

# Navigating uncertainty in a low carbon world

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# | Chemical industry market analysis

- Abundant, advantaged feedstock
- Good technology, efficient assets
- Logistics and supply chains
- Access to global markets
  
- And the new competitive concern:
  - Carbon intensity--

# | Sustainability in Petrochemical Production

- A number of approaches to becoming “greener” and more bio-based.
- Newer technologies for direct production of downstream products. Many companies taking a mass-balance approach to production of downstream derivatives from “bio-certified” or “recycled” feedstocks.
- Renewable energy and carbon sequestration.
- These do not necessarily mean zero emissions, need to be careful of greenwashing.

# How to reduce CO<sub>2</sub> emissions from ethylene production – *two paths being pursued*

## New technology

- Electrifying ethylene furnaces,
  - Potential to reduce emissions by as much as 50%
  - Three groups
    - Borealis, BP; Total; Versalis; Repsol
    - BASF & Sabic in collaboration with Linde
    - Dow & Shell
  - Issue - reliable sourcing renewable electricity
- Making ethylene directly from CO<sub>2</sub>
- Using new catalytic routes to ethylene
  - Shell/Linde working on ethane oxidative dehydrogenation
  - EcoCatalytic is developing another oxidative process involving looping of a metal oxygen donor.

## Reduce CO<sub>2</sub> emissions from current assets

- Revamp steam cracker – offset CO<sub>2</sub> emissions via “mass balance accounting across site”
  - Ineos announce new range of “offsetting” projects at Grangemouth
  - Dow announces new project in Canada (nuclear power?)
- New routes to ethylene that apply catalysis or chemical looping to conventional ethane feedstock

**But commercial processes, experts say, aren't likely to appear until the end of the decade.**

# | Challenges to sustainability initiatives

- Scale
  - Feedstock availability
  - Underdeveloped supply chains
- Passing through higher costs to customers
- Lack of accepted industry standards for measuring CO<sub>2e</sub>.
- Cost disadvantage vis a vis non-compliant competitors.
- Uncertain (or lack of) consistent government regulations.
- Decarbonization constrains net capacity increases
  - rationalization
  - Delays in new investment decisions

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# | Pannel Session and Interactive Audience Q&A

- Chuck Venezia, SVP, Chemicals (Moderator)
- Sarah Rae, VP, Olefins and Derivatives
- Craig Barry, Lead Consultant, Ethylene & Derivatives, Americas
- Alan Williamson (title)



# Thank you

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