## POWERJump<sup>™</sup> Subsea Boosting System



Slow the production decline curve, boost recovery from existing subsea fields and capture stranded reserves by integrating a cost-effective production







er is divided into discrete sections section is marked by a background	œ		SI							<u>е</u> н	ш.						Subsea Field Architecture Cases us	ing Subsea Processing			
color denotes the type of technology in the section. This color code is	PLINE	FIELD OR PROJECT	LI COMMENTS	CURRENT OWNER/FIELD	REGION/	WATER	TIEBACK	SYSTEM FLOW RATE	DIFFERENTIAL	WER POWE	AND 0LUM 0LUM	SYSTEM	NO. OF	PUMP TYPE	COMPRESSOR/PUMP	IN-SERVICE/OPERATING	and Active Heating as Complement	ary Technologies		Case 2: Satelli	te Field with Low Pres
oughout the poster. Below are the color nations for each of the seven themes.	PISCI	(Ordered by Start Date)		OPERATOR	BASINS	DEPTH	DISTANCE	(@LINE CONDITIONS)	PRESSURE	IT PO	DEM (GVF AS V FRAC	PACKAGER	PUMPS UNITS	or COMPR. TYPE	MANUFACTURER	INFORMATION	1 million - 1 mill			Single flowline t	ie-back enabled by:
Full Wellstream Subsea Boosting	4		5							NN H	ۍ ۲						Case 1: Long Distance Tie-ba	ick /			Boosting (oil + gas + w
Subsea Separation				COMPANY		Meters Feet	Km Miles	M <sup>3</sup> /Hr. MBOPD	BAR (4) PSI (4)	MW M	/W % OF	COMPANY	PUMPS or COMPR.	ТҮРЕ	COMPANY	START (11) END or (Month-Year) PRESENT MTHS	Single flowline tie-back enable	d by:		• ETH Active Heat	ating (Type 2)
Subsea Gas Compression	1	1 DEMO 2000	Q Statoil K-Lab Test	Statoil	Offshore Norway					3.60	n/a	OneSubsea		Counter Axial	OneSubsea	2001	• SS Multiphase Boosting (oil -	gas + water)			
Vater Injection with Subsea Pumps	2	2 Ormen Lange Gas Compression Pilot 3 Åsgard - Midgard & Mikkel Fields (7)	CP Testing 1 train @ Nyhamna, Norway O Subsea Gas Compression	Norske Shell Statoil (18)	Offshore Norway Offshore Norway	10 33 300 984	0.0 0.0 40.0 25.0	25,000 3,776 20,000 3,021	+ +	12.50 58 11.50 24	3.00 n/a	Aker Solutions Aker Solutions (11)	1	Centrifugal Centrifugal	GE Compr/Aker Pump MAN/Aker pumps	2011 30-Aug-16 6-Sep-15 1-Mar-17 18	• DEH Active Heating (Type 1A)		AACM	69	
Flowline Active Heating		4 Gullfaks South Brent (25)	I, N Subsea Wet Gas Compression	Statoil (18)	Offshore Norway	135 443	40.0 25.0 15.5 9.7	9,600 1,450			4.40 n/a 0.00 95%	OneSubsea (10)	2+1 Spare +1 2 + 1 Spare	Counter Axial	OneSubsea	6-Sep-15 1-Mar-17 18 12-Oct-15 2-Nov-15 1	Water Injection from Topside				
Transmission/Distribution and Controls	EA G	5 Ormen Lange Gas Compression 2 (27)	C Subsea Gas Compression	Norske Shell	Offshore Norway	860 2,821	120.0 75.0	TBD TBD	TBD TBD	TBD	n/a	ТВА	2	Centrifugal	ТВА	2021					
ous Information/Combination of Technologies		6 Troll 7 Peon (34)	C Subsea Gas Compression P/H Subsea Gas Compression	Statoil Statoil	Offshore Norway Offshore Norway	340 1,116 385 1,263	4.0 2.5 TBD TBD		TBD TBD		n/a	ТВА		Undecided	ТВА	TBD					
	S S .	B Snohvit	C Subsea Gas Compression	Statoil	Barents Sea	345 1,132	143.0 89.4			TBD	n/a	TBA			ТВА	2020	-	-1		-	
3 – ACRONYMS &	9	9 Shtokman (35) 0 Åsgard - Midgard & Mikkel Fields	P/H Subsea Gas Compression	Gazprom	Barents Sea	350 1,148	565.0 353.1	10.000		TBD 11.50 24	n/a	TBA	0.1 Crows1	Centrifugal	TBA MAN/Aker pumps	2022 2021			4		///
VIATIONS ernating Current	1	1 Prezioso (18)	C Subsea Gas Compression - Phase 2 A MPP at Base of Platform	Statoil ENI	Offshore Norway Italy	300 984 50 164	40.0 25.0 0.0 0.0	12,000 65.0 10		0.15	4.40 n/a 30-90%	Saipem	2+1 Spare +1 1	Centrifugal Twin-Screw	Nuovo Pignone (9)	1994 1995	6 DEH	Cable		/	//
ificial Lift ificial Lift Manifold	2	2 Draugen Field (17)	A Hydraulic Drive MPP	Norske Shell	Offshore Norway	270 886	4.0 2.5	193.0 29	50.0 725	0.75	42%	OneSubsea	1 + 1 Spare	SMUBS, 1-MPP	SPX ClydeUnion	Nov-95 15-Nov-96 12.2	6 DEH Connection Bulkhead (Tvp.)	er cable se the		1	
justable Speed Drive ntrifugal Subsea Submersible Pumps	3	Lufeng 22/1 Field (10)     Machar Field (ETAP Project)	A Tieback to FPS0 A Hydraulic Drive MPP	Statoil BP	South China Sea UK North Sea	330 1,083 85 277	1.0 0.6 35.2 21.9	675.0 102 1.100.0 166		0.40	3% 64%	OneSubsea / TechnipFMC OneSubsea	5+2 Spare 2+1 Spare	Centrifugal (SPP) Helico-Axial	) OneSubsea OneSubsea	Jan-98 15-Jul-09 138.0	DEH Connection Buikhead (Typ.)	NAC POWE with Street Call and C.		Him Z	
rrels per Day tish Offshore Engineering Technology	5	5 Topacio Field	0 1 x Dual MPP System	ExxonMobil	Equatorial Guinea	550 1,805	8.0 5.0	940.0 142		0.86	75%	OneSubsea	2+1 Spare	Helico-Axial	OneSubsea	Aug-00 1-Mar-17 197.1	E Subaga Power Distribution	St. St. Reno Perce and		<sup>2</sup> 2 ET	Um Um
rrels of Oil per Day	6	6 Ceiba C3 + C4	0 Phase 1 SS MPP Project	Hess	Equatorial Guinea	750 2,461	7.0 4.3	600.0 91		0.85	75%	OneSubsea	2+1 Spare	Helico-Axial	OneSubsea	Oct-02 1-Mar-17 171.1	Subsea Power Distribution	at set so a set	<sup>9</sup>	emov emov	bilical 6 DEH Connect
rrels of Water per Day pital Expenditure	8	7 Jubarte EWT 8 Ceiba Field (FFD)	A Riser lift to Seillean drillship O Full Field Development (FFD)	Petrobras Hess	Espirito Santo Basin Equatorial Guinea	1,400 4,593 700 2,297	1.4         0.9           14.5         9.0	145.0 22 2,500.0 378		0.70	22% 75%	TechnipFMC OneSubsea	6+ 2 Spare	ESP Helico-Axial	Schlumberger (REDA) OneSubsea	Dec-02 1-Dec-06 47.9 Dec-03 1-Mar-17 157.1	1		Subsea Po	ower Distribution	
cuit Breaker nfigurable Subsea Separation & Pimping	9	9 Mutineer / Exeter (16)	0 2 x Single MPP Systems	Santos	NW Shelf, Australia	145 476	7.0 4.3	1,200.0 181		1.10	0-40%	OneSubsea	2 MPP	Helico-Axial	OneSubsea (16)	Mar-05 1-Mar-17 142.1	MPP				Water
ntrifugal Subsea Submersible Pump ble Traction Control Unit	1(	0 Lyell (Original Install)	A SS Tieback to Ninian South	CNR Anadarko	UK North Sea US GOM	146 479 1.110 3.642	15.0         9.3           7.2         4.5	1,100.0 166 24.0 4		1.60 0.75	40-70% 57%	Aker Solutions	1	Twin Screw ESP	Bornemann SMPC 9	Jan-06         Dec-06         11.0           Feb-07         1-Aug-07         5.5	Prod. Manifold	- STR	A la		3
ect Electrical Heating epwater Multiphase Boosting System	ा जिन्दी	1 Navajo (17) 2 Jubarte Field - Phase 1 (22)	A Seabed ESP-MOBO, Uses BCSS (14)	Petrobras	Espirito Santo Basin	1,350 4,429	4.0 2.5	120.0 18		0.75	10-40%	Baker Hughes TechnipFMC	1	ESP	Baker Hughes Schlumberger (REDA)	Mar-07 Aug-07 5.0					
ectrical Heat Traced Flowline ectrical Submersible Pump	<u>د ا</u>	3 Brenda & Nicol Fields	0 MultiManifold with 1 MPP	Premier Oil	UK North Sea	145 476	8.5 5.3	800.0 121	+ + + + + + + + + + + + + + + + + + + +	1.10	75%	OneSubsea	1+1 Spare	Helico-Axial	OneSubsea	Apr-07 1-Mar-17 117.1			1 MPP		
ectrical Trace Heating Il Field Development	910H 1	4 King (8) 5 Vincent	A SS Tieback to Marlin TLP O Dual MPP System	Anadarko Woodside	US GOM NW Shelf. Australia	1,700 5,578 475 1.558	29.0 18.0 3.0 1.9	496.5 75 2.400.0 363		1.30 1.80	0-95% 25-70%	Aker Solutions OneSubsea	2+1 Spare 2+2 Spare	Twin-Screw Helico-Axial	ITT Bornemann / Loher OneSubsea	Nov-07         15-Feb-09         15.0           Aug-10         1-Mar-17         77.1	DEH Cable		C		SUTA
ating Production System ating, Production, Storage & Offloading		6 Marlim	A SBMS-500 SS Field Test	Petrobras	Campos Basin	1,900 6,234	3.1 1.9	500.0 75	.2.0 000	1.20	0-100%	Curtiss-Wright/OneSubsea	a 1	Twin-Screw	Leistritz		6	7.100			
s/Liquid Centrifugal Cyclonic s Liquid Batio		7 Golfinho Field	0 Seabed ESP-MOBO, Uses BCSS (14)	Petrobras	Espirito Santo Basin	1,500 4,922	11.0 6.8	146.0 22	· · · · · · · · · · · · · · · · · · ·	1.20	10-40%	TechnipFMC (32)	2	ESP	Schlumberger (REDA) (32)	Dec-14 4-Jan-17 25.1	1 Age	with Rents			Prod. Manifold
s Volume Fraction rsepower		8 Azurite Field 9 Golfinho Field	A Dual MPP System     MOB0 BCSS (ESP) Caissons (14)	Murphy Oil Petrobras	Congo, W. Africa Espirito Santo Basin	1,338 4,390 1,500 4,922	3.0 1.9 5.0 3.1	350.0 53 146.0 22		0.85	28%	OneSubsea Aker Solutions	2+1 Spare 2	Helico-Axial ESP	OneSubsea Schlumberger (REDA) (32)	Sep-10         1-Oct-13         36.5           Dec-14         4-Jan-17         24.2	State State	A TOO HEAD	Line.	0.	2
draulic Submersible Pump		0 Espadarte (Field Trial)	A Horizontal ESP on Skid	Petrobras	Brazil	1,350 4,429	11.5 7.1	125.0 19	· · · · · · · · · · · · · · · · · · ·	0.90	10-40%	TechnipFMC	2	ESP	Baker Hughes	Dec-11 Mar-13 14.5		Calle T			
egrated Production Bundle		Parque Das Conchas (BC 10) Phase 1 (20) Parque Das Conchas (BC-10) Phase 2	O Caisson / Artifical Non-Separated     2 additional ESP systems	Shell	Campos Basin	2,150 7,054 2.150 7.054	9.0 5.6 9.0 5.6	185.0 28 185.0 28	. ,	1.10	40%	TechnipFMC	2	ESP	Baker Hughes	Jul-09 1-Mar-17 91.3 Oct-13 1-Mar-17 40.4	6 DEH Connection Bulkhead (Typ				
proved (Increased) Oil Recovery owatt		<ul> <li>Parque Das conchas (BC-10) Phase 2</li> <li>Parque Das Conchas (BC-10) MPP Repl.</li> </ul>	M Replacement MPP system	Shell	Campos Basin Campos Basin	2,150 7,054 2,150 7,054	9.0 5.6	185.0 28 185.0 28	152 2,205	1.10	40% 40%	TechnipFMC TechnipFMC	1	ESP	Baker Hughes TechnipFMC	Oct-13 1-Mar-17 40.4	B DEH Connection Buiknead (Typ				
ng Distance Delivery Management	STF 0 HE 24	4 Jubarte Field - Phase 2 (22)	0 Tieback to FPSO P-57, Uses BCSS (14)	Petrobras	Espirito Santo Basin	1,400 4,593	8.0 5.0	1,325.0 200		1.20	30-40%	Aker Solutions	15	ESP	Schlumberger (REDA)	6-Dec-10 1-Mar-17 74.7					
ng Distance Delivery System Iltiphase Pump		Cascade & Chinook (6)	I, N Skid BCSS - Horizontal ESP on Skid O SS MP High Boost Pump System	Petrobras Petrobras	US GOM Campos Basin	2,484 8,150 1.040 3.412	8.0 5.0 10.5 6.5	135.0 20 280.0 42		1.10 1.50	10% 35-60%	TechnipFMC OneSubsea	4+2 Spare	ESP Helico-Axial	Baker Hughes OneSubsea	14-Jul-12 Unkown 14-Jul-12 1-Mar-17 55.4				Prod.	Тгее (Тур.)
ega Watts tural Flow		7 Montanazo & Lubina	0 Single MPP System	Repsol	Mediterranean	740 2,428	12.3 7.6	280.0         42           80.0         12		0.23	10%	OneSubsea	1 + 1 Spare	Centrifugal (SPP)	) OneSubsea	14-Jul-12 1-Mar-17 55.4 15-Jan-14 1-Mar-17 37.4	PLET (Typ.)				
erational Expenditures and Water	EAE FUI	8 Schiehallion	I, N 2 x Dual MPP Systems	BP	UK, West of Shetland	400 1,312	4.0 2.5	2,700.0 408	26.0 377	1.80	74%	GE/OneSubsea	4+0 Spare	Helico-Axial	OneSubsea	2014 Delayed Start Up	Prod Ma	nifeld			
wer Control Module wer and Communication Distribution Module		9 CLOV (19) 10 Jack & St. Malo	O Subsea MPP System     3 x Single SPP Systems (JSM)	Total Chevron	Angola, Blk 17 US GOM	1,170 3,839 2,134 7,000	11.0 6.8 13.0 21.0	660.0 100 1,191.0 180		2.30 3.00	50% 10%	OneSubsea OneSubsea	2+1 Spare 3+2 Spare	Helico-Axial Centrifugal (SPP)	OneSubsea ) OneSubsea	31-Jul-16 1-Mar-17 7.0 10-May-16 1-Mar-17 9.7	Prod. Ma				
ocess Flow Diagram be-in-Pipe	.ON) 3	1 Lyell Retrofit	0 MPP Retrofit System - Tieback to Ninian	CNR	UK North Sea	145 476	7.0 4.3	700.0 106	,	1.00	97%	OneSubsea	1	Helico-Axial	OneSubsea	21-Aug-14 1-Mar-17 30.3	Notes: 1. Conventional flowline loop removed as the addi	tion of Active Heating reduces the	nood for regular maintan		
eline End Termination	32	2 Rosa / Girassol (24)	0 Field Expansion Project	Total	Angola, Blk 17	1,350 4,429	18.0 11.2	600.0 91	130.0 1,885	2.50	20-50%	OneSubsea	4+2 Spare	Helico-Axial	OneSubsea	Q2 2015 1-Mar-17	<ol> <li>Conventional nowine loop removed as the addi</li> <li>Shows brownfield addition of production umbili</li> </ol>				ystems
peline Inline Manifold peline Simulation Interest Group	33	3 Draugen Field (Infill Program) 44 Julia	0 2 x Dual MPP Station 0 SS Tieback with Dual SPP Systems	A/S Norske Shell ExxonMobil	Offshore Norway US GOM	268 879 2,287 7,500	4.0 2.5 27.2 17.0	1,710.0 253 331 50		2.30 3.00	10-31% 10%	OneSubsea OneSubsea	2	Helico-Axial Centrifugal (SPP)	OneSubsea	24-Nov-16 1-Mar-17 3.2 Q1 2017					
mp Subsea Umbilical Termination Assembly oduced Water Reinjection	3	5 Moho Phase 1bis	I, N Brownfield Tieback to Alima FPU	Total	Congo, W. Africa	650 2,133	6.7 4.0	400 60	· · · · · · · · · · · · · · · · · · ·	3.50	49%	OneSubsea	2	Helico-Axial	OneSubsea	2015	TABLE 5: 2017 WORLDWIDE SURVE	Y OF INSTALLED ACTIVE	HEATING SYSTEN	IS (AS OF FEBRUARY 2	.017)
motely Operated Vehicle volutions per Minute	30	6 Stones	M Single Phase HPHT Pump System	Shell	US GOM	2,927 9,600	5.0 3.1	TBD TBD	TBD TBD	TBD	<10%	OneSubsea	2 +1 Spare	Centrifugal (SPP)	) OneSubsea	2018		-		E E	S
w Water Injection bsea Control Module	3	7 Appomattox 18 Parque Das Baleias (14)	C MPP in future Phases O Horizontal ESP on Skid	Shell Petrobras	US GOM Espirito Santo Basin	2,222 7,290 1,500 4,922	10.0 6.2	125.0 19	140 2.058	1.20	10-25%	TechnipFMC	5 +1 Spare	TBD ESP	TBD Schlumberger (REDA)	3/19/14 1-Mar-17 35.3			IZE		ND HE HON ROS
afloor Boosting bsea Increased Oil Recovery System	3	9 Greater Enfield	M Dual MPP System	Woodside	W. Australia	850 2,788	32.0 20.0	959.0 145			.20 81%	OneSubsea	2+1 Spare	Helico-Axial	OneSubsea	2018	FLOWLINE ACTIVE HEATING TYPE	FIELD/PROJECT	OWNER 없	MAX FLOWL LENG U-VAL	SECTI SECTI CABI RATIN POWI
stem Integration Testing ell Multiphase Underwater Boost Station	40	Dalmatian (33)	M Single MPP System	Murphy E & P Co.	US GOM	,,	35.0 22.0	231.0 35	150.0 2,176	2.20 2.	.20 65%	OneSubsea (33)	1+1 Spare	Helico-Axial	OneSubsea (33)	2018		PRO			CAB D F D SI
osea Power Electrical Equipment Distribution gle Phase Pump	4	11 West Hub 12 Viqdis	M Mud Line Boosting Pump C Subsea Boosting of existing wells	ENI Statoil	Angola Block 15/06 Offshore Norway	1,000 3,281 280 919	6.5 4.1		50.0 725	2.30 2.	.30 20-40%	TechnipFMC TBA	1	TBD	TBD	Q2, 2018 2021			inch	km m W/m <sup>2</sup> K	mm <sup>2</sup> A/kV MW
bsea bsea Separation Boosting Injection	<b>z</b> 1	1 Troll C Pilot (15) (21)	0 SUBSIS (SS Sep. and WI Sys.)	Statoil	Offshore Norway	340 1,116	3.5 2.2	250.0 38	151.0 2,190		0%	GE / OneSubsea	1+1 Spare	Centrifugal (SPP)	) OneSubsea	Aug-01 1-Mar-17 185.8		1 Åsgard Sta		9 300 5.0	1.000 1.520/12 1.50
bsea Processing		2 Columba E.	I, N Dual SPP System	CNR	North Sea	145 476	7.0 4.3	331.0 50		2.30	0%	OneSubsea	2+0 Spare	Centrifugal (SPP)	) OneSubsea	May-07 1-0ct-13 76.4		2 Alve Sta		16 350 3.0	1,200 1,300/12 2.40
bsea Separation and Injection System bsea Umbilical Termination Assembly		3 Tordis (WI) (13) 4 Tvrihans	Dual SPP & SS RWI Filtration System     3 SPP & SS RWI Filtration System	Statoil Statoil	Offshore Norway Offshore Norway	210 689 270 886	11.0 6.8 31.0 19.3	700.0 106 583.0 88	· · · · · · · · · · · · · · · · · · ·	2.30	0%	TechnipFMC FMC / Aker Solutions	1+1 Spare 2+1 Spare	SPP&MPP Centrifugal (SPP)	OneSubsea Aker Solutions	1-Nov-07 1-Mar-17 109.1 12-Mar-13 1-Mar-17 47.5		3 Goliat ENI		7.5 330 4.0	1,200 1,300/12 2.40
chnology Readiness Level bside Umbilical Termination Assembly		5 Albacora L'Este Field (30)	0 Raw Water Injection to 7 Wells	Petrobras	Campos Basin, Brazil		4 to 9 2.5-6.0			1.2	0%	OneSubsea	3+1 Spare	Centrifugal (SPP)	,	14-Mar-14 1-Mar-17 35.5		4 Gullfaks South Stat 5 Huldra Stat		6.2         150         4.0           16         175         3.5	630         980/12         1.10           650         1,100/24         2.00
tical Annular Separation and Pumping System iable Speed Drive	1	1 Zakum 2 Highlander Field (21)	A Shallow Water Test Separation System	BP Bancal Sinance (26)	Offshore Abu Dhabi	24 79										1969 1972 36		6 Kristin Sta	toil 10	7 370 8.0	1,200 1,500/12 1.60
ter Depth ter Injection	2 3	2 Highlander Field (31) 3 Argyll	A SS Separator / Slug Catcher A SS Sep. and Pumping Unit (SSPU)	Repsol Sinopec (26) Hamilton Bros	UK North Sea UK North Sea	420 1,378 80 262									BOET (27)	1989	TYPE 1A: Direct Electrical Heating		evron 12 ntershall 14	43 1,050 3.0 26 370 3.5	1,400 1,400/24 9.00 1,000 1.350/24 4.00
ter Injection Christmas Tree ristmas Tree		4 Marimba Field (21)	I, N VASPS Field Test	Petrobras	Campos Basin	395 1,296	1.7 1.1	60.0 9		0.3		OneSubsea	1	ESP	Schlumberger (REDA)	Jul-01 1-Jul-08 83.0	(DEH) – Wet Insulated Rigid Pipe	9 Morvin Sta		26         370         3.5           20         300         5.0	1,000         1,350/24         4.00           1,200         1,500/24         4.00
COURTESY OF	PAR/	5 Troll C Pilot (15 & 23) 6 Tordis	0 Horizontal SUBSIS (SS Sep. & WI Sys.) 0 (12), Separation, Boosting, WI	Statoil Statoil	Offshore Norway Offshore Norway	340 1,116 210 689	3.5 2.2 11.0 6.8	250.0 38 1.500.0 227	,	1.60 2.30	0%	GE / OneSubsea TechnipFMC	1+1 Spare 1+1 Spare	n/a Helico-Axial	OneSubsea OneSubsea	Aug-01 1-Mar-17 185.8 Oct-07 1-Mar-17 112.3		10 Norne Urd Sta		9 390 4.0	1,200 1,450/12 2.30
WorleyParsons Group	E S S S S S S S S S S S S S S S S S S S	7 Parque Das Conchas (BC 10) Phase 1	0 Separation Caisson / Artifical Lift Manifold	Shell	Campos Basin	2,150 7,054	25.0 15.6	185.0 28		1.10	15%	TechnipFMC	4	ESP	Baker Hughes Centrilift	Aug-09 1-Mar-17 90.3		11         Olowi (2)         CNF           12         Ormen Lange         Hydrogeneration	RI 8 dro, Shell 30	4 30 4.5 20 1.000 20.0	1,000 1,300/12 2.70 1,200 3,000/52 8,00
n Accuracy: We have attempted to use	8 SEA	B Perdido	0 Caisson Separation and Boosting (28)	Shell	US GOM	2,438 7,999	0.0 0.0	132-264 20-40	158.8 2,303	1.20	15%	TechnipFMC	5	ESP	Baker Hughes Centrilift	Mar-10 1-Mar-17 84.0		13 Shah Deniz Ph. II BP	,	18 500 4.0	1,000 1,300/24 2.50
current, as of press time, information for the cessing systems and equipment described		9 Pazflor 0 Marlim SSAO - Pilot	O 3 Gas/Liquid Vertical Separation System     O In-Line Separation	Total Petrobras	Angola, Blk 17	800 2,625 878 2,881	4.0 2.5 3.8 2.4	1,800.0 272 135.0 20	,	2.30	<16% 67%	TechnipFMC	6+2 Spare	Hybrid H-A Centrifugal (SPP)	OneSubsea ) OneSubsea	Aug-11 1-Mar-17 65.9 Mar-13 1-Mar-17 46.9		14 Skarv BP	12	12.8 375 3.0	1,200 1,400/2 2.20
nstalled, sanctioned, or pending application onally excluded. We have summarized the	1	1 Parque Das Conchas (BC 10) Phase 2	M 2 additional ESP systems	Shell	Campos Basin Campos Basin		25.0 15.6	135.0 20 185.0 28	,	1.10	15%	TechnipFMC TechnipFMC	2	ESP	Baker Hughes Centrilift	Wai-15 1-Wai-17 40.9		15 Skuld Sta 16 Tvrihans Sta			1,200         1,300/24         4.00           1,200         1.600/52         10.00
nd operating experience by acting as a neutral integrator of information. Information has	12	2 Corvina (26)	CP VASPS w/Horizontal ESP	Petrobras	Campos Basin	280 919	8.0 5.0	135.0 20	21 305	0.4	<10%	TechnipFMC	1	ESP	Baker Hughes Centrilift		TYPE 1B: Direct Electrical Heating	17 Habanero She			N/A N/A –
ed from public sources, company brochures, terviews, phone interviews, press releases,	CURRENT STATU	tual Drainatt that the q	tion Status – See information accuracy statement below title block an qualification status categorizations shown in this table, and throughout	it the pumps in th	e near future.	ndications that Anadarko will reacti	ESPs	per well feeding 1 x OneSubsea N			connected to the F	ase 2) – Phased installations fr FPSO P-57. All wells will have g	gas-lift as a backup.	ad	additional information about the MPP.	igh boost MPP. Ref. 2013 OTC Paper 24217 for	(DEH) – Pipe-in-Pipe	18 NaKika She		13 1,900 1.1	N/A N/A 1.00
agazines, vendor-supplied information, and No guarantee is made that information is	·	d/Testing These qua	re based on unverified claims from equipment suppliers and field opera alification status designations are not necessarily derived using technic a laved (JT) accorements per API PD 170 cr DNV_PB_A202	nology 10. Gullfaks – G	one is now part of GE. Go to OTC Paper 27224 by OneS	Subsea. This paper will provide an (	overview instal	led in 1993. It ran successfully fro	st Multiphase Subsea Pump which om 1995 for 12 Months (1,000 hours change in water injection strategy	s) and was	water injection put			31. Hi	Albacora Field – Ref. 2013 OTC Paper 2 Highlander Field – SS Tieback to the Ta	24167 rtan Field which has a SS separator/slug catcher form. See papers: 1994 OTC #7438-MS, 1987		19 Serrano/Oregano She	en 6/10	12 1,000 1.0 (3)	N/A N/A 1.00
all-inclusive. Neither INTECSEA nor Offshore		d and in Manufacturing or Delivered 2. Pumping	s level (TRL) assessments per API RP 17Q or DNV-RP-A203. & Boosting: The terms "Pumping" and "Boosting" are used interchanged ut this poster and in the industry.	ngeably Compression	n (GSC) project.	QP) completed for Statoil's Gullfaks Anders Storstenvik: Aker Assgard I	18. Stato	il – See OTC Paper 27201 by Rune	change in water injection strategy. Ramberg & other for Statoil's resea tations. It highlights Statoil's future	arch leading	1st set operational	velopment project includes the al in Sept., 2015 & 2nd set opera was shut down in Nov. 2015. T	ational in April, 2016.	SF	SPE #13970-PA, 1987 SPE # 16532-MS		TYPE 2: Electrical Trace Heating (ETH) – Pipe-in-Pipe	20 Islay Tota	al 6×12 PiP	6 120 1.0	4×8 (4) 0.6/1.0 0.18
for any party's		a d ouriently operating 3. Unit Moto	or Power: Is the unit motor power for either a pump or compressor ass ial Pressure: Differential Pressure values are for individual boosting ur	ssembly. 12. START: Mon inits. system.	th & Year indicates first month	and year of operation for the SS p	rocessing 19. CLOV pump	<ul> <li>Two (2) MPPs are on the sea floos will boost flow from 4 fields white</li> </ul>	or since Dec. 2015. The seabed MP ch are: Cravo, Lirio, Orquidea and Vi	boosting ioleta.	"AC corrosion in th	he umbilicals that led to the lea cording to a Statoil spokesman.	akage, ruling out any fault wit	th the 20	2015. 1 of each still has a Baker Hughe						
If any information		ned, Removed 5. GVF = Ga 6. Cascade	as Volume Fraction at inlet of a boosting assembly. & Chinook – Utilizes horizontal ESPs on a skid above mudline. It is an	n Tordis Field Pumps; Tieb	ack to Gullfaks C platform.	ng Pumps, and 1+1 Spare Water In	jection 20. Parqu Argon	ue Das Conchas (BC 10) Phase 1 -	- Composed of 3 reservoirs: Ostra, A o be added in Phase 2. Awarded to I	Abalone and	26. Repsol Sinopec – Repsol acquired th	<ul> <li>full Operator name is REPSOL he field through the Talisman ac</li> </ul>	SINOPEC RESOURCES UK LIM cquisition.	AITED. Mi Su	Miles). Murphy E & P has awarded the S Subsea 7) an EPCIC contract for the the	Subsea Integration Alliance (SIA) (Onesubsea + subsea multi-phase boosting system.	TYPE 3: Integrated Production Bundle	21 Dalia (risers) Tota		,	6×6 (4) 0.6/1.0 0.25
o be incorrect, t, or has been		designed	ve ESP boosting configuration to caisson in the seabed. This technology to cover the low GVF and high DeltaP multiphase flow.	the seabed,	200m from producing wells. N	umps. Pumps are placed in protect 10B0 - Modulo de Bombas (Pumpir 2001 See OTC paper 20619, page	ive holes in installing Module). 21. Marin	lled. <b>nba VASPS</b> – 2000 - First installat	ion in Marimba (JIP Petrobras / Eni-	-Agip/	design, remove un	s Compression 2 – Currently No nnecessary redundancy, and red		e weights un	until they see how SS gas compression		(IPB) – Flexible Pipe	22 Papa-Terra Pet	trobras-Chevron 6	27 (5) 1,200 4.8	16×6 (4) 0.9/1.6 1.00 (6)
ase send commen tecsea.com.		2016 Åsg	s the longest subsea tieback in the world with SS gas compression. In ard passed a major milestone. It has run successfully for over 12 mon t perfect track record.	nths with further detai		2001. See OTC paper 20619, page te that injection pump data is only able	shown in JIP, By		on (July to Dec.) until ESP failure, 20 er Plan (IWP), 2004 - Workover and F PS operated well until well failure		by more than 50% 28. Peridido – Cassior Paper 21716	%. n for separation is 350 feet long	g drilled into the seabed. Rea		Shtokman Field – In 2014 Gazprom dec of the Shtokman field.	cided not to go ahead with the the development	NOTES: 1. Subsea 7 installed riser System Only. 2. Olowi uses	continuous DEH system. 3. U values are	assumed. 4. Number of cables :	× size of cable (these are 3 phase cable	s) 5. Papa-Terra project has three (3) risers
		an almost	יי שיוויטיו שמעת וסטעול.	uie subséa (	water injection section of the ta	ແບເບ.	May 8	o, 2004. 110111 2005 untul 2008 VAS	o operateu wen untur well fallure.		raper 21710										
1 – SUBSEA SUPPLIER MAT	RIX (As of	f Feb., 2017)	su	UBSEA PROCESSING					CO	URTESY OF	INTECSEA WorleyParsons Group	SUBSEA PO	WER CONN	ECTORS	Fig. 3: S	Siemens DigiTRON+ and DigiTRON3	Fig. 4: Siemens DigiTRONf	SUBSEA PO	OWER DISTR	<b>IBUTION EQUIP</b>	MENT
												TYPES: WET-MAT	E AND DRY-MATE				All and a second	Fig. 1: Ormen Lange Pi	ilot SS Circuit Breaker	Fig. 2: Siemens Cond	ceptual Subsea Power Grid F
SUBSEA BOOSTING	SUBSEA SEAW	SUBSEA GAS	SUBSEA INTEGRATED ACTIVE SUBSEA			HV & AC/DC POWER		CONT	MS	TESTING				Wet-Mate Conn		NO					
	INJECTION	(3) SYSTEMS COMPRESSION	HEATING (13) SYSTEM SUPPLIERS						SYSTEMS			Fig. 1: GE MECON DM 14	5/700			603		4	APPERE		Sig 4





and the second and the second se

AP CAR









TechnipFMC

We are enhancing the performance of the oil and gas industry. **TechnipFMC.com** 

**NOV** Completion & Production Solution

siemens.com\subse