

TABLE OF CONTENTS

A. Introd	duction to Floating Production Systems (FPS)	16
≻Brief	History of the Offshore Industry	16
≻ FPS L	ife Cycle	21
≻ FPS L	Init Types	25
\$	Floating Production, Storage and Offloading Units (FPSOs)	25
\$	Production Semisubmersibles (Semis)	29
\diamond	Tension Leg Platforms (TLPs)	32
\diamond	Spar	36
\diamond	Floating Liquefied Natural Gas Units (FLNGs)	39
\$	Floating Storage and Regasification Units (FSRUs)	44
\diamond	Floating Storage and Offloading Vessels (FSOs)	47
\diamond	Mobile Offshore Production Units (MOPUs)	50
B. Curre	nt Market Status	52
➤ What	Happened in 2017?	52
≻ What	Does the Market Look Like as of Jan 2018?	62
\$	On Order	66
\$	Trend in Order Backlog	71
\$	Available Floating Production Systems	73
\diamond	FPS Units Likely to Cease Operations in 2018-2019	75
\diamond	Projects in the Planning Pipeline	77
≻ List o	f Leading FPS Operators and Owners	80
\$	Top FPS Operators (Planning Pipeline)	80
\$	Top FPS Owners	81
\diamond	Top FPS Operators (Installed Units)	82
\$	Top FLNG Owners	82
\diamond	Top FPSO Owners	83
\diamond	Top FPSO Owners by Water Depth (Installed Units)	84
\diamond	Top FSO Owners	85



♦ Top SPAR Owners	86
Top Production Semi Owners	87
♦ Top FSRU Owners	88
♦ Top TLP Owners	89
C. Underlying Market Drivers	90
Global Oil and Gas Demand Drivers	90
Long Term Energy Demand	91
➢ Global Oil and Gas Supplies	101
≻ Global Oil Price	104
➢ U.S. Onshore Production and Investment	107
➢ Offshore Drilling	108
D. Market Forecasts	111
Summary of 2018-2022 Forecast	111
Forecast Scenarios	114
➢ FPSO Forecast	119
➢ FLNG Forecast	127
➢ FSRU Forecast	131
➢ FSO Forecast	134
Production SEMI Forecast	137
SPAR Forecast	141
➤ TLP Forecast	144
➢ Forecast Appendix	147



F. Contro	actoi	r Focus	161
≻ Leasir	ng Con	tractors	161
\$	Blue	ewater	163
\$	Bum	ii Armada	165
\$	BW	Offshore (BWO)	167
\$	MIS	C	169
\$	MO	DEC	171
\$	SBM	1	173
\$	Teek	kay	176
\$	Yins	on	179
FSRU/	FLNG (Companies (Excelerate, Exmar, Golar, Hoegh)	181
\$	Exce	elerate	181
\$	Exm	ar	183
\$	Gola	ar LNG	184
\$	Hoe	gh LNG	186
≻ EPC C	Contrac	ctors	188
\$	Chin	ese Yards	191
	\diamond	Cosco Shipping Heavy Industry (CSHI)	191
	\diamond	China Shipbuilding Industry Corporation (CSIC)	193
	\diamond	China State Shipbuilding Corporation (CSSC)	194
	\diamond	Wison Offshore & Marine	195
\$	Kore	ean Yards	196
	\diamond	Daewoo Shipbuilding & Marine Engineering (DSME)	196
	\diamond	Hyundai Heavy Industries (HHI)	198
	\diamond	Samsung Heavy Industries (SHI)	200
\$	Sout	theast Asian Yards	202
	\diamond	Keppel	202
	\diamond	Malaysia Marine and Heavy Engineering (MMHE)	204
	\diamond	Sembcorp Marine (Jurong and Sembawang)	206



LIST OF ILLUSTRATIONS

A. Introduction to Floating Production Systems (FPS)	16
Fig 1. FPS Units > 1,500m by Year Installed	17
➢ Fig 2. Installed FPS Units by Maximum Water Depth Over Time	18
➢ Fig 3. Regional Distribution of Installed Units 1991-2000	18
➢ Fig 4. Regional Distribution of Installed Units 2001-2010	19
➢ Fig 5. Regional Distribution of Installed Units 2011-2017	19
➢ Fig 6. FPS Awards in Relation to Oil Price	20
➢ Fig 7. FPS Life Cycle Schematic	24
➢ Fig 8. FPSO Schematic	26
➢ Fig 9. Mooring Systems Comparison	27
➢ Fig 10. Production Semi Schematic	30
≻ Fig 11. TLP Schematic	34
➢ Fig 12. SPAR Schematic	38
≻ Fig 13. FLNG Schematic	42
≽ Fig 14. FSRU Schematic	45
➢ Fig 15 FSO Schematic	48
➢ Fig 16. MOPU Schematic	51
B. Current Market Status	52
\succ Fig 17. Units Awarded in 2016 and 2017 by FPS Type	53
▶ Fig 18. Units Awarded in 2016 and 2017 by Capex	53
➢ Fig 19. Awarded Units 2014-2017 by Quarter	54
▶ Fig 20. Awarded Units 2014-2017 by Capex	54
➢ Fig 21. Distribution of Units Awarded in 2017 by Type	55
➢ Fig 22. Details for Units Awarded in 2017	56
➢ Fig 23. Units Awarded in 2017 by Capital Cost	57
➢ Fig 24. Units Awarded in 2017 by Yard	58
➢ Fig 25. Units Awarded in 2017 by Operator Category	58



➢ Fig 26. Units Delivered in 2017 by Region and Unit Type	59
➢ Fig 27. Details of Units Delivered in 2017	60
➢ Fig 29. Units Decommissioned in 2017	61
➢ Fig 28. Units Delivered in 2017 by Operator Type	61
➢ Fig 30. Total Installed Units by Type	62
➢ Fig 31. Global Distribution of Installed Units by Type	63
➢ Fig 32. Installed Units by FPS Type and Region	64
➢ Fig 33. Table of Production and Storage Floaters by Type and Region	65
➢ Fig 34. FPS Units On Order by Type and Region	67
➢ Fig 35. FPS Units On Order by Name and Type	68
Fig 36. FPS Units Under Repair by Name and Type	68
Fig 37. Distribution of Units On Order by Destination	69
➢ Fig 38. Distribution of Units On Order by Yard	70
➢ Fig 39. FPS Order Book by Unit Type	71
➢ Fig 40. FPS Order Book 1997-2017	72
➢ Fig 41. Available FPS Units by Year of Lay-Up and Type	73
➢ Fig 42. Available FPS Units by Year of Lay-Up, Type and Status	74
Fig 43. Possible Available FPS Units 2018-2019	76
➢ Fig 44. Projects in Planning Process	77
Fig 45. Projects in Planning Process by Region	78
Fig 46. Projects in Planning Process by Region and Water Depth	79
Fig 47. Top Operators by Projects in Planning Process	80
➢ Fig 48. Top FPS Unit Owners	81
Fig 49. Top Operators by Units Leased or Owned	82
➢ Fig 50. Top FLNG Owners	82
➢ Fig 51. Top FPSO Owners	83
Fig 52. Top FPSO Owners by Water Depth	84
Fig 53. Top FSO Owners	85



➢ Fig 54. Top Spar Owners	86
➢ Fig 55. Top Semi Owners	87
➢ Fig 56. Top FSRU Owners	88
➢ Fig 57. Top TLP Owners	89
C. Underlying Market Drivers	90
➢ Fig 58. World Energy Consumption	91
➢ Fig 59. Growth in Primary Energy Demand by region 2015-2040	92
Fig 60. Energy Consumption by Fuel Type 2015-2040	92
➢ Fig 61. Average Oil Demand Growth	93
Fig 62. Average Oil Demand Growth in Developing Countries	93
Fig 63. Sectoral Share of Liquid Consumption	94
\succ Fig 64. Oil Demand by Sector in Developing Countries 2016 , 2040	95
➢ Fig 65. Natural Gas Demand by Major Regions 2015-2040	98
➢ Fig 66. World Natural Gas Consumption 1990-2040	98
Fig 67. Natural Gas Consumption by Sector 2010-2040	99
➢ Fig 68. Growth in Energy Demand by Type 2015-2040	99
➢ Fig 69. Floating Offshore Wind Market	100
➢ Fig 70. EIA vs OPEC Oil Production Forecasts	101
➢ Fig 71. Us Tight Oil Production 2010-2040	102
➢ Fig 72. US Oil and Gas Production	103
Fig 73. LNG Importers and Exporters by 2040	103
➢ Fig 74. WTI and Brent Spot Price by Month	104
Fig 75. Brent Futures Trading Contracts Q-o-Q	105
Fig 76. Brent Futures Trading Contracts Y-o-Y	105
➢ Fig 77. Henry Hub Spot Gas Prices	106
➢ Fig 78. Henry Hub Natural Gas Price	106
➢ Fig 79. Henry Hub Futures Contracts Y-o-Y	106



	≻ Fig 80. N. American Rotary Count vs Oil Price	107
	≻ Fig 81. Rig Productivity in US Shale Oil Fields	107
	➢ Fig 82. Permian Basin Well Productivity	108
	➢ Fig 83. Shale Peer Group Cost Breakdown	108
	≻ Fig 84. SE Asia Jackups Utilization and Day Rate	109
	≻ Fig 85. Drillship Utilization and Day Rate	109
	≻ Fig 86. Semisub Utilization and Day Rate	109
D.	Market Forecasts	111
	➢ Fig 87. FPS Forecast by Unit Type	111
	➢ Fig 88. Capex Forecast by Region and FPS Type	112
	≻ Fig 89. Growth of FPS Inventory	112
	▶ Fig 90. 2018-2022 Forecast by FPS Type and Capex	118
	≻ Fig 91. Historical Growth of FPSO Inventory	119
	➢ Fig 92. FPSO Awards 2003-2022	120
	▶ Fig 93. Forecast of FPSO Awards per Year (2018-2022)	121
	≽ Fig 94. FPSO Awards 2018-2022 with Petrobras' Proportion	121
	≻ Fig 95. FPSO Forecast by Hull Type	122
	≻ Fig 96. FPSO Forecast by Hull Type	123
	➢ Fig 97. FPSO Forecast by Production Capacity	124
	Fig 98. Leased FPSO Forecast by Production Capacity	124
	➢ Fig 99. FPSO Capex by Hull Type	124
	➢ Fig 100. FPSO Awards by Region	125
	➢ Fig 101. FPSO Capex by Production Ranges and Hull Type	126
	➢ Fig 102. FPSO Orders by Production Ranges and Hull Type	126
	➢ Fig 103. FLNG Orders and Deliveries	127
	➢ Fig 104. FLNG Orders by Unit Size 2018-2022	130
	➢ Fig 105. FLNG Forecast and Capex by Unit Size 2018-2022	130



	≻ Fig 106. Historical Growth of FSRU Inventory	131
	≻ Fig 107. Historical FSRU Orders	131
	≽ Fig 108. FSRU Forecast by Unit Size 2018-2022	133
	≻ Fig 109. FSRU Forecast and Total Capex by Unit Size 2018-2022	133
	≻ Fig 110. Historical FSO Inventory	134
	≻ Fig 111. Historical FSO Orders	134
	≻ Fig 112. FSO Forecast by Type 2018-2022	136
	➢ Fig 113. FSO Forecast and Capex by Type 2018-2022	136
	≻ Fig 114. Historical Inventory of Semis	137
	≻ Fig 115. Historical Semi Orders	138
	≻ Fig 116. Semi Forecast by Type 2018-2022	140
	≻ Fig 117. Semi Forecast and Capex by Type 2018-2022	140
	≻ Fig 118. Historical Inventory of Spars	141
	≻ Fig 119. Historical Spar Orders	141
	≻ Fig 120. Spar Forecast by Type 2018-2022	143
	≻ Fig 121. Spar Forecast and Capex by Type 2018-2022	143
	➢ Fig 122. Historical TLP Inventory	144
	➢ Fig 123. Historical TLP Orders	145
	≽ Fig 124. TLP Forecast by Type 2018-2022	146
	➢ Fig 125. TLP Forecast and Capex by Type 2018-2022	146
	➢ Fig 126. Forecast Appendix	147
E.	Floating Production Industry Survey	148
	➢ Fig 127. Confidence in Business Outlook in the Next 12 Months	148
	➢ Fig 128. Expected Length of Downturn	149
	≻ Fig 129. Impact of Downturn	150
	≻ Fig 130. Activity Levels in the Next 12-24 Months	151
	≻ Fig 131. Largest Obstacle for Awards in the Next 12-24 Months	152



	➢ Fig 132. Capacity Constraints in the Next 12-24 Months	153
	➢ Fig 133. Most Attractive Regions in the Next 5-10 Years	154
	➢ Fig 134. FPS Type with the Highest Growth Opportunities	155
	➢ Fig 135. Technologies with the Largest Impact	156
	Fig 136. Outlook for Leased, Newbuilt, and Redeployed Units	157
	Fig 137. Contractors Participation in Upstream Field Development	158
	Fig 138. Sustainability of Offshore Oil and Gas Development	159
	➢ Fig 139. Survey Profile -Business	160
	➢ Fig 140. Survey Profile - Position	160
F. (Contractor Focus	161
	➢ Fig 141. Top Leasing Contractors and Their Fleets	161
	➢ Fig 142. Top Leasing Contractors and Their Fleets by Region	162
	➢ Fig 143. Bluewater- Contracts by Field Operator	163
	➢ Fig 144. Bluewater- Asset Distribution by Region	164
	➢ Fig 145. Bluewater- Fleet Status	164
	➢ Fig 146. Bumi Armada- Contracts by Field Operator	165
	Fig 147. Bumi Armada- Asset Distribution by Region	165
	Fig 148. Bumi Armada- Fleet Status	166
	➢ Fig 149. BWO- Contracts by Field Operator	167
	➢ Fig 150. BWO- Asset Distribution by Region	167
	➢ Fig 151. BWO- Fleet Status	168
	➢ Fig 152. MISC- Contracts by Field Operator	169
	➢ Fig 153. MISC- Asset Distribution by Region	170
	➢ Fig 154. MISC- Fleet Status	170
	➢ Fig 155. Modec- Contracts by Operator	171
	➢ Fig 156. Modec- Asset Distribution by Region	171
	≽ Fig 157. Modec- Fleet Status	172



➢ Fig 158. SBM- Contracts by Field Operator	173
➢ Fig 159. SBM- Asset Distribution by Region	173
➢ Fig 160. SBM- Fleet Status	175
➢ Fig 161. Teekay- Contracts by Field Operator	176
➢ Fig 162. Teekay- Asset Distribution by Region	176
≽ Fig 163. Teekay- Fleet Status	178
Fig 164. Yinson- Contracts by Field Operator	179
Fig 165. Yinson- Asset Distribution by Region	179
Fig 166. Yinson- Fleet Status	180
Fig 167. Excelerate- Contracts by Field Operator	181
➢ Fig 168. Excelerate- Asset Distribution by Region	182
➢ Fig 169. Excelerate- Fleet Status	182
≻ Fig 170. Exmar- Fleet Status	183
Fig 171. Golar- Contracts by Operator	184
➢ Fig 172. Golar- Asset Distribution by Region	184
➢ Fig 173. Golar- Fleet Status	185
➢ Fig 174. Hoegh- Contracts by Operator	187
➢ Fig 175. Hoegh- Asset Distribution by Region	187
➢ Fig 176. Hoegh- Fleet Status	187
➢ Fig 177. EPC Contractor Orderbook by Type	188
Fig 178. SEA Yards - Client Distribution	190
Fig 179. Korean Yards - Client Distribution	190
Fig 180. Chinese Yards - Client Distribution	190
➢ Fig 181. SEA Yards - Order Destination	190
Fig 182. Korean Yards - Order Destination	190
Fig 183. Chinese Yards - Order Destination	190
➢ Fig 184. COSCO - Orders by Client	192
≽ Fig 186. COSCO - Order Backlog	192



Fig 185. COSCO - Order Destination	192
Fig 187. CSIC - Orders by Client	193
➢ Fig 188. CSIC- Order Destination	193
➢ Fig 189. CSIC - Order Backlog	193
➢ Fig 190. CSSC - Orders by Client	194
Fig 191. CSSC - Order Destination	194
≽ Fig 192. CSSC - Order Backlog	194
➢ Fig 193. Wison - Orders by Client	195
Fig 194. Wison - Order Destination	195
➢ Fig 195. Wison - Order Backlog	195
➢ Fig 196. Daewoo - Orders by Client	197
Fig 197. Daewoo - Order Destination	197
≽ Fig 198. Daewoo - Order Backlog	197
Fig 199. Hyundai - Orders by Client	198
Fig 200. Hyundai - Order Destination	198
Fig 201. Hyundai - Order Backlog	199
Fig 202. Samsung - Orders by Client	200
Fig 203. Samsung - Order Destination	200
Fig 204. Samsung - Order Backlog	201
≽ Fig 205. Keppel - Orders by Client	202
➢ Fig 206. Keppel - Order Destination	202
≽ Fig 207. Keppel - Order Backlog	203
Fig 208. MMHE - Orders by Client	204
Fig 209. MMHE - Order Destination	204
≽ Fig 210. MMHE - Order Backlog	205
Fig 211. Sembcorp - Orders by Client	206
Fig 212. Sembcorp - Order Destination	206
Fig 213. Sembcorp - Order Backlog	207