Interreg North Sea Region Inn2POWER European Regional Development Fund

EUROPEAN UNION

energy CLUSTER DENMARK

Common Standards – Common Cost Reductions

Agenda

- Background & process
- Design guideline content
- Results



Interreg North Sea Region Inn2POWER European Regional Development Fund

EUROPEAN UNION

energy CLUSTER DENMARK

800 mio.
DKK in project portfolio

+375
members

+80
active projects
including 66 innovation projects

5 focus areas
across the entire energy sector

6 offices
Aalborg
Aarhus
Esbjerg
Fredericia
København
Sønderborg



The energy industry

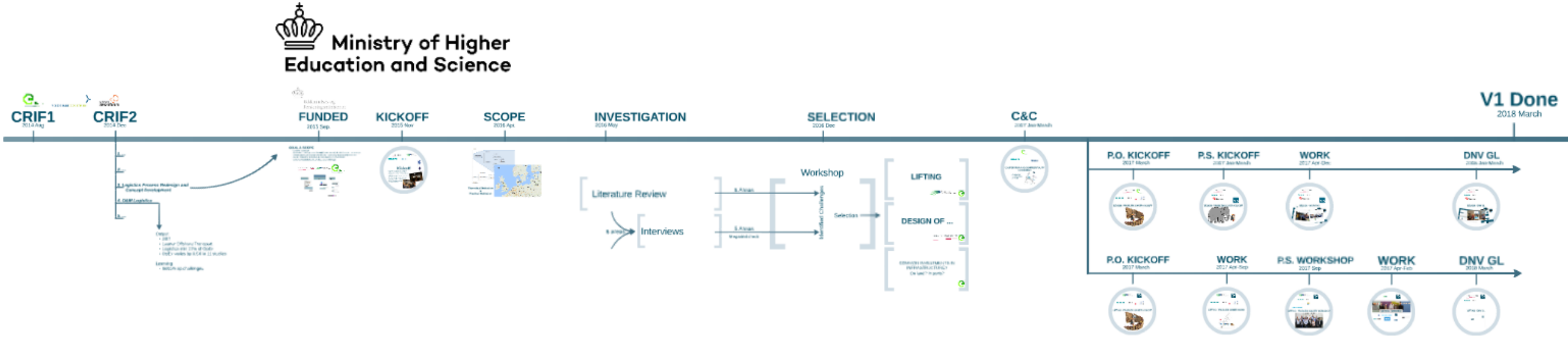
contributes to
more than 130.000 jobs

generates
+334 mia. DKK in turnover

generates
117 mia. DKK in export


SCHMIDT INNOVATION
acti-Chem
imile
Avalon INNOVATION
Aguardio
FORCE TECHNOLOGY
CATONETS
Aalborg Kommune
ENPRO
GEOKON
CORPORATE TRAVEL
ASATECH
ATCOM
AARHUS UNIVERSITY
seluxit
inQvation
SEABORG
ACCELERACE
FRECON
FORMAT
DDV
AEGIR
Aarhus Maskinmesterskole
ARBEJDSMILJØEksperten
Elmann
A.P.MØLLER
NUVVE
enexio
dmn
SYDDANSK INNOVATION
DSV
AquaGreen
AARHUS KOMMUNE
pernexus systems
EE.SH
FISCHER LIGHTING
NorthQ
amager ressource center
SEACABIN
ISOVER
DANISH EXPORT ASSOCIATION
ADVANTIS
BBC Chartering
AVEVA
GLOBAL GRAVITY
AURA energi
semco maritime
ALL NRG
DNV-GL
DOGIS
danvak
SLAGELSE erhvervscenter
KYHNHANSEN
DWP System Supplier
AALBORG UNIVERSITET
Bizer
LUNDGRENS
BIIR
Banke ACCESSORY DRIVES
BLADT INDUSTRIES
LARS HOVGAARD
KAIROS TECHNOLOGY
Baltic Sea Suppliers
cetec
SH GROUP
DYNAMICA Ropes ApS
EWII
LOGSTOR
HYTECH Personnel
Aguardio
BUSINESS ESBJERG
KORSØR HAVN
BUMAX
blue consulting
BLUE WATER SHIPPING
ABB
CBS
GMF
convert
BlueKolding
B&W vølund
DAMRC TEKNOLOGICENTER
CLIMB Partner
Caverion
CS electric
HEMPEL
CCM electronic engineering
DFM Danish National Metrology Institute
DSV
bal Transport and Logis
BUSINESS REGION ESBJERG
DANSK ENERGI
centerdenmark
Skiveegnens Erhvervs- og Turistcenter
Bladena
CSK Group
Supplier of Optimization + Reliability
DANEQUIP
COPCO
Viegand Maagøe
zacco
RAMBØLL
Dan-iso A/S
OFFSHORE DENMARK
BKS Byens Kloak Service
HYTOR
DHI
clean
ENFORM
BM2 INDUSTRI
COLDING A/S
e·on
Sønderborg Vækstråd
virsabi
Ørsted
MORE Consulting
Desupervised
AHK Dansk-Tysk Handelskammer Deutsch-Dänische Handelskammer
DANSK RETUR SYSTEM
Danske Bank
Resen Waves
Bech·Bruun
CenSec
CONVERDAN ENGINEERING
SUMMIT ELECTRONICS
DIS innovative engineering
visblue energy in the flow
ØGLÆND SYSTEM
dj-mg
EAST METAL
DEVELCO
Dansk Industri
DGC
Danish Gas Technology Centre
EMS
DAHL advokatfirma
SIHM HØJTRYK
ESBJERG HAVN
Erhvervshus
EMERSON
DTU Danmarks Tekniske Universitet
EGUS
Dansk Overskuds Energi A/S
Endress+Hauser
TESS
Vestas
Faraday SYSTEMS
ERHVERVS AKADEMI SYDVEST
EMD International
SHANGHAI ELECTRIC
SH GROUP
Green Tech Center
THYBORØN HAVN
VATTENFALL
Hybrid Greentech
HESS
GADE
Fiskeri- og Søfartsmuseet
eryk
SolMeCentral
STENA RECYCLING
Stiesdal
ENERGY AND CLIMATE ACADEMY
GREEN moves
HEDENSTED KOMMUNE
VlabWind
ZEVIT
Kolding Kommune
INCUBA
Fischer ADVOKATFIRMA
ESVAGT
ENERGYSOLUTION
PORT OF HANSTHOLM
HjulmandKaptain
TRELLEBORG
visility
wind denmark
Victor
ProjectZero
LEAP technology
HOLTEC automatic
JAK
KiteX
SIMAC
Sub C
solar
MASH Biotech
is·plus
SVERDRUP STEEL
Esbjerg Kommune
STRATEGI rummet
UdviklingsRåd Sønderjylland
ventomaritime
QuickTube
MAERSK DRILLING
Finetune
Sønderborg
TIKKURILA
Energistyrelsen
Bech·Bruun
WorldPower
ZBM
Nyborg
Energi Danmark
World Marine Offshore
WAVEPISTON
SABIK OFFSHORE
polytech
OFFSHORECENTER BORNHOLM
±Orogenic
JYSKE BANK
FURUNO
Frederiksberg Forsyning
JUEL&KRØYER
kanda
MASKINMESTER SKOLEN KØBENHAVN
Danfoss
SWECO
Wave Dragon
WIND POWER LAB
NordicFlexHouse
OceanGov
TopRejser
FJERNVARME FYN
HSSG
KYOCERA
senti
RACELL
P.N.Eriksen A/S
ØKO TØMRENEREN
UMORE
GeoScandia
HORTEN
MEDIEGRUPPEN
NorSeaGroup
SFF
VENTUS
VESTFROST SOLUTIONS
TEKNOLOGISK INSTITUT
ENERGINET
REVAL
UPTEKO
IRT
INEOS
LEMVIGH-MÜLLER
KC BD
MASAVA KEMI
picca
ACURAIL GET A SAFE GRIP
midt regionmidtjylland
Plast2oil
PlanMiljø
UNISENSE
KIRTXTHOMSEN
!pu.
MAERSK TRAINING
Middelfart
nature energy
RØNNE HAVN
ASOILPOWER HYDRAULICS
Transform
PurFil ApS
GeoDrilling.dk
KIRK
HYDROGEN VALLEY
ReMoni
lorenz
Maritime
Safe Marine Service
TOTAL
pwc
pondTwelve
UAS DENMARK
PETERMOURITSEN
kiwa
ncnielsen
M.A.R.S.
NSG WIND
RT3 Scandinavian Rope Access
SCANELEC
HEAD ENERGY
Novadros
pmchydraulics
PlanEnergi
Special container.dk
SYNOVANCE
FLOATING POWER PLANT
Liftra
LED LBOND
Geemit
MARSH
LERBA Consult
eviShine
Jakob Albertsen
KALUNDBORG FORSYNING
leapcraft
MDC MARITIME DEVELOPMENT CENTER
Mati2ilt
NERVE
NORTHSEA OFFSHORE SERVICEGROUP
ROCKWOOL BRANDSIKKER ISOLERING
SafeEx
Region Hovedstaden
NORD SENSE
seneco
Smedegaarden
NORDIQ
niko
NEXTECH
NORDPHOS
processio
RelyOn Nutec 360° Safety
RAMBØLL
Port of Grenaa
Partnerskabet for Bølgekraft
SCANEX VENTURE
RESCUE CENTER DENMARK

Process


Ministry of Higher Education and Science
CRIF1
CRIF2
FUNDED
KICKOFF
SCOPE
INVESTIGATION
SELECTION
C&C
V1 Done
2018 March
Literature Review
Interviews
Workshop
LIFTING
DESIGN OF ...
P.O. KICKOFF
P.S. KICKOFF
WORK
DNV GL
P.O. KICKOFF
WORK
P.S. WORKSHOP
WORK
DNV GL

Process

C&C
2017 Jan-March



V1 Done
2018 March

P.O. KICKOFF
2017 March



P.S. KICKOFF
2017 Jan-March



WORK
2017 Apr-Dec



DNV GL
2018 Jan-March



P.O. KICKOFF
2017 March



WORK
2017 Apr-Sep



P.S. WORKSHOP
2017 Sep



WORK
2017 Apr-Feb



DNV GL
2018 March



Process

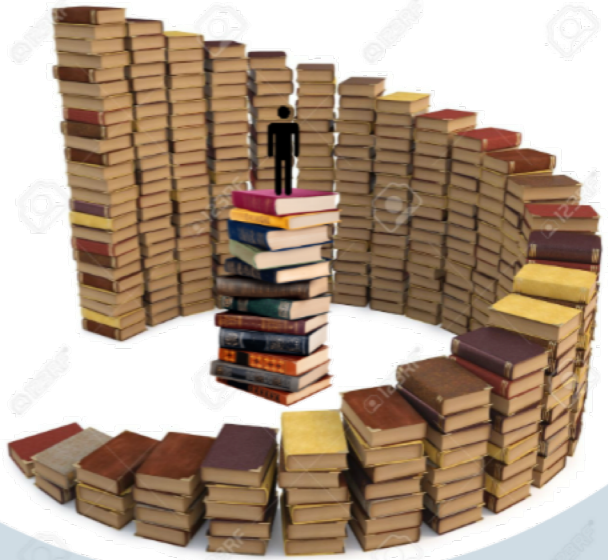
SERVICE PLATFORM

energy CLUSTER DENMARK

SIEMENS Gamesa RENEWABLE ENERGY

MHI VESTAS OFFSHORE WIND

DESIGN - PROBLEM OWNER KICKOFF



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Process


SERVICE PLATFORM
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SIEMENS Gamesa RENEWABLE ENERGY
MHI VESTAS OFFSHORE WIND
LIC ENGINEERING A/S
D I S
semco maritime
R&D
DESIGN - PROBLEM SOLVER KICKOFF

Process

SERVICE PLATFORM

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SIEMENS Gamesa RENEWABLE ENERGY

MHI VESTAS OFFSHORE WIND

LIC ENGINEERING A/S

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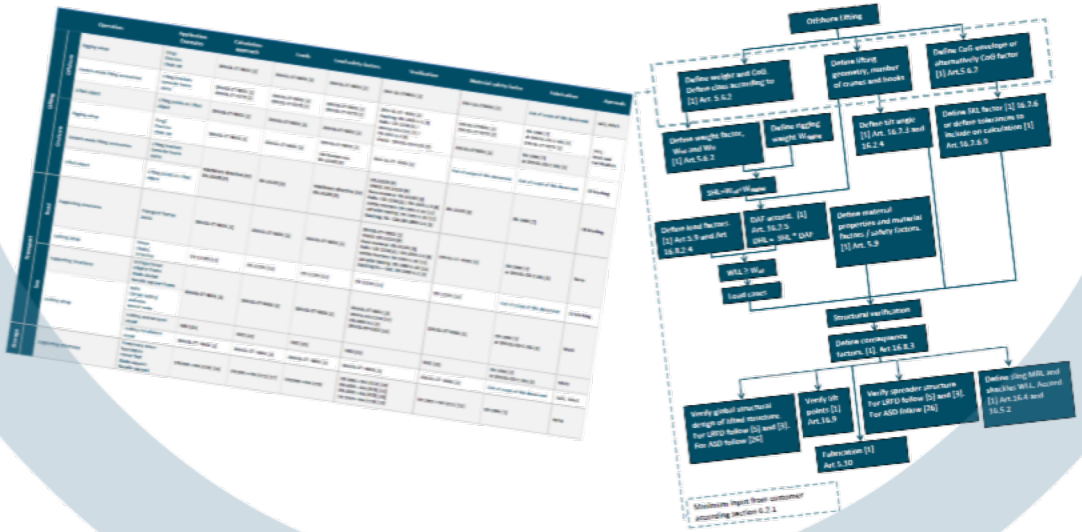
semco maritime

R&D

DESIGN - WORKING



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R&D
DESIGN - WORKING
Offshoreenergy.dk
4mo
Great meeting in the design guideline group in the INNOlog project in p
are making a new recommended practice for the design c
and handling lifting equipment. It will make design and pr
78 Likes · 1 Comment
Like
Comment
Share
Offshoreenergy.dk
3mo
This week we agreed on a recommended practice for design of lifting, transport,
storage and accessory equipment to hand over to DNV GL. We look forward to
presenting it in the new year.
10 Likes · 2 Comments
Like
Comment
Share
Vestas

Process

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MHI VESTAS OFFSHORE WIND

LIC ENGINEERING A/S

DNV·GL

D I S

semco maritime

R&D

DESIGN - DNV GL



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Process


RECOMMENDED PRACTICE
OE–RP– 01
DESIGN OF LIFTING, TRANSPORT, STORAGE AND ACCESSORY EQUIPMENT
EDITION MARCH 2018
OFFSHORE ENERGY.DK

Process

SERVICE PLATFORM energy CLUSTER DENMARK

SIEMENS Gamesa RENEWABLE ENERGY

MHI VESTAS OFFSHORE WIND

LIC ENGINEERING A/S

DNV·GL

D I S

semco maritime

R&D

DESIGN - DNV GL



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Process – Lifting Guideline

P.O. KICKOFF
2017 March



WORK
2017 Apr-Sep



P.S. WORKSHOP
2017 Sep



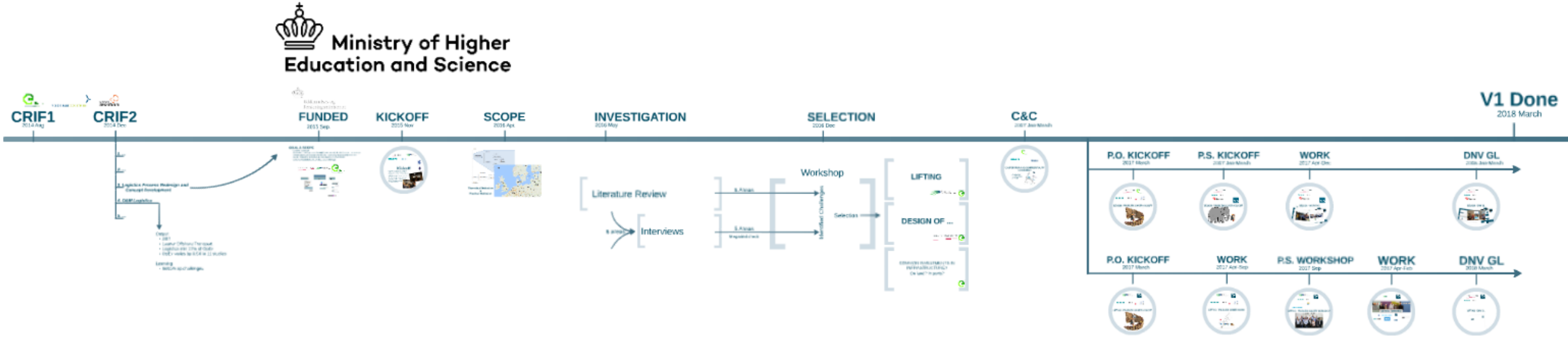
WORK
2017 Apr-Feb



DNV GL
2018 March



Process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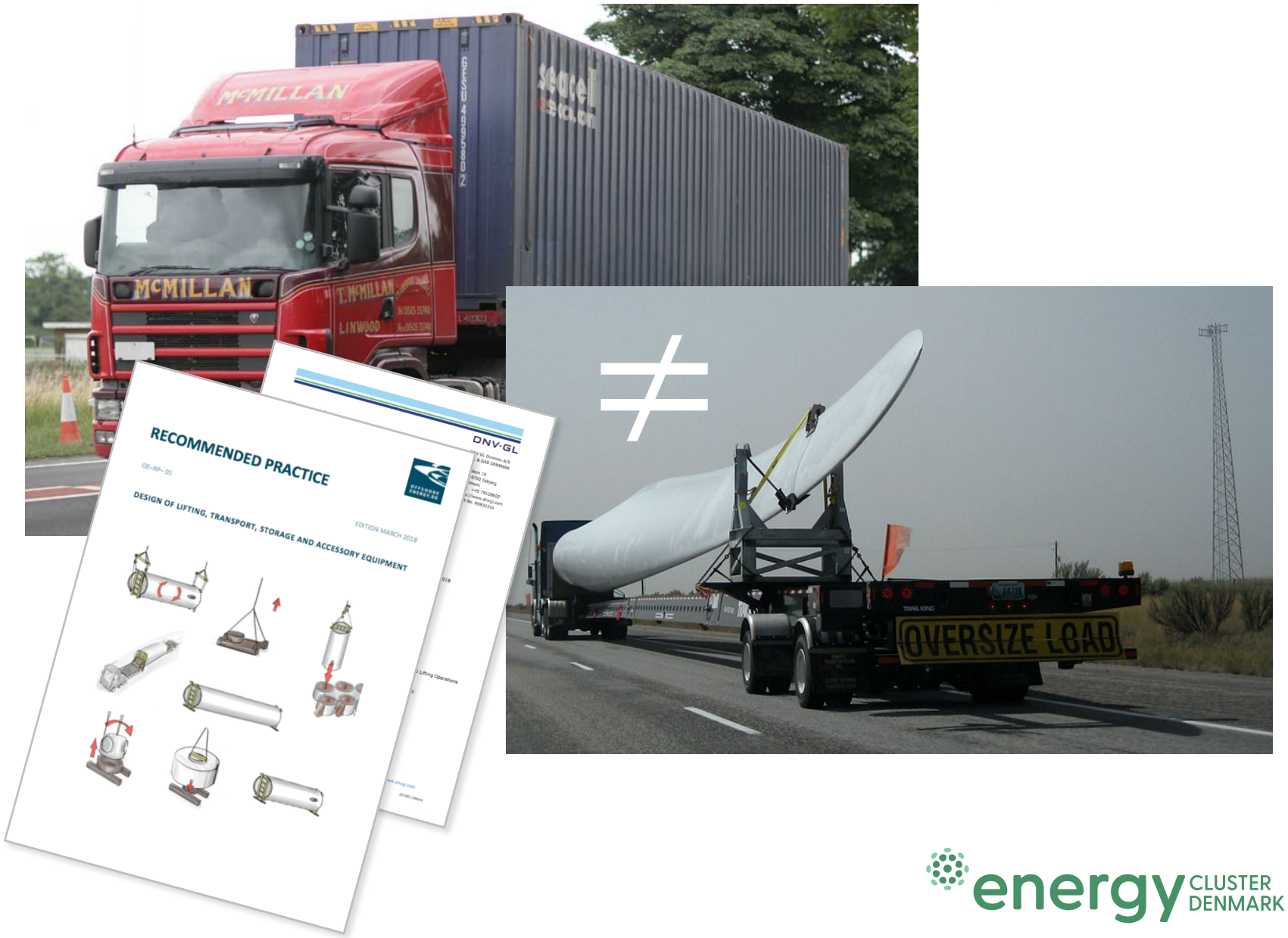
WORK
DNV GL
P.O. KICKOFF
WORK
P.S. WORKSHOP
WORK
DNV GL

Design

Why did we start?

- Made for offshore wind
- Reduce waste in design
- Concensus in recieved solutions
- Enable common solutions



Operation			Application Examples	Calculation approach	Loads	Load safety factors	Verification	Material safety factor	Fabrication	Aprovals
Lifting	Offshore	Rigging setup	Slings Shackles Chain set	DNVGL-ST-N001 [1]	DNVGL-ST-N001 [1]	DNVGL-ST-N001 [1]	DNV-GL-STN001 [1]	DNV-GL-STN001 [1]	Out of scope of this document	IACS, MWS
		Custom made lifting accessories	Lifting brackets Spreader beam Joints	DNVGL-ST-N001 [1] DNVGL-ST-0378 [2]	DNVGL-ST-N001 [1] DNVGL-ST-0378 [2]	DNVGL-ST-N001 [1] DNVGL-ST-0378 [2]	DNV-GL-ST- N001 [1] Buckling: EN 1993-1-1 [3] Bolts: VDI 2230 [4] / DNVGL-OS-C101 [5] / EN 1993-1-8 [6] Welds: DNVGL-OS-C101 [5]	DNVGL-STN001 [1] DNVGL-ST-0378 [2]	EN 1090 [7] or DNVGL-OS-C 401 [8] DNVGL-ST-0378 [2]	IACS, MWS and Certification
		Lifted object	Lifting points on lifted object	DNVGL-ST-N001 [1]	DNVGL-ST-N001 [1]	DNVGL-ST-N001 [1]		DNVGL-STN001 [1]	EN 1090 [7] or DNVGL-OS-C 401 [8]	
	Onshore	Rigging setup	Slings Shackles Chain set	DNVGL-ST-N001 [1]	DNVGL-ST-N001 [1]	DNVGL-ST-N001 [1] Verification acc. EN 13155 [9]	DNV-GL-ST- N001 [1]	Out of scope of this document	Out of scope of this document	CE Marking
		Custom made lifting accessories	Lifting brackets Spreader beam Joints	Machinery directive [10] EN 13155 [9]	EN 13155 [9]	Machinery directive [10] EN 13155 [9]	EN 13155 [9] Welds: EN 13155 [9] Basis material: EN 13155 [9] Bolts: VDI 2230 [4] / EN 1993-1-8 [6] Brittle Fracture: EN 1993-1-10 [11] Lamellar tearing: EN 1993-1-10 [11] Buckling: NL - Calc EN 1993-1-1 [3]	EN 13155 [9]	EN 1090 [7]	CE Marking
		Lifted object	Lifting points on lifted object							
Transport	Road	Supporting structures	Transport frames Joints	DNVGL-ST-N001 [1]	DNVGL-ST-N001 [1]	DNVGL-ST-N001 [1]	DNVGL-ST- N001 [1] Welds: EN 13155 [9] Basis material: EN 13155 [9] Bolts: VDI 2230 [4] / EN 1993-1-8 [6] Brittle Fracture: EN 1993-1-10 [11] Lamellar tearing: EN 1993-1-10 [11] Buckling NL – Calc: EN 1993-1-1 [3]	DNVGL-ST- N001 [1]	EN 1090 [7] or DNVGL-OS-C 401 [8]	None
		Lashing setup	Straps Chains, Schackles	EN 12195 [12]	EN 12195 [12]	EN 12195 [12]	EN 12195 [12]	EN 12195 [12]	Out of scope of this document	CE Marking
	Sea	Supporting Structures	Grillage/tower adapter frame Blade stacker Nacelle support frame	DNVGL-ST-N001 [1]	DNVGL-ST-N001 [1]	DNVGL-ST-N001 [1]	DNVGL-ST-N001 [1] DNVGL-OS-C104 [13] EN 1993-1-1 [3] DNVGL-RP-C203 [14]	DNVGL-ST-N001 [1]	EN 1090 [7] or DNVGL-OS-C 401 [8]	MWS
		Lashing setup	Bolts Corner casting pad eyes special node							
			Lashing seatransport vessel	IMO [15]	IMO [15]	IMO [15]	IMO [15]	IMO [15]	EN 1090 [7] or DNVGL-OS-C 401 [8]	MWS
			Lashing installation vessel	DNVGL-ST- N001 [1]	DNVGL-ST- N001 [1]	DNVGL-ST- N001 [1]	DNVGL-ST- N001 [1]	DNVGL-ST- N001 [1]	Out of scope of this document	IACS, MWS
Storage		Supporting structures	Temporary tower foundation Tower feet Blade support Nacelle support	EN1990 + NA (EC0) [16]	EN1991 + NA (EC1) [17]	EN1990 + NA (EC0)	EN 1992 + NA (EC2) [18] EN 1993 + NA (EC3) [11] EN 1995 + NA (EC5) [19] EN 1999 + NA (EC9) [20]	EN 1993 + NA (EC3) [11]	EN 1090 [7]	None

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Design

Land transport

- Minimum input from customer
- Design procedure

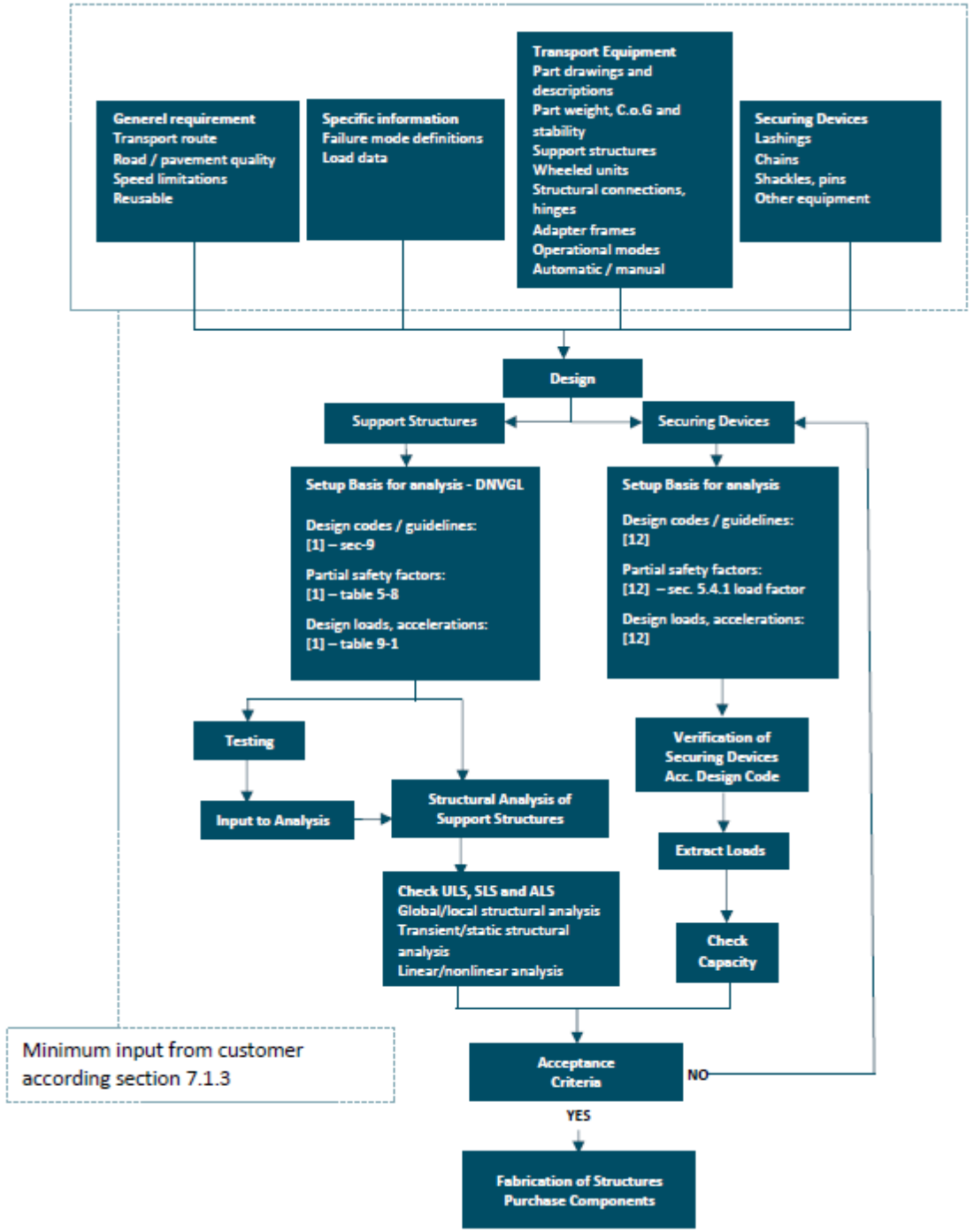

Figure 7-1 Road transport flowchart

Design Guideline

Requirement specification

- Introduction and general scope of work
- Function of the product/tool incl. area of use
- WTG component data
- Weight envelope, upper and lower boundary Technical requirements
  - Interface
  - Physical requirements (outer dimensions, weight, etc.)
  - Structural requirements
  - Design lifetime (user frequency)
  - Fabrication requirement
- Operational requirements/parameters
  - Environmental conditions, loads etc.
- Certification required
- Documentation requirements

Impact

Long term

Short Term

- Reduced waste in design process: 15% of design cost
- Uniform bids increases transparency and comparability of designs
- Correct use of factors reduces material cost
- Increased material choices
    - Reduces material & manufacturing cost
    - Reduces entry barriers for manufacturers increasing flexibility of the supply chain

Long Term

- Specific measurement projects to update standards
- Common equipment, e.g. tower transport

Results so far

- Vessel access aligned interfaces
- Aligned specification for surface preparation of casted components
- Aligned specification for internal environment
- Planning and execution of WTG lifting operations
- Design of lifting, transport, storage and accessory equipment
- Common Tower Tool

- Selection of new projects in process

Improvement

I have a suggestion

Your suggestions for improvement are welcome

www.eicluster.dk/rp

Soon available on new website



INPUT DOCUMENT

1. CONTACT INFORMATION			
Name		Phone	
Title		Email	
Company		Date	

2. DOCUMENT	
Name	E.g. RECOMMENDED PRACTICE & GUIDELINE - PLANNING AND EXECUTION OF WTG LIFTING OPERATIONS
Document code	E.g. OE–GL– 01
Edition	E.g. March 2018

3. CURRENT WORDING	
Heading	Copy paste in the heading(s) from the current document that your input is directly relevant for. E.g. 5.2 DEFINITIONS
Text	Copy paste in the text from the document that your input is directly relevant for. E.g. Coefficient factors Various factors used to calculate wind loading.

4. SUGGESTED WORDING	
Heading	As above. E.g. 5.2 DEFINITIONS
Text	As above and change it to your suggestion using track changes. E.g. Coefficient factors Various factors used to calculate wind loading in offshore wind.

5. REASONING
What are the advantages of your suggested wording?

Please send one input document pr. suggested change.

Send your input to

Contact information



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+45 5055 2606| cmj@energycluster.dk

Energy Cluster Denmark
energycluster.dk