SuperGreen - Tech Cards Report

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Engines and Propulsion Systems

Full/parallel hybrid

Technology Data

ID	Category	Transport modes
EN16	Engines and Propulsion Systems	Road
Description		
Electrical support of engine power by saving and re-use of break-energy; combination of 6 cylinder engine plus electrical engine		

Readiness Level	Time to Market	Energy Source	Efficiency
9	3	electricity	same as Diesel engine
CO_2	NO_x	SO_x	LCC
ca. 25% less than Diesel	ca. 25% less than Diesel	ca. 25% less than Diesel	ca. +50% more than Diesel engine

High Level Benchmark

Baseline	Diesel engines
Relative Cost	
% cost savings during operation	-
CAPEX	Small increase in CAPEX
% fuel savings	0-35%
Emissions	
% CO2 savings	0-35%
% SOx savings	0-35%
% NOx savings	
Service & bottlenecks	
% operational or infrastructural delays reduction	-
% of frequency of service potential improvement due to delays & bottlenecks reduction	-
% of reliability improvement due to delays & bottlenecks reduction	-

Positive influence | Negative influence | Not relevant or no influence | no information

Technology Applicability per Corridor

Corridor 'Brenner'

Nodes		Arcs	
Malmo	Road	*Malmo-Trelleborg*	-
Trelleborg	Road	*Trelleborg-Sassnitz*	-
Sassnitz	Road	*Trelleborg-Rostock*	-
Rostock	Road	*Sassnitz-Berlin*	-
Berlin	Road	*Rostock-Berlin*	-
Nurnberg	Road	*Berlin-Nurnberg*	-
Munich	Road	*Nurnberg-Munich*	-
Salzburg	Road	*Munich-Salzburg*	Road
Villach	Road	*Salzburg-Villach*	Road
Trieste	Road	*Villach-Trieste*	Road
Verona	Road	*Munich-Verona*	Road
Bologna	Road	*Verona-Bologna*	-
Ancona	Road	*Bologna-Ancona*	-
Bari	Road	*Ancona-Bari*	-
Brindisi	Road	*Bari-Brindisi*	-
Igoumenitsa	Road	*Igoumenitsa-Thessaloniki*	Road
Thessaloniki	Road	*Igoumenitsa-Patras*	-
Patras	Road	*Patras-Athens*	-
Athens	Road	*Bologna-Rome*	Road
Rome	Road	*Rome-Naples*	-
Naples	Road	*Naples-Messina*	-
Messina	Road	*Villa San Giovanni-Messina*	-
Villa San Giovanni	Road	*Messina-Palermo*	-
Palermo	Road	*Naples-Villa San Giovanni*	-
		Ancona-Brindisi	-
		Bari-Igoumenitsa	-

Corridor 'Finis Terrae'

Nodes		Arcs	
Paris	Road	*Paris-St. Nazaire*	Road
St. Nazaire	-	*Paris-Irun*	Road
Irun	-	*St. Nazaire-Gijon*	-
Gijon	-	*Irun-Valladolid*	Road
Valladolid	-	*Gijon-Valladolid*	Road
Madrid	-	*Valladolid-Madrid*	Road
Lisboa	-	*Madrid-Lisboa*	Road

Corridor 'Cloverleaf'

Nodes		Arcs	
Glasgow	Road	*Glasgow-Carlisle*	Road
Carlisle	Road	*Carlisle-Liverpool*	Road
Liverpool	Road	*Liverpool-Dublin*	-
Dublin	-	*Liverpool-London*	Road
London	Road	*London-Dover*	Road
Dover	Road	*Dover-Calais*	-
Calais	Road	*Calais-Duisburg*	Road
Duisburg	Road		

Corridor 'Edelweiss'

Nodes		Arcs	
St. Petersburg	Road	*St. Petersburg-Lappeenranta*	Road
Lappeenranta	Road	*Lappeenranta-Helsinki*	Road
Helsinki	Road	*Helsinki-Turku*	Road
Turku	Road	*Stockholm-Oslo*	Road
Stockholm	Road	*Stockholm-Malmo*	Road
Oslo	Road	*Oslo-Gothenburg*	Road
Malmo	Road	*Gothenburg-Malmo*	Road
Gothenburg	Road	*Malmo-Copenhagen*	Road
Copenhagen	Road	*Copenhagen-Taulov*	Road
Taulov	Road	*Copenhagen-Rodbyhavn*	Road
Rodbyhavn	Road	*Rodbyhavn-Puttgarden*	-
Puttgarden	Road	*Taulov-Hamburg*	Road

Hamburg	Road	*Puttgarden-Hamburg*	Road
Hannover	Road	*Hamburg-Hannover*	Road
Würzburg	Road	*Hannover-Würzburg*	Road
Ulm	Road	*Würzburg-Ulm*	Road
Lugano	Road	*Ulm-Lugano*	Road
Milan	Road	*Lugano-Milan*	Road
Genoa	Road	*Milan-Genoa*	Road
		Turku-Stockholm	-

Corridor 'Nureyeev'

Nodes		*Arcs*	
Helsinki	Road	*Helsinki-Tallinn*	-
Tallinn	-	*St. Petersburg-Moscow*	Road
St. Petersburg	Road	*Ventspils-Klaipeda*	-
Moscow	Road	*Klaipeda-Minsk*	Road
Ventspils	-	*Klaipeda-Karlshamn*	-
Klaipeda	Road	*Gothenburg-Hamburg*	-
Minsk	Road	*Rostock-Gothenburg*	-
Karlshamn	-	*Hamburg-Malmo*	-
Gothenburg	Road	*Helsinki-St. Petersburg*	-
Hamburg	Road	*Hamburg-Gdansk*	-
Rostock	Road	*Hamburg-Tallinn*	-
Malmo	Road	*Ventspils-Karlshamn*	-
Gdansk	-	*Malmo-Helsinki*	-
Riga	-	*Helsinki-Hamburg*	-
Rotterdam	Road	*Tallinn-Riga*	-
Turku	Road	*Rotterdam-Hamburg*	-
		Klaipeda-Rotterdam	-
		Rostock-Helsinki	-
		Helsinki-Rotterdam	-
		Turku-Gothenburg	-
		Turku-Hamburg	-
		Gothenburg-Rotterdam	-
		Klaipeda-Riga	-
		Hamburg-Riga	-
		St. Petersburg-Hamburg	-
		Rotterdam-Gdansk	-
		Rotterdam-Ventspils	-
		Rotterdam-St. Petersburg	-

Corridor 'Strauss'

Nodes		*Arcs*	
Rotterdam	Road	*Rotterdam-Duisburg*	Road
Duisburg	Road	*Duisburg-Frankfurt*	Road
Frankfurt	Road	*Frankfurt-Paris*	Road
Paris	Road	*Frankfurt-Nurnberg*	Road
Nurnberg	Road	*Nurnberg-Vienna*	Road
Vienna	Road	*Vienna-Bratislava*	Road
Bratislava	Road	*Bratislava-Budapest*	-
Budapest	Road	*Budapest-Belgrade*	-
Belgrade	Road	*Belgrade-Constanta*	Road
Constanta	Road		

Corridor 'Two Seas'

Nodes		*Arcs*	
Hamburg	Road	*Hamburg-Berlin*	Road
Berlin	Road	*Berlin-Dresden*	Road
Dresden	Road	*Dresden-Prague*	Road
Prague	Road	*Prague-Nurnberg*	Road
Nurnberg	Road	*Prague-Bratislava*	Road
Bratislava	Road	*Bratislava-Budapest*	Road
Budapest	Road	*Budapest-Belgrade*	Road
Belgrade	Road	*Belgrade-Sofia*	Road
Sofia	Road	*Sofia-Thessaloniki*	Road
Thessaloniki	Road	*Thessaloniki-Athens*	Road
Athens	Road		

Corridor 'Mare Nostrum'

Nodes		*Arcs*	
Bourgas	-	*Bourgas-Istanbul*	-
Istanbul	-	*La Spezia-Genoa*	-
La Spezia	-	*Marseille-Lyon*	Road
Genoa	Road	*Odessa-Istanbul*	-
Marseille	Road	*Constanta-Istanbul*	-
Lyon	Road	*Algeciras-Istanbul*	-
Odessa	-	*Barcelona-Valencia*	Road
Constanta	Road	*Valencia-Algeciras*	Road
Algeciras	Road	*Istanbul-Athens*	-
Barcelona	Road	*Athens-Gioia Tauro*	-
Valencia	Road	*Gioia Tauro-La Spezia*	-
Athens	Road	*Marseille-Barcelona*	Road
Gioia Tauro	-	*Algeciras-Sines*	-
Sines	-	*Genoa-Barcelona*	-
Trieste	Road	*Istanbul-Trieste*	-
		Istanbul-Gioia Tauro	-
		Istanbul-Algeciras	-

Corridor 'Silk Way'

Nodes		*Arcs*	
Rotterdam	Road	*Rotterdam-Shanghai*	-
Shanghai	-	*Hamburg-Berlin*	-
Hamburg	Road	*Berlin-Warsaw*	-
Berlin	Road	*Warsaw-Minsk*	-
Warsaw	-	*Minsk-Moscow*	-
Minsk	Road	*Moscow-Beijing*	-
Moscow	Road	*Hamburg-Shanghai*	-
Beijing	-	*St. Petersburg-Shanghai*	-
St. Petersburg	Road	*Shanghai-Gothenburg*	-
Gothenburg	Road	*Tallinn-Shanghai*	-
Tallinn	-		

Exhaust abatement system

Technology Data

ID	Category	Transport modes
EN21	Engines and Propulsion Systems	Maritime, Inland Waterways

Description
Emission reduction system comprising a reactor for selective catalytic reduction of NOX and a reactor containing a particulate matter filter for reduction of particulate matter

Readiness Level	Time to Market	Energy Source	Efficiency
9	<1	MGO	0
CO_2	NO_x	SO_x	LCC
Increase by 2%	Reduction by 90%	Increase by 2%	0

Notes on technology

Applicability on the maritime sector: Under the IMO air pollution regulations, exhaust gas cleaning systems, like scrubbers, are one option to mitigate sulfur emissions, with alternative fuels like LNG or low-sulfur marine diesel oil being the other technically known option. Scrubbers can remove sulphur from the engine exhaust gas up to 99% by using chemicals, seawater, or dry scrubbing technology. However, the scrubber operation increases the power consumption, thereby increasing the CO2 emissions. In addition, the scrubber installation requires alterations on-board the vessel, like the installation of additional tanks, pipes, pumps, water treatment system (in case of wet scrubber systems), and sludge tank (the sulfur-rich sludge is treated as special waste). Extra operational costs may be required, if chemicals solvents are in use. Applicability on inland waterways: The application of a Selective Catalytic Reduction (SCR) system on the exhaust gas path of the inland water way vessel is considered. SCR is a technique to remove NOx emissions by means of injecting a urea agent (32.5% in water) into the exhaust gas stream. The urea substance reduces both NO and NO2 to nitrogen and water. According to the high-level benchmark, the SCR technology would require additional operating costs for urea and maintenance. In addition, it could bring a 2-5% fuel increase. On the other hand, according to, NOx after-treatment gives the opportunity to increase combustion efficiency, resulting in up to 7.5% less fuel consumed and less CO2 emitted. Considering that both approaches could be realised, a range of -2% to +7.5% for the fuel cost factor is assumed.

High Level Benchmark

Baseline		No exhaust abatement system.
Relative Cost		
% cost savings during operation		SOX scrubber: Savings in reduced OPEX exceed the increase of CAPEX
CAPEX		-
% fuel savings		2 - 3% (SOX scrubbers)
Emissions		
% CO2 savings		2 - 3% (SOX scrubbers)
% SOx savings		90-95% (SOX scrubbers) This assumes comparison with High Sulphur Fuel

% NOx savings	
Service & bottlenecks	
% operational or infrastructural delays reduction	-
% of frequency of service potential improvement due to delays & bottlenecks reduction	-
% of reliability improvement due to delays & bottlenecks reduction	-

Positive influence | Negative influence | Not relevant or no influence | no information

Detailed Benchmark

(with respect to baseline performance on specific corridor)

Corridor	*Strauss*	
Mode of transport	*Internal water transport*	
Cost	*Min: -0.5%*	*Max: 0.9%*
CO2 emissions	*Min: -5.0%*	*Max: 7.5%*
SOX emissions	*Min: 0.0%*	*Max: 0.0%*
Average speed	*Min: 0.0%*	*Max: 0.0%*
Frequency	*Min: 0.0%*	*Max: 0.0%*
Reliability	*Min: 0.0%*	*Max: 0.0%*

Corridor	*Mare Nostrum*	
Mode of transport	*sss*	
Cost	*Min: -3.7%*	*Max: -0.6%*
CO2 emissions	*Min: 0.0%*	*Max: 0.0%*
SOX emissions	*Min: 90.0%*	*Max: 95.7%*
Average speed	*Min: 0.0%*	*Max: 0.0%*
Frequency	*Min: 0.0%*	*Max: 0.0%*
Reliability	*Min: 0.0%*	*Max: 0.0%*

Technology Applicability per Corridor

Corridor 'Brenner'

Nodes		*Arcs*	
Malmo	-	*Malmo-Trelleborg*	-
Trelleborg	-	*Trelleborg-Sassnitz*	sss

Sassnitz	-	*Trelleborg-Rostock*	sss
Rostock	-	*Sassnitz-Berlin*	-
Berlin	-	*Rostock-Berlin*	-
Nurnberg	-	*Berlin-Nurnberg*	-
Munich	-	*Nurnberg-Munich*	-
Salzburg	-	*Munich-Salzburg*	-
Villach	-	*Salzburg-Villach*	-
Trieste	-	*Villach-Trieste*	-
Verona	-	*Munich-Verona*	-
Bologna	-	*Verona-Bologna*	-
Ancona	-	*Bologna-Ancona*	-
Bari	-	*Ancona-Bari*	-
Brindisi	-	*Bari-Brindisi*	-
Igoumenitsa	-	*Igoumenitsa-Thessaloniki*	-
Thessaloniki	-	*Igoumenitsa-Patras*	sss
Patras	-	*Patras-Athens*	-
Athens	-	*Bologna-Rome*	-
Rome	-	*Rome-Naples*	-
Naples	-	*Naples-Messina*	sss
Messina	-	*Villa San Giovanni-Messina*	sss
Villa San Giovanni	-	*Messina-Palermo*	-
Palermo	-	*Naples-Villa San Giovanni*	-
		Ancona-Brindisi	sss
		Bari-Igoumenitsa	sss

Corridor 'Finis Terrae'

Nodes		*Arcs*	
Paris	-	*Paris-St. Nazaire*	-
St. Nazaire	-	*Paris-Irun*	-
Irun	-	*St. Nazaire-Gijon*	sss
Gijon	-	*Irun-Valladolid*	-
Valladolid	-	*Gijon-Valladolid*	-
Madrid	-	*Valladolid-Madrid*	-
Lisboa	-	*Madrid-Lisboa*	-

Corridor 'Cloverleaf'

Nodes		*Arcs*	
Glasgow	-	*Glasgow-Carlisle*	-
Carlisle	-	*Carlisle-Liverpool*	-
Liverpool	-	*Liverpool-Dublin*	sss
Dublin	-	*Liverpool-London*	-
London	-	*London-Dover*	-
Dover	-	*Dover-Calais*	sss
Calais	-	*Calais-Duisburg*	-
Duisburg	-		

Corridor 'Edelweiss'

Nodes		*Arcs*	
St. Petersburg	-	*St. Petersburg-Lappeenranta*	-
Lappeenranta	-	*Lappeenranta-Helsinki*	-
Helsinki	-	*Helsinki-Turku*	-
Turku	-	*Stockholm-Oslo*	-
Stockholm	-	*Stockholm-Malmo*	-
Oslo	-	*Oslo-Gothenburg*	-
Malmo	-	*Gothenburg-Malmo*	-
Gothenburg	-	*Malmo-Copenhagen*	-
Copenhagen	-	*Copenhagen-Taulov*	-
Taulov	-	*Copenhagen-Rodbyhavn*	-
Rodbyhavn	-	*Rodbyhavn-Puttgarden*	sss
Puttgarden	-	*Taulov-Hamburg*	-
Hamburg	-	*Puttgarden-Hamburg*	-
Hannover	-	*Hamburg-Hannover*	-
Würzburg	-	*Hannover-Würzburg*	-
Ulm	-	*Würzburg-Ulm*	-
Lugano	-	*Ulm-Lugano*	-
Milan	-	*Lugano-Milan*	-
Genoa	-	*Milan-Genoa*	-
		Turku-Stockholm	sss

Corridor 'Nureyeev'

Nodes		Arcs	
Helsinki	-	Helsinki-Tallinn	sss
Tallinn	-	St. Petersburg-Moscow	-
St. Petersburg	-	Ventspils-Klaipeda	sss
Moscow	-	Klaipeda-Minsk	-
Ventspils	-	Klaipeda-Karlshamn	sss
Klaipeda	-	Gothenburg-Hamburg	sss
Minsk	-	Rostock-Gothenburg	sss
Karlshamn	-	Hamburg-Malmo	sss
Gothenburg	-	Helsinki-St. Petersburg	sss
Hamburg	-	Hamburg-Gdansk	sss
Rostock	-	Hamburg-Tallinn	sss
Malmo	-	Ventspils-Karlshamn	sss
Gdansk	-	Malmo-Helsinki	sss
Riga	-	Helsinki-Hamburg	sss
Rotterdam	-	Tallinn-Riga	sss
Turku	-	Rotterdam-Hamburg	sss
		Klaipeda-Rotterdam	sss
		Rostock-Helsinki	sss
		Helsinki-Rotterdam	sss
		Turku-Gothenburg	sss
		Turku-Hamburg	sss
		Gothenburg-Rotterdam	sss
		Klaipeda-Riga	sss
		Hamburg-Riga	sss
		St. Petersburg-Hamburg	sss
		Rotterdam-Gdansk	sss
		Rotterdam-Ventspils	sss
		Rotterdam-St. Petersburg	sss

Corridor 'Strauss'

Nodes		Arcs	
Rotterdam	-	Rotterdam-Duisburg	Internal water transport
Duisburg	-	Duisburg-Frankfurt	Internal water transport
Frankfurt	-	Frankfurt-Paris	-
Paris	-	Frankfurt-Nurnberg	Internal water transport
Nurnberg	-	Nurnberg-Vienna	Internal water transport
Vienna	-	Vienna-Bratislava	Internal water transport
Bratislava	-	Bratislava-Budapest	Internal water transport
Budapest	-	Budapest-Belgrade	Internal water transport
Belgrade	-	Belgrade-Constanta	Internal water transport
Constanta	-		

Corridor 'Two Seas'

Nodes		Arcs	
Hamburg	-	Hamburg-Berlin	-
Berlin	-	Berlin-Dresden	-
Dresden	-	Dresden-Prague	-
Prague	-	Prague-Nurnberg	-
Nurnberg	-	Prague-Bratislava	-
Bratislava	-	Bratislava-Budapest	Internal water transport
Budapest	-	Budapest-Belgrade	Internal water transport
Belgrade	-	Belgrade-Sofia	-
Sofia	-	Sofia-Thessaloniki	-
Thessaloniki	-	Thessaloniki-Athens	-
Athens	-		

Corridor 'Mare Nostrum'

Nodes		Arcs	
Bourgas	-	Bourgas-Istanbul	sss
Istanbul	-	La Spezia-Genoa	sss
La Spezia	-	Marseille-Lyon	Internal water transport
Genoa	-	Odessa-Istanbul	sss
Marseille	-	Constanta-Istanbul	sss
Lyon	-	Algeciras-Istanbul	sss
Odessa	-	Barcelona-Valencia	sss

Constanta	-	*Valencia-Algeciras*	sss
Algeciras	-	*Istanbul-Athens*	sss
Barcelona	-	*Athens-Gioia Tauro*	sss
Valencia	-	*Gioia Tauro-La Spezia*	sss
Athens	-	*Marseille-Barcelona*	sss
Gioia Tauro	-	*Algeciras-Sines*	sss
Sines	-	*Genoa-Barcelona*	sss
Trieste	-	*Istanbul-Trieste*	sss
		Istanbul-Gioia Tauro	sss
		Istanbul-Algeciras	sss

Corridor 'Silk Way'

Nodes		*Arcs*	
Rotterdam	-	*Rotterdam-Shanghai*	dss
Shanghai	-	*Hamburg-Berlin*	-
Hamburg	-	*Berlin-Warsaw*	-
Berlin	-	*Warsaw-Minsk*	-
Warsaw	-	*Minsk-Moscow*	-
Minsk	-	*Moscow-Beijing*	-
Moscow	-	*Hamburg-Shanghai*	dss
Beijing	-	*St. Petersburg-Shanghai*	dss
St. Petersburg	-	*Shanghai-Gothenburg*	dss
Gothenburg	-	*Tallinn-Shanghai*	dss
Tallinn	-		

Mechanical azimuthing thrusters

Technology Data

ID	Category	Transport modes
EN06	Engines and Propulsion Systems	Maritime
Description		
The engine runs generator. An electric motor is located inside the ship where it runs propeller shaft. 20 year life time, running 5500 h/a.		

Readiness Level	Time to Market	Energy Source	Efficiency
8	<1	HFO	27
CO_2	NO_x	SO_x	LCC
1960	33	37	28100

Notes on technology

This is a technology that can result in energy savings depending on the user. It is a baseline technology. Currently, and compared to a traditional propulsion system (e.g. mechanically connected propeller), procuring such technology will result in an increased capital expenditure, while at the same time opening up for potential fuel savings in the range of up to 20% (i.e. increased capital cost and reduced operating cost). Although the savings in energy consumption are fully dependent on the user of the technology, this naturally also has the corresponding effect on the emission of CO2 and SOx. The KPIs average speed, frequency of service and reliability are not likely to be affected by the introduction of mechanical azimuth thrusters.

High Level Benchmark

Baseline		Mechanically connected propeller by reduction gear to the propeller shaft, thruster assisted
Relative Cost		
% cost savings during operation		Potential lower OPEX
CAPEX		higher CAPEX
% fuel savings		0-20%
Emissions		
% CO2 savings		0-20%
% SOx savings		0-20%
% NOx savings		
Service & bottlenecks		
% operational or infrastructural delays reduction		-
% of frequency of service potential improvement due to delays & bottlenecks reduction		-
% of reliability improvement due		-

to delays & bottlenecks reduction

Positive influence | Negative influence | Not relevant or no influence | no information

Detailed Benchmark

(with respect to baseline performance on specific corridor)

Corridor	*Nureyeev*	
Mode of transport	*sss*	
Cost	*Min: 0.0%*	*Max: 0.0%*
CO2 emissions	*Min: 0.0%*	*Max: 20.0%*
SOX emissions	*Min: 0.0%*	*Max: 21.4%*
Average speed	*Min: 0.0%*	*Max: 0.0%*
Frequency	*Min: 0.0%*	*Max: 0.0%*
Reliability	*Min: 0.0%*	*Max: 0.0%*

Technology Applicability per Corridor

Corridor 'Brenner'

Nodes		*Arcs*	
Malmo	-	*Malmo-Trelleborg*	-
Trelleborg	-	*Trelleborg-Sassnitz*	sss
Sassnitz	-	*Trelleborg-Rostock*	sss
Rostock	-	*Sassnitz-Berlin*	-
Berlin	-	*Rostock-Berlin*	-
Nurnberg	-	*Berlin-Nurnberg*	-
Munich	-	*Nurnberg-Munich*	-
Salzburg	-	*Munich-Salzburg*	-
Villach	-	*Salzburg-Villach*	-
Trieste	-	*Villach-Trieste*	-
Verona	-	*Munich-Verona*	-
Bologna	-	*Verona-Bologna*	-
Ancona	-	*Bologna-Ancona*	-
Bari	-	*Ancona-Bari*	-
Brindisi	-	*Bari-Brindisi*	-
Igoumenitsa	-	*Igoumenitsa-Thessaloniki*	-
Thessaloniki	-	*Igoumenitsa-Patras*	sss
Patras	-	*Patras-Athens*	-
Athens	-	*Bologna-Rome*	-
Rome	-	*Rome-Naples*	-
Naples	-	*Naples-Messina*	sss
Messina	-	*Villa San Giovanni-Messina*	sss
Villa San Giovanni	-	*Messina-Palermo*	-
Palermo	-	*Naples-Villa San Giovanni*	-
		Ancona-Brindisi	sss
		Bari-Igoumenitsa	sss

Corridor 'Finis Terrae'

Nodes		*Arcs*	
Paris	-	*Paris-St. Nazaire*	-
St. Nazaire	-	*Paris-Irun*	-
Irun	-	*St. Nazaire-Gijon*	sss

Gijon	-	*Irun-Valladolid*	-
Valladolid	-	*Gijon-Valladolid*	-
Madrid	-	*Valladolid-Madrid*	-
Lisboa	-	*Madrid-Lisboa*	-

Corridor 'Cloverleaf'

Nodes		*Arcs*	
Glasgow	-	*Glasgow-Carlisle*	-
Carlisle	-	*Carlisle-Liverpool*	-
Liverpool	-	*Liverpool-Dublin*	sss
Dublin	-	*Liverpool-London*	-
London	-	*London-Dover*	-
Dover	-	*Dover-Calais*	sss
Calais	-	*Calais-Duisburg*	-
Duisburg	-		

Corridor 'Edelweiss'

Nodes		*Arcs*	
St. Petersburg	-	*St. Petersburg-Lappeenranta*	-
Lappeenranta	-	*Lappeenranta-Helsinki*	-
Helsinki	-	*Helsinki-Turku*	-
Turku	-	*Stockholm-Oslo*	-
Stockholm	-	*Stockholm-Malmo*	-
Oslo	-	*Oslo-Gothenburg*	-
Malmo	-	*Gothenburg-Malmo*	-
Gothenburg	-	*Malmo-Copenhagen*	-
Copenhagen	-	*Copenhagen-Taulov*	-
Taulov	-	*Copenhagen-Rodbyhavn*	-
Rodbyhavn	-	*Rodbyhavn-Puttgarden*	sss
Puttgarden	-	*Taulov-Hamburg*	-
Hamburg	-	*Puttgarden-Hamburg*	-
Hannover	-	*Hamburg-Hannover*	-
Würzburg	-	*Hannover-Würzburg*	-
Ulm	-	*Würzburg-Ulm*	-
Lugano	-	*Ulm-Lugano*	-
Milan	-	*Lugano-Milan*	-
Genoa	-	*Milan-Genoa*	-
		Turku-Stockholm	sss

Corridor 'Nureyeev'

Nodes		*Arcs*	
Helsinki	-	*Helsinki-Tallinn*	sss
Tallinn	-	*St. Petersburg-Moscow*	-
St. Petersburg	-	*Ventspils-Klaipeda*	sss
Moscow	-	*Klaipeda-Minsk*	-
Ventspils	-	*Klaipeda-Karlshamn*	sss
Klaipeda	-	*Gothenburg-Hamburg*	sss
Minsk	-	*Rostock-Gothenburg*	sss
Karlshamn	-	*Hamburg-Malmo*	sss
Gothenburg	-	*Helsinki-St. Petersburg*	sss
Hamburg	-	*Hamburg-Gdansk*	sss
Rostock	-	*Hamburg-Tallinn*	sss
Malmo	-	*Ventspils-Karlshamn*	sss
Gdansk	-	*Malmo-Helsinki*	sss
Riga	-	*Helsinki-Hamburg*	sss
Rotterdam	-	*Tallinn-Riga*	sss
Turku	-	*Rotterdam-Hamburg*	sss
		Klaipeda-Rotterdam	sss
		Rostock-Helsinki	sss
		Helsinki-Rotterdam	sss
		Turku-Gothenburg	sss
		Turku-Hamburg	sss
		Gothenburg-Rotterdam	sss
		Klaipeda-Riga	sss
		Hamburg-Riga	sss
		St. Petersburg-Hamburg	sss
		Rotterdam-Gdansk	sss
		Rotterdam-Ventspils	sss

		Rotterdam-St. Petersburg	sss

Corridor 'Strauss'

The technology is not applicable to this corridor.

Corridor 'Two Seas'

The technology is not applicable to this corridor.

Corridor 'Mare Nostrum'

Nodes		*Arcs*	
Bourgas	-	*Bourgas-Istanbul*	sss
Istanbul	-	*La Spezia-Genoa*	sss
La Spezia	-	*Marseille-Lyon*	-
Genoa	-	*Odessa-Istanbul*	sss
Marseille	-	*Constanta-Istanbul*	sss
Lyon	-	*Algeciras-Istanbul*	sss
Odessa	-	*Barcelona-Valencia*	sss
Constanta	-	*Valencia-Algeciras*	sss
Algeciras	-	*Istanbul-Athens*	sss
Barcelona	-	*Athens-Gioia Tauro*	sss
Valencia	-	*Gioia Tauro-La Spezia*	sss
Athens	-	*Marseille-Barcelona*	sss
Gioia Tauro	-	*Algeciras-Sines*	sss
Sines	-	*Genoa-Barcelona*	sss
Trieste	-	*Istanbul-Trieste*	sss
		Istanbul-Gioia Tauro	sss
		Istanbul-Algeciras	sss

Corridor 'Silk Way'

Nodes		*Arcs*	
Rotterdam	-	*Rotterdam-Shanghai*	dss
Shanghai	-	*Hamburg-Berlin*	-
Hamburg	-	*Berlin-Warsaw*	-
Berlin	-	*Warsaw-Minsk*	-
Warsaw	-	*Minsk-Moscow*	-
Minsk	-	*Moscow-Beijing*	-
Moscow	-	*Hamburg-Shanghai*	dss
Beijing	-	*St. Petersburg-Shanghai*	dss
St. Petersburg	-	*Shanghai-Gothenburg*	dss
Gothenburg	-	*Tallinn-Shanghai*	dss
Tallinn	-		

Gas engines

Technology Data

ID	Category	Transport modes
EN39	Engines and Propulsion Systems	Inland Waterways

Description
Engines running on natural gas (different solutions available, pure gas engines, gas-diesel engines, dual fuel engines)

Readiness Level	Time to Market	Energy Source	Efficiency
6	>10	Natural gas	Approximately 40 %

CO_2	NO_x	SO_x	LCC
Reduction by 10 up to 25 % compared with diesel engine (CCNR I Standard)	Reduction by 90 % compared with diesel engine (CCNR I Standard)	Reduction by 100 % compared with diesel engine (CCNR I Standard)	0

High Level Benchmark

Baseline	Traditional diesel engines
Relative Cost	
% cost savings during operation	OPEX currerntly positive but depends on price difference between gas and oil
CAPEX	CAPEX approximately 10-20% more than baseline technology.
% fuel savings	-
Emissions	
% CO2 savings	15-25%
% SOx savings	90-95%
% NOx savings	
Service & bottlenecks	
% operational or infrastructural delays reduction	-
% of frequency of service potential improvement due to delays & bottlenecks reduction	-
% of reliability improvement due to delays & bottlenecks reduction	-

Positive influence | Negative influence | Not relevant or no influence | no information

Technology Applicability per Corridor

Corridor 'Brenner'

The technology is not applicable to this corridor.

Corridor 'Finis Terrae'

The technology is not applicable to this corridor.

Corridor 'Cloverleaf'

The technology is not applicable to this corridor.

Corridor 'Edelweiss'

The technology is not applicable to this corridor.

Corridor 'Nureyeev'

The technology is not applicable to this corridor.

Corridor 'Strauss'

Nodes		*Arcs*	
Rotterdam	-	*Rotterdam-Duisburg*	Internal water transport
Duisburg	-	*Duisburg-Frankfurt*	Internal water transport
Frankfurt	-	*Frankfurt-Paris*	-
Paris	-	*Frankfurt-Nurnberg*	Internal water transport
Nurnberg	-	*Nurnberg-Vienna*	Internal water transport
Vienna	-	*Vienna-Bratislava*	Internal water transport
Bratislava	-	*Bratislava-Budapest*	Internal water transport
Budapest	-	*Budapest-Belgrade*	Internal water transport
Belgrade	-	*Belgrade-Constanta*	Internal water transport
Constanta	-		

Corridor 'Two Seas'

Nodes		*Arcs*	
Hamburg	-	*Hamburg-Berlin*	-
Berlin	-	*Berlin-Dresden*	-
Dresden	-	*Dresden-Prague*	-
Prague	-	*Prague-Nurnberg*	-
Nurnberg	-	*Prague-Bratislava*	-
Bratislava	-	*Bratislava-Budapest*	Internal water transport
Budapest	-	*Budapest-Belgrade*	Internal water transport
Belgrade	-	*Belgrade-Sofia*	-
Sofia	-	*Sofia-Thessaloniki*	-
Thessaloniki	-	*Thessaloniki-Athens*	-
Athens	-		

Corridor 'Mare Nostrum'

Nodes		*Arcs*	
Bourgas	-	*Bourgas-Istanbul*	-
Istanbul	-	*La Spezia-Genoa*	-
La Spezia	-	*Marseille-Lyon*	Internal water transport
Genoa	-	*Odessa-Istanbul*	-
Marseille	-	*Constanta-Istanbul*	-
Lyon	-	*Algeciras-Istanbul*	-
Odessa	-	*Barcelona-Valencia*	-
Constanta	-	*Valencia-Algeciras*	-
Algeciras	-	*Istanbul-Athens*	-
Barcelona	-	*Athens-Gioia Tauro*	-
Valencia	-	*Gioia Tauro-La Spezia*	-
Athens	-	*Marseille-Barcelona*	-
Gioia Tauro	-	*Algeciras-Sines*	-
Sines	-	*Genoa-Barcelona*	-
Trieste	-	*Istanbul-Trieste*	-
		Istanbul-Gioia Tauro	-
		Istanbul-Algeciras	-

Corridor 'Silk Way'

The technology is not applicable to this corridor.

CCNR III Engine

Technology Data

ID	Category	Transport modes
EN48	Engines and Propulsion Systems	Inland Waterways

Description
Still under negotiation

Readiness Level	Time to Market	Energy Source	Efficiency
9	3	MGO	Approximately 40 %

CO_2	NO_x	SO_x	LCC
661 - 680 (refernce engine output power)	4.0 - 6.6 (test stand conditions)	0.004	0

High Level Benchmark

Baseline	CCNR II Engine
Relative Cost	
% cost savings during operation	-
CAPEX	-
% fuel savings	-
Emissions	
% CO2 savings	-
% SOx savings	-
% NOx savings	
Service & bottlenecks	
% operational or infrastructural delays reduction	-
% of frequency of service potential improvement due to delays & bottlenecks reduction	-
% of reliability improvement due to delays & bottlenecks reduction	-

Positive influence | Negative influence | Not relevant or no influence | no information

Technology Applicability per Corridor

Corridor 'Brenner'

The technology is not applicable to this corridor.

Corridor 'Finis Terrae'

The technology is not applicable to this corridor.

Corridor 'Cloverleaf'

The technology is not applicable to this corridor.

Corridor 'Edelweiss'

The technology is not applicable to this corridor.

Corridor 'Nureyeev'

The technology is not applicable to this corridor.

Corridor 'Strauss'

Nodes		Arcs	
Rotterdam	-	*Rotterdam-Duisburg*	Internal water transport
Duisburg	-	*Duisburg-Frankfurt*	Internal water transport
Frankfurt	-	*Frankfurt-Paris*	-
Paris	-	*Frankfurt-Nurnberg*	Internal water transport
Nurnberg	-	*Nurnberg-Vienna*	Internal water transport
Vienna	-	*Vienna-Bratislava*	Internal water transport
Bratislava	-	*Bratislava-Budapest*	Internal water transport
Budapest	-	*Budapest-Belgrade*	Internal water transport
Belgrade	-	*Belgrade-Constanta*	Internal water transport
Constanta	-		

Corridor 'Two Seas'

Nodes		Arcs	
Hamburg	-	*Hamburg-Berlin*	-
Berlin	-	*Berlin-Dresden*	-
Dresden	-	*Dresden-Prague*	-
Prague	-	*Prague-Nurnberg*	-
Nurnberg	-	*Prague-Bratislava*	-
Bratislava	-	*Bratislava-Budapest*	Internal water transport
Budapest	-	*Budapest-Belgrade*	Internal water transport
Belgrade	-	*Belgrade-Sofia*	-
Sofia	-	*Sofia-Thessaloniki*	-
Thessaloniki	-	*Thessaloniki-Athens*	-
Athens	-		

Corridor 'Mare Nostrum'

Nodes		Arcs	
Bourgas	-	*Bourgas-Istanbul*	-
Istanbul	-	*La Spezia-Genoa*	-
La Spezia	-	*Marseille-Lyon*	Internal water transport
Genoa	-	*Odessa-Istanbul*	-
Marseille	-	*Constanta-Istanbul*	-
Lyon	-	*Algeciras-Istanbul*	-
Odessa	-	*Barcelona-Valencia*	-
Constanta	-	*Valencia-Algeciras*	-
Algeciras	-	*Istanbul-Athens*	-
Barcelona	-	*Athens-Gioia Tauro*	-
Valencia	-	*Gioia Tauro-La Spezia*	-
Athens	-	*Marseille-Barcelona*	-
Gioia Tauro	-	*Algeciras-Sines*	-
Sines	-	*Genoa-Barcelona*	-
Trieste	-	*Istanbul-Trieste*	-
		Istanbul-Gioia Tauro	-
		Istanbul-Algeciras	-

Corridor 'Silk Way'

The technology is not applicable to this corridor.

CCNR IV Engine

Technology Data

ID	Category		Transport modes
EN51	Engines and Propulsion Systems		Inland Waterways
Description			
Still under negotiation			
Readiness Level	Time to Market	Energy Source	Efficiency
3	6	MGO	Approximately 40 %
CO_2	NO_x	SO_x	LCC
662 - 680 (refernce engine output power)	0.4 (test stand conditions)	0.004	0

High Level Benchmark

Baseline	CCNR III Engine
Relative Cost	
% cost savings during operation	-
CAPEX	-
% fuel savings	-
Emissions	
% CO2 savings	-
% SOx savings	-
% NOx savings	
Service & bottlenecks	
% operational or infrastructural delays reduction	-
% of frequency of service potential improvement due to delays & bottlenecks reduction	-
% of reliability improvement due to delays & bottlenecks reduction	-

Positive influence | Negative influence | Not relevant or no influence | no information

Technology Applicability per Corridor

Corridor 'Brenner'

The technology is not applicable to this corridor.

Corridor 'Finis Terrae'

The technology is not applicable to this corridor.

Corridor 'Cloverleaf'

The technology is not applicable to this corridor.

Corridor 'Edelweiss'

The technology is not applicable to this corridor.

Corridor 'Nureyeev'

The technology is not applicable to this corridor.

Corridor 'Strauss'

Nodes		Arcs	
Rotterdam	-	*Rotterdam-Duisburg*	Internal water transport
Duisburg	-	*Duisburg-Frankfurt*	Internal water transport
Frankfurt	-	*Frankfurt-Paris*	-
Paris	-	*Frankfurt-Nurnberg*	Internal water transport
Nurnberg	-	*Nurnberg-Vienna*	Internal water transport
Vienna	-	*Vienna-Bratislava*	Internal water transport
Bratislava	-	*Bratislava-Budapest*	Internal water transport
Budapest	-	*Budapest-Belgrade*	Internal water transport
Belgrade	-	*Belgrade-Constanta*	Internal water transport
Constanta	-		

Corridor 'Two Seas'

Nodes		Arcs	
Hamburg	-	*Hamburg-Berlin*	-
Berlin	-	*Berlin-Dresden*	-
Dresden	-	*Dresden-Prague*	-
Prague	-	*Prague-Nurnberg*	-
Nurnberg	-	*Prague-Bratislava*	-
Bratislava	-	*Bratislava-Budapest*	Internal water transport
Budapest	-	*Budapest-Belgrade*	Internal water transport
Belgrade	-	*Belgrade-Sofia*	-
Sofia	-	*Sofia-Thessaloniki*	-
Thessaloniki	-	*Thessaloniki-Athens*	-
Athens	-		

Corridor 'Mare Nostrum'

Nodes		Arcs	
Bourgas	-	*Bourgas-Istanbul*	-
Istanbul	-	*La Spezia-Genoa*	-
La Spezia	-	*Marseille-Lyon*	Internal water transport
Genoa	-	*Odessa-Istanbul*	-
Marseille	-	*Constanta-Istanbul*	-
Lyon	-	*Algeciras-Istanbul*	-
Odessa	-	*Barcelona-Valencia*	-
Constanta	-	*Valencia-Algeciras*	-
Algeciras	-	*Istanbul-Athens*	-
Barcelona	-	*Athens-Gioia Tauro*	-
Valencia	-	*Gioia Tauro-La Spezia*	-
Athens	-	*Marseille-Barcelona*	-
Gioia Tauro	-	*Algeciras-Sines*	-
Sines	-	*Genoa-Barcelona*	-
Trieste	-	*Istanbul-Trieste*	-
		Istanbul-Gioia Tauro	-
		Istanbul-Algeciras	-

Corridor 'Silk Way'

The technology is not applicable to this corridor.

Counter rotating propeller

Technology Data

ID	Category	Transport modes
EN61	Engines and Propulsion Systems	Maritime

Description
Thrust system consisting of a pair of propellers behind each other which rotates in opposite directions, so that the aft propeller recovers some of the rotational energy in the slipstream from the forward propeller

Readiness Level	Time to Market	Energy Source	Efficiency
0	0	Wind	0
CO_2	NO_x	SO_x	LCC
4% reduction estimated by 2050	0	0	0

Notes on technology

Although the technology is more expensive than a single propeller system, it holds the possibility to provide fuel savings in the range of 5-15%. Although the idea and technology cannot be regarded as new, it holds the potential of significantly reducing the energy consumption. Since the cost of contra rotating propellers mostly refers to the point of installation/ acquisition, it is assumed that it has no significant impact on the transport cost. This means if installed in a vessel it will increase the capital cost in comparison to a vessel without this technology. However, in terms of energy savings the technology has a potential to provide savings in the range of 5-15% for CO2, SOx and NOx. The average speed will not be affected, but the technology allows for installation of less engine power, meaning that less energy is needed to maintain the same vessel speed. This means that average speed, frequency of sailing, and reliability can be maintained by consuming less energy.

High Level Benchmark

Baseline	Single rotating propeller
Relative Cost	
% cost savings during operation	Reduced OPEX (depends on vessel type and operational profile)
CAPEX	higher CAPEX (depends on vessel type)
% fuel savings	5-15%
Emissions	
% CO2 savings	5-15%
% SOx savings	5-15%
% NOx savings	
Service & bottlenecks	
% operational or infrastructural delays reduction	-
% of frequency of service potential improvement due to	-

delays & bottlenecks reduction	
% of reliability improvement due to delays & bottlenecks reduction	-

Positive influence | Negative influence | Not relevant or no influence | no information

Detailed Benchmark

(with respect to baseline performance on specific corridor)

Corridor	*Nureyeev*	
Mode of transport	*sss*	
Cost	*Min: 0.0%*	*Max: 0.0%*
CO2 emissions	*Min: 5.0%*	*Max: 15.0%*
SOX emissions	*Min: 4.3%*	*Max: 15.7%*
Average speed	*Min: 0.0%*	*Max: 0.0%*
Frequency	*Min: 0.0%*	*Max: 0.0%*
Reliability	*Min: 0.0%*	*Max: 0.0%*

Technology Applicability per Corridor

Corridor 'Brenner'

The technology is not applicable to this corridor.

Corridor 'Finis Terrae'

Nodes		*Arcs*	
Paris	-	*Paris-St. Nazaire*	-
St. Nazaire	-	*Paris-Irun*	-
Irun	-	*St. Nazaire-Gijon*	sss
Gijon	-	*Irun-Valladolid*	-
Valladolid	-	*Gijon-Valladolid*	-
Madrid	-	*Valladolid-Madrid*	-
Lisboa	-	*Madrid-Lisboa*	-

Corridor 'Cloverleaf'

Nodes		*Arcs*	
Glasgow	-	*Glasgow-Carlisle*	-
Carlisle	-	*Carlisle-Liverpool*	-
Liverpool	-	*Liverpool-Dublin*	sss
Dublin	-	*Liverpool-London*	-
London	-	*London-Dover*	-
Dover	-	*Dover-Calais*	sss
Calais	-	*Calais-Duisburg*	-
Duisburg	-		

Corridor 'Edelweiss'

Nodes		*Arcs*	
St. Petersburg	-	*St. Petersburg-Lappeenranta*	-
Lappeenranta	-	*Lappeenranta-Helsinki*	-
Helsinki	-	*Helsinki-Turku*	-
Turku	-	*Stockholm-Oslo*	-

Stockholm	-	*Stockholm-Malmo*	-
Oslo	-	*Oslo-Gothenburg*	-
Malmo	-	*Gothenburg-Malmo*	-
Gothenburg	-	*Malmo-Copenhagen*	-
Copenhagen	-	*Copenhagen-Taulov*	-
Taulov	-	*Copenhagen-Rodbyhavn*	-
Rodbyhavn	-	*Rodbyhavn-Puttgarden*	sss
Puttgarden	-	*Taulov-Hamburg*	-
Hamburg	-	*Puttgarden-Hamburg*	-
Hannover	-	*Hamburg-Hannover*	-
Würzburg	-	*Hannover-Würzburg*	-
Ulm	-	*Würzburg-Ulm*	-
Lugano	-	*Ulm-Lugano*	-
Milan	-	*Lugano-Milan*	-
Genoa	-	*Milan-Genoa*	-
		Turku-Stockholm	sss

Corridor 'Nureyeev'

Nodes		*Arcs*	
Helsinki	-	*Helsinki-Tallinn*	sss
Tallinn	-	*St. Petersburg-Moscow*	-
St. Petersburg	-	*Ventspils-Klaipeda*	sss
Moscow	-	*Klaipeda-Minsk*	-
Ventspils	-	*Klaipeda-Karlshamn*	sss
Klaipeda	-	*Gothenburg-Hamburg*	sss
Minsk	-	*Rostock-Gothenburg*	sss
Karlshamn	-	*Hamburg-Malmo*	sss
Gothenburg	-	*Helsinki-St. Petersburg*	sss
Hamburg	-	*Hamburg-Gdansk*	sss
Rostock	-	*Hamburg-Tallinn*	sss
Malmo	-	*Ventspils-Karlshamn*	sss
Gdansk	-	*Malmo-Helsinki*	sss
Riga	-	*Helsinki-Hamburg*	sss
Rotterdam	-	*Tallinn-Riga*	sss
Turku	-	*Rotterdam-Hamburg*	sss
		Klaipeda-Rotterdam	sss
		Rostock-Helsinki	sss
		Helsinki-Rotterdam	sss
		Turku-Gothenburg	sss
		Turku-Hamburg	sss
		Gothenburg-Rotterdam	sss
		Klaipeda-Riga	sss
		Hamburg-Riga	sss
		St. Petersburg-Hamburg	sss
		Rotterdam-Gdansk	sss
		Rotterdam-Ventspils	sss
		Rotterdam-St. Petersburg	sss

Corridor 'Strauss'

The technology is not applicable to this corridor.

Corridor 'Two Seas'

The technology is not applicable to this corridor.

Corridor 'Mare Nostrum'

Nodes		*Arcs*	
Bourgas	-	*Bourgas-Istanbul*	sss
Istanbul	-	*La Spezia-Genoa*	sss
La Spezia	-	*Marseille-Lyon*	-
Genoa	-	*Odessa-Istanbul*	sss
Marseille	-	*Constanta-Istanbul*	sss
Lyon	-	*Algeciras-Istanbul*	sss
Odessa	-	*Barcelona-Valencia*	sss
Constanta	-	*Valencia-Algeciras*	sss
Algeciras	-	*Istanbul-Athens*	sss
Barcelona	-	*Athens-Gioia Tauro*	sss
Valencia	-	*Gioia Tauro-La Spezia*	sss
Athens	-	*Marseille-Barcelona*	sss

Gioia Tauro	-	*Algeciras-Sines*	sss
Sines	-	*Genoa-Barcelona*	sss
Trieste	-	*Istanbul-Trieste*	sss
		Istanbul-Gioia Tauro	sss
		Istanbul-Algeciras	sss

Corridor 'Silk Way'

Nodes		*Arcs*	
Rotterdam	-	*Rotterdam-Shanghai*	dss
Shanghai	-	*Hamburg-Berlin*	-
Hamburg	-	*Berlin-Warsaw*	-
Berlin	-	*Warsaw-Minsk*	-
Warsaw	-	*Minsk-Moscow*	-
Minsk	-	*Moscow-Beijing*	-
Moscow	-	*Hamburg-Shanghai*	dss
Beijing	-	*St. Petersburg-Shanghai*	dss
St. Petersburg	-	*Shanghai-Gothenburg*	dss
Gothenburg	-	*Tallinn-Shanghai*	dss
Tallinn	-		

Diesel-Electric propulsion with dual fuel engine

Technology Data

ID	Category	Transport modes
EN11	Engines and Propulsion Systems	Maritime

Description
Medium speed engine using LNG (Liquefied Natural Gas) as primary fuel and HFO (Heavy Fuel Oil) or MDO (Marine Diesel Oil) as pilot fuel. The engine runs generator. An electric motor runs propeller shaft. 20 year life time, running 5500 h/a.

Readiness Level	Time to Market	Energy Source	Efficiency
8	<1		30

CO_2	NO_x	SO_x	LCC
1530	4	0	23600

High Level Benchmark

Baseline		Conventional diesel
Relative Cost		
% cost savings during operation		OPEX currently positive but depends on price difference between gas and oil
CAPEX		CAPEX approximately 10-20% more than baseline technology
% fuel savings		-
Emissions		
% CO2 savings		10-20%
% SOx savings		90-99%
% NOx savings		
Service & bottlenecks		
% operational or infrastructural delays reduction		-
% of frequency of service potential improvement due to delays & bottlenecks reduction		-
% of reliability improvement due to delays & bottlenecks reduction		-

Positive influence | Negative influence | Not relevant or no influence | no information

Technology Applicability per Corridor

Corridor 'Brenner'	
Nodes	Arcs

Malmo	-	*Malmo-Trelleborg*	-
Trelleborg	-	*Trelleborg-Sassnitz*	sss
Sassnitz	-	*Trelleborg-Rostock*	sss
Rostock	-	*Sassnitz-Berlin*	-
Berlin	-	*Rostock-Berlin*	-
Nurnberg	-	*Berlin-Nurnberg*	-
Munich	-	*Nurnberg-Munich*	-
Salzburg	-	*Munich-Salzburg*	-
Villach	-	*Salzburg-Villach*	-
Trieste	-	*Villach-Trieste*	-
Verona	-	*Munich-Verona*	-
Bologna	-	*Verona-Bologna*	-
Ancona	-	*Bologna-Ancona*	-
Bari	-	*Ancona-Bari*	-
Brindisi	-	*Bari-Brindisi*	-
Igoumenitsa	-	*Igoumenitsa-Thessaloniki*	-
Thessaloniki	-	*Igoumenitsa-Patras*	sss
Patras	-	*Patras-Athens*	-
Athens	-	*Bologna-Rome*	-
Rome	-	*Rome-Naples*	-
Naples	-	*Naples-Messina*	sss
Messina	-	*Villa San Giovanni-Messina*	sss
Villa San Giovanni	-	*Messina-Palermo*	-
Palermo	-	*Naples-Villa San Giovanni*	-
		Ancona-Brindisi	sss
		Bari-Igoumenitsa	sss

Corridor 'Finis Terrae'

Nodes		*Arcs*	
Paris	-	*Paris-St. Nazaire*	-
St. Nazaire	-	*Paris-Irun*	-
Irun	-	*St. Nazaire-Gijon*	sss
Gijon	-	*Irun-Valladolid*	-
Valladolid	-	*Gijon-Valladolid*	-
Madrid	-	*Valladolid-Madrid*	-
Lisboa	-	*Madrid-Lisboa*	-

Corridor 'Cloverleaf'

Nodes		*Arcs*	
Glasgow	-	*Glasgow-Carlisle*	-
Carlisle	-	*Carlisle-Liverpool*	-
Liverpool	-	*Liverpool-Dublin*	sss
Dublin	-	*Liverpool-London*	-
London	-	*London-Dover*	-
Dover	-	*Dover-Calais*	sss
Calais	-	*Calais-Duisburg*	-
Duisburg	-		

Corridor 'Edelweiss'

Nodes		*Arcs*	
St. Petersburg	-	*St. Petersburg-Lappeenranta*	-
Lappeenranta	-	*Lappeenranta-Helsinki*	-
Helsinki	-	*Helsinki-Turku*	-
Turku	-	*Stockholm-Oslo*	-
Stockholm	-	*Stockholm-Malmo*	-
Oslo	-	*Oslo-Gothenburg*	-
Malmo	-	*Gothenburg-Malmo*	-
Gothenburg	-	*Malmo-Copenhagen*	-
Copenhagen	-	*Copenhagen-Taulov*	-
Taulov	-	*Copenhagen-Rodbyhavn*	-
Rodbyhavn	-	*Rodbyhavn-Puttgarden*	sss
Puttgarden	-	*Taulov-Hamburg*	-
Hamburg	-	*Puttgarden-Hamburg*	-
Hannover	-	*Hamburg-Hannover*	-
Würzburg	-	*Hannover-Würzburg*	-
Ulm	-	*Würzburg-Ulm*	-
Lugano	-	*Ulm-Lugano*	-
Milan	-	*Lugano-Milan*	-

Genoa	-	*Milan-Genoa*	-
		Turku-Stockholm	sss

Corridor 'Nureyeev'

Nodes		*Arcs*	
Helsinki	-	*Helsinki-Tallinn*	sss
Tallinn	-	*St. Petersburg-Moscow*	-
St. Petersburg	-	*Ventspils-Klaipeda*	sss
Moscow	-	*Klaipeda-Minsk*	-
Ventspils	-	*Klaipeda-Karlshamn*	sss
Klaipeda	-	*Gothenburg-Hamburg*	sss
Minsk	-	*Rostock-Gothenburg*	sss
Karlshamn	-	*Hamburg-Malmo*	sss
Gothenburg	-	*Helsinki-St. Petersburg*	sss
Hamburg	-	*Hamburg-Gdansk*	sss
Rostock	-	*Hamburg-Tallinn*	sss
Malmo	-	*Ventspils-Karlshamn*	sss
Gdansk	-	*Malmo-Helsinki*	sss
Riga	-	*Helsinki-Hamburg*	sss
Rotterdam	-	*Tallinn-Riga*	-
Turku	-	*Rotterdam-Hamburg*	sss
		Klaipeda-Rotterdam	sss
		Rostock-Helsinki	sss
		Helsinki-Rotterdam	sss
		Turku-Gothenburg	sss
		Turku-Hamburg	sss
		Gothenburg-Rotterdam	sss
		Klaipeda-Riga	sss
		Hamburg-Riga	sss
		St. Petersburg-Hamburg	sss
		Rotterdam-Gdansk	sss
		Rotterdam-Ventspils	sss
		Rotterdam-St. Petersburg	sss

Corridor 'Strauss'

The technology is not applicable to this corridor.

Corridor 'Two Seas'

The technology is not applicable to this corridor.

Corridor 'Mare Nostrum'

Nodes		*Arcs*	
Bourgas	-	*Bourgas-Istanbul*	sss
Istanbul	-	*La Spezia-Genoa*	sss
La Spezia	-	*Marseille-Lyon*	-
Genoa	-	*Odessa-Istanbul*	sss
Marseille	-	*Constanta-Istanbul*	sss
Lyon	-	*Algeciras-Istanbul*	sss
Odessa	-	*Barcelona-Valencia*	sss
Constanta	-	*Valencia-Algeciras*	sss
Algeciras	-	*Istanbul-Athens*	sss
Barcelona	-	*Athens-Gioia Tauro*	sss
Valencia	-	*Gioia Tauro-La Spezia*	sss
Athens	-	*Marseille-Barcelona*	sss
Gioia Tauro	-	*Algeciras-Sines*	sss
Sines	-	*Genoa-Barcelona*	sss
Trieste	-	*Istanbul-Trieste*	sss
		Istanbul-Gioia Tauro	sss
		Istanbul-Algeciras	sss

Corridor 'Silk Way'

Nodes		*Arcs*	
Rotterdam	-	*Rotterdam-Shanghai*	dss
Shanghai	-	*Hamburg-Berlin*	-
Hamburg	-	*Berlin-Warsaw*	-
Berlin	-	*Warsaw-Minsk*	-
Warsaw	-	*Minsk-Moscow*	-

Minsk	-	*Moscow-Beijing*	-
Moscow	-	*Hamburg-Shanghai*	dss
Beijing	-	*St. Petersburg-Shanghai*	dss
St. Petersburg	-	*Shanghai-Gothenburg*	dss
Gothenburg	-	*Tallinn-Shanghai*	dss
Tallinn	-		

Fuel cell technology

Technology Data

ID	Category	Transport modes	
EN18	Engines and Propulsion Systems	Road	
Description			
> 3,5 ton transporter running on renewable fuel cell technology			
Readiness Level	Time to Market	Energy Source	Efficiency
9	<1		double as much as Diesel (ca. 70%)
CO_2	NO_x	SO_x	LCC
close to 0	close to 0	---	n.a.

High Level Benchmark

Baseline	0	
Relative Cost		
% cost savings during operation	the efficiency of the fuel cell system will reduce drastically the energy bill (in the case of a mass production of fuel cells).	
CAPEX	-	
% fuel savings	-	
Emissions		
% CO2 savings	50%	
% SOx savings	100%	
% NOx savings		
Service & bottlenecks		
% operational or infrastructural delays reduction	-	
% of frequency of service potential improvement due to delays & bottlenecks reduction	-	
% of reliability improvement due to delays & bottlenecks reduction	-	

Positive influence | Negative influence | Not relevant or no influence | no information

Technology Applicability per Corridor

Corridor 'Brenner'			
Nodes		Arcs	
Malmo	Road	Malmo-Trelleborg	Road

Trelleborg	Road	*Trelleborg-Sassnitz*	-
Sassnitz	Road	*Trelleborg-Rostock*	-
Rostock	Road	*Sassnitz-Berlin*	Road
Berlin	Road	*Rostock-Berlin*	Road
Nurnberg	Road	*Berlin-Nurnberg*	Road
Munich	Road	*Nurnberg-Munich*	Road
Salzburg	Road	*Munich-Salzburg*	Road
Villach	Road	*Salzburg-Villach*	Road
Trieste	Road	*Villach-Trieste*	Road
Verona	Road	*Munich-Verona*	Road
Bologna	Road	*Verona-Bologna*	Road
Ancona	Road	*Bologna-Ancona*	Road
Bari	Road	*Ancona-Bari*	Road
Brindisi	Road	*Bari-Brindisi*	Road
Igoumenitsa	Road	*Igoumenitsa-Thessaloniki*	Road
Thessaloniki	Road	*Igoumenitsa-Patras*	-
Patras	Road	*Patras-Athens*	Road
Athens	Road	*Bologna-Rome*	Road
Rome	Road	*Rome-Naples*	Road
Naples	Road	*Naples-Messina*	-
Messina	Road	*Villa San Giovanni-Messina*	-
Villa San Giovanni	Road	*Messina-Palermo*	Road
Palermo	Road	*Naples-Villa San Giovanni*	Road
		Ancona-Brindisi	-
		Bari-Igoumenitsa	-

Corridor 'Finis Terrae'

Nodes		*Arcs*	
Paris	Road	*Paris-St. Nazaire*	Road
St. Nazaire	Road	*Paris-Irun*	Road
Irun	Road	*St. Nazaire-Gijon*	-
Gijon	Road	*Irun-Valladolid*	Road
Valladolid	Road	*Gijon-Valladolid*	Road
Madrid	Road	*Valladolid-Madrid*	Road
Lisboa	Road	*Madrid-Lisboa*	Road

Corridor 'Cloverleaf'

Nodes		*Arcs*	
Glasgow	Road	*Glasgow-Carlisle*	Road
Carlisle	Road	*Carlisle-Liverpool*	Road
Liverpool	Road	*Liverpool-Dublin*	-
Dublin	-	*Liverpool-London*	Road
London	Road	*London-Dover*	Road
Dover	Road	*Dover-Calais*	-
Calais	Road	*Calais-Duisburg*	Road
Duisburg	Road		

Corridor 'Edelweiss'

Nodes		*Arcs*	
St. Petersburg	Road	*St. Petersburg-Lappeenranta*	Road
Lappeenranta	Road	*Lappeenranta-Helsinki*	Road
Helsinki	Road	*Helsinki-Turku*	Road
Turku	Road	*Stockholm-Oslo*	Road
Stockholm	Road	*Stockholm-Malmo*	Road
Oslo	Road	*Oslo-Gothenburg*	Road
Malmo	Road	*Gothenburg-Malmo*	Road
Gothenburg	Road	*Malmo-Copenhagen*	Road
Copenhagen	Road	*Copenhagen-Taulov*	Road
Taulov	Road	*Copenhagen-Rodbyhavn*	Road
Rodbyhavn	Road	*Rodbyhavn-Puttgarden*	-
Puttgarden	Road	*Taulov-Hamburg*	Road
Hamburg	Road	*Puttgarden-Hamburg*	Road
Hannover	Road	*Hamburg-Hannover*	Road
Würzburg	Road	*Hannover-Würzburg*	Road
Ulm	Road	*Würzburg-Ulm*	Road
Lugano	Road	*Ulm-Lugano*	Road
Milan	Road	*Lugano-Milan*	Road
Genoa	Road	*Milan-Genoa*	Road

		Turku-Stockholm	-

Corridor 'Nureyeev'

Nodes		*Arcs*	
Helsinki	Road	*Helsinki-Tallinn*	-
Tallinn	-	*St. Petersburg-Moscow*	-
St. Petersburg	Road	*Ventspils-Klaipeda*	-
Moscow	-	*Klaipeda-Minsk*	-
Ventspils	-	*Klaipeda-Karlshamn*	-
Klaipeda	-	*Gothenburg-Hamburg*	-
Minsk	-	*Rostock-Gothenburg*	-
Karlshamn	-	*Hamburg-Malmo*	-
Gothenburg	Road	*Helsinki-St. Petersburg*	-
Hamburg	Road	*Hamburg-Gdansk*	-
Rostock	Road	*Hamburg-Tallinn*	-
Malmo	Road	*Ventspils-Karlshamn*	-
Gdansk	-	*Malmo-Helsinki*	-
Riga	-	*Helsinki-Hamburg*	-
Rotterdam	Road	*Tallinn-Riga*	-
Turku	Road	*Rotterdam-Hamburg*	-
		Klaipeda-Rotterdam	-
		Rostock-Helsinki	-
		Helsinki-Rotterdam	-
		Turku-Gothenburg	-
		Turku-Hamburg	-
		Gothenburg-Rotterdam	-
		Klaipeda-Riga	-
		Hamburg-Riga	-
		St. Petersburg-Hamburg	-
		Rotterdam-Gdansk	-
		Rotterdam-Ventspils	-
		Rotterdam-St. Petersburg	-

Corridor 'Strauss'

Nodes		*Arcs*	
Rotterdam	Road	*Rotterdam-Duisburg*	-
Duisburg	Road	*Duisburg-Frankfurt*	-
Frankfurt	Road	*Frankfurt-Paris*	-
Paris	Road	*Frankfurt-Nurnberg*	-
Nurnberg	Road	*Nurnberg-Vienna*	-
Vienna	Road	*Vienna-Bratislava*	-
Bratislava	Road	*Bratislava-Budapest*	-
Budapest	Road	*Budapest-Belgrade*	-
Belgrade	Road	*Belgrade-Constanta*	-
Constanta	Road		

Corridor 'Two Seas'

Nodes		*Arcs*	
Hamburg	Road	*Hamburg-Berlin*	-
Berlin	Road	*Berlin-Dresden*	-
Dresden	Road	*Dresden-Prague*	-
Prague	Road	*Prague-Nurnberg*	-
Nurnberg	Road	*Prague-Bratislava*	-
Bratislava	Road	*Bratislava-Budapest*	-
Budapest	Road	*Budapest-Belgrade*	-
Belgrade	Road	*Belgrade-Sofia*	-
Sofia	Road	*Sofia-Thessaloniki*	-
Thessaloniki	Road	*Thessaloniki-Athens*	-
Athens	Road		

Corridor 'Mare Nostrum'

Nodes		*Arcs*	
Bourgas	-	*Bourgas-Istanbul*	-
Istanbul	-	*La Spezia-Genoa*	-
La Spezia	-	*Marseille-Lyon*	Road
Genoa	Road	*Odessa-Istanbul*	-
Marseille	Road	*Constanta-Istanbul*	-
Lyon	Road	*Algeciras-Istanbul*	-

Odessa	-	*Barcelona-Valencia*	-
Constanta	Road	*Valencia-Algeciras*	-
Algeciras	Road	*Istanbul-Athens*	-
Barcelona	Road	*Athens-Gioia Tauro*	-
Valencia	Road	*Gioia Tauro-La Spezia*	-
Athens	Road	*Marseille-Barcelona*	-
Gioia Tauro	-	*Algeciras-Sines*	-
Sines	-	*Genoa-Barcelona*	-
Trieste	Road	*Istanbul-Trieste*	-
		Istanbul-Gioia Tauro	-
		Istanbul-Algeciras	-

Corridor 'Silk Way'

Nodes		*Arcs*	
Rotterdam	Road	*Rotterdam-Shanghai*	-
Shanghai	-	*Hamburg-Berlin*	-
Hamburg	Road	*Berlin-Warsaw*	-
Berlin	Road	*Warsaw-Minsk*	-
Warsaw	-	*Minsk-Moscow*	-
Minsk	-	*Moscow-Beijing*	-
Moscow	-	*Hamburg-Shanghai*	-
Beijing	-	*St. Petersburg-Shanghai*	-
St. Petersburg	Road	*Shanghai-Gothenburg*	-
Gothenburg	Road	*Tallinn-Shanghai*	-
Tallinn	-		

Fuels and sources of energy

Ethanol and bio-diesel

Technology Data

ID	Category		Transport modes
FU02	Fuels and sources of energy		Maritime, Road
Description			
Investigation about using alternative fuels.			
Readiness Level	Time to Market	Energy Source	Efficiency
3	3	0	-
CO_2	NO_x	SO_x	LCC
			-

High Level Benchmark

Baseline		Diesel 10 ppm
Relative Cost		
% cost savings during operation		-
CAPEX		-
% fuel savings		1-2% for biodiesel
Emissions		
% CO2 savings		Bioethanol: 70-85%, biodiesel 15-75%
% SOx savings		Bioethanol: ~100%, biodiesel: 20-100%
% NOx savings		
Service & bottlenecks		
% operational or infrastructural delays reduction		-
% of frequency of service potential improvement due to delays & bottlenecks reduction		-
% of reliability improvement due to delays & bottlenecks reduction		-

Positive influence | Negative influence | Not relevant or no influence | no information

Technology Applicability per Corridor

Corridor 'Brenner'

Nodes		Arcs	
Malmo	-	*Malmo-Trelleborg*	-
Trelleborg	-	*Trelleborg-Sassnitz*	sss
Sassnitz	-	*Trelleborg-Rostock*	sss
Rostock	-	*Sassnitz-Berlin*	-
Berlin	-	*Rostock-Berlin*	-
Nurnberg	-	*Berlin-Nurnberg*	-
Munich	-	*Nurnberg-Munich*	-
Salzburg	-	*Munich-Salzburg*	-
Villach	-	*Salzburg-Villach*	-
Trieste	-	*Villach-Trieste*	-
Verona	-	*Munich-Verona*	-
Bologna	-	*Verona-Bologna*	-
Ancona	-	*Bologna-Ancona*	-
Bari	-	*Ancona-Bari*	-
Brindisi	-	*Bari-Brindisi*	-
Igoumenitsa	-	*Igoumenitsa-Thessaloniki*	-
Thessaloniki	-	*Igoumenitsa-Patras*	sss
Patras	-	*Patras-Athens*	-
Athens	-	*Bologna-Rome*	-
Rome	-	*Rome-Naples*	-
Naples	-	*Naples-Messina*	sss
Messina	-	*Villa San Giovanni-Messina*	sss
Villa San Giovanni	-	*Messina-Palermo*	-
Palermo	-	*Naples-Villa San Giovanni*	-
		Ancona-Brindisi	sss
		Bari-Igoumenitsa	sss

Corridor 'Finis Terrae'

Nodes		Arcs	
Paris	-	*Paris-St. Nazaire*	Road
St. Nazaire	-	*Paris-Irun*	Road
Irun	-	*St. Nazaire-Gijon*	sss
Gijon	-	*Irun-Valladolid*	Road
Valladolid	-	*Gijon-Valladolid*	Road
Madrid	-	*Valladolid-Madrid*	Road
Lisboa	-	*Madrid-Lisboa*	Road

Corridor 'Cloverleaf'

Nodes		Arcs	
Glasgow	-	*Glasgow-Carlisle*	Road
Carlisle	-	*Carlisle-Liverpool*	Road
Liverpool	-	*Liverpool-Dublin*	sss
Dublin	-	*Liverpool-London*	Road
London	-	*London-Dover*	Road
Dover	-	*Dover-Calais*	sss
Calais	-	*Calais-Duisburg*	Road
Duisburg	-		

Corridor 'Edelweiss'

Nodes		Arcs	
St. Petersburg	-	*St. Petersburg-Lappeenranta*	Road
Lappeenranta	-	*Lappeenranta-Helsinki*	Road
Helsinki	-	*Helsinki-Turku*	Road
Turku	-	*Stockholm-Oslo*	Road
Stockholm	-	*Stockholm-Malmo*	Road
Oslo	-	*Oslo-Gothenburg*	Road
Malmo	-	*Gothenburg-Malmo*	Road
Gothenburg	-	*Malmo-Copenhagen*	Road
Copenhagen	-	*Copenhagen-Taulov*	Road
Taulov	-	*Copenhagen-Rodbyhavn*	Road
Rodbyhavn	-	*Rodbyhavn-Puttgarden*	sss
Puttgarden	-	*Taulov-Hamburg*	Road
Hamburg	-	*Puttgarden-Hamburg*	Road
Hannover	-	*Hamburg-Hannover*	Road
Würzburg	-	*Hannover-Würzburg*	Road
Ulm	-	*Würzburg-Ulm*	Road
Lugano	-	*Ulm-Lugano*	Road

Milan	-	*Lugano-Milan*	Road
Genoa	-	*Milan-Genoa*	Road
		Turku-Stockholm	sss

Corridor 'Nureyeev'

Nodes		*Arcs*	
Helsinki	-	*Helsinki-Tallinn*	sss
Tallinn	-	*St. Petersburg-Moscow*	Road
St. Petersburg	-	*Ventspils-Klaipeda*	sss
Moscow	-	*Klaipeda-Minsk*	Road
Ventspils	-	*Klaipeda-Karlshamn*	sss
Klaipeda	-	*Gothenburg-Hamburg*	sss
Minsk	-	*Rostock-Gothenburg*	sss
Karlshamn	-	*Hamburg-Malmo*	sss
Gothenburg	-	*Helsinki-St. Petersburg*	sss
Hamburg	-	*Hamburg-Gdansk*	sss
Rostock	-	*Hamburg-Tallinn*	sss
Malmo	-	*Ventspils-Karlshamn*	sss
Gdansk	-	*Malmo-Helsinki*	sss
Riga	-	*Helsinki-Hamburg*	sss
Rotterdam	-	*Tallinn-Riga*	sss
Turku	-	*Rotterdam-Hamburg*	sss
		Klaipeda-Rotterdam	sss
		Rostock-Helsinki	sss
		Helsinki-Rotterdam	sss
		Turku-Gothenburg	sss
		Turku-Hamburg	sss
		Gothenburg-Rotterdam	sss
		Klaipeda-Riga	sss
		Hamburg-Riga	sss
		St. Petersburg-Hamburg	sss
		Rotterdam-Gdansk	sss
		Rotterdam-Ventspils	sss
		Rotterdam-St. Petersburg	sss

Corridor 'Strauss'

Nodes		*Arcs*	
Rotterdam	-	*Rotterdam-Duisburg*	Road
Duisburg	-	*Duisburg-Frankfurt*	Road
Frankfurt	-	*Frankfurt-Paris*	Road
Paris	-	*Frankfurt-Nurnberg*	Road
Nurnberg	-	*Nurnberg-Vienna*	Road
Vienna	-	*Vienna-Bratislava*	Road
Bratislava	-	*Bratislava-Budapest*	-
Budapest	-	*Budapest-Belgrade*	-
Belgrade	-	*Belgrade-Constanta*	Road
Constanta	-		

Corridor 'Two Seas'

Nodes		*Arcs*	
Hamburg	-	*Hamburg-Berlin*	Road
Berlin	-	*Berlin-Dresden*	Road
Dresden	-	*Dresden-Prague*	Road
Prague	-	*Prague-Nurnberg*	Road
Nurnberg	-	*Prague-Bratislava*	Road
Bratislava	-	*Bratislava-Budapest*	Road
Budapest	-	*Budapest-Belgrade*	Road
Belgrade	-	*Belgrade-Sofia*	Road
Sofia	-	*Sofia-Thessaloniki*	Road
Thessaloniki	-	*Thessaloniki-Athens*	Road
Athens	-		

Corridor 'Mare Nostrum'

Nodes		*Arcs*	
Bourgas	-	*Bourgas-Istanbul*	-
Istanbul	-	*La Spezia-Genoa*	-
La Spezia	-	*Marseille-Lyon*	Road
Genoa	-	*Odessa-Istanbul*	-

Marseille	Road	*Constanta-Istanbul*	-
Lyon	Road	*Algeciras-Istanbul*	-
Odessa	-	*Barcelona-Valencia*	Road, sss
Constanta	-	*Valencia-Algeciras*	Road, sss
Algeciras	Road	*Istanbul-Athens*	-
Barcelona	Road	*Athens-Gioia Tauro*	-
Valencia	Road	*Gioia Tauro-La Spezia*	-
Athens	-	*Marseille-Barcelona*	Road, sss
Gioia Tauro	-	*Algeciras-Sines*	sss
Sines	-	*Genoa-Barcelona*	-
Trieste	-	*Istanbul-Trieste*	-
		Istanbul-Gioia Tauro	-
		Istanbul-Algeciras	-

Corridor 'Silk Way'

Nodes		*Arcs*	
Rotterdam	-	*Rotterdam-Shanghai*	dss
Shanghai	-	*Hamburg-Berlin*	-
Hamburg	-	*Berlin-Warsaw*	-
Berlin	-	*Warsaw-Minsk*	-
Warsaw	-	*Minsk-Moscow*	-
Minsk	-	*Moscow-Beijing*	-
Moscow	-	*Hamburg-Shanghai*	dss
Beijing	-	*St. Petersburg-Shanghai*	dss
St. Petersburg	-	*Shanghai-Gothenburg*	dss
Gothenburg	-	*Tallinn-Shanghai*	dss
Tallinn	-		

CGN (compressed natural gas)

Technology Data

ID	Category	Transport modes
FU03	Fuels and sources of energy	Inland Waterways, Road
Description		
Cleaner fuel for yard handling equipment (Prime movers)		

Readiness Level	Time to Market	Energy Source	Efficiency
9	<1	0	-
CO_2	NO_x	SO_x	LCC
IWW: Reduction by 10 up to 25 % compared with diesel engine (CCNR I Standard)	IWW: Reduction by 98.5 % compared with diesel engine (CCNR I Standard)	IWW: Reduction by 100 % compared with diesel engine (CCNR I Standard)	-

High Level Benchmark

Baseline		ULSD
Relative Cost		
% cost savings during operation		Depending on the tax rates, emission taxes per country/region, future fuel prices
CAPEX		-
% fuel savings		-
Emissions		
% CO2 savings		Road: 2-6%
% SOx savings		90-95%
% NOx savings		
Service & bottlenecks		
% operational or infrastructural delays reduction		-
% of frequency of service potential improvement due to delays & bottlenecks reduction		-
% of reliability improvement due to delays & bottlenecks reduction		-

Positive influence | Negative influence | Not relevant or no influence | no information

Technology Applicability per Corridor

Corridor 'Brenner'

Nodes		Arcs	
Malmo	Road	*Malmo-Trelleborg*	-
Trelleborg	Road	*Trelleborg-Sassnitz*	-
Sassnitz	Road	*Trelleborg-Rostock*	-
Rostock	Road	*Sassnitz-Berlin*	-
Berlin	Road	*Rostock-Berlin*	-
Nurnberg	Road	*Berlin-Nurnberg*	-
Munich	Road	*Nurnberg-Munich*	-
Salzburg	Road	*Munich-Salzburg*	-
Villach	Road	*Salzburg-Villach*	-
Trieste	Road	*Villach-Trieste*	-
Verona	Road	*Munich-Verona*	-
Bologna	Road	*Verona-Bologna*	-
Ancona	Road	*Bologna-Ancona*	-
Bari	Road	*Ancona-Bari*	-
Brindisi	Road	*Bari-Brindisi*	-
Igoumenitsa	Road	*Igoumenitsa-Thessaloniki*	-
Thessaloniki	Road	*Igoumenitsa-Patras*	-
Patras	Road	*Patras-Athens*	-
Athens	Road	*Bologna-Rome*	-
Rome	Road	*Rome-Naples*	-
Naples	Road	*Naples-Messina*	-
Messina	Road	*Villa San Giovanni-Messina*	-
Villa San Giovanni	Road	*Messina-Palermo*	-
Palermo	Road	*Naples-Villa San Giovanni*	-
		Ancona-Brindisi	-
		Bari-Igoumenitsa	-

Corridor 'Finis Terrae'

Nodes		Arcs	
Paris	Road	*Paris-St. Nazaire*	-
St. Nazaire	Road	*Paris-Irun*	-
Irun	Road	*St. Nazaire-Gijon*	-
Gijon	Road	*Irun-Valladolid*	-
Valladolid	Road	*Gijon-Valladolid*	-
Madrid	Road	*Valladolid-Madrid*	-
Lisboa	Road	*Madrid-Lisboa*	-

Corridor 'Cloverleaf'

Nodes		Arcs	
Glasgow	Road	*Glasgow-Carlisle*	-
Carlisle	Road	*Carlisle-Liverpool*	-
Liverpool	Road	*Liverpool-Dublin*	-
Dublin	-	*Liverpool-London*	-
London	Road	*London-Dover*	-
Dover	Road	*Dover-Calais*	-
Calais	Road	*Calais-Duisburg*	-
Duisburg	Road		

Corridor 'Edelweiss'

Nodes		Arcs	
St. Petersburg	Road	*St. Petersburg-Lappeenranta*	Road
Lappeenranta	Road	*Lappeenranta-Helsinki*	Road
Helsinki	Road	*Helsinki-Turku*	Road
Turku	Road	*Stockholm-Oslo*	Road
Stockholm	Road	*Stockholm-Malmo*	Road
Oslo	Road	*Oslo-Gothenburg*	Road
Malmo	Road	*Gothenburg-Malmo*	Road
Gothenburg	Road	*Malmo-Copenhagen*	Road
Copenhagen	Road	*Copenhagen-Taulov*	Road
Taulov	Road	*Copenhagen-Rodbyhavn*	Road
Rodbyhavn	Road	*Rodbyhavn-Puttgarden*	-
Puttgarden	Road	*Taulov-Hamburg*	Road
Hamburg	Road	*Puttgarden-Hamburg*	Road
Hannover	Road	*Hamburg-Hannover*	Road
Würzburg	Road	*Hannover-Würzburg*	Road
Ulm	Road	*Würzburg-Ulm*	Road
Lugano	Road	*Ulm-Lugano*	Road

Milan	Road	*Lugano-Milan*	Road
Genoa	Road	*Milan-Genoa*	Road
		Turku-Stockholm	-

Corridor 'Nureyeev'

Nodes		*Arcs*	
Helsinki	Road	*Helsinki-Tallinn*	-
Tallinn	-	*St. Petersburg-Moscow*	Road
St. Petersburg	Road	*Ventspils-Klaipeda*	-
Moscow	Road	*Klaipeda-Minsk*	Road
Ventspils	-	*Klaipeda-Karlshamn*	-
Klaipeda	Road	*Gothenburg-Hamburg*	-
Minsk	Road	*Rostock-Gothenburg*	-
Karlshamn	-	*Hamburg-Malmo*	-
Gothenburg	Road	*Helsinki-St. Petersburg*	-
Hamburg	Road	*Hamburg-Gdansk*	-
Rostock	Road	*Hamburg-Tallinn*	-
Malmo	Road	*Ventspils-Karlshamn*	-
Gdansk	-	*Malmo-Helsinki*	-
Riga	-	*Helsinki-Hamburg*	-
Rotterdam	Road	*Tallinn-Riga*	-
Turku	Road	*Rotterdam-Hamburg*	-
		Klaipeda-Rotterdam	-
		Rostock-Helsinki	-
		Helsinki-Rotterdam	-
		Turku-Gothenburg	-
		Turku-Hamburg	-
		Gothenburg-Rotterdam	-
		Klaipeda-Riga	-
		Hamburg-Riga	-
		St. Petersburg-Hamburg	-
		Rotterdam-Gdansk	-
		Rotterdam-Ventspils	-
		Rotterdam-St. Petersburg	-

Corridor 'Strauss'

Nodes		*Arcs*	
Rotterdam	Road	*Rotterdam-Duisburg*	Internal water transport, Road
Duisburg	Road	*Duisburg-Frankfurt*	Internal water transport, Road
Frankfurt	Road	*Frankfurt-Paris*	Road
Paris	Road	*Frankfurt-Nurnberg*	Internal water transport, Road
Nurnberg	Road	*Nurnberg-Vienna*	Internal water transport, Road
Vienna	Road	*Vienna-Bratislava*	Internal water transport, Road
Bratislava	Road	*Bratislava-Budapest*	Internal water transport, Road
Budapest	Road	*Budapest-Belgrade*	Internal water transport, Road
Belgrade	Road	*Belgrade-Constanta*	Internal water transport, Road
Constanta	Road		

Corridor 'Two Seas'

Nodes		*Arcs*	
Hamburg	Road	*Hamburg-Berlin*	Road
Berlin	Road	*Berlin-Dresden*	Road
Dresden	Road	*Dresden-Prague*	Road
Prague	Road	*Prague-Nurnberg*	Road
Nurnberg	Road	*Prague-Bratislava*	Road
Bratislava	Road	*Bratislava-Budapest*	Road
Budapest	Road	*Budapest-Belgrade*	Road
Belgrade	Road	*Belgrade-Sofia*	Road
Sofia	Road	*Sofia-Thessaloniki*	Road
Thessaloniki	Road	*Thessaloniki-Athens*	Road
Athens	Road		

Corridor 'Mare Nostrum'

Nodes		*Arcs*	
Bourgas	-	*Bourgas-Istanbul*	-
Istanbul	-	*La Spezia-Genoa*	-
La Spezia	-	*Marseille-Lyon*	Internal water transport, Road
Genoa	Road	*Odessa-Istanbul*	-

Marseille	Road	*Constanta-Istanbul*	-
Lyon	Road	*Algeciras-Istanbul*	-
Odessa	-	*Barcelona-Valencia*	Road
Constanta	Road	*Valencia-Algeciras*	Road
Algeciras	Road	*Istanbul-Athens*	-
Barcelona	Road	*Athens-Gioia Tauro*	-
Valencia	Road	*Gioia Tauro-La Spezia*	-
Athens	Road	*Marseille-Barcelona*	Road
Gioia Tauro	-	*Algeciras-Sines*	-
Sines	-	*Genoa-Barcelona*	-
Trieste	Road	*Istanbul-Trieste*	-
		Istanbul-Gioia Tauro	-
		Istanbul-Algeciras	-

Corridor 'Silk Way'

Nodes		*Arcs*	
Rotterdam	Road	*Rotterdam-Shanghai*	-
Shanghai	-	*Hamburg-Berlin*	-
Hamburg	Road	*Berlin-Warsaw*	-
Berlin	Road	*Warsaw-Minsk*	-
Warsaw	-	*Minsk-Moscow*	-
Minsk	Road	*Moscow-Beijing*	-
Moscow	Road	*Hamburg-Shanghai*	-
Beijing	-	*St. Petersburg-Shanghai*	-
St. Petersburg	Road	*Shanghai-Gothenburg*	-
Gothenburg	Road	*Tallinn-Shanghai*	-
Tallinn	-		

LNG

Technology Data

ID	Category	Transport modes
FU08	Fuels and sources of energy	Inland Waterways, Maritime, Railway, Road

Description
Liquefied natural gas

Readiness Level	Time to Market	Energy Source	Efficiency
8	<1	Natural gas	-

CO_2	NO_x	SO_x	LCC
IWW: Reduction by 10 up to 25 % compared with diesel engine (CCNR I Standard)	IWW: Reduction by 98.5 % compared with diesel engine (CCNR I Standard)	IWW: Reduction by 100 % compared with diesel engine (CCNR I Standard)	-

Notes on technology

Natural gas (NG) is a cleaner alternative to diesel fuel oil, offering environmental and economic benefits from the reduced emissions, price and taxation. As a fuel, it is compressed (CNG) or liquefied (LNG) and it is characterised by high methane concentration and close to zero sulfur and PM content, compared to diesel fuel oil. LNG for shipping is a proven and safe technology, and an alternative to after-treatment systems to reduce SOx, NOx and PM emissions. LNG is currently used by 30 vessels, as of July 2012, and the new-building order book has approximately the same number of ships. The interest on LNG will increase in the future due to the environmental regulations on sulfur (MARPOL 73/78 Annex VI) and carbon emissions (Energy Efficiency Design Index and Ship Energy Efficiency Management Plan, IMO 2011), and the estimated lower fuel consumption. The estimated CO2 emissions reduction is 20-25% compared to diesel oil. There are two challenges regarding this reduction: first, the unburned methane (the so-called methane slip) and, second, possible release of methane through the total NG transport chain. Using LNG as a marine fuel, NOx emissions are reduced by 90%, and SOx and PM emissions are eliminated. The main engine specific fuel consumption is lower for the LNG case (including the pilot fuel) compared to marine diesel oil (3.5% at maximum continuous rating, MCR). Large vessels can benefit more from LNG compared to small ones, due to the economy of scale in the installation. Another important benefit of natural gas is that the noise level reduces during trip. From a technical point of view, the installation of the cryogenic LNG fuel tanks may require a reduction in cargo capacity. This depends on the type of vessel and system complexity. The price of LNG varies from country to country and according to EIA and IEA projections, the LNG price is likely to rise to $400-1200 per tonne in 2035, starting from a range of $300-800 per tonne in 2010. Regardless of price uncertainties, LNG is the cleanest of fossil fuels and it is a viable solution to reduce carbon, NOx, SOx and PM emissions. The development of LNG terminals at strategic points across Europe would facilitate the adoption of LNG as a marine fuel in the future.

High Level Benchmark

Baseline	ULSD
Relative Cost	
% cost savings during operation	Depending on the tax rates, emission taxes per country/region, future fuel prices

CAPEX	-
% fuel savings	*up to 20%*
Emissions	
% CO2 savings	*Road: 2-6%, Maritime: 20-25%*
% SOx savings	*90-100%*
% NOx savings	
Service & bottlenecks	
% operational or infrastructural delays reduction	-
% of frequency of service potential improvement due to delays & bottlenecks reduction	-
% of reliability improvement due to delays & bottlenecks reduction	-

Positive influence | Negative influence | Not relevant or no influence | no information

Detailed Benchmark

(with respect to baseline performance on specific corridor)

Corridor	*Strauss*	
Mode of transport	*Internal water transport*	
Cost	*Min: 0.0%*	*Max: 0.0%*
CO2 emissions	*Min: 10.0%*	*Max: 19.0%*
SOX emissions	*Min: 95.2%*	*Max: 100.0%*
Average speed	*Min: 0.0%*	*Max: 0.0%*
Frequency	*Min: 0.0%*	*Max: 0.0%*
Reliability	*Min: 0.0%*	*Max: 0.0%*

Corridor	*Nureyeev*	
Mode of transport	*sss*	
Cost	*Min: 0.0%*	*Max: 0.0%*
CO2 emissions	*Min: 9.9%*	*Max: 20.0%*
SOX emissions	*Min: 97.9%*	*Max: 100.0%*
Average speed	*Min: 0.0%*	*Max: 0.0%*
Frequency	*Min: 0.0%*	*Max: 0.0%*
Reliability	*Min: 0.0%*	*Max: 0.0%*

Technology Applicability per Corridor

Corridor 'Brenner'

Nodes		Arcs	
Malmo	Rail, Road, sss	Malmo-Trelleborg	Rail, Road
Trelleborg	Rail, Road, sss	Trelleborg-Sassnitz	sss
Sassnitz	Rail, Road, sss	Trelleborg-Rostock	sss
Rostock	Rail, Road, sss	Sassnitz-Berlin	Rail, Road
Berlin	Rail, Road	Rostock-Berlin	Rail, Road
Nurnberg	Internal water transport, Rail, Road	Berlin-Nurnberg	Rail, Road
Munich	Rail, Road	Nurnberg-Munich	Rail, Road
Salzburg	Rail, Road	Munich-Salzburg	Rail, Road
Villach	Rail, Road	Salzburg-Villach	Rail, Road
Trieste	Rail, Road, sss	Villach-Trieste	Rail, Road
Verona	Rail, Road	Munich-Verona	Rail, Road
Bologna	Rail, Road	Verona-Bologna	Rail, Road
Ancona	Rail, Road, sss	Bologna-Ancona	Rail, Road
Bari	Rail, Road, sss	Ancona-Bari	Rail, Road
Brindisi	Rail, Road, sss	Bari-Brindisi	Rail, Road
Igoumenitsa	Road, sss	Igoumenitsa-Thessaloniki	Road
Thessaloniki	Rail, Road	Igoumenitsa-Patras	sss
Patras	Road, sss	Patras-Athens	Road
Athens	Rail, Road, sss	Bologna-Rome	Rail, Road
Rome	Rail, Road	Rome-Naples	Rail, Road
Naples	Rail, Road, sss	Naples-Messina	sss
Messina	Rail, Road, sss	Villa San Giovanni-Messina	sss
Villa San Giovanni	Rail, Road, sss	Messina-Palermo	Rail, Road
Palermo	Rail, Road	Naples-Villa San Giovanni	Rail, Road
		Ancona-Brindisi	sss
		Bari-Igoumenitsa	sss

Corridor 'Finis Terrae'

Nodes		Arcs	
Paris	Rail, Road	Paris-St. Nazaire	Rail, Road
St. Nazaire	Rail, Road, sss	Paris-Irun	Rail, Road
Irun	Rail, Road	St. Nazaire-Gijon	sss
Gijon	Rail, Road, sss	Irun-Valladolid	Rail, Road
Valladolid	Rail, Road	Gijon-Valladolid	Rail, Road
Madrid	Rail, Road	Valladolid-Madrid	Rail, Road
Lisboa	Rail, Road	Madrid-Lisboa	Rail, Road

Corridor 'Cloverleaf'

Nodes		Arcs	
Glasgow	Rail, Road	Glasgow-Carlisle	Rail, Road
Carlisle	Rail, Road	Carlisle-Liverpool	Rail, Road
Liverpool	Rail, Road, sss	Liverpool-Dublin	sss
Dublin	sss	Liverpool-London	Rail, Road
London	Rail, Road	London-Dover	Rail, Road
Dover	Rail, Road, sss	Dover-Calais	Rail, sss
Calais	Rail, Road, sss	Calais-Duisburg	Rail, Road
Duisburg	Internal water transport, Rail, Road		

Corridor 'Edelweiss'

Nodes		Arcs	
St. Petersburg	dss, Rail, Road, sss	St. Petersburg-Lappeenranta	Rail, Road
Lappeenranta	Rail, Road	Lappeenranta-Helsinki	Rail, Road
Helsinki	Rail, Road, sss	Helsinki-Turku	Rail, Road
Turku	Rail, Road, sss	Stockholm-Oslo	Rail, Road
Stockholm	Rail, Road, sss	Stockholm-Malmo	Rail, Road
Oslo	Rail, Road	Oslo-Gothenburg	Rail, Road
Malmo	Rail, Road, sss	Gothenburg-Malmo	Rail, Road
Gothenburg	dss, Rail, Road, sss	Malmo-Copenhagen	Rail, Road
Copenhagen	Rail, Road	Copenhagen-Taulov	Rail, Road
Taulov	Rail, Road	Copenhagen-Rodbyhavn	Road
Rodbyhavn	Road, sss	Rodbyhavn-Puttgarden	sss
Puttgarden	Road, sss	Taulov-Hamburg	Rail, Road

Hamburg	dss, Rail, Road, sss	*Puttgarden-Hamburg*	Road
Hannover	Rail, Road	*Hamburg-Hannover*	Rail, Road
Würzburg	Rail, Road	*Hannover-Würzburg*	Rail, Road
Ulm	Rail, Road	*Würzburg-Ulm*	Rail, Road
Lugano	Rail, Road	*Ulm-Lugano*	Rail, Road
Milan	Rail, Road	*Lugano-Milan*	Rail, Road
Genoa	Rail, Road, sss	*Milan-Genoa*	Rail, Road
		Turku-Stockholm	sss

Corridor 'Nureyeev'

Nodes		*Arcs*	
Helsinki	Rail, Road, sss	*Helsinki-Tallinn*	sss
Tallinn	dss, sss	*St. Petersburg-Moscow*	Rail, Road
St. Petersburg	dss, Rail, Road, sss	*Ventspils-Klaipeda*	sss
Moscow	Rail, Road	*Klaipeda-Minsk*	Rail, Road
Ventspils	sss	*Klaipeda-Karlshamn*	-
Klaipeda	Rail, Road, sss	*Gothenburg-Hamburg*	sss
Minsk	Rail, Road	*Rostock-Gothenburg*	sss
Karlshamn	sss	*Hamburg-Malmo*	sss
Gothenburg	dss, Rail, Road, sss	*Helsinki-St. Petersburg*	sss
Hamburg	dss, Rail, Road, sss	*Hamburg-Gdansk*	sss
Rostock	Rail, Road, sss	*Hamburg-Tallinn*	sss
Malmo	Rail, Road, sss	*Ventspils-Karlshamn*	sss
Gdansk	sss	*Malmo-Helsinki*	sss
Riga	sss	*Helsinki-Hamburg*	sss
Rotterdam	dss, Internal water transport, Rail,	*Tallinn-Riga*	sss
Road, sss		*Rotterdam-Hamburg*	sss
Turku	Rail, Road, sss	*Klaipeda-Rotterdam*	sss
		Rostock-Helsinki	sss
		Helsinki-Rotterdam	sss
		Turku-Gothenburg	sss
		Turku-Hamburg	sss
		Gothenburg-Rotterdam	sss
		Klaipeda-Riga	sss
		Hamburg-Riga	sss
		St. Petersburg-Hamburg	sss
		Rotterdam-Gdansk	sss
		Rotterdam-Ventspils	sss
		Rotterdam-St. Petersburg	sss

Corridor 'Strauss'

Nodes		*Arcs*	
Rotterdam	dss, Internal water transport, Rail,	*Rotterdam-Duisburg*	Internal water transport, Rail, Road
Road, sss		*Duisburg-Frankfurt*	Internal water transport, Rail, Road
Duisburg	Internal water transport, Rail, Road	*Frankfurt-Paris*	Rail, Road
Frankfurt	Internal water transport, Rail, Road	*Frankfurt-Nurnberg*	Internal water transport, Rail, Road
Paris	Rail, Road	*Nurnberg-Vienna*	Internal water transport, Rail, Road
Nurnberg	Internal water transport, Rail, Road	*Vienna-Bratislava*	Internal water transport, Rail, Road
Vienna	Internal water transport, Rail, Road	*Bratislava-Budapest*	Internal water transport, Rail, Road
Bratislava	Internal water transport, Rail, Road	*Budapest-Belgrade*	Internal water transport, Rail, Road
Budapest	Internal water transport, Rail, Road	*Belgrade-Constanta*	Internal water transport, Rail, Road
Belgrade	Internal water transport, Rail, Road		
Constanta	Internal water transport, Rail,		
Road, sss			

Corridor 'Two Seas'

Nodes		*Arcs*	
Hamburg	dss, Rail, Road, sss	*Hamburg-Berlin*	Road
Berlin	Rail, Road	*Berlin-Dresden*	Rail, Road
Dresden	Rail, Road	*Dresden-Prague*	Rail, Road
Prague	Rail, Road	*Prague-Nurnberg*	Rail, Road
Nurnberg	Internal water transport, Rail, Road	*Prague-Bratislava*	Rail, Road
Bratislava	Internal water transport, Rail, Road	*Bratislava-Budapest*	Internal water transport, Rail, Road
Budapest	Internal water transport, Rail, Road	*Budapest-Belgrade*	Internal water transport, Rail, Road
Belgrade	Internal water transport, Rail, Road	*Belgrade-Sofia*	Rail, Road
Sofia	Rail, Road	*Sofia-Thessaloniki*	Rail, Road
Thessaloniki	Rail, Road	*Thessaloniki-Athens*	Rail, Road
Athens	Rail, Road, sss		

Corridor 'Mare Nostrum'

Nodes		Arcs	
Bourgas	sss	*Bourgas-Istanbul*	sss
Istanbul	sss	*La Spezia-Genoa*	sss
La Spezia	sss	*Marseille-Lyon*	Internal water transport, Rail, Road
Genoa	Rail, Road, sss	*Odessa-Istanbul*	sss
Marseille	Internal water transport, Rail,	*Constanta-Istanbul*	sss
Road, sss		*Algeciras-Istanbul*	sss
Lyon	Internal water transport, Rail, Road	*Barcelona-Valencia*	sss
Odessa	sss	*Valencia-Algeciras*	sss
Constanta	Internal water transport, Rail,	*Istanbul-Athens*	sss
Road, sss		*Athens-Gioia Tauro*	sss
Algeciras	sss	*Gioia Tauro-La Spezia*	sss
Barcelona	sss	*Marseille-Barcelona*	sss
Valencia	sss	*Algeciras-Sines*	sss
Athens	Rail, Road, sss	*Genoa-Barcelona*	sss
Gioia Tauro	sss	*Istanbul-Trieste*	sss
Sines	sss	*Istanbul-Gioia Tauro*	sss
Trieste	Rail, Road, sss	*Istanbul-Algeciras*	sss

Corridor 'Silk Way'

Nodes		Arcs	
Rotterdam	dss, Internal water transport, Rail,	*Rotterdam-Shanghai*	dss
Road, sss		*Hamburg-Berlin*	Rail
Shanghai	dss	*Berlin-Warsaw*	Rail
Hamburg	dss, Rail, Road, sss	*Warsaw-Minsk*	Rail
Berlin	Rail, Road	*Minsk-Moscow*	Rail
Warsaw	Rail	*Moscow-Beijing*	Rail
Minsk	Rail, Road	*Hamburg-Shanghai*	dss
Moscow	Rail, Road	*St. Petersburg-Shanghai*	dss
Beijing	Rail	*Shanghai-Gothenburg*	dss
St. Petersburg	dss, Rail, Road, sss	*Tallinn-Shanghai*	dss
Gothenburg	dss, Rail, Road, sss		
Tallinn	dss, sss		

Biogas

Technology Data

ID	Category	Transport modes
FU18	Fuels and sources of energy	Inland Waterways, Maritime, Railway, Road

Description
Biogas is mainly produced from bio-wast, agricultural recidues and residues from sewage treatment plants

Readiness Level	Time to Market	Energy Source	Efficiency
1	<1	Chemical	-

CO_2	NO_x	SO_x	LCC
Road: Typically 80-90% below liquid fossil fuels; IWW: Typically 80-90% below liquid fossil fuels	Road: very low; IWW: Reduction by 98.5 % compared with diesel engine (CCNR I Standard)	Road: very low; IWW: Reduction by 100 % compared with diesel engine (CCNR I Standard)	-

High Level Benchmark

Baseline	ULSD
Relative Cost	
% cost savings during operation	-
CAPEX	-
% fuel savings	40% cheaper from diesel
Emissions	
% CO2 savings	For TTW: For WTW: 80-90% less than liquid fossil fuels
% SOx savings	-
% NOx savings	
Service & bottlenecks	
% operational or infrastructural delays reduction	-
% of frequency of service potential improvement due to delays & bottlenecks reduction	-
% of reliability improvement due to delays & bottlenecks reduction	-

Positive influence | Negative influence | Not relevant or no influence | no information

Technology Applicability per Corridor

Corridor 'Brenner'

Nodes		Arcs	
Malmo	Rail, Road, sss	*Malmo-Trelleborg*	Rail, Road
Trelleborg	Road, sss	*Trelleborg-Sassnitz*	sss
Sassnitz	Road, sss	*Trelleborg-Rostock*	sss
Rostock	Road, sss	*Sassnitz-Berlin*	Rail, Road
Berlin	Rail, Road	*Rostock-Berlin*	Rail, Road
Nurnberg	Internal water transport, Rail, Road	*Berlin-Nurnberg*	Rail, Road
Munich	Road	*Nurnberg-Munich*	Rail, Road
Salzburg	Road	*Munich-Salzburg*	Rail, Road
Villach	Road	*Salzburg-Villach*	Rail, Road
Trieste	Road	*Villach-Trieste*	Rail, Road
Verona	Road	*Munich-Verona*	Rail, Road
Bologna	Road	*Verona-Bologna*	Rail, Road
Ancona	Road, sss	*Bologna-Ancona*	Rail, Road
Bari	Road, sss	*Ancona-Bari*	Rail, Road
Brindisi	Road, sss	*Bari-Brindisi*	Rail, Road
Igoumenitsa	Road, sss	*Igoumenitsa-Thessaloniki*	Road
Thessaloniki	Rail, Road	*Igoumenitsa-Patras*	sss
Patras	Road, sss	*Patras-Athens*	Road
Athens	Rail, Road	*Bologna-Rome*	Rail, Road
Rome	Road	*Rome-Naples*	Rail, Road
Naples	Road, sss	*Naples-Messina*	sss
Messina	Road, sss	*Villa San Giovanni-Messina*	sss
Villa San Giovanni	Road, sss	*Messina-Palermo*	Rail, Road
Palermo	Road	*Naples-Villa San Giovanni*	Rail, Road
		Ancona-Brindisi	sss
		Bari-Igoumenitsa	sss

Corridor 'Finis Terrae'

Nodes		Arcs	
Paris	Rail, Road	*Paris-St. Nazaire*	Rail, Road
St. Nazaire	Rail, Road, sss	*Paris-Irun*	Rail, Road
Irun	Rail, Road	*St. Nazaire-Gijon*	sss
Gijon	Rail, Road, sss	*Irun-Valladolid*	Rail, Road
Valladolid	Rail, Road	*Gijon-Valladolid*	Rail, Road
Madrid	Rail, Road	*Valladolid-Madrid*	Rail, Road
Lisboa	Rail, Road	*Madrid-Lisboa*	Rail, Road

Corridor 'Cloverleaf'

Nodes		Arcs	
Glasgow	Rail, Road	*Glasgow-Carlisle*	Rail, Road
Carlisle	Rail, Road	*Carlisle-Liverpool*	Rail, Road
Liverpool	Rail, Road, sss	*Liverpool-Dublin*	sss
Dublin	sss	*Liverpool-London*	Rail, Road
London	Rail, Road	*London-Dover*	Rail, Road
Dover	Rail, Road, sss	*Dover-Calais*	Rail, sss
Calais	Rail, Road, sss	*Calais-Duisburg*	Rail, Road
Duisburg	Internal water transport, Rail, Road		

Corridor 'Edelweiss'

Nodes		Arcs	
St. Petersburg	dss, Rail, Road, sss	*St. Petersburg-Lappeenranta*	Rail, Road
Lappeenranta	Rail, Road	*Lappeenranta-Helsinki*	Rail, Road
Helsinki	Rail, Road, sss	*Helsinki-Turku*	Rail, Road
Turku	Rail, Road, sss	*Stockholm-Oslo*	Rail, Road
Stockholm	Rail, Road, sss	*Stockholm-Malmo*	Rail, Road
Oslo	Rail, Road	*Oslo-Gothenburg*	Rail, Road
Malmo	Rail, Road, sss	*Gothenburg-Malmo*	Rail, Road
Gothenburg	dss, Rail, Road, sss	*Malmo-Copenhagen*	Rail, Road
Copenhagen	Rail, Road	*Copenhagen-Taulov*	Rail, Road
Taulov	Rail, Road	*Copenhagen-Rodbyhavn*	Road
Rodbyhavn	Road, sss	*Rodbyhavn-Puttgarden*	sss
Puttgarden	Road, sss	*Taulov-Hamburg*	Rail, Road
Hamburg	dss, Rail, Road, sss	*Puttgarden-Hamburg*	Road
Hannover	Rail, Road	*Hamburg-Hannover*	Rail, Road
Würzburg	Rail, Road	*Hannover-Würzburg*	Rail, Road
Ulm	Rail, Road	*Würzburg-Ulm*	Rail, Road
Lugano	Rail, Road	*Ulm-Lugano*	Rail, Road

Milan	Rail, Road	*Lugano-Milan*	Rail, Road
Genoa	Rail, Road, sss	*Milan-Genoa*	Rail, Road
		Turku-Stockholm	sss

Corridor 'Nureyeev'

Nodes		*Arcs*	
Helsinki	Rail, Road, sss	*Helsinki-Tallinn*	sss
Tallinn	dss, sss	*St. Petersburg-Moscow*	Rail, Road
St. Petersburg	dss, Rail, Road, sss	*Ventspils-Klaipeda*	sss
Moscow	Rail, Road	*Klaipeda-Minsk*	Rail, Road
Ventspils	sss	*Klaipeda-Karlshamn*	sss
Klaipeda	Rail, Road, sss	*Gothenburg-Hamburg*	sss
Minsk	Rail, Road	*Rostock-Gothenburg*	sss
Karlshamn	sss	*Hamburg-Malmo*	sss
Gothenburg	dss, Rail, Road, sss	*Helsinki-St. Petersburg*	sss
Hamburg	dss, Rail, Road, sss	*Hamburg-Gdansk*	sss
Rostock	Road, sss	*Hamburg-Tallinn*	sss
Malmo	Rail, Road, sss	*Ventspils-Karlshamn*	sss
Gdansk	sss	*Malmo-Helsinki*	sss
Riga	sss	*Helsinki-Hamburg*	sss
Rotterdam	dss, Internal water transport, Rail,	*Tallinn-Riga*	sss
Road, sss		*Rotterdam-Hamburg*	sss
Turku	Rail, Road, sss	*Klaipeda-Rotterdam*	sss
		Rostock-Helsinki	sss
		Helsinki-Rotterdam	sss
		Turku-Gothenburg	sss
		Turku-Hamburg	sss
		Gothenburg-Rotterdam	sss
		Klaipeda-Riga	sss
		Hamburg-Riga	sss
		St. Petersburg-Hamburg	sss
		Rotterdam-Gdansk	sss
		Rotterdam-Ventspils	sss
		Rotterdam-St. Petersburg	sss

Corridor 'Strauss'

Nodes		*Arcs*	
Rotterdam	dss, Internal water transport, Rail,	*Rotterdam-Duisburg*	Internal water transport, Rail, Road
Road, sss		*Duisburg-Frankfurt*	Internal water transport, Rail, Road
Duisburg	Internal water transport, Rail, Road	*Frankfurt-Paris*	Rail, Road
Frankfurt	Internal water transport, Rail, Road	*Frankfurt-Nurnberg*	Internal water transport, Rail, Road
Paris	Rail, Road	*Nurnberg-Vienna*	Internal water transport, Rail, Road
Nurnberg	Internal water transport, Rail, Road	*Vienna-Bratislava*	Internal water transport, Rail, Road
Vienna	Internal water transport, Rail, Road	*Bratislava-Budapest*	Internal water transport, Rail, Road
Bratislava	Internal water transport, Rail, Road	*Budapest-Belgrade*	Internal water transport, Rail, Road
Budapest	Internal water transport, Rail, Road	*Belgrade-Constanta*	Internal water transport, Rail, Road
Belgrade	Internal water transport, Rail, Road		
Constanta	Internal water transport, Rail, Road		

Corridor 'Two Seas'

Nodes		*Arcs*	
Hamburg	dss, Rail, Road, sss	*Hamburg-Berlin*	Road
Berlin	Rail, Road	*Berlin-Dresden*	Rail, Road
Dresden	Rail, Road	*Dresden-Prague*	Rail, Road
Prague	Rail, Road	*Prague-Nurnberg*	Rail, Road
Nurnberg	Internal water transport, Rail, Road	*Prague-Bratislava*	Rail, Road
Bratislava	Internal water transport, Rail, Road	*Bratislava-Budapest*	Internal water transport, Rail, Road
Budapest	Internal water transport, Rail, Road	*Budapest-Belgrade*	Internal water transport, Rail, Road
Belgrade	Internal water transport, Rail, Road	*Belgrade-Sofia*	Rail, Road
Sofia	Rail, Road	*Sofia-Thessaloniki*	Rail, Road
Thessaloniki	Rail, Road	*Thessaloniki-Athens*	Rail, Road
Athens	Rail, Road		

Corridor 'Mare Nostrum'

Nodes		*Arcs*	
Bourgas	-	*Bourgas-Istanbul*	-
Istanbul	-	*La Spezia-Genoa*	-
La Spezia	-	*Marseille-Lyon*	Internal water transport, Rail, Road

Genoa	Rail, Road, sss	*Odessa-Istanbul*	-
Marseille	Internal water transport, Rail,	*Constanta-Istanbul*	-
Road, sss		*Algeciras-Istanbul*	-
Lyon	Internal water transport, Rail, Road	*Barcelona-Valencia*	Rail, sss
Odessa	-	*Valencia-Algeciras*	Rail, sss
Constanta	Internal water transport, Rail, Road	*Istanbul-Athens*	-
Algeciras	Rail, sss	*Athens-Gioia Tauro*	-
Barcelona	Rail, sss	*Gioia Tauro-La Spezia*	-
Valencia	Rail, sss	*Marseille-Barcelona*	Rail, sss
Athens	Rail, Road	*Algeciras-Sines*	sss
Gioia Tauro	-	*Genoa-Barcelona*	-
Sines	sss	*Istanbul-Trieste*	-
Trieste	Road	*Istanbul-Gioia Tauro*	-
		Istanbul-Algeciras	-

Corridor 'Silk Way'

Nodes		*Arcs*	
Rotterdam	dss, Internal water transport, Rail,	*Rotterdam-Shanghai*	dss
Road, sss		*Hamburg-Berlin*	Rail
Shanghai	dss	*Berlin-Warsaw*	Rail
Hamburg	dss, Rail, Road, sss	*Warsaw-Minsk*	Rail
Berlin	Rail, Road	*Minsk-Moscow*	Rail
Warsaw	Rail	*Moscow-Beijing*	Rail
Minsk	Rail, Road	*Hamburg-Shanghai*	dss
Moscow	Rail, Road	*St. Petersburg-Shanghai*	dss
Beijing	Rail	*Shanghai-Gothenburg*	dss
St. Petersburg	dss, Rail, Road, sss	*Tallinn-Shanghai*	dss
Gothenburg	dss, Rail, Road, sss		
Tallinn	dss, sss		

Alternative maritime power (AMP)

Technology Data

ID	Category	Transport modes
FU05	Fuels and sources of energy	Maritime

Description
AMP is a shore-side power source, a conversion process to transform the shore-side power voltage to match the vessel power system and a vessel that is fitted with a system capable of taking on electrical power while at dock

Readiness Level	Time to Market	Energy Source	Efficiency
9	<1	0	-
CO_2	NO_x	SO_x	LCC
	Depending on vessel's size	Depending on vessel's size	-

High Level Benchmark

Baseline	Ship based power generation in harbour
Relative Cost	
% cost savings during operation	-
CAPEX	-
% fuel savings	100% when in harbour/port
Emissions	
% CO2 savings	Tank-to-wheel: 100% when in harbour/port. Well-to-wheel: depends on the electricity source ashore.
% SOx savings	Tank-to-wheel: 100% when in harbour/port. Well-to-wheel: depends on the electricity source ashore.
% NOx savings	
Service & bottlenecks	
% operational or infrastructural delays reduction	-
% of frequency of service potential improvement due to delays & bottlenecks reduction	-
% of reliability improvement due to delays & bottlenecks reduction	-

Positive influence | Negative influence | Not relevant or no influence | no information

Technology Applicability per Corridor

Corridor 'Brenner'	
Nodes	Arcs

Malmo	sss	*Malmo-Trelleborg*	-
Trelleborg	sss	*Trelleborg-Sassnitz*	-
Sassnitz	sss	*Trelleborg-Rostock*	-
Rostock	sss	*Sassnitz-Berlin*	-
Berlin	-	*Rostock-Berlin*	-
Nurnberg	-	*Berlin-Nurnberg*	-
Munich	-	*Nurnberg-Munich*	-
Salzburg	-	*Munich-Salzburg*	-
Villach	-	*Salzburg-Villach*	-
Trieste	-	*Villach-Trieste*	-
Verona	-	*Munich-Verona*	-
Bologna	-	*Verona-Bologna*	-
Ancona	sss	*Bologna-Ancona*	-
Bari	sss	*Ancona-Bari*	-
Brindisi	sss	*Bari-Brindisi*	-
Igoumenitsa	sss	*Igoumenitsa-Thessaloniki*	-
Thessaloniki	-	*Igoumenitsa-Patras*	-
Patras	sss	*Patras-Athens*	-
Athens	-	*Bologna-Rome*	-
Rome	-	*Rome-Naples*	-
Naples	sss	*Naples-Messina*	-
Messina	sss	*Villa San Giovanni-Messina*	-
Villa San Giovanni	sss	*Messina-Palermo*	-
Palermo	-	*Naples-Villa San Giovanni*	-
		Ancona-Brindisi	-
		Bari-Igoumenitsa	-

Corridor 'Finis Terrae'

The technology is not applicable to this corridor.

Corridor 'Cloverleaf'

The technology is not applicable to this corridor.

Corridor 'Edelweiss'

Nodes		*Arcs*	
St. Petersburg	dss, sss	*St. Petersburg-Lappeenranta*	-
Lappeenranta	-	*Lappeenranta-Helsinki*	-
Helsinki	sss	*Helsinki-Turku*	-
Turku	sss	*Stockholm-Oslo*	-
Stockholm	-	*Stockholm-Malmo*	-
Oslo	-	*Oslo-Gothenburg*	-
Malmo	sss	*Gothenburg-Malmo*	-
Gothenburg	dss, sss	*Malmo-Copenhagen*	-
Copenhagen	-	*Copenhagen-Taulov*	-
Taulov	-	*Copenhagen-Rodbyhavn*	-
Rodbyhavn	-	*Rodbyhavn-Puttgarden*	-
Puttgarden	-	*Taulov-Hamburg*	-
Hamburg	dss, sss	*Puttgarden-Hamburg*	-
Hannover	-	*Hamburg-Hannover*	-
Würzburg	-	*Hannover-Würzburg*	-
Ulm	-	*Würzburg-Ulm*	-
Lugano	-	*Ulm-Lugano*	-
Milan	-	*Lugano-Milan*	-
Genoa	sss	*Milan-Genoa*	-
		Turku-Stockholm	-

Corridor 'Nureyeev'

Nodes		*Arcs*	
Helsinki	sss	*Helsinki-Tallinn*	-
Tallinn	dss, sss	*St. Petersburg-Moscow*	-
St. Petersburg	dss, sss	*Ventspils-Klaipeda*	-
Moscow	-	*Klaipeda-Minsk*	-
Ventspils	sss	*Klaipeda-Karlshamn*	-
Klaipeda	sss	*Gothenburg-Hamburg*	-
Minsk	-	*Rostock-Gothenburg*	-
Karlshamn	sss	*Hamburg-Malmo*	-
Gothenburg	dss, sss	*Helsinki-St. Petersburg*	-
Hamburg	dss, sss	*Hamburg-Gdansk*	-

Rostock	sss	*Hamburg-Tallinn*	-
Malmo	sss	*Ventspils-Karlshamn*	-
Gdansk	sss	*Malmo-Helsinki*	-
Riga	sss	*Helsinki-Hamburg*	-
Rotterdam	dss, sss	*Tallinn-Riga*	-
Turku	sss	*Rotterdam-Hamburg*	-
		Klaipeda-Rotterdam	-
		Rostock-Helsinki	-
		Helsinki-Rotterdam	-
		Turku-Gothenburg	-
		Turku-Hamburg	-
		Gothenburg-Rotterdam	-
		Klaipeda-Riga	-
		Hamburg-Riga	-
		St. Petersburg-Hamburg	-
		Rotterdam-Gdansk	-
		Rotterdam-Ventspils	-
		Rotterdam-St. Petersburg	-

Corridor 'Strauss'

Nodes		*Arcs*	
Rotterdam	dss, sss	*Rotterdam-Duisburg*	-
Duisburg	-	*Duisburg-Frankfurt*	-
Frankfurt	-	*Frankfurt-Paris*	-
Paris	-	*Frankfurt-Nurnberg*	-
Nurnberg	-	*Nurnberg-Vienna*	-
Vienna	-	*Vienna-Bratislava*	-
Bratislava	-	*Bratislava-Budapest*	-
Budapest	-	*Budapest-Belgrade*	-
Belgrade	-	*Belgrade-Constanta*	-
Constanta	-		

Corridor 'Two Seas'

Nodes		*Arcs*	
Hamburg	dss, sss	*Hamburg-Berlin*	-
Berlin	-	*Berlin-Dresden*	-
Dresden	-	*Dresden-Prague*	-
Prague	-	*Prague-Nurnberg*	-
Nurnberg	-	*Prague-Bratislava*	-
Bratislava	-	*Bratislava-Budapest*	-
Budapest	-	*Budapest-Belgrade*	-
Belgrade	-	*Belgrade-Sofia*	-
Sofia	-	*Sofia-Thessaloniki*	-
Thessaloniki	-	*Thessaloniki-Athens*	-
Athens	-		

Corridor 'Mare Nostrum'

Nodes		*Arcs*	
Bourgas	-	*Bourgas-Istanbul*	-
Istanbul	-	*La Spezia-Genoa*	-
La Spezia	-	*Marseille-Lyon*	-
Genoa	sss	*Odessa-Istanbul*	-
Marseille	sss	*Constanta-Istanbul*	-
Lyon	-	*Algeciras-Istanbul*	-
Odessa	-	*Barcelona-Valencia*	-
Constanta	-	*Valencia-Algeciras*	-
Algeciras	sss	*Istanbul-Athens*	-
Barcelona	sss	*Athens-Gioia Tauro*	-
Valencia	sss	*Gioia Tauro-La Spezia*	-
Athens	-	*Marseille-Barcelona*	-
Gioia Tauro	-	*Algeciras-Sines*	-
Sines	sss	*Genoa-Barcelona*	-
Trieste	-	*Istanbul-Trieste*	-
		Istanbul-Gioia Tauro	-
		Istanbul-Algeciras	-

Corridor 'Silk Way'

Nodes	*Arcs*

Rotterdam	dss, sss	*Rotterdam-Shanghai*	-
Shanghai	dss	*Hamburg-Berlin*	-
Hamburg	dss, sss	*Berlin-Warsaw*	-
Berlin	-	*Warsaw-Minsk*	-
Warsaw	-	*Minsk-Moscow*	-
Minsk	-	*Moscow-Beijing*	-
Moscow	-	*Hamburg-Shanghai*	-
Beijing	-	*St. Petersburg-Shanghai*	-
St. Petersburg	dss, sss	*Shanghai-Gothenburg*	-
Gothenburg	dss, sss	*Tallinn-Shanghai*	-
Tallinn	dss, sss		

wind energy

Technology Data

ID	Category	Transport modes
FU06	Fuels and sources of energy	Inland Waterways, Maritime

Description
Wind turbines which will generate clean energy to power 14 Container Terminal Quay cranes, reefer containers, repair workshops and other power consumption needs

Readiness Level	Time to Market	Energy Source	Efficiency
7	1	0	-

CO_2	NO_x	SO_x	LCC
Expectation to reduce emissions by 45% per year			-

High Level Benchmark

Baseline	0
Relative Cost	
% cost savings during operation	-
CAPEX	-
% fuel savings	100%
Emissions	
% CO2 savings	100%
% SOx savings	100%
% NOx savings	
Service & bottlenecks	
% operational or infrastructural delays reduction	-
% of frequency of service potential improvement due to delays & bottlenecks reduction	-
% of reliability improvement due to delays & bottlenecks reduction	-

Positive influence | Negative influence | Not relevant or no influence | no information

Technology Applicability per Corridor

Corridor 'Brenner'	
Nodes	Arcs

Malmo	sss	*Malmo-Trelleborg*	-
Trelleborg	sss	*Trelleborg-Sassnitz*	-
Sassnitz	sss	*Trelleborg-Rostock*	-
Rostock	sss	*Sassnitz-Berlin*	-
Berlin	-	*Rostock-Berlin*	-
Nurnberg	Internal water transport	*Berlin-Nurnberg*	-
Munich	-	*Nurnberg-Munich*	-
Salzburg	-	*Munich-Salzburg*	-
Villach	-	*Salzburg-Villach*	-
Trieste	-	*Villach-Trieste*	-
Verona	-	*Munich-Verona*	-
Bologna	-	*Verona-Bologna*	-
Ancona	sss	*Bologna-Ancona*	-
Bari	sss	*Ancona-Bari*	-
Brindisi	sss	*Bari-Brindisi*	-
Igoumenitsa	sss	*Igoumenitsa-Thessaloniki*	-
Thessaloniki	-	*Igoumenitsa-Patras*	-
Patras	sss	*Patras-Athens*	-
Athens	-	*Bologna-Rome*	-
Rome	-	*Rome-Naples*	-
Naples	sss	*Naples-Messina*	-
Messina	sss	*Villa San Giovanni-Messina*	-
Villa San Giovanni	sss	*Messina-Palermo*	-
Palermo	-	*Naples-Villa San Giovanni*	-
		Ancona-Brindisi	-
		Bari-Igoumenitsa	-

Corridor 'Finis Terrae'

Nodes		*Arcs*	
Paris	-	*Paris-St. Nazaire*	-
St. Nazaire	sss	*Paris-Irun*	-
Irun	-	*St. Nazaire-Gijon*	-
Gijon	sss	*Irun-Valladolid*	-
Valladolid	-	*Gijon-Valladolid*	-
Madrid	-	*Valladolid-Madrid*	-
Lisboa	-	*Madrid-Lisboa*	-

Corridor 'Cloverleaf'

Nodes		*Arcs*	
Glasgow	-	*Glasgow-Carlisle*	-
Carlisle	-	*Carlisle-Liverpool*	-
Liverpool	-	*Liverpool-Dublin*	-
Dublin	-	*Liverpool-London*	-
London	-	*London-Dover*	-
Dover	-	*Dover-Calais*	-
Calais	-	*Calais-Duisburg*	-
Duisburg	Internal water transport		

Corridor 'Edelweiss'

Nodes		*Arcs*	
St. Petersburg	dss, sss	*St. Petersburg-Lappeenranta*	-
Lappeenranta	-	*Lappeenranta-Helsinki*	-
Helsinki	sss	*Helsinki-Turku*	-
Turku	sss	*Stockholm-Oslo*	-
Stockholm	sss	*Stockholm-Malmo*	-
Oslo	-	*Oslo-Gothenburg*	-
Malmo	sss	*Gothenburg-Malmo*	-
Gothenburg	dss, sss	*Malmo-Copenhagen*	-
Copenhagen	-	*Copenhagen-Taulov*	-
Taulov	-	*Copenhagen-Rodbyhavn*	-
Rodbyhavn	sss	*Rodbyhavn-Puttgarden*	-
Puttgarden	sss	*Taulov-Hamburg*	-
Hamburg	dss, sss	*Puttgarden-Hamburg*	-
Hannover	-	*Hamburg-Hannover*	-
Würzburg	-	*Hannover-Würzburg*	-
Ulm	-	*Würzburg-Ulm*	-
Lugano	-	*Ulm-Lugano*	-
Milan	-	*Lugano-Milan*	-

Genoa	sss	*Milan-Genoa*	-
		Turku-Stockholm	-

Corridor 'Nureyeev'

Nodes		*Arcs*	
Helsinki	sss	*Helsinki-Tallinn*	-
Tallinn	dss, sss	*St. Petersburg-Moscow*	-
St. Petersburg	dss, sss	*Ventspils-Klaipeda*	-
Moscow	-	*Klaipeda-Minsk*	-
Ventspils	sss	*Klaipeda-Karlshamn*	-
Klaipeda	sss	*Gothenburg-Hamburg*	-
Minsk	-	*Rostock-Gothenburg*	-
Karlshamn	sss	*Hamburg-Malmo*	-
Gothenburg	dss, sss	*Helsinki-St. Petersburg*	-
Hamburg	dss, sss	*Hamburg-Gdansk*	-
Rostock	sss	*Hamburg-Tallinn*	-
Malmo	sss	*Ventspils-Karlshamn*	-
Gdansk	sss	*Malmo-Helsinki*	-
Riga	sss	*Helsinki-Hamburg*	-
Rotterdam	dss, Internal water transport, sss	*Tallinn-Riga*	-
Turku	sss	*Rotterdam-Hamburg*	-
		Klaipeda-Rotterdam	-
		Rostock-Helsinki	-
		Helsinki-Rotterdam	-
		Turku-Gothenburg	-
		Turku-Hamburg	-
		Gothenburg-Rotterdam	-
		Klaipeda-Riga	-
		Hamburg-Riga	-
		St. Petersburg-Hamburg	-
		Rotterdam-Gdansk	-
		Rotterdam-Ventspils	-
		Rotterdam-St. Petersburg	-

Corridor 'Strauss'

Nodes		*Arcs*	
Rotterdam	dss, Internal water transport, sss	*Rotterdam-Duisburg*	-
Duisburg	Internal water transport	*Duisburg-Frankfurt*	-
Frankfurt	Internal water transport	*Frankfurt-Paris*	-
Paris	-	*Frankfurt-Nurnberg*	-
Nurnberg	Internal water transport	*Nurnberg-Vienna*	-
Vienna	Internal water transport	*Vienna-Bratislava*	-
Bratislava	-	*Bratislava-Budapest*	-
Budapest	-	*Budapest-Belgrade*	-
Belgrade	-	*Belgrade-Constanta*	-
Constanta	-		

Corridor 'Two Seas'

Nodes		*Arcs*	
Hamburg	dss, sss	*Hamburg-Berlin*	-
Berlin	-	*Berlin-Dresden*	-
Dresden	-	*Dresden-Prague*	-
Prague	-	*Prague-Nurnberg*	-
Nurnberg	Internal water transport	*Prague-Bratislava*	-
Bratislava	-	*Bratislava-Budapest*	-
Budapest	-	*Budapest-Belgrade*	-
Belgrade	-	*Belgrade-Sofia*	-
Sofia	-	*Sofia-Thessaloniki*	-
Thessaloniki	-	*Thessaloniki-Athens*	-
Athens	-		

Corridor 'Mare Nostrum'

Nodes		*Arcs*	
Bourgas	-	*Bourgas-Istanbul*	-
Istanbul	-	*La Spezia-Genoa*	-
La Spezia	-	*Marseille-Lyon*	-
Genoa	sss	*Odessa-Istanbul*	-
Marseille	sss	*Constanta-Istanbul*	-

Lyon	-	*Algeciras-Istanbul*	-
Odessa	-	*Barcelona-Valencia*	-
Constanta	-	*Valencia-Algeciras*	-
Algeciras	sss	*Istanbul-Athens*	-
Barcelona	sss	*Athens-Gioia Tauro*	-
Valencia	sss	*Gioia Tauro-La Spezia*	-
Athens	-	*Marseille-Barcelona*	-
Gioia Tauro	-	*Algeciras-Sines*	-
Sines	sss	*Genoa-Barcelona*	-
Trieste	-	*Istanbul-Trieste*	-
		Istanbul-Gioia Tauro	-
		Istanbul-Algeciras	-

Corridor 'Silk Way'

Nodes		*Arcs*	
Rotterdam	dss, Internal water transport, sss	*Rotterdam-Shanghai*	-
Shanghai	dss	*Hamburg-Berlin*	-
Hamburg	dss, sss	*Berlin-Warsaw*	-
Berlin	-	*Warsaw-Minsk*	-
Warsaw	-	*Minsk-Moscow*	-
Minsk	-	*Moscow-Beijing*	-
Moscow	-	*Hamburg-Shanghai*	-
Beijing	-	*St. Petersburg-Shanghai*	-
St. Petersburg	dss, sss	*Shanghai-Gothenburg*	-
Gothenburg	dss, sss	*Tallinn-Shanghai*	-
Tallinn	dss, sss		

Electricity

Technology Data

ID	Category	Transport modes
FU13	Fuels and sources of energy	Railway, Road
Description		
Electricity is today produced from fossil fuels, nuclear energy and renewable energy sources		

Readiness Level	Time to Market	Energy Source	Efficiency
1	<1	Electrical	-
CO_2	NO_x	SO_x	LCC
			-

High Level Benchmark

Baseline	Diesel
Relative Cost	
% cost savings during operation	-
CAPEX	-
% fuel savings	-
Emissions	
% CO2 savings	100% on site emissions reduction. However, WTT emissions depend on the energy mix of the country. If the source is renewables, then the footprint is positive.
% SOx savings	100% on site emissions reduction. However, WTT emissions depend on the energy mix of the country. If the source is renewables, then the footprint is positive.
% NOx savings	
Service & bottlenecks	
% operational or infrastructural delays reduction	-
% of frequency of service potential improvement due to delays & bottlenecks reduction	-
% of reliability improvement due to delays & bottlenecks reduction	-

Positive influence | Negative influence | Not relevant or no influence | no information

Technology Applicability per Corridor

Corridor 'Brenner'	
Nodes	Arcs

Malmo	Rail	*Malmo-Trelleborg*	Rail
Trelleborg	Rail	*Trelleborg-Sassnitz*	-
Sassnitz	Rail	*Trelleborg-Rostock*	-
Rostock	Rail	*Sassnitz-Berlin*	Rail
Berlin	Rail, Road	*Rostock-Berlin*	Rail
Nurnberg	Rail, Road	*Berlin-Nurnberg*	Rail
Munich	Rail	*Nurnberg-Munich*	Rail
Salzburg	Rail	*Munich-Salzburg*	Rail
Villach	Rail	*Salzburg-Villach*	Rail
Trieste	Rail	*Villach-Trieste*	Rail
Verona	Rail	*Munich-Verona*	Rail
Bologna	Rail	*Verona-Bologna*	Rail
Ancona	Rail	*Bologna-Ancona*	Rail
Bari	Rail	*Ancona-Bari*	Rail
Brindisi	Rail	*Bari-Brindisi*	Rail
Igoumenitsa	-	*Igoumenitsa-Thessaloniki*	-
Thessaloniki	Rail, Road	*Igoumenitsa-Patras*	-
Patras	-	*Patras-Athens*	-
Athens	Rail, Road	*Bologna-Rome*	Rail
Rome	Rail	*Rome-Naples*	Rail
Naples	Rail	*Naples-Messina*	-
Messina	Rail	*Villa San Giovanni-Messina*	-
Villa San Giovanni	Rail	*Messina-Palermo*	Rail
Palermo	Rail	*Naples-Villa San Giovanni*	Rail
		Ancona-Brindisi	-
		Bari-Igoumenitsa	-

Corridor 'Finis Terrae'

Nodes		*Arcs*	
Paris	Road	*Paris-St. Nazaire*	-
St. Nazaire	-	*Paris-Irun*	-
Irun	-	*St. Nazaire-Gijon*	-
Gijon	-	*Irun-Valladolid*	-
Valladolid	-	*Gijon-Valladolid*	-
Madrid	-	*Valladolid-Madrid*	-
Lisboa	-	*Madrid-Lisboa*	-

Corridor 'Cloverleaf'

Nodes		*Arcs*	
Glasgow	Rail	*Glasgow-Carlisle*	Rail, Road
Carlisle	Rail	*Carlisle-Liverpool*	Rail, Road
Liverpool	Rail	*Liverpool-Dublin*	-
Dublin	-	*Liverpool-London*	Rail, Road
London	Rail	*London-Dover*	Rail, Road
Dover	Rail	*Dover-Calais*	Rail
Calais	Rail	*Calais-Duisburg*	Rail, Road
Duisburg	Rail, Road		

Corridor 'Edelweiss'

Nodes		*Arcs*	
St. Petersburg	Road	*St. Petersburg-Lappeenranta*	Rail, Road
Lappeenranta	Rail	*Lappeenranta-Helsinki*	Rail, Road
Helsinki	Rail	*Helsinki-Turku*	Rail, Road
Turku	Rail	*Stockholm-Oslo*	Rail, Road
Stockholm	Rail	*Stockholm-Malmo*	Rail, Road
Oslo	Rail	*Oslo-Gothenburg*	Rail, Road
Malmo	Rail	*Gothenburg-Malmo*	Rail, Road
Gothenburg	Rail	*Malmo-Copenhagen*	Rail, Road
Copenhagen	Rail	*Copenhagen-Taulov*	Rail, Road
Taulov	Rail	*Copenhagen-Rodbyhavn*	Road
Rodbyhavn	-	*Rodbyhavn-Puttgarden*	-
Puttgarden	-	*Taulov-Hamburg*	Rail, Road
Hamburg	Rail, Road	*Puttgarden-Hamburg*	Road
Hannover	Rail	*Hamburg-Hannover*	Rail, Road
Würzburg	Rail	*Hannover-Würzburg*	Rail, Road
Ulm	Rail	*Würzburg-Ulm*	Rail, Road
Lugano	Rail	*Ulm-Lugano*	Rail, Road
Milan	Rail	*Lugano-Milan*	Rail, Road

Genoa	Rail	*Milan-Genoa*	Rail, Road
		Turku-Stockholm	-

Corridor 'Nureyeev'

Nodes		*Arcs*	
Helsinki	Rail	*Helsinki-Tallinn*	-
Tallinn	-	*St. Petersburg-Moscow*	-
St. Petersburg	Road	*Ventspils-Klaipeda*	-
Moscow	Rail, Road	*Klaipeda-Minsk*	Rail
Ventspils	-	*Klaipeda-Karlshamn*	-
Klaipeda	Rail, Road	*Gothenburg-Hamburg*	-
Minsk	Rail, Road	*Rostock-Gothenburg*	-
Karlshamn	-	*Hamburg-Malmo*	-
Gothenburg	Rail	*Helsinki-St. Petersburg*	-
Hamburg	Rail, Road	*Hamburg-Gdansk*	-
Rostock	Rail	*Hamburg-Tallinn*	-
Malmo	Rail	*Ventspils-Karlshamn*	-
Gdansk	-	*Malmo-Helsinki*	-
Riga	-	*Helsinki-Hamburg*	-
Rotterdam	Rail, Road	*Tallinn-Riga*	-
Turku	Rail	*Rotterdam-Hamburg*	-
		Klaipeda-Rotterdam	-
		Rostock-Helsinki	-
		Helsinki-Rotterdam	-
		Turku-Gothenburg	-
		Turku-Hamburg	-
		Gothenburg-Rotterdam	-
		Klaipeda-Riga	-
		Hamburg-Riga	-
		St. Petersburg-Hamburg	-
		Rotterdam-Gdansk	-
		Rotterdam-Ventspils	-
		Rotterdam-St. Petersburg	-

Corridor 'Strauss'

Nodes		*Arcs*	
Rotterdam	Rail, Road	*Rotterdam-Duisburg*	Rail, Road
Duisburg	Rail, Road	*Duisburg-Frankfurt*	Rail, Road
Frankfurt	Rail, Road	*Frankfurt-Paris*	Rail, Road
Paris	Road	*Frankfurt-Nurnberg*	Rail, Road
Nurnberg	Rail, Road	*Nurnberg-Vienna*	Rail, Road
Vienna	Rail, Road	*Vienna-Bratislava*	Rail, Road
Bratislava	Rail, Road	*Bratislava-Budapest*	-
Budapest	Rail, Road	*Budapest-Belgrade*	-
Belgrade	Rail, Road	*Belgrade-Constanta*	Rail, Road
Constanta	Rail, Road		

Corridor 'Two Seas'

Nodes		*Arcs*	
Hamburg	Rail, Road	*Hamburg-Berlin*	-
Berlin	Rail, Road	*Berlin-Dresden*	Rail
Dresden	Rail, Road	*Dresden-Prague*	Rail
Prague	Rail, Road	*Prague-Nurnberg*	Rail
Nurnberg	Rail, Road	*Prague-Bratislava*	Rail
Bratislava	Rail, Road	*Bratislava-Budapest*	Rail
Budapest	Rail, Road	*Budapest-Belgrade*	Rail
Belgrade	Rail, Road	*Belgrade-Sofia*	Rail
Sofia	Rail, Road	*Sofia-Thessaloniki*	Rail
Thessaloniki	Rail, Road	*Thessaloniki-Athens*	Rail
Athens	Rail, Road		

Corridor 'Mare Nostrum'

Nodes		*Arcs*	
Bourgas	-	*Bourgas-Istanbul*	-
Istanbul	-	*La Spezia-Genoa*	-
La Spezia	-	*Marseille-Lyon*	Rail, Road
Genoa	Rail	*Odessa-Istanbul*	-
Marseille	Rail, Road	*Constanta-Istanbul*	-

Lyon	Rail, Road	*Algeciras-Istanbul*	-
Odessa	-	*Barcelona-Valencia*	Rail, Road
Constanta	Rail, Road	*Valencia-Algeciras*	Rail, Road
Algeciras	Rail, Road	*Istanbul-Athens*	-
Barcelona	Rail, Road	*Athens-Gioia Tauro*	-
Valencia	Rail, Road	*Gioia Tauro-La Spezia*	-
Athens	Rail, Road	*Marseille-Barcelona*	Rail, Road
Gioia Tauro	-	*Algeciras-Sines*	-
Sines	-	*Genoa-Barcelona*	-
Trieste	Rail	*Istanbul-Trieste*	-
		Istanbul-Gioia Tauro	-
		Istanbul-Algeciras	-

Corridor 'Silk Way'

Nodes		*Arcs*	
Rotterdam	Rail, Road	*Rotterdam-Shanghai*	-
Shanghai	-	*Hamburg-Berlin*	Rail
Hamburg	Rail, Road	*Berlin-Warsaw*	Rail
Berlin	Rail, Road	*Warsaw-Minsk*	Rail
Warsaw	Rail	*Minsk-Moscow*	Rail
Minsk	Rail, Road	*Moscow-Beijing*	Rail
Moscow	Rail, Road	*Hamburg-Shanghai*	-
Beijing	Rail	*St. Petersburg-Shanghai*	-
St. Petersburg	Road	*Shanghai-Gothenburg*	-
Gothenburg	Rail	*Tallinn-Shanghai*	-
Tallinn	-		

Sky sails system

Technology Data

ID	Category	Transport modes
FU25	Fuels and sources of energy	Maritime

Description
It uses large towing kites for the propulsion of the ship. The tractive forces are transmitted to the ship via a highly tear proof, synthetic rope.

Readiness Level	Time to Market	Energy Source	Efficiency
9	<1	Wind	-
CO_2	NO_x	SO_x	LCC
9	9	9	-

Notes on technology

Depending on wind conditions this technology can provide considerable energy savings. Wind propulsion has been used for ages. In our days, novel materials and self-adjusting sail systems are introduced to this technology to improve its performance . Apart from the acquisition and installation costs, a marginal maintenance cost for this technology must be included. According to technology manufacturers it is possible to reach energy savings in the range of 5-20% (ideally), all depending on conditions and optimized used of installed equipment. On average, the energy savings from sky sails are up to 6-7%. The average speed will not be affected, but the utilisation of wind energy allows the captain to reduce the engine thrust while still maintaining the same speed. This gives corresponding savings in CO2 and SOx. As with the average speed KPI, it is assumed that both frequency of service and the reliability of service will not be affected by the technology. This since it is very unlikely that any user of this technology will rank fuel saving, above the ability to deliver according to customer expectations (e.g. delivering on-time).

High Level Benchmark

Baseline	*No sky-sails*
Relative Cost	
% cost savings during operation	*5-20% on OPEX*
CAPEX	*Higher CAPEX*
% fuel savings	*5-20%*
Emissions	
% CO2 savings	*5-20%*
% SOx savings	*5-20%*
% NOx savings	
Service & bottlenecks	
% operational or infrastructural delays reduction	-
% of frequency of service	-

potential improvement due to delays & bottlenecks reduction	
% of reliability improvement due to delays & bottlenecks reduction	-

Positive influence | Negative influence | Not relevant or no influence | no information

Detailed Benchmark

(with respect to baseline performance on specific corridor)

Corridor	*Nureyeev*	
Mode of transport	*sss*	
Cost	*Min: 0.0%*	*Max: 0.0%*
CO2 emissions	*Min: 0.0%*	*Max: 15.0%*
SOX emissions	*Min: 0.0%*	*Max: 14.3%*
Average speed	*Min: 0.0%*	*Max: 0.0%*
Frequency	*Min: 0.0%*	*Max: 0.0%*
Reliability	*Min: 0.0%*	*Max: 0.0%*

Technology Applicability per Corridor

Corridor 'Brenner'

The technology is not applicable to this corridor.

Corridor 'Finis Terrae'

Nodes		*Arcs*	
Paris	-	*Paris-St. Nazaire*	-
St. Nazaire	-	*Paris-Irun*	-
Irun	-	*St. Nazaire-Gijon*	sss
Gijon	-	*Irun-Valladolid*	-
Valladolid	-	*Gijon-Valladolid*	-
Madrid	-	*Valladolid-Madrid*	-
Lisboa	-	*Madrid-Lisboa*	-

Corridor 'Cloverleaf'

The technology is not applicable to this corridor.

Corridor 'Edelweiss'

The technology is not applicable to this corridor.

Corridor 'Nureyeev'

Nodes		*Arcs*	
Helsinki	-	*Helsinki-Tallinn*	sss
Tallinn	-	*St. Petersburg-Moscow*	-
St. Petersburg	-	*Ventspils-Klaipeda*	sss
Moscow	-	*Klaipeda-Minsk*	-
Ventspils	-	*Klaipeda-Karlshamn*	sss
Klaipeda	-	*Gothenburg-Hamburg*	sss
Minsk	-	*Rostock-Gothenburg*	sss
Karlshamn	-	*Hamburg-Malmo*	sss

Gothenburg	-	*Helsinki-St. Petersburg*	sss
Hamburg	-	*Hamburg-Gdansk*	sss
Rostock	-	*Hamburg-Tallinn*	sss
Malmo	-	*Ventspils-Karlshamn*	sss
Gdansk	-	*Malmo-Helsinki*	sss
Riga	-	*Helsinki-Hamburg*	sss
Rotterdam	-	*Tallinn-Riga*	-
Turku	-	*Rotterdam-Hamburg*	-
		Klaipeda-Rotterdam	sss
		Rostock-Helsinki	sss
		Helsinki-Rotterdam	sss
		Turku-Gothenburg	sss
		Turku-Hamburg	sss
		Gothenburg-Rotterdam	sss
		Klaipeda-Riga	sss
		Hamburg-Riga	sss
		St. Petersburg-Hamburg	sss
		Rotterdam-Gdansk	-
		Rotterdam-Ventspils	sss
		Rotterdam-St. Petersburg	sss

Corridor 'Strauss'

The technology is not applicable to this corridor.

Corridor 'Two Seas'

The technology is not applicable to this corridor.

Corridor 'Mare Nostrum'

The technology is not applicable to this corridor.

Corridor 'Silk Way'

Nodes		*Arcs*	
Rotterdam	-	*Rotterdam-Shanghai*	dss
Shanghai	-	*Hamburg-Berlin*	-
Hamburg	-	*Berlin-Warsaw*	-
Berlin	-	*Warsaw-Minsk*	-
Warsaw	-	*Minsk-Moscow*	-
Minsk	-	*Moscow-Beijing*	-
Moscow	-	*Hamburg-Shanghai*	dss
Beijing	-	*St. Petersburg-Shanghai*	dss
St. Petersburg	-	*Shanghai-Gothenburg*	dss
Gothenburg	-	*Tallinn-Shanghai*	dss
Tallinn	-		

Waste heat recovery system

Technology Data

ID	Category	Transport modes
FU26	Fuels and sources of energy	Maritime
Description		
It passes exhaust gases from the ship's main engine through a heat exchanger to generate steam for a turbine driven generator the electrical power generated assists ship propulsion or supplies shipboard services.		

Readiness Level	Time to Market	Energy Source	Efficiency
0	0	Electrical	-
CO_2	NO_x	SO_x	LCC
0	0	0	-

Notes on technology

"Waste heat recovery systems are used to recover part of the main engine exhaust gas thermal energy, in order to produce steam and, thereby, electrical power in a steam turbine generator. Heat recovery systems could be applied to all Mare Nostrum corridor segments related to trades operated by large vessels, in order to improve the energy efficiency of baseline diesel engines propulsion. For the Mare Nostrum container ships, a fuel saving gain of 2-7% was assumed. The gains from waste heat recovery (WHR) mainly depend on the system size and complexity. Using phenomenological process modelling of the system, the energy efficiency and environmental performance can be predicted and optimised. The benefits from waste heat recovery are higher for large ships due to the economies of scale. A main drawback is the space requirement for the installation of the heat recovery system, which results in cargo capacity reduction. Therefore, for small ships such systems may be a highly costly option.

High Level Benchmark

Baseline	Vessels without steam driven turbine generator (ocean going vessels with installed power exceeding 20 MW)
Relative Cost	
% cost savings during operation	Reduced OPEX by 4-8%
CAPEX	-
% fuel savings	4-8%, large container vessels up to 10%
Emissions	
% CO2 savings	4-8%, large container vessels up to 10%
% SOx savings	4-8%, large container vessels up to 10%
% NOx savings	
Service & bottlenecks	
% operational or infrastructural delays reduction	-
% of frequency of service	-

potential improvement due to delays & bottlenecks reduction	
% of reliability improvement due to delays & bottlenecks reduction	-

Positive influence | Negative influence | Not relevant or no influence | no information

Detailed Benchmark

(with respect to baseline performance on specific corridor)

Corridor	*Mare Nostrum*	
Mode of transport	*sss*	
Cost	*Min: 0.6%*	*Max: 5.2%*
CO2 emissions	*Min: 1.5%*	*Max: 5.3%*
SOX emissions	*Min: 1.1%*	*Max: 5.4%*
Average speed	*Min: 0.0%*	*Max: 0.0%*
Frequency	*Min: 0.0%*	*Max: 0.0%*
Reliability	*Min: 0.0%*	*Max: 0.0%*

Technology Applicability per Corridor

Corridor 'Brenner'

The technology is not applicable to this corridor.

Corridor 'Finis Terrae'

Nodes		*Arcs*	
Paris	-	*Paris-St. Nazaire*	-
St. Nazaire	-	*Paris-Irun*	-
Irun	-	*St. Nazaire-Gijon*	sss
Gijon	-	*Irun-Valladolid*	-
Valladolid	-	*Gijon-Valladolid*	-
Madrid	-	*Valladolid-Madrid*	-
Lisboa	-	*Madrid-Lisboa*	-

Corridor 'Cloverleaf'

Nodes		*Arcs*	
Glasgow	-	*Glasgow-Carlisle*	-
Carlisle	-	*Carlisle-Liverpool*	-
Liverpool	-	*Liverpool-Dublin*	sss
Dublin	-	*Liverpool-London*	-
London	-	*London-Dover*	-
Dover	-	*Dover-Calais*	sss
Calais	-	*Calais-Duisburg*	-
Duisburg	-		

Corridor 'Edelweiss'

Nodes		*Arcs*	
St. Petersburg	-	*St. Petersburg-Lappeenranta*	-
Lappeenranta	-	*Lappeenranta-Helsinki*	-
Helsinki	-	*Helsinki-Turku*	-
Turku	-	*Stockholm-Oslo*	-

Stockholm	-	*Stockholm-Malmo*	-
Oslo	-	*Oslo-Gothenburg*	-
Malmo	-	*Gothenburg-Malmo*	-
Gothenburg	-	*Malmo-Copenhagen*	-
Copenhagen	-	*Copenhagen-Taulov*	-
Taulov	-	*Copenhagen-Rodbyhavn*	-
Rodbyhavn	-	*Rodbyhavn-Puttgarden*	sss
Puttgarden	-	*Taulov-Hamburg*	-
Hamburg	-	*Puttgarden-Hamburg*	-
Hannover	-	*Hamburg-Hannover*	-
Würzburg	-	*Hannover-Würzburg*	-
Ulm	-	*Würzburg-Ulm*	-
Lugano	-	*Ulm-Lugano*	-
Milan	-	*Lugano-Milan*	-
Genoa	-	*Milan-Genoa*	-
		Turku-Stockholm	sss

Corridor 'Nureyeev'

Nodes		*Arcs*	
Helsinki	-	*Helsinki-Tallinn*	sss
Tallinn	-	*St. Petersburg-Moscow*	-
St. Petersburg	-	*Ventspils-Klaipeda*	sss
Moscow	-	*Klaipeda-Minsk*	-
Ventspils	-	*Klaipeda-Karlshamn*	sss
Klaipeda	-	*Gothenburg-Hamburg*	sss
Minsk	-	*Rostock-Gothenburg*	sss
Karlshamn	-	*Hamburg-Malmo*	sss
Gothenburg	-	*Helsinki-St. Petersburg*	sss
Hamburg	-	*Hamburg-Gdansk*	sss
Rostock	-	*Hamburg-Tallinn*	sss
Malmo	-	*Ventspils-Karlshamn*	sss
Gdansk	-	*Malmo-Helsinki*	sss
Riga	-	*Helsinki-Hamburg*	sss
Rotterdam	-	*Tallinn-Riga*	sss
Turku	-	*Rotterdam-Hamburg*	-
		Klaipeda-Rotterdam	sss
		Rostock-Helsinki	sss
		Helsinki-Rotterdam	sss
		Turku-Gothenburg	sss
		Turku-Hamburg	sss
		Gothenburg-Rotterdam	sss
		Klaipeda-Riga	sss
		Hamburg-Riga	sss
		St. Petersburg-Hamburg	sss
		Rotterdam-Gdansk	-
		Rotterdam-Ventspils	sss
		Rotterdam-St. Petersburg	sss

Corridor 'Strauss'

The technology is not applicable to this corridor.

Corridor 'Two Seas'

The technology is not applicable to this corridor.

Corridor 'Mare Nostrum'

Nodes		*Arcs*	
Bourgas	-	*Bourgas-Istanbul*	sss
Istanbul	-	*La Spezia-Genoa*	sss
La Spezia	-	*Marseille-Lyon*	-
Genoa	-	*Odessa-Istanbul*	sss
Marseille	-	*Constanta-Istanbul*	sss
Lyon	-	*Algeciras-Istanbul*	sss
Odessa	-	*Barcelona-Valencia*	sss
Constanta	-	*Valencia-Algeciras*	sss
Algeciras	-	*Istanbul-Athens*	sss
Barcelona	-	*Athens-Gioia Tauro*	sss
Valencia	-	*Gioia Tauro-La Spezia*	sss
Athens	-	*Marseille-Barcelona*	sss

Gioia Tauro	-	*Algeciras-Sines*	sss
Sines	-	*Genoa-Barcelona*	sss
Trieste	-	*Istanbul-Trieste*	sss
		Istanbul-Gioia Tauro	sss
		Istanbul-Algeciras	sss

Corridor 'Silk Way'

The technology is not applicable to this corridor.

Cargo Handling and Transfer

Diesel to electric power convertor (RTGs)

Technology Data

ID	Category	Transport modes
HT01	Cargo Handling and Transfer	Maritime, Inland Waterways, Railway, Road

Description
RTGs fitted with electrical components in place of traditional hydraulic parts. Conversion will eliminate black emissions and lower noise levels of engines

Readiness Level	Time to Market	Energy Source	Efficiency
9	<1	-	-
CO_2	NO_x	SO_x	LCC
0	0	0	0

High Level Benchmark

Baseline		0
Relative Cost		
% cost savings during operation		Reduced maintenance costs by 70%
CAPEX		-
% fuel savings		95%
Emissions		
% CO2 savings		-
% SOx savings		-
% NOx savings		
Service & bottlenecks		
% operational or infrastructural delays reduction		-
% of frequency of service potential improvement due to delays & bottlenecks reduction		-
% of reliability improvement due to delays & bottlenecks reduction		-

Positive influence | Negative influence | Not relevant or no influence | no information

Technology Applicability per Corridor

Corridor 'Brenner'

Nodes		Arcs	
Malmo	Rail, Road, sss	Malmo-Trelleborg	-
Trelleborg	Rail, Road, sss	Trelleborg-Sassnitz	-
Sassnitz	Rail, Road, sss	Trelleborg-Rostock	-
Rostock	Rail, Road, sss	Sassnitz-Berlin	-
Berlin	-	Rostock-Berlin	-
Nurnberg	Internal water transport, Rail, Road	Berlin-Nurnberg	-
Munich	-	Nurnberg-Munich	-
Salzburg	-	Munich-Salzburg	-
Villach	-	Salzburg-Villach	-
Trieste	Rail, Road, sss	Villach-Trieste	-
Verona	-	Munich-Verona	-
Bologna	-	Verona-Bologna	-
Ancona	Rail, Road, sss	Bologna-Ancona	-
Bari	Rail, Road, sss	Ancona-Bari	-
Brindisi	Rail, Road, sss	Bari-Brindisi	-
Igoumenitsa	Road, sss	Igoumenitsa-Thessaloniki	-
Thessaloniki	-	Igoumenitsa-Patras	-
Patras	sss	Patras-Athens	-
Athens	sss	Bologna-Rome	-
Rome	-	Rome-Naples	-
Naples	Rail, Road, sss	Naples-Messina	-
Messina	Rail, Road, sss	Villa San Giovanni-Messina	-
Villa San Giovanni	Rail, Road, sss	Messina-Palermo	-
Palermo	Rail, Road	Naples-Villa San Giovanni	-
		Ancona-Brindisi	-
		Bari-Igoumenitsa	-

Corridor 'Finis Terrae'

Nodes		Arcs	
Paris	Rail, Road	Paris-St. Nazaire	-
St. Nazaire	Rail, Road, sss	Paris-Irun	-
Irun	Rail, Road	St. Nazaire-Gijon	-
Gijon	Rail, Road, sss	Irun-Valladolid	-
Valladolid	Rail, Road	Gijon-Valladolid	-
Madrid	Rail, Road	Valladolid-Madrid	-
Lisboa	Rail, Road	Madrid-Lisboa	-

Corridor 'Cloverleaf'

Nodes		Arcs	
Glasgow	Rail, Road	Glasgow-Carlisle	-
Carlisle	Rail, Road	Carlisle-Liverpool	-
Liverpool	Rail, Road, sss	Liverpool-Dublin	-
Dublin	sss	Liverpool-London	-
London	Rail, Road	London-Dover	-
Dover	Rail, Road, sss	Dover-Calais	-
Calais	Rail, Road, sss	Calais-Duisburg	-
Duisburg	Internal water transport, Rail, Road		

Corridor 'Edelweiss'

Nodes		Arcs	
St. Petersburg	dss, Rail, Road, sss	St. Petersburg-Lappeenranta	-
Lappeenranta	Rail, Road	Lappeenranta-Helsinki	-
Helsinki	Rail, Road, sss	Helsinki-Turku	-
Turku	Rail, Road, sss	Stockholm-Oslo	-
Stockholm	Rail, Road, sss	Stockholm-Malmo	-
Oslo	Rail, Road	Oslo-Gothenburg	-
Malmo	Rail, Road, sss	Gothenburg-Malmo	-
Gothenburg	dss, Rail, Road, sss	Malmo-Copenhagen	-
Copenhagen	Rail, Road	Copenhagen-Taulov	-
Taulov	Rail, Road	Copenhagen-Rodbyhavn	-
Rodbyhavn	Road, sss	Rodbyhavn-Puttgarden	-
Puttgarden	Road, sss	Taulov-Hamburg	-

Hamburg	dss, Rail, Road, sss	*Puttgarden-Hamburg*	-
Hannover	Rail, Road	*Hamburg-Hannover*	-
Würzburg	Rail, Road	*Hannover-Würzburg*	-
Ulm	Rail, Road	*Würzburg-Ulm*	-
Lugano	Rail, Road	*Ulm-Lugano*	-
Milan	Rail, Road	*Lugano-Milan*	-
Genoa	Rail, Road, sss	*Milan-Genoa*	-
		Turku-Stockholm	-

Corridor 'Nureyeev'

Nodes		*Arcs*	
Helsinki	Rail, Road, sss	*Helsinki-Tallinn*	-
Tallinn	dss, sss	*St. Petersburg-Moscow*	-
St. Petersburg	dss, Rail, Road, sss	*Ventspils-Klaipeda*	-
Moscow	Rail, Road	*Klaipeda-Minsk*	-
Ventspils	sss	*Klaipeda-Karlshamn*	-
Klaipeda	Rail, Road, sss	*Gothenburg-Hamburg*	-
Minsk	Rail, Road	*Rostock-Gothenburg*	-
Karlshamn	sss	*Hamburg-Malmo*	-
Gothenburg	dss, Rail, Road, sss	*Helsinki-St. Petersburg*	-
Hamburg	dss, Rail, Road, sss	*Hamburg-Gdansk*	-
Rostock	Rail, Road, sss	*Hamburg-Tallinn*	-
Malmo	Rail, Road, sss	*Ventspils-Karlshamn*	-
Gdansk	sss	*Malmo-Helsinki*	-
Riga	sss	*Helsinki-Hamburg*	-
Rotterdam	dss, Internal water transport, Rail, Road, sss	*Tallinn-Riga*	-
		Rotterdam-Hamburg	-
Turku	Rail, Road, sss	*Klaipeda-Rotterdam*	-
		Rostock-Helsinki	-
		Helsinki-Rotterdam	-
		Turku-Gothenburg	-
		Turku-Hamburg	-
		Gothenburg-Rotterdam	-
		Klaipeda-Riga	-
		Hamburg-Riga	-
		St. Petersburg-Hamburg	-
		Rotterdam-Gdansk	-
		Rotterdam-Ventspils	-
		Rotterdam-St. Petersburg	-

Corridor 'Strauss'

Nodes		*Arcs*	
Rotterdam	dss, Internal water transport, Rail, Road, sss	*Rotterdam-Duisburg*	-
		Duisburg-Frankfurt	-
Duisburg	Internal water transport, Rail, Road	*Frankfurt-Paris*	-
Frankfurt	Internal water transport, Rail, Road	*Frankfurt-Nurnberg*	-
Paris	Rail, Road	*Nurnberg-Vienna*	-
Nurnberg	Internal water transport, Rail, Road	*Vienna-Bratislava*	-
Vienna	Internal water transport, Rail, Road	*Bratislava-Budapest*	-
Bratislava	Internal water transport, Rail, Road	*Budapest-Belgrade*	-
Budapest	Internal water transport	*Belgrade-Constanta*	-
Belgrade	Internal water transport, Rail, Road		
Constanta	Internal water transport, Rail, Road, sss		

Corridor 'Two Seas'

Nodes		*Arcs*	
Hamburg	dss, Rail, Road, sss	*Hamburg-Berlin*	-
Berlin	-	*Berlin-Dresden*	-
Dresden	-	*Dresden-Prague*	-
Prague	-	*Prague-Nurnberg*	-
Nurnberg	Internal water transport, Rail, Road	*Prague-Bratislava*	-
Bratislava	Internal water transport, Rail, Road	*Bratislava-Budapest*	-
Budapest	Internal water transport	*Budapest-Belgrade*	-
Belgrade	Internal water transport, Rail, Road	*Belgrade-Sofia*	-
Sofia	-	*Sofia-Thessaloniki*	-
Thessaloniki	-	*Thessaloniki-Athens*	-
Athens	sss		

Corridor 'Mare Nostrum'

Nodes		Arcs	
Bourgas	sss	*Bourgas-Istanbul*	-
Istanbul	sss	*La Spezia-Genoa*	-
La Spezia	sss	*Marseille-Lyon*	-
Genoa	Rail, Road, sss	*Odessa-Istanbul*	-
Marseille	Internal water transport, Rail,	*Constanta-Istanbul*	-
Road, sss		*Algeciras-Istanbul*	-
Lyon	Internal water transport, Rail, Road	*Barcelona-Valencia*	-
Odessa	sss	*Valencia-Algeciras*	-
Constanta	Internal water transport, Rail,	*Istanbul-Athens*	-
Road, sss		*Athens-Gioia Tauro*	-
Algeciras	Rail, Road, sss	*Gioia Tauro-La Spezia*	-
Barcelona	Rail, Road, sss	*Marseille-Barcelona*	-
Valencia	Rail, Road, sss	*Algeciras-Sines*	-
Athens	sss	*Genoa-Barcelona*	-
Gioia Tauro	sss	*Istanbul-Trieste*	-
Sines	sss	*Istanbul-Gioia Tauro*	-
Trieste	Rail, Road, sss	*Istanbul-Algeciras*	-

Corridor 'Silk Way'

Nodes		Arcs	
Rotterdam	dss, Internal water transport, Rail,	*Rotterdam-Shanghai*	-
Road, sss		*Hamburg-Berlin*	-
Shanghai	dss	*Berlin-Warsaw*	-
Hamburg	dss, Rail, Road, sss	*Warsaw-Minsk*	-
Berlin	-	*Minsk-Moscow*	-
Warsaw	-	*Moscow-Beijing*	-
Minsk	Rail, Road	*Hamburg-Shanghai*	-
Moscow	Rail, Road	*St. Petersburg-Shanghai*	-
Beijing	Rail	*Shanghai-Gothenburg*	-
St. Petersburg	dss, Rail, Road, sss	*Tallinn-Shanghai*	-
Gothenburg	dss, Rail, Road, sss		
Tallinn	dss, sss		

Hybrid hydraulic drive for Terminal tractors

Technology Data

ID	Category	Transport modes
HT03	Cargo Handling and Transfer	Maritime

Description
Storing braking energy into hydraulic system for acceleration and system

Readiness Level	Time to Market	Energy Source	Efficiency
9	1	-	-
CO_2	NO_x	SO_x	LCC
0	reduction of equivalent to 19 tonnes of Nox	0	0

High Level Benchmark

Baseline	No braking energy recovery systems
Relative Cost	
% cost savings during operation	-
CAPEX	-
% fuel savings	20%
Emissions	
% CO2 savings	20%
% SOx savings	20%
% NOx savings	
Service & bottlenecks	
% operational or infrastructural delays reduction	-
% of frequency of service potential improvement due to delays & bottlenecks reduction	-
% of reliability improvement due to delays & bottlenecks reduction	-

Positive influence | Negative influence | Not relevant or no influence | no information

Technology Applicability per Corridor

Corridor 'Brenner'

Nodes		Arcs	
Malmo	sss	Malmo-Trelleborg	-
Trelleborg	sss	Trelleborg-Sassnitz	-

Sassnitz	sss	*Trelleborg-Rostock*	-
Rostock	sss	*Sassnitz-Berlin*	-
Berlin	-	*Rostock-Berlin*	-
Nurnberg	-	*Berlin-Nurnberg*	-
Munich	-	*Nurnberg-Munich*	-
Salzburg	-	*Munich-Salzburg*	-
Villach	-	*Salzburg-Villach*	-
Trieste	sss	*Villach-Trieste*	-
Verona	-	*Munich-Verona*	-
Bologna	-	*Verona-Bologna*	-
Ancona	sss	*Bologna-Ancona*	-
Bari	sss	*Ancona-Bari*	-
Brindisi	sss	*Bari-Brindisi*	-
Igoumenitsa	sss	*Igoumenitsa-Thessaloniki*	-
Thessaloniki	-	*Igoumenitsa-Patras*	-
Patras	sss	*Patras-Athens*	-
Athens	sss	*Bologna-Rome*	-
Rome	-	*Rome-Naples*	-
Naples	sss	*Naples-Messina*	-
Messina	sss	*Villa San Giovanni-Messina*	-
Villa San Giovanni	sss	*Messina-Palermo*	-
Palermo	-	*Naples-Villa San Giovanni*	-
		Ancona-Brindisi	-
		Bari-Igoumenitsa	-

Corridor 'Finis Terrae'

Nodes		*Arcs*	
Paris	-	*Paris-St. Nazaire*	-
St. Nazaire	sss	*Paris-Irun*	-
Irun	-	*St. Nazaire-Gijon*	-
Gijon	sss	*Irun-Valladolid*	-
Valladolid	-	*Gijon-Valladolid*	-
Madrid	-	*Valladolid-Madrid*	-
Lisboa	-	*Madrid-Lisboa*	-

Corridor 'Cloverleaf'

The technology is not applicable to this corridor.

Corridor 'Edelweiss'

Nodes		*Arcs*	
St. Petersburg	dss, sss	*St. Petersburg-Lappeenranta*	-
Lappeenranta	-	*Lappeenranta-Helsinki*	-
Helsinki	sss	*Helsinki-Turku*	-
Turku	sss	*Stockholm-Oslo*	-
Stockholm	sss	*Stockholm-Malmo*	-
Oslo	-	*Oslo-Gothenburg*	-
Malmo	sss	*Gothenburg-Malmo*	-
Gothenburg	dss, sss	*Malmo-Copenhagen*	-
Copenhagen	-	*Copenhagen-Taulov*	-
Taulov	-	*Copenhagen-Rodbyhavn*	-
Rodbyhavn	sss	*Rodbyhavn-Puttgarden*	-
Puttgarden	sss	*Taulov-Hamburg*	-
Hamburg	dss, sss	*Puttgarden-Hamburg*	-
Hannover	-	*Hamburg-Hannover*	-
Würzburg	-	*Hannover-Würzburg*	-
Ulm	-	*Würzburg-Ulm*	-
Lugano	-	*Ulm-Lugano*	-
Milan	-	*Lugano-Milan*	-
Genoa	sss	*Milan-Genoa*	-
		Turku-Stockholm	-

Corridor 'Nureyeev'

Nodes		*Arcs*	
Helsinki	sss	*Helsinki-Tallinn*	-
Tallinn	dss, sss	*St. Petersburg-Moscow*	-
St. Petersburg	dss, sss	*Ventspils-Klaipeda*	-
Moscow	-	*Klaipeda-Minsk*	-
Ventspils	sss	*Klaipeda-Karlshamn*	-

Klaipeda	sss	*Gothenburg-Hamburg*	-
Minsk	-	*Rostock-Gothenburg*	-
Karlshamn	sss	*Hamburg-Malmo*	-
Gothenburg	dss, sss	*Helsinki-St. Petersburg*	-
Hamburg	dss, sss	*Hamburg-Gdansk*	-
Rostock	sss	*Hamburg-Tallinn*	-
Malmo	sss	*Ventspils-Karlshamn*	-
Gdansk	sss	*Malmo-Helsinki*	-
Riga	sss	*Helsinki-Hamburg*	-
Rotterdam	dss, sss	*Tallinn-Riga*	-
Turku	sss	*Rotterdam-Hamburg*	-
		Klaipeda-Rotterdam	-
		Rostock-Helsinki	-
		Helsinki-Rotterdam	-
		Turku-Gothenburg	-
		Turku-Hamburg	-
		Gothenburg-Rotterdam	-
		Klaipeda-Riga	-
		Hamburg-Riga	-
		St. Petersburg-Hamburg	-
		Rotterdam-Gdansk	-
		Rotterdam-Ventspils	-
		Rotterdam-St. Petersburg	-

Corridor 'Strauss'

Nodes		*Arcs*	
Rotterdam	dss, sss	*Rotterdam-Duisburg*	-
Duisburg	-	*Duisburg-Frankfurt*	-
Frankfurt	-	*Frankfurt-Paris*	-
Paris	-	*Frankfurt-Nurnberg*	-
Nurnberg	-	*Nurnberg-Vienna*	-
Vienna	-	*Vienna-Bratislava*	-
Bratislava	-	*Bratislava-Budapest*	-
Budapest	-	*Budapest-Belgrade*	-
Belgrade	-	*Belgrade-Constanta*	-
Constanta	sss		

Corridor 'Two Seas'

Nodes		*Arcs*	
Hamburg	dss, sss	*Hamburg-Berlin*	-
Berlin	-	*Berlin-Dresden*	-
Dresden	-	*Dresden-Prague*	-
Prague	-	*Prague-Nurnberg*	-
Nurnberg	-	*Prague-Bratislava*	-
Bratislava	-	*Bratislava-Budapest*	-
Budapest	-	*Budapest-Belgrade*	-
Belgrade	-	*Belgrade-Sofia*	-
Sofia	-	*Sofia-Thessaloniki*	-
Thessaloniki	-	*Thessaloniki-Athens*	-
Athens	sss		

Corridor 'Mare Nostrum'

Nodes		*Arcs*	
Bourgas	sss	*Bourgas-Istanbul*	-
Istanbul	sss	*La Spezia-Genoa*	-
La Spezia	sss	*Marseille-Lyon*	-
Genoa	sss	*Odessa-Istanbul*	-
Marseille	sss	*Constanta-Istanbul*	-
Lyon	-	*Algeciras-Istanbul*	-
Odessa	sss	*Barcelona-Valencia*	-
Constanta	sss	*Valencia-Algeciras*	-
Algeciras	sss	*Istanbul-Athens*	-
Barcelona	sss	*Athens-Gioia Tauro*	-
Valencia	sss	*Gioia Tauro-La Spezia*	-
Athens	sss	*Marseille-Barcelona*	-
Gioia Tauro	sss	*Algeciras-Sines*	-
Sines	sss	*Genoa-Barcelona*	-
Trieste	sss	*Istanbul-Trieste*	-

		Istanbul-Gioia Tauro	-
		Istanbul-Algeciras	-

Corridor 'Silk Way'			
Nodes		*Arcs*	
Rotterdam	dss, sss	*Rotterdam-Shanghai*	-
Shanghai	dss	*Hamburg-Berlin*	-
Hamburg	dss, sss	*Berlin-Warsaw*	-
Berlin	-	*Warsaw-Minsk*	-
Warsaw	-	*Minsk-Moscow*	-
Minsk	-	*Moscow-Beijing*	-
Moscow	-	*Hamburg-Shanghai*	-
Beijing	-	*St. Petersburg-Shanghai*	-
St. Petersburg	dss, sss	*Shanghai-Gothenburg*	-
Gothenburg	dss, sss	*Tallinn-Shanghai*	-
Tallinn	dss, sss		

Low emission engines

Technology Data

ID	Category	Transport modes
HT07	Cargo Handling and Transfer	Maritime, Inland Waterways, Railway, Road

Description
Replacement of old handling equipment by new machines fitted with Euro III/ IV ccompliant engines. While the upfront capital cost is higher in abt 15K euros/unit, these engines burn diesel more efficiently, give the engine more power while reducing emission of CO2 and providing up to 5% reduction on fuel consumption

Readiness Level	Time to Market	Energy Source	Efficiency
9	<1	-	-
CO_2	NO_x	SO_x	LCC
0	0	0	0

High Level Benchmark

Baseline	Euro II
Relative Cost	
% cost savings during operation	-
CAPEX	-
% fuel savings	5%
Emissions	
% CO2 savings	-
% SOx savings	-
% NOx savings	
Service & bottlenecks	
% operational or infrastructural delays reduction	-
% of frequency of service potential improvement due to delays & bottlenecks reduction	-
% of reliability improvement due to delays & bottlenecks reduction	-

Positive influence | Negative influence | Not relevant or no influence | no information

Technology Applicability per Corridor

Corridor 'Brenner'	
Nodes	Arcs

Malmo	Rail	*Malmo-Trelleborg*	Road
Trelleborg	-	*Trelleborg-Sassnitz*	sss
Sassnitz	-	*Trelleborg-Rostock*	sss
Rostock	-	*Sassnitz-Berlin*	Road
Berlin	-	*Rostock-Berlin*	Road
Nurnberg	-	*Berlin-Nurnberg*	Road
Munich	-	*Nurnberg-Munich*	Road
Salzburg	-	*Munich-Salzburg*	Road
Villach	-	*Salzburg-Villach*	Road
Trieste	-	*Villach-Trieste*	Road
Verona	-	*Munich-Verona*	Road
Bologna	-	*Verona-Bologna*	Road
Ancona	-	*Bologna-Ancona*	Road
Bari	-	*Ancona-Bari*	Road
Brindisi	-	*Bari-Brindisi*	Road
Igoumenitsa	-	*Igoumenitsa-Thessaloniki*	Road
Thessaloniki	-	*Igoumenitsa-Patras*	sss
Patras	-	*Patras-Athens*	Road
Athens	-	*Bologna-Rome*	Road
Rome	-	*Rome-Naples*	Road
Naples	-	*Naples-Messina*	sss
Messina	-	*Villa San Giovanni-Messina*	sss
Villa San Giovanni	-	*Messina-Palermo*	Road
Palermo	-	*Naples-Villa San Giovanni*	Road
		Ancona-Brindisi	sss
		Bari-Igoumenitsa	sss

Corridor 'Finis Terrae'

Nodes		*Arcs*	
Paris	Rail, Road	*Paris-St. Nazaire*	Rail, Road
St. Nazaire	Rail, Road, sss	*Paris-Irun*	Rail, Road
Irun	Rail, Road	*St. Nazaire-Gijon*	sss
Gijon	Rail, Road, sss	*Irun-Valladolid*	Rail, Road
Valladolid	Rail, Road	*Gijon-Valladolid*	Rail, Road
Madrid	Rail, Road	*Valladolid-Madrid*	Rail, Road
Lisboa	Rail, Road	*Madrid-Lisboa*	Rail, Road

Corridor 'Cloverleaf'

Nodes		*Arcs*	
Glasgow	Rail, Road	*Glasgow-Carlisle*	-
Carlisle	Rail, Road	*Carlisle-Liverpool*	-
Liverpool	Rail, Road, sss	*Liverpool-Dublin*	-
Dublin	sss	*Liverpool-London*	-
London	Rail, Road	*London-Dover*	-
Dover	Rail, Road, sss	*Dover-Calais*	-
Calais	Rail, Road, sss	*Calais-Duisburg*	-
Duisburg	Rail, Road		

Corridor 'Edelweiss'

Nodes		*Arcs*	
St. Petersburg	Rail, sss	*St. Petersburg-Lappeenranta*	Rail, Road
Lappeenranta	Rail	*Lappeenranta-Helsinki*	Rail, Road
Helsinki	Rail, sss	*Helsinki-Turku*	Rail, Road
Turku	Rail, sss	*Stockholm-Oslo*	Rail, Road
Stockholm	Rail, sss	*Stockholm-Malmo*	Rail, Road
Oslo	Rail	*Oslo-Gothenburg*	Rail, Road
Malmo	Rail	*Gothenburg-Malmo*	Rail, Road
Gothenburg	Rail, sss	*Malmo-Copenhagen*	Rail, Road
Copenhagen	Rail, Road	*Copenhagen-Taulov*	Rail, Road
Taulov	Rail	*Copenhagen-Rodbyhavn*	Road
Rodbyhavn	Road, sss	*Rodbyhavn-Puttgarden*	-
Puttgarden	Road, sss	*Taulov-Hamburg*	Rail, Road
Hamburg	Rail, sss	*Puttgarden-Hamburg*	Road
Hannover	Rail	*Hamburg-Hannover*	Rail, Road
Würzburg	Rail	*Hannover-Würzburg*	Rail, Road
Ulm	Rail	*Würzburg-Ulm*	Rail, Road
Lugano	Rail	*Ulm-Lugano*	Rail, Road
Milan	Rail	*Lugano-Milan*	Rail, Road

Genoa	Rail, sss	*Milan-Genoa*	Rail, Road
		Turku-Stockholm	-

Corridor 'Nureyeev'

Nodes		*Arcs*	
Helsinki	Rail, sss	*Helsinki-Tallinn*	-
Tallinn	-	*St. Petersburg-Moscow*	Rail, Road
St. Petersburg	Rail, sss	*Ventspils-Klaipeda*	-
Moscow	-	*Klaipeda-Minsk*	Rail, Road
Ventspils	sss	*Klaipeda-Karlshamn*	-
Klaipeda	sss	*Gothenburg-Hamburg*	-
Minsk	-	*Rostock-Gothenburg*	-
Karlshamn	sss	*Hamburg-Malmo*	-
Gothenburg	Rail, sss	*Helsinki-St. Petersburg*	-
Hamburg	Rail, sss	*Hamburg-Gdansk*	-
Rostock	-	*Hamburg-Tallinn*	-
Malmo	Rail	*Ventspils-Karlshamn*	-
Gdansk	sss	*Malmo-Helsinki*	-
Riga	-	*Helsinki-Hamburg*	-
Rotterdam	sss	*Tallinn-Riga*	-
Turku	Rail, sss	*Rotterdam-Hamburg*	-
		Klaipeda-Rotterdam	-
		Rostock-Helsinki	-
		Helsinki-Rotterdam	-
		Turku-Gothenburg	-
		Turku-Hamburg	-
		Gothenburg-Rotterdam	-
		Klaipeda-Riga	-
		Hamburg-Riga	-
		St. Petersburg-Hamburg	-
		Rotterdam-Gdansk	-
		Rotterdam-Ventspils	-
		Rotterdam-St. Petersburg	-

Corridor 'Strauss'

Nodes		*Arcs*	
Rotterdam	sss	*Rotterdam-Duisburg*	Rail, Road
Duisburg	Rail, Road	*Duisburg-Frankfurt*	Rail, Road
Frankfurt	-	*Frankfurt-Paris*	Rail, Road
Paris	Rail, Road	*Frankfurt-Nurnberg*	Rail, Road
Nurnberg	-	*Nurnberg-Vienna*	Rail, Road
Vienna	-	*Vienna-Bratislava*	Rail, Road
Bratislava	-	*Bratislava-Budapest*	-
Budapest	-	*Budapest-Belgrade*	-
Belgrade	-	*Belgrade-Constanta*	Rail, Road
Constanta	-		

Corridor 'Two Seas'

Nodes		*Arcs*	
Hamburg	Rail, sss	*Hamburg-Berlin*	Road
Berlin	-	*Berlin-Dresden*	Rail, Road
Dresden	-	*Dresden-Prague*	Rail, Road
Prague	-	*Prague-Nurnberg*	Rail, Road
Nurnberg	-	*Prague-Bratislava*	Rail, Road
Bratislava	-	*Bratislava-Budapest*	Rail, Road
Budapest	-	*Budapest-Belgrade*	Rail, Road
Belgrade	-	*Belgrade-Sofia*	Rail, Road
Sofia	-	*Sofia-Thessaloniki*	Rail, Road
Thessaloniki	-	*Thessaloniki-Athens*	Rail, Road
Athens	-		

Corridor 'Mare Nostrum'

Nodes		*Arcs*	
Bourgas	-	*Bourgas-Istanbul*	-
Istanbul	-	*La Spezia-Genoa*	-
La Spezia	-	*Marseille-Lyon*	Rail, Road
Genoa	Rail, sss	*Odessa-Istanbul*	-
Marseille	Rail, Road, sss	*Constanta-Istanbul*	-

Lyon	Rail, Road	*Algeciras-Istanbul*	-
Odessa	-	*Barcelona-Valencia*	Rail, Road, sss
Constanta	-	*Valencia-Algeciras*	Rail, Road, sss
Algeciras	Rail, Road, sss	*Istanbul-Athens*	-
Barcelona	Rail, Road, sss	*Athens-Gioia Tauro*	-
Valencia	Rail, Road, sss	*Gioia Tauro-La Spezia*	-
Athens	-	*Marseille-Barcelona*	Rail, Road, sss
Gioia Tauro	-	*Algeciras-Sines*	sss
Sines	sss	*Genoa-Barcelona*	-
Trieste	-	*Istanbul-Trieste*	-
		Istanbul-Gioia Tauro	-
		Istanbul-Algeciras	-

Corridor 'Silk Way'

Nodes		*Arcs*	
Rotterdam	sss	*Rotterdam-Shanghai*	-
Shanghai	-	*Hamburg-Berlin*	-
Hamburg	Rail, sss	*Berlin-Warsaw*	-
Berlin	-	*Warsaw-Minsk*	-
Warsaw	-	*Minsk-Moscow*	-
Minsk	-	*Moscow-Beijing*	-
Moscow	-	*Hamburg-Shanghai*	-
Beijing	-	*St. Petersburg-Shanghai*	-
St. Petersburg	Rail, sss	*Shanghai-Gothenburg*	-
Gothenburg	Rail, sss	*Tallinn-Shanghai*	-
Tallinn	-		

Horizontal container (un)loading

Technology Data

ID	Category	Transport modes
HT10	Cargo Handling and Transfer	Railway

Description
Metrocargo is an innovative solution for containers cargo handling in overhead electrified railways, it's a containers horizontal movement system from an automated platform to train wagons. This technology is ready to experimentation. Metrocargo will be tested on new Maersk's Platform in Vado Ligure (SV), Italy.

Readiness Level	Time to Market	Energy Source	Efficiency
9	2	-	-

CO_2	NO_x	SO_x	LCC
No typical emmision value of ICE are usable	No typical emmision value of ICE are usable	No typical emmision value of ICE are usable	unknown

High Level Benchmark

Baseline	Traditional containers cargo handling
Relative Cost	
% cost savings during operation	-
CAPEX	-
% fuel savings	-
Emissions	
% CO2 savings	-
% SOx savings	-
% NOx savings	
Service & bottlenecks	
% operational or infrastructural delays reduction	-
% of frequency of service potential improvement due to delays & bottlenecks reduction	-
% of reliability improvement due to delays & bottlenecks reduction	92,6% reliability

Positive influence | Negative influence | Not relevant or no influence | no information

Technology Applicability per Corridor

Corridor 'Brenner'	
Nodes	Arcs

Malmo	Rail	*Malmo-Trelleborg*	-
Trelleborg	-	*Trelleborg-Sassnitz*	-
Sassnitz	-	*Trelleborg-Rostock*	-
Rostock	-	*Sassnitz-Berlin*	-
Berlin	Rail	*Rostock-Berlin*	-
Nurnberg	Rail	*Berlin-Nurnberg*	-
Munich	Rail	*Nurnberg-Munich*	-
Salzburg	-	*Munich-Salzburg*	-
Villach	-	*Salzburg-Villach*	-
Trieste	-	*Villach-Trieste*	-
Verona	-	*Munich-Verona*	-
Bologna	Rail	*Verona-Bologna*	-
Ancona	-	*Bologna-Ancona*	-
Bari	-	*Ancona-Bari*	-
Brindisi	-	*Bari-Brindisi*	-
Igoumenitsa	-	*Igoumenitsa-Thessaloniki*	-
Thessaloniki	Rail	*Igoumenitsa-Patras*	-
Patras	-	*Patras-Athens*	-
Athens	Rail	*Bologna-Rome*	-
Rome	-	*Rome-Naples*	-
Naples	Rail	*Naples-Messina*	-
Messina	-	*Villa San Giovanni-Messina*	-
Villa San Giovanni	-	*Messina-Palermo*	-
Palermo	-	*Naples-Villa San Giovanni*	-
		Ancona-Brindisi	-
		Bari-Igoumenitsa	-

Corridor 'Finis Terrae'

Nodes		*Arcs*	
Paris	Rail	*Paris-St. Nazaire*	-
St. Nazaire	Rail	*Paris-Irun*	-
Irun	Rail	*St. Nazaire-Gijon*	-
Gijon	Rail	*Irun-Valladolid*	-
Valladolid	Rail	*Gijon-Valladolid*	-
Madrid	Rail	*Valladolid-Madrid*	-
Lisboa	Rail	*Madrid-Lisboa*	-

Corridor 'Cloverleaf'

Nodes		*Arcs*	
Glasgow	Rail	*Glasgow-Carlisle*	-
Carlisle	Rail	*Carlisle-Liverpool*	-
Liverpool	Rail	*Liverpool-Dublin*	-
Dublin	-	*Liverpool-London*	-
London	Rail	*London-Dover*	-
Dover	Rail	*Dover-Calais*	-
Calais	Rail	*Calais-Duisburg*	-
Duisburg	Rail		

Corridor 'Edelweiss'

Nodes		*Arcs*	
St. Petersburg	Rail	*St. Petersburg-Lappeenranta*	-
Lappeenranta	Rail	*Lappeenranta-Helsinki*	-
Helsinki	Rail	*Helsinki-Turku*	-
Turku	Rail	*Stockholm-Oslo*	-
Stockholm	Rail	*Stockholm-Malmo*	-
Oslo	Rail	*Oslo-Gothenburg*	-
Malmo	Rail	*Gothenburg-Malmo*	-
Gothenburg	Rail	*Malmo-Copenhagen*	-
Copenhagen	Rail	*Copenhagen-Taulov*	-
Taulov	Rail	*Copenhagen-Rodbyhavn*	-
Rodbyhavn	-	*Rodbyhavn-Puttgarden*	-
Puttgarden	-	*Taulov-Hamburg*	-
Hamburg	Rail	*Puttgarden-Hamburg*	-
Hannover	Rail	*Hamburg-Hannover*	-
Würzburg	Rail	*Hannover-Würzburg*	-
Ulm	Rail	*Würzburg-Ulm*	-
Lugano	Rail	*Ulm-Lugano*	-
Milan	Rail	*Lugano-Milan*	-

Genoa	Rail	*Milan-Genoa*	-
		Turku-Stockholm	-

Corridor 'Nureyeev'

Nodes		*Arcs*	
Helsinki	Rail	*Helsinki-Tallinn*	-
Tallinn	-	*St. Petersburg-Moscow*	-
St. Petersburg	Rail	*Ventspils-Klaipeda*	-
Moscow	Rail	*Klaipeda-Minsk*	-
Ventspils	-	*Klaipeda-Karlshamn*	-
Klaipeda	Rail	*Gothenburg-Hamburg*	-
Minsk	Rail	*Rostock-Gothenburg*	-
Karlshamn	-	*Hamburg-Malmo*	-
Gothenburg	Rail	*Helsinki-St. Petersburg*	-
Hamburg	Rail	*Hamburg-Gdansk*	-
Rostock	-	*Hamburg-Tallinn*	-
Malmo	Rail	*Ventspils-Karlshamn*	-
Gdansk	-	*Malmo-Helsinki*	-
Riga	-	*Helsinki-Hamburg*	-
Rotterdam	Rail	*Tallinn-Riga*	-
Turku	Rail	*Rotterdam-Hamburg*	-
		Klaipeda-Rotterdam	-
		Rostock-Helsinki	-
		Helsinki-Rotterdam	-
		Turku-Gothenburg	-
		Turku-Hamburg	-
		Gothenburg-Rotterdam	-
		Klaipeda-Riga	-
		Hamburg-Riga	-
		St. Petersburg-Hamburg	-
		Rotterdam-Gdansk	-
		Rotterdam-Ventspils	-
		Rotterdam-St. Petersburg	-

Corridor 'Strauss'

Nodes		*Arcs*	
Rotterdam	Rail	*Rotterdam-Duisburg*	-
Duisburg	Rail	*Duisburg-Frankfurt*	-
Frankfurt	Rail	*Frankfurt-Paris*	-
Paris	Rail	*Frankfurt-Nurnberg*	-
Nurnberg	Rail	*Nurnberg-Vienna*	-
Vienna	Rail	*Vienna-Bratislava*	-
Bratislava	Rail	*Bratislava-Budapest*	-
Budapest	-	*Budapest-Belgrade*	-
Belgrade	Rail	*Belgrade-Constanta*	-
Constanta	Rail		

Corridor 'Two Seas'

Nodes		*Arcs*	
Hamburg	Rail	*Hamburg-Berlin*	-
Berlin	Rail	*Berlin-Dresden*	-
Dresden	Rail	*Dresden-Prague*	-
Prague	Rail	*Prague-Nurnberg*	-
Nurnberg	Rail	*Prague-Bratislava*	-
Bratislava	Rail	*Bratislava-Budapest*	-
Budapest	-	*Budapest-Belgrade*	-
Belgrade	Rail	*Belgrade-Sofia*	-
Sofia	Rail	*Sofia-Thessaloniki*	-
Thessaloniki	Rail	*Thessaloniki-Athens*	-
Athens	Rail		

Corridor 'Mare Nostrum'

Nodes		*Arcs*	
Bourgas	-	*Bourgas-Istanbul*	-
Istanbul	-	*La Spezia-Genoa*	-
La Spezia	-	*Marseille-Lyon*	-
Genoa	Rail	*Odessa-Istanbul*	-
Marseille	Rail	*Constanta-Istanbul*	-

Lyon	Rail	*Algeciras-Istanbul*	-
Odessa	-	*Barcelona-Valencia*	-
Constanta	Rail	*Valencia-Algeciras*	-
Algeciras	-	*Istanbul-Athens*	-
Barcelona	-	*Athens-Gioia Tauro*	-
Valencia	-	*Gioia Tauro-La Spezia*	-
Athens	Rail	*Marseille-Barcelona*	-
Gioia Tauro	-	*Algeciras-Sines*	-
Sines	-	*Genoa-Barcelona*	-
Trieste	-	*Istanbul-Trieste*	-
		Istanbul-Gioia Tauro	-
		Istanbul-Algeciras	-

Corridor 'Silk Way'

Nodes		*Arcs*	
Rotterdam	Rail	*Rotterdam-Shanghai*	-
Shanghai	-	*Hamburg-Berlin*	-
Hamburg	Rail	*Berlin-Warsaw*	-
Berlin	Rail	*Warsaw-Minsk*	-
Warsaw	Rail	*Minsk-Moscow*	-
Minsk	Rail	*Moscow-Beijing*	-
Moscow	Rail	*Hamburg-Shanghai*	-
Beijing	Rail	*St. Petersburg-Shanghai*	-
St. Petersburg	Rail	*Shanghai-Gothenburg*	-
Gothenburg	Rail	*Tallinn-Shanghai*	-
Tallinn	-		

Mains-powered RTG (MP-RTGs)

Technology Data

ID	Category	Transport modes
HT06	Cargo Handling and Transfer	Maritime, Railway, Road

Description
Mains-powered RTGs transfer the power generation from the engine of the yard crane to a far more efficient power station. Power station can be up to 40% more efficient than equipment engine. Upfront capital cost is higher

Readiness Level	Time to Market	Energy Source	Efficiency
9	<1	-	-
CO_2	NO_x	SO_x	LCC
0	0	0	0

High Level Benchmark

Baseline	Traditional gantry cranes
Relative Cost	
% cost savings during operation	Reduces equipment
CAPEX	-
% fuel savings	30-40% more efficient
Emissions	
% CO2 savings	-
% SOx savings	-
% NOx savings	
Service & bottlenecks	
% operational or infrastructural delays reduction	-
% of frequency of service potential improvement due to delays & bottlenecks reduction	-
% of reliability improvement due to delays & bottlenecks reduction	-

Positive influence | Negative influence | Not relevant or no influence | no information

Technology Applicability per Corridor

Corridor 'Brenner'

Nodes		Arcs	
Malmo	Rail, Road	Malmo-Trelleborg	-

Trelleborg	-	*Trelleborg-Sassnitz*	-
Sassnitz	-	*Trelleborg-Rostock*	-
Rostock	Rail, Road, sss	*Sassnitz-Berlin*	-
Berlin	Rail	*Rostock-Berlin*	-
Nurnberg	Rail, Road	*Berlin-Nurnberg*	-
Munich	Rail, Road	*Nurnberg-Munich*	-
Salzburg	-	*Munich-Salzburg*	-
Villach	Rail, Road	*Salzburg-Villach*	-
Trieste	-	*Villach-Trieste*	-
Verona	-	*Munich-Verona*	-
Bologna	Rail, Road	*Verona-Bologna*	-
Ancona	-	*Bologna-Ancona*	-
Bari	-	*Ancona-Bari*	-
Brindisi	-	*Bari-Brindisi*	-
Igoumenitsa	Road	*Igoumenitsa-Thessaloniki*	-
Thessaloniki	-	*Igoumenitsa-Patras*	-
Patras	Road	*Patras-Athens*	-
Athens	-	*Bologna-Rome*	-
Rome	-	*Rome-Naples*	-
Naples	Rail, Road	*Naples-Messina*	-
Messina	-	*Villa San Giovanni-Messina*	-
Villa San Giovanni	-	*Messina-Palermo*	-
Palermo	-	*Naples-Villa San Giovanni*	-
		Ancona-Brindisi	-
		Bari-Igoumenitsa	-

Corridor 'Finis Terrae'

Nodes		*Arcs*	
Paris	Rail, Road	*Paris-St. Nazaire*	-
St. Nazaire	Rail, Road	*Paris-Irun*	-
Irun	Rail, Road	*St. Nazaire-Gijon*	-
Gijon	Rail, Road	*Irun-Valladolid*	-
Valladolid	Rail, Road	*Gijon-Valladolid*	-
Madrid	Rail, Road	*Valladolid-Madrid*	-
Lisboa	Rail, Road	*Madrid-Lisboa*	-

Corridor 'Cloverleaf'

Nodes		*Arcs*	
Glasgow	Rail, Road	*Glasgow-Carlisle*	-
Carlisle	Rail, Road	*Carlisle-Liverpool*	-
Liverpool	Rail, Road, sss	*Liverpool-Dublin*	-
Dublin	sss	*Liverpool-London*	-
London	Rail, Road	*London-Dover*	-
Dover	Rail, Road, sss	*Dover-Calais*	-
Calais	Rail, Road, sss	*Calais-Duisburg*	-
Duisburg	Rail, Road		

Corridor 'Edelweiss'

Nodes		*Arcs*	
St. Petersburg	dss, Rail, Road, sss	*St. Petersburg-Lappeenranta*	-
Lappeenranta	Rail, Road	*Lappeenranta-Helsinki*	-
Helsinki	Rail, Road, sss	*Helsinki-Turku*	-
Turku	Rail, Road, sss	*Stockholm-Oslo*	-
Stockholm	Rail, Road, sss	*Stockholm-Malmo*	-
Oslo	Rail, Road	*Oslo-Gothenburg*	-
Malmo	Rail, Road	*Gothenburg-Malmo*	-
Gothenburg	dss, Rail, Road, sss	*Malmo-Copenhagen*	-
Copenhagen	Rail, Road	*Copenhagen-Taulov*	-
Taulov	Rail, Road	*Copenhagen-Rodbyhavn*	-
Rodbyhavn	Road, sss	*Rodbyhavn-Puttgarden*	-
Puttgarden	Road, sss	*Taulov-Hamburg*	-
Hamburg	dss, Rail, Road, sss	*Puttgarden-Hamburg*	-
Hannover	Rail, Road	*Hamburg-Hannover*	-
Würzburg	Rail, Road	*Hannover-Würzburg*	-
Ulm	Rail, Road	*Würzburg-Ulm*	-
Lugano	Rail, Road	*Ulm-Lugano*	-
Milan	Rail, Road	*Lugano-Milan*	-
Genoa	Rail, Road, sss	*Milan-Genoa*	-

		Turku-Stockholm	-

Corridor 'Nureyeev'

Nodes		*Arcs*	
Helsinki	Rail, Road, sss	*Helsinki-Tallinn*	-
Tallinn	dss	*St. Petersburg-Moscow*	-
St. Petersburg	dss, Rail, Road, sss	*Ventspils-Klaipeda*	-
Moscow	Rail, Road	*Klaipeda-Minsk*	-
Ventspils	sss	*Klaipeda-Karlshamn*	-
Klaipeda	Rail, Road, sss	*Gothenburg-Hamburg*	-
Minsk	Rail, Road	*Rostock-Gothenburg*	-
Karlshamn	sss	*Hamburg-Malmo*	-
Gothenburg	dss, Rail, Road, sss	*Helsinki-St. Petersburg*	-
Hamburg	dss, Rail, Road, sss	*Hamburg-Gdansk*	-
Rostock	Rail, Road, sss	*Hamburg-Tallinn*	-
Malmo	Rail, Road	*Ventspils-Karlshamn*	-
Gdansk	sss	*Malmo-Helsinki*	-
Riga	-	*Helsinki-Hamburg*	-
Rotterdam	dss, Rail, Road, sss	*Tallinn-Riga*	-
Turku	Rail, Road, sss	*Rotterdam-Hamburg*	-
		Klaipeda-Rotterdam	-
		Rostock-Helsinki	-
		Helsinki-Rotterdam	-
		Turku-Gothenburg	-
		Turku-Hamburg	-
		Gothenburg-Rotterdam	-
		Klaipeda-Riga	-
		Hamburg-Riga	-
		St. Petersburg-Hamburg	-
		Rotterdam-Gdansk	-
		Rotterdam-Ventspils	-
		Rotterdam-St. Petersburg	-

Corridor 'Strauss'

Nodes		*Arcs*	
Rotterdam	dss, Rail, Road, sss	*Rotterdam-Duisburg*	-
Duisburg	Rail, Road	*Duisburg-Frankfurt*	-
Frankfurt	Rail, Road	*Frankfurt-Paris*	-
Paris	Rail, Road	*Frankfurt-Nurnberg*	-
Nurnberg	Rail, Road	*Nurnberg-Vienna*	-
Vienna	Rail, Road	*Vienna-Bratislava*	-
Bratislava	Rail, Road	*Bratislava-Budapest*	-
Budapest	Rail, Road	*Budapest-Belgrade*	-
Belgrade	Rail, Road	*Belgrade-Constanta*	-
Constanta	Rail, Road		

Corridor 'Two Seas'

Nodes		*Arcs*	
Hamburg	dss, Rail, Road, sss	*Hamburg-Berlin*	-
Berlin	Rail	*Berlin-Dresden*	-
Dresden	-	*Dresden-Prague*	-
Prague	-	*Prague-Nurnberg*	-
Nurnberg	Rail, Road	*Prague-Bratislava*	-
Bratislava	Rail, Road	*Bratislava-Budapest*	-
Budapest	Rail, Road	*Budapest-Belgrade*	-
Belgrade	Rail, Road	*Belgrade-Sofia*	-
Sofia	-	*Sofia-Thessaloniki*	-
Thessaloniki	-	*Thessaloniki-Athens*	-
Athens	-		

Corridor 'Mare Nostrum'

Nodes		*Arcs*	
Bourgas	-	*Bourgas-Istanbul*	-
Istanbul	-	*La Spezia-Genoa*	-
La Spezia	-	*Marseille-Lyon*	-
Genoa	Rail, Road, sss	*Odessa-Istanbul*	-
Marseille	Rail, Road, sss	*Constanta-Istanbul*	-
Lyon	Rail, Road	*Algeciras-Istanbul*	-

Odessa	-	*Barcelona-Valencia*	sss
Constanta	Rail, Road	*Valencia-Algeciras*	sss
Algeciras	Rail, Road, sss	*Istanbul-Athens*	-
Barcelona	Rail, Road, sss	*Athens-Gioia Tauro*	-
Valencia	Rail, Road, sss	*Gioia Tauro-La Spezia*	-
Athens	-	*Marseille-Barcelona*	sss
Gioia Tauro	-	*Algeciras-Sines*	-
Sines	sss	*Genoa-Barcelona*	-
Trieste	-	*Istanbul-Trieste*	-
		Istanbul-Gioia Tauro	-
		Istanbul-Algeciras	-

Corridor 'Silk Way'

Nodes		*Arcs*	
Rotterdam	dss, Rail, Road, sss	*Rotterdam-Shanghai*	-
Shanghai	dss	*Hamburg-Berlin*	-
Hamburg	dss, Rail, Road, sss	*Berlin-Warsaw*	-
Berlin	Rail	*Warsaw-Minsk*	-
Warsaw	Rail	*Minsk-Moscow*	-
Minsk	Rail, Road	*Moscow-Beijing*	-
Moscow	Rail, Road	*Hamburg-Shanghai*	-
Beijing	Rail	*St. Petersburg-Shanghai*	-
St. Petersburg	dss, Rail, Road, sss	*Shanghai-Gothenburg*	-
Gothenburg	dss, Rail, Road, sss	*Tallinn-Shanghai*	-
Tallinn	dss		

Cargo Cassette and Translifter for cargo cassette

Technology Data

ID	Category	Transport modes
HT11	Cargo Handling and Transfer	Maritime

Description
Wheelless cassette is a loading platform which is used together with a translifter in a cassette system. Cassettes are specially designed depending on the cargo and handling type. Translifter is a steerable lifting trailer which together with cassettes replaces roll trailers in Ro-Ro (Roll on-Roll off-ship) and StoRo (Stowable Ro-Ro) handling.

Readiness Level	Time to Market	Energy Source	Efficiency
9	<1	-	-
CO_2	NO_x	SO_x	LCC
0	0	0	0

Notes on technology

This technology has been chosen due to the importance of designing smart solutions for efficient (un)loading operations allowing for fast turn-around times for vessels in ports, while also enabling advances in intermodal cargo handling (e.g. cargo shift between transport modes). Cargo handling technology is a critical component for securing efficient and effective transfer of cargo between transport modes (e.g. reducing vessel port turnaround time), and thus an important prerequisite for establishing intermodal transport solutions. Since this technology has main focus on increasing terminal efficiency, the emission of CO2 and SOx are not expected to be significantly reduced. This is based on the assumption that the majority of energy is consumed by the transport mode during transit. However, since the technology allows for increased speed of (un)loading operations, the potential for much faster turnaround time is present. This may also affect the level of reliability, as fast loading increases the operator`s ability to deliver according to schedule. Also, the increase in turnaround time may be utilised for achieving two main goals: lwering the operational speed at sea, and thereby reducing the energy consumption and emissions to air, while still upholding the same level of service frequency; creased reliability by more efficient operations in port due to less waiting time for available quay space.

High Level Benchmark

Baseline	*Traditional container cargo handling*
Relative Cost	
% cost savings during operation	*Positive: based on the assumption that tech will lead to increased cargo through put*
CAPEX	-
% fuel savings	-
Emissions	
% CO2 savings	-
% SOx savings	-
% NOx savings	

Service & bottlenecks	
% operational or infrastructural delays reduction	*Potential for faster ship turn around due to increased efficiency during loading and unloading operations*
% of frequency of service potential improvement due to delays & bottlenecks reduction	*Possible to increase frequency, but highly dependent on operational conditions*
% of reliability improvement due to delays & bottlenecks reduction	*Difficult to quantify, but has a potential positive effect*

Positive influence | Negative influence | Not relevant or no influence | no information

Detailed Benchmark

(with respect to baseline performance on specific corridor)

Corridor	*Nureyeev*	
Mode of transport	*sss*	
Cost	*Min: 0.0%*	*Max: 0.0%*
CO2 emissions	*Min: 0.0%*	*Max: 0.0%*
SOX emissions	*Min: 0.0%*	*Max: 0.0%*
Average speed	*Min: 0.0%*	*Max: 37.5%*
Frequency	*Min: 0.0%*	*Max: 5.6%*
Reliability	*Min: 0.0%*	*Max: 5.6%*

Technology Applicability per Corridor

Corridor 'Brenner'

Nodes		*Arcs*	
Malmo	sss	*Malmo-Trelleborg*	-
Trelleborg	-	*Trelleborg-Sassnitz*	-
Sassnitz	-	*Trelleborg-Rostock*	-
Rostock	sss	*Sassnitz-Berlin*	-
Berlin	-	*Rostock-Berlin*	-
Nurnberg	-	*Berlin-Nurnberg*	-
Munich	-	*Nurnberg-Munich*	-
Salzburg	-	*Munich-Salzburg*	-
Villach	-	*Salzburg-Villach*	-
Trieste	sss	*Villach-Trieste*	-
Verona	-	*Munich-Verona*	-
Bologna	-	*Verona-Bologna*	-
Ancona	-	*Bologna-Ancona*	-
Bari	-	*Ancona-Bari*	-
Brindisi	-	*Bari-Brindisi*	-
Igoumenitsa	-	*Igoumenitsa-Thessaloniki*	-
Thessaloniki	-	*Igoumenitsa-Patras*	-
Patras	-	*Patras-Athens*	-
Athens	sss	*Bologna-Rome*	-
Rome	-	*Rome-Naples*	-
Naples	-	*Naples-Messina*	-
Messina	-	*Villa San Giovanni-Messina*	-
Villa San Giovanni	-	*Messina-Palermo*	-

Palermo	-	*Naples-Villa San Giovanni*	-
		Ancona-Brindisi	-
		Bari-Igoumenitsa	-

Corridor 'Finis Terrae'

Nodes		*Arcs*	
Paris	-	*Paris-St. Nazaire*	-
St. Nazaire	sss	*Paris-Irun*	-
Irun	-	*St. Nazaire-Gijon*	sss
Gijon	sss	*Irun-Valladolid*	-
Valladolid	-	*Gijon-Valladolid*	-
Madrid	-	*Valladolid-Madrid*	-
Lisboa	-	*Madrid-Lisboa*	-

Corridor 'Cloverleaf'

Nodes		*Arcs*	
Glasgow	-	*Glasgow-Carlisle*	-
Carlisle	-	*Carlisle-Liverpool*	-
Liverpool	-	*Liverpool-Dublin*	sss
Dublin	-	*Liverpool-London*	-
London	-	*London-Dover*	-
Dover	-	*Dover-Calais*	sss
Calais	-	*Calais-Duisburg*	-
Duisburg	-		

Corridor 'Edelweiss'

Nodes		*Arcs*	
St. Petersburg	sss	*St. Petersburg-Lappeenranta*	-
Lappeenranta	-	*Lappeenranta-Helsinki*	-
Helsinki	sss	*Helsinki-Turku*	-
Turku	sss	*Stockholm-Oslo*	-
Stockholm	sss	*Stockholm-Malmo*	-
Oslo	-	*Oslo-Gothenburg*	-
Malmo	sss	*Gothenburg-Malmo*	-
Gothenburg	sss	*Malmo-Copenhagen*	-
Copenhagen	-	*Copenhagen-Taulov*	-
Taulov	-	*Copenhagen-Rodbyhavn*	-
Rodbyhavn	sss	*Rodbyhavn-Puttgarden*	-
Puttgarden	sss	*Taulov-Hamburg*	-
Hamburg	sss	*Puttgarden-Hamburg*	-
Hannover	-	*Hamburg-Hannover*	-
Würzburg	-	*Hannover-Würzburg*	-
Ulm	-	*Würzburg-Ulm*	-
Lugano	-	*Ulm-Lugano*	-
Milan	-	*Lugano-Milan*	-
Genoa	sss	*Milan-Genoa*	-
		Turku-Stockholm	-

Corridor 'Nureyeev'

Nodes		*Arcs*	
Helsinki	sss	*Helsinki-Tallinn*	-
Tallinn	sss	*St. Petersburg-Moscow*	-
St. Petersburg	sss	*Ventspils-Klaipeda*	-
Moscow	-	*Klaipeda-Minsk*	-
Ventspils	sss	*Klaipeda-Karlshamn*	-
Klaipeda	sss	*Gothenburg-Hamburg*	-
Minsk	-	*Rostock-Gothenburg*	-
Karlshamn	sss	*Hamburg-Malmo*	-
Gothenburg	sss	*Helsinki-St. Petersburg*	-
Hamburg	sss	*Hamburg-Gdansk*	-
Rostock	sss	*Hamburg-Tallinn*	-
Malmo	sss	*Ventspils-Karlshamn*	-
Gdansk	sss	*Malmo-Helsinki*	-
Riga	sss	*Helsinki-Hamburg*	-
Rotterdam	sss	*Tallinn-Riga*	-
Turku	sss	*Rotterdam-Hamburg*	-
		Klaipeda-Rotterdam	-
		Rostock-Helsinki	-

		Helsinki-Rotterdam	-
		Turku-Gothenburg	-
		Turku-Hamburg	-
		Gothenburg-Rotterdam	-
		Klaipeda-Riga	-
		Hamburg-Riga	-
		St. Petersburg-Hamburg	-
		Rotterdam-Gdansk	-
		Rotterdam-Ventspils	-
		Rotterdam-St. Petersburg	-

Corridor 'Strauss'

Nodes		*Arcs*	
Rotterdam	sss	*Rotterdam-Duisburg*	-
Duisburg	-	*Duisburg-Frankfurt*	-
Frankfurt	-	*Frankfurt-Paris*	-
Paris	-	*Frankfurt-Nurnberg*	-
Nurnberg	-	*Nurnberg-Vienna*	-
Vienna	-	*Vienna-Bratislava*	-
Bratislava	-	*Bratislava-Budapest*	-
Budapest	-	*Budapest-Belgrade*	-
Belgrade	-	*Belgrade-Constanta*	-
Constanta	sss		

Corridor 'Two Seas'

Nodes		*Arcs*	
Hamburg	sss	*Hamburg-Berlin*	-
Berlin	-	*Berlin-Dresden*	-
Dresden	-	*Dresden-Prague*	-
Prague	-	*Prague-Nurnberg*	-
Nurnberg	-	*Prague-Bratislava*	-
Bratislava	-	*Bratislava-Budapest*	-
Budapest	-	*Budapest-Belgrade*	-
Belgrade	-	*Belgrade-Sofia*	-
Sofia	-	*Sofia-Thessaloniki*	-
Thessaloniki	-	*Thessaloniki-Athens*	-
Athens	sss		

Corridor 'Mare Nostrum'

Nodes		*Arcs*	
Bourgas	sss	*Bourgas-Istanbul*	sss
Istanbul	sss	*La Spezia-Genoa*	sss
La Spezia	sss	*Marseille-Lyon*	-
Genoa	sss	*Odessa-Istanbul*	sss
Marseille	sss	*Constanta-Istanbul*	sss
Lyon	-	*Algeciras-Istanbul*	sss
Odessa	sss	*Barcelona-Valencia*	sss
Constanta	sss	*Valencia-Algeciras*	sss
Algeciras	sss	*Istanbul-Athens*	sss
Barcelona	sss	*Athens-Gioia Tauro*	sss
Valencia	sss	*Gioia Tauro-La Spezia*	sss
Athens	sss	*Marseille-Barcelona*	sss
Gioia Tauro	sss	*Algeciras-Sines*	sss
Sines	sss	*Genoa-Barcelona*	sss
Trieste	sss	*Istanbul-Trieste*	sss
		Istanbul-Gioia Tauro	sss
		Istanbul-Algeciras	sss

Corridor 'Silk Way'

Nodes		*Arcs*	
Rotterdam	sss	*Rotterdam-Shanghai*	-
Shanghai	-	*Hamburg-Berlin*	-
Hamburg	sss	*Berlin-Warsaw*	-
Berlin	-	*Warsaw-Minsk*	-
Warsaw	-	*Minsk-Moscow*	-
Minsk	-	*Moscow-Beijing*	-
Moscow	-	*Hamburg-Shanghai*	-
Beijing	-	*St. Petersburg-Shanghai*	-

St. Petersburg	sss	*Shanghai-Gothenburg*	-
Gothenburg	sss	*Tallinn-Shanghai*	-
Tallinn	sss		

ZF transmission systems

Technology Data

ID	Category	Transport modes
HT08	Cargo Handling and Transfer	Inland Waterways, Road, Maritime, Railway

Description
Installation in the new PM (prime movers) of new transmission system operating based on Automatic-Manual transmission concept. Reduction of fuel consumption by 10% when compared with older exisiting transmission systems

Readiness Level	Time to Market	Energy Source	Efficiency
9	<1		0
CO_2	NO_x	SO_x	LCC
0	0	0	0

High Level Benchmark

Baseline	0	
Relative Cost		
% cost savings during operation	-	
CAPEX	-	
% fuel savings	Road: 6% - 10%	
Emissions		
% CO2 savings	-	
% SOx savings	-	
% NOx savings		
Service & bottlenecks		
% operational or infrastructural delays reduction	-	
% of frequency of service potential improvement due to delays & bottlenecks reduction	-	
% of reliability improvement due to delays & bottlenecks reduction	-	

Positive influence | Negative influence | Not relevant or no influence | no information

Technology Applicability per Corridor

Corridor 'Brenner'	
Nodes	Arcs

Malmo	-	*Malmo-Trelleborg*	Road
Trelleborg	-	*Trelleborg-Sassnitz*	-
Sassnitz	-	*Trelleborg-Rostock*	-
Rostock	-	*Sassnitz-Berlin*	Road
Berlin	-	*Rostock-Berlin*	Road
Nurnberg	-	*Berlin-Nurnberg*	Road
Munich	-	*Nurnberg-Munich*	Road
Salzburg	-	*Munich-Salzburg*	Road
Villach	-	*Salzburg-Villach*	Road
Trieste	sss	*Villach-Trieste*	Road
Verona	-	*Munich-Verona*	Road
Bologna	-	*Verona-Bologna*	Road
Ancona	-	*Bologna-Ancona*	Road
Bari	-	*Ancona-Bari*	Road
Brindisi	-	*Bari-Brindisi*	Road
Igoumenitsa	-	*Igoumenitsa-Thessaloniki*	Road
Thessaloniki	-	*Igoumenitsa-Patras*	-
Patras	-	*Patras-Athens*	Road
Athens	sss	*Bologna-Rome*	Road
Rome	-	*Rome-Naples*	Road
Naples	-	*Naples-Messina*	-
Messina	-	*Villa San Giovanni-Messina*	-
Villa San Giovanni	-	*Messina-Palermo*	Road
Palermo	-	*Naples-Villa San Giovanni*	Road
		Ancona-Brindisi	-
		Bari-Igoumenitsa	-

Corridor 'Finis Terrae'

Nodes		*Arcs*	
Paris	Rail, Road	*Paris-St. Nazaire*	-
St. Nazaire	Rail, Road, sss	*Paris-Irun*	-
Irun	Rail, Road	*St. Nazaire-Gijon*	-
Gijon	Rail, Road, sss	*Irun-Valladolid*	-
Valladolid	Rail, Road	*Gijon-Valladolid*	-
Madrid	Rail, Road	*Valladolid-Madrid*	-
Lisboa	Rail, Road	*Madrid-Lisboa*	-

Corridor 'Cloverleaf'

Nodes		*Arcs*	
Glasgow	-	*Glasgow-Carlisle*	Road
Carlisle	-	*Carlisle-Liverpool*	Road
Liverpool	-	*Liverpool-Dublin*	-
Dublin	-	*Liverpool-London*	Road
London	-	*London-Dover*	Road
Dover	-	*Dover-Calais*	-
Calais	-	*Calais-Duisburg*	Road
Duisburg	-		

Corridor 'Edelweiss'

Nodes		*Arcs*	
St. Petersburg	-	*St. Petersburg-Lappeenranta*	Road
Lappeenranta	-	*Lappeenranta-Helsinki*	Road
Helsinki	-	*Helsinki-Turku*	Road
Turku	-	*Stockholm-Oslo*	Road
Stockholm	-	*Stockholm-Malmo*	Road
Oslo	-	*Oslo-Gothenburg*	Road
Malmo	-	*Gothenburg-Malmo*	Road
Gothenburg	-	*Malmo-Copenhagen*	Road
Copenhagen	-	*Copenhagen-Taulov*	Road
Taulov	-	*Copenhagen-Rodbyhavn*	Road
Rodbyhavn	-	*Rodbyhavn-Puttgarden*	-
Puttgarden	-	*Taulov-Hamburg*	Road
Hamburg	-	*Puttgarden-Hamburg*	Road
Hannover	-	*Hamburg-Hannover*	Road
Würzburg	-	*Hannover-Würzburg*	Road
Ulm	-	*Würzburg-Ulm*	Road
Lugano	-	*Ulm-Lugano*	Road
Milan	-	*Lugano-Milan*	Road

Genoa	sss	*Milan-Genoa*	Road
		Turku-Stockholm	-

Corridor 'Nureyeev'

Nodes		*Arcs*	
Helsinki	-	*Helsinki-Tallinn*	-
Tallinn	-	*St. Petersburg-Moscow*	Road
St. Petersburg	-	*Ventspils-Klaipeda*	-
Moscow	-	*Klaipeda-Minsk*	Road
Ventspils	-	*Klaipeda-Karlshamn*	-
Klaipeda	-	*Gothenburg-Hamburg*	-
Minsk	-	*Rostock-Gothenburg*	-
Karlshamn	-	*Hamburg-Malmo*	-
Gothenburg	-	*Helsinki-St. Petersburg*	-
Hamburg	-	*Hamburg-Gdansk*	-
Rostock	-	*Hamburg-Tallinn*	-
Malmo	-	*Ventspils-Karlshamn*	-
Gdansk	-	*Malmo-Helsinki*	-
Riga	-	*Helsinki-Hamburg*	-
Rotterdam	-	*Tallinn-Riga*	-
Turku	-	*Rotterdam-Hamburg*	-
		Klaipeda-Rotterdam	-
		Rostock-Helsinki	-
		Helsinki-Rotterdam	-
		Turku-Gothenburg	-
		Turku-Hamburg	-
		Gothenburg-Rotterdam	-
		Klaipeda-Riga	-
		Hamburg-Riga	-
		St. Petersburg-Hamburg	-
		Rotterdam-Gdansk	-
		Rotterdam-Ventspils	-
		Rotterdam-St. Petersburg	-

Corridor 'Strauss'

Nodes		*Arcs*	
Rotterdam	-	*Rotterdam-Duisburg*	Road
Duisburg	-	*Duisburg-Frankfurt*	Road
Frankfurt	-	*Frankfurt-Paris*	Road
Paris	Rail, Road	*Frankfurt-Nurnberg*	Road
Nurnberg	-	*Nurnberg-Vienna*	Road
Vienna	-	*Vienna-Bratislava*	Road
Bratislava	-	*Bratislava-Budapest*	Road
Budapest	-	*Budapest-Belgrade*	Road
Belgrade	-	*Belgrade-Constanta*	Road
Constanta	sss		

Corridor 'Two Seas'

Nodes		*Arcs*	
Hamburg	-	*Hamburg-Berlin*	Road
Berlin	-	*Berlin-Dresden*	Road
Dresden	-	*Dresden-Prague*	Road
Prague	-	*Prague-Nurnberg*	Road
Nurnberg	-	*Prague-Bratislava*	Road
Bratislava	-	*Bratislava-Budapest*	Road
Budapest	-	*Budapest-Belgrade*	Road
Belgrade	-	*Belgrade-Sofia*	Road
Sofia	-	*Sofia-Thessaloniki*	Road
Thessaloniki	-	*Thessaloniki-Athens*	Road
Athens	sss		

Corridor 'Mare Nostrum'

Nodes		*Arcs*	
Bourgas	sss	*Bourgas-Istanbul*	-
Istanbul	sss	*La Spezia-Genoa*	-
La Spezia	sss	*Marseille-Lyon*	-
Genoa	sss	*Odessa-Istanbul*	-
Marseille	Internal water transport, Rail,	*Constanta-Istanbul*	-

Road, sss		*Algeciras-Istanbul*	-
Lyon	Internal water transport, Rail, Road	*Barcelona-Valencia*	-
Odessa	sss	*Valencia-Algeciras*	-
Constanta	sss	*Istanbul-Athens*	-
Algeciras	Rail, Road, sss	*Athens-Gioia Tauro*	-
Barcelona	Rail, Road, sss	*Gioia Tauro-La Spezia*	-
Valencia	Rail, Road, sss	*Marseille-Barcelona*	-
Athens	sss	*Algeciras-Sines*	-
Gioia Tauro	sss	*Genoa-Barcelona*	-
Sines	sss	*Istanbul-Trieste*	-
Trieste	sss	*Istanbul-Gioia Tauro*	-
		Istanbul-Algeciras	-

Corridor 'Silk Way'

Nodes		*Arcs*	
Rotterdam	-	*Rotterdam-Shanghai*	-
Shanghai	-	*Hamburg-Berlin*	Road
Hamburg	-	*Berlin-Warsaw*	-
Berlin	-	*Warsaw-Minsk*	-
Warsaw	-	*Minsk-Moscow*	-
Minsk	-	*Moscow-Beijing*	-
Moscow	-	*Hamburg-Shanghai*	-
Beijing	-	*St. Petersburg-Shanghai*	-
St. Petersburg	-	*Shanghai-Gothenburg*	-
Gothenburg	-	*Tallinn-Shanghai*	-
Tallinn	-		

Green schemes to improve RTGs emissions and noise

Technology Data

ID	Category	Transport modes
HT09	Cargo Handling and Transfer	Inland Waterways, Road, Maritime, Railway

Description
Addition of a super-capacitor on RTGs. When RTGs engine is running, it charges the super capacity at the same time, and when super capacitor is fully charged, it will supply electricity to the cranes when it is hoisting a container

Readiness Level	Time to Market	Energy Source	Efficiency
8	<1		0
CO_2	NO_x	SO_x	LCC
0	0	0	0

High Level Benchmark

Baseline	0	
Relative Cost		
% cost savings during operation	-	
CAPEX	-	
% fuel savings	Supercapacitors: 8-25%	
Emissions		
% CO2 savings	-	
% SOx savings	-	
% NOx savings		
Service & bottlenecks		
% operational or infrastructural delays reduction	-	
% of frequency of service potential improvement due to delays & bottlenecks reduction	-	
% of reliability improvement due to delays & bottlenecks reduction	-	

Positive influence | Negative influence | Not relevant or no influence | no information

Technology Applicability per Corridor

Corridor 'Brenner'	
Nodes	Arcs

Malmo	dss, Internal water transport, Rail,	*Malmo-Trelleborg*	-
Road, sss		*Trelleborg-Sassnitz*	-
Trelleborg	Road	*Trelleborg-Rostock*	-
Sassnitz	Road	*Sassnitz-Berlin*	-
Rostock	dss, Internal water transport, Rail,	*Rostock-Berlin*	-
Road, sss		*Berlin-Nurnberg*	-
Berlin	dss, Internal water transport, Rail,	*Nurnberg-Munich*	-
Road, sss		*Munich-Salzburg*	-
Nurnberg	dss, Internal water transport, Rail,	*Salzburg-Villach*	-
Road, sss		*Villach-Trieste*	-
Munich	Road	*Munich-Verona*	-
Salzburg	Road	*Verona-Bologna*	-
Villach	Road	*Bologna-Ancona*	-
Trieste	Road, sss	*Ancona-Bari*	-
Verona	Road	*Bari-Brindisi*	-
Bologna	Road	*Igoumenitsa-Thessaloniki*	-
Ancona	Road	*Igoumenitsa-Patras*	-
Bari	Road	*Patras-Athens*	-
Brindisi	Road	*Bologna-Rome*	-
Igoumenitsa	Road	*Rome-Naples*	-
Thessaloniki	dss, Internal water transport, Rail,	*Naples-Messina*	-
Road, sss		*Villa San Giovanni-Messina*	-
Patras	Road	*Messina-Palermo*	-
Athens	dss, Internal water transport, Rail,	*Naples-Villa San Giovanni*	-
Road, sss		*Ancona-Brindisi*	-
Rome	Road	*Bari-Igoumenitsa*	-
Naples	Road		
Messina	Road		
Villa San Giovanni	Road		
Palermo	Road		

Corridor 'Finis Terrae'

Nodes		*Arcs*	
Paris	dss, Internal water transport, Rail,	*Paris-St. Nazaire*	-
Road, sss		*Paris-Irun*	-
St. Nazaire	Rail, Road, sss	*St. Nazaire-Gijon*	-
Irun	Rail, Road	*Irun-Valladolid*	-
Gijon	Rail, Road, sss	*Gijon-Valladolid*	-
Valladolid	Rail, Road	*Valladolid-Madrid*	-
Madrid	Rail, Road	*Madrid-Lisboa*	-
Lisboa	Rail, Road		

Corridor 'Cloverleaf'

Nodes		*Arcs*	
Glasgow	dss, Internal water transport, Rail,	*Glasgow-Carlisle*	-
Road, sss		*Carlisle-Liverpool*	-
Carlisle	dss, Internal water transport, Rail,	*Liverpool-Dublin*	-
Road, sss		*Liverpool-London*	-
Liverpool	dss, Internal water transport, Rail,	*London-Dover*	-
Road, sss		*Dover-Calais*	-
Dublin	dss, Internal water transport, Rail,	*Calais-Duisburg*	-
Road, sss			
London	dss, Internal water transport, Rail,		
Road, sss			
Dover	dss, Internal water transport, Rail,		
Road, sss			
Calais	dss, Internal water transport, Rail,		
Road, sss			
Duisburg	dss, Internal water transport, Rail,		
Road, sss			

Corridor 'Edelweiss'

Nodes		*Arcs*	
St. Petersburg	dss, Internal water transport, Rail,	*St. Petersburg-Lappeenranta*	-
Road, sss		*Lappeenranta-Helsinki*	-
Lappeenranta	dss, Internal water transport, Rail,	*Helsinki-Turku*	-
Road, sss		*Stockholm-Oslo*	-
Helsinki	dss, Internal water transport, Rail,	*Stockholm-Malmo*	-

Road, sss		*Oslo-Gothenburg*	-
Turku	dss, Internal water transport, Rail,	*Gothenburg-Malmo*	-
Road, sss		*Malmo-Copenhagen*	-
Stockholm	dss, Internal water transport, Rail,	*Copenhagen-Taulov*	-
Road, sss		*Copenhagen-Rodbyhavn*	-
Oslo	dss, Internal water transport, Rail,	*Rodbyhavn-Puttgarden*	-
Road, sss		*Taulov-Hamburg*	-
Malmo	dss, Internal water transport, Rail,	*Puttgarden-Hamburg*	-
Road, sss		*Hamburg-Hannover*	-
Gothenburg	dss, Internal water transport, Rail,	*Hannover-Würzburg*	-
Road, sss		*Würzburg-Ulm*	-
Copenhagen	dss, Internal water transport, Rail,	*Ulm-Lugano*	-
Road, sss		*Lugano-Milan*	-
Taulov	dss, Internal water transport, Rail,	*Milan-Genoa*	-
Road, sss		*Turku-Stockholm*	-
Rodbyhavn	dss, Internal water transport, Rail,		
Road, sss			
Puttgarden	dss, Internal water transport, Rail,		
Road, sss			
Hamburg	dss, Internal water transport, Rail,		
Road, sss			
Hannover	dss, Internal water transport, Rail,		
Road, sss			
Würzburg	dss, Internal water transport, Rail,		
Road, sss			
Ulm	dss, Internal water transport, Rail,		
Road, sss			
Lugano	dss, Internal water transport, Rail,		
Road, sss			
Milan	dss, Internal water transport, Rail,		
Road, sss			
Genoa	dss, Internal water transport, Rail,		
Road, sss			

Corridor 'Nureyeev'

Nodes		*Arcs*	
Helsinki	dss, Internal water transport, Rail,	*Helsinki-Tallinn*	-
Road, sss		*St. Petersburg-Moscow*	-
Tallinn	-	*Ventspils-Klaipeda*	-
St. Petersburg	dss, Internal water transport, Rail,	*Klaipeda-Minsk*	-
Road, sss		*Klaipeda-Karlshamn*	-
Moscow	dss, Internal water transport, Rail,	*Gothenburg-Hamburg*	-
Road, sss		*Rostock-Gothenburg*	-
Ventspils	dss, Internal water transport, Rail,	*Hamburg-Malmo*	-
Road, sss		*Helsinki-St. Petersburg*	-
Klaipeda	dss, Internal water transport, Rail,	*Hamburg-Gdansk*	-
Road, sss		*Hamburg-Tallinn*	-
Minsk	dss, Internal water transport, Rail,	*Ventspils-Karlshamn*	-
Road, sss		*Malmo-Helsinki*	-
Karlshamn	dss, Internal water transport, Rail,	*Helsinki-Hamburg*	-
Road, sss		*Tallinn-Riga*	-
Gothenburg	dss, Internal water transport, Rail,	*Rotterdam-Hamburg*	-
Road, sss		*Klaipeda-Rotterdam*	-
Hamburg	dss, Internal water transport, Rail,	*Rostock-Helsinki*	-
Road, sss		*Helsinki-Rotterdam*	-
Rostock	dss, Internal water transport, Rail,	*Turku-Gothenburg*	-
Road, sss		*Turku-Hamburg*	-
Malmo	dss, Internal water transport, Rail,	*Gothenburg-Rotterdam*	-
Road, sss		*Klaipeda-Riga*	-
Gdansk	dss, Internal water transport, Rail,	*Hamburg-Riga*	-
Road, sss		*St. Petersburg-Hamburg*	-
Riga	-	*Rotterdam-Gdansk*	-
Rotterdam	dss, Internal water transport, Rail,	*Rotterdam-Ventspils*	-
Road, sss		*Rotterdam-St. Petersburg*	-
Turku	dss, Internal water transport, Rail,		
Road, sss			

Corridor 'Strauss'

Nodes	*Arcs*

Rotterdam	dss, Internal water transport, Rail,	*Rotterdam-Duisburg*	-
Road, sss		*Duisburg-Frankfurt*	-
Duisburg	dss, Internal water transport, Rail,	*Frankfurt-Paris*	-
Road, sss		*Frankfurt-Nurnberg*	-
Frankfurt	dss, Internal water transport, Rail,	*Nurnberg-Vienna*	-
Road, sss		*Vienna-Bratislava*	-
Paris	dss, Internal water transport, Rail,	*Bratislava-Budapest*	-
Road, sss		*Budapest-Belgrade*	-
Nurnberg	dss, Internal water transport, Rail,	*Belgrade-Constanta*	-
Road, sss			
Vienna	dss, Internal water transport, Rail,		
Road, sss			
Bratislava	dss, Internal water transport, Rail,		
Road, sss			
Budapest	dss, Internal water transport, Rail,		
Road, sss			
Belgrade	dss, Internal water transport, Rail,		
Road, sss			
Constanta	dss, Internal water transport, Rail,		
Road, sss			

Corridor 'Two Seas'

Nodes		*Arcs*	
Hamburg	dss, Internal water transport, Rail,	*Hamburg-Berlin*	-
Road, sss		*Berlin-Dresden*	-
Berlin	dss, Internal water transport, Rail,	*Dresden-Prague*	-
Road, sss		*Prague-Nurnberg*	-
Dresden	dss, Internal water transport, Rail,	*Prague-Bratislava*	-
Road, sss		*Bratislava-Budapest*	-
Prague	dss, Internal water transport, Rail,	*Budapest-Belgrade*	-
Road, sss		*Belgrade-Sofia*	-
Nurnberg	dss, Internal water transport, Rail,	*Sofia-Thessaloniki*	-
Road, sss		*Thessaloniki-Athens*	-
Bratislava	dss, Internal water transport, Rail,		
Road, sss			
Budapest	dss, Internal water transport, Rail,		
Road, sss			
Belgrade	dss, Internal water transport, Rail,		
Road, sss			
Sofia	dss, Internal water transport, Rail,		
Road, sss			
Thessaloniki	dss, Internal water transport, Rail,		
Road, sss			
Athens	dss, Internal water transport, Rail,		
Road, sss			

Corridor 'Mare Nostrum'

Nodes		*Arcs*	
Bourgas	-	*Bourgas-Istanbul*	-
Istanbul	sss	*La Spezia-Genoa*	-
La Spezia	sss	*Marseille-Lyon*	-
Genoa	dss, Internal water transport, Rail,	*Odessa-Istanbul*	-
Road, sss		*Constanta-Istanbul*	-
Marseille	Internal water transport, Rail,	*Algeciras-Istanbul*	-
Road, sss		*Barcelona-Valencia*	-
Lyon	Internal water transport, Rail, Road	*Valencia-Algeciras*	-
Odessa	sss	*Istanbul-Athens*	-
Constanta	dss, Internal water transport, Rail,	*Athens-Gioia Tauro*	-
Road, sss		*Gioia Tauro-La Spezia*	-
Algeciras	Rail, Road, sss	*Marseille-Barcelona*	-
Barcelona	Rail, Road, sss	*Algeciras-Sines*	-
Valencia	Rail, Road, sss	*Genoa-Barcelona*	-
Athens	dss, Internal water transport, Rail,	*Istanbul-Trieste*	-
Road, sss		*Istanbul-Gioia Tauro*	-
Gioia Tauro	sss	*Istanbul-Algeciras*	-
Sines	sss		
Trieste	Road, sss		

Corridor 'Silk Way'

Nodes		*Arcs*	
Rotterdam	dss, Internal water transport, Rail, Road, sss	*Rotterdam-Shanghai*	-
Shanghai	dss, Internal water transport, Rail, Road, sss	*Hamburg-Berlin*	-
Hamburg	dss, Internal water transport, Rail, Road, sss	*Berlin-Warsaw*	-
Berlin	dss, Internal water transport, Rail, Road, sss	*Warsaw-Minsk*	-
Warsaw	-	*Minsk-Moscow*	-
Minsk	dss, Internal water transport, Rail, Road, sss	*Moscow-Beijing*	-
Moscow	dss, Internal water transport, Rail, Road, sss	*Hamburg-Shanghai*	-
Beijing	dss, Internal water transport, Rail, Road, sss	*St. Petersburg-Shanghai*	-
St. Petersburg	dss, Internal water transport, Rail, Road, sss	*Shanghai-Gothenburg*	-
Gothenburg	dss, Internal water transport, Rail, Road, sss	*Tallinn-Shanghai*	-
Tallinn	-		

FlexiWaggon

Technology Data

ID	Category	Transport modes
HT36	Cargo Handling and Transfer	Railway

Description
Flexiwaggon can combine lorries, buses, cars, containers on one and the same waggon. Individual loading and unloading of waggons. Loading and unloading is done horizontally which means no consideration is necessary for overhead contact lines. The emissions will be reduced by 75%, including carbon dioxide emissions

Readiness Level	Time to Market	Energy Source	Efficiency
9	2		0
CO_2	NO_x	SO_x	LCC
0	0	0	0

High Level Benchmark

Baseline	0
Relative Cost	
% cost savings during operation	-
CAPEX	-
% fuel savings	-
Emissions	
% CO2 savings	75%
% SOx savings	-
% NOx savings	
Service & bottlenecks	
% operational or infrastructural delays reduction	-
% of frequency of service potential improvement due to delays & bottlenecks reduction	-
% of reliability improvement due to delays & bottlenecks reduction	-

Positive influence | Negative influence | Not relevant or no influence | no information

Technology Applicability per Corridor

Corridor 'Brenner'

Nodes		Arcs	
Malmo	-	Malmo-Trelleborg	Rail

Trelleborg	-	*Trelleborg-Sassnitz*	-
Sassnitz	-	*Trelleborg-Rostock*	-
Rostock	-	*Sassnitz-Berlin*	Rail
Berlin	-	*Rostock-Berlin*	Rail
Nurnberg	-	*Berlin-Nurnberg*	Rail
Munich	-	*Nurnberg-Munich*	Rail
Salzburg	-	*Munich-Salzburg*	Rail
Villach	-	*Salzburg-Villach*	Rail
Trieste	-	*Villach-Trieste*	Rail
Verona	-	*Munich-Verona*	Rail
Bologna	-	*Verona-Bologna*	Rail
Ancona	-	*Bologna-Ancona*	Rail
Bari	-	*Ancona-Bari*	Rail
Brindisi	-	*Bari-Brindisi*	Rail
Igoumenitsa	-	*Igoumenitsa-Thessaloniki*	-
Thessaloniki	-	*Igoumenitsa-Patras*	-
Patras	-	*Patras-Athens*	-
Athens	-	*Bologna-Rome*	Rail
Rome	-	*Rome-Naples*	Rail
Naples	-	*Naples-Messina*	-
Messina	-	*Villa San Giovanni-Messina*	-
Villa San Giovanni	-	*Messina-Palermo*	Rail
Palermo	-	*Naples-Villa San Giovanni*	Rail
		Ancona-Brindisi	-
		Bari-Igoumenitsa	-

Corridor 'Finis Terrae'

Nodes		*Arcs*	
Paris	-	*Paris-St. Nazaire*	Rail
St. Nazaire	-	*Paris-Irun*	Rail
Irun	-	*St. Nazaire-Gijon*	-
Gijon	-	*Irun-Valladolid*	Rail
Valladolid	-	*Gijon-Valladolid*	Rail
Madrid	-	*Valladolid-Madrid*	Rail
Lisboa	-	*Madrid-Lisboa*	Rail

Corridor 'Cloverleaf'

Nodes		*Arcs*	
Glasgow	-	*Glasgow-Carlisle*	Rail
Carlisle	-	*Carlisle-Liverpool*	Rail
Liverpool	-	*Liverpool-Dublin*	-
Dublin	-	*Liverpool-London*	Rail
London	-	*London-Dover*	Rail
Dover	-	*Dover-Calais*	Rail
Calais	-	*Calais-Duisburg*	Rail
Duisburg	-		

Corridor 'Edelweiss'

Nodes		*Arcs*	
St. Petersburg	-	*St. Petersburg-Lappeenranta*	Rail
Lappeenranta	-	*Lappeenranta-Helsinki*	Rail
Helsinki	-	*Helsinki-Turku*	Rail
Turku	-	*Stockholm-Oslo*	Rail
Stockholm	-	*Stockholm-Malmo*	Rail
Oslo	-	*Oslo-Gothenburg*	Rail
Malmo	-	*Gothenburg-Malmo*	Rail
Gothenburg	-	*Malmo-Copenhagen*	Rail
Copenhagen	-	*Copenhagen-Taulov*	Rail
Taulov	-	*Copenhagen-Rodbyhavn*	-
Rodbyhavn	-	*Rodbyhavn-Puttgarden*	-
Puttgarden	-	*Taulov-Hamburg*	Rail
Hamburg	-	*Puttgarden-Hamburg*	-
Hannover	-	*Hamburg-Hannover*	Rail
Würzburg	-	*Hannover-Würzburg*	Rail
Ulm	-	*Würzburg-Ulm*	Rail
Lugano	-	*Ulm-Lugano*	Rail
Milan	-	*Lugano-Milan*	Rail
Genoa	-	*Milan-Genoa*	Rail

		Turku-Stockholm	-

Corridor 'Nureyeev'

The technology is not applicable to this corridor.

Corridor 'Strauss'

Nodes		*Arcs*	
Rotterdam	-	*Rotterdam-Duisburg*	Rail
Duisburg	-	*Duisburg-Frankfurt*	Rail
Frankfurt	-	*Frankfurt-Paris*	Rail
Paris	-	*Frankfurt-Nurnberg*	Rail
Nurnberg	-	*Nurnberg-Vienna*	Rail
Vienna	-	*Vienna-Bratislava*	Rail
Bratislava	-	*Bratislava-Budapest*	Rail
Budapest	-	*Budapest-Belgrade*	Rail
Belgrade	-	*Belgrade-Constanta*	Rail
Constanta	-		

Corridor 'Two Seas'

Nodes		*Arcs*	
Hamburg	-	*Hamburg-Berlin*	-
Berlin	-	*Berlin-Dresden*	Rail
Dresden	-	*Dresden-Prague*	Rail
Prague	-	*Prague-Nurnberg*	Rail
Nurnberg	-	*Prague-Bratislava*	Rail
Bratislava	-	*Bratislava-Budapest*	Rail
Budapest	-	*Budapest-Belgrade*	Rail
Belgrade	-	*Belgrade-Sofia*	Rail
Sofia	-	*Sofia-Thessaloniki*	Rail
Thessaloniki	-	*Thessaloniki-Athens*	Rail
Athens	-		

Corridor 'Mare Nostrum'

Nodes		*Arcs*	
Bourgas	-	*Bourgas-Istanbul*	-
Istanbul	-	*La Spezia-Genoa*	-
La Spezia	-	*Marseille-Lyon*	Rail
Genoa	-	*Odessa-Istanbul*	-
Marseille	-	*Constanta-Istanbul*	-
Lyon	-	*Algeciras-Istanbul*	-
Odessa	-	*Barcelona-Valencia*	-
Constanta	-	*Valencia-Algeciras*	-
Algeciras	-	*Istanbul-Athens*	-
Barcelona	-	*Athens-Gioia Tauro*	-
Valencia	-	*Gioia Tauro-La Spezia*	-
Athens	-	*Marseille-Barcelona*	-
Gioia Tauro	-	*Algeciras-Sines*	-
Sines	-	*Genoa-Barcelona*	-
Trieste	-	*Istanbul-Trieste*	-
		Istanbul-Gioia Tauro	-
		Istanbul-Algeciras	-

Corridor 'Silk Way'

Nodes		*Arcs*	
Rotterdam	-	*Rotterdam-Shanghai*	-
Shanghai	-	*Hamburg-Berlin*	Rail
Hamburg	-	*Berlin-Warsaw*	Rail
Berlin	-	*Warsaw-Minsk*	Rail
Warsaw	-	*Minsk-Moscow*	Rail
Minsk	-	*Moscow-Beijing*	Rail
Moscow	-	*Hamburg-Shanghai*	-
Beijing	-	*St. Petersburg-Shanghai*	-
St. Petersburg	-	*Shanghai-Gothenburg*	-
Gothenburg	-	*Tallinn-Shanghai*	-
Tallinn	-		

Cargo Preparation

Heating and Cooling

RFID tag antenna with temperature alarm sensor

Technology Data

ID	Category	Transport modes
HC04	Heating and Cooling	Inland Waterways, Road, Maritime, Railway

Description
RFID tag antenna with ultra-low cost temperature alarm sensors which is capable of detecting temperature violations above a critical temperature threshold.

Readiness Level	Time to Market	Energy Source	Efficiency
9	<1		0

CO_2	NO_x	SO_x	LCC
0	0	0	0

High Level Benchmark

Baseline	0
Relative Cost	
% cost savings during operation	-
CAPEX	-
% fuel savings	-
Emissions	
% CO2 savings	-
% SOx savings	-
% NOx savings	
Service & bottlenecks	
% operational or infrastructural delays reduction	-
% of frequency of service potential improvement due to delays & bottlenecks reduction	-
% of reliability improvement due to delays & bottlenecks reduction	-

Positive influence | Negative influence | Not relevant or no influence | no information

Technology Applicability per Corridor

Corridor 'Brenner'

Nodes		Arcs	
Malmo	Road	*Malmo-Trelleborg*	Road
Trelleborg	Road	*Trelleborg-Sassnitz*	-
Sassnitz	Road	*Trelleborg-Rostock*	-
Rostock	Road	*Sassnitz-Berlin*	Road
Berlin	Road	*Rostock-Berlin*	Road
Nurnberg	Road	*Berlin-Nurnberg*	Road
Munich	Road	*Nurnberg-Munich*	Road
Salzburg	Road	*Munich-Salzburg*	Road
Villach	Road	*Salzburg-Villach*	Road
Trieste	Road, sss	*Villach-Trieste*	Road
Verona	Road	*Munich-Verona*	Road
Bologna	Road	*Verona-Bologna*	Road
Ancona	Road	*Bologna-Ancona*	Road
Bari	Road	*Ancona-Bari*	Road
Brindisi	Road	*Bari-Brindisi*	Road
Igoumenitsa	Road	*Igoumenitsa-Thessaloniki*	Road
Thessaloniki	Road	*Igoumenitsa-Patras*	-
Patras	Road	*Patras-Athens*	Road
Athens	Road, sss	*Bologna-Rome*	Road
Rome	Road	*Rome-Naples*	Road
Naples	Road	*Naples-Messina*	-
Messina	Road	*Villa San Giovanni-Messina*	-
Villa San Giovanni	Road	*Messina-Palermo*	Road
Palermo	Road	*Naples-Villa San Giovanni*	Road
		Ancona-Brindisi	-
		Bari-Igoumenitsa	-

Corridor 'Finis Terrae'

Nodes		Arcs	
Paris	Rail, Road	*Paris-St. Nazaire*	Rail, Road
St. Nazaire	Rail, Road, sss	*Paris-Irun*	Rail, Road
Irun	Rail, Road	*St. Nazaire-Gijon*	sss
Gijon	Rail, Road, sss	*Irun-Valladolid*	Rail, Road
Valladolid	Rail, Road	*Gijon-Valladolid*	Rail, Road
Madrid	Rail, Road	*Valladolid-Madrid*	Rail, Road
Lisboa	Rail, Road	*Madrid-Lisboa*	Rail, Road

Corridor 'Cloverleaf'

The technology is not applicable to this corridor.

Corridor 'Edelweiss'

Nodes		Arcs	
St. Petersburg	-	*St. Petersburg-Lappeenranta*	-
Lappeenranta	-	*Lappeenranta-Helsinki*	-
Helsinki	-	*Helsinki-Turku*	-
Turku	-	*Stockholm-Oslo*	-
Stockholm	-	*Stockholm-Malmo*	-
Oslo	-	*Oslo-Gothenburg*	-
Malmo	Road	*Gothenburg-Malmo*	-
Gothenburg	-	*Malmo-Copenhagen*	-
Copenhagen	-	*Copenhagen-Taulov*	-
Taulov	-	*Copenhagen-Rodbyhavn*	-
Rodbyhavn	-	*Rodbyhavn-Puttgarden*	-
Puttgarden	-	*Taulov-Hamburg*	-
Hamburg	-	*Puttgarden-Hamburg*	-
Hannover	-	*Hamburg-Hannover*	-
Würzburg	-	*Hannover-Würzburg*	-
Ulm	-	*Würzburg-Ulm*	-
Lugano	-	*Ulm-Lugano*	-
Milan	-	*Lugano-Milan*	-
Genoa	sss	*Milan-Genoa*	-
		Turku-Stockholm	-

Corridor 'Nureyeev'

Nodes		Arcs	
Helsinki	-	*Helsinki-Tallinn*	-
Tallinn	-	*St. Petersburg-Moscow*	Road
St. Petersburg	-	*Ventspils-Klaipeda*	-
Moscow	-	*Klaipeda-Minsk*	Road
Ventspils	-	*Klaipeda-Karlshamn*	-
Klaipeda	-	*Gothenburg-Hamburg*	-
Minsk	-	*Rostock-Gothenburg*	-
Karlshamn	-	*Hamburg-Malmo*	-
Gothenburg	-	*Helsinki-St. Petersburg*	-
Hamburg	-	*Hamburg-Gdansk*	-
Rostock	Road	*Hamburg-Tallinn*	-
Malmo	Road	*Ventspils-Karlshamn*	-
Gdansk	-	*Malmo-Helsinki*	-
Riga	-	*Helsinki-Hamburg*	-
Rotterdam	-	*Tallinn-Riga*	-
Turku	-	*Rotterdam-Hamburg*	-
		Klaipeda-Rotterdam	-
		Rostock-Helsinki	-
		Helsinki-Rotterdam	-
		Turku-Gothenburg	-
		Turku-Hamburg	-
		Gothenburg-Rotterdam	-
		Klaipeda-Riga	-
		Hamburg-Riga	-
		St. Petersburg-Hamburg	-
		Rotterdam-Gdansk	-
		Rotterdam-Ventspils	-
		Rotterdam-St. Petersburg	-

Corridor 'Strauss'

Nodes		Arcs	
Rotterdam	-	*Rotterdam-Duisburg*	Road
Duisburg	-	*Duisburg-Frankfurt*	Road
Frankfurt	-	*Frankfurt-Paris*	Road
Paris	Rail, Road	*Frankfurt-Nurnberg*	Road
Nurnberg	Road	*Nurnberg-Vienna*	Road
Vienna	-	*Vienna-Bratislava*	Road
Bratislava	-	*Bratislava-Budapest*	Road
Budapest	-	*Budapest-Belgrade*	Road
Belgrade	-	*Belgrade-Constanta*	Road
Constanta	sss		

Corridor 'Two Seas'

Nodes		Arcs	
Hamburg	-	*Hamburg-Berlin*	Road
Berlin	Road	*Berlin-Dresden*	Road
Dresden	-	*Dresden-Prague*	Road
Prague	-	*Prague-Nurnberg*	Road
Nurnberg	Road	*Prague-Bratislava*	Road
Bratislava	-	*Bratislava-Budapest*	Road
Budapest	-	*Budapest-Belgrade*	Road
Belgrade	-	*Belgrade-Sofia*	Road
Sofia	-	*Sofia-Thessaloniki*	Road
Thessaloniki	Road	*Thessaloniki-Athens*	Road
Athens	Road, sss		

Corridor 'Mare Nostrum'

Nodes		Arcs	
Bourgas	sss	*Bourgas-Istanbul*	sss
Istanbul	sss	*La Spezia-Genoa*	sss
La Spezia	sss	*Marseille-Lyon*	Internal water transport, Rail, Road
Genoa	sss	*Odessa-Istanbul*	sss
Marseille	Internal water transport, Rail,	*Constanta-Istanbul*	sss
Road, sss		*Algeciras-Istanbul*	sss
Lyon	Internal water transport, Rail, Road	*Barcelona-Valencia*	sss

Odessa	sss	*Valencia-Algeciras*	sss
Constanta	sss	*Istanbul-Athens*	sss
Algeciras	Rail, Road, sss	*Athens-Gioia Tauro*	sss
Barcelona	Rail, Road, sss	*Gioia Tauro-La Spezia*	sss
Valencia	Rail, Road, sss	*Marseille-Barcelona*	sss
Athens	Road, sss	*Algeciras-Sines*	sss
Gioia Tauro	sss	*Genoa-Barcelona*	sss
Sines	sss	*Istanbul-Trieste*	sss
Trieste	Road, sss	*Istanbul-Gioia Tauro*	sss
		Istanbul-Algeciras	sss

Corridor 'Silk Way'

Nodes		*Arcs*	
Rotterdam	-	*Rotterdam-Shanghai*	-
Shanghai	-	*Hamburg-Berlin*	Road
Hamburg	-	*Berlin-Warsaw*	-
Berlin	Road	*Warsaw-Minsk*	-
Warsaw	-	*Minsk-Moscow*	-
Minsk	-	*Moscow-Beijing*	-
Moscow	-	*Hamburg-Shanghai*	-
Beijing	-	*St. Petersburg-Shanghai*	-
St. Petersburg	-	*Shanghai-Gothenburg*	-
Gothenburg	-	*Tallinn-Shanghai*	-
Tallinn	-		

Innovative units and treatment

Braking energy recovery

Technology Data

ID	Category	Transport modes
LU13	Innovative units and treatment	Railway
Description		
Recovery of dynamic braking energy and restitution to national grid / Reversible DB Substaion		
Readiness Level	Time to Market	Energy Source	Efficiency
	medium-term	-	-
CO_2	NO_x	SO_x	LCC
saving	Reduktion im Umfang der Bremsenergie	Reduktion	---

Notes on technology

This technology has been analysed together with technology LU14 - Onboard energy storage systems. Regenerative braking is a mature and relatively standard technology in new trains. A conventional electric train braking system uses dynamic braking, in which the train kinetic energy is dissipated as waste, like heat. With the use of regenerative braking, the current in the electric motors is reversed, slowing down the train, while the motors generate electricity and return it to the power distribution system. This electricity can be used to power other trains, or to offset power demands of other loads, like lighting . Friction brakes are still needed as backup in the case that the regenerative brakes fail. However, the power recovered via regenerative braking can only be used simultaneously. In order to recover this energy at a different phase in time, an energy storage system is required. Super-capacitors, batteries, and/or flywheels can serve as energy storage systems. A flywheel is a mechanical device with a significant moment of inertia used as a storage device for rotational energy. Flywheel energy storage or the rotational energy of a flywheel, and rechargeable electric traction batteries are also used as storage systems. Batteries are electrochemical energy storage systems. A super-capacitor is a tool offering very high electrical capacitance in a small package. On-board energy storage systems deliver an enormous potential for energy saving in traction applications. The most suitable vehicle application might be a Diesel Multiple unit where energy storage (LU14) and reuse of brake energy (LU13) can recover the normally wasted brake energy and lead to energy savings up to 30 to 40% (Railenergy project). This saving can be measured directly in terms of reduced fossil fuel consumption per 100km. In addition there will be emission savings in the same order or even higher, since the small diesel engine can be operated in an optimal fashion. The optimal size and operation mode of such a storage system depends on the considered application and operating conditions. Reversible DC substation is able to recover into the upstream network the regenerative braking energy; this is done by association of controlled rectifier/inverter with specific control to be able to recover the braking energy between the nominal voltage (Un) and maximal voltage (UMax2) according to the EN standard ref EN 50163. The advantages against the baseline technologies are: - Maximum efficiency over parallel inverter, storage systems (Flywheel and Supra Capacitors). - Diode rectifier to be able to cancel braking resistors on board of traction units. The effects from the application of LU13 and LU14 on the rail routes connecting Shanghai to Brest/Malaszewicze and Slubice Kunowice are assessed. For the LU13 & LU14 combination, the estimation for energy savings is 30 to 40%. Thus, the block train CO2 emissions would drop from 41gr/tkm (baseline) to the range of 24.6-28.7 gr/tkm. The energy savings would, also, affect the transport costs, as the electricity bill would benefit from the consumption reduction. However, this is difficult to quantify, since no relevant information is available in the baseline description.

High Level Benchmark

Baseline	*Conventional train without brake energy recovery*
Relative Cost	
% cost savings during operation	-
CAPEX	-
% fuel savings	*7%-10% saving of traction energy*
Emissions	
% CO2 savings	*10%*
% SOx savings	-
% NOx savings	
Service & bottlenecks	
% operational or infrastructural delays reduction	-
% of frequency of service potential improvement due to delays & bottlenecks reduction	-
% of reliability improvement due to delays & bottlenecks reduction	-

Positive influence | Negative influence | Not relevant or no influence | no information

Detailed Benchmark

(with respect to baseline performance on specific corridor)

Corridor	*Silk Way*	
Mode of transport	*Rail*	
Cost	*Min: 0.0%*	*Max: 0.0%*
CO2 emissions	*Min: 30.0%*	*Max: 40.0%*
SOX emissions	*Min: 0.0%*	*Max: 0.0%*
Average speed	*Min: 0.0%*	*Max: 0.0%*
Frequency	*Min: 0.0%*	*Max: 0.0%*
Reliability	*Min: 0.0%*	*Max: 0.0%*

Technology Applicability per Corridor

Corridor 'Brenner'

The technology is not applicable to this corridor.

Corridor 'Finis Terrae'

Nodes		Arcs	
Paris	-	*Paris-St. Nazaire*	Rail
St. Nazaire	-	*Paris-Irun*	Rail
Irun	-	*St. Nazaire-Gijon*	-
Gijon	-	*Irun-Valladolid*	Rail
Valladolid	-	*Gijon-Valladolid*	Rail
Madrid	-	*Valladolid-Madrid*	Rail
Lisboa	-	*Madrid-Lisboa*	Rail

Corridor 'Cloverleaf'

Nodes		Arcs	
Glasgow	-	*Glasgow-Carlisle*	Rail
Carlisle	-	*Carlisle-Liverpool*	Rail
Liverpool	-	*Liverpool-Dublin*	-
Dublin	-	*Liverpool-London*	Rail
London	-	*London-Dover*	Rail
Dover	-	*Dover-Calais*	Rail
Calais	-	*Calais-Duisburg*	Rail
Duisburg	-		

Corridor 'Edelweiss'

Nodes		Arcs	
St. Petersburg	-	*St. Petersburg-Lappeenranta*	Rail
Lappeenranta	-	*Lappeenranta-Helsinki*	Rail
Helsinki	-	*Helsinki-Turku*	Rail
Turku	-	*Stockholm-Oslo*	Rail
Stockholm	-	*Stockholm-Malmo*	Rail
Oslo	-	*Oslo-Gothenburg*	Rail
Malmo	-	*Gothenburg-Malmo*	Rail
Gothenburg	-	*Malmo-Copenhagen*	Rail
Copenhagen	-	*Copenhagen-Taulov*	Rail
Taulov	-	*Copenhagen-Rodbyhavn*	-
Rodbyhavn	-	*Rodbyhavn-Puttgarden*	-
Puttgarden	-	*Taulov-Hamburg*	Rail
Hamburg	-	*Puttgarden-Hamburg*	-
Hannover	-	*Hamburg-Hannover*	Rail
Würzburg	-	*Hannover-Würzburg*	Rail
Ulm	-	*Würzburg-Ulm*	Rail
Lugano	-	*Ulm-Lugano*	Rail
Milan	-	*Lugano-Milan*	Rail
Genoa	-	*Milan-Genoa*	Rail
		Turku-Stockholm	-

Corridor 'Nureyeev'

Nodes		Arcs	
Helsinki	-	*Helsinki-Tallinn*	-
Tallinn	-	*St. Petersburg-Moscow*	Rail
St. Petersburg	-	*Ventspils-Klaipeda*	-
Moscow	-	*Klaipeda-Minsk*	-
Ventspils	-	*Klaipeda-Karlshamn*	-
Klaipeda	-	*Gothenburg-Hamburg*	-
Minsk	-	*Rostock-Gothenburg*	-
Karlshamn	-	*Hamburg-Malmo*	-
Gothenburg	-	*Helsinki-St. Petersburg*	-
Hamburg	-	*Hamburg-Gdansk*	-
Rostock	-	*Hamburg-Tallinn*	-
Malmo	-	*Ventspils-Karlshamn*	-
Gdansk	-	*Malmo-Helsinki*	-
Riga	-	*Helsinki-Hamburg*	-
Rotterdam	-	*Tallinn-Riga*	-
Turku	-	*Rotterdam-Hamburg*	-
		Klaipeda-Rotterdam	-
		Rostock-Helsinki	-
		Helsinki-Rotterdam	-
		Turku-Gothenburg	-
		Turku-Hamburg	-
		Gothenburg-Rotterdam	-
		Klaipeda-Riga	-

		Hamburg-Riga	-
		St. Petersburg-Hamburg	-
		Rotterdam-Gdansk	-
		Rotterdam-Ventspils	-
		Rotterdam-St. Petersburg	-

Corridor 'Strauss'

The technology is not applicable to this corridor.

Corridor 'Two Seas'

Nodes		*Arcs*	
Hamburg	-	*Hamburg-Berlin*	-
Berlin	-	*Berlin-Dresden*	-
Dresden	-	*Dresden-Prague*	Rail
Prague	-	*Prague-Nurnberg*	-
Nurnberg	-	*Prague-Bratislava*	-
Bratislava	-	*Bratislava-Budapest*	-
Budapest	-	*Budapest-Belgrade*	-
Belgrade	-	*Belgrade-Sofia*	-
Sofia	-	*Sofia-Thessaloniki*	-
Thessaloniki	-	*Thessaloniki-Athens*	-
Athens	-		

Corridor 'Mare Nostrum'

Nodes		*Arcs*	
Bourgas	-	*Bourgas-Istanbul*	-
Istanbul	-	*La Spezia-Genoa*	-
La Spezia	-	*Marseille-Lyon*	Rail
Genoa	-	*Odessa-Istanbul*	-
Marseille	-	*Constanta-Istanbul*	-
Lyon	-	*Algeciras-Istanbul*	-
Odessa	-	*Barcelona-Valencia*	Rail
Constanta	-	*Valencia-Algeciras*	Rail
Algeciras	-	*Istanbul-Athens*	-
Barcelona	-	*Athens-Gioia Tauro*	-
Valencia	-	*Gioia Tauro-La Spezia*	-
Athens	-	*Marseille-Barcelona*	Rail
Gioia Tauro	-	*Algeciras-Sines*	-
Sines	-	*Genoa-Barcelona*	-
Trieste	-	*Istanbul-Trieste*	-
		Istanbul-Gioia Tauro	-
		Istanbul-Algeciras	-

Corridor 'Silk Way'

The technology is not applicable to this corridor.

Onboard energy storage systems

Technology Data

ID	Category	Transport modes
LU14	Innovative units and treatment	Railway

Description
Supercaps, batteries, flywheels, hybrid storage; A flywheel is a mechanical device with a significant moment of inertia used as a storage device for rotational energy.Flywheel energy storage, or the rotational energy of a flywheel, and rechargeable electric traction batteries are also used as storage systems.Batteries are electrochemical energy storage systems.A supercapacitor is a tool offering very high electrical capacitance in a small package.A hybrid train is a locomotive, railcar or train that uses an onboard rechargeable energy storage system (RESS), placed between the power source (often a diesel engine prime mover) and the traction transmission system connected to the wheels

Readiness Level	Time to Market	Energy Source	Efficiency
	available	-	-

CO_2	NO_x	SO_x	LCC
saving potential 25-30%	saving potential 25-30%	0	0

Notes on technology

This technology has been analysed together with technology LU13 - Braking energy recovery. Regenerative braking is a mature and relatively standard technology in new trains. A conventional electric train braking system uses dynamic braking, in which the train kinetic energy is dissipated as waste, like heat. With the use of regenerative braking, the current in the electric motors is reversed, slowing down the train, while the motors generate electricity and return it to the power distribution system. This electricity can be used to power other trains, or to offset power demands of other loads, like lighting . Friction brakes are still needed as backup in the case that the regenerative brakes fail. However, the power recovered via regenerative braking can only be used simultaneously. In order to recover this energy at a different phase in time, an energy storage system is required. Super-capacitors, batteries, and/or flywheels can serve as energy storage systems. A flywheel is a mechanical device with a significant moment of inertia used as a storage device for rotational energy. Flywheel energy storage or the rotational energy of a flywheel, and rechargeable electric traction batteries are also used as storage systems. Batteries are electrochemical energy storage systems. A super-capacitor is a tool offering very high electrical capacitance in a small package. On-board energy storage systems deliver an enormous potential for energy saving in traction applications. The most suitable vehicle application might be a Diesel Multiple unit where energy storage (LU14) and reuse of brake energy (LU13) can recover the normally wasted brake energy and lead to energy savings up to 30 to 40% (Railenergy project). This saving can be measured directly in terms of reduced fossil fuel consumption per 100km. In addition there will be emission savings in the same order or even higher, since the small diesel engine can be operated in an optimal fashion. The optimal size and operation mode of such a storage system depends on the considered application and operating conditions. Reversible DC substation is able to recover into the upstream network the regenerative braking energy; this is done by association of controlled rectifier/inverter with specific control to be able to recover the braking energy between the nominal voltage (Un) and maximal voltage (UMax2) according to the EN standard ref EN 50163. The advantages against the baseline technologies are: - Maximum efficiency over parallel inverter, storage systems (Flywheel and Supra Capacitors). - Diode rectifier to be able to cancel braking resistors on board of traction units. The effects from the application of LU13 and LU14 on the rail routes connecting Shanghai to Brest/Malaszewicze and Slubice Kunowice are assessed. For the LU13 & LU14 combination, the estimation for energy savings is 30 to 40%. Thus, the block train CO2 emissions would drop from 41gr/tkm (baseline) to the range of 24.6-28.7 gr/tkm. The energy savings would, also, affect the transport costs, as the electricity bill would benefit from the consumption reduction. However, this is difficult to quantify, since no relevant information is available in the baseline description.

High Level Benchmark

Baseline	*0*
Relative Cost	
% cost savings during operation	-
CAPEX	-
% fuel savings	*up to 30% of saving of traction energy*
Emissions	
% CO2 savings	*%25-30*
% SOx savings	-
% NOx savings	
Service & bottlenecks	
% operational or infrastructural delays reduction	-
% of frequency of service potential improvement due to delays & bottlenecks reduction	-
% of reliability improvement due to delays & bottlenecks reduction	-

Positive influence | Negative influence | Not relevant or no influence | no information

Detailed Benchmark

(with respect to baseline performance on specific corridor)

Corridor	*Silk Way*	
Mode of transport	*Rail*	
Cost	*Min: 0.0%*	*Max: 0.0%*
CO2 emissions	*Min: 30.0%*	*Max: 40.0%*
SOX emissions	*Min: 0.0%*	*Max: 0.0%*
Average speed	*Min: 0.0%*	*Max: 0.0%*
Frequency	*Min: 0.0%*	*Max: 0.0%*
Reliability	*Min: 0.0%*	*Max: 0.0%*

Technology Applicability per Corridor

Corridor 'Brenner'

Nodes		*Arcs*	
Malmo	-	*Malmo-Trelleborg*	-
Trelleborg	-	*Trelleborg-Sassnitz*	-

Sassnitz	-	*Trelleborg-Rostock*	-
Rostock	-	*Sassnitz-Berlin*	-
Berlin	Rail	*Rostock-Berlin*	-
Nurnberg	Rail	*Berlin-Nurnberg*	-
Munich	-	*Nurnberg-Munich*	-
Salzburg	-	*Munich-Salzburg*	-
Villach	-	*Salzburg-Villach*	-
Trieste	-	*Villach-Trieste*	-
Verona	-	*Munich-Verona*	-
Bologna	-	*Verona-Bologna*	-
Ancona	-	*Bologna-Ancona*	-
Bari	-	*Ancona-Bari*	-
Brindisi	-	*Bari-Brindisi*	-
Igoumenitsa	-	*Igoumenitsa-Thessaloniki*	-
Thessaloniki	Rail	*Igoumenitsa-Patras*	-
Patras	-	*Patras-Athens*	-
Athens	Rail	*Bologna-Rome*	-
Rome	-	*Rome-Naples*	-
Naples	-	*Naples-Messina*	-
Messina	-	*Villa San Giovanni-Messina*	-
Villa San Giovanni	-	*Messina-Palermo*	-
Palermo	-	*Naples-Villa San Giovanni*	-
		Ancona-Brindisi	-
		Bari-Igoumenitsa	-

Corridor 'Finis Terrae'

Nodes		*Arcs*	
Paris	Rail	*Paris-St. Nazaire*	Rail
St. Nazaire	-	*Paris-Irun*	Rail
Irun	-	*St. Nazaire-Gijon*	-
Gijon	-	*Irun-Valladolid*	Rail
Valladolid	-	*Gijon-Valladolid*	Rail
Madrid	-	*Valladolid-Madrid*	Rail
Lisboa	-	*Madrid-Lisboa*	Rail

Corridor 'Cloverleaf'

Nodes		*Arcs*	
Glasgow	-	*Glasgow-Carlisle*	Rail
Carlisle	-	*Carlisle-Liverpool*	Rail
Liverpool	-	*Liverpool-Dublin*	-
Dublin	-	*Liverpool-London*	Rail
London	-	*London-Dover*	Rail
Dover	-	*Dover-Calais*	Rail
Calais	-	*Calais-Duisburg*	Rail
Duisburg	Rail		

Corridor 'Edelweiss'

Nodes		*Arcs*	
St. Petersburg	Rail	*St. Petersburg-Lappeenranta*	Rail
Lappeenranta	-	*Lappeenranta-Helsinki*	Rail
Helsinki	-	*Helsinki-Turku*	Rail
Turku	-	*Stockholm-Oslo*	Rail
Stockholm	-	*Stockholm-Malmo*	Rail
Oslo	-	*Oslo-Gothenburg*	Rail
Malmo	-	*Gothenburg-Malmo*	Rail
Gothenburg	-	*Malmo-Copenhagen*	Rail
Copenhagen	-	*Copenhagen-Taulov*	Rail
Taulov	-	*Copenhagen-Rodbyhavn*	-
Rodbyhavn	-	*Rodbyhavn-Puttgarden*	-
Puttgarden	-	*Taulov-Hamburg*	Rail
Hamburg	Rail	*Puttgarden-Hamburg*	-
Hannover	-	*Hamburg-Hannover*	Rail
Würzburg	-	*Hannover-Würzburg*	Rail
Ulm	-	*Würzburg-Ulm*	Rail
Lugano	-	*Ulm-Lugano*	Rail
Milan	-	*Lugano-Milan*	Rail
Genoa	-	*Milan-Genoa*	Rail
		Turku-Stockholm	-

Corridor 'Nureyeev'

Nodes		Arcs	
Helsinki	-	Helsinki-Tallinn	-
Tallinn	-	St. Petersburg-Moscow	-
St. Petersburg	Rail	Ventspils-Klaipeda	-
Moscow	Rail	Klaipeda-Minsk	-
Ventspils	-	Klaipeda-Karlshamn	-
Klaipeda	Rail	Gothenburg-Hamburg	-
Minsk	-	Rostock-Gothenburg	-
Karlshamn	-	Hamburg-Malmo	-
Gothenburg	-	Helsinki-St. Petersburg	-
Hamburg	Rail	Hamburg-Gdansk	-
Rostock	-	Hamburg-Tallinn	-
Malmo	-	Ventspils-Karlshamn	-
Gdansk	-	Malmo-Helsinki	-
Riga	-	Helsinki-Hamburg	-
Rotterdam	Rail	Tallinn-Riga	-
Turku	-	Rotterdam-Hamburg	-
		Klaipeda-Rotterdam	-
		Rostock-Helsinki	-
		Helsinki-Rotterdam	-
		Turku-Gothenburg	-
		Turku-Hamburg	-
		Gothenburg-Rotterdam	-
		Klaipeda-Riga	-
		Hamburg-Riga	-
		St. Petersburg-Hamburg	-
		Rotterdam-Gdansk	-
		Rotterdam-Ventspils	-
		Rotterdam-St. Petersburg	-

Corridor 'Strauss'

Nodes		Arcs	
Rotterdam	Rail	Rotterdam-Duisburg	-
Duisburg	Rail	Duisburg-Frankfurt	-
Frankfurt	Rail	Frankfurt-Paris	-
Paris	Rail	Frankfurt-Nurnberg	-
Nurnberg	Rail	Nurnberg-Vienna	-
Vienna	Rail	Vienna-Bratislava	-
Bratislava	Rail	Bratislava-Budapest	-
Budapest	Rail	Budapest-Belgrade	-
Belgrade	Rail	Belgrade-Constanta	-
Constanta	Rail		

Corridor 'Two Seas'

Nodes		Arcs	
Hamburg	Rail	Hamburg-Berlin	-
Berlin	Rail	Berlin-Dresden	-
Dresden	Rail	Dresden-Prague	-
Prague	Rail	Prague-Nurnberg	-
Nurnberg	Rail	Prague-Bratislava	-
Bratislava	Rail	Bratislava-Budapest	-
Budapest	Rail	Budapest-Belgrade	-
Belgrade	Rail	Belgrade-Sofia	-
Sofia	Rail	Sofia-Thessaloniki	-
Thessaloniki	Rail	Thessaloniki-Athens	-
Athens	Rail		

Corridor 'Mare Nostrum'

Nodes		Arcs	
Bourgas	-	Bourgas-Istanbul	-
Istanbul	-	La Spezia-Genoa	-
La Spezia	-	Marseille-Lyon	Rail
Genoa	-	Odessa-Istanbul	-
Marseille	-	Constanta-Istanbul	-
Lyon	-	Algeciras-Istanbul	-
Odessa	-	Barcelona-Valencia	Rail

Constanta	Rail	*Valencia-Algeciras*	Rail
Algeciras	-	*Istanbul-Athens*	-
Barcelona	-	*Athens-Gioia Tauro*	-
Valencia	-	*Gioia Tauro-La Spezia*	-
Athens	Rail	*Marseille-Barcelona*	Rail
Gioia Tauro	-	*Algeciras-Sines*	-
Sines	-	*Genoa-Barcelona*	-
Trieste	-	*Istanbul-Trieste*	-
		Istanbul-Gioia Tauro	-
		Istanbul-Algeciras	-

Corridor 'Silk Way'

Nodes		*Arcs*	
Rotterdam	Rail	*Rotterdam-Shanghai*	-
Shanghai	-	*Hamburg-Berlin*	Rail
Hamburg	Rail	*Berlin-Warsaw*	Rail
Berlin	Rail	*Warsaw-Minsk*	Rail
Warsaw	-	*Minsk-Moscow*	Rail
Minsk	-	*Moscow-Beijing*	Rail
Moscow	Rail	*Hamburg-Shanghai*	-
Beijing	-	*St. Petersburg-Shanghai*	-
St. Petersburg	Rail	*Shanghai-Gothenburg*	-
Gothenburg	-	*Tallinn-Shanghai*	-
Tallinn	-		

Vehicles

Electric Locomotive

Technology Data

ID	Category	Transport modes
VE02	Vehicles	Railway
Description		
NS 999 is an entirely electric locomotive that uses a lead-acid energy storage system without the use of a diesel engine and with zero exhaust emissions.		

Readiness Level	Time to Market	Energy Source	Efficiency
9	<1	-	-
CO_2	NO_x	SO_x	LCC
0	0	0	-

High Level Benchmark

Baseline	0	
Relative Cost		
% cost savings during operation	~ 50%	
CAPEX	-	
% fuel savings	~ 40-50%	
Emissions		
% CO2 savings	100%	
% SOx savings	100%	
% NOx savings		
Service & bottlenecks		
% operational or infrastructural delays reduction	-	
% of frequency of service potential improvement due to delays & bottlenecks reduction	-	
% of reliability improvement due to delays & bottlenecks reduction	-	

Positive influence | Negative influence | Not relevant or no influence | no information

Technology Applicability per Corridor

Corridor 'Brenner'

Nodes		Arcs	
Malmo	-	Malmo-Trelleborg	Rail
Trelleborg	-	Trelleborg-Sassnitz	-
Sassnitz	-	Trelleborg-Rostock	-
Rostock	-	Sassnitz-Berlin	Rail
Berlin	Rail	Rostock-Berlin	Rail
Nurnberg	Rail	Berlin-Nurnberg	Rail
Munich	-	Nurnberg-Munich	Rail
Salzburg	-	Munich-Salzburg	Rail
Villach	-	Salzburg-Villach	Rail
Trieste	-	Villach-Trieste	Rail
Verona	-	Munich-Verona	Rail
Bologna	-	Verona-Bologna	Rail
Ancona	-	Bologna-Ancona	Rail
Bari	-	Ancona-Bari	Rail
Brindisi	-	Bari-Brindisi	Rail
Igoumenitsa	-	Igoumenitsa-Thessaloniki	-
Thessaloniki	Rail	Igoumenitsa-Patras	-
Patras	-	Patras-Athens	-
Athens	Rail	Bologna-Rome	Rail
Rome	-	Rome-Naples	Rail
Naples	-	Naples-Messina	-
Messina	-	Villa San Giovanni-Messina	-
Villa San Giovanni	-	Messina-Palermo	Rail
Palermo	-	Naples-Villa San Giovanni	Rail
		Ancona-Brindisi	-
		Bari-Igoumenitsa	-

Corridor 'Finis Terrae'

Nodes		Arcs	
Paris	-	Paris-St. Nazaire	Rail
St. Nazaire	-	Paris-Irun	Rail
Irun	-	St. Nazaire-Gijon	-
Gijon	-	Irun-Valladolid	Rail
Valladolid	-	Gijon-Valladolid	Rail
Madrid	-	Valladolid-Madrid	Rail
Lisboa	-	Madrid-Lisboa	Rail

Corridor 'Cloverleaf'

Nodes		Arcs	
Glasgow	-	Glasgow-Carlisle	Rail
Carlisle	-	Carlisle-Liverpool	Rail
Liverpool	-	Liverpool-Dublin	-
Dublin	-	Liverpool-London	Rail
London	-	London-Dover	Rail
Dover	-	Dover-Calais	Rail
Calais	-	Calais-Duisburg	Rail
Duisburg	-		

Corridor 'Edelweiss'

Nodes		Arcs	
St. Petersburg	Rail	St. Petersburg-Lappeenranta	Rail
Lappeenranta	-	Lappeenranta-Helsinki	Rail
Helsinki	-	Helsinki-Turku	Rail
Turku	-	Stockholm-Oslo	Rail
Stockholm	-	Stockholm-Malmo	Rail
Oslo	-	Oslo-Gothenburg	Rail
Malmo	-	Gothenburg-Malmo	Rail
Gothenburg	-	Malmo-Copenhagen	Rail
Copenhagen	-	Copenhagen-Taulov	Rail
Taulov	-	Copenhagen-Rodbyhavn	-
Rodbyhavn	-	Rodbyhavn-Puttgarden	-
Puttgarden	-	Taulov-Hamburg	Rail
Hamburg	-	Puttgarden-Hamburg	-
Hannover	-	Hamburg-Hannover	Rail
Würzburg	-	Hannover-Würzburg	Rail

Ulm	-	*Würzburg-Ulm*	Rail
Lugano	-	*Ulm-Lugano*	Rail
Milan	-	*Lugano-Milan*	Rail
Genoa	-	*Milan-Genoa*	Rail
		Turku-Stockholm	-

Corridor 'Nureyeev'

Nodes		*Arcs*	
Helsinki	-	*Helsinki-Tallinn*	-
Tallinn	-	*St. Petersburg-Moscow*	-
St. Petersburg	Rail	*Ventspils-Klaipeda*	-
Moscow	Rail	*Klaipeda-Minsk*	-
Ventspils	-	*Klaipeda-Karlshamn*	-
Klaipeda	Rail	*Gothenburg-Hamburg*	-
Minsk	Rail	*Rostock-Gothenburg*	-
Karlshamn	-	*Hamburg-Malmo*	-
Gothenburg	-	*Helsinki-St. Petersburg*	-
Hamburg	-	*Hamburg-Gdansk*	-
Rostock	-	*Hamburg-Tallinn*	-
Malmo	-	*Ventspils-Karlshamn*	-
Gdansk	-	*Malmo-Helsinki*	-
Riga	-	*Helsinki-Hamburg*	-
Rotterdam	-	*Tallinn-Riga*	-
Turku	-	*Rotterdam-Hamburg*	-
		Klaipeda-Rotterdam	-
		Rostock-Helsinki	-
		Helsinki-Rotterdam	-
		Turku-Gothenburg	-
		Turku-Hamburg	-
		Gothenburg-Rotterdam	-
		Klaipeda-Riga	-
		Hamburg-Riga	-
		St. Petersburg-Hamburg	-
		Rotterdam-Gdansk	-
		Rotterdam-Ventspils	-
		Rotterdam-St. Petersburg	-

Corridor 'Strauss'

Nodes		*Arcs*	
Rotterdam	-	*Rotterdam-Duisburg*	Rail
Duisburg	-	*Duisburg-Frankfurt*	Rail
Frankfurt	-	*Frankfurt-Paris*	Rail
Paris	-	*Frankfurt-Nurnberg*	Rail
Nurnberg	Rail	*Nurnberg-Vienna*	Rail
Vienna	-	*Vienna-Bratislava*	Rail
Bratislava	Rail	*Bratislava-Budapest*	-
Budapest	Rail	*Budapest-Belgrade*	-
Belgrade	Rail	*Belgrade-Constanta*	Rail
Constanta	-		

Corridor 'Two Seas'

Nodes		*Arcs*	
Hamburg	-	*Hamburg-Berlin*	-
Berlin	Rail	*Berlin-Dresden*	-
Dresden	Rail	*Dresden-Prague*	-
Prague	Rail	*Prague-Nurnberg*	-
Nurnberg	Rail	*Prague-Bratislava*	-
Bratislava	Rail	*Bratislava-Budapest*	-
Budapest	Rail	*Budapest-Belgrade*	-
Belgrade	Rail	*Belgrade-Sofia*	-
Sofia	Rail	*Sofia-Thessaloniki*	-
Thessaloniki	Rail	*Thessaloniki-Athens*	-
Athens	Rail		

Corridor 'Mare Nostrum'

Nodes		*Arcs*	
Bourgas	-	*Bourgas-Istanbul*	-
Istanbul	-	*La Spezia-Genoa*	-

La Spezia	-	*Marseille-Lyon*	Rail
Genoa	-	*Odessa-Istanbul*	-
Marseille	Rail	*Constanta-Istanbul*	-
Lyon	Rail	*Algeciras-Istanbul*	-
Odessa	-	*Barcelona-Valencia*	Rail
Constanta	-	*Valencia-Algeciras*	Rail
Algeciras	Rail	*Istanbul-Athens*	-
Barcelona	Rail	*Athens-Gioia Tauro*	-
Valencia	Rail	*Gioia Tauro-La Spezia*	-
Athens	Rail	*Marseille-Barcelona*	Rail
Gioia Tauro	-	*Algeciras-Sines*	-
Sines	-	*Genoa-Barcelona*	-
Trieste	-	*Istanbul-Trieste*	-
		Istanbul-Gioia Tauro	-
		Istanbul-Algeciras	-

Corridor 'Silk Way'

Nodes		*Arcs*	
Rotterdam	-	*Rotterdam-Shanghai*	-
Shanghai	-	*Hamburg-Berlin*	Rail
Hamburg	-	*Berlin-Warsaw*	Rail
Berlin	Rail	*Warsaw-Minsk*	Rail
Warsaw	-	*Minsk-Moscow*	Rail
Minsk	Rail	*Moscow-Beijing*	Rail
Moscow	Rail	*Hamburg-Shanghai*	-
Beijing	-	*St. Petersburg-Shanghai*	-
St. Petersburg	Rail	*Shanghai-Gothenburg*	-
Gothenburg	-	*Tallinn-Shanghai*	-
Tallinn	-		

Hybrid Truck

Technology Data

ID	Category	Transport modes
VE03	Vehicles	Road
Description		
The M2e Hybrid Freightliner; Support engine plus auxiliary drive to operate an elevating platform of the truck; combination of 6 cylinder engine plus electrical engine		

Readiness Level	Time to Market	Energy Source	Efficiency
9	<1	-	-
CO_2	NO_x	SO_x	LCC
ca. 25% less than Diesel	ca. 25% less than Diesel	--	n.a.

Notes on technology

A hybrid truck combines the conventional diesel engine with an electrical motor for auxiliary power generation, resulting in fuel economy and reduction of CO2 emissions. The hybrid system includes a lithium-ion battery, which is recharged through regenerative braking. Other indicative features are: (a). the added power boost for hills or rapid acceleration using the electric motor and (b). the engine turning-off when the service brake is applied. The application of hybrid trucks has been evaluated for the Brenner and Cloverleaf corridors. According to the first benchmarking level, the potential benefits from the use of hybrid trucks compared to conventional diesel vehicles include 60-80% fuel savings and relevant reduction of emissions. If conventional diesel fuel is used, then 60-80% CO2 and SOx emissions' reduction are estimated. However, this figure is general and can change according to the driving profile, the hybrid system in use, and other factors. Assuming an average loading factor of 85% per trip (no data on loading factor are given in the baseline description) and typical vehicle characteristics on engine power and fuel consumption, a 22-29% fuel cost factor is estimated.

High Level Benchmark

Baseline	*If the truck is during operation, then the baseline technology is a conventional diesel truck. If it is idle, the baseline technology to compare with is the fuel (diesel).*
Relative Cost	
% cost savings during operation	-
CAPEX	-
% fuel savings	60-80%
Emissions	
% CO2 savings	80%
% SOx savings	-
% NOx savings	
Service & bottlenecks	
% operational or infrastructural	-

delays reduction	
% of frequency of service potential improvement due to delays & bottlenecks reduction	-
% of reliability improvement due to delays & bottlenecks reduction	-

Positive influence | Negative influence | Not relevant or no influence | no information

Detailed Benchmark

(with respect to baseline performance on specific corridor)

Corridor	*Brenner*	
Mode of transport	*Road*	
Cost	*Min: 5.7%*	*Max: 7.1%*
CO2 emissions	*Min: 25.0%*	*Max: 25.0%*
SOX emissions	*Min: 0.0%*	*Max: 0.0%*
Average speed	*Min: 0.0%*	*Max: 0.0%*
Frequency	*Min: 0.0%*	*Max: 0.0%*
Reliability	*Min: 0.0%*	*Max: 0.0%*

Corridor	*Cloverleaf*	
Mode of transport	*Road*	
Cost	*Min: 13.1%*	*Max: 23.2%*
CO2 emissions	*Min: -49.2%*	*Max: 25.4%*
SOX emissions	*Min: 10.0%*	*Max: 26.0%*
Average speed	*Min: 0.0%*	*Max: 0.0%*
Frequency	*Min: 0.0%*	*Max: 0.0%*
Reliability	*Min: 0.0%*	*Max: 0.0%*

Technology Applicability per Corridor

Corridor 'Brenner'

Nodes		*Arcs*	
Malmo	-	*Malmo-Trelleborg*	Road
Trelleborg	-	*Trelleborg-Sassnitz*	-
Sassnitz	-	*Trelleborg-Rostock*	-
Rostock	-	*Sassnitz-Berlin*	Road
Berlin	-	*Rostock-Berlin*	Road
Nurnberg	-	*Berlin-Nurnberg*	Road

Munich	-	*Nurnberg-Munich*	Road
Salzburg	-	*Munich-Salzburg*	Road
Villach	-	*Salzburg-Villach*	Road
Trieste	-	*Villach-Trieste*	Road
Verona	-	*Munich-Verona*	Road
Bologna	-	*Verona-Bologna*	Road
Ancona	-	*Bologna-Ancona*	Road
Bari	-	*Ancona-Bari*	Road
Brindisi	-	*Bari-Brindisi*	Road
Igoumenitsa	-	*Igoumenitsa-Thessaloniki*	Road
Thessaloniki	-	*Igoumenitsa-Patras*	-
Patras	-	*Patras-Athens*	Road
Athens	-	*Bologna-Rome*	Road
Rome	-	*Rome-Naples*	Road
Naples	-	*Naples-Messina*	-
Messina	-	*Villa San Giovanni-Messina*	-
Villa San Giovanni	-	*Messina-Palermo*	Road
Palermo	-	*Naples-Villa San Giovanni*	Road
		Ancona-Brindisi	-
		Bari-Igoumenitsa	-

Corridor 'Finis Terrae'

Nodes		*Arcs*	
Paris	-	*Paris-St. Nazaire*	Road
St. Nazaire	-	*Paris-Irun*	Road
Irun	-	*St. Nazaire-Gijon*	-
Gijon	-	*Irun-Valladolid*	Road
Valladolid	-	*Gijon-Valladolid*	Road
Madrid	-	*Valladolid-Madrid*	Road
Lisboa	-	*Madrid-Lisboa*	Road

Corridor 'Cloverleaf'

Nodes		*Arcs*	
Glasgow	-	*Glasgow-Carlisle*	Road
Carlisle	-	*Carlisle-Liverpool*	Road
Liverpool	-	*Liverpool-Dublin*	-
Dublin	-	*Liverpool-London*	Road
London	-	*London-Dover*	Road
Dover	-	*Dover-Calais*	-
Calais	-	*Calais-Duisburg*	Road
Duisburg	-		

Corridor 'Edelweiss'

Nodes		*Arcs*	
St. Petersburg	-	*St. Petersburg-Lappeenranta*	Road
Lappeenranta	-	*Lappeenranta-Helsinki*	Road
Helsinki	-	*Helsinki-Turku*	Road
Turku	-	*Stockholm-Oslo*	Road
Stockholm	-	*Stockholm-Malmo*	Road
Oslo	-	*Oslo-Gothenburg*	Road
Malmo	-	*Gothenburg-Malmo*	Road
Gothenburg	-	*Malmo-Copenhagen*	Road
Copenhagen	-	*Copenhagen-Taulov*	Road
Taulov	-	*Copenhagen-Rodbyhavn*	Road
Rodbyhavn	-	*Rodbyhavn-Puttgarden*	-
Puttgarden	-	*Taulov-Hamburg*	Road
Hamburg	-	*Puttgarden-Hamburg*	Road
Hannover	-	*Hamburg-Hannover*	Road
Würzburg	-	*Hannover-Würzburg*	Road
Ulm	-	*Würzburg-Ulm*	Road
Lugano	-	*Ulm-Lugano*	Road
Milan	-	*Lugano-Milan*	Road
Genoa	-	*Milan-Genoa*	Road
		Turku-Stockholm	-

Corridor 'Nureyeev'

Nodes		*Arcs*	
Helsinki	-	*Helsinki-Tallinn*	-

Tallinn	-	*St. Petersburg-Moscow*	Road
St. Petersburg	-	*Ventspils-Klaipeda*	-
Moscow	-	*Klaipeda-Minsk*	Road
Ventspils	-	*Klaipeda-Karlshamn*	-
Klaipeda	-	*Gothenburg-Hamburg*	-
Minsk	-	*Rostock-Gothenburg*	-
Karlshamn	-	*Hamburg-Malmo*	-
Gothenburg	-	*Helsinki-St. Petersburg*	-
Hamburg	-	*Hamburg-Gdansk*	-
Rostock	-	*Hamburg-Tallinn*	-
Malmo	-	*Ventspils-Karlshamn*	-
Gdansk	-	*Malmo-Helsinki*	-
Riga	-	*Helsinki-Hamburg*	-
Rotterdam	-	*Tallinn-Riga*	-
Turku	-	*Rotterdam-Hamburg*	-
		Klaipeda-Rotterdam	-
		Rostock-Helsinki	-
		Helsinki-Rotterdam	-
		Turku-Gothenburg	-
		Turku-Hamburg	-
		Gothenburg-Rotterdam	-
		Klaipeda-Riga	-
		Hamburg-Riga	-
		St. Petersburg-Hamburg	-
		Rotterdam-Gdansk	-
		Rotterdam-Ventspils	-
		Rotterdam-St. Petersburg	-

Corridor 'Strauss'

Nodes		*Arcs*	
Rotterdam	-	*Rotterdam-Duisburg*	Road
Duisburg	-	*Duisburg-Frankfurt*	Road
Frankfurt	-	*Frankfurt-Paris*	Road
Paris	-	*Frankfurt-Nurnberg*	Road
Nurnberg	-	*Nurnberg-Vienna*	Road
Vienna	-	*Vienna-Bratislava*	Road
Bratislava	-	*Bratislava-Budapest*	-
Budapest	-	*Budapest-Belgrade*	-
Belgrade	-	*Belgrade-Constanta*	Road
Constanta	-		

Corridor 'Two Seas'

Nodes		*Arcs*	
Hamburg	-	*Hamburg-Berlin*	Road
Berlin	-	*Berlin-Dresden*	Road
Dresden	-	*Dresden-Prague*	Road
Prague	-	*Prague-Nurnberg*	Road
Nurnberg	-	*Prague-Bratislava*	Road
Bratislava	-	*Bratislava-Budapest*	Road
Budapest	-	*Budapest-Belgrade*	Road
Belgrade	-	*Belgrade-Sofia*	Road
Sofia	-	*Sofia-Thessaloniki*	Road
Thessaloniki	-	*Thessaloniki-Athens*	Road
Athens	-		

Corridor 'Mare Nostrum'

Nodes		*Arcs*	
Bourgas	-	*Bourgas-Istanbul*	-
Istanbul	-	*La Spezia-Genoa*	-
La Spezia	-	*Marseille-Lyon*	Road
Genoa	-	*Odessa-Istanbul*	-
Marseille	Road	*Constanta-Istanbul*	-
Lyon	Road	*Algeciras-Istanbul*	-
Odessa	-	*Barcelona-Valencia*	Road
Constanta	-	*Valencia-Algeciras*	Road
Algeciras	Road	*Istanbul-Athens*	-
Barcelona	Road	*Athens-Gioia Tauro*	-
Valencia	Road	*Gioia Tauro-La Spezia*	-

Athens	-	*Marseille-Barcelona*	Road
Gioia Tauro	-	*Algeciras-Sines*	-
Sines	-	*Genoa-Barcelona*	-
Trieste	-	*Istanbul-Trieste*	-
		Istanbul-Gioia Tauro	-
		Istanbul-Algeciras	-

Corridor 'Silk Way'

The technology is not applicable to this corridor.

Electric vehicles

Technology Data

ID	Category	Transport modes
VE09	Vehicles	Road
Description		
Battery-electric vehicles		

Readiness Level	Time to Market	Energy Source	Efficiency
9	1	-	-
CO_2	NO_x	SO_x	LCC
100% reduction tank to wheel	100% reduction tank to wheel	When reaching maturation reduced MTBF should be expected. Today in low volume applications MTBF is difficult to systemize	today higher than conventional vehicles, over time probably lower than conventional vehicles

High Level Benchmark

Baseline		For truck in operation, the baseline technology is a conventional diesel truck. For idle status, the baseline technology to compare with is the fuel (diesel).
Relative Cost		
% cost savings during operation		The battery physical physical dimensions are high. This could reduce the capacity of the vehicle
CAPEX		the battery cost is very high (CAPEX).
% fuel savings		100%
Emissions		
% CO2 savings		100%
% SOx savings		-
% NOx savings		
Service & bottlenecks		
% operational or infrastructural delays reduction		-
% of frequency of service potential improvement due to delays & bottlenecks reduction		-
% of reliability improvement due to delays & bottlenecks reduction		-

Positive influence | Negative influence | Not relevant or no influence | no information

Technology Applicability per Corridor

Corridor 'Brenner'

Nodes		Arcs	
Malmo	-	Malmo-Trelleborg	Road
Trelleborg	-	Trelleborg-Sassnitz	-
Sassnitz	-	Trelleborg-Rostock	-
Rostock	-	Sassnitz-Berlin	Road
Berlin	Road	Rostock-Berlin	Road
Nurnberg	Road	Berlin-Nurnberg	Road
Munich	-	Nurnberg-Munich	Road
Salzburg	-	Munich-Salzburg	Road
Villach	-	Salzburg-Villach	Road
Trieste	-	Villach-Trieste	Road
Verona	-	Munich-Verona	Road
Bologna	-	Verona-Bologna	Road
Ancona	-	Bologna-Ancona	Road
Bari	-	Ancona-Bari	Road
Brindisi	-	Bari-Brindisi	Road
Igoumenitsa	-	Igoumenitsa-Thessaloniki	Road
Thessaloniki	Road	Igoumenitsa-Patras	-
Patras	-	Patras-Athens	Road
Athens	Road	Bologna-Rome	Road
Rome	-	Rome-Naples	Road
Naples	-	Naples-Messina	-
Messina	-	Villa San Giovanni-Messina	-
Villa San Giovanni	-	Messina-Palermo	Road
Palermo	-	Naples-Villa San Giovanni	Road
		Ancona-Brindisi	-
		Bari-Igoumenitsa	-

Corridor 'Finis Terrae'

Nodes		Arcs	
Paris	-	Paris-St. Nazaire	Road
St. Nazaire	-	Paris-Irun	Road
Irun	-	St. Nazaire-Gijon	-
Gijon	-	Irun-Valladolid	Road
Valladolid	-	Gijon-Valladolid	Road
Madrid	-	Valladolid-Madrid	Road
Lisboa	-	Madrid-Lisboa	Road

Corridor 'Cloverleaf'

Nodes		Arcs	
Glasgow	-	Glasgow-Carlisle	Road
Carlisle	-	Carlisle-Liverpool	Road
Liverpool	-	Liverpool-Dublin	-
Dublin	-	Liverpool-London	Road
London	-	London-Dover	Road
Dover	-	Dover-Calais	-
Calais	-	Calais-Duisburg	Road
Duisburg	-		

Corridor 'Edelweiss'

Nodes		Arcs	
St. Petersburg	Road	St. Petersburg-Lappeenranta	Road
Lappeenranta	-	Lappeenranta-Helsinki	Road
Helsinki	-	Helsinki-Turku	Road
Turku	-	Stockholm-Oslo	Road
Stockholm	-	Stockholm-Malmo	Road
Oslo	-	Oslo-Gothenburg	Road
Malmo	-	Gothenburg-Malmo	Road
Gothenburg	-	Malmo-Copenhagen	Road
Copenhagen	-	Copenhagen-Taulov	Road
Taulov	-	Copenhagen-Rodbyhavn	Road
Rodbyhavn	-	Rodbyhavn-Puttgarden	-
Puttgarden	-	Taulov-Hamburg	Road

Hamburg	Road	*Puttgarden-Hamburg*	Road
Hannover	-	*Hamburg-Hannover*	Road
Würzburg	-	*Hannover-Würzburg*	Road
Ulm	-	*Würzburg-Ulm*	Road
Lugano	-	*Ulm-Lugano*	Road
Milan	-	*Lugano-Milan*	Road
Genoa	-	*Milan-Genoa*	Road
		Turku-Stockholm	-

Corridor 'Nureyeev'

Nodes		*Arcs*	
Helsinki	-	*Helsinki-Tallinn*	-
Tallinn	-	*St. Petersburg-Moscow*	Road
St. Petersburg	Road	*Ventspils-Klaipeda*	-
Moscow	Road	*Klaipeda-Minsk*	Road
Ventspils	-	*Klaipeda-Karlshamn*	-
Klaipeda	Road	*Gothenburg-Hamburg*	-
Minsk	Road	*Rostock-Gothenburg*	-
Karlshamn	-	*Hamburg-Malmo*	-
Gothenburg	-	*Helsinki-St. Petersburg*	-
Hamburg	Road	*Hamburg-Gdansk*	-
Rostock	-	*Hamburg-Tallinn*	-
Malmo	-	*Ventspils-Karlshamn*	-
Gdansk	-	*Malmo-Helsinki*	-
Riga	-	*Helsinki-Hamburg*	-
Rotterdam	-	*Tallinn-Riga*	-
Turku	-	*Rotterdam-Hamburg*	-
		Klaipeda-Rotterdam	-
		Rostock-Helsinki	-
		Helsinki-Rotterdam	-
		Turku-Gothenburg	-
		Turku-Hamburg	-
		Gothenburg-Rotterdam	-
		Klaipeda-Riga	-
		Hamburg-Riga	-
		St. Petersburg-Hamburg	-
		Rotterdam-Gdansk	-
		Rotterdam-Ventspils	-
		Rotterdam-St. Petersburg	-

Corridor 'Strauss'

Nodes		*Arcs*	
Rotterdam	-	*Rotterdam-Duisburg*	Road
Duisburg	-	*Duisburg-Frankfurt*	Road
Frankfurt	-	*Frankfurt-Paris*	Road
Paris	-	*Frankfurt-Nurnberg*	Road
Nurnberg	Road	*Nurnberg-Vienna*	Road
Vienna	-	*Vienna-Bratislava*	Road
Bratislava	Road	*Bratislava-Budapest*	-
Budapest	Road	*Budapest-Belgrade*	-
Belgrade	Road	*Belgrade-Constanta*	Road
Constanta	-		

Corridor 'Two Seas'

Nodes		*Arcs*	
Hamburg	Road	*Hamburg-Berlin*	Road
Berlin	Road	*Berlin-Dresden*	Road
Dresden	Road	*Dresden-Prague*	Road
Prague	Road	*Prague-Nurnberg*	Road
Nurnberg	Road	*Prague-Bratislava*	Road
Bratislava	Road	*Bratislava-Budapest*	Road
Budapest	Road	*Budapest-Belgrade*	Road
Belgrade	Road	*Belgrade-Sofia*	Road
Sofia	Road	*Sofia-Thessaloniki*	Road
Thessaloniki	Road	*Thessaloniki-Athens*	Road
Athens	Road		

Corridor 'Mare Nostrum'

Nodes		*Arcs*	
Bourgas	-	*Bourgas-Istanbul*	-
Istanbul	-	*La Spezia-Genoa*	-
La Spezia	-	*Marseille-Lyon*	Road
Genoa	-	*Odessa-Istanbul*	-
Marseille	Road	*Constanta-Istanbul*	-
Lyon	Road	*Algeciras-Istanbul*	-
Odessa	-	*Barcelona-Valencia*	Road
Constanta	-	*Valencia-Algeciras*	Road
Algeciras	Road	*Istanbul-Athens*	-
Barcelona	Road	*Athens-Gioia Tauro*	-
Valencia	Road	*Gioia Tauro-La Spezia*	-
Athens	Road	*Marseille-Barcelona*	Road
Gioia Tauro	-	*Algeciras-Sines*	-
Sines	-	*Genoa-Barcelona*	-
Trieste	-	*Istanbul-Trieste*	-
		Istanbul-Gioia Tauro	-
		Istanbul-Algeciras	-

Corridor 'Silk Way'

Nodes		*Arcs*	
Rotterdam	-	*Rotterdam-Shanghai*	-
Shanghai	-	*Hamburg-Berlin*	-
Hamburg	Road	*Berlin-Warsaw*	-
Berlin	Road	*Warsaw-Minsk*	-
Warsaw	-	*Minsk-Moscow*	-
Minsk	Road	*Moscow-Beijing*	-
Moscow	Road	*Hamburg-Shanghai*	-
Beijing	-	*St. Petersburg-Shanghai*	-
St. Petersburg	Road	*Shanghai-Gothenburg*	-
Gothenburg	-	*Tallinn-Shanghai*	-
Tallinn	-		

Euro VI vehicles

Technology Data

ID	Category	Transport modes
VE10	Vehicles	Road
Description		
Euro VI is compulory for new trucks from 2013, replacing Euro V		

Readiness Level	Time to Market	Energy Source	Efficiency
0	0	-	-
CO_2	NO_x	SO_x	LCC
Unchanged	50% below Euro V	unchanged	slightly higher than euro V

High Level Benchmark

Baseline		Euro IV
Relative Cost		
% cost savings during operation		-
CAPEX		-
% fuel savings		increase of 2-3%
Emissions		
% CO2 savings		increase of 2-3%
% SOx savings		-
% NOx savings		
Service & bottlenecks		
% operational or infrastructural delays reduction		-
% of frequency of service potential improvement due to delays & bottlenecks reduction		-
% of reliability improvement due to delays & bottlenecks reduction		-

Positive influence | Negative influence | Not relevant or no influence | no information

Technology Applicability per Corridor

Corridor 'Brenner'

Nodes		Arcs	
Malmo	-	Malmo-Trelleborg	Road
Trelleborg	-	Trelleborg-Sassnitz	-
Sassnitz	-	Trelleborg-Rostock	-

Rostock	-	*Sassnitz-Berlin*	Road
Berlin	-	*Rostock-Berlin*	Road
Nurnberg	-	*Berlin-Nurnberg*	Road
Munich	-	*Nurnberg-Munich*	Road
Salzburg	-	*Munich-Salzburg*	Road
Villach	-	*Salzburg-Villach*	Road
Trieste	-	*Villach-Trieste*	Road
Verona	-	*Munich-Verona*	Road
Bologna	-	*Verona-Bologna*	Road
Ancona	-	*Bologna-Ancona*	Road
Bari	-	*Ancona-Bari*	Road
Brindisi	-	*Bari-Brindisi*	Road
Igoumenitsa	-	*Igoumenitsa-Thessaloniki*	Road
Thessaloniki	-	*Igoumenitsa-Patras*	-
Patras	-	*Patras-Athens*	Road
Athens	-	*Bologna-Rome*	Road
Rome	-	*Rome-Naples*	Road
Naples	-	*Naples-Messina*	-
Messina	-	*Villa San Giovanni-Messina*	-
Villa San Giovanni	-	*Messina-Palermo*	Road
Palermo	-	*Naples-Villa San Giovanni*	Road
		Ancona-Brindisi	-
		Bari-Igoumenitsa	-

Corridor 'Finis Terrae'

Nodes		*Arcs*	
Paris	-	*Paris-St. Nazaire*	Road
St. Nazaire	-	*Paris-Irun*	Road
Irun	-	*St. Nazaire-Gijon*	-
Gijon	-	*Irun-Valladolid*	Road
Valladolid	-	*Gijon-Valladolid*	Road
Madrid	-	*Valladolid-Madrid*	Road
Lisboa	-	*Madrid-Lisboa*	Road

Corridor 'Cloverleaf'

Nodes		*Arcs*	
Glasgow	-	*Glasgow-Carlisle*	Road
Carlisle	-	*Carlisle-Liverpool*	Road
Liverpool	-	*Liverpool-Dublin*	-
Dublin	-	*Liverpool-London*	Road
London	-	*London-Dover*	Road
Dover	-	*Dover-Calais*	-
Calais	-	*Calais-Duisburg*	Road
Duisburg	-		

Corridor 'Edelweiss'

Nodes		*Arcs*	
St. Petersburg	-	*St. Petersburg-Lappeenranta*	Road
Lappeenranta	-	*Lappeenranta-Helsinki*	Road
Helsinki	-	*Helsinki-Turku*	Road
Turku	-	*Stockholm-Oslo*	Road
Stockholm	-	*Stockholm-Malmo*	Road
Oslo	-	*Oslo-Gothenburg*	Road
Malmo	-	*Gothenburg-Malmo*	Road
Gothenburg	-	*Malmo-Copenhagen*	Road
Copenhagen	-	*Copenhagen-Taulov*	Road
Taulov	-	*Copenhagen-Rodbyhavn*	Road
Rodbyhavn	-	*Rodbyhavn-Puttgarden*	-
Puttgarden	-	*Taulov-Hamburg*	Road
Hamburg	-	*Puttgarden-Hamburg*	Road
Hannover	-	*Hamburg-Hannover*	Road
Würzburg	-	*Hannover-Würzburg*	Road
Ulm	-	*Würzburg-Ulm*	Road
Lugano	-	*Ulm-Lugano*	Road
Milan	-	*Lugano-Milan*	Road
Genoa	-	*Milan-Genoa*	Road
		Turku-Stockholm	-

Corridor 'Nureyeev'

Nodes		Arcs	
Helsinki	-	*Helsinki-Tallinn*	-
Tallinn	-	*St. Petersburg-Moscow*	Road
St. Petersburg	-	*Ventspils-Klaipeda*	-
Moscow	-	*Klaipeda-Minsk*	Road
Ventspils	-	*Klaipeda-Karlshamn*	-
Klaipeda	-	*Gothenburg-Hamburg*	-
Minsk	-	*Rostock-Gothenburg*	-
Karlshamn	-	*Hamburg-Malmo*	-
Gothenburg	-	*Helsinki-St. Petersburg*	-
Hamburg	-	*Hamburg-Gdansk*	-
Rostock	-	*Hamburg-Tallinn*	-
Malmo	-	*Ventspils-Karlshamn*	-
Gdansk	-	*Malmo-Helsinki*	-
Riga	-	*Helsinki-Hamburg*	-
Rotterdam	-	*Tallinn-Riga*	-
Turku	-	*Rotterdam-Hamburg*	-
		Klaipeda-Rotterdam	-
		Rostock-Helsinki	-
		Helsinki-Rotterdam	-
		Turku-Gothenburg	-
		Turku-Hamburg	-
		Gothenburg-Rotterdam	-
		Klaipeda-Riga	-
		Hamburg-Riga	-
		St. Petersburg-Hamburg	-
		Rotterdam-Gdansk	-
		Rotterdam-Ventspils	-
		Rotterdam-St. Petersburg	-

Corridor 'Strauss'

Nodes		Arcs	
Rotterdam	-	*Rotterdam-Duisburg*	Road
Duisburg	-	*Duisburg-Frankfurt*	Road
Frankfurt	-	*Frankfurt-Paris*	Road
Paris	-	*Frankfurt-Nurnberg*	Road
Nurnberg	-	*Nurnberg-Vienna*	Road
Vienna	-	*Vienna-Bratislava*	Road
Bratislava	-	*Bratislava-Budapest*	Road
Budapest	-	*Budapest-Belgrade*	Road
Belgrade	-	*Belgrade-Constanta*	Road
Constanta	-		

Corridor 'Two Seas'

Nodes		Arcs	
Hamburg	-	*Hamburg-Berlin*	Road
Berlin	-	*Berlin-Dresden*	Road
Dresden	-	*Dresden-Prague*	Road
Prague	-	*Prague-Nurnberg*	Road
Nurnberg	-	*Prague-Bratislava*	Road
Bratislava	-	*Bratislava-Budapest*	Road
Budapest	-	*Budapest-Belgrade*	Road
Belgrade	-	*Belgrade-Sofia*	Road
Sofia	-	*Sofia-Thessaloniki*	Road
Thessaloniki	-	*Thessaloniki-Athens*	Road
Athens	-		

Corridor 'Mare Nostrum'

Nodes		Arcs	
Bourgas	-	*Bourgas-Istanbul*	-
Istanbul	-	*La Spezia-Genoa*	-
La Spezia	-	*Marseille-Lyon*	Road
Genoa	-	*Odessa-Istanbul*	-
Marseille	Road	*Constanta-Istanbul*	-
Lyon	Road	*Algeciras-Istanbul*	-
Odessa	-	*Barcelona-Valencia*	Road
Constanta	-	*Valencia-Algeciras*	Road
Algeciras	Road	*Istanbul-Athens*	-

Barcelona	Road	*Athens-Gioia Tauro*	-
Valencia	Road	*Gioia Tauro-La Spezia*	-
Athens	-	*Marseille-Barcelona*	Road
Gioia Tauro	-	*Algeciras-Sines*	-
Sines	-	*Genoa-Barcelona*	-
Trieste	-	*Istanbul-Trieste*	-
		Istanbul-Gioia Tauro	-
		Istanbul-Algeciras	-

Corridor 'Silk Way'

The technology is not applicable to this corridor.

Hybrid Locomotive

Technology Data

ID	Category	Transport modes
VE01	Vehicles	Railway

Description
Hybrid Locomotive was developed with the goal of creating the cleanest, most fuel-efficient high-horsepower diesel locomotive ever built.

Readiness Level	Time to Market	Energy Source	Efficiency
8	<1	-	-
CO_2	NO_x	SO_x	LCC
-	-	-	-

High Level Benchmark

Baseline	*Conventional freight ocomotives without brake energy recovery and storage.*
Relative Cost	
% cost savings during operation	~ 15-20%
CAPEX	-
% fuel savings	15%
Emissions	
% CO2 savings	50%
% SOx savings	-
% NOx savings	
Service & bottlenecks	
% operational or infrastructural delays reduction	-
% of frequency of service potential improvement due to delays & bottlenecks reduction	-
% of reliability improvement due to delays & bottlenecks reduction	-

Positive influence | Negative influence | Not relevant or no influence | no information

Technology Applicability per Corridor

Corridor 'Brenner'			
Nodes		Arcs	
Malmo	-	Malmo-Trelleborg	Rail

Trelleborg	-	*Trelleborg-Sassnitz*	-
Sassnitz	-	*Trelleborg-Rostock*	-
Rostock	-	*Sassnitz-Berlin*	Rail
Berlin	-	*Rostock-Berlin*	Rail
Nurnberg	-	*Berlin-Nurnberg*	Rail
Munich	-	*Nurnberg-Munich*	Rail
Salzburg	-	*Munich-Salzburg*	Rail
Villach	-	*Salzburg-Villach*	Rail
Trieste	-	*Villach-Trieste*	Rail
Verona	-	*Munich-Verona*	Rail
Bologna	-	*Verona-Bologna*	Rail
Ancona	-	*Bologna-Ancona*	Rail
Bari	-	*Ancona-Bari*	Rail
Brindisi	-	*Bari-Brindisi*	Rail
Igoumenitsa	-	*Igoumenitsa-Thessaloniki*	-
Thessaloniki	-	*Igoumenitsa-Patras*	-
Patras	-	*Patras-Athens*	-
Athens	-	*Bologna-Rome*	Rail
Rome	-	*Rome-Naples*	Rail
Naples	-	*Naples-Messina*	-
Messina	-	*Villa San Giovanni-Messina*	-
Villa San Giovanni	-	*Messina-Palermo*	Rail
Palermo	-	*Naples-Villa San Giovanni*	Rail
		Ancona-Brindisi	-
		Bari-Igoumenitsa	-

Corridor 'Finis Terrae'

Nodes		*Arcs*	
Paris	-	*Paris-St. Nazaire*	Rail
St. Nazaire	-	*Paris-Irun*	Rail
Irun	-	*St. Nazaire-Gijon*	-
Gijon	-	*Irun-Valladolid*	Rail
Valladolid	-	*Gijon-Valladolid*	Rail
Madrid	-	*Valladolid-Madrid*	Rail
Lisboa	-	*Madrid-Lisboa*	Rail

Corridor 'Cloverleaf'

Nodes		*Arcs*	
Glasgow	-	*Glasgow-Carlisle*	Rail
Carlisle	-	*Carlisle-Liverpool*	Rail
Liverpool	-	*Liverpool-Dublin*	-
Dublin	-	*Liverpool-London*	Rail
London	-	*London-Dover*	Rail
Dover	-	*Dover-Calais*	Rail
Calais	-	*Calais-Duisburg*	Rail
Duisburg	-		

Corridor 'Edelweiss'

Nodes		*Arcs*	
St. Petersburg	Rail	*St. Petersburg-Lappeenranta*	Rail
Lappeenranta	-	*Lappeenranta-Helsinki*	Rail
Helsinki	-	*Helsinki-Turku*	Rail
Turku	-	*Stockholm-Oslo*	Rail
Stockholm	-	*Stockholm-Malmo*	Rail
Oslo	-	*Oslo-Gothenburg*	Rail
Malmo	-	*Gothenburg-Malmo*	Rail
Gothenburg	-	*Malmo-Copenhagen*	Rail
Copenhagen	-	*Copenhagen-Taulov*	Rail
Taulov	-	*Copenhagen-Rodbyhavn*	-
Rodbyhavn	-	*Rodbyhavn-Puttgarden*	-
Puttgarden	-	*Taulov-Hamburg*	Rail
Hamburg	-	*Puttgarden-Hamburg*	-
Hannover	-	*Hamburg-Hannover*	Rail
Würzburg	-	*Hannover-Würzburg*	Rail
Ulm	-	*Würzburg-Ulm*	Rail
Lugano	-	*Ulm-Lugano*	Rail
Milan	-	*Lugano-Milan*	Rail
Genoa	-	*Milan-Genoa*	Rail

		Turku-Stockholm	-

Corridor 'Nureyeev'

Nodes		*Arcs*	
Helsinki	-	*Helsinki-Tallinn*	-
Tallinn	-	*St. Petersburg-Moscow*	-
St. Petersburg	Rail	*Ventspils-Klaipeda*	-
Moscow	Rail	*Klaipeda-Minsk*	Rail
Ventspils	-	*Klaipeda-Karlshamn*	-
Klaipeda	Rail	*Gothenburg-Hamburg*	-
Minsk	Rail	*Rostock-Gothenburg*	-
Karlshamn	-	*Hamburg-Malmo*	-
Gothenburg	-	*Helsinki-St. Petersburg*	-
Hamburg	-	*Hamburg-Gdansk*	-
Rostock	-	*Hamburg-Tallinn*	-
Malmo	-	*Ventspils-Karlshamn*	-
Gdansk	-	*Malmo-Helsinki*	-
Riga	-	*Helsinki-Hamburg*	-
Rotterdam	-	*Tallinn-Riga*	-
Turku	-	*Rotterdam-Hamburg*	-
		Klaipeda-Rotterdam	-
		Rostock-Helsinki	-
		Helsinki-Rotterdam	-
		Turku-Gothenburg	-
		Turku-Hamburg	-
		Gothenburg-Rotterdam	-
		Klaipeda-Riga	-
		Hamburg-Riga	-
		St. Petersburg-Hamburg	-
		Rotterdam-Gdansk	-
		Rotterdam-Ventspils	-
		Rotterdam-St. Petersburg	-

Corridor 'Strauss'

Nodes		*Arcs*	
Rotterdam	-	*Rotterdam-Duisburg*	Rail
Duisburg	-	*Duisburg-Frankfurt*	Rail
Frankfurt	-	*Frankfurt-Paris*	Rail
Paris	-	*Frankfurt-Nurnberg*	Rail
Nurnberg	-	*Nurnberg-Vienna*	Rail
Vienna	-	*Vienna-Bratislava*	Rail
Bratislava	-	*Bratislava-Budapest*	-
Budapest	-	*Budapest-Belgrade*	-
Belgrade	-	*Belgrade-Constanta*	Rail
Constanta	-		

Corridor 'Two Seas'

Nodes		*Arcs*	
Hamburg	-	*Hamburg-Berlin*	-
Berlin	-	*Berlin-Dresden*	-
Dresden	-	*Dresden-Prague*	-
Prague	-	*Prague-Nurnberg*	-
Nurnberg	-	*Prague-Bratislava*	-
Bratislava	-	*Bratislava-Budapest*	-
Budapest	-	*Budapest-Belgrade*	-
Belgrade	-	*Belgrade-Sofia*	-
Sofia	-	*Sofia-Thessaloniki*	Rail
Thessaloniki	-	*Thessaloniki-Athens*	-
Athens	-		

Corridor 'Mare Nostrum'

Nodes		*Arcs*	
Bourgas	-	*Bourgas-Istanbul*	-
Istanbul	-	*La Spezia-Genoa*	-
La Spezia	-	*Marseille-Lyon*	Rail
Genoa	-	*Odessa-Istanbul*	-
Marseille	Rail	*Constanta-Istanbul*	-
Lyon	Rail	*Algeciras-Istanbul*	-

Odessa	-	*Barcelona-Valencia*	Rail
Constanta	-	*Valencia-Algeciras*	Rail
Algeciras	Rail	*Istanbul-Athens*	-
Barcelona	Rail	*Athens-Gioia Tauro*	-
Valencia	Rail	*Gioia Tauro-La Spezia*	-
Athens	-	*Marseille-Barcelona*	Rail
Gioia Tauro	-	*Algeciras-Sines*	-
Sines	-	*Genoa-Barcelona*	-
Trieste	-	*Istanbul-Trieste*	-
		Istanbul-Gioia Tauro	-
		Istanbul-Algeciras	-

Corridor 'Silk Way'

Nodes		*Arcs*	
Rotterdam	-	*Rotterdam-Shanghai*	-
Shanghai	-	*Hamburg-Berlin*	Rail
Hamburg	-	*Berlin-Warsaw*	Rail
Berlin	-	*Warsaw-Minsk*	Rail
Warsaw	-	*Minsk-Moscow*	Rail
Minsk	Rail	*Moscow-Beijing*	Rail
Moscow	Rail	*Hamburg-Shanghai*	-
Beijing	-	*St. Petersburg-Shanghai*	-
St. Petersburg	Rail	*Shanghai-Gothenburg*	-
Gothenburg	-	*Tallinn-Shanghai*	-
Tallinn	-		

Aerodynamic drag improvements

Technology Data

ID	Category	Transport modes
VE29	Vehicles	Road

Description
Aerodynamic mirrors, cab side extenders, integrated cab roof fairings, aerodynamic front bumper, full fuel tank fairings, trailer side skirt fairings, trailer gap fairing, rear mounted trailer fairing. Ref to the "Reducing heavy-duty long haul combination truck fuel consumption and CO2 emissions report" http://www.nescaum.org/documents/heavy-duty-truck-ghg_report_final-200910.pdf/

Readiness Level	Time to Market	Energy Source	Efficiency
9	available	-	-

CO_2	NO_x	SO_x	LCC
reduction potential 10-26%	reduction potential 10-26%	reduction potential 10-26%	0

Notes on technology

Aerodynamic drag improvements of the truck structure can bear a saving potential of 10-26% for emissions (CO2, NOx and SO2) and energy consumption. Drag improvements are applicable to the mirrors, the cab side extenders, the integrated cab roof fairings and the aerodynamic front bumper. The California Global Warming Solutions Act of 2006 established a program to reduce GHG emissions through regulatory and market mechanisms; the target is to achieve an approximately 30% reduction of GHG emissions by 2020. For this purpose, a Climate Change Scoping Plan was adopted in December 2008, in order to indicate how emission reductions could be achieved from significant GHG sources via regulations, market mechanisms, and other actions. The scoping plan includes two regulations on the GHG emissions from heavy-duty vehicles. The first action measure was adopted in December 2008 and required new and in-use trucks with 53 foot or longer trailers operating in California to achieve aerodynamic drag and rolling resistance improvements via certified new equipment and retrofits. New tractors and trailers must meet the requirements by 2011, in-use tractors by 2012, and in-use trailers by 2014. In [NESCCAF, 2009], an assessment of technologies to reduce GHG emissions and fuel consumption from new heavy-duty trucks in the timeframe from 2012 to 2017 is provided. According to the report, currently available technologies for heavy-duty trucks like aerodynamic drag improvements and improved tires are evaluated as good as more advanced technologies, such as bottoming cycle and variable valve actuation.

High Level Benchmark

Baseline	Conventional diesel trucks
Relative Cost	
% cost savings during operation	depending on operational patterns
CAPEX	-
% fuel savings	10-26%
Emissions	
% CO2 savings	10-26%
% SOx savings	10-26%

% NOx savings	
Service & bottlenecks	
% operational or infrastructural delays reduction	-
% of frequency of service potential improvement due to delays & bottlenecks reduction	-
% of reliability improvement due to delays & bottlenecks reduction	-

Positive influence | Negative influence | Not relevant or no influence | no information

Detailed Benchmark

(with respect to baseline performance on specific corridor)

Corridor	*Brenner*	
Mode of transport	*Road*	
Cost	*Min: 2.9%*	*Max: 4.3%*
CO2 emissions	*Min: 10.0%*	*Max: 26.0%*
SOX emissions	*Min: 12.5%*	*Max: 25.0%*
Average speed	*Min: 0.0%*	*Max: 0.0%*
Frequency	*Min: 0.0%*	*Max: 0.0%*
Reliability	*Min: 0.0%*	*Max: 0.0%*

Corridor	*Cloverleaf*	
Mode of transport	*Road*	
Cost	*Min: 2.2%*	*Max: 7.5%*
CO2 emissions	*Min: 10.0%*	*Max: 26.0%*
SOX emissions	*Min: 10.0%*	*Max: 26.0%*
Average speed	*Min: 0.0%*	*Max: 0.0%*
Frequency	*Min: 0.0%*	*Max: 0.0%*
Reliability	*Min: 0.0%*	*Max: 0.0%*

Technology Applicability per Corridor

Corridor 'Brenner'

The technology is not applicable to this corridor.

Corridor 'Finis Terrae'

The technology is not applicable to this corridor.

Corridor 'Cloverleaf'			
Nodes		*Arcs*	
Glasgow	-	*Glasgow-Carlisle*	Road
Carlisle	-	*Carlisle-Liverpool*	Road
Liverpool	-	*Liverpool-Dublin*	-
Dublin	-	*Liverpool-London*	Road
London	-	*London-Dover*	Road
Dover	-	*Dover-Calais*	-
Calais	-	*Calais-Duisburg*	Road
Duisburg	-		

Corridor 'Edelweiss'			
Nodes		*Arcs*	
St. Petersburg	-	*St. Petersburg-Lappeenranta*	Road
Lappeenranta	-	*Lappeenranta-Helsinki*	Road
Helsinki	-	*Helsinki-Turku*	Road
Turku	-	*Stockholm-Oslo*	Road
Stockholm	-	*Stockholm-Malmo*	Road
Oslo	-	*Oslo-Gothenburg*	Road
Malmo	-	*Gothenburg-Malmo*	Road
Gothenburg	-	*Malmo-Copenhagen*	Road
Copenhagen	-	*Copenhagen-Taulov*	Road
Taulov	-	*Copenhagen-Rodbyhavn*	Road
Rodbyhavn	-	*Rodbyhavn-Puttgarden*	-
Puttgarden	-	*Taulov-Hamburg*	Road
Hamburg	-	*Puttgarden-Hamburg*	Road
Hannover	-	*Hamburg-Hannover*	Road
Würzburg	-	*Hannover-Würzburg*	Road
Ulm	-	*Würzburg-Ulm*	Road
Lugano	-	*Ulm-Lugano*	Road
Milan	-	*Lugano-Milan*	Road
Genoa	-	*Milan-Genoa*	Road
		Turku-Stockholm	-

Corridor 'Nureyeev'			
Nodes		*Arcs*	
Helsinki	-	*Helsinki-Tallinn*	-
Tallinn	-	*St. Petersburg-Moscow*	Road
St. Petersburg	-	*Ventspils-Klaipeda*	-
Moscow	-	*Klaipeda-Minsk*	Road
Ventspils	-	*Klaipeda-Karlshamn*	-
Klaipeda	-	*Gothenburg-Hamburg*	-
Minsk	-	*Rostock-Gothenburg*	-
Karlshamn	-	*Hamburg-Malmo*	-
Gothenburg	-	*Helsinki-St. Petersburg*	-
Hamburg	-	*Hamburg-Gdansk*	-
Rostock	-	*Hamburg-Tallinn*	-
Malmo	-	*Ventspils-Karlshamn*	-
Gdansk	-	*Malmo-Helsinki*	-
Riga	-	*Helsinki-Hamburg*	-
Rotterdam	-	*Tallinn-Riga*	-
Turku	-	*Rotterdam-Hamburg*	-
		Klaipeda-Rotterdam	-
		Rostock-Helsinki	-
		Helsinki-Rotterdam	-
		Turku-Gothenburg	-
		Turku-Hamburg	-
		Gothenburg-Rotterdam	-
		Klaipeda-Riga	-
		Hamburg-Riga	-
		St. Petersburg-Hamburg	-
		Rotterdam-Gdansk	-
		Rotterdam-Ventspils	-
		Rotterdam-St. Petersburg	-

Corridor 'Strauss'

Nodes		*Arcs*	
Rotterdam	-	*Rotterdam-Duisburg*	Road
Duisburg	-	*Duisburg-Frankfurt*	Road
Frankfurt	-	*Frankfurt-Paris*	Road
Paris	-	*Frankfurt-Nurnberg*	Road
Nurnberg	-	*Nurnberg-Vienna*	Road
Vienna	-	*Vienna-Bratislava*	Road
Bratislava	-	*Bratislava-Budapest*	Road
Budapest	-	*Budapest-Belgrade*	Road
Belgrade	-	*Belgrade-Constanta*	Road
Constanta	-		

Corridor 'Two Seas'

Nodes		*Arcs*	
Hamburg	-	*Hamburg-Berlin*	Road
Berlin	-	*Berlin-Dresden*	Road
Dresden	-	*Dresden-Prague*	Road
Prague	-	*Prague-Nurnberg*	Road
Nurnberg	-	*Prague-Bratislava*	Road
Bratislava	-	*Bratislava-Budapest*	Road
Budapest	-	*Budapest-Belgrade*	Road
Belgrade	-	*Belgrade-Sofia*	Road
Sofia	-	*Sofia-Thessaloniki*	Road
Thessaloniki	-	*Thessaloniki-Athens*	Road
Athens	-		

Corridor 'Mare Nostrum'

Nodes		*Arcs*	
Bourgas	-	*Bourgas-Istanbul*	-
Istanbul	-	*La Spezia-Genoa*	-
La Spezia	-	*Marseille-Lyon*	Road
Genoa	-	*Odessa-Istanbul*	-
Marseille	-	*Constanta-Istanbul*	-
Lyon	-	*Algeciras-Istanbul*	-
Odessa	-	*Barcelona-Valencia*	Road
Constanta	-	*Valencia-Algeciras*	Road
Algeciras	-	*Istanbul-Athens*	-
Barcelona	-	*Athens-Gioia Tauro*	-
Valencia	-	*Gioia Tauro-La Spezia*	-
Athens	-	*Marseille-Barcelona*	Road
Gioia Tauro	-	*Algeciras-Sines*	-
Sines	-	*Genoa-Barcelona*	-
Trieste	-	*Istanbul-Trieste*	-
		Istanbul-Gioia Tauro	-
		Istanbul-Algeciras	-

Corridor 'Silk Way'

The technology is not applicable to this corridor.

Low rolling resistance tires

Technology Data

ID	Category	Transport modes
VE33	Vehicles	Road
Description		
Tires which are designed to minimize the energy wasted as heat as the tire rolls down the road		

Readiness Level	Time to Market	Energy Source	Efficiency
9	<1	-	-
CO_2	NO_x	SO_x	LCC
10% reduction estimated by 2050	0	0	0

Notes on technology

Low rolling resistance tires are designed to minimize the energy wasted as heat as the tire rolls down the road. A 1.4-4.5% reduction of CO2 emissions is referenced in the relevant literature. An important feature of lower rolling resistance tires is that the traction and braking performance often suffer due to lower resistance. For the one hand, a balance must be achieved that both energy saving benefits and safety are achieved, [NESCCAF, 2009]. In this respect, good road infrastructure conditions should support the effectiveness of such measures.

High Level Benchmark

Baseline		Conventional tires
Relative Cost		
% cost savings during operation		depending on operational patterns
CAPEX		-
% fuel savings		1.5-4.5%
Emissions		
% CO2 savings		1.5-4.5%
% SOx savings		1.5-4.5%
% NOx savings		
Service & bottlenecks		
% operational or infrastructural delays reduction		-
% of frequency of service potential improvement due to delays & bottlenecks reduction		-
% of reliability improvement due to delays & bottlenecks reduction		-

Positive influence | Negative influence | Not relevant or no influence | no information

Detailed Benchmark

(with respect to baseline performance on specific corridor)

Corridor	*Brenner*	
Mode of transport	*Road*	
Cost	*Min: 0.0%*	*Max: 1.4%*
CO2 emissions	*Min: 1.5%*	*Max: 4.5%*
SOX emissions	*Min: 0.0%*	*Max: 0.0%*
Average speed	*Min: 0.0%*	*Max: 0.0%*
Frequency	*Min: 0.0%*	*Max: 0.0%*
Reliability	*Min: 0.0%*	*Max: 0.0%*

Technology Applicability per Corridor

Corridor 'Brenner'

The technology is not applicable to this corridor.

Corridor 'Finis Terrae'

The technology is not applicable to this corridor.

Corridor 'Cloverleaf'

Nodes		*Arcs*	
Glasgow	-	*Glasgow-Carlisle*	Road
Carlisle	-	*Carlisle-Liverpool*	Road
Liverpool	-	*Liverpool-Dublin*	-
Dublin	-	*Liverpool-London*	Road
London	-	*London-Dover*	Road
Dover	-	*Dover-Calais*	-
Calais	-	*Calais-Duisburg*	Road
Duisburg	-		

Corridor 'Edelweiss'

Nodes		*Arcs*	
St. Petersburg	-	*St. Petersburg-Lappeenranta*	Road
Lappeenranta	-	*Lappeenranta-Helsinki*	Road
Helsinki	-	*Helsinki-Turku*	Road
Turku	-	*Stockholm-Oslo*	Road
Stockholm	-	*Stockholm-Malmo*	Road
Oslo	-	*Oslo-Gothenburg*	Road
Malmo	-	*Gothenburg-Malmo*	Road
Gothenburg	-	*Malmo-Copenhagen*	Road
Copenhagen	-	*Copenhagen-Taulov*	Road
Taulov	-	*Copenhagen-Rodbyhavn*	Road
Rodbyhavn	-	*Rodbyhavn-Puttgarden*	-
Puttgarden	-	*Taulov-Hamburg*	Road
Hamburg	-	*Puttgarden-Hamburg*	Road
Hannover	-	*Hamburg-Hannover*	Road
Würzburg	-	*Hannover-Würzburg*	Road
Ulm	-	*Würzburg-Ulm*	Road
Lugano	-	*Ulm-Lugano*	Road
Milan	-	*Lugano-Milan*	Road
Genoa	-	*Milan-Genoa*	Road
		Turku-Stockholm	-

Corridor 'Nureyeev'

Nodes	*Arcs*

Helsinki	-	*Helsinki-Tallinn*	-
Tallinn	-	*St. Petersburg-Moscow*	Road
St. Petersburg	-	*Ventspils-Klaipeda*	-
Moscow	-	*Klaipeda-Minsk*	Road
Ventspils	-	*Klaipeda-Karlshamn*	-
Klaipeda	-	*Gothenburg-Hamburg*	-
Minsk	-	*Rostock-Gothenburg*	-
Karlshamn	-	*Hamburg-Malmo*	-
Gothenburg	-	*Helsinki-St. Petersburg*	-
Hamburg	-	*Hamburg-Gdansk*	-
Rostock	-	*Hamburg-Tallinn*	-
Malmo	-	*Ventspils-Karlshamn*	-
Gdansk	-	*Malmo-Helsinki*	-
Riga	-	*Helsinki-Hamburg*	-
Rotterdam	-	*Tallinn-Riga*	-
Turku	-	*Rotterdam-Hamburg*	-
		Klaipeda-Rotterdam	-
		Rostock-Helsinki	-
		Helsinki-Rotterdam	-
		Turku-Gothenburg	-
		Turku-Hamburg	-
		Gothenburg-Rotterdam	-
		Klaipeda-Riga	-
		Hamburg-Riga	-
		St. Petersburg-Hamburg	-
		Rotterdam-Gdansk	-
		Rotterdam-Ventspils	-
		Rotterdam-St. Petersburg	-

Corridor 'Strauss'

Nodes		*Arcs*	
Rotterdam	-	*Rotterdam-Duisburg*	Road
Duisburg	-	*Duisburg-Frankfurt*	Road
Frankfurt	-	*Frankfurt-Paris*	Road
Paris	-	*Frankfurt-Nurnberg*	Road
Nurnberg	-	*Nurnberg-Vienna*	Road
Vienna	-	*Vienna-Bratislava*	Road
Bratislava	-	*Bratislava-Budapest*	Road
Budapest	-	*Budapest-Belgrade*	Road
Belgrade	-	*Belgrade-Constanta*	Road
Constanta	-		

Corridor 'Two Seas'

Nodes		*Arcs*	
Hamburg	-	*Hamburg-Berlin*	Road
Berlin	-	*Berlin-Dresden*	Road
Dresden	-	*Dresden-Prague*	Road
Prague	-	*Prague-Nurnberg*	Road
Nurnberg	-	*Prague-Bratislava*	Road
Bratislava	-	*Bratislava-Budapest*	Road
Budapest	-	*Budapest-Belgrade*	Road
Belgrade	-	*Belgrade-Sofia*	Road
Sofia	-	*Sofia-Thessaloniki*	Road
Thessaloniki	-	*Thessaloniki-Athens*	Road
Athens	-		

Corridor 'Mare Nostrum'

Nodes		*Arcs*	
Bourgas	-	*Bourgas-Istanbul*	-
Istanbul	-	*La Spezia-Genoa*	-
La Spezia	-	*Marseille-Lyon*	Road
Genoa	-	*Odessa-Istanbul*	-
Marseille	-	*Constanta-Istanbul*	-
Lyon	-	*Algeciras-Istanbul*	-
Odessa	-	*Barcelona-Valencia*	Road
Constanta	-	*Valencia-Algeciras*	Road
Algeciras	-	*Istanbul-Athens*	-
Barcelona	-	*Athens-Gioia Tauro*	-

Valencia	-	*Gioia Tauro-La Spezia*	-
Athens	-	*Marseille-Barcelona*	Road
Gioia Tauro	-	*Algeciras-Sines*	-
Sines	-	*Genoa-Barcelona*	-
Trieste	-	*Istanbul-Trieste*	-
		Istanbul-Gioia Tauro	-
		Istanbul-Algeciras	-

Corridor 'Silk Way'

The technology is not applicable to this corridor.

Navigation technologies

WiMax - Worldwide Interoperability for Microwave Access

Technology Data

ID	Category		Transport modes
NA15	Navigation technologies		Maritime, Railway, Road
Description			
Long range, high bandwidth wireless Internet			
Readiness Level	Time to Market	Energy Source	Efficiency
8	0	-	-
CO_2	NO_x	SO_x	LCC
-	-	-	2.3 - 5 GHz MIMO-SOFDMA

High Level Benchmark

Baseline		No internet use
Relative Cost		
% cost savings during operation		Potential cost saving through increased efficiency of document handling between ship-shore
CAPEX		-
% fuel savings		-
Emissions		
% CO2 savings		-
% SOx savings		-
% NOx savings		
Service & bottlenecks		
% operational or infrastructural delays reduction		Reduced probability of delays due to more efficient ship reporting/ document handling
% of frequency of service potential improvement due to delays & bottlenecks reduction		Potential for increased vessel turn around time
% of reliability improvement due to delays & bottlenecks reduction		Potential for increased vessel turn around time

Positive influence | Negative influence | Not relevant or no influence | no information

Technology Applicability per Corridor

Corridor 'Brenner'

Nodes		Arcs	
Malmo	Rail	Malmo-Trelleborg	Rail, Road
Trelleborg	-	Trelleborg-Sassnitz	sss
Sassnitz	-	Trelleborg-Rostock	sss
Rostock	-	Sassnitz-Berlin	Rail, Road
Berlin	-	Rostock-Berlin	Rail, Road
Nurnberg	Rail, Road	Berlin-Nurnberg	Rail, Road
Munich	-	Nurnberg-Munich	Rail, Road
Salzburg	-	Munich-Salzburg	Rail, Road
Villach	-	Salzburg-Villach	Rail, Road
Trieste	sss	Villach-Trieste	Rail, Road
Verona	-	Munich-Verona	Rail, Road
Bologna	-	Verona-Bologna	Rail, Road
Ancona	-	Bologna-Ancona	Rail, Road
Bari	-	Ancona-Bari	Rail, Road
Brindisi	-	Bari-Brindisi	Rail, Road
Igoumenitsa	-	Igoumenitsa-Thessaloniki	Road
Thessaloniki	-	Igoumenitsa-Patras	sss
Patras	-	Patras-Athens	Road
Athens	sss	Bologna-Rome	Rail, Road
Rome	-	Rome-Naples	Rail, Road
Naples	-	Naples-Messina	sss
Messina	-	Villa San Giovanni-Messina	sss
Villa San Giovanni	-	Messina-Palermo	Rail, Road
Palermo	-	Naples-Villa San Giovanni	Rail, Road
		Ancona-Brindisi	sss
		Bari-Igoumenitsa	sss

Corridor 'Finis Terrae'

Nodes		Arcs	
Paris	Rail, Road	Paris-St. Nazaire	Rail, Road
St. Nazaire	-	Paris-Irun	Rail, Road
Irun	-	St. Nazaire-Gijon	sss
Gijon	-	Irun-Valladolid	Rail, Road
Valladolid	-	Gijon-Valladolid	Rail, Road
Madrid	-	Valladolid-Madrid	Rail, Road
Lisboa	-	Madrid-Lisboa	Rail, Road

Corridor 'Cloverleaf'

Nodes		Arcs	
Glasgow	-	Glasgow-Carlisle	-
Carlisle	-	Carlisle-Liverpool	-
Liverpool	-	Liverpool-Dublin	sss
Dublin	-	Liverpool-London	-
London	-	London-Dover	-
Dover	-	Dover-Calais	sss
Calais	-	Calais-Duisburg	-
Duisburg	Rail, Road		

Corridor 'Edelweiss'

Nodes		Arcs	
St. Petersburg	-	St. Petersburg-Lappeenranta	Rail, Road
Lappeenranta	Rail	Lappeenranta-Helsinki	Rail, Road
Helsinki	Rail	Helsinki-Turku	Rail, Road
Turku	Rail, sss	Stockholm-Oslo	Rail, Road
Stockholm	Rail, sss	Stockholm-Malmo	Rail, Road
Oslo	Rail	Oslo-Gothenburg	Rail, Road
Malmo	Rail	Gothenburg-Malmo	Rail, Road
Gothenburg	Rail	Malmo-Copenhagen	Rail, Road
Copenhagen	Rail	Copenhagen-Taulov	Rail, Road
Taulov	Rail	Copenhagen-Rodbyhavn	Road
Rodbyhavn	sss	Rodbyhavn-Puttgarden	sss
Puttgarden	sss	Taulov-Hamburg	Rail, Road

Hamburg	Rail	*Puttgarden-Hamburg*	Road
Hannover	Rail	*Hamburg-Hannover*	Rail, Road
Würzburg	Rail	*Hannover-Würzburg*	Rail, Road
Ulm	Rail	*Würzburg-Ulm*	Rail, Road
Lugano	Rail	*Ulm-Lugano*	Rail, Road
Milan	Rail	*Lugano-Milan*	Rail, Road
Genoa	Rail, sss	*Milan-Genoa*	Rail, Road
		Turku-Stockholm	sss

Corridor 'Nureyeev'

Nodes		*Arcs*	
Helsinki	Rail	*Helsinki-Tallinn*	sss
Tallinn	-	*St. Petersburg-Moscow*	Road
St. Petersburg	-	*Ventspils-Klaipeda*	sss
Moscow	-	*Klaipeda-Minsk*	Road
Ventspils	-	*Klaipeda-Karlshamn*	sss
Klaipeda	-	*Gothenburg-Hamburg*	sss
Minsk	-	*Rostock-Gothenburg*	sss
Karlshamn	-	*Hamburg-Malmo*	sss
Gothenburg	Rail	*Helsinki-St. Petersburg*	sss
Hamburg	Rail	*Hamburg-Gdansk*	sss
Rostock	-	*Hamburg-Tallinn*	sss
Malmo	Rail	*Ventspils-Karlshamn*	sss
Gdansk	-	*Malmo-Helsinki*	sss
Riga	-	*Helsinki-Hamburg*	sss
Rotterdam	Rail, Road	*Tallinn-Riga*	sss
Turku	Rail, sss	*Rotterdam-Hamburg*	sss
		Klaipeda-Rotterdam	sss
		Rostock-Helsinki	sss
		Helsinki-Rotterdam	sss
		Turku-Gothenburg	sss
		Turku-Hamburg	sss
		Gothenburg-Rotterdam	sss
		Klaipeda-Riga	sss
		Hamburg-Riga	sss
		St. Petersburg-Hamburg	sss
		Rotterdam-Gdansk	sss
		Rotterdam-Ventspils	sss
		Rotterdam-St. Petersburg	sss

Corridor 'Strauss'

Nodes		*Arcs*	
Rotterdam	Rail, Road	*Rotterdam-Duisburg*	Rail, Road
Duisburg	Rail, Road	*Duisburg-Frankfurt*	Rail, Road
Frankfurt	Rail, Road	*Frankfurt-Paris*	Rail, Road
Paris	Rail, Road	*Frankfurt-Nurnberg*	Rail, Road
Nurnberg	Rail, Road	*Nurnberg-Vienna*	Rail, Road
Vienna	Rail, Road	*Vienna-Bratislava*	Rail, Road
Bratislava	Rail, Road	*Bratislava-Budapest*	-
Budapest	-	*Budapest-Belgrade*	-
Belgrade	Rail, Road	*Belgrade-Constanta*	Rail, Road
Constanta	Rail, Road, sss		

Corridor 'Two Seas'

Nodes		*Arcs*	
Hamburg	Rail	*Hamburg-Berlin*	Road
Berlin	-	*Berlin-Dresden*	Road
Dresden	-	*Dresden-Prague*	Road
Prague	-	*Prague-Nurnberg*	Road
Nurnberg	Rail, Road	*Prague-Bratislava*	Road
Bratislava	Rail, Road	*Bratislava-Budapest*	Road
Budapest	-	*Budapest-Belgrade*	Road
Belgrade	Rail, Road	*Belgrade-Sofia*	Road
Sofia	-	*Sofia-Thessaloniki*	Road
Thessaloniki	-	*Thessaloniki-Athens*	Road
Athens	sss		

Corridor 'Mare Nostrum'

Nodes		*Arcs*	
Bourgas	sss	*Bourgas-Istanbul*	sss
Istanbul	sss	*La Spezia-Genoa*	sss
La Spezia	sss	*Marseille-Lyon*	Rail, Road
Genoa	Rail, sss	*Odessa-Istanbul*	sss
Marseille	Rail, Road, sss	*Constanta-Istanbul*	sss
Lyon	Rail, Road	*Algeciras-Istanbul*	sss
Odessa	sss	*Barcelona-Valencia*	Rail, Road, sss
Constanta	Rail, Road, sss	*Valencia-Algeciras*	Rail, Road, sss
Algeciras	Rail, Road, sss	*Istanbul-Athens*	sss
Barcelona	Rail, Road, sss	*Athens-Gioia Tauro*	sss
Valencia	Rail, Road, sss	*Gioia Tauro-La Spezia*	sss
Athens	sss	*Marseille-Barcelona*	Rail, Road, sss
Gioia Tauro	sss	*Algeciras-Sines*	sss
Sines	sss	*Genoa-Barcelona*	sss
Trieste	sss	*Istanbul-Trieste*	sss
		Istanbul-Gioia Tauro	sss
		Istanbul-Algeciras	sss

Corridor 'Silk Way'

Nodes		*Arcs*	
Rotterdam	Rail, Road	*Rotterdam-Shanghai*	dss
Shanghai	-	*Hamburg-Berlin*	Rail
Hamburg	Rail	*Berlin-Warsaw*	Rail
Berlin	-	*Warsaw-Minsk*	Rail
Warsaw	-	*Minsk-Moscow*	Rail
Minsk	-	*Moscow-Beijing*	Rail
Moscow	-	*Hamburg-Shanghai*	dss
Beijing	-	*St. Petersburg-Shanghai*	dss
St. Petersburg	-	*Shanghai-Gothenburg*	dss
Gothenburg	Rail	*Tallinn-Shanghai*	dss
Tallinn	-		

Route optimisation system (scheduling)

Technology Data

ID	Category	Transport modes
NA16	Navigation technologies	Inland Waterways
Description		
"The advising Tempomaat (ATM) is a system enabling an economically optimised operation of a		

Readiness Level	Time to Market	Energy Source	Efficiency
	<1	-	-
CO_2	NO_x	SO_x	LCC
-	-	-	-

Notes on technology

Optimal route planning in inland waterways aims at energy savings, by advising the skipper to optimally select the route and speed of the vessel, in order to arrive on time with a most efficient use of fuel. The technology benefits were analysed in the framework of the EC-funded project CREATING (Concepts to Reduce Environmental impact and Attain optimal Transport performance by Inland NaviGation). According to this study, up to 10% reduction of NOx, PM and CO2 emissions can be achieved.

High Level Benchmark

Baseline	No route optimisation system
Relative Cost	
% cost savings during operation	-
CAPEX	-
% fuel savings	10%
Emissions	
% CO2 savings	10%
% SOx savings	10%
% NOx savings	
Service & bottlenecks	
% operational or infrastructural delays reduction	-
% of frequency of service potential improvement due to delays & bottlenecks reduction	-
% of reliability improvement due to delays & bottlenecks reduction	-

Positive influence | Negative influence | Not relevant or no influence | no information

Detailed Benchmark

(with respect to baseline performance on specific corridor)

Corridor	*Strauss*	
Mode of transport	*Internal water transport*	
Cost	*Min: 1.1%*	*Max: 1.1%*
CO2 emissions	*Min: 10.0%*	*Max: 10.0%*
SOX emissions	*Min: 10.2%*	*Max: 10.2%*
Average speed	*Min: 0.0%*	*Max: 0.0%*
Frequency	*Min: 0.0%*	*Max: 0.0%*
Reliability	*Min: 0.0%*	*Max: 0.0%*

Technology Applicability per Corridor

Corridor 'Brenner'

The technology is not applicable to this corridor.

Corridor 'Finis Terrae'

The technology is not applicable to this corridor.

Corridor 'Cloverleaf'

The technology is not applicable to this corridor.

Corridor 'Edelweiss'

The technology is not applicable to this corridor.

Corridor 'Nureyeev'

The technology is not applicable to this corridor.

Corridor 'Strauss'

The technology is not applicable to this corridor.

Corridor 'Two Seas'

The technology is not applicable to this corridor.

Corridor 'Mare Nostrum'

The technology is not applicable to this corridor.

Corridor 'Silk Way'

The technology is not applicable to this corridor.

River Information Services (RIS)

Technology Data

ID	Category	Transport modes
NA17	Navigation technologies	Inland Waterways

Description

River Information Services (RIS) are customized information services for inland waterway transport and make it possible to coordinate logistical processes with actual transport situations on a constant basis. RIS play a key role in making cargo transport and passenger services on waterways more efficient leading to a reduction of fuel consumption by approximately 5 %, while at the same time increasing traffic safety .

Readiness Level	Time to Market	Energy Source	Efficiency
9	<1	-	-
CO_2	NO_x	SO_x	LCC
-	-	-	0

High Level Benchmark

Baseline	0
Relative Cost	
% cost savings during operation	-
CAPEX	-
% fuel savings	5%
Emissions	
% CO2 savings	-
% SOx savings	-
% NOx savings	
Service & bottlenecks	
% operational or infrastructural delays reduction	-
% of frequency of service potential improvement due to delays & bottlenecks reduction	-
% of reliability improvement due to delays & bottlenecks reduction	-

Positive influence | Negative influence | Not relevant or no influence | no information

Technology Applicability per Corridor

Corridor 'Brenner'

The technology is not applicable to this corridor.

Corridor 'Finis Terrae'

The technology is not applicable to this corridor.

Corridor 'Cloverleaf'

The technology is not applicable to this corridor.

Corridor 'Edelweiss'

The technology is not applicable to this corridor.

Corridor 'Nureyeev'

The technology is not applicable to this corridor.

Corridor 'Strauss'

Nodes		Arcs	
Rotterdam	-	*Rotterdam-Duisburg*	Internal water transport
Duisburg	-	*Duisburg-Frankfurt*	Internal water transport
Frankfurt	-	*Frankfurt-Paris*	-
Paris	-	*Frankfurt-Nurnberg*	Internal water transport
Nurnberg	-	*Nurnberg-Vienna*	Internal water transport
Vienna	-	*Vienna-Bratislava*	Internal water transport
Bratislava	-	*Bratislava-Budapest*	Internal water transport
Budapest	-	*Budapest-Belgrade*	Internal water transport
Belgrade	-	*Belgrade-Constanta*	Internal water transport
Constanta	-		

Corridor 'Two Seas'

Nodes		Arcs	
Hamburg	-	*Hamburg-Berlin*	-
Berlin	-	*Berlin-Dresden*	-
Dresden	-	*Dresden-Prague*	-
Prague	-	*Prague-Nurnberg*	-
Nurnberg	-	*Prague-Bratislava*	-
Bratislava	-	*Bratislava-Budapest*	Internal water transport
Budapest	-	*Budapest-Belgrade*	Internal water transport
Belgrade	-	*Belgrade-Sofia*	-
Sofia	-	*Sofia-Thessaloniki*	-
Thessaloniki	-	*Thessaloniki-Athens*	-
Athens	-		

Corridor 'Mare Nostrum'

Nodes		Arcs	
Bourgas	-	*Bourgas-Istanbul*	-
Istanbul	-	*La Spezia-Genoa*	-
La Spezia	-	*Marseille-Lyon*	Internal water transport
Genoa	-	*Odessa-Istanbul*	-
Marseille	-	*Constanta-Istanbul*	-
Lyon	-	*Algeciras-Istanbul*	-
Odessa	-	*Barcelona-Valencia*	-
Constanta	-	*Valencia-Algeciras*	-
Algeciras	-	*Istanbul-Athens*	-
Barcelona	-	*Athens-Gioia Tauro*	-
Valencia	-	*Gioia Tauro-La Spezia*	-
Athens	-	*Marseille-Barcelona*	-
Gioia Tauro	-	*Algeciras-Sines*	-
Sines	-	*Genoa-Barcelona*	-
Trieste	-	*Istanbul-Trieste*	-
		Istanbul-Gioia Tauro	-
		Istanbul-Algeciras	-

Corridor 'Silk Way'

The technology is not applicable to this corridor.

Best Practices

Traffic Flow Management

Technology Data

ID	Category	Transport modes
BP04	Best Practices	Railway

Description
A system for online optimisation of rail traffic flow to have mininum delays and minimum energy consumption, developed by emkamatik on behalf of SBB

Readiness Level	Time to Market	Energy Source	Efficiency
	-	-	-

CO_2	NO_x	SO_x	LCC
-	-	-	-

High Level Benchmark

Baseline	No system for software-based traffic management
Relative Cost	
% cost savings during operation	5%
CAPEX	-
% fuel savings	20%
Emissions	
% CO2 savings	5%
% SOx savings	-
% NOx savings	
Service & bottlenecks	
% operational or infrastructural delays reduction	-
% of frequency of service potential improvement due to delays & bottlenecks reduction	-
% of reliability improvement due to delays & bottlenecks reduction	-

Positive influence | Negative influence | Not relevant or no influence | no information

Technology Applicability per Corridor

Corridor 'Brenner'

Nodes		Arcs	
Malmo	Rail	Malmo-Trelleborg	-
Trelleborg	-	Trelleborg-Sassnitz	-
Sassnitz	-	Trelleborg-Rostock	-
Rostock	-	Sassnitz-Berlin	-
Berlin	-	Rostock-Berlin	-
Nurnberg	Rail	Berlin-Nurnberg	-
Munich	-	Nurnberg-Munich	-
Salzburg	-	Munich-Salzburg	-
Villach	-	Salzburg-Villach	-
Trieste	-	Villach-Trieste	-
Verona	-	Munich-Verona	-
Bologna	-	Verona-Bologna	-
Ancona	-	Bologna-Ancona	-
Bari	-	Ancona-Bari	-
Brindisi	-	Bari-Brindisi	-
Igoumenitsa	-	Igoumenitsa-Thessaloniki	-
Thessaloniki	-	Igoumenitsa-Patras	-
Patras	-	Patras-Athens	-
Athens	-	Bologna-Rome	-
Rome	-	Rome-Naples	-
Naples	-	Naples-Messina	-
Messina	-	Villa San Giovanni-Messina	-
Villa San Giovanni	-	Messina-Palermo	-
Palermo	-	Naples-Villa San Giovanni	-
		Ancona-Brindisi	-
		Bari-Igoumenitsa	-

Corridor 'Finis Terrae'

Nodes		Arcs	
Paris	Rail	Paris-St. Nazaire	Rail
St. Nazaire	-	Paris-Irun	Rail
Irun	-	St. Nazaire-Gijon	-
Gijon	-	Irun-Valladolid	Rail
Valladolid	-	Gijon-Valladolid	Rail
Madrid	-	Valladolid-Madrid	Rail
Lisboa	-	Madrid-Lisboa	Rail

Corridor 'Cloverleaf'

Nodes		Arcs	
Glasgow	-	Glasgow-Carlisle	Rail
Carlisle	-	Carlisle-Liverpool	Rail
Liverpool	-	Liverpool-Dublin	-
Dublin	-	Liverpool-London	Rail
London	-	London-Dover	Rail
Dover	-	Dover-Calais	Rail
Calais	-	Calais-Duisburg	Rail
Duisburg	Rail		

Corridor 'Edelweiss'

Nodes		Arcs	
St. Petersburg	Rail	St. Petersburg-Lappeenranta	Rail
Lappeenranta	Rail	Lappeenranta-Helsinki	Rail
Helsinki	Rail	Helsinki-Turku	Rail
Turku	Rail	Stockholm-Oslo	Rail
Stockholm	Rail	Stockholm-Malmo	Rail
Oslo	Rail	Oslo-Gothenburg	Rail
Malmo	Rail	Gothenburg-Malmo	Rail
Gothenburg	Rail	Malmo-Copenhagen	Rail
Copenhagen	Rail	Copenhagen-Taulov	Rail
Taulov	Rail	Copenhagen-Rodbyhavn	-
Rodbyhavn	-	Rodbyhavn-Puttgarden	-
Puttgarden	-	Taulov-Hamburg	Rail
Hamburg	Rail	Puttgarden-Hamburg	-
Hannover	Rail	Hamburg-Hannover	Rail
Würzburg	Rail	Hannover-Würzburg	Rail

Ulm	Rail	*Würzburg-Ulm*	Rail
Lugano	Rail	*Ulm-Lugano*	Rail
Milan	Rail	*Lugano-Milan*	Rail
Genoa	Rail	*Milan-Genoa*	Rail
		Turku-Stockholm	-

Corridor 'Nureyeev'

Nodes		*Arcs*	
Helsinki	Rail	*Helsinki-Tallinn*	-
Tallinn	-	*St. Petersburg-Moscow*	Rail
St. Petersburg	Rail	*Ventspils-Klaipeda*	-
Moscow	-	*Klaipeda-Minsk*	Rail
Ventspils	-	*Klaipeda-Karlshamn*	-
Klaipeda	-	*Gothenburg-Hamburg*	-
Minsk	-	*Rostock-Gothenburg*	-
Karlshamn	-	*Hamburg-Malmo*	-
Gothenburg	Rail	*Helsinki-St. Petersburg*	-
Hamburg	Rail	*Hamburg-Gdansk*	-
Rostock	-	*Hamburg-Tallinn*	-
Malmo	Rail	*Ventspils-Karlshamn*	-
Gdansk	-	*Malmo-Helsinki*	-
Riga	-	*Helsinki-Hamburg*	-
Rotterdam	Rail	*Tallinn-Riga*	-
Turku	Rail	*Rotterdam-Hamburg*	-
		Klaipeda-Rotterdam	-
		Rostock-Helsinki	-
		Helsinki-Rotterdam	-
		Turku-Gothenburg	-
		Turku-Hamburg	-
		Gothenburg-Rotterdam	-
		Klaipeda-Riga	-
		Hamburg-Riga	-
		St. Petersburg-Hamburg	-
		Rotterdam-Gdansk	-
		Rotterdam-Ventspils	-
		Rotterdam-St. Petersburg	-

Corridor 'Strauss'

Nodes		*Arcs*	
Rotterdam	Rail	*Rotterdam-Duisburg*	Rail
Duisburg	Rail	*Duisburg-Frankfurt*	Rail
Frankfurt	Rail	*Frankfurt-Paris*	Rail
Paris	Rail	*Frankfurt-Nurnberg*	Rail
Nurnberg	Rail	*Nurnberg-Vienna*	Rail
Vienna	Rail	*Vienna-Bratislava*	Rail
Bratislava	Rail	*Bratislava-Budapest*	-
Budapest	-	*Budapest-Belgrade*	-
Belgrade	Rail	*Belgrade-Constanta*	Rail
Constanta	Rail		

Corridor 'Two Seas'

Nodes		*Arcs*	
Hamburg	Rail	*Hamburg-Berlin*	-
Berlin	-	*Berlin-Dresden*	Rail
Dresden	-	*Dresden-Prague*	Rail
Prague	-	*Prague-Nurnberg*	Rail
Nurnberg	Rail	*Prague-Bratislava*	Rail
Bratislava	Rail	*Bratislava-Budapest*	Rail
Budapest	-	*Budapest-Belgrade*	Rail
Belgrade	Rail	*Belgrade-Sofia*	Rail
Sofia	-	*Sofia-Thessaloniki*	Rail
Thessaloniki	-	*Thessaloniki-Athens*	Rail
Athens	-		

Corridor 'Mare Nostrum'

Nodes		*Arcs*	
Bourgas	-	*Bourgas-Istanbul*	-
Istanbul	-	*La Spezia-Genoa*	-

La Spezia	-	*Marseille-Lyon*	Rail
Genoa	Rail	*Odessa-Istanbul*	-
Marseille	Rail	*Constanta-Istanbul*	-
Lyon	Rail	*Algeciras-Istanbul*	-
Odessa	-	*Barcelona-Valencia*	Rail
Constanta	Rail	*Valencia-Algeciras*	Rail
Algeciras	Rail	*Istanbul-Athens*	-
Barcelona	Rail	*Athens-Gioia Tauro*	-
Valencia	Rail	*Gioia Tauro-La Spezia*	-
Athens	-	*Marseille-Barcelona*	Rail
Gioia Tauro	-	*Algeciras-Sines*	-
Sines	-	*Genoa-Barcelona*	-
Trieste	-	*Istanbul-Trieste*	-
		Istanbul-Gioia Tauro	-
		Istanbul-Algeciras	-

Corridor 'Silk Way'

Nodes		*Arcs*	
Rotterdam	Rail	*Rotterdam-Shanghai*	-
Shanghai	-	*Hamburg-Berlin*	-
Hamburg	Rail	*Berlin-Warsaw*	-
Berlin	-	*Warsaw-Minsk*	-
Warsaw	-	*Minsk-Moscow*	-
Minsk	-	*Moscow-Beijing*	-
Moscow	-	*Hamburg-Shanghai*	-
Beijing	-	*St. Petersburg-Shanghai*	-
St. Petersburg	Rail	*Shanghai-Gothenburg*	-
Gothenburg	Rail	*Tallinn-Shanghai*	-
Tallinn	-		

Carbon-free rail freight transport

Technology Data

ID	Category	Transport modes
BP07	Best Practices	Railway

Description
Now you can have your goods transported carbon-free on all European rail freight transport routes. DB Schenker Rail replaces the electricity required for your freight transport with regenerative energy that comes 100% from renewable sources in Germany. This helps to avoid carbon emissions right from the outset. Even the smallest quantities can be transported in this way without carbon emissions, on a national and international scale.

Readiness Level	Time to Market	Energy Source	Efficiency
	-	-	-

CO_2	NO_x	SO_x	LCC
-	-	-	-

High Level Benchmark

Baseline	*Diesel locomotives and electric locomotives power by fossil fuel power production.*	
Relative Cost		
% cost savings during operation	*16%*	
CAPEX	-	
% fuel savings	*20%*	
Emissions		
% CO2 savings	-	
% SOx savings	-	
% NOx savings		
Service & bottlenecks		
% operational or infrastructural delays reduction	-	
% of frequency of service potential improvement due to delays & bottlenecks reduction	-	
% of reliability improvement due to delays & bottlenecks reduction	-	

Positive influence | Negative influence | Not relevant or no influence | no information

Technology Applicability per Corridor

Corridor 'Brenner'

The technology is not applicable to this corridor.

Corridor 'Finis Terrae'

Nodes		Arcs	
Paris	-	Paris-St. Nazaire	Rail
St. Nazaire	-	Paris-Irun	Rail
Irun	-	St. Nazaire-Gijon	-
Gijon	-	Irun-Valladolid	Rail
Valladolid	-	Gijon-Valladolid	Rail
Madrid	-	Valladolid-Madrid	Rail
Lisboa	-	Madrid-Lisboa	Rail

Corridor 'Cloverleaf'

Nodes		Arcs	
Glasgow	-	Glasgow-Carlisle	Rail
Carlisle	-	Carlisle-Liverpool	Rail
Liverpool	-	Liverpool-Dublin	-
Dublin	-	Liverpool-London	Rail
London	-	London-Dover	Rail
Dover	-	Dover-Calais	Rail
Calais	-	Calais-Duisburg	Rail
Duisburg	-		

Corridor 'Edelweiss'

Nodes		Arcs	
St. Petersburg	-	St. Petersburg-Lappeenranta	Rail
Lappeenranta	-	Lappeenranta-Helsinki	Rail
Helsinki	-	Helsinki-Turku	Rail
Turku	-	Stockholm-Oslo	Rail
Stockholm	-	Stockholm-Malmo	Rail
Oslo	-	Oslo-Gothenburg	Rail
Malmo	-	Gothenburg-Malmo	Rail
Gothenburg	-	Malmo-Copenhagen	Rail
Copenhagen	-	Copenhagen-Taulov	Rail
Taulov	-	Copenhagen-Rodbyhavn	-
Rodbyhavn	-	Rodbyhavn-Puttgarden	-
Puttgarden	-	Taulov-Hamburg	Rail
Hamburg	-	Puttgarden-Hamburg	-
Hannover	-	Hamburg-Hannover	Rail
Würzburg	-	Hannover-Würzburg	Rail
Ulm	-	Würzburg-Ulm	Rail
Lugano	-	Ulm-Lugano	Rail
Milan	-	Lugano-Milan	Rail
Genoa	-	Milan-Genoa	Rail
		Turku-Stockholm	-

Corridor 'Nureyeev'

The technology is not applicable to this corridor.

Corridor 'Strauss'

Nodes		Arcs	
Rotterdam	-	Rotterdam-Duisburg	Rail
Duisburg	-	Duisburg-Frankfurt	Rail
Frankfurt	-	Frankfurt-Paris	Rail
Paris	-	Frankfurt-Nurnberg	Rail
Nurnberg	-	Nurnberg-Vienna	Rail
Vienna	-	Vienna-Bratislava	Rail
Bratislava	-	Bratislava-Budapest	-
Budapest	-	Budapest-Belgrade	-
Belgrade	-	Belgrade-Constanta	Rail
Constanta	-		

Corridor 'Two Seas'

Nodes	Arcs

Hamburg	-	*Hamburg-Berlin*	-
Berlin	-	*Berlin-Dresden*	Rail
Dresden	-	*Dresden-Prague*	-
Prague	-	*Prague-Nurnberg*	-
Nurnberg	-	*Prague-Bratislava*	-
Bratislava	-	*Bratislava-Budapest*	-
Budapest	-	*Budapest-Belgrade*	-
Belgrade	-	*Belgrade-Sofia*	-
Sofia	-	*Sofia-Thessaloniki*	-
Thessaloniki	-	*Thessaloniki-Athens*	-
Athens	-		

Corridor 'Mare Nostrum'

Nodes		*Arcs*	
Bourgas	-	*Bourgas-Istanbul*	-
Istanbul	-	*La Spezia-Genoa*	-
La Spezia	-	*Marseille-Lyon*	Rail
Genoa	-	*Odessa-Istanbul*	-
Marseille	-	*Constanta-Istanbul*	-
Lyon	-	*Algeciras-Istanbul*	-
Odessa	-	*Barcelona-Valencia*	Rail
Constanta	-	*Valencia-Algeciras*	Rail
Algeciras	-	*Istanbul-Athens*	-
Barcelona	-	*Athens-Gioia Tauro*	-
Valencia	-	*Gioia Tauro-La Spezia*	-
Athens	-	*Marseille-Barcelona*	Rail
Gioia Tauro	-	*Algeciras-Sines*	-
Sines	-	*Genoa-Barcelona*	-
Trieste	-	*Istanbul-Trieste*	-
		Istanbul-Gioia Tauro	-
		Istanbul-Algeciras	-

Corridor 'Silk Way'

The technology is not applicable to this corridor.

TDS

Technology Data

ID	Category	Transport modes
BP02	Best Practices	Railway

Description
TDS (Train Control System based on a new GPS application method)

Readiness Level	Time to Market	Energy Source	Efficiency
	-	-	-

CO_2	NO_x	SO_x	LCC
-	-	-	-

High Level Benchmark

Baseline	*No computer aided support with radio data system for communication between trains and central train controller .*
Relative Cost	
% cost savings during operation	20%
CAPEX	-
% fuel savings	-
Emissions	
% CO2 savings	-
% SOx savings	-
% NOx savings	
Service & bottlenecks	
% operational or infrastructural delays reduction	-
% of frequency of service potential improvement due to delays & bottlenecks reduction	-
% of reliability improvement due to delays & bottlenecks reduction	-

Positive influence | Negative influence | Not relevant or no influence | no information

Technology Applicability per Corridor

Corridor 'Brenner'

Nodes		Arcs	
Malmo	Rail	Malmo-Trelleborg	-
Trelleborg	Rail	Trelleborg-Sassnitz	-

Sassnitz	Rail	*Trelleborg-Rostock*	-
Rostock	Rail	*Sassnitz-Berlin*	-
Berlin	Rail	*Rostock-Berlin*	-
Nurnberg	Rail	*Berlin-Nurnberg*	-
Munich	Rail	*Nurnberg-Munich*	-
Salzburg	Rail	*Munich-Salzburg*	-
Villach	Rail	*Salzburg-Villach*	-
Trieste	Rail	*Villach-Trieste*	-
Verona	Rail	*Munich-Verona*	-
Bologna	Rail	*Verona-Bologna*	-
Ancona	Rail	*Bologna-Ancona*	-
Bari	Rail	*Ancona-Bari*	-
Brindisi	Rail	*Bari-Brindisi*	-
Igoumenitsa	-	*Igoumenitsa-Thessaloniki*	-
Thessaloniki	Rail	*Igoumenitsa-Patras*	-
Patras	-	*Patras-Athens*	-
Athens	Rail	*Bologna-Rome*	-
Rome	Rail	*Rome-Naples*	-
Naples	Rail	*Naples-Messina*	-
Messina	Rail	*Villa San Giovanni-Messina*	-
Villa San Giovanni	Rail	*Messina-Palermo*	-
Palermo	Rail	*Naples-Villa San Giovanni*	-
		Ancona-Brindisi	-
		Bari-Igoumenitsa	-

Corridor 'Finis Terrae'

Nodes		*Arcs*	
Paris	Rail	*Paris-St. Nazaire*	Rail
St. Nazaire	Rail	*Paris-Irun*	Rail
Irun	Rail	*St. Nazaire-Gijon*	-
Gijon	Rail	*Irun-Valladolid*	Rail
Valladolid	Rail	*Gijon-Valladolid*	Rail
Madrid	Rail	*Valladolid-Madrid*	Rail
Lisboa	Rail	*Madrid-Lisboa*	Rail

Corridor 'Cloverleaf'

Nodes		*Arcs*	
Glasgow	Rail	*Glasgow-Carlisle*	Rail
Carlisle	Rail	*Carlisle-Liverpool*	Rail
Liverpool	Rail	*Liverpool-Dublin*	-
Dublin	-	*Liverpool-London*	Rail
London	Rail	*London-Dover*	Rail
Dover	Rail	*Dover-Calais*	Rail
Calais	Rail	*Calais-Duisburg*	Rail
Duisburg	Rail		

Corridor 'Edelweiss'

Nodes		*Arcs*	
St. Petersburg	-	*St. Petersburg-Lappeenranta*	Rail
Lappeenranta	-	*Lappeenranta-Helsinki*	Rail
Helsinki	-	*Helsinki-Turku*	Rail
Turku	-	*Stockholm-Oslo*	Rail
Stockholm	-	*Stockholm-Malmo*	Rail
Oslo	-	*Oslo-Gothenburg*	Rail
Malmo	Rail	*Gothenburg-Malmo*	Rail
Gothenburg	-	*Malmo-Copenhagen*	Rail
Copenhagen	-	*Copenhagen-Taulov*	Rail
Taulov	-	*Copenhagen-Rodbyhavn*	-
Rodbyhavn	-	*Rodbyhavn-Puttgarden*	-
Puttgarden	-	*Taulov-Hamburg*	Rail
Hamburg	Rail	*Puttgarden-Hamburg*	-
Hannover	-	*Hamburg-Hannover*	Rail
Würzburg	-	*Hannover-Würzburg*	Rail
Ulm	-	*Würzburg-Ulm*	Rail
Lugano	-	*Ulm-Lugano*	Rail
Milan	-	*Lugano-Milan*	Rail
Genoa	-	*Milan-Genoa*	Rail
		Turku-Stockholm	-

Corridor 'Nureyeev'

Nodes		Arcs	
Helsinki	-	Helsinki-Tallinn	-
Tallinn	-	St. Petersburg-Moscow	Rail
St. Petersburg	-	Ventspils-Klaipeda	-
Moscow	Rail	Klaipeda-Minsk	Rail
Ventspils	-	Klaipeda-Karlshamn	-
Klaipeda	-	Gothenburg-Hamburg	-
Minsk	Rail	Rostock-Gothenburg	-
Karlshamn	-	Hamburg-Malmo	-
Gothenburg	-	Helsinki-St. Petersburg	-
Hamburg	Rail	Hamburg-Gdansk	-
Rostock	Rail	Hamburg-Tallinn	-
Malmo	Rail	Ventspils-Karlshamn	-
Gdansk	-	Malmo-Helsinki	-
Riga	-	Helsinki-Hamburg	-
Rotterdam	Rail	Tallinn-Riga	-
Turku	-	Rotterdam-Hamburg	-
		Klaipeda-Rotterdam	-
		Rostock-Helsinki	-
		Helsinki-Rotterdam	-
		Turku-Gothenburg	-
		Turku-Hamburg	-
		Gothenburg-Rotterdam	-
		Klaipeda-Riga	-
		Hamburg-Riga	-
		St. Petersburg-Hamburg	-
		Rotterdam-Gdansk	-
		Rotterdam-Ventspils	-
		Rotterdam-St. Petersburg	-

Corridor 'Strauss'

Nodes		Arcs	
Rotterdam	Rail	Rotterdam-Duisburg	Rail
Duisburg	Rail	Duisburg-Frankfurt	Rail
Frankfurt	Rail	Frankfurt-Paris	Rail
Paris	Rail	Frankfurt-Nurnberg	Rail
Nurnberg	Rail	Nurnberg-Vienna	Rail
Vienna	Rail	Vienna-Bratislava	Rail
Bratislava	Rail	Bratislava-Budapest	-
Budapest	Rail	Budapest-Belgrade	-
Belgrade	Rail	Belgrade-Constanta	Rail
Constanta	Rail		

Corridor 'Two Seas'

Nodes		Arcs	
Hamburg	Rail	Hamburg-Berlin	-
Berlin	Rail	Berlin-Dresden	Rail
Dresden	Rail	Dresden-Prague	Rail
Prague	Rail	Prague-Nurnberg	Rail
Nurnberg	Rail	Prague-Bratislava	Rail
Bratislava	Rail	Bratislava-Budapest	Rail
Budapest	Rail	Budapest-Belgrade	Rail
Belgrade	Rail	Belgrade-Sofia	Rail
Sofia	Rail	Sofia-Thessaloniki	Rail
Thessaloniki	Rail	Thessaloniki-Athens	Rail
Athens	Rail		

Corridor 'Mare Nostrum'

Nodes		Arcs	
Bourgas	-	Bourgas-Istanbul	-
Istanbul	-	La Spezia-Genoa	-
La Spezia	-	Marseille-Lyon	Rail
Genoa	-	Odessa-Istanbul	-
Marseille	Rail	Constanta-Istanbul	-
Lyon	Rail	Algeciras-Istanbul	-
Odessa	-	Barcelona-Valencia	Rail

Constanta	Rail	*Valencia-Algeciras*	Rail
Algeciras	Rail	*Istanbul-Athens*	-
Barcelona	Rail	*Athens-Gioia Tauro*	-
Valencia	Rail	*Gioia Tauro-La Spezia*	-
Athens	Rail	*Marseille-Barcelona*	Rail
Gioia Tauro	-	*Algeciras-Sines*	-
Sines	-	*Genoa-Barcelona*	-
Trieste	Rail	*Istanbul-Trieste*	-
		Istanbul-Gioia Tauro	-
		Istanbul-Algeciras	-

Corridor 'Silk Way'

Nodes		*Arcs*	
Rotterdam	Rail	*Rotterdam-Shanghai*	-
Shanghai	-	*Hamburg-Berlin*	-
Hamburg	Rail	*Berlin-Warsaw*	-
Berlin	Rail	*Warsaw-Minsk*	-
Warsaw	Rail	*Minsk-Moscow*	-
Minsk	Rail	*Moscow-Beijing*	-
Moscow	Rail	*Hamburg-Shanghai*	-
Beijing	Rail	*St. Petersburg-Shanghai*	-
St. Petersburg	-	*Shanghai-Gothenburg*	-
Gothenburg	-	*Tallinn-Shanghai*	-
Tallinn	-		

Traffic Management System

Technology Data

ID	Category	Transport modes
BP03	Best Practices	Railway

Description
GEKKO is a system to provide guidance to energy efficiency driving and timetable optimization, developed for Danish State Railways

Readiness Level	Time to Market	Energy Source	Efficiency
	-	-	-

CO_2	NO_x	SO_x	LCC
-	-	-	-

High Level Benchmark

Baseline		No software guidance for scheduled route, timetables and train characteristics.
Relative Cost		
% cost savings during operation		10%
CAPEX		-
% fuel savings		-
Emissions		
% CO2 savings		15%
% SOx savings		-
% NOx savings		
Service & bottlenecks		
% operational or infrastructural delays reduction		-
% of frequency of service potential improvement due to delays & bottlenecks reduction		-
% of reliability improvement due to delays & bottlenecks reduction		-

Positive influence | Negative influence | Not relevant or no influence | no information

Technology Applicability per Corridor

Corridor 'Brenner'

The technology is not applicable to this corridor.

Corridor 'Finis Terrae'

Nodes		Arcs	
Paris	-	Paris-St. Nazaire	Rail
St. Nazaire	-	Paris-Irun	Rail
Irun	-	St. Nazaire-Gijon	-
Gijon	-	Irun-Valladolid	Rail
Valladolid	-	Gijon-Valladolid	Rail
Madrid	-	Valladolid-Madrid	Rail
Lisboa	-	Madrid-Lisboa	Rail

Corridor 'Cloverleaf'

Nodes		Arcs	
Glasgow	-	Glasgow-Carlisle	Rail
Carlisle	-	Carlisle-Liverpool	Rail
Liverpool	-	Liverpool-Dublin	-
Dublin	-	Liverpool-London	Rail
London	-	London-Dover	Rail
Dover	-	Dover-Calais	Rail
Calais	-	Calais-Duisburg	Rail
Duisburg	-		

Corridor 'Edelweiss'

Nodes		Arcs	
St. Petersburg	-	St. Petersburg-Lappeenranta	Rail
Lappeenranta	-	Lappeenranta-Helsinki	Rail
Helsinki	-	Helsinki-Turku	Rail
Turku	-	Stockholm-Oslo	Rail
Stockholm	-	Stockholm-Malmo	Rail
Oslo	-	Oslo-Gothenburg	Rail
Malmo	-	Gothenburg-Malmo	Rail
Gothenburg	-	Malmo-Copenhagen	Rail
Copenhagen	-	Copenhagen-Taulov	Rail
Taulov	-	Copenhagen-Rodbyhavn	-
Rodbyhavn	-	Rodbyhavn-Puttgarden	-
Puttgarden	-	Taulov-Hamburg	Rail
Hamburg	-	Puttgarden-Hamburg	-
Hannover	-	Hamburg-Hannover	Rail
Würzburg	-	Hannover-Würzburg	Rail
Ulm	-	Würzburg-Ulm	Rail
Lugano	-	Ulm-Lugano	Rail
Milan	-	Lugano-Milan	Rail
Genoa	-	Milan-Genoa	Rail
		Turku-Stockholm	-

Corridor 'Nureyeev'

Nodes		Arcs	
Helsinki	-	Helsinki-Tallinn	-
Tallinn	-	St. Petersburg-Moscow	Rail
St. Petersburg	-	Ventspils-Klaipeda	-
Moscow	-	Klaipeda-Minsk	Rail
Ventspils	-	Klaipeda-Karlshamn	-
Klaipeda	-	Gothenburg-Hamburg	-
Minsk	-	Rostock-Gothenburg	-
Karlshamn	-	Hamburg-Malmo	-
Gothenburg	-	Helsinki-St. Petersburg	-
Hamburg	-	Hamburg-Gdansk	-
Rostock	-	Hamburg-Tallinn	-
Malmo	-	Ventspils-Karlshamn	-
Gdansk	-	Malmo-Helsinki	-
Riga	-	Helsinki-Hamburg	-
Rotterdam	-	Tallinn-Riga	-
Turku	-	Rotterdam-Hamburg	-
		Klaipeda-Rotterdam	-
		Rostock-Helsinki	-
		Helsinki-Rotterdam	-
		Turku-Gothenburg	-
		Turku-Hamburg	-

		Gothenburg-Rotterdam	-
		Klaipeda-Riga	-
		Hamburg-Riga	-
		St. Petersburg-Hamburg	-
		Rotterdam-Gdansk	-
		Rotterdam-Ventspils	-
		Rotterdam-St. Petersburg	-

Corridor 'Strauss'

Nodes		*Arcs*	
Rotterdam	-	*Rotterdam-Duisburg*	Rail
Duisburg	-	*Duisburg-Frankfurt*	Rail
Frankfurt	-	*Frankfurt-Paris*	Rail
Paris	-	*Frankfurt-Nurnberg*	Rail
Nurnberg	-	*Nurnberg-Vienna*	Rail
Vienna	-	*Vienna-Bratislava*	Rail
Bratislava	-	*Bratislava-Budapest*	-
Budapest	-	*Budapest-Belgrade*	-
Belgrade	-	*Belgrade-Constanta*	Rail
Constanta	-		

Corridor 'Two Seas'

Nodes		*Arcs*	
Hamburg	-	*Hamburg-Berlin*	-
Berlin	-	*Berlin-Dresden*	Rail
Dresden	-	*Dresden-Prague*	Rail
Prague	-	*Prague-Nurnberg*	Rail
Nurnberg	-	*Prague-Bratislava*	Rail
Bratislava	-	*Bratislava-Budapest*	Rail
Budapest	-	*Budapest-Belgrade*	Rail
Belgrade	-	*Belgrade-Sofia*	Rail
Sofia	-	*Sofia-Thessaloniki*	Rail
Thessaloniki	-	*Thessaloniki-Athens*	Rail
Athens	-		

Corridor 'Mare Nostrum'

Nodes		*Arcs*	
Bourgas	-	*Bourgas-Istanbul*	-
Istanbul	-	*La Spezia-Genoa*	-
La Spezia	-	*Marseille-Lyon*	Rail
Genoa	-	*Odessa-Istanbul*	-
Marseille	Rail	*Constanta-Istanbul*	-
Lyon	Rail	*Algeciras-Istanbul*	-
Odessa	-	*Barcelona-Valencia*	-
Constanta	-	*Valencia-Algeciras*	-
Algeciras	-	*Istanbul-Athens*	-
Barcelona	-	*Athens-Gioia Tauro*	-
Valencia	-	*Gioia Tauro-La Spezia*	-
Athens	-	*Marseille-Barcelona*	-
Gioia Tauro	-	*Algeciras-Sines*	-
Sines	-	*Genoa-Barcelona*	-
Trieste	-	*Istanbul-Trieste*	-
		Istanbul-Gioia Tauro	-
		Istanbul-Algeciras	-

Corridor 'Silk Way'

The technology is not applicable to this corridor.

Integrated shortsea transport

Technology Data

ID	Category	Transport modes
BP08	Best Practices	Maritime

Description
The concept of Coaster Express (CoEx) is a short sea transport concept directed to bundling the transport flows, scaling-up the short sea facilities and standardization and automation of the transition processes.

Readiness Level	Time to Market	Energy Source	Efficiency
	-	-	-
CO_2	NO_x	SO_x	LCC
-	-	-	-

Notes on technology

Integrated short sea transport and logistics concepts for the accommodation of large container feedering include designs of smart docking and automated transhipment port systems. Coaster Express (CoEx) is a concept for automated container terminal concept for short sea applications directed to bundling the transport flows, scaling-up the short sea facilities and standardization and automation of the transition processes. However, it is only on a conceptual stage and it is difficult to determine its impact on the greening of corridors. The automation of operation may provide an estimated increase in cargo throughput and service speed increase service of approximately 43%.

High Level Benchmark

Baseline	*Short sea shipping/ feedering services*
Relative Cost	
% cost savings during operation	-
CAPEX	-
% fuel savings	-
Emissions	
% CO2 savings	-
% SOx savings	-
% NOx savings	
Service & bottlenecks	
% operational or infrastructural delays reduction	-
% of frequency of service potential improvement due to delays & bottlenecks reduction	-
% of reliability improvement due to delays & bottlenecks reduction	-

Positive influence | Negative influence | Not relevant or no influence | no information

Detailed Benchmark

(with respect to baseline performance on specific corridor)

Corridor	*Mare Nostrum*	
Mode of transport	*sss*	
Cost	*Min: 0.0%*	*Max: 0.0%*
CO2 emissions	*Min: 0.0%*	*Max: 0.0%*
SOX emissions	*Min: 0.0%*	*Max: 0.0%*
Average speed	*Min: 5.3%*	*Max: 8.1%*
Frequency	*Min: 0.0%*	*Max: 0.0%*
Reliability	*Min: 0.0%*	*Max: 0.0%*

Technology Applicability per Corridor

Corridor 'Brenner'

Nodes		*Arcs*	
Malmo	sss	*Malmo-Trelleborg*	-
Trelleborg	sss	*Trelleborg-Sassnitz*	-
Sassnitz	sss	*Trelleborg-Rostock*	-
Rostock	sss	*Sassnitz-Berlin*	-
Berlin	-	*Rostock-Berlin*	-
Nurnberg	-	*Berlin-Nurnberg*	-
Munich	-	*Nurnberg-Munich*	-
Salzburg	-	*Munich-Salzburg*	-
Villach	-	*Salzburg-Villach*	-
Trieste	sss	*Villach-Trieste*	-
Verona	-	*Munich-Verona*	-
Bologna	-	*Verona-Bologna*	-
Ancona	sss	*Bologna-Ancona*	-
Bari	sss	*Ancona-Bari*	-
Brindisi	sss	*Bari-Brindisi*	-
Igoumenitsa	sss	*Igoumenitsa-Thessaloniki*	-
Thessaloniki	-	*Igoumenitsa-Patras*	-
Patras	sss	*Patras-Athens*	-
Athens	sss	*Bologna-Rome*	-
Rome	-	*Rome-Naples*	-
Naples	sss	*Naples-Messina*	-
Messina	sss	*Villa San Giovanni-Messina*	-
Villa San Giovanni	sss	*Messina-Palermo*	-
Palermo	-	*Naples-Villa San Giovanni*	-
		Ancona-Brindisi	-
		Bari-Igoumenitsa	-

Corridor 'Finis Terrae'

Nodes		*Arcs*	
Paris	-	*Paris-St. Nazaire*	-
St. Nazaire	-	*Paris-Irun*	-
Irun	-	*St. Nazaire-Gijon*	sss
Gijon	-	*Irun-Valladolid*	-
Valladolid	-	*Gijon-Valladolid*	-

Madrid	-	*Valladolid-Madrid*	-
Lisboa	-	*Madrid-Lisboa*	-

Corridor 'Cloverleaf'

Nodes		*Arcs*	
Glasgow	-	*Glasgow-Carlisle*	-
Carlisle	-	*Carlisle-Liverpool*	-
Liverpool	-	*Liverpool-Dublin*	sss
Dublin	-	*Liverpool-London*	-
London	-	*London-Dover*	-
Dover	-	*Dover-Calais*	sss
Calais	-	*Calais-Duisburg*	-
Duisburg	-		

Corridor 'Edelweiss'

Nodes		*Arcs*	
St. Petersburg	sss	*St. Petersburg-Lappeenranta*	-
Lappeenranta	-	*Lappeenranta-Helsinki*	-
Helsinki	sss	*Helsinki-Turku*	-
Turku	sss	*Stockholm-Oslo*	-
Stockholm	sss	*Stockholm-Malmo*	-
Oslo	-	*Oslo-Gothenburg*	-
Malmo	sss	*Gothenburg-Malmo*	-
Gothenburg	sss	*Malmo-Copenhagen*	-
Copenhagen	-	*Copenhagen-Taulov*	-
Taulov	-	*Copenhagen-Rodbyhavn*	-
Rodbyhavn	sss	*Rodbyhavn-Puttgarden*	sss
Puttgarden	sss	*Taulov-Hamburg*	-
Hamburg	sss	*Puttgarden-Hamburg*	-
Hannover	-	*Hamburg-Hannover*	-
Würzburg	-	*Hannover-Würzburg*	-
Ulm	-	*Würzburg-Ulm*	-
Lugano	-	*Ulm-Lugano*	-
Milan	-	*Lugano-Milan*	-
Genoa	sss	*Milan-Genoa*	-
		Turku-Stockholm	sss

Corridor 'Nureyeev'

Nodes		*Arcs*	
Helsinki	sss	*Helsinki-Tallinn*	-
Tallinn	sss	*St. Petersburg-Moscow*	-
St. Petersburg	sss	*Ventspils-Klaipeda*	-
Moscow	-	*Klaipeda-Minsk*	-
Ventspils	sss	*Klaipeda-Karlshamn*	-
Klaipeda	sss	*Gothenburg-Hamburg*	-
Minsk	-	*Rostock-Gothenburg*	-
Karlshamn	sss	*Hamburg-Malmo*	-
Gothenburg	sss	*Helsinki-St. Petersburg*	-
Hamburg	sss	*Hamburg-Gdansk*	-
Rostock	sss	*Hamburg-Tallinn*	-
Malmo	sss	*Ventspils-Karlshamn*	-
Gdansk	sss	*Malmo-Helsinki*	-
Riga	sss	*Helsinki-Hamburg*	-
Rotterdam	sss	*Tallinn-Riga*	-
Turku	sss	*Rotterdam-Hamburg*	-
		Klaipeda-Rotterdam	-
		Rostock-Helsinki	-
		Helsinki-Rotterdam	-
		Turku-Gothenburg	-
		Turku-Hamburg	-
		Gothenburg-Rotterdam	-
		Klaipeda-Riga	-
		Hamburg-Riga	-
		St. Petersburg-Hamburg	-
		Rotterdam-Gdansk	-
		Rotterdam-Ventspils	-
		Rotterdam-St. Petersburg	-

Corridor 'Strauss'

Nodes		*Arcs*	
Rotterdam	sss	*Rotterdam-Duisburg*	-
Duisburg	-	*Duisburg-Frankfurt*	-
Frankfurt	-	*Frankfurt-Paris*	-
Paris	-	*Frankfurt-Nurnberg*	-
Nurnberg	-	*Nurnberg-Vienna*	-
Vienna	-	*Vienna-Bratislava*	-
Bratislava	-	*Bratislava-Budapest*	-
Budapest	-	*Budapest-Belgrade*	-
Belgrade	-	*Belgrade-Constanta*	-
Constanta	sss		

Corridor 'Two Seas'

Nodes		*Arcs*	
Hamburg	sss	*Hamburg-Berlin*	-
Berlin	-	*Berlin-Dresden*	-
Dresden	-	*Dresden-Prague*	-
Prague	-	*Prague-Nurnberg*	-
Nurnberg	-	*Prague-Bratislava*	-
Bratislava	-	*Bratislava-Budapest*	-
Budapest	-	*Budapest-Belgrade*	-
Belgrade	-	*Belgrade-Sofia*	-
Sofia	-	*Sofia-Thessaloniki*	-
Thessaloniki	-	*Thessaloniki-Athens*	-
Athens	sss		

Corridor 'Mare Nostrum'

Nodes		*Arcs*	
Bourgas	sss	*Bourgas-Istanbul*	sss
Istanbul	sss	*La Spezia-Genoa*	sss
La Spezia	sss	*Marseille-Lyon*	-
Genoa	sss	*Odessa-Istanbul*	sss
Marseille	sss	*Constanta-Istanbul*	sss
Lyon	-	*Algeciras-Istanbul*	sss
Odessa	sss	*Barcelona-Valencia*	sss
Constanta	sss	*Valencia-Algeciras*	sss
Algeciras	sss	*Istanbul-Athens*	sss
Barcelona	sss	*Athens-Gioia Tauro*	sss
Valencia	sss	*Gioia Tauro-La Spezia*	sss
Athens	sss	*Marseille-Barcelona*	sss
Gioia Tauro	sss	*Algeciras-Sines*	sss
Sines	sss	*Genoa-Barcelona*	sss
Trieste	sss	*Istanbul-Trieste*	sss
		Istanbul-Gioia Tauro	sss
		Istanbul-Algeciras	sss

Corridor 'Silk Way'

Nodes		*Arcs*	
Rotterdam	sss	*Rotterdam-Shanghai*	-
Shanghai	-	*Hamburg-Berlin*	-
Hamburg	sss	*Berlin-Warsaw*	-
Berlin	-	*Warsaw-Minsk*	-
Warsaw	-	*Minsk-Moscow*	-
Minsk	-	*Moscow-Beijing*	-
Moscow	-	*Hamburg-Shanghai*	-
Beijing	-	*St. Petersburg-Shanghai*	-
St. Petersburg	sss	*Shanghai-Gothenburg*	-
Gothenburg	sss	*Tallinn-Shanghai*	-
Tallinn	sss		

EREX(ERESS)

Technology Data

ID	Category	Transport modes
BP13	Best Practices	Railway

Description
The Erex system, has been designed by the European Railway Energy Saving Solution (ERESS), to help railways to save money and reduce CO2 emissions by providing exact energy consumption data. It provides an efficient, reliable, and flexible energy settlement process, enabling railway undertakings to understand their use of energy and thereby save energy and costs.

Readiness Level	Time to Market	Energy Source	Efficiency
9	<1		

CO_2	NO_x	SO_x	LCC

Notes on technology

EREX is a railway system that has been designed by the European Railway Energy Saving Solution (ERESS), to help railways to save money and reduce CO2 emissions by providing accurate billing based on actual consumption. EREX is an energy settlement system that enables the infrastructure managers to calculate the accurate energy consumption of their clients and the railway undertakings to understand their use of energy, apply smarter driving and, thus, save energy and costs. The EREX system is comprised of: advanced energy meters mounted on board trains; an energy measurement system, which collects and validates the measured data; a system that performs the settlement, cost distribution, data exchange and billing. According to the literature, the application of this technology provides the ability to design energy saving programs of up to 15% - 30% energy and cost savings. As a documented example the Norwegian National Railway (NSB) started an energy saving project in 2005 based on measured energy data. Between 2004 and 2011 the energy efficiency was improved by 20.5%. This project has thereby allowed NSB to achieve substantial cost savings. The EREX system is, also, designed for cross-European railway traffic, irrespective of the country or the operators, giving the opportunity to calculate the exact energy bill at every country where the train travels.

High Level Benchmark

Baseline	no application of the Best Practice
Relative Cost	
% cost savings during operation	-
CAPEX	-
% fuel savings	-
Emissions	
% CO2 savings	up to 15%
% SOx savings	-
% NOx savings	
Service & bottlenecks	

% operational or infrastructural delays reduction	-
% of frequency of service potential improvement due to delays & bottlenecks reduction	-
% of reliability improvement due to delays & bottlenecks reduction	-

Positive influence | Negative influence | Not relevant or no influence | no information

Detailed Benchmark

(with respect to baseline performance on specific corridor)

Corridor	*Cloverleaf*	
Mode of transport	*Rail*	
Cost	*Min: 1.5%*	*Max: 2.0%*
CO2 emissions	*Min: 0.0%*	*Max: 0.0%*
SOX emissions	*Min: 0.0%*	*Max: 0.0%*
Average speed	*Min: 0.0%*	*Max: 0.0%*
Frequency	*Min: 0.0%*	*Max: 0.0%*
Reliability	*Min: 0.0%*	*Max: 0.0%*

Technology Applicability per Corridor

Corridor 'Brenner'

Nodes		*Arcs*	
Malmo	-	*Malmo-Trelleborg*	Rail
Trelleborg	-	*Trelleborg-Sassnitz*	-
Sassnitz	-	*Trelleborg-Rostock*	-
Rostock	-	*Sassnitz-Berlin*	Rail
Berlin	-	*Rostock-Berlin*	Rail
Nurnberg	-	*Berlin-Nurnberg*	Rail
Munich	-	*Nurnberg-Munich*	Rail
Salzburg	-	*Munich-Salzburg*	Rail
Villach	-	*Salzburg-Villach*	Rail
Trieste	-	*Villach-Trieste*	Rail
Verona	-	*Munich-Verona*	Rail
Bologna	-	*Verona-Bologna*	Rail
Ancona	-	*Bologna-Ancona*	Rail
Bari	-	*Ancona-Bari*	Rail
Brindisi	-	*Bari-Brindisi*	Rail
Igoumenitsa	-	*Igoumenitsa-Thessaloniki*	-
Thessaloniki	-	*Igoumenitsa-Patras*	-
Patras	-	*Patras-Athens*	-
Athens	-	*Bologna-Rome*	Rail
Rome	-	*Rome-Naples*	Rail
Naples	-	*Naples-Messina*	-
Messina	-	*Villa San Giovanni-Messina*	-
Villa San Giovanni	-	*Messina-Palermo*	Rail
Palermo	-	*Naples-Villa San Giovanni*	Rail
		Ancona-Brindisi	-
		Bari-Igoumenitsa	-

Corridor 'Finis Terrae'

Nodes		Arcs	
Paris	-	Paris-St. Nazaire	Rail
St. Nazaire	-	Paris-Irun	Rail
Irun	-	St. Nazaire-Gijon	-
Gijon	-	Irun-Valladolid	Rail
Valladolid	-	Gijon-Valladolid	Rail
Madrid	-	Valladolid-Madrid	Rail
Lisboa	-	Madrid-Lisboa	Rail

Corridor 'Cloverleaf'

Nodes		Arcs	
Glasgow	-	Glasgow-Carlisle	Rail
Carlisle	-	Carlisle-Liverpool	Rail
Liverpool	-	Liverpool-Dublin	-
Dublin	-	Liverpool-London	Rail
London	-	London-Dover	Rail
Dover	-	Dover-Calais	Rail
Calais	-	Calais-Duisburg	Rail
Duisburg	-		

Corridor 'Edelweiss'

Nodes		Arcs	
St. Petersburg	-	St. Petersburg-Lappeenranta	Rail
Lappeenranta	-	Lappeenranta-Helsinki	Rail
Helsinki	-	Helsinki-Turku	Rail
Turku	-	Stockholm-Oslo	Rail
Stockholm	-	Stockholm-Malmo	Rail
Oslo	-	Oslo-Gothenburg	Rail
Malmo	-	Gothenburg-Malmo	Rail
Gothenburg	-	Malmo-Copenhagen	Rail
Copenhagen	-	Copenhagen-Taulov	Rail
Taulov	-	Copenhagen-Rodbyhavn	-
Rodbyhavn	-	Rodbyhavn-Puttgarden	-
Puttgarden	-	Taulov-Hamburg	Rail
Hamburg	-	Puttgarden-Hamburg	-
Hannover	-	Hamburg-Hannover	Rail
Würzburg	-	Hannover-Würzburg	Rail
Ulm	-	Würzburg-Ulm	Rail
Lugano	-	Ulm-Lugano	Rail
Milan	-	Lugano-Milan	Rail
Genoa	-	Milan-Genoa	Rail
		Turku-Stockholm	-

Corridor 'Nureyeev'

Nodes		Arcs	
Helsinki	-	Helsinki-Tallinn	-
Tallinn	-	St. Petersburg-Moscow	Rail
St. Petersburg	-	Ventspils-Klaipeda	-
Moscow	-	Klaipeda-Minsk	Rail
Ventspils	-	Klaipeda-Karlshamn	-
Klaipeda	-	Gothenburg-Hamburg	-
Minsk	-	Rostock-Gothenburg	-
Karlshamn	-	Hamburg-Malmo	-
Gothenburg	-	Helsinki-St. Petersburg	-
Hamburg	-	Hamburg-Gdansk	-
Rostock	-	Hamburg-Tallinn	-
Malmo	-	Ventspils-Karlshamn	-
Gdansk	-	Malmo-Helsinki	-
Riga	-	Helsinki-Hamburg	-
Rotterdam	-	Tallinn-Riga	-
Turku	-	Rotterdam-Hamburg	-
		Klaipeda-Rotterdam	-
		Rostock-Helsinki	-
		Helsinki-Rotterdam	-
		Turku-Gothenburg	-
		Turku-Hamburg	-

		Gothenburg-Rotterdam	-
		Klaipeda-Riga	-
		Hamburg-Riga	-
		St. Petersburg-Hamburg	-
		Rotterdam-Gdansk	-
		Rotterdam-Ventspils	-
		Rotterdam-St. Petersburg	-

Corridor 'Strauss'

Nodes		*Arcs*	
Rotterdam	-	*Rotterdam-Duisburg*	Rail
Duisburg	-	*Duisburg-Frankfurt*	Rail
Frankfurt	-	*Frankfurt-Paris*	Rail
Paris	-	*Frankfurt-Nurnberg*	Rail
Nurnberg	-	*Nurnberg-Vienna*	Rail
Vienna	-	*Vienna-Bratislava*	Rail
Bratislava	-	*Bratislava-Budapest*	-
Budapest	-	*Budapest-Belgrade*	-
Belgrade	-	*Belgrade-Constanta*	Rail
Constanta	-		

Corridor 'Two Seas'

Nodes		*Arcs*	
Hamburg	-	*Hamburg-Berlin*	-
Berlin	-	*Berlin-Dresden*	Rail
Dresden	-	*Dresden-Prague*	Rail
Prague	-	*Prague-Nurnberg*	Rail
Nurnberg	-	*Prague-Bratislava*	Rail
Bratislava	-	*Bratislava-Budapest*	Rail
Budapest	-	*Budapest-Belgrade*	Rail
Belgrade	-	*Belgrade-Sofia*	Rail
Sofia	-	*Sofia-Thessaloniki*	Rail
Thessaloniki	-	*Thessaloniki-Athens*	Rail
Athens	-		

Corridor 'Mare Nostrum'

Nodes		*Arcs*	
Bourgas	-	*Bourgas-Istanbul*	-
Istanbul	-	*La Spezia-Genoa*	-
La Spezia	-	*Marseille-Lyon*	Rail
Genoa	-	*Odessa-Istanbul*	-
Marseille	-	*Constanta-Istanbul*	-
Lyon	-	*Algeciras-Istanbul*	-
Odessa	-	*Barcelona-Valencia*	Rail
Constanta	-	*Valencia-Algeciras*	Rail
Algeciras	-	*Istanbul-Athens*	-
Barcelona	-	*Athens-Gioia Tauro*	-
Valencia	-	*Gioia Tauro-La Spezia*	-
Athens	-	*Marseille-Barcelona*	Rail
Gioia Tauro	-	*Algeciras-Sines*	-
Sines	-	*Genoa-Barcelona*	-
Trieste	-	*Istanbul-Trieste*	-
		Istanbul-Gioia Tauro	-
		Istanbul-Algeciras	-

Corridor 'Silk Way'

Nodes		*Arcs*	
Rotterdam	-	*Rotterdam-Shanghai*	-
Shanghai	-	*Hamburg-Berlin*	Rail
Hamburg	-	*Berlin-Warsaw*	Rail
Berlin	-	*Warsaw-Minsk*	Rail
Warsaw	-	*Minsk-Moscow*	Rail
Minsk	-	*Moscow-Beijing*	Rail
Moscow	-	*Hamburg-Shanghai*	-
Beijing	-	*St. Petersburg-Shanghai*	-
St. Petersburg	-	*Shanghai-Gothenburg*	-
Gothenburg	-	*Tallinn-Shanghai*	-
Tallinn	-		