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Alternative Jet Fuels

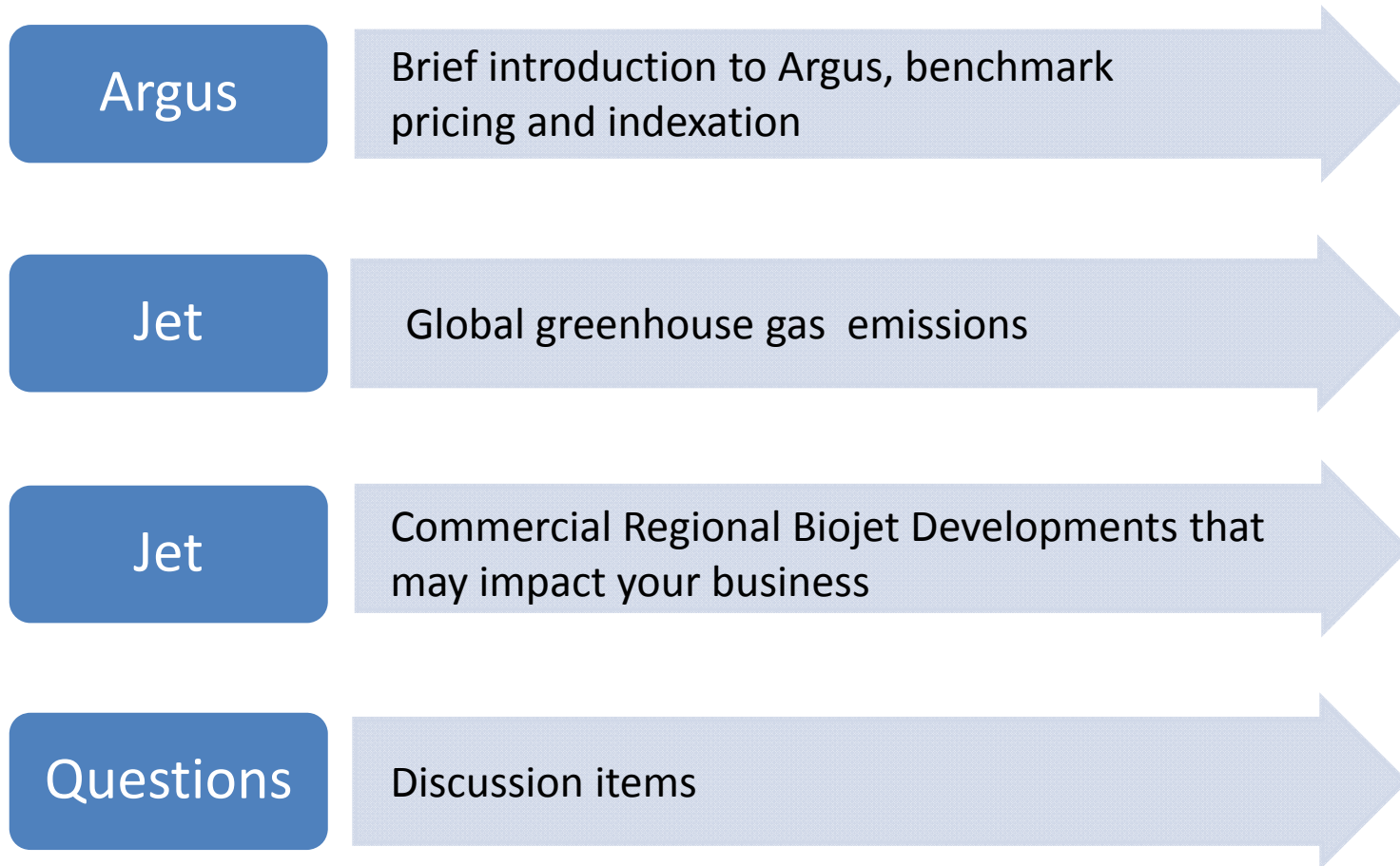
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Market Reporting
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illuminating the markets

Presentation overview



Argus Media: global, market-focused, independent

- World's largest independently held energy and commodity PRA – 700 staff, 19 global offices
- Publish > 8,000 daily commodity price assessments + energy market intelligence
- Benchmarking examples
 - US refined products
 - Global crude oil and condensate
 - Air and coal
- Recent acquisitions
 - MetalPrices.com, MetalPages (Metals)
 - DeWitt, JJ&A (Petrochemicals)
 - FMB (Fertilizers)
- Organic coverage expansions
 - US Natural Gas
 - Base Oils/ Waxes
- Services
 - Price reporting and indexation
 - Consulting
 - Conferences



European Markets

European Market

- Intra-EU aviation emissions now included in EU emissions trading scheme (ETS)
- Self-reporting of GHG emissions to ensure compliance by airlines
- IATA agreement now expected in 2017 for 2020 implementation
- Agreement will require airlines to offset emissions - This is **different** from a cap-and trade scheme like the EU ETS where overall emissions are capped.
- IATA is pushing for multiple offset options to be available, meaning that UN credits, voluntary carbon standards (VCS) credits, and REDD+ forestry credits could all be eligible.
- These credits currently range from around \$0.50/ credit to \$5/credit depending on their type.

US Proposal

US Proposal

- The US is moving towards regulating emissions from its domestic aviation by 2018.
- June 2015 - EPA issued a proposed “endangerment finding” linking GHG from aviation to climate change.
- Proposal to regulate aviation emissions by adopting standards being developed in international talks.
- Not applicable to military jets or smaller turboprop aircraft
- 11% of GHG emissions from the domestic transportation sector
- 29% of global aircraft emissions
- The endangerment finding is a foundation under the Clean Air Act for issuing regulations for the sector.
- 2009 – EPA set similar regulations for passenger vehicles

US Proposal (cont.)

- EPA to follow the International Civil Aviation Organization (ICAO).
- ICAO is due to issue a standard by February 2016.
- The endangerment finding would be finalized in early 2016
- Regulation ruling expected in 2016
- Implementation in 2018

A nighttime photograph of a city skyline reflected in a body of water. A prominent glowing blue line, resembling a fiber optic cable or a light trail, curves across the water from the bottom left towards the center right. The city lights are visible in the background, including a large dome and several skyscrapers. The sky is a deep blue.

Biojet Projects – What matters in your business

| illuminating the markets

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Biojet Projects

Several pilot projects in Europe that heavily rely on third-party (government) funding

- IAG - BA
- Total
- Neste

- Euglena and its applications

Biojet - Pilot projects in European Market

IAG - BA

- British Airways to open biofuel plant at Coryton – former 180kbd mineral oil refinery
- BA and Solena to operate plant in Thames Estuary
- Due to open in 2015 and be operational in 2017.
- 575,000 tonnes of waste converted to:
 - 50,000t of sustainable low carbon jet fuel,
 - 50,000t of biodiesel, bionaphtha and renewable power.
- BA has committed to buying the 50,000t of jet fuel a year produced at the plant for the next 11 years “at market competitive prices”.
- British Airways also injected capital for the construction of the site.

Biojet - Pilot projects in European Market

Total

- October 2014 - Total purchased part of US feedstock development company NexSteppe.
- The company is already marketing bio jet fuel in the Americas
- December 2014 - 3-year partnership with US firm Amyris.
- Construction of 200,000 t/yr second-generation biodiesel and biokerosene unit at Dunkirk called BioTfuel.
- Construction of the pilot facility will be completed in 2016.
- Convert forest residue feedstock to biofuels.
- Total is targeting a 2020 start date for the final stage of the €180mn (\$242mn) project.
- Collaboration with several partners:
 - Europe's biggest biodiesel producer, Sofiproteol
 - Germany's ThyssenKrupp
 - French company Axens
 - French petroleum institute IFP.

Biojet - Pilot projects in European Market

Neste-Lufthansa

- Test project on biojet concluded in 2012
- The biojet was said to have performed “excellently” in terms of fuel quality, performance and storability.
- It was used on 1,187 test flights between Hamburg and Frankfurt and on a single long-haul flight between Frankfurt and Washington, DC.
- Neste Oil can produce biojet at its 190,000 t/yr NExBTL plant in Finland
- 800,000 t/yr plants in Rotterdam and Singapore.
- Neste's biojet fuel is currently being produced in Porvoo, Finland.

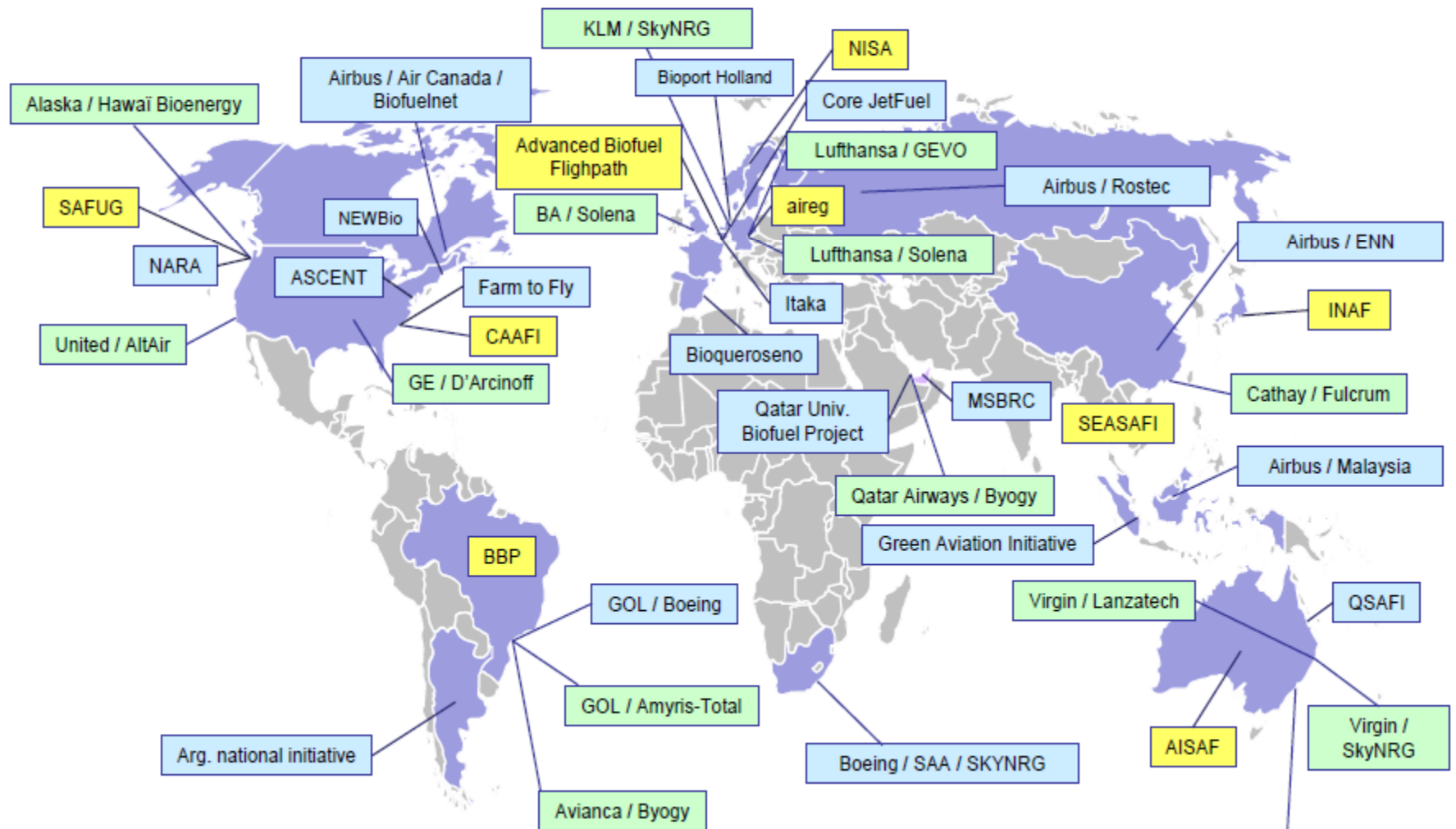
Biojet - Pilot projects in the global Market

Euglena

- Produce algal oil that can be refined into kerosene
- 15x higher yield of fuel than from palm oil
- Euglena consume CO2 in the production of oil
- Laboratory-based technology at this stage
- CO2 capture also useful in other applications, such as power generation
- Company founded in 2005 to grow Euglena as a food source



Global Initiatives



Outlook & Summary

- Sustainable alternative fuels are important for reducing aviation emissions
- There has been significant progress in developing these fuels
- Government support is critical
- Regional differences will exist based on differing government mandates
- Europe and the Americas are further along in steps to commercial development



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Questions?

A nighttime photograph of the London skyline across the River Thames. The city lights are reflected in the water. A bright, glowing blue line starts from the bottom left and curves across the water towards the right. The text is overlaid on the left side of the image.

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