Technology Innovation Outlook for Advanced Liquid Biofuels

Bioenergy 2016:
Mobilizing the Bioeconomy through Innovation
Innovative Approaches and Materials for Clean Energy
Washington, DC
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Introduction to IRENA

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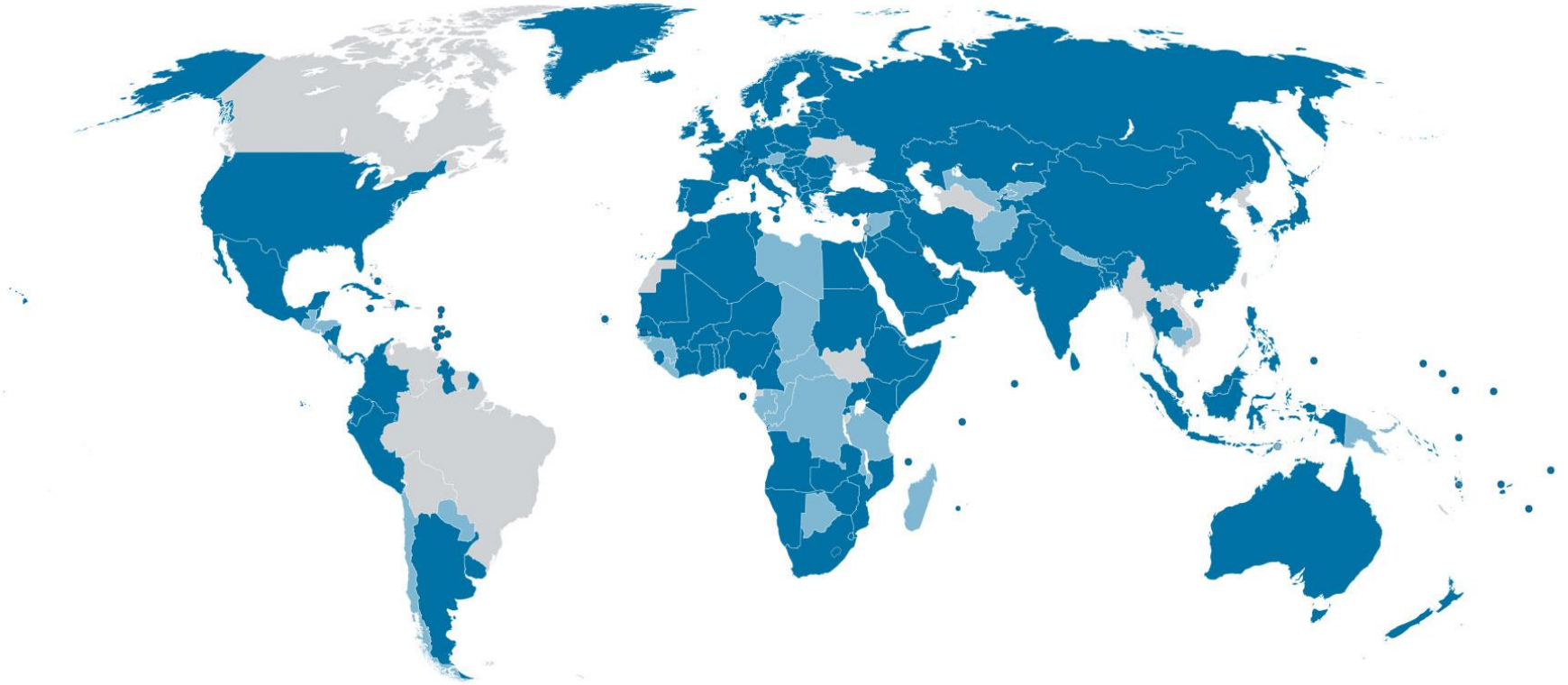
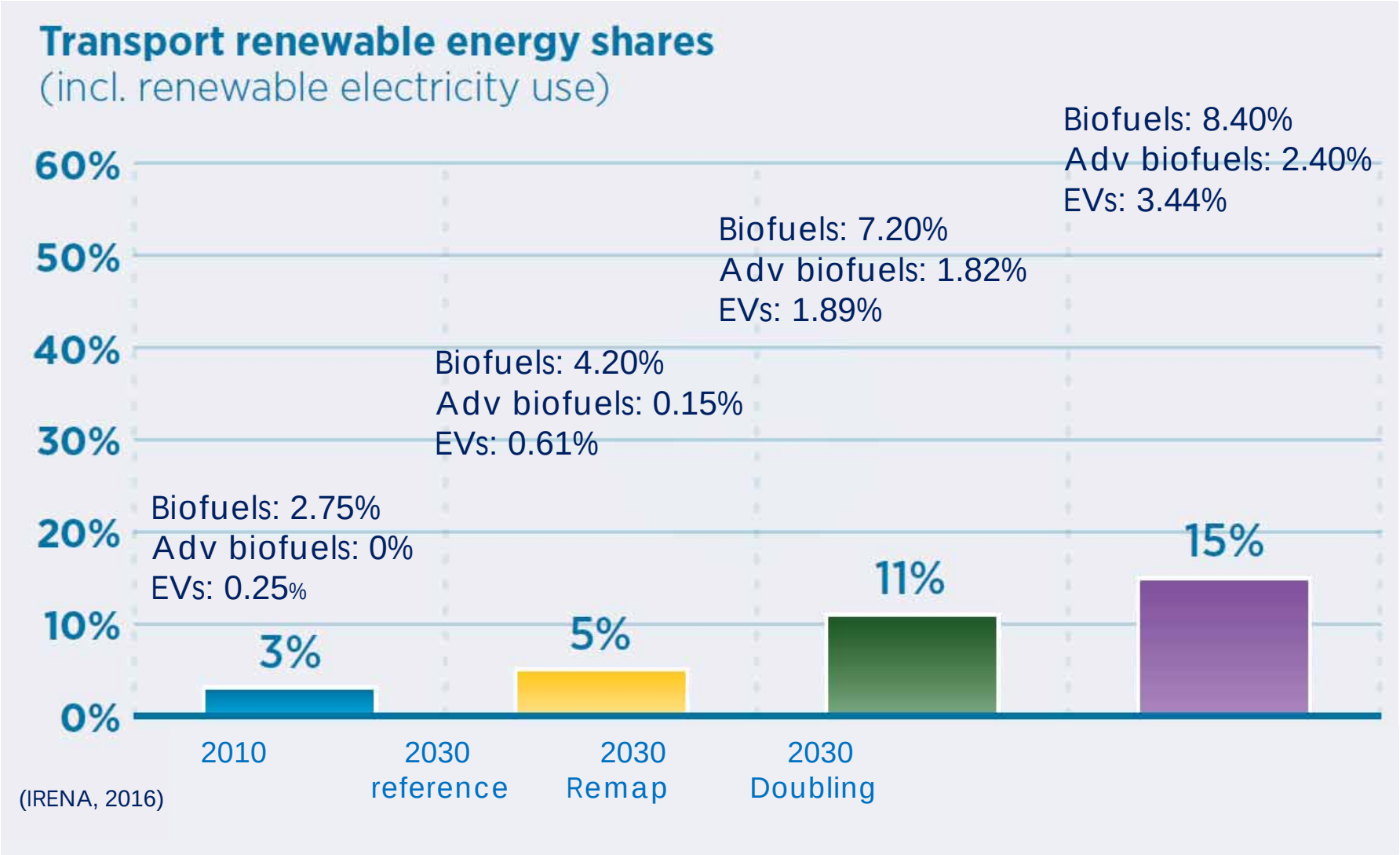
International Renewable Energy Agency



- The Intergovernmental Organisation focused on renewable energy
- 148 members countries (including EU) and 28 in process of accession

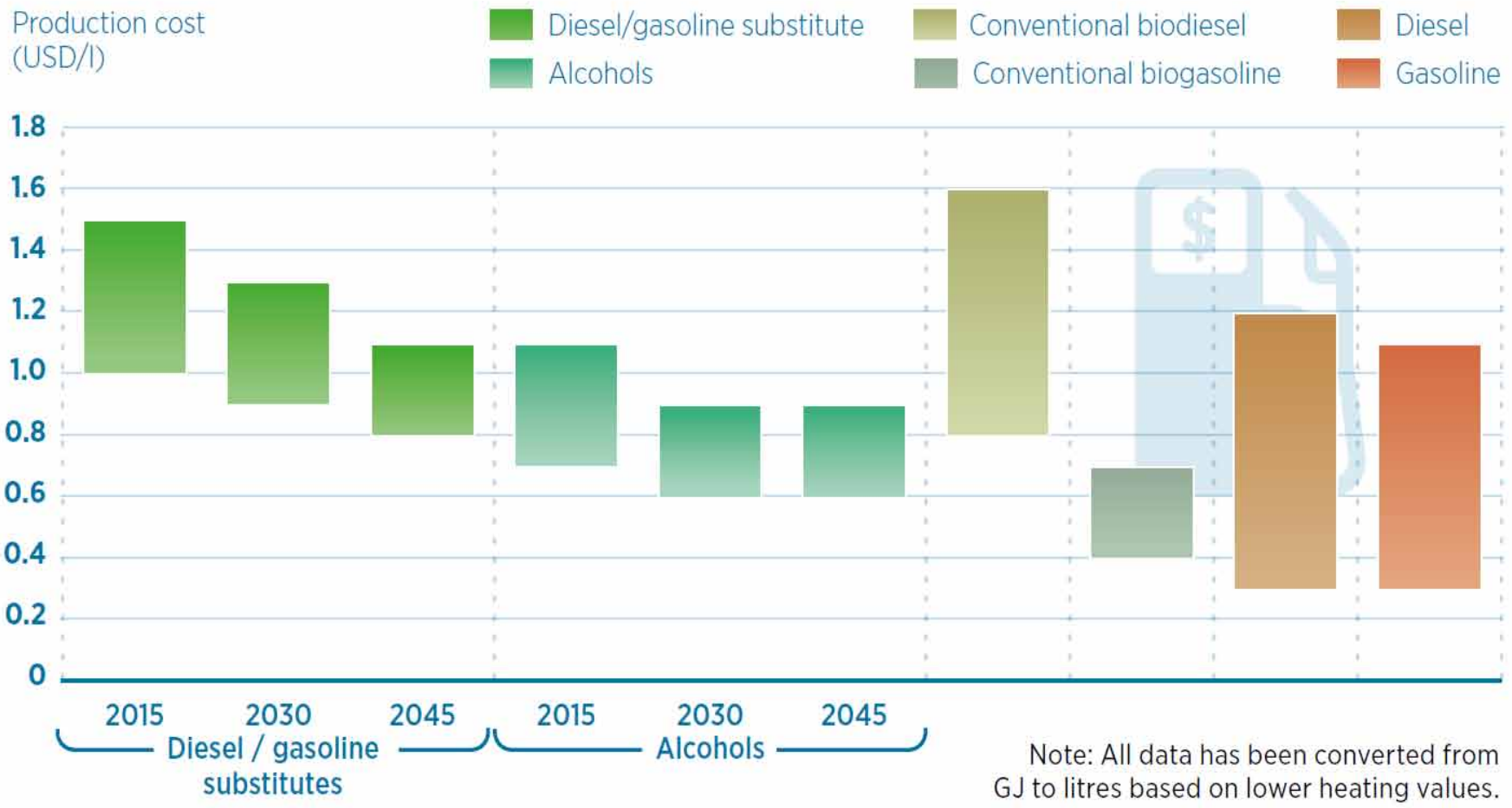
The Case for Advanced Biofuels



Advanced biofuels broaden sustainable feedstock options.

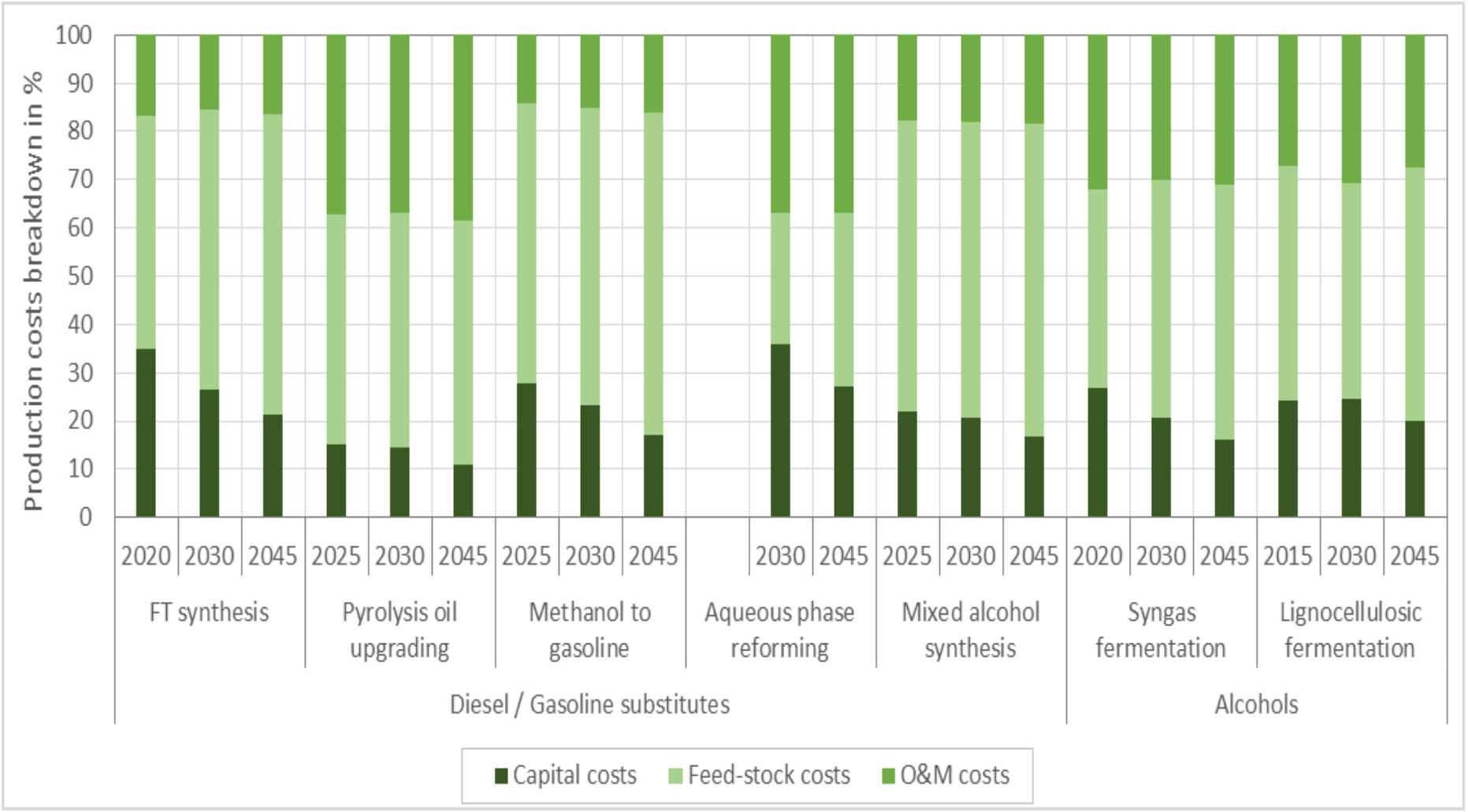
Economic potential

- Advanced biofuels cannot compete with oil prices below $80 per barrel

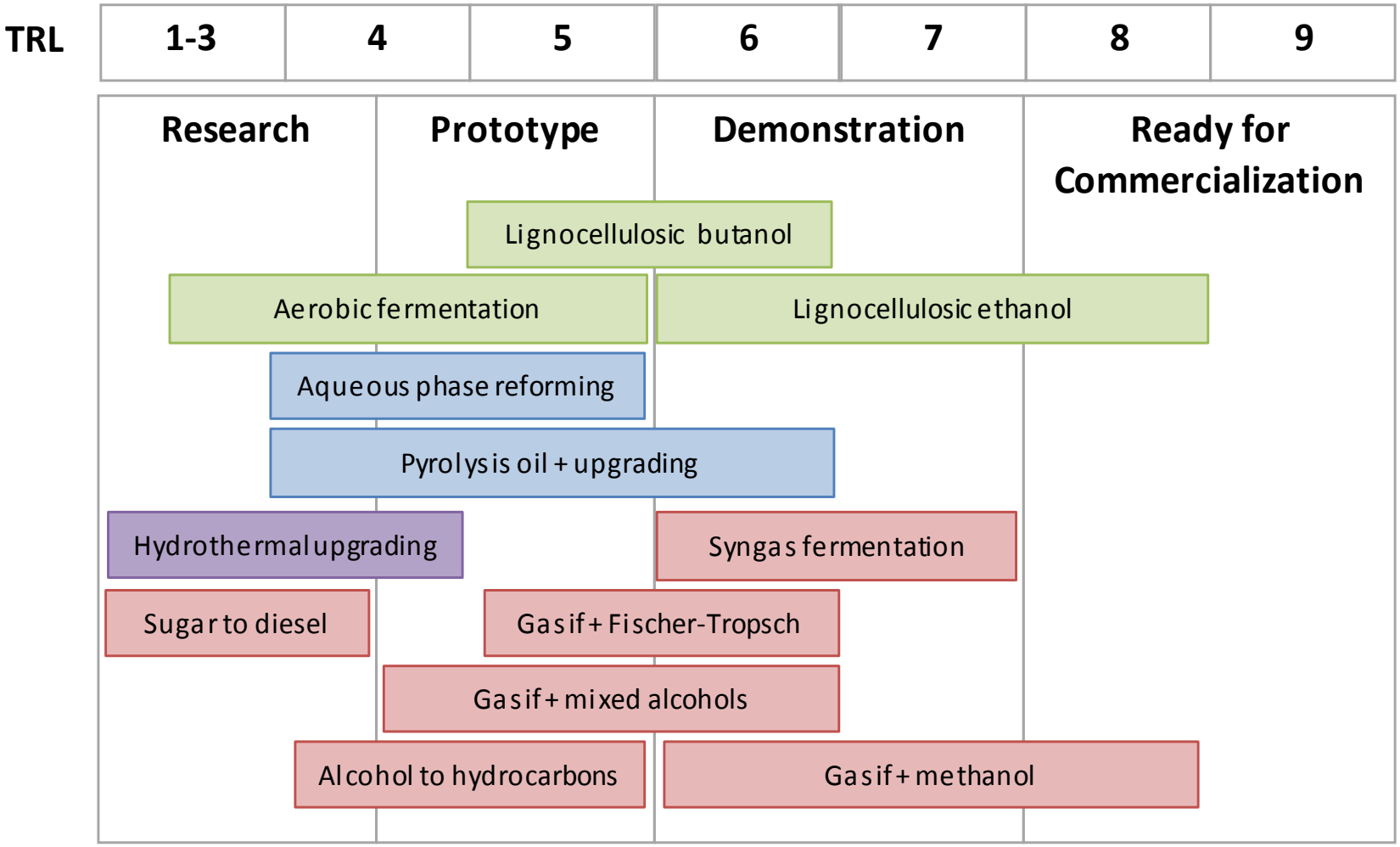


Feedstock cost is key

- Feedstock cost represents 40% to 70 % of production cost



Advanced biofuels pathways



Fermentation

Status: Depends on Feedstock

- Fermentation plants using *agricultural residues* or energy crops are at an *early commercial* phase
- Fermentation plants using *woody biomass* are still at an early *demonstration* stage.
- Fermentation of ethanol from *municipal solid waste* is still under *development*

Ongoing R&D Approaches

- *Integrating the hydrolysis and fermentation* processes could reduce production costs by as much as 80%.
- *In-situ removal of butanol*, with *membrane separation* instead of distillation, can reduce energy use by half. (Principle of ButaNext project.)

Fermentation: Dupont Nevada (114ML/y)

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Gasification

Status: Technology Demonstration

- Gasification can use a *variety of feedstocks.*
- Gasification with *catalytic synthesis*: many demonstration projects using *forestry residues*
- Gasification followed by *syngas fermentation to ethanol* is being demonstrated, nearly commercial.

Ongoing R&D Objectives

- Gasification still needs to prove *reliable long-term operation with feedstock contaminants*
- Alter-NRG is working on *enhanced pre-treatment and ash removal* using plasma gasification or torches
- Process optimisation is also needed to achieve *target syngas composition with sufficient hydrogen content.*

Gasification: Enerkem Alberta (38 ML/y)

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Pyrolysis

Status

- Can use a *changing mix of feedstocks* over time.
- *Agricultural residues, wood residues and wastes* have all been used in *pilot and demonstration plants*

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Ongoing R&D Focus

- More effective *catalytic upgrading* processes needed.
- Petrobras and Ensyn have demonstrated the *co-cracking of refinery-ready pyrolysis oil*

Pyrolysis: Ensyn, Renfew, Ontario (12 ML/y)

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Investment Stagnating

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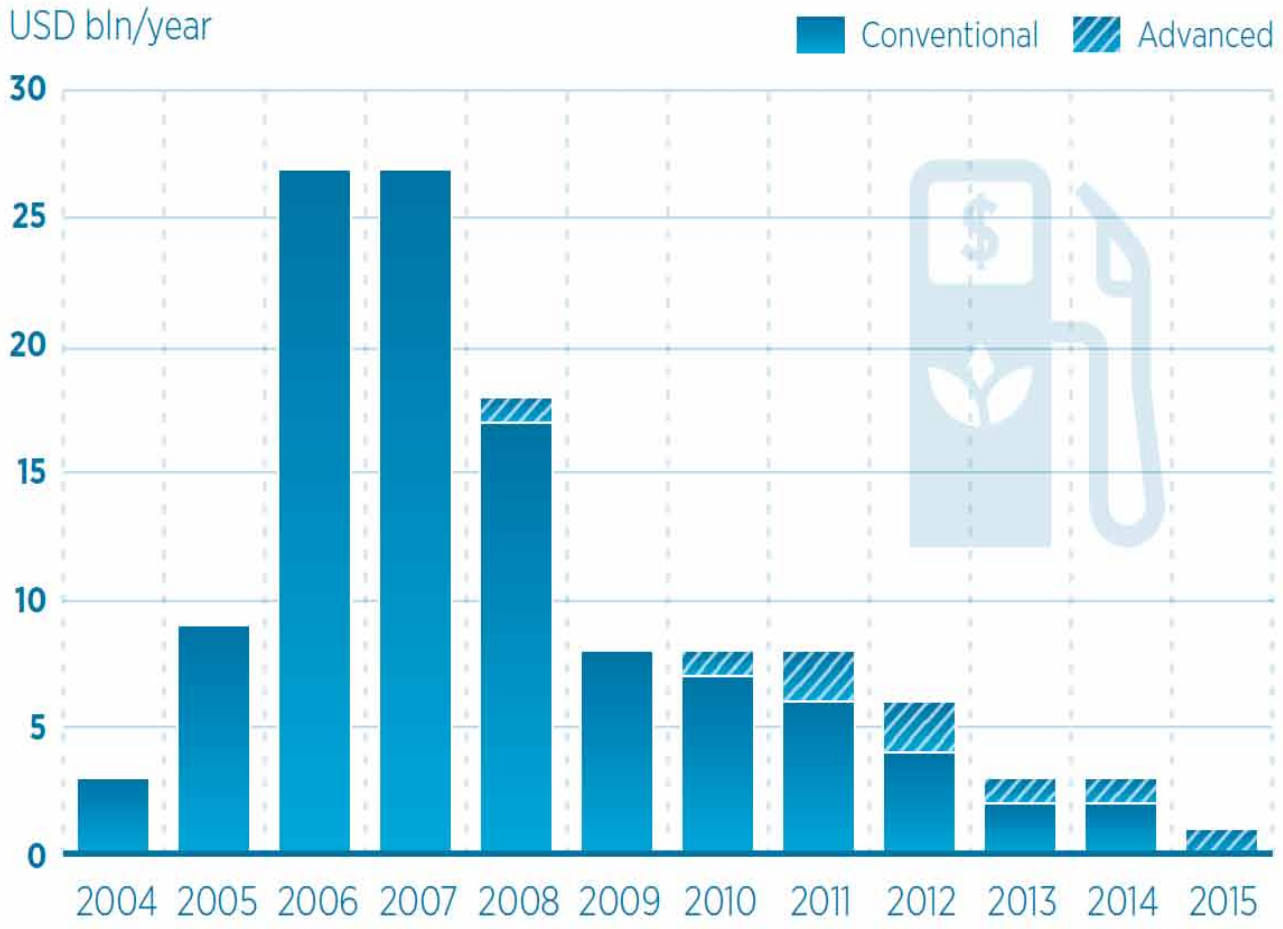
Liquid biofuel investments have dried up in recent years.

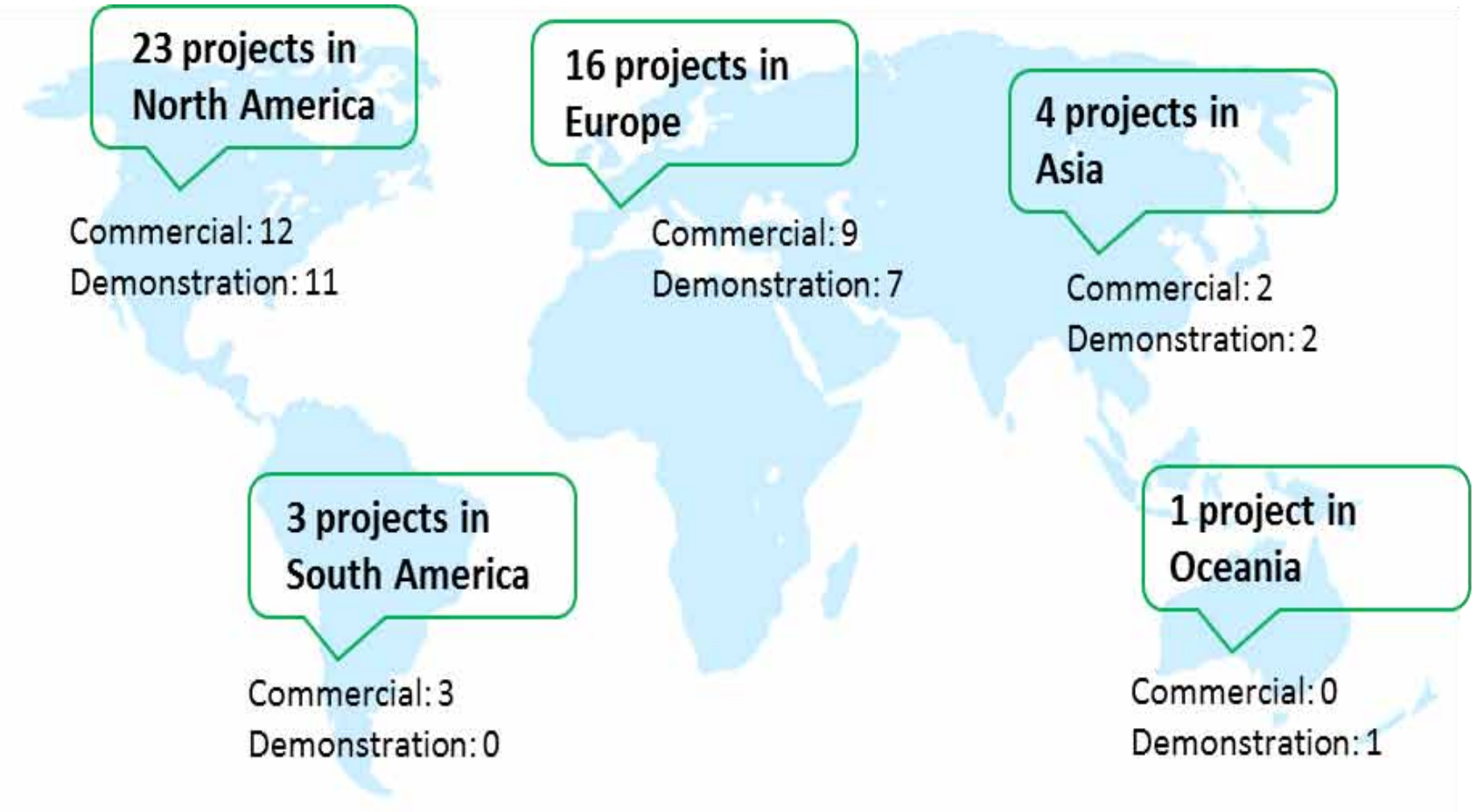


IRENA analysis based on BNEF (2015)

investments have stagnated with lower oil prices and weakened policy support

Current implementation activity

- Present: 1 billion l/year production capacity
- Actual production -> ???
- Efforts centralized in Europe and North America



Needed areas of focus

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TECHNOLOGY DEVELOPMENT
- Support for first of a kind commercial-scale pilot plants
- Risk mitigation for other early pilot plants: getting to the Nth.

MARKET FORMATION
- Bio-refineries
- Policy incentives, targets or mandates
- Internalisation of carbon cost
- Public procurement
- Niche markets

ENTERPRISE FORMATION
- Support start-ups
- Strategic partnerships
- Sharing successful business models
- Harness potential socio-economic benefits

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Thank you very much for your attention

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