SkyNRG

Renewable marine fuel : opportunity?

Prepared for: MiD- Maintenance in Dredging “new developments in dredging industry”

MID
MAINTENANCE IN DREDGING

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FUTURE FRIENDLY FLYING

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SkyNRG's mission: provide truly sustainable fuels for those segments for which there is no sustainable alternative

- Aviation needs sustainable jet fuel to reduce its carbon print and to hedge fossil energy
- Unlike the road transport segment, airlines can not afford to settle with first generation unsustainable biofuels and local blending mandates distorting level playing fields are not possible in a global industry
- There is a huge drive from airlines, aircraft OEM's and industry associations to create the market for sustainable fuel

- The shipping industry needs sustainable bio fuels to reduce its carbon print, come to cleaner emissions (IMO 2015) and to hedge fossil energy
- A voluntary green move is being led by forward thinking shippers (sometimes pushed by customers) and by shipping companies with high end customer profiles such as ferries & cruise companies
- The International Marine Organisation is pushing hard for lower toxic emissions

- Contrary to current legislation in which many countries mandate biofuels for cars, SkyNRG along with leading NGO's believes that current first generation fuels have not improved the world sufficiently from a sustainability perspective.
- Cars are long term better off going electric and sustainable fuels should mainly be used for heavy trucking in the road transport segment

But good, steady, sustainable, affordable, well distributed and marketed supply is lacking dearly!

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How we started: supply aviation with sustainable jet fuel that is affordable

Executive Summary

In 2006 we asked ourselves 3 questions regarding bio-kerosene.....

Technically Feasible? ✓

Yes – bio-kerosene can be made on spec and certification as drop-in within a few years is highly likely

Sustainable? ✓

Yes – if we limit ourselves to truly sustainable feedstock

Economically viable? ✓

It will remain premium for a long time until supportive legislation falls into place

.....which resulted in the launch of the SkyNRG Joint Venture, in november 2009

KLM · NORTH SEA PETROLEUM · spring associates

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Supply aviation with sustainable jet fuel

Along the guidelines & sustainability criteria of the **Roundtable on Sustainable Biofuels** and **SAFUG**

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SkyNRG has made it to the world market leader in bio jet fuel, with a global footprint in production and distribution on 5 continents

Current customers

Americas

North America

BOEING

Alaska Airlines

porter

Air Canada

South America

AEROMEXICO.

LAN

TAM

EMEA

Europe

KLM

AIRBUS

AIRFRANCE

Thomson Airways

FINNAIR

Virgin

Middle East

ETIHAD AIRWAYS

APAC

Asia

ANA

THAI

Jetstar

Australia

Virgin

QANTAS

Close friends & partners

Global

Aviation

AIRBUS

BOEING

IATA

Supply

Greenergy

DynamicFuels

NESTE OIL

LanzaTech

heliae

Distribution

EPIC

China National Aviation Fuel

NGOs'

ClimateSolutions

RSB ROUNDTABLE ON SUSTAINABLE BIOFUELS

CARBON WAR ROOM

WWF

NRDC

NATIONAL WILDLIFE FEDERATION

"The biofuel blend was supplied by SkyNRG, which has virtually cornered the market availability of sustainable jet fuel just now, with involvement already in commercial biofuel flights by carriers in Europe, Asia, the United States and now the Middle East"

(GreenAirOnline – the leading news letter for sustainability in aviation industry - after the Etihad flight)

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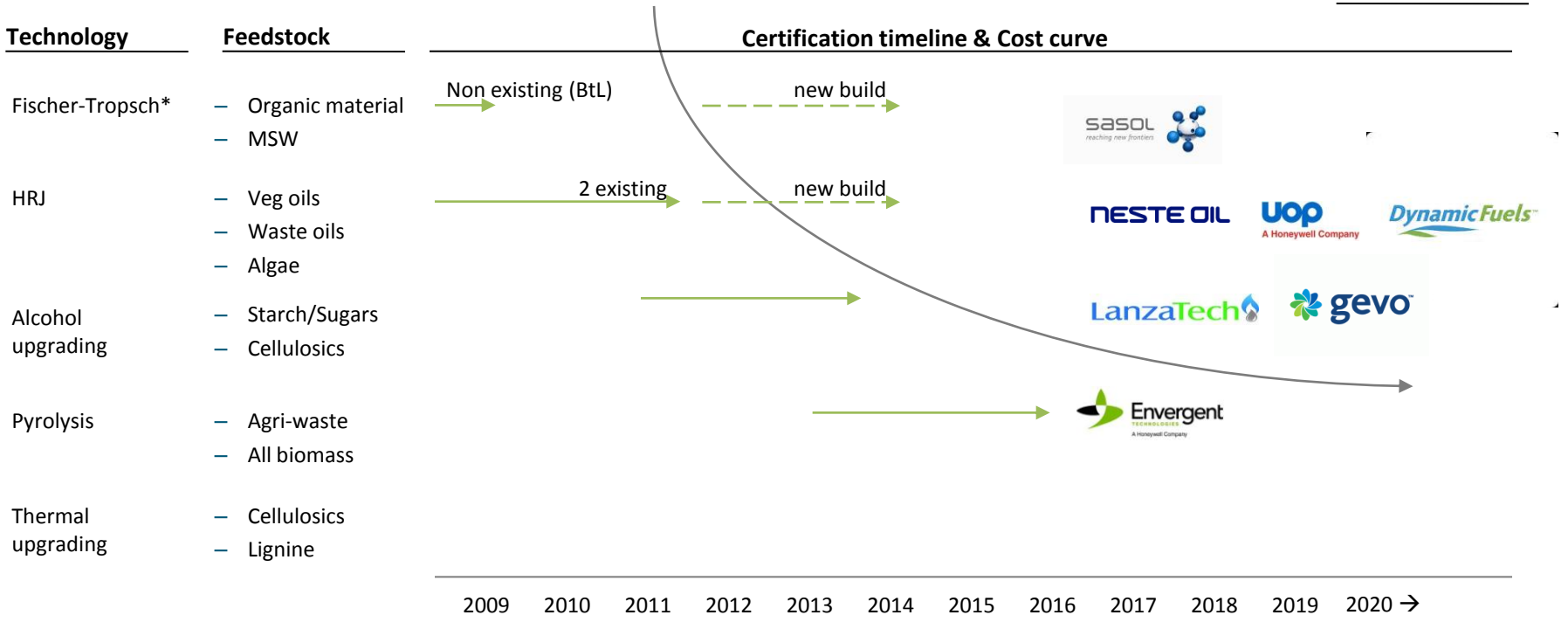
SkyNRG's current and future supply is based upon a range of new bio based technologies enabling next generation sustainable fuels that are long term cost competitive with fossil

INDICATIVE & CONCEPTUAL



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Our biofuels meet the highest requirements for sustainability

Environmental
- Reduces carbon emissions
- Minimal impact on biodiversity
- Does not displace or compete with food crops

Social
- Respects human rights
- Respects labour rights
- Provides a positive socioeconomic impact

Economic
- Commercially feasible and available
- Contributes to local and global economic growth

SkyNRG is the first biofuel operator worldwide with **Roundtable on Sustainable Biofuels (RSB)** certification for their entire supply chain for renewable jet fuel.

RSB

Partners

National Wildlife Federation · NRDC · Climate Solutions · Carbon War Room · ZERO

To make the right decisions now and in the future, SkyNRG is advised by an independent Sustainability Board.

- Meets 5 times a year
- Assesses all feedstock options on a case-by-case basis

Sustainability Board

Solidaridad

Copernicus Institute Utrecht University

WWF

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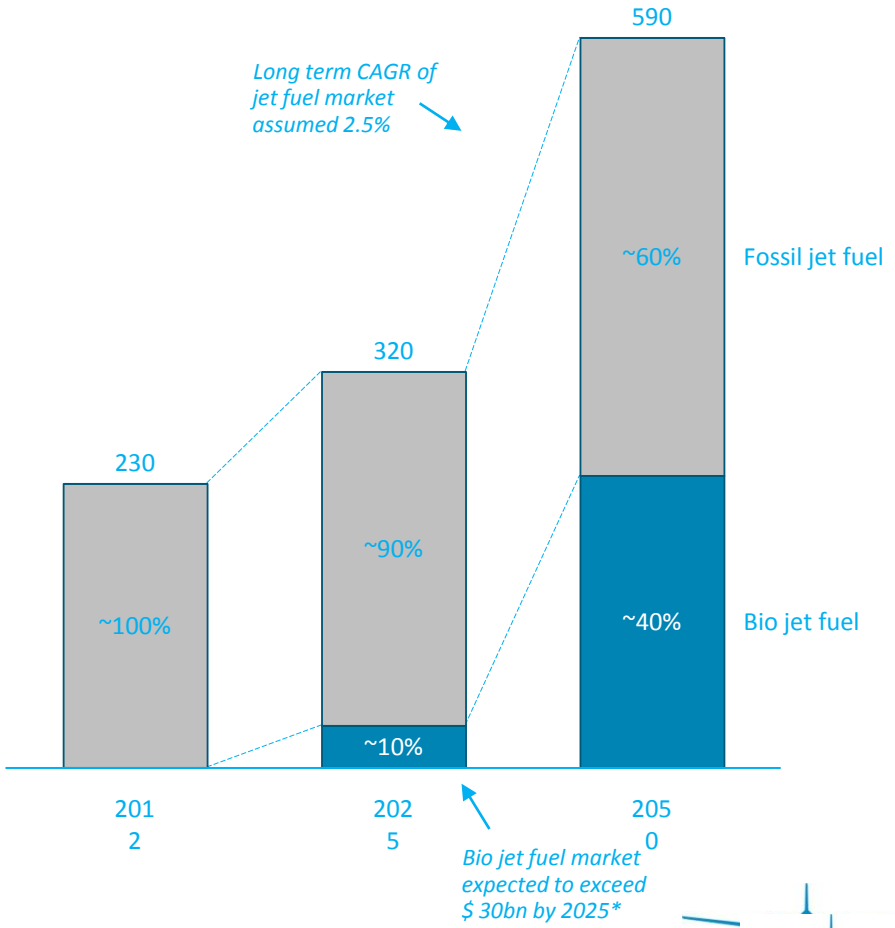
For bio jet fuel, strong demand growth is anticipated over the coming decades

Aviation needs bio jet fuel to hedge fossil energy risks and to reduce its carbon footprint

- Renewable fuels are the natural hedge against fossil volatility and risks
  - Scarcity of cheap oil increases volatility and pushes up prices
  - High prices, volatility and supply disruptions are an existential threat for the struggling aviation sector
  - Biofuels are the only viable alternative
- Renewable fuels and aviation are a logical match from a sustainability perspective
  - The industry has to act; For the average western consumer, flying is one of the larger contributors to his carbon footprint
  - Other transportation sectors will see a shift towards (renewable) electric power
  - Unlike for the transportation sector at large, for aviation there is no alternative; fuel based planes are here to stay for decades

Global jet fuel market, 2012-50 (m tonnes)



** IEA forecasts that biofuels will constitute 30% of global fuel use by commercial airlines in 2050; ATAG estimates biofuel will account for 50% of aviation fuels by 2040; PIRA assumes all volume growth >2020 comes from biofuels*

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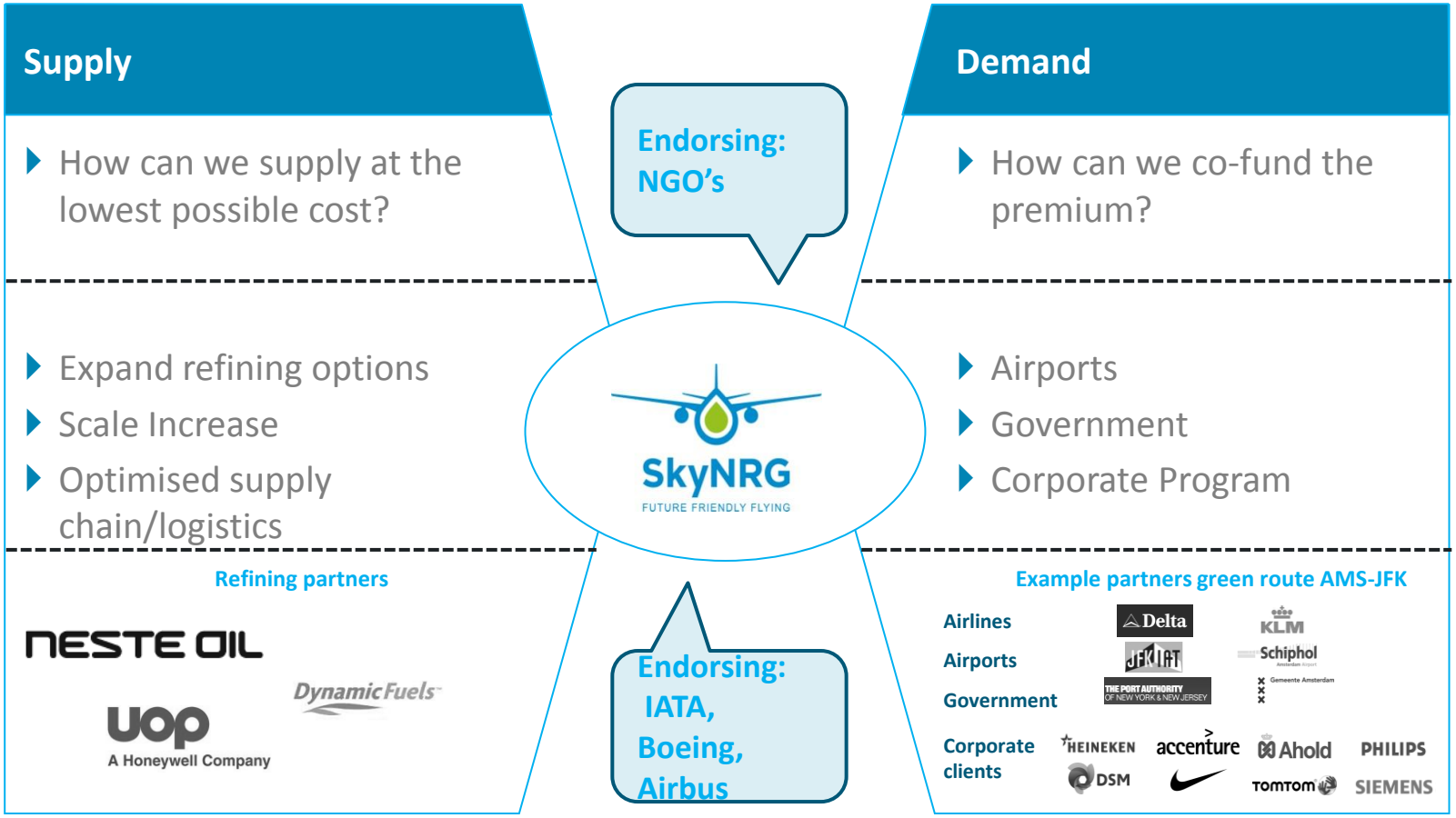
By continuously lowering cost combined with smart co-funding SkyNRG was the first to match supply and demand and create a global bio jet market



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SkyNRG's Fuel Future Program is a strong weapon to boost sales and make the market

SkyNRG Corporate Program: rationale and description

- Airlines do not have enough capital to pay the bio jet premium
- The SkyNRG Corporate Program enables corporations to fly for a proportion of their company's aircraft movements made annually on sustainable jet fuel in order to reduce their carbon footprint
- The aggregation of demand allows for the development of technologies, succesful government lobby and dedicated bio jet supply chains.
- The first corporate program offering is now in place in Amsterdam with KLM and Schiphol Airport as partners
- Global roll out now in progress (North America, Australia, Europe). Target: 100 major corporations by 2015

The program enables us to launch green routes

Green Route: New York JFK- Amsterdam Schiphol

Airline:	**KLM**
Aircraft:	**B777**
Feedstock:	**Used Cooking Oil**
Blend:	**20%**
Frequency:	**every Thursday**

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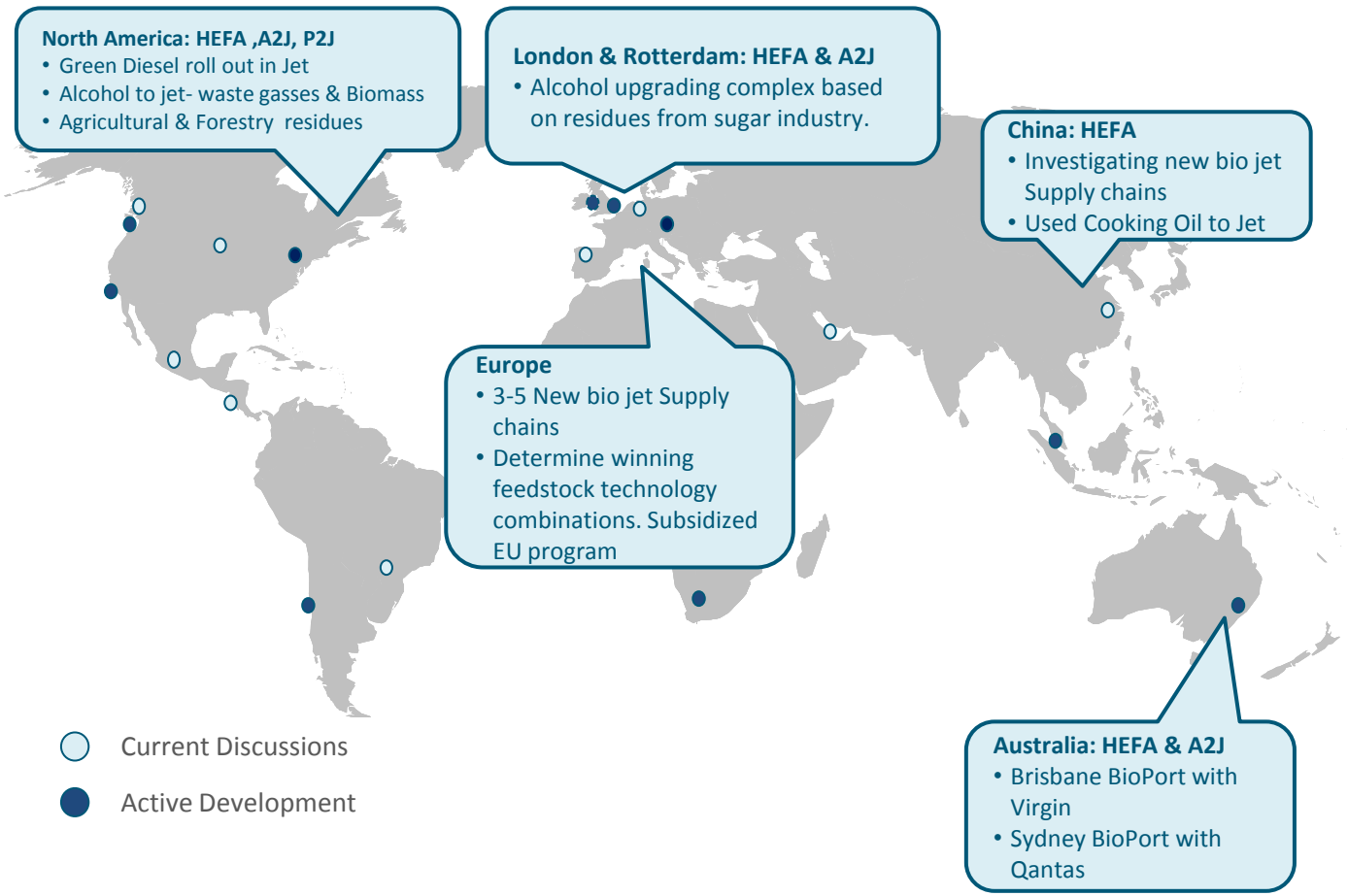
Long term (2015-2025): creating local supply chains that can compete outright with fossil fuel based on various technologies that "fit" the geographical region

'SkyNRG BioPorts": Examples of current BioPort development initiatives



The BioPort

- A local BioPort focuses on creating value downstream in the bio jet fuel value chain through collaboration of all stakeholders at a single airport.
- These parties work together to build a defendable position in the emerging market of bio jet fuel
- Two key elements:
  - Development of regional supply chain (feedstock and conversion technology)
  - Get co-funding mechanisms in place (government, airports, corporations) to fund a potential premium

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SkyNRG has a global pipeline of BioPorts ! Next to Bio Jet Fuel these will by default produce renewable (marine) diesel

INDICATIVE

PENDING DISCUSSIONS

ExpectedLaunch	Country	Bioport	Airline	Partner	Anticipated Business model
2015		Rotterdam	KLM	NESTE OIL	Feedstock & Marketeer
2016		Brisbane/Sydney	Virgin australia	Brisbane Airport	Lead Developer
2016		Karlstad/Oslo etc.	various	STATOIL	Lead Developer

INDICATIVE

	Vancouver	Air Canada	BOEING	Lead Developer
	Johannesburg	South African Airways		Lead developer
	Singapore	Singapore Airlines	CHANGI	Lead Developer
	Beijing	various	中国航油	Lead Developer
	Londen	virgin atlantic	?	Lead Developer
	Helsinki	Finnair	NESTE OIL	Feedstock & Marketeer
	LAX/ORD/SEA/JFK	various		Lead Developer
	Istanbul	Turkish Airlines	TÜRKPETROL	Lead Developer

SkyNRG Entry Criteria for BioPorts

1. Active, supportive government
2. Active , supportive market demand out of airlines, airports & corporate community
3. Availability of supply (feedstock, (idle) refining capacity)
4. Stable end position possible

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In summary : SkyNRG's Market Making Strategy

Step 1: Launch, solve technical hurdles/ certification / fear for biofuels

Step 2: Create Initial Demand by active co-funding and launching partners

Step 3: Criticial scale combined with tactical legislation = `viable business case, but only at certain locations for certain customers.

Step 4: Structural market

Our ingoing hypothesis: this can work for the Marine world too !

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We see similar sustainability challenges in the marine and aviation industries.

Area	Challenges
Sustainable	 ▸ Sustainability is becoming increasingly important due to tightened regulations. ▸ Sustainability can be done good or bad ▸ The notion of “what is sustainable” is a dynamic one
Technical	 ▸ Drop in is preferred ▸ Don’t want to rebuild infrastructure that is in place ▸ Often expensive to implement new sustainable solutions
Economical	 ▸ Fuel is large part of operational costs ▸ Fossil prices are volatile ▸ No control over fuel costs

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Our hypothesis: Renewable Marine fuel can be a real solution next to LNG

Drop-in fuel		▸ No modifications to the ship is required ▸ No additional maintenance ▸ It can be stored and transported similarly to fossil diesel fuel ▸ No blending wall limitations (as with FAME) ▸ No loss of commercial cargo spcace (as with LNG)
Good technical performance		▸ Good cold operability ▸ High engine efficiency ▸ Clean engine ▸ No increase of service intervals
Environmentally friendly		▸ No SOx ▸ Less particulate matter and NOx emissions ▸ Reduction of GHG emissions

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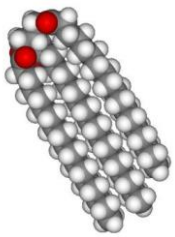
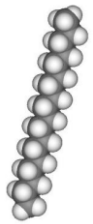
What is Renewable Marine (diesel) fuel ??

- Can be made out of of various technologies. We currently use mostly Hydrotreating based on sustainable vegetable or waste oils.
- Important: Renewable diesel is NOT biodiesel
- The product is a pure hydrocarbon, chemically virtually identical to conventional diesel
- Renewable diesel is also referred to as HRD (Hydrotreated Renewable Diesel) or HVO (Hydrotreated Vegetable Oils)

Production of Hydrotreated Renewable Diesel

Feedstock	Processing	Product
	■ Combine with Hydrogen ■ Hydrotreat & isomerize ■ C_3 backbone converted to naphtha and LPG ■ Oxygen converted to H_2O	
Vegetable oil, tallow or used cooking oils		Hydrotreated Renewable Diesel (Pure hydrocarbons)

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Emission reductions with Renewable Marine fuel

- The average reductions are as follows:
  - NOx: 10%
  - Particulate matter: 30%
  - CO: 29%
  - THC: 39%
- SOx emission is almost completely removed as renewable diesel contains no sulphur
- CO2 reduction depends on the feedstock used to produce renewable diesel and can be up to 80% in case of Used Cooking Oil (currently SkyNRG's preferred feedstock)

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Hence… we have started marketing more and more our sustainable fuels to A-Brand Marine & Heavy Trucking Customers

Other segments according the WWF Energy 2050 vision*

1. **Marine> SeaNRG, segment of green marine fuels**
   - Investigating entry to marine fuel market
   - Discussions with

SeaNRG
FUTURE FRIENDLY SHIPPING

2. **Heavy trucking > RoadNRG**
   - Schiphol green diesel pilot
     - Roll out to B30 in 2014/5 years (4 M Liters per year)
     - 30% = estimated segment for which fuel is only alternative.
   - Roll out to other airports
   - Other potential customers:

RoadNRG
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* http://wwf.panda.org/what_we_do/footprint/climate_carbon_energy/energy_solutions/renewable_energy/sustainable_energy_report/

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Your active feedback please !

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