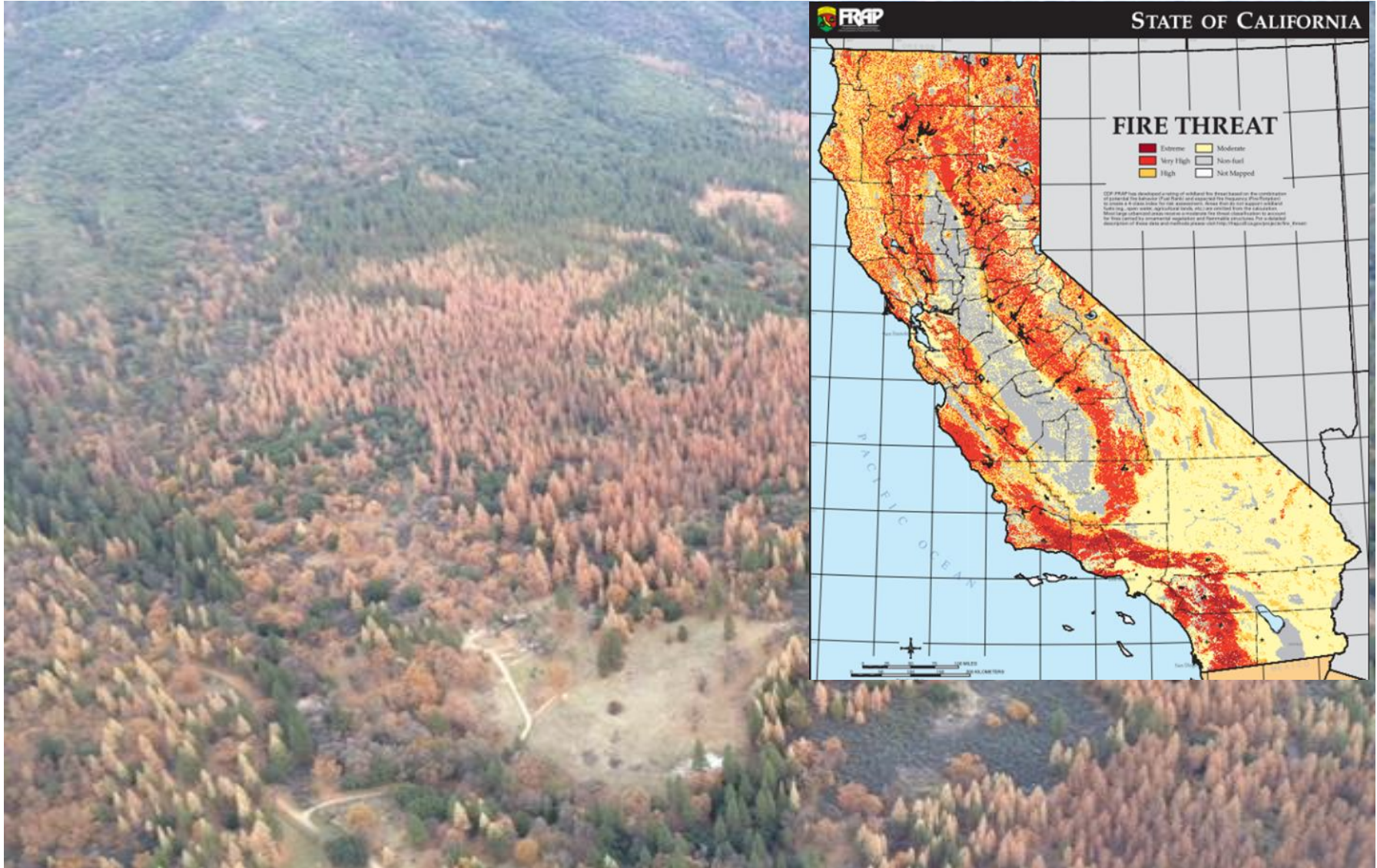
California Greenhouse Gas Reduction Goals and Historic Emissions

Million metric tons CO₂e





- Lower emissions
- Comparable range to diesel
- Proven technology
- Compatible with existing trucks





- Store renewable energy in the form of hydrogen or methane
- Cost effective when electric prices are low – overgeneration
- Enables greater renewable penetration



Contact PG&E

Biomethane information:

pge.com/biomethane

Biomethane Interconnection Questions?

Email: biomethane@pge.com