

REPORT

NFR PROJECT 225946/E20 – RENERGIX CONCRETE SUBSTRUCTURE FOR FLOATING OFFSHORE WIND TURBINES MOORING ANALYSES – PHASE II



REPORT



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Project Owner: Appendix - design load cases

The time domain Fatigue Limit State (FLS) and Ultimate Limit State (ULS) analyses require several design load cases (DLC) in order to provide accurate results. The DLC matrices for FLS and ULS are presented in Section 10.1 and 10.2.

1.1 Design Load Cases for Fatigue limit state

FLS load conditions are given in Table 10-1. General assumptions applicable to all load cases (see Section 5.2.1):

- > 1 seed per case
- > 30 minutes analysis time per case
- > Pierson-Moskowitz wave spectrum
- > Spread 10.0
- > Current exponent 0.120
- > Mean water depth 100 m
- > Normal Turbulence Model (NTM) wind, ref. IEC61400-1
- > No misalignment between wind and waves
- > Table 10-1: Design load cases and corresponding yearly duration for fatigue calculations, PM-spectra

DLC	FLS	Waves			Current		Wind					Time
	Run-id	Hs	Tp	Dir	vcurr	Dir	U,hub	I,amb	Ieff	Exp	Dir	
	[Fxx]	[m]	[s]	[Deg]	[m/s]	[Deg]	[m/s]	[%]	[%]	[.]	[Deg]	Hours/year
Production	01	1.184	7.314	0	0.21	0	6	0.08	0.24	0.07	0	177.8
	02	1.652	7.673	0	0.315	0	10	0.06	0.19	0.08	0	224.3
	03	1.951	7.903	0	0.42	0	11	0.05	0.19	0.08	0	97.4
	04	2.722	8.494	0	0.525	0	12	0.06	0.18	0.09	0	119.1

	5.1	3.215	8.872	0	0.743077	0	16	0.058	0.168	0.09	0	25.4
	5.2	3.797	9.319	0	0.767308	0	18	0.061	0.163	0.09	0	18.4
	5.3	6.255	11.205	0	0.84	0	20	0.064	0.159	0.1	0	10.5
Production	08	1.184	7.314	330	0.21	0	6	0.08	0.24	0.07	330	147.2
	09	1.652	7.673	330	0.315	0	10	0.06	0.19	0.08	330	129.6
	10	1.951	7.903	330	0.42	0	11	0.05	0.19	0.08	330	41.3
	11	2.722	8.494	330	0.525	0	12	0.06	0.18	0.09	330	39.4
	12	6.100	11.086	330	0.84	0	16	0.064	0.168	0.09	330	15.8
Production	15	1.184	7.314	300	0.21	0	6	0.08	0.24	0.07	300	117.4
	16	1.652	7.673	300	0.315	0	10	0.06	0.19	0.08	300	96.4
	17	1.951	7.903	300	0.42	0	11	0.05	0.19	0.08	300	29.9
	18	2.722	8.494	300	0.525	0	12	0.06	0.18	0.09	300	24.5

	19	5.400	10.549	300	0.84	0	16	0.064	0.168	0.09	300	10.5
Production	22	1.184	7.314	270	0.21	0	6	0.08	0.24	0.07	270	120.9
	23	1.652	7.673	270	0.315	0	10	0.06	0.19	0.08	270	99.9
	24	1.951	7.903	270	0.42	0	11	0.05	0.19	0.08	270	46.5
	25	2.722	8.494	270	0.525	0	12	0.06	0.18	0.09	270	51.7
	26	6.255	11.205	270	0.84	0	16	0.064	0.168	0.09	270	21.0
	29	1.184	7.314	240	0.21	180	6	0.08	0.24	0.07	240	131.4
Production	30	1.652	7.673	240	0.315	180	10	0.06	0.19	0.08	240	147.2
	31	1.951	7.903	240	0.42	180	11	0.05	0.19	0.08	240	63.2
	32	2.722	8.494	240	0.525	180	12	0.06	0.18	0.09	240	100.7
	33	6.255	11.205	240	0.84	180	16	0.064	0.168	0.09	240	53.4

Production	36	1.184	7.314	210	0.21	180	6	0.08	0.24	0.07	210	176.1
	37	1.652	7.673	210	0.315	180	10	0.06	0.19	0.08	210	241.8
	38	1.951	7.903	210	0.42	180	11	0.05	0.19	0.08	210	120.1
	39	2.722	8.494	210	0.525	180	12	0.06	0.18	0.09	210	162.1
	40.1	3.215	8.872	210	0.743077	180	16	0.055	0.168	0.09	210	42.9
	40.2	3.797	9.319	210	0.767308	180	18	0.058	0.163	0.09	210	26.3
	40.3	6.255	11.205	210	0.84	180	20	0.061	0.159	0.1	210	22.8
Production	43	1.184	7.314	180	0.21	180	6	0.08	0.24	0.07	180	195.3
	44	1.652	7.673	180	0.315	180	10	0.06	0.19	0.08	180	327.6
	45	1.951	7.903	180	0.42	180	11	0.05	0.19	0.08	180	177.1
	46.1	2.305	8.174	180	0.694615	180	12	0.06	0.18	0.09	180	153.3
	46.2	2.722	8.494	180	0.718846	180	14	0.055	0.175	0.09	180	120.9

	47.1	3.215	8.872	180	0.743077	180	16	0.058	0.168	0.09	180	77.1
	47.2	3.797	9.319	180	0.767308	180	18	0.061	0.163	0.09	180	52.6
	47.3.1	4.484	9.846	180	0.791538	180	20	0.061	0.159	0.09	180	28.9
	47.3.2	5.296	10.469	180	0.815769	180	22	0.064	0.154	0.1	180	12.3
	47.3.3	6.255	11.205	180	0.767308	180	24	0.067	0.15	0.1	180	5.3
Production	50	1.184	7.314	150	0.21	180	6	0.08	0.24	0.07	150	185.7
	51	1.652	7.673	150	0.315	180	10	0.06	0.19	0.08	150	328.5
	52	1.951	7.903	150	0.42	180	11	0.05	0.19	0.08	150	208.6
	53.1	2.305	8.174	150	0.694615	180	12	0.06	0.18	0.09	150	220.8
	53.2	2.722	8.494	150	0.718846	180	14	0.055	0.175	0.09	150	205.0
	54.1	3.215	8.872	150	0.743077	180	16	0.058	0.168	0.09	150	138.4

	54.2	3.797	9.319	150	0.767308	180	18	0.061	0.163	0.09	150	90.2
	54.3.1	4.484	9.846	150	0.791538	180	20	0.061	0.159	0.09	150	48.2
	54.3.2	5.296	10.469	150	0.815769	180	22	0.064	0.154	0.1	150	22.8
	54.3.3	6.255	11.205	150	0.767308	180	24	0.067	0.15	0.1	150	7.9
Parked	55	6.800	11.623	150	1.155	180	32	0.08	0.111	0.11	150	2.6
	56	6.800	11.623	150	1.26	180	36	0.08	0.109	0.12	150	3.0
Production	57	1.184	7.314	120	0.21	180	6	0.08	0.24	0.07	120	151.5
	58	1.652	7.673	120	0.315	180	10	0.06	0.19	0.08	120	226.0
	59	1.951	7.903	120	0.42	180	11	0.05	0.19	0.08	120	137.6
	60	2.722	8.494	120	0.694615	180	12	0.06	0.18	0.09	120	225.1
	61	4.700	10.012	120	0.743077	180	16	0.058	0.168	0.09	120	98.1
Production	64	1.184	7.314	90	0.21	180	6	0.08	0.24	0.07	90	141.0

	65	1.652	7.673	90	0.315	180	10	0.06	0.19	0.08	90	206.7
	66	1.951	7.903	90	0.42	180	11	0.05	0.19	0.08	90	103.5
	67	2.722	8.494	90	0.694615	180	12	0.06	0.18	0.09	90	146.3
	68	4.800	10.089	90	0.743077	180	16	0.058	0.168	0.09	90	73.6
Parked	69	4.800	10.089	90	1.155	180	32	0.08	0.111	0.11	90	1.8
Production	71	1.184	7.314	60	0.21	0	6	0.08	0.24	0.07	60	144.5
	72	1.652	7.673	60	0.315	0	10	0.06	0.19	0.08	60	216.4
	73	1.951	7.903	60	0.42	0	11	0.05	0.19	0.08	60	121.0
	74	2.722	8.494	60	0.694615	0	12	0.06	0.18	0.09	60	153.3
	75	5.500	10.626	60	0.743077	0	16	0.058	0.168	0.09	60	90.2
Parked	76	5.500	10.626	60	1.155	0	32	0.08	0.111	0.11	60	0.9

Production	78	1.184	7.314	30	0.21	0	6	0.08	0.24	0.07	30	183.1
	79	1.652	7.673	30	0.315	0	10	0.06	0.19	0.08	30	282.9
	80	1.951	7.903	30	0.42	0	11	0.05	0.19	0.08	30	145.5
	81	2.722	8.494	30	0.694615	0	12	0.06	0.18	0.09	30	215.5
	82.1	3.215	8.872	30	0.743077	0	16	0.058	0.168	0.09	30	59.6
	82.2	3.797	9.319	30	0.767308	0	18	0.061	0.163	0.09	30	35.9
	83.3	6.255	11.205	30	0.84	0	20	0.064	0.159	0.1	30	34.2
Parked	83	7.300	12.007	30	1.155	0	32	0.08	0.111	0.11	30	0.9
Active DLCs	81											8 760.0

