

ARPA-E WORKSHOP  
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# CHALLENGES OF CREATING IMPACTFUL VALUE FROM CARBON DIOXIDE

FROM CAPTURE TO UTILIZATION : TECHNOLOGY, SCALE-UP, AND EXECUTION

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## CAUTIONARY STATEMENT

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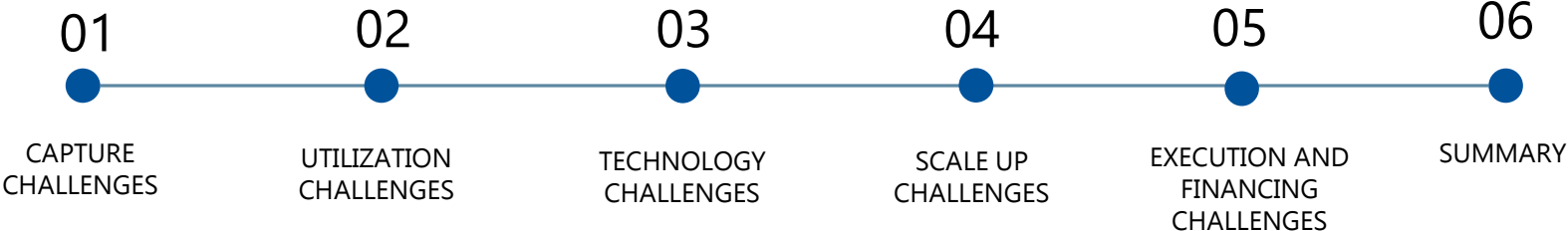


# WHO IS OXY?

- An **international energy company** with assets in the United States, Middle East, Africa and Latin America
- **One of the largest oil producers in the U.S.**, including a leading producer in the Permian and DJ basins, and offshore Gulf of Mexico.
- Our midstream and marketing segment provides flow assurance and **maximizes the value** of our oil and gas
- Our chemical subsidiary OxyChem **manufactures the building blocks** for life-enhancing products
- Our Oxy Low Carbon Ventures subsidiary is **advancing leading-edge technologies and business solutions** that economically grow our business while reducing emissions
- **Committed** to using our **global leadership** in **carbon dioxide management** to advance a lower-carbon world



# AGENDA



# CAPTURE CHALLENGES

- Point Source Capture
  - Long-term commitment of point source emitter
  - Variable feedstock quality
  - Is “net-zero” possible on a point source?
  - Transparent permanence certification of capture/storage/uses
  - Process of transfer of environmental attributes to point source product (no double counting!)
  - Cost of the whole project = capture + transportation + sequestration/utilization
- Technical Solutions to Remove CO<sub>2</sub> out of the Air
  - Direct Air Capture - Solid vs Liquid Sorbents or Batch vs Continuous
  - Transparent permanence certification of removal
  - Permanence - removal to geosphere vs biosphere

# UTILIZATION CHALLENGES

- Where to start?
  - Ask the question, who is willing to pay and why?
  - Be wary of the mentality, “If we build it, they will come.”
- Size of the prize?
  - Where are carbon-based products used today? Where is there CO2 being emitted?
    - Power/electricity
    - Industrial
    - Transportation
    - Products
- 4R’s – Reduce, Reuse, Recycle, Remove

# TECHNOLOGY CHALLENGES

- There are many solutions
- Overall economics should be the primary driver
- Understand the whole process and how your solution fits
- Everything looks good on paper
- Learn by doing (Wright's Law primer)

# SCALE-UP CHALLENGES

- Scale up is not trivial
- The purpose of a pilot plant
- New team members should be added over time to add diversity of experience and expertise
- Perspectives on electrochemical systems



# EXECUTION AND FINANCING CHALLENGES

- Project management
  - Recognize that unless you have been part of a commercial-scale, multi-million/billion dollar, multi-year/decade project, you are at a disadvantage at executing a project at scale
  - “On-time and on-budget” is the goal (Note: it goes without saying no safety or environmental impacts)
  - Disciplined project management is to set the scope and not change even with new learnings from your lab/pilot
- Financing hurdles and risks
  - Derisking demand chain (off-take/revenue)
  - Derisking supply chain (raw materials/energy/equipment)
    - Unique challenges of point source capture projects
  - Backstopping/guaranteeing the technology (and balance sheet behind it)
  - Backstopping/guaranteeing the project execution (and the balance sheet behind it)
  - Nothing is “free” and nothing should be taken for granted

# SUMMARY

- It is not a trivial exercise to create impactful value from carbon dioxide
- It can be done, but it takes a diverse team, with diverse perspectives and experiences, to minimize waste, cost, and time



**LEAD WITH PASSION • OUTPERFORM EXPECTATIONS  
DELIVER RESULTS RESPONSIBLY • UNLEASH OPPORTUNITIES • COMMIT TO GOOD**

