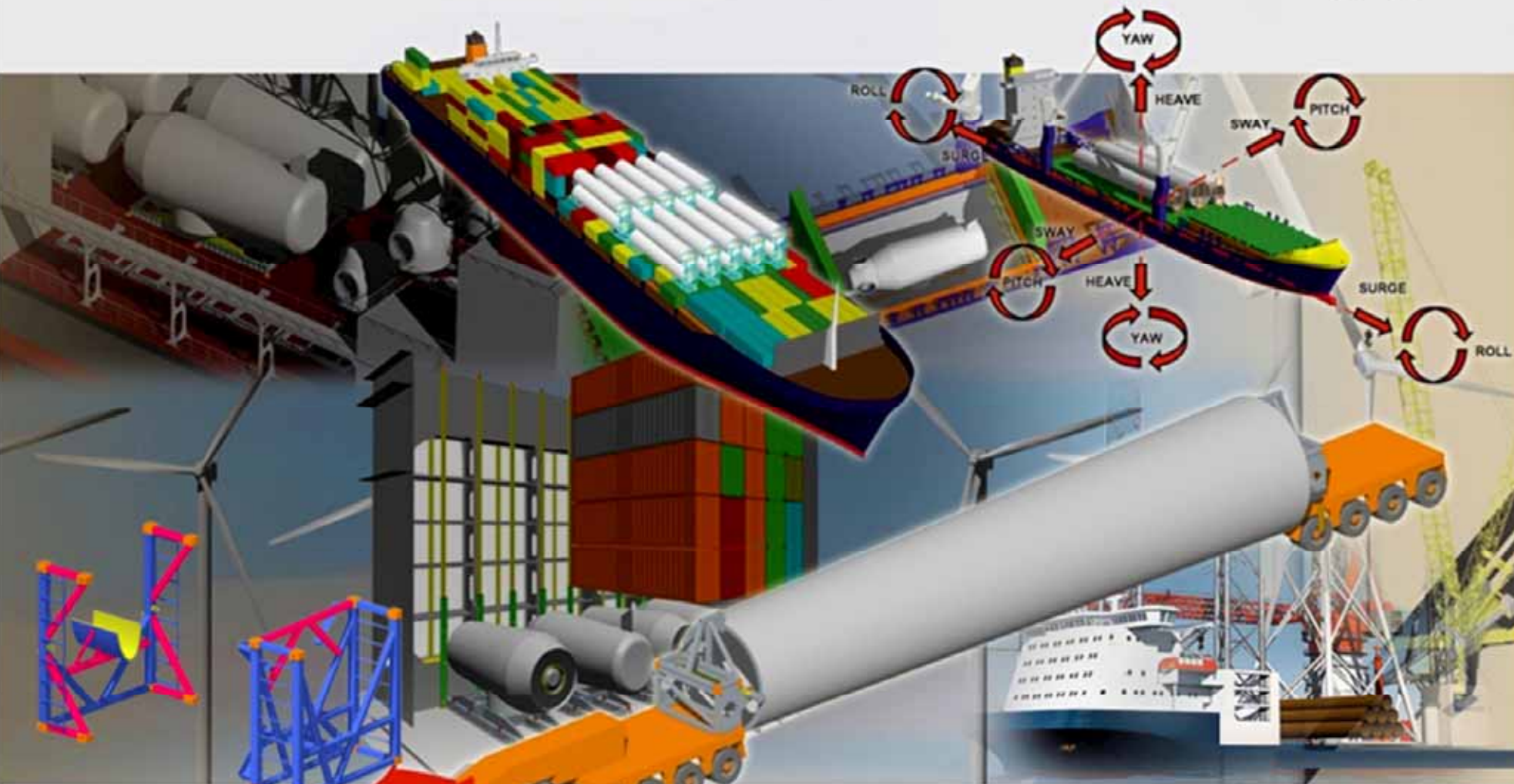


# WADER-WITTIS GMBH

WIND TURBINE TRANSPORTATION & INSTALLATION SYSTEMS

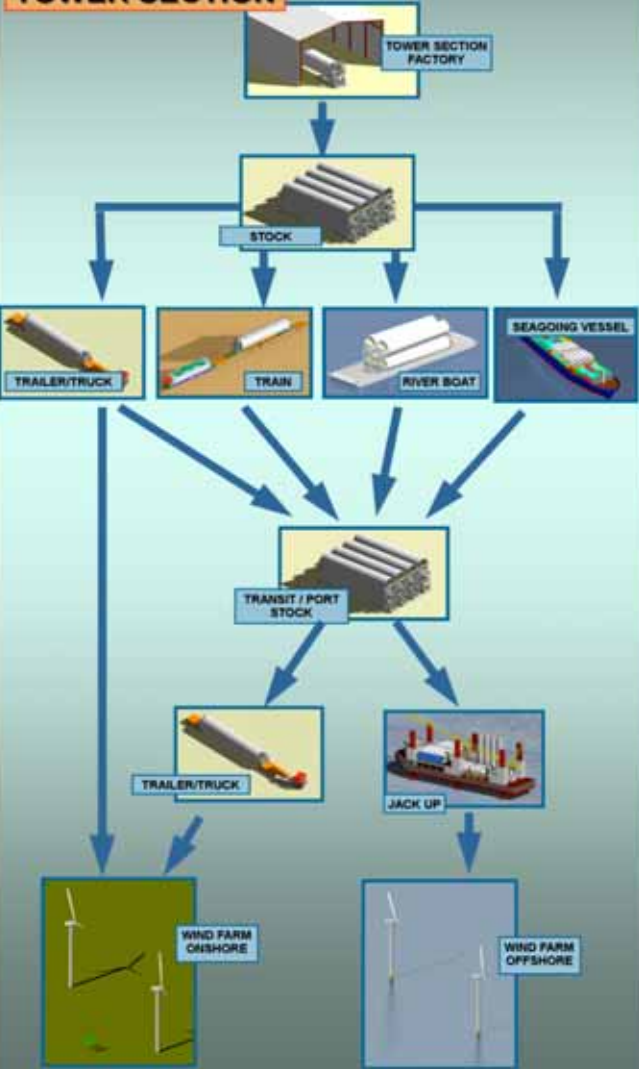


# WADER - WITTIS

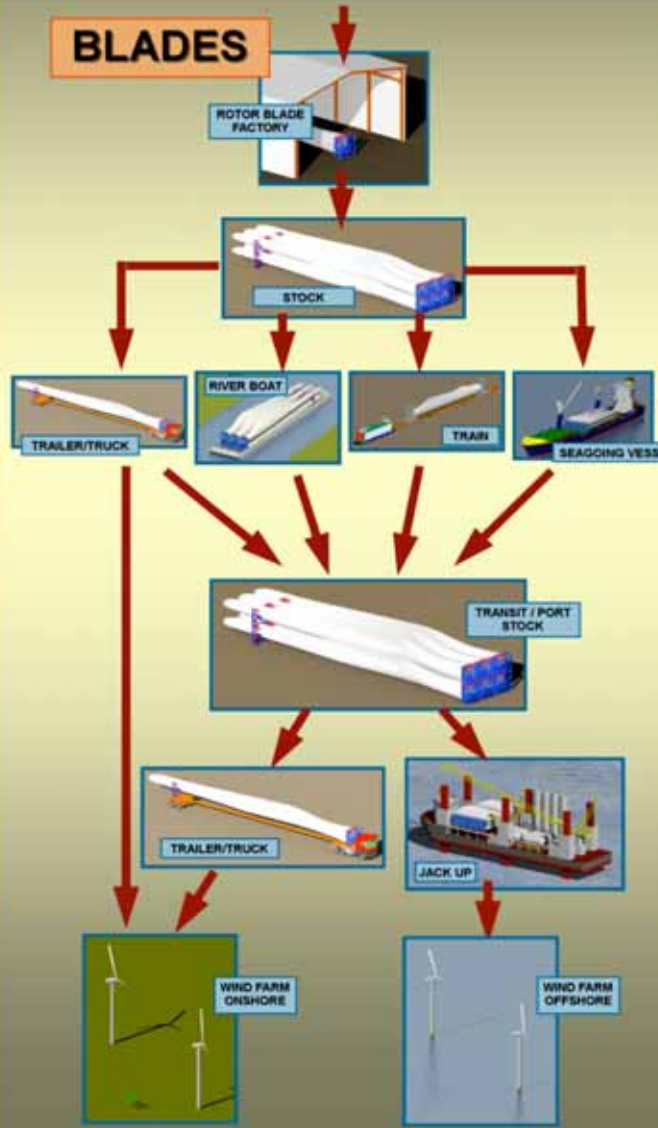
# SUPPLY CHAIN FOR WIND TURBINE MAIN COMPONENTS

## MATERIAL & SUB SUPPLIER

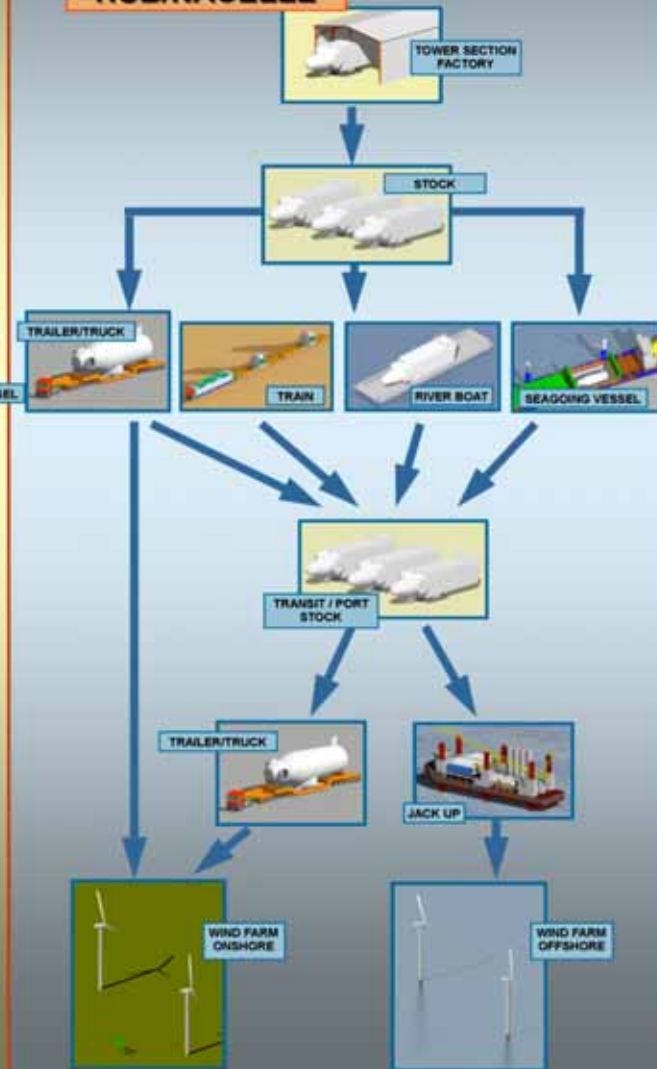
### TOWER SECTION



### BLADES

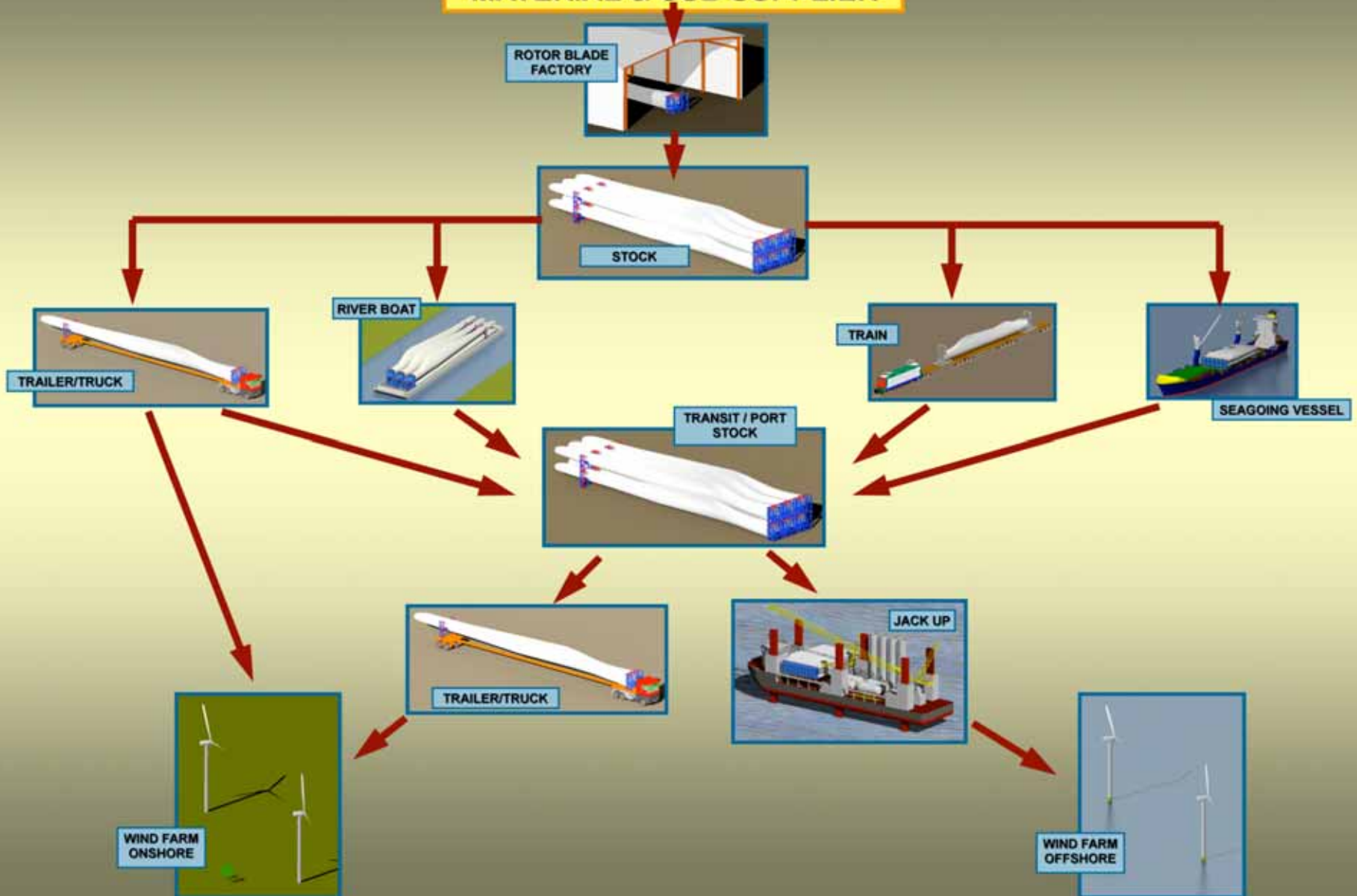


### HUB/NACELLE



# SUPPLY CHAIN - BLADES

## MATERIAL & SUB SUPPLIER



# TRANSPORT & SECURING OF BLADES

**STORAGE & LOADING WITH CONVERTED FRAMES**

FRAME 1

**STORAGE BLADES IN FACTORY**

FRAME 2

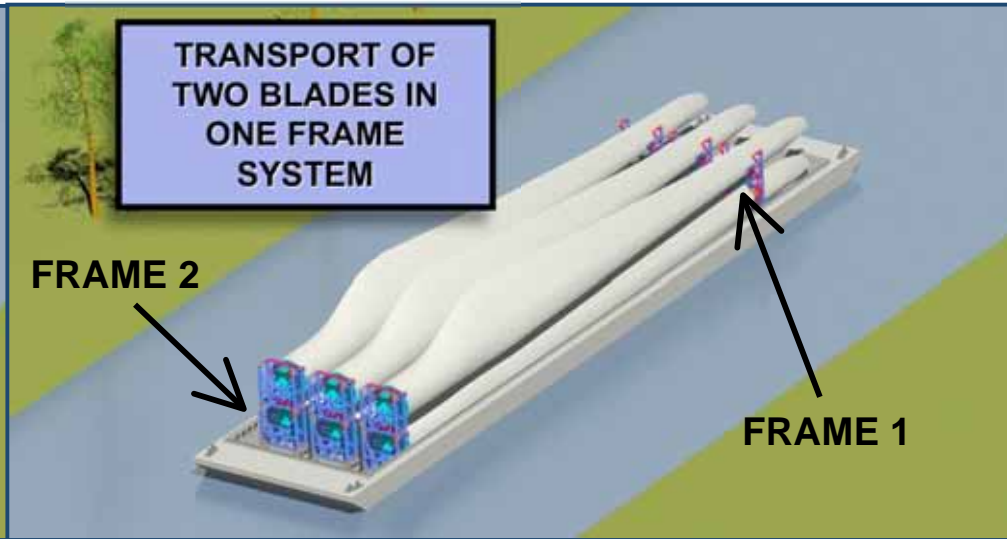
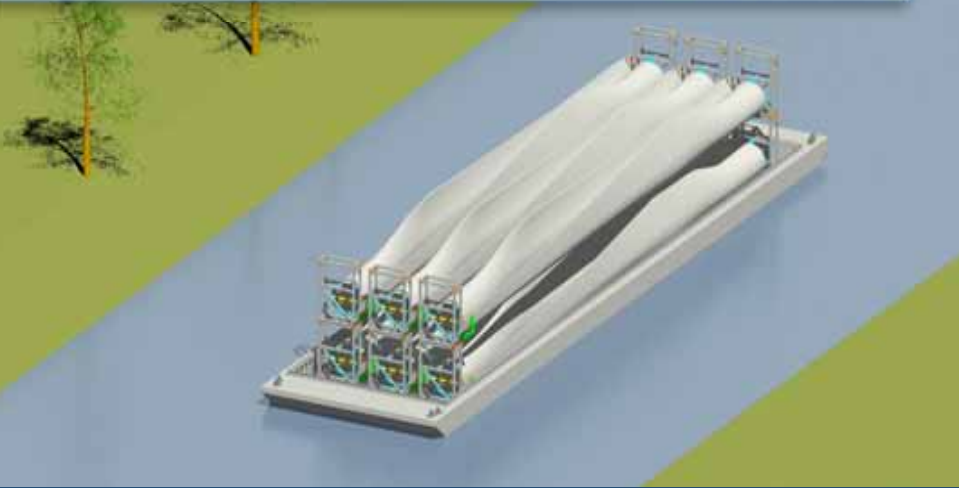
**LOADING OF BLADE ON TRUCK**

**BLADE ON TRUCK**

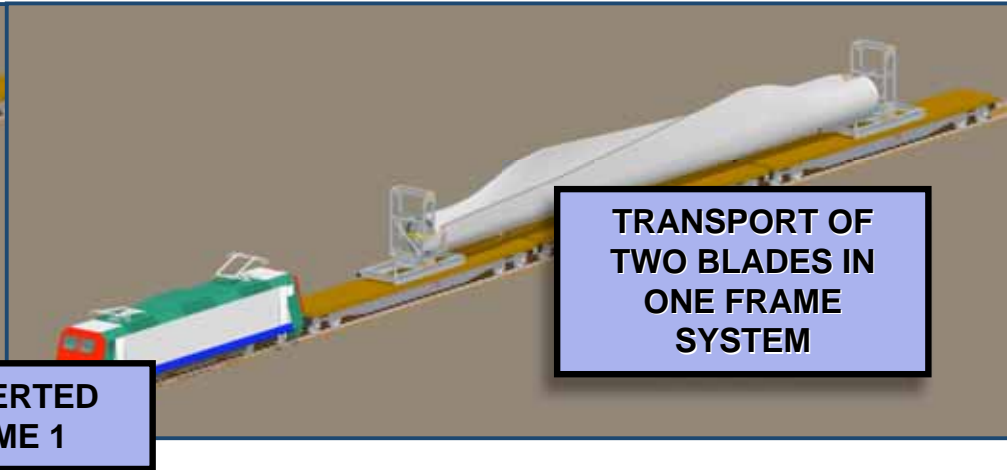
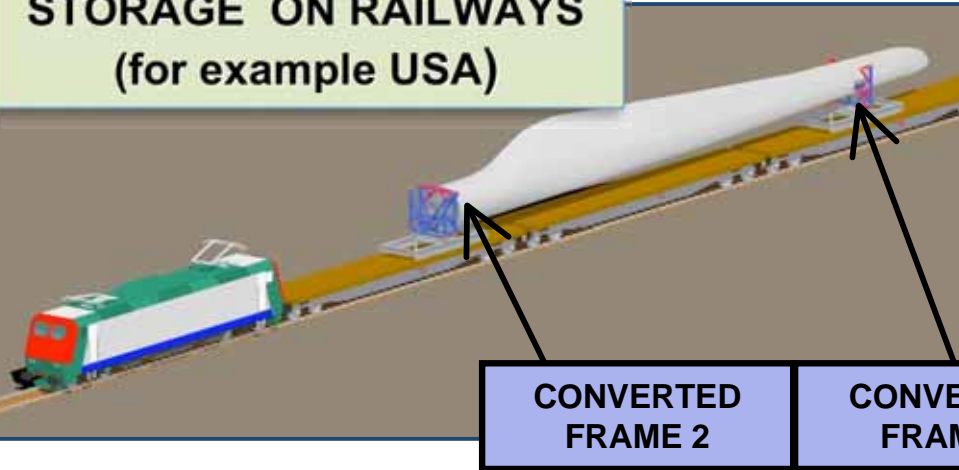


# STORAGE & LOADING WITH CONVERTED FRAMES

## STORAGE OF BLADES ON RIVER BOATS



## STORAGE ON RAILWAYS (for example USA)



# STORAGE & LOADING WITH CONVERTED FRAMES

**STOWAGE OF BLADES ON SEAGOING VESSELS**



**STOWAGE OF TWO BLADES IN ONE FRAME SYSTEM**



**STOWAGE ON 1st. TIER OF 20FT CONTAINER ON PAN MAX OR POSTPAN MAX CONTAINER VESSEL**

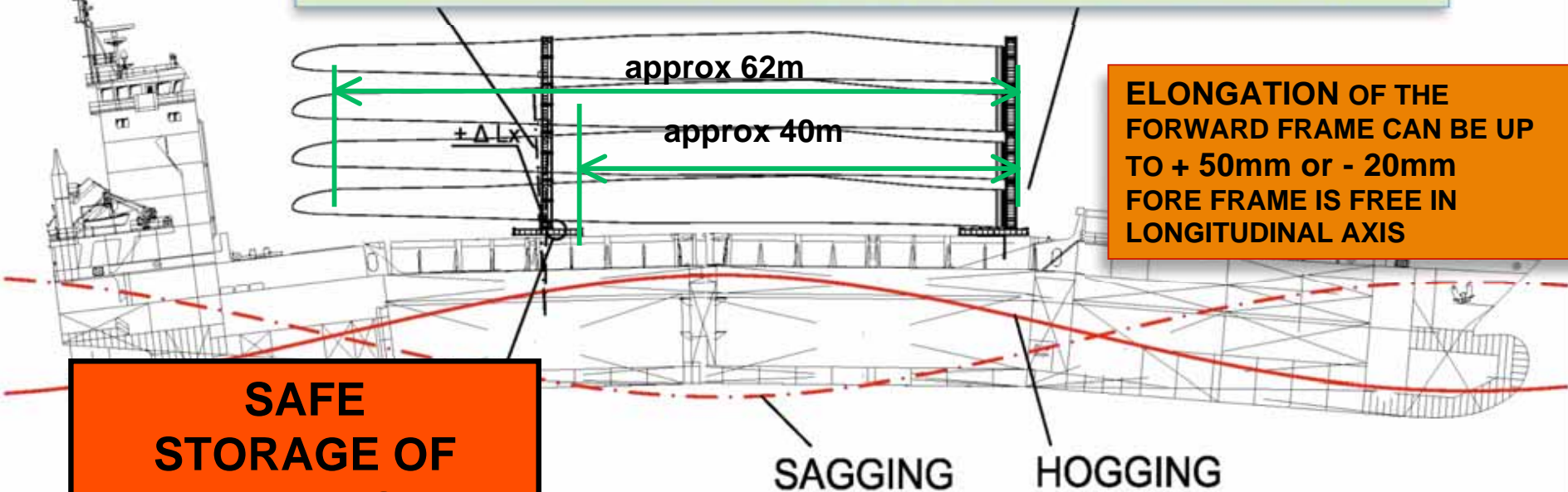


# VESSEL IN HOGGING/SAGGING CONDITION

FIXED SUPPORT IN X DIRECTION  
SLIDING SUPPORT IN Y DIRECTION

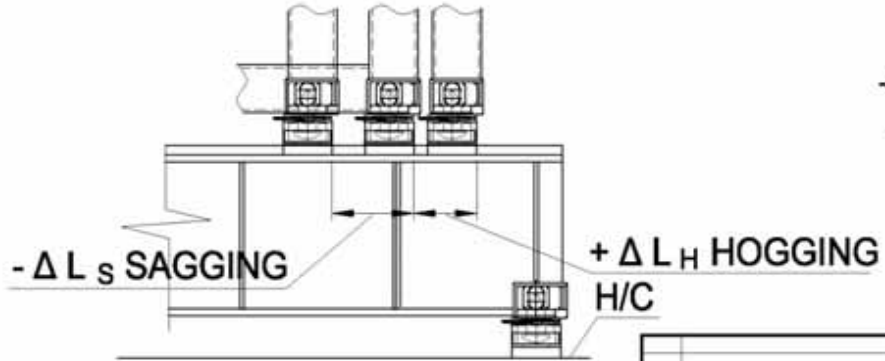
FIXED SUPPORT IN X DIRECTION  
SLIDING SUPPORT IN Y DIRECTION

## VESSEL IN HOGGING OR SAGGING CONDITION



**ELONGATION OF THE FORWARD FRAME CAN BE UP TO + 50mm or - 20mm  
FORE FRAME IS FREE IN LONGITUDINAL AXIS**

**SAFE STORAGE OF BLADES**



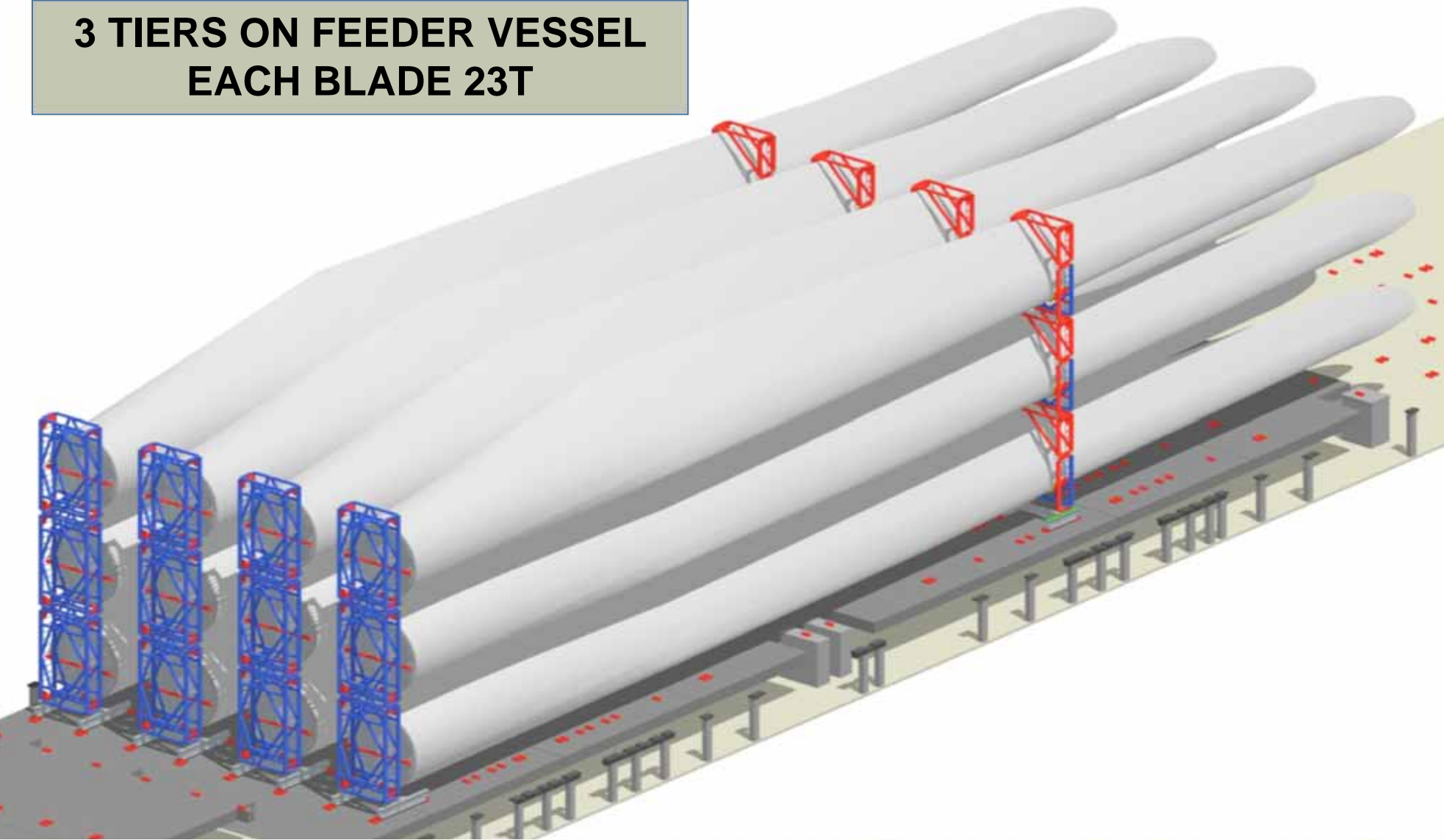
+  $\Delta L_H$  = displacement due to hogging condition  
-  $\Delta L_S$  = similar in case of sagging condition but smaller values

INDEX		DATE		NAME				LOGISTIC & INSTALLATION SYSTEMS FOR WINDTURBINES		SCALE NTS	
								DRAWN WM	VESSEL IN HOGGING/SAGGING CONDITION		DWG. NO. 80070079-03-01
								DATE 07.05.2010			8
								UP TO DATE			



# STOWAGE & SECURING OF CONVERTED FRAMES FOR OFFSHORE BLADE TRANSPORT ON FEEDER VESSEL

**3 TIERS ON FEEDER VESSEL  
EACH BLADE 23T**

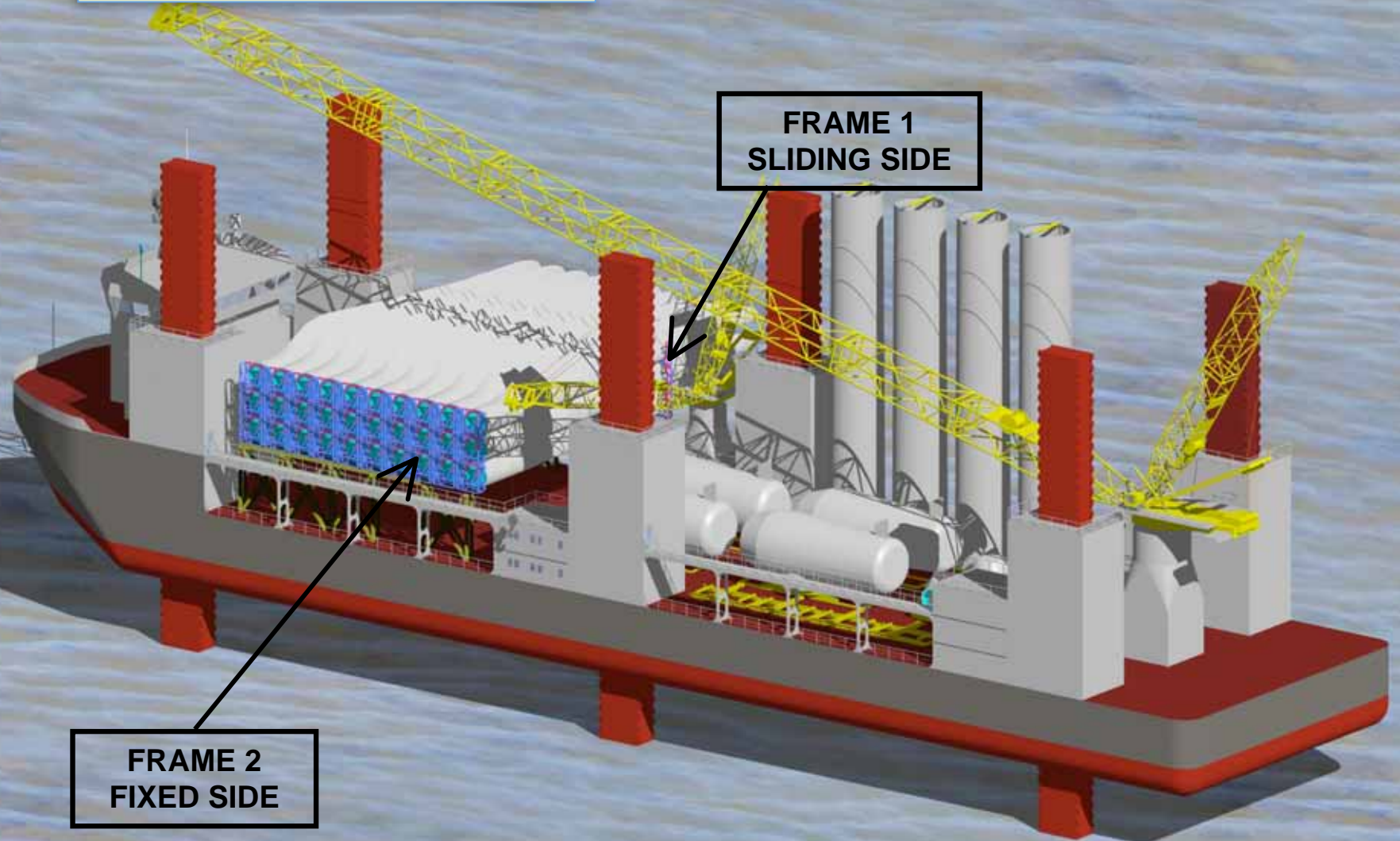


# STORAGE & LOADING WITH CONVERTED FRAMES

**STORAGE ON JACK UP**

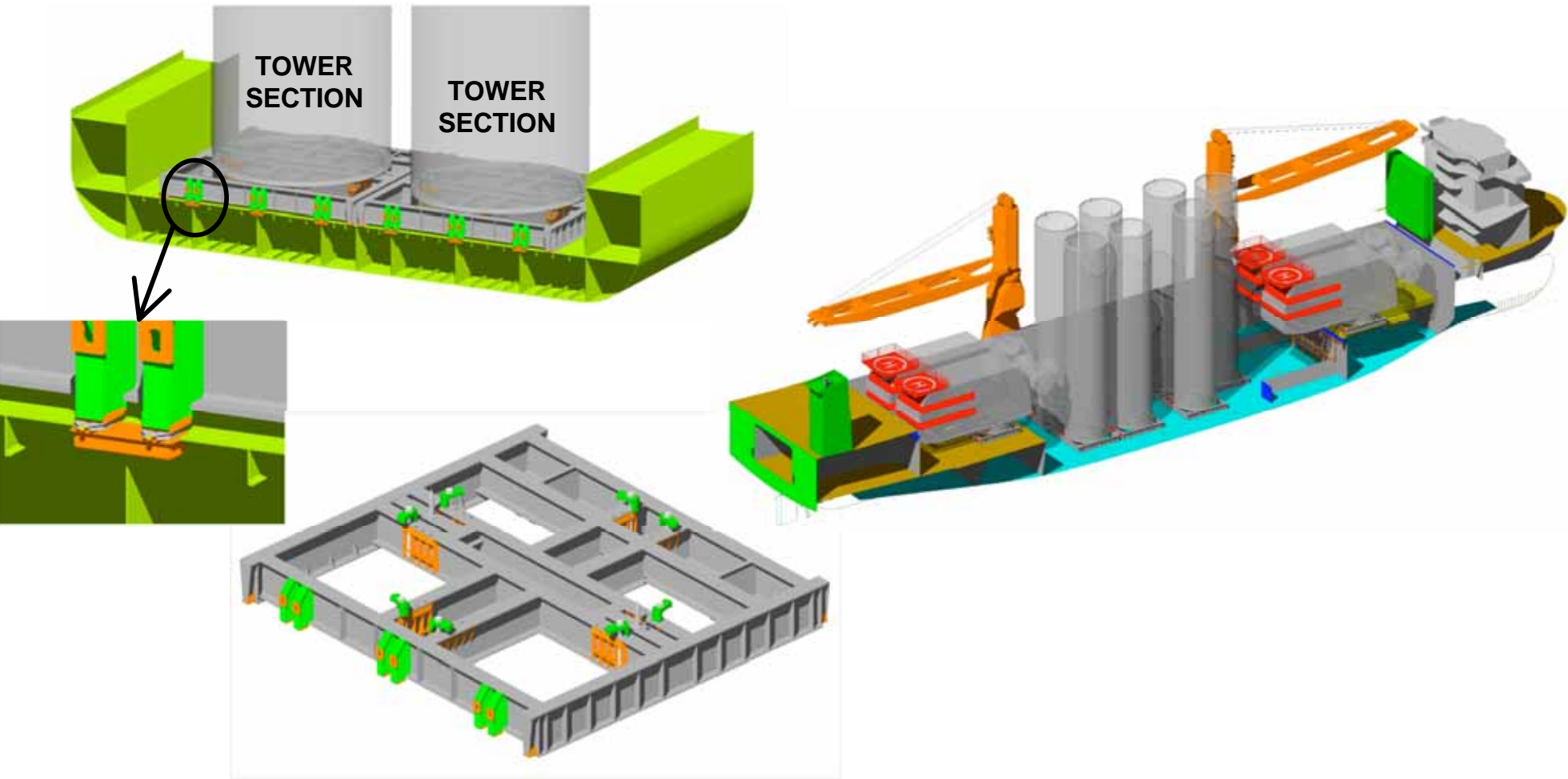
**FRAME 1  
SLIDING SIDE**

**FRAME 2  
FIXED SIDE**



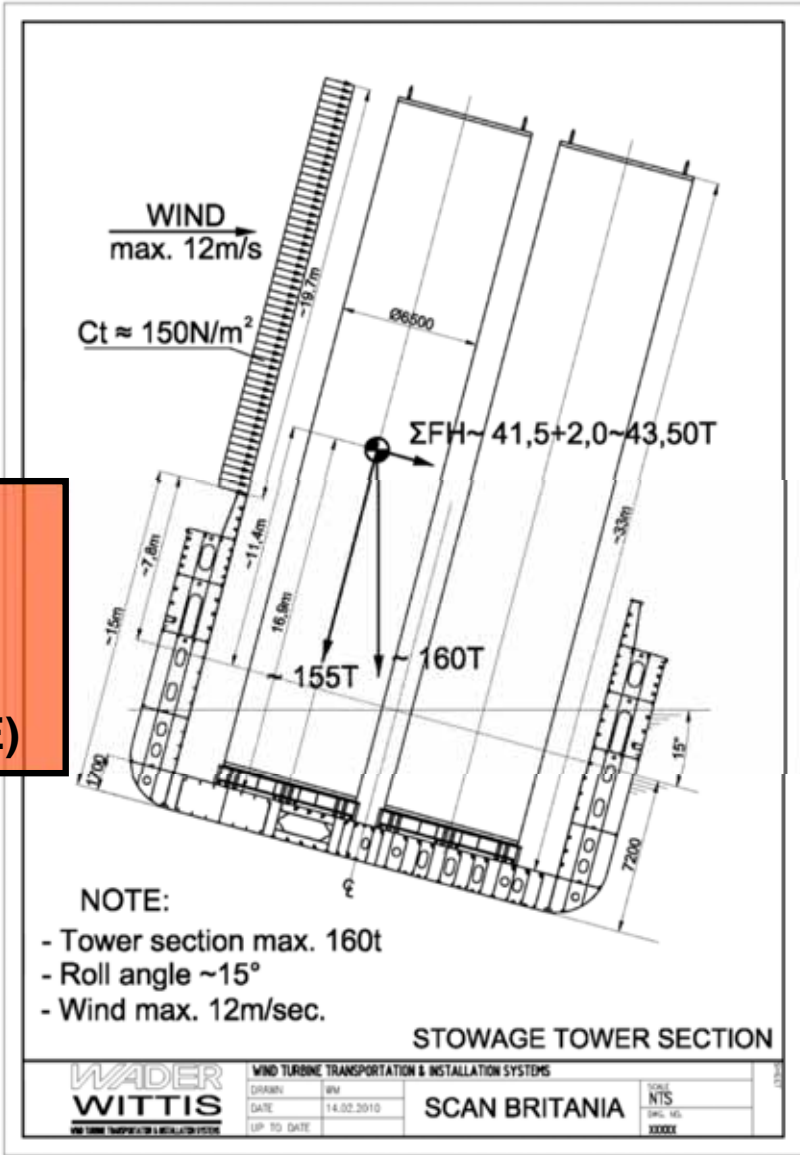
# TRANSPORT FRAMES FOR TOWER SECTION APPROX. 40M LONG ON FEEDER VESSEL

TRANSPORT IN VERTICAL POSITION IN HOLD  
OF HEAVY LIFT VESSEL  
OPEN HATCH WITH RESTRICTED VOYAGE



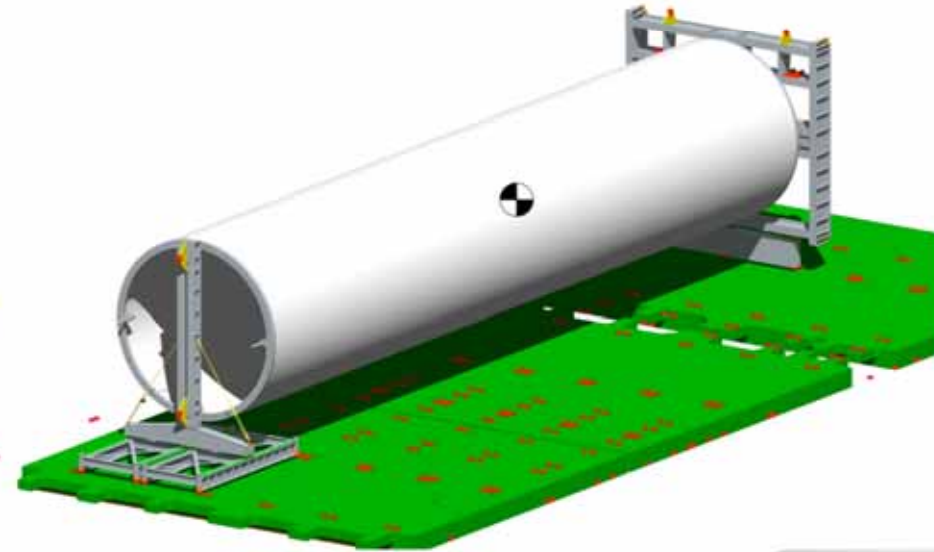
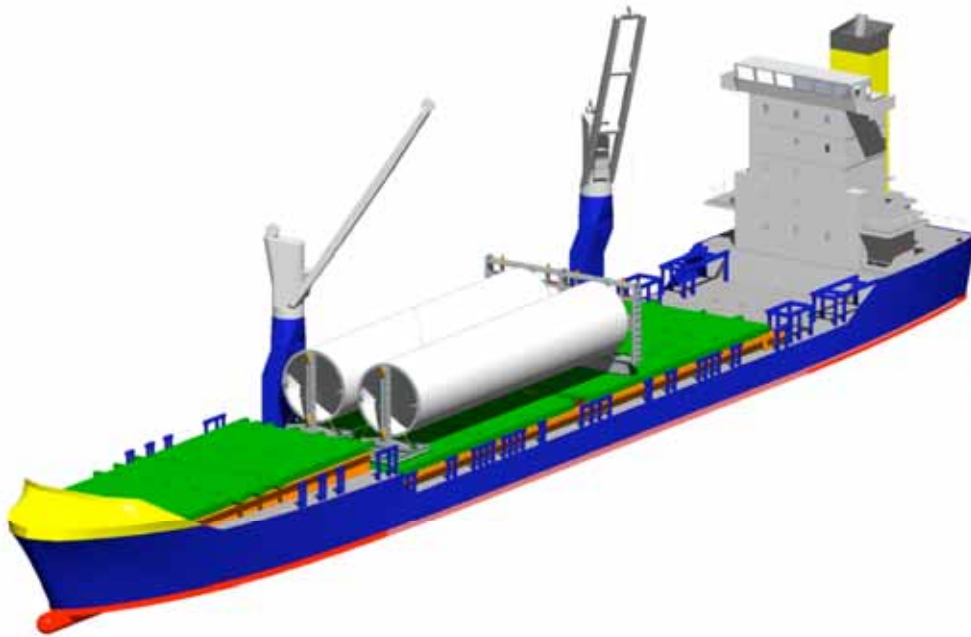
# FRAMES FOR TOWER SECTION TRANSPORT

**ACTUAL FORCES  
ROLLING & WIND  
FOR TOWER SECTION  
WITH OPEN HATCH  
(RESTRICTED VOYAGE)**

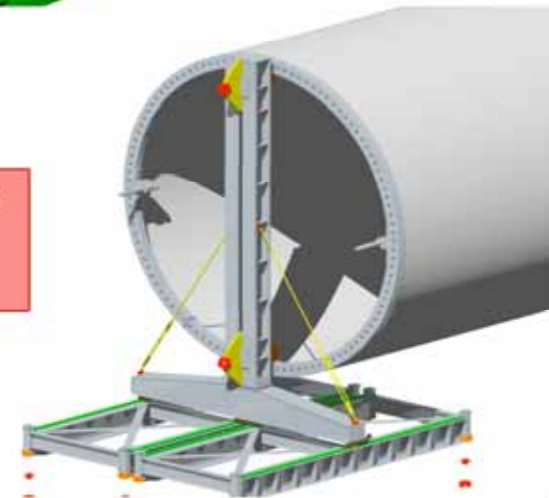


# FRAMES FOR LONG TOWER SECTION TRANSPORT

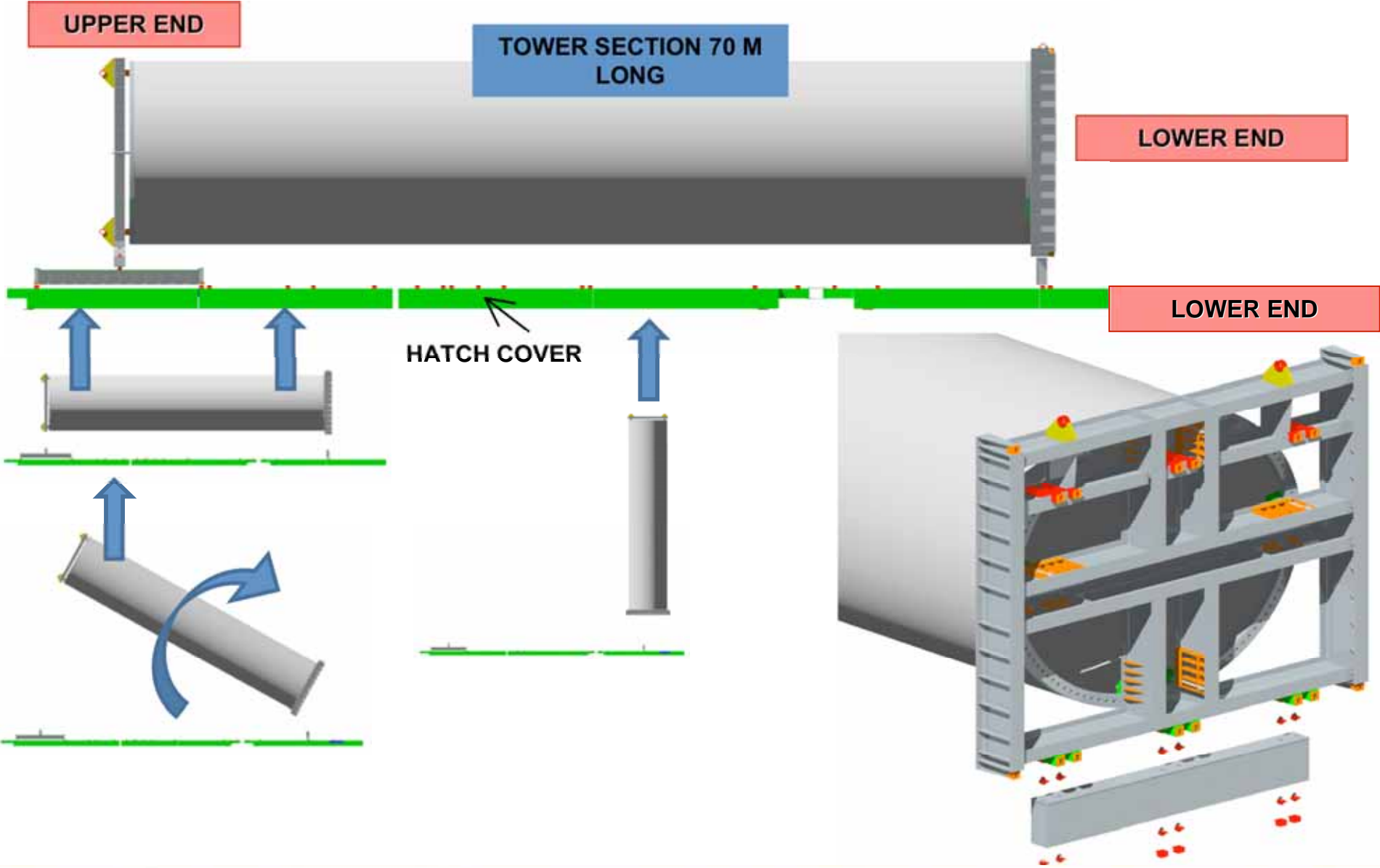
**TRANSPORT OF 70 m LONG TOWER SECTIONS & LONGER IN HORIZONTAL POSITION ON FEEDER VESSEL**



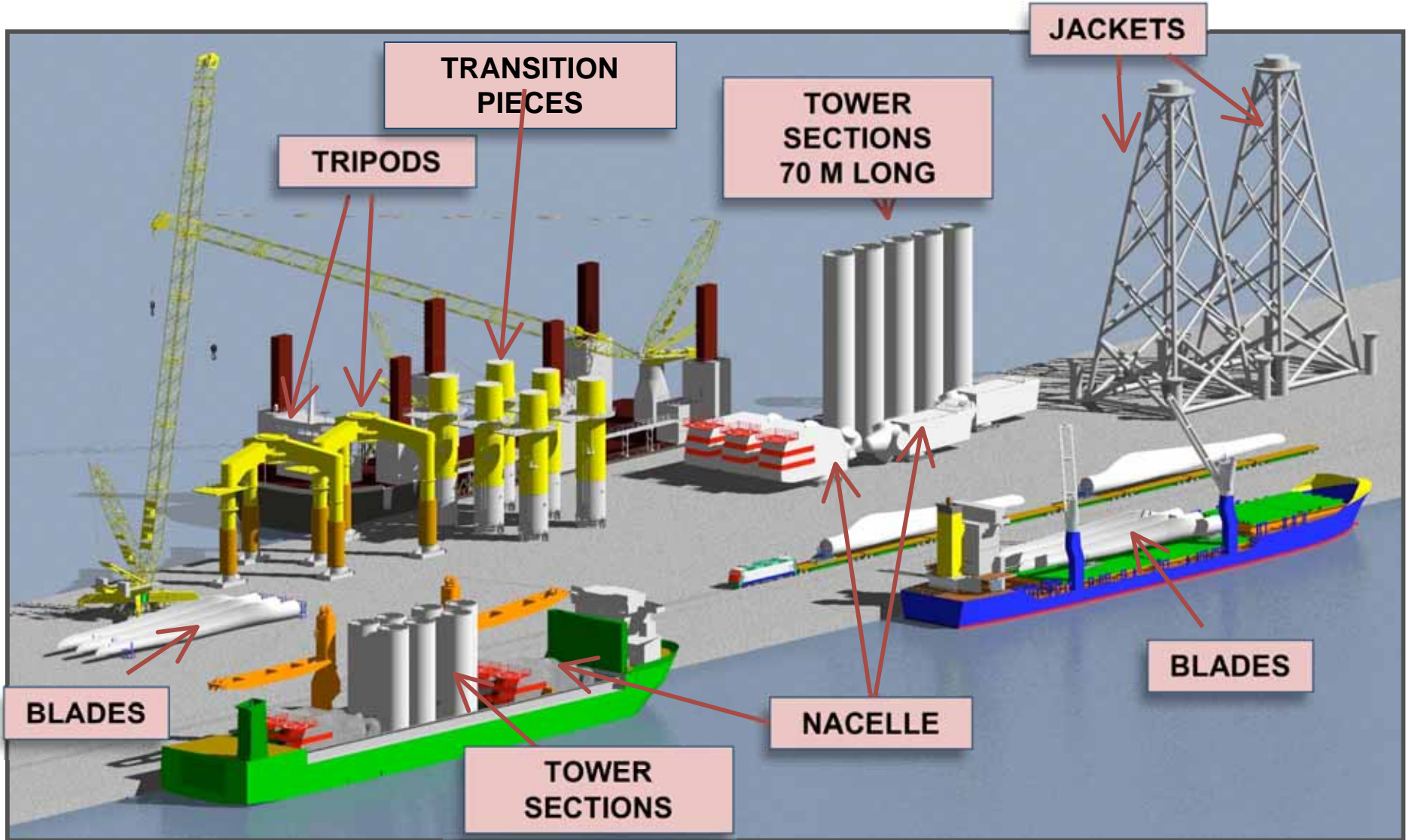
**UPPER END OF  
TOWER  
SECTION**



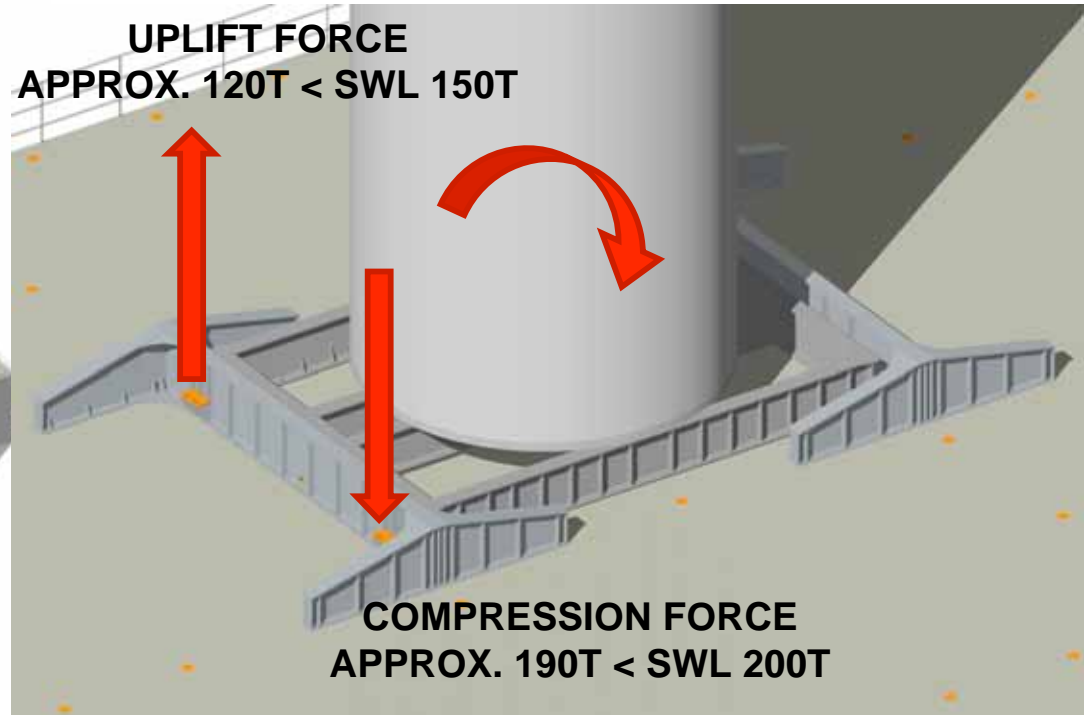
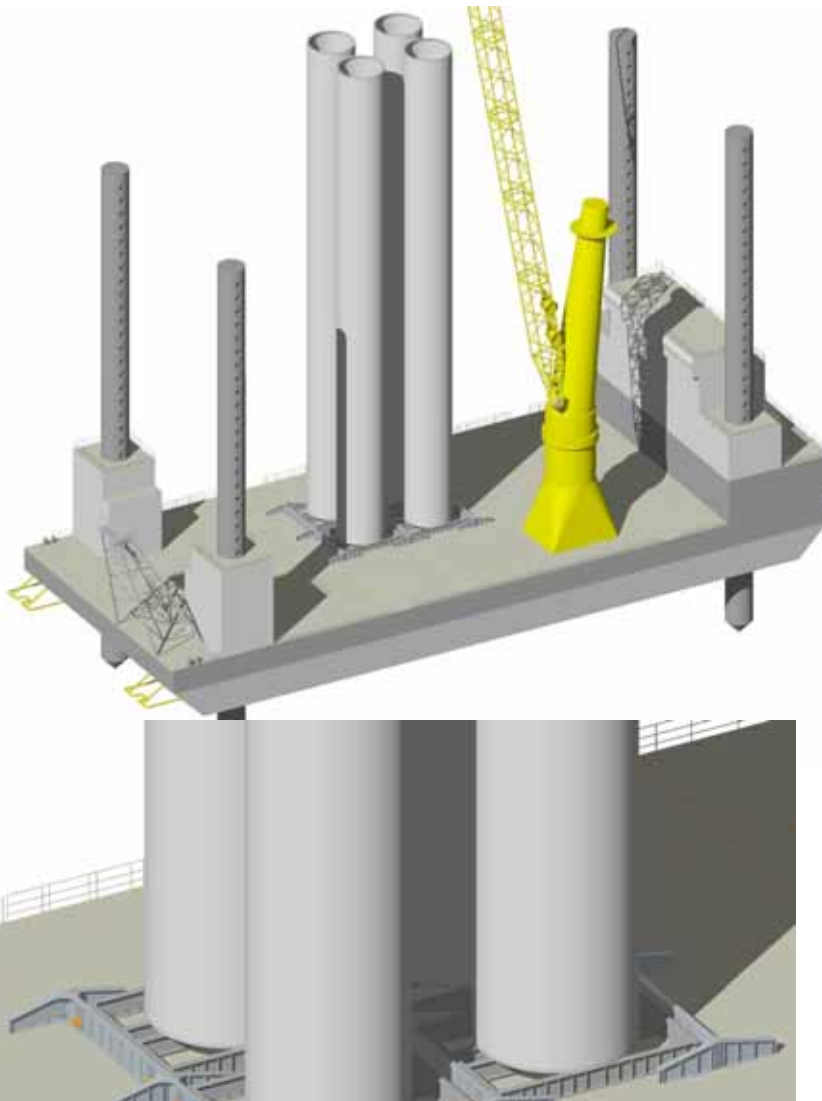
# FRAMES FOR TOWER SECTION TRANSPORT



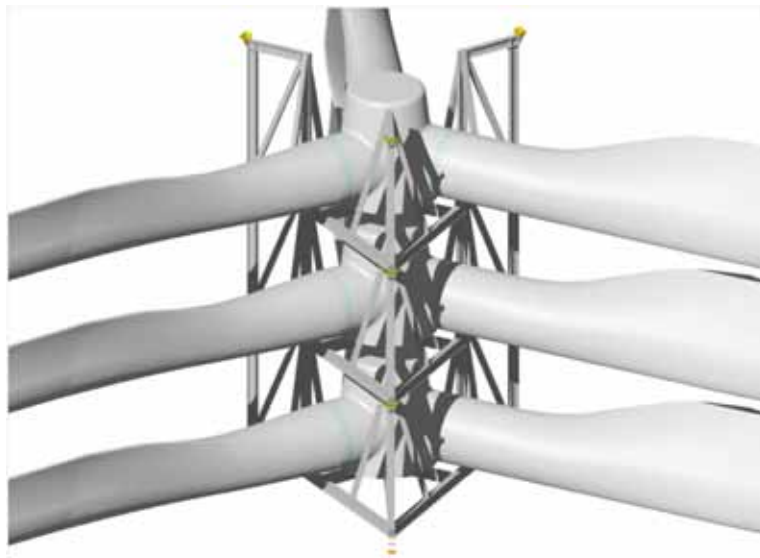
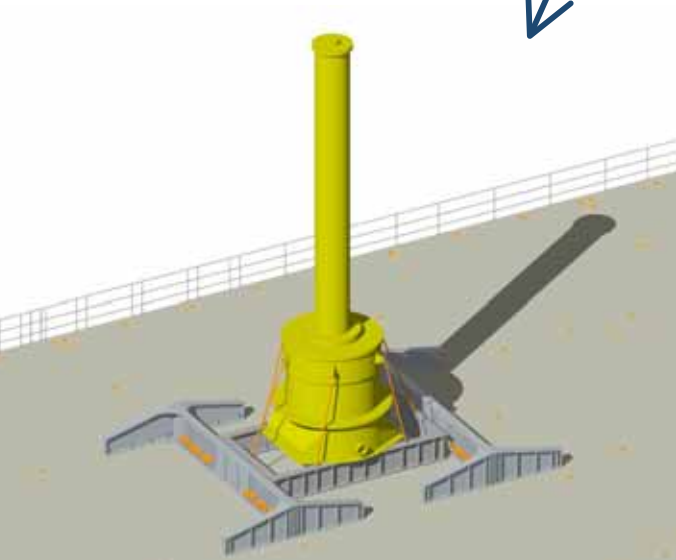
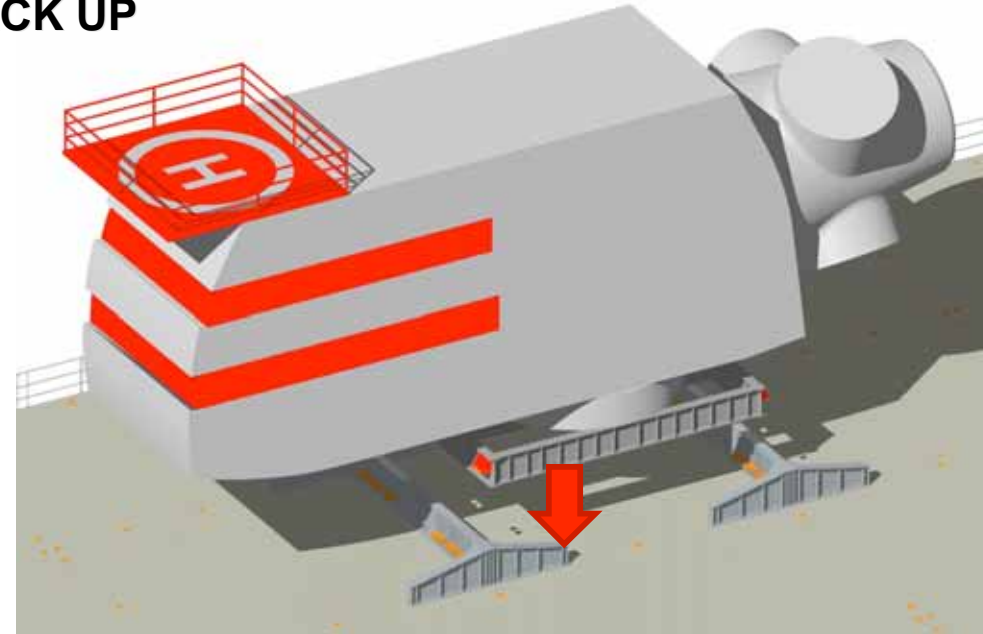
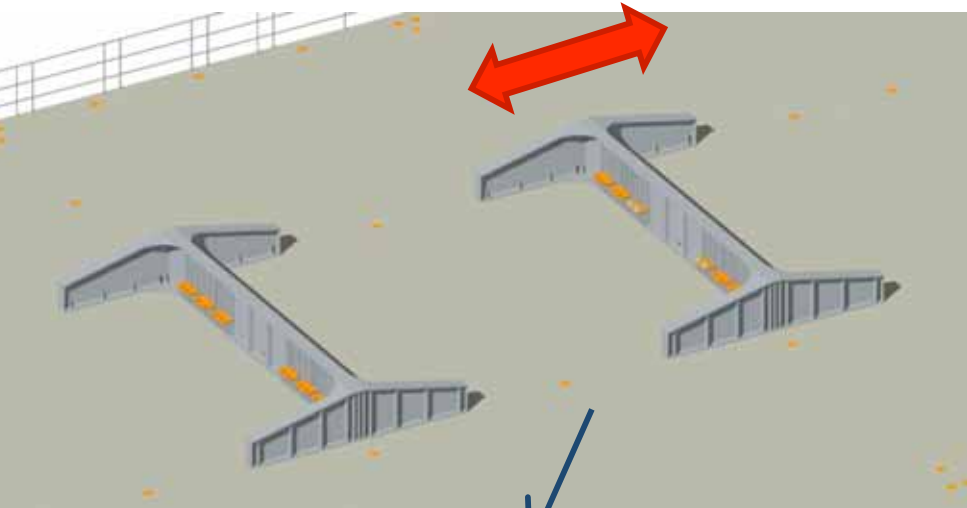
# JACK UP TERMINAL COMPONENTS READY FOR TRANSPORT



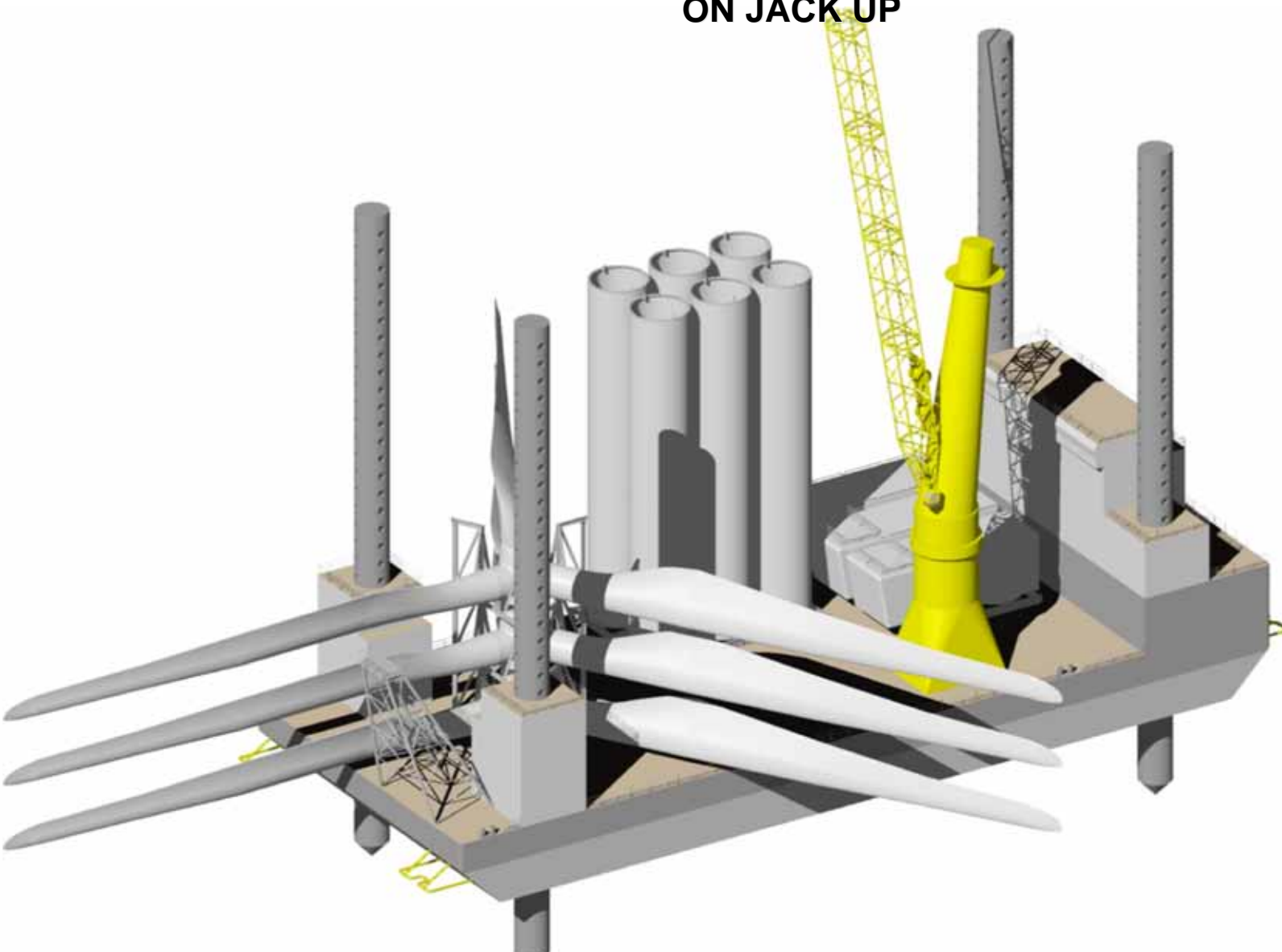
# H-TYPE FRAMES FOR TOWER SECTION TRANSPORT IN UPRIGHT POSITION ON JACK UP



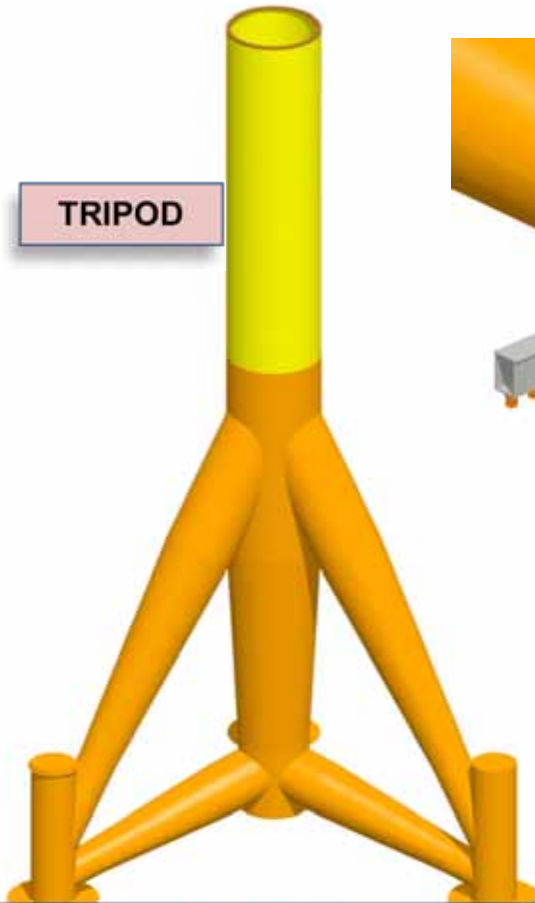
# H-TYPE FRAMES FOR TOWER SECTION, HAMMER & STARS (HUBS WITH 3 BLADES) ON JACK UP



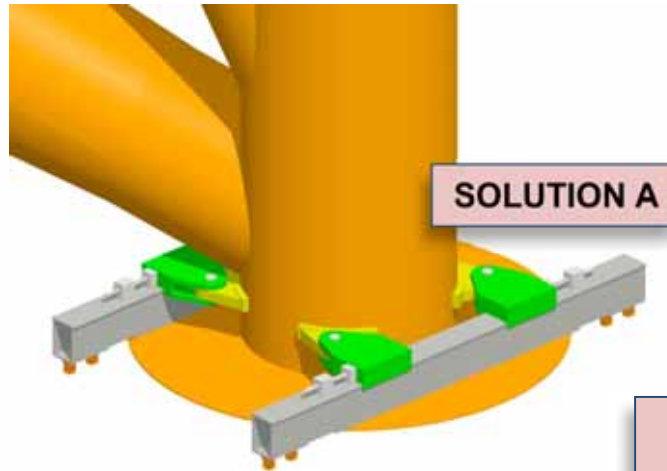
# FRAMES FOR TRANSPORT & SECURING OF WIND TURBINE ELEMENTS ON JACK UP



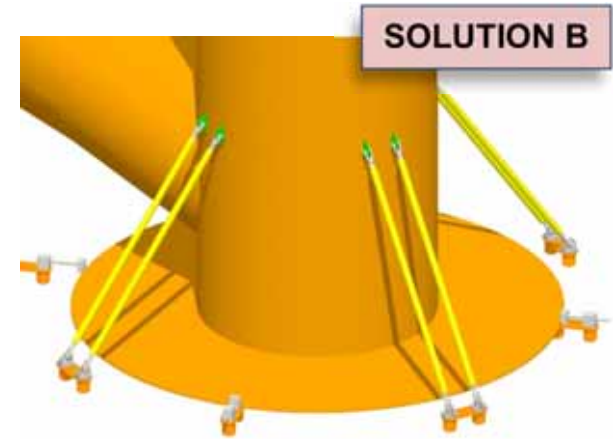
# SECURING OF TRIPODS ON JACK UPS



TRIPOD

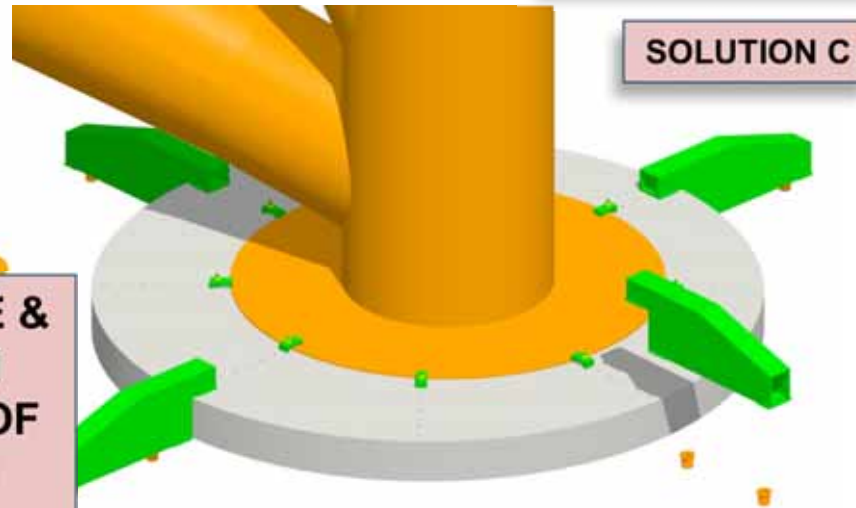


SOLUTION A



SOLUTION B

NO WELDING, NO CUTTING  
NO „HOT WORK“  
EASY & SAFE SYSTEMS



SOLUTION C

3 ALTERNATIVE STORAGE &  
SECURING SYSTEMS ON  
JACK UPS FOR TRIPODS OF  
900 T WEIGHT AND 60 M  
LONG

