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The role of different carbon accounting methods for alternative fuels

Dr Pu Shuyi

Research Fellow

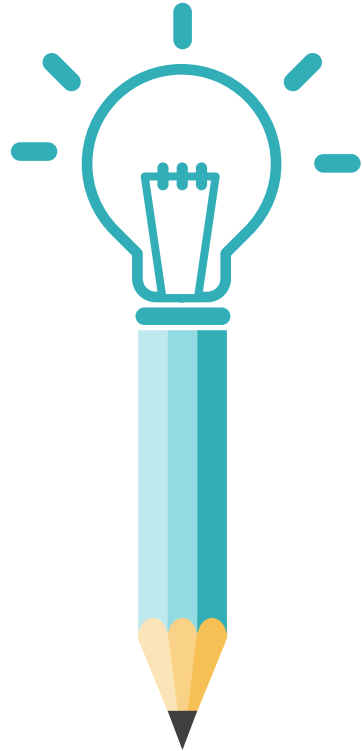
Maritime Energy & Sustainable
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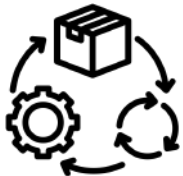
- Introduction
- Three carbon accounting methods- LCA, ISCC & IPCC
- Differences between the methods
- Case study – Bio-methanol
- Moving forward

Introduction - carbon accounting methods



Various carbon accounting methods/standards/guidelines

- **Product / service / project level**
 - GHG protocol (Product/project) / ISCC / REDII / PAS 2050 / ISO 14040/44/33/24/25/21/67 / ILCD / BPX 3-323
- **Organisational level**
 - GHG Protocol (Scope 1,2,3) / ISO 14064 / DEFRA
- **National level**
 - IPCC



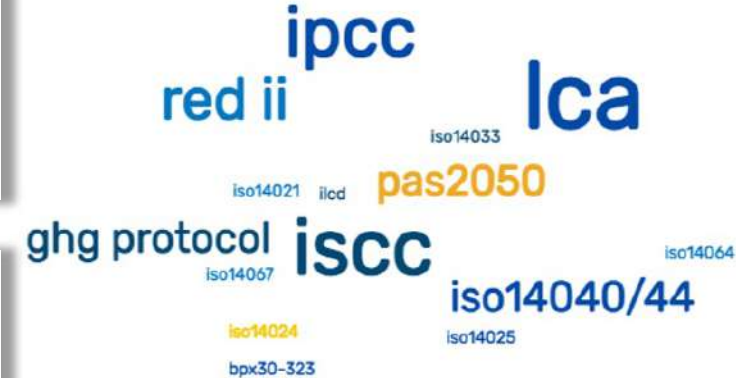
Many follow a life cycle approach

- From acquisition of raw materials to production, distribution, use, recycle and end-of-life



Most relevant ones for the use of alternative fuels

- LCA (Life Cycle Assessment) – ISO 14040/44
- ISCC (International Sustainability & Carbon Certification)
- IPCC (Intergovernmental Panel on Climate Change)



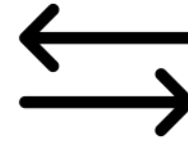
LCA - Life Cycle Assessment



For the use of alternative fuels for shipping

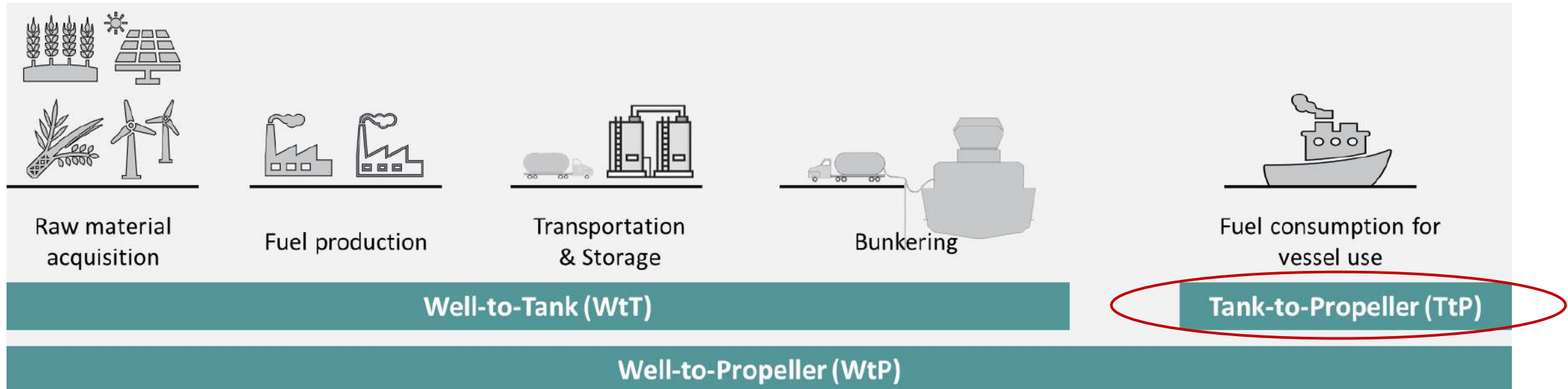
From raw material acquisition to fuel production, distribution and end-use by a vessel.

- Well-to-Tank | Tank-to-Propeller | Well-to-Propeller



Avoid unwanted “shifting of burden”

The environmental impact is reduced at one stage but increased at another stage in the life cycle



LCA – Environmental Impact

Two levels of assessment

Midpoint

- Climate change
- Acidification
- Ozone depletion
- Human toxicity
- Eutrophication
- Marine ecotoxicity
- Etc.



Endpoint

- Human health
- Ecosystem quality
- Resources



ISCC - International Sustainability & Carbon Certification System



A certification process

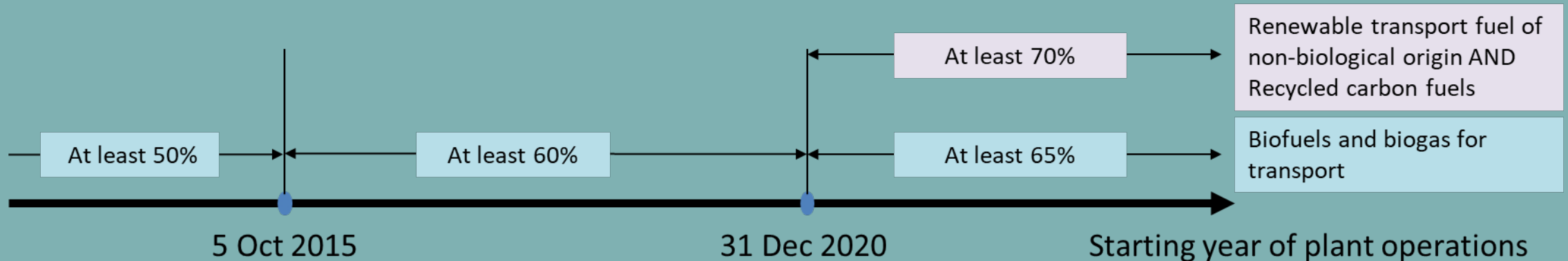
Compliance with the recast European Renewable Energy Directive (RED II) requirements for sustainable bio-related fuels.



ISCC GHG Calculation

Calculate emission savings (in %) of bio-related fuels, compared with fossil fuels

ISCC adopts GHG emission savings requirement in RED II*



* Subject to changes based on future revisions to the EU Renewable Energy Directive

Things to Take Note



GHG Data

- Default values
- Actual values
- Combination of both



Wastes/Residues as Raw Materials

ZERO
emissions for such raw
material extraction



Tank to Propeller Emissions

ZERO
emissions for biofuel
combustion for transport

IPCC – Intergovernmental Panel on Climate Change

2006 IPCC guidelines for national GHG inventories

- Guidelines for estimating national anthropogenic GHG emissions
- GHG within national territory and offshore areas where the country has jurisdiction
- 2013 Wetlands Supplement and 2019 refinement

Tier 1 Calculation - Basic

Use default emission factors provided by IPCC

Tier 2 Calculation - Intermediate

Use country-specific emission factors

Tier 3 Calculation - The most demanding

Require detailed emission measurement and activity data at an individual plant level

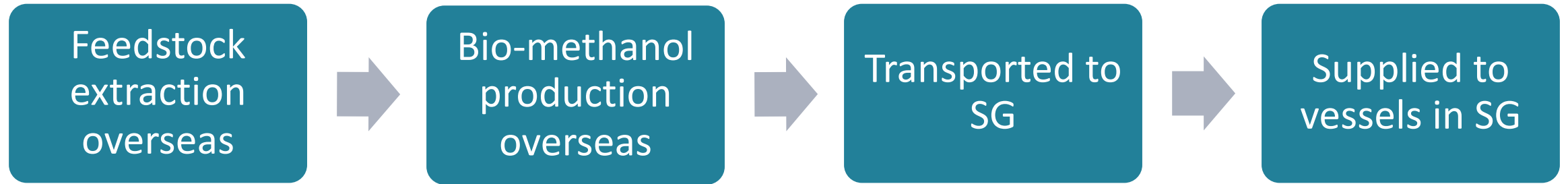
Differences between Different Carbon Accounting Methods

	LCA	ISCC	IPCC
Goals	Defined by users	GHG emission savings - biofuels, bioliquids and biomass fuels	National GHG inventories
Impact categories	Climate change, acidification, eutrophication, etc.	Climate change only	Climate change only
Emissions	GHG and non-GHG (e.g., heavy metals & PM2.5)	GHG only;	GHG only;
GHG from biofuel combustion	CO ₂ – Excluded / included CH ₄ and N ₂ O – Included	Zero	CO ₂ – Excluded CH ₄ and N ₂ O – Included
Emission factors (EF)	Actual values (Site-specific)	Default EF	Default or country-specific EF
Capital goods [#]	Generally included	Excluded	Excluded from the manufacture of fuels
Comparability	Not necessarily comparable with other LCA results due to different scopes and methods used	Comparable with other ISCC results	Comparable between countries
Validity	No expiry date, but may be updated for new technologies/processes	One year	A calendar year

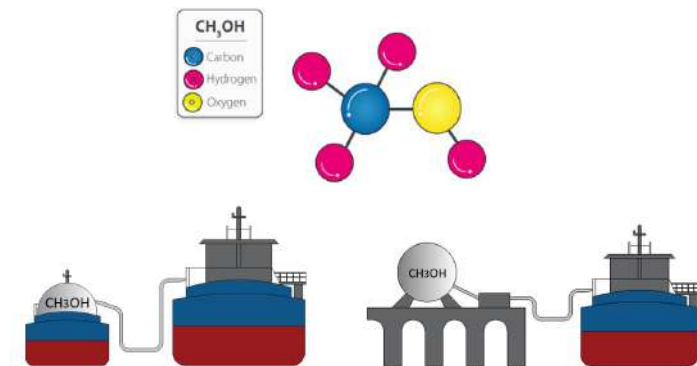
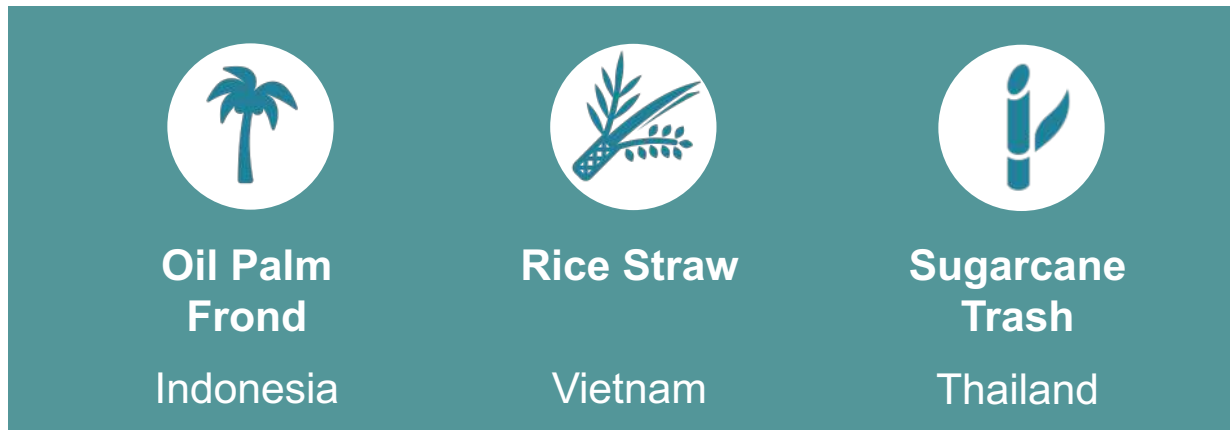
[#]Capital goods: Manufacturing or construction of goods that are fixed assets for an entity, such as buildings, trucks and machines.

Source: MESD

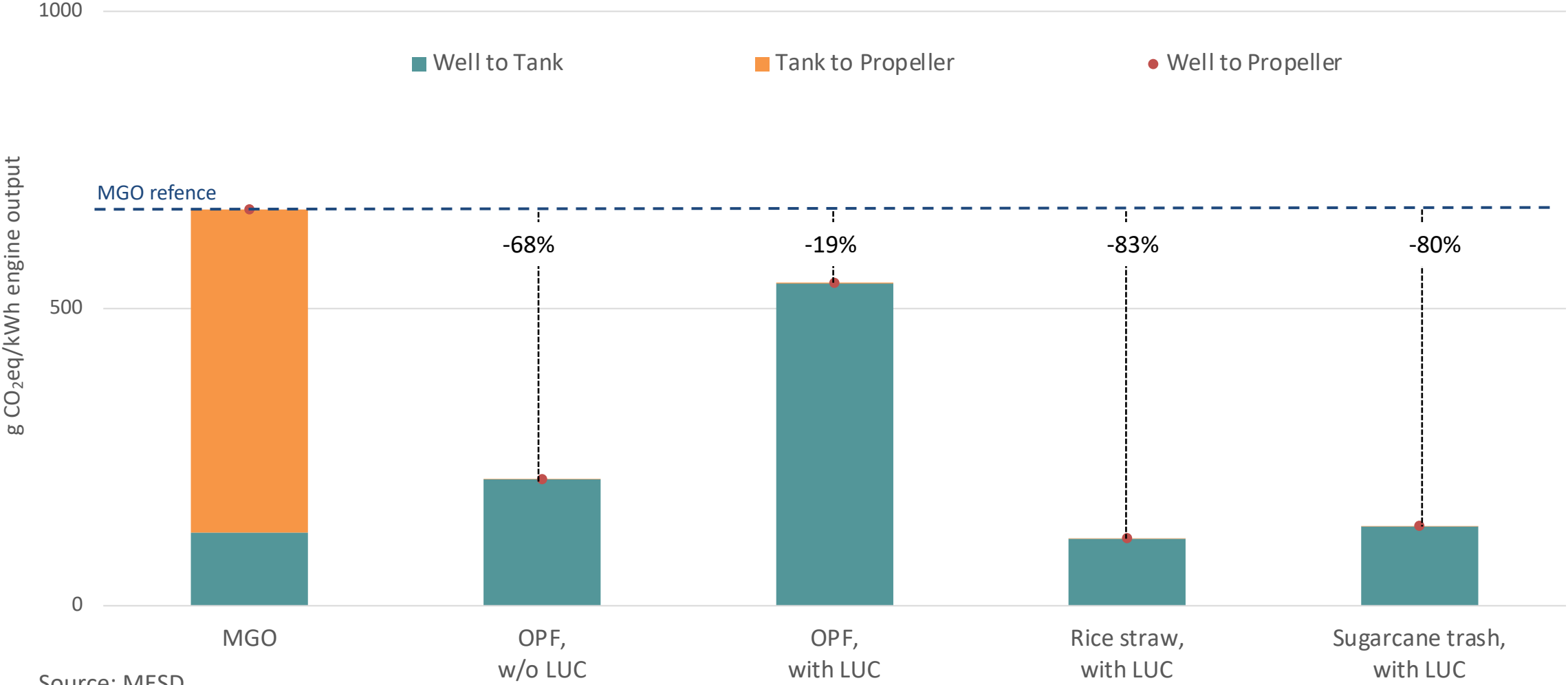
Case Study – Bio-methanol



Bio-methanol Feedstocks



Case study – Bio-methanol LCA Analysis

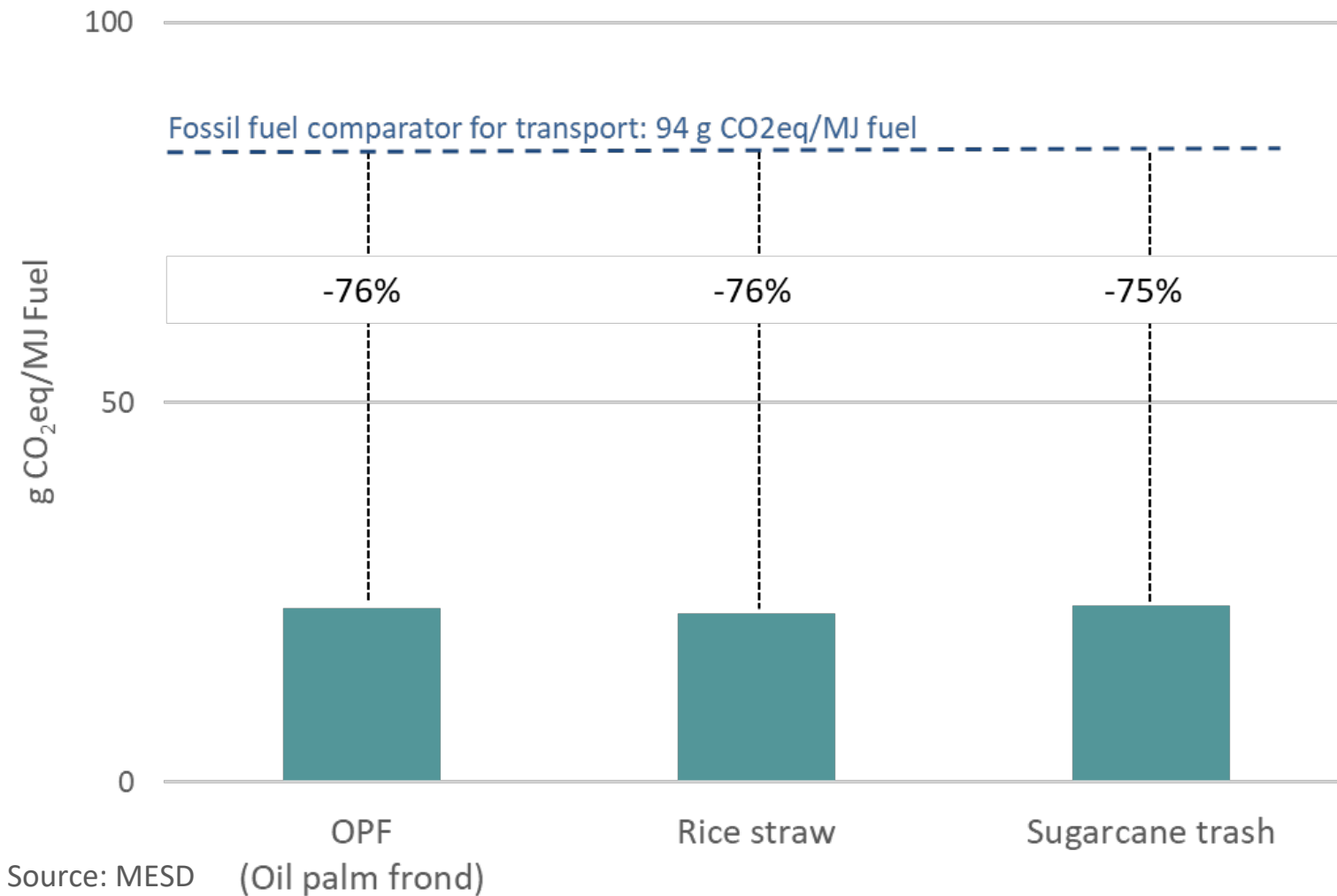


Source: MESD

OPF: Oil Palm Frond
LUC: Land Use Change

Bio-methanol from different feedstocks in Southeast Asia

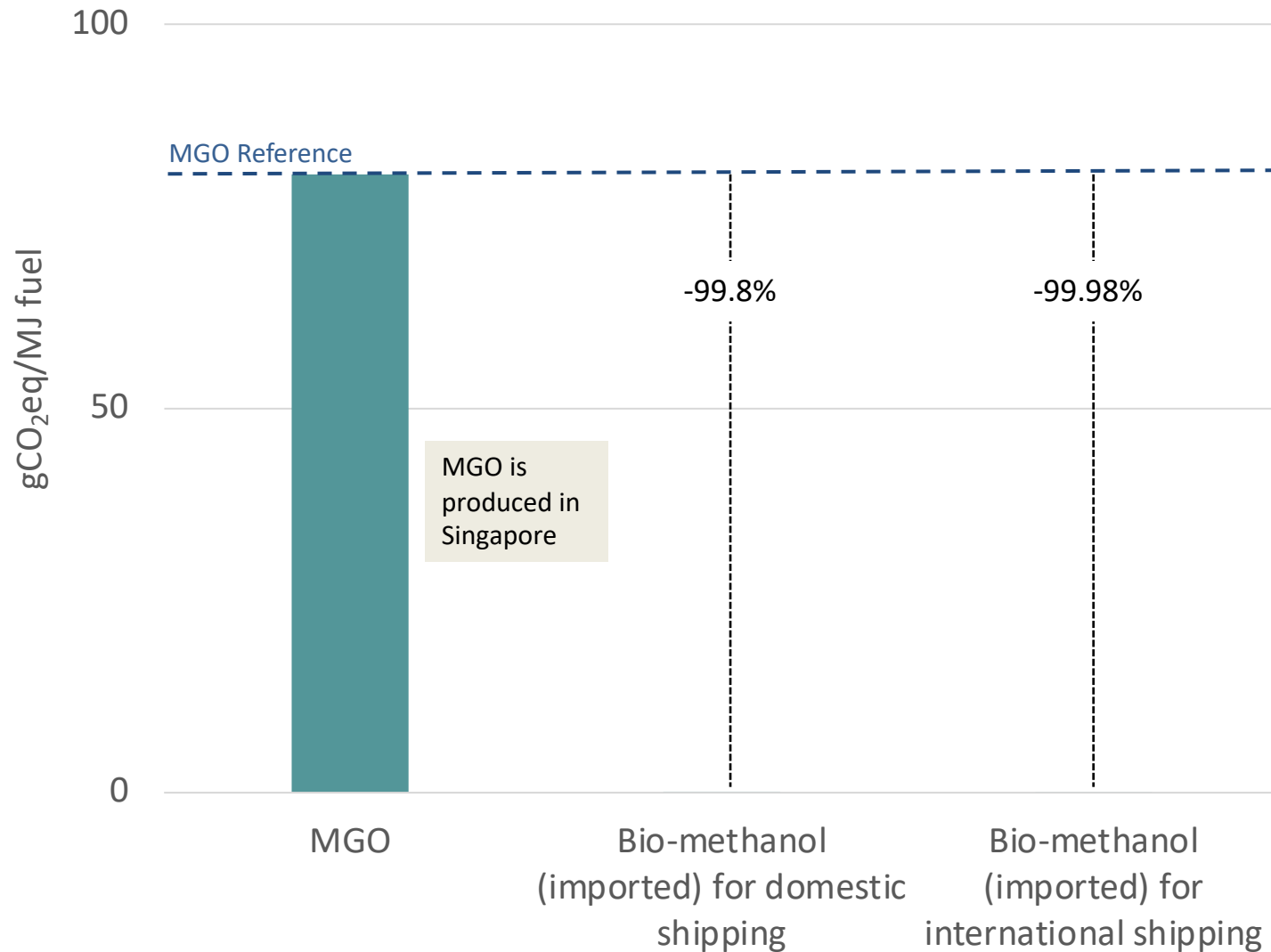
Case study – Bio-methanol ISCC Analysis



Bio-methanol from different feedstocks in SE Asia

Note: ISCC GHG analysis for crop residues does not consider land use change because in ISCC the GHG emissions of cultivation of crop residues are considered to be zero.

Case study – Bio-methanol IPCC Analysis for Singapore



Source: MESD



Future: From TtP to WtP perspective

01

Stricter regulations for vessel emissions - a WtP approach



- Proposed a WtP approach for FuelEU Maritime regulations (yet voted)



- Unofficial suggestions to IMO to use WtP emission factors for CII calculation (yet considered)

02

Need for a harmonized LCA method for marine fuels



- Default values
- Actual values
- Documentation, verification and certification



- IMO (ISWG-GHG) is developing a common framework for LCA for marine fuels – WtP

03

A more aggressive approach for maritime stakeholders to prepare for a stricter future

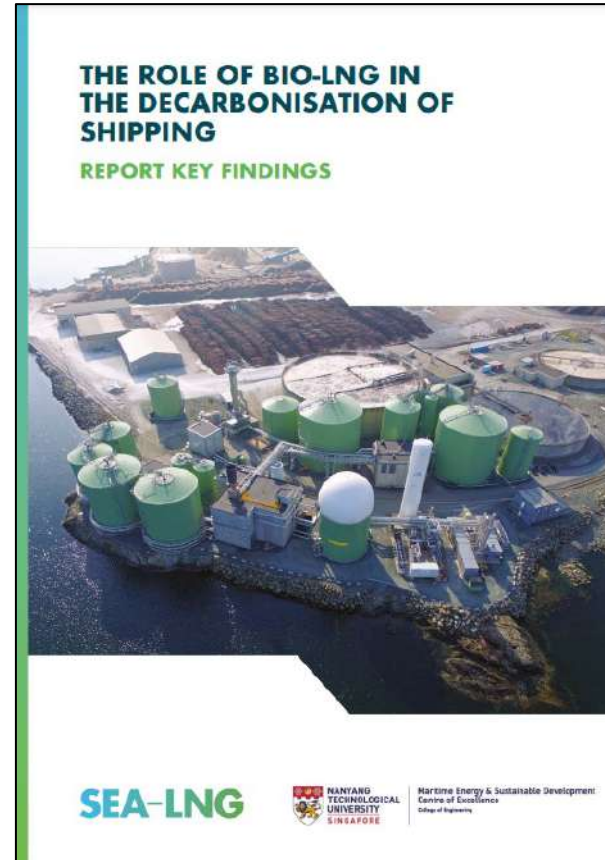
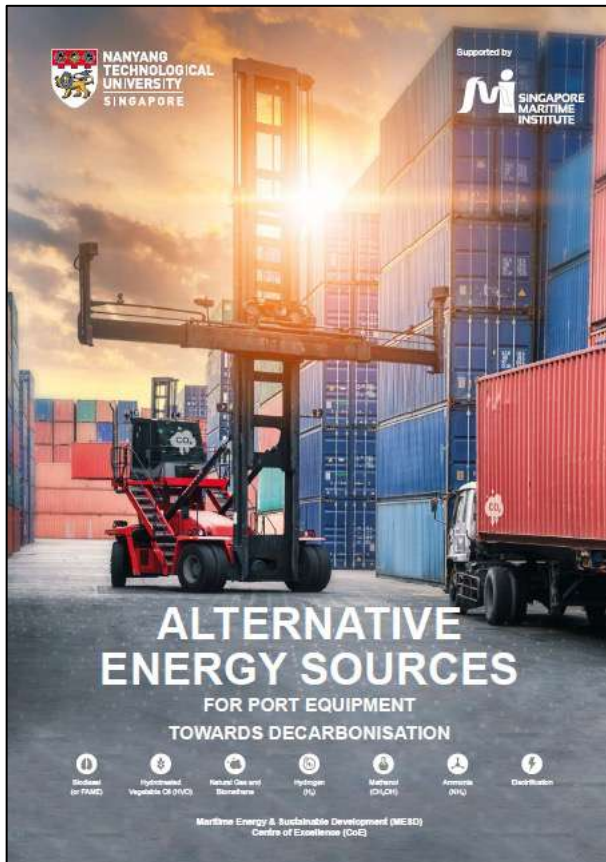


- Go beyond current regulations



- A WtP approach for assessment

MESD Reports with LCA



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