

Energy Policy Directions and the Integrated Road-Map

Marie Donnelly

European Commission

Renewables, Research and Innovation, Energy Efficiency

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EU Energy Policy State of Play – the Challenge

 Move forward on ambitious agendas, for clean energy, for an integrated market and for access to indigineous sources of energy

 And at the same time achieve the balance between these objectives in sustainability, security of supply and the market (affordablity)





Policy State of Play – Security of Supply

• Import Dependency is geopolitical, many dimensions to resolve it. Proposals in preparation.

- Power system stability;
 - short-term corrections to grid management rules needed
 - mid-long term the Integrated energy technologies Road-Map





Policy State of Play – Sustainability

- Renewables; also contribute to security of supply
 - Market position maturing in some markets
 - Good design needed if support mechanisms used
- Zero/Low- Carbon; for member states that have a high share of fossil fuels, environmental concerns are a must.
- Energy Efficiency; complex but essential
- Innovation; new technology will be an essential piece of every solution.





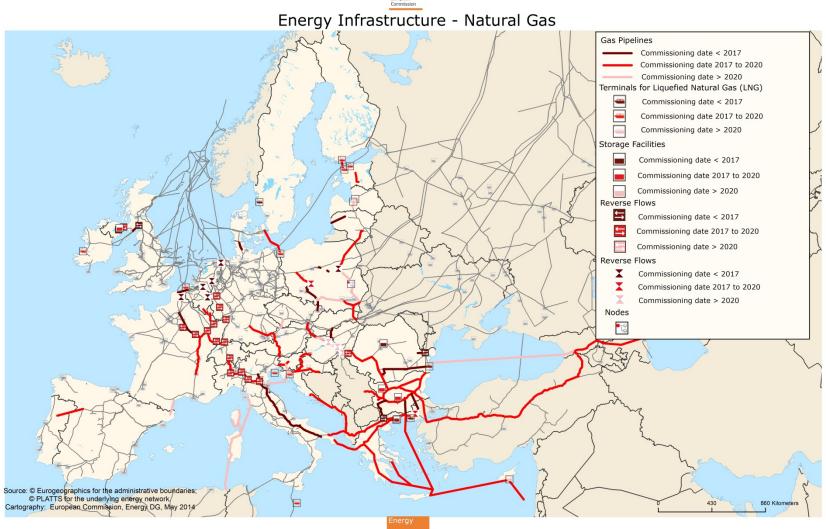
Policy State of Play – Affordability

- The real key to implementing the shift in energy policy
- Energy Efficiency; reduce demand
- Reduce the costs of sustainability through technology
- New business models related to consumer empowerment, demand response, intermittency ...
- Vulnerable consumers









Energy



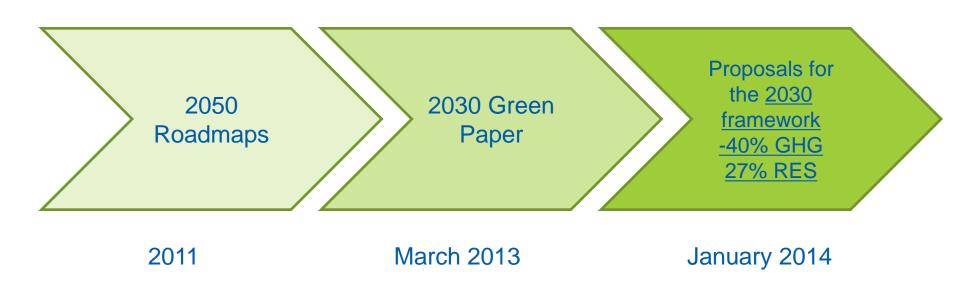
Shifts for security of supply - EU gas infrastructure

- Bidirectional pipeline operation
- Increased LNG
- New uses for the network; biogas, CCS, hydrogen





But underpinning investments with policy should help – the 2030 framework



On-going discussions with Member States, EU institutions and stakeholders



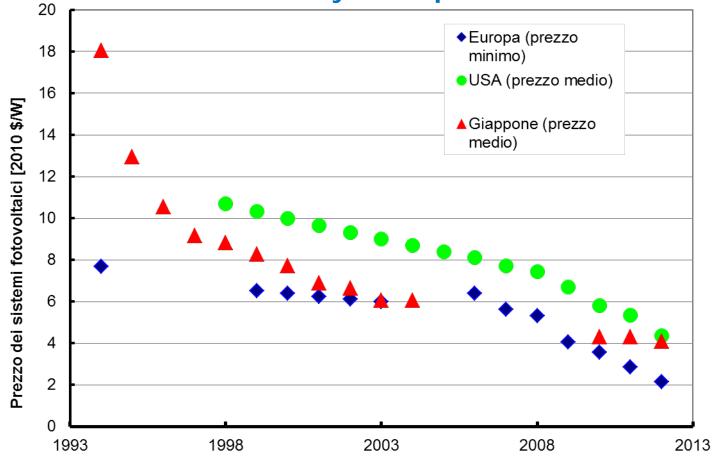
Post-2020 Policy Choices

- Type of and scope of targets (GHG, RES, EE)
- Mandatory or indicative
- Implementation mechanisms; carbon price, certificates, tariffs, taxes



Technology can help to cut costs; Residential and commercial PV systems price

Source: JRC (2013)





The Electricity Grid & Integration

- The centre of the challenge
- New flexibility needed to allow for more dynamic flows and new business models at local and system levels
- Cross-border issues
- Who leads? key role for the Integrated Road-Map





The Integrated Road-Map I

- Will provide a path to new technology and innovation, to underpin shifts in energy policy
- Takes a holistic system view
- Five key directions ...





The Integrated Road-Map II

- To empower the consumer in new energy business models
- Rationalise demand (energy efficiency)
- Optimise system management flexibility for demand response, intermittency …)
- Reduce the costs of energy production, while enhancing sustainability and security of supply
- Support multidisciplinary and international contributions to the effort





The Integrated Road-Map III - Practical Steps

- Communication on energy technology and innovation (May 2013), based ona public consultation in early 2013
- Stakeholders develop the Road-Map, to April 2014
- Discussion with Member States, Summer 2014
- Develop the IRM Action Plan
- Political and Public Debate
- Link to New Governance of Energy Policy





Conclusions

- The Integrated Road-Map is central to new energy policy and related development of technology
- Major shifts in energy policy are underway, so the challenge on technology is major also
- Need a balanced approach, that combines policy, regulation, technology and new business models



Difficult investment climate for RES ...

FIGURE 3: GLOBAL TRENDS IN RENEWABLE ENERGY INVESTMENT 2012 DATA TABLE, \$BN

1 Total Investment 1.1 New investment 1.2 Teer transactors 2 New Investment 2.1 Teer transactors 2 New Investment by Value Chain 2.1 Teer transactors 2.1 Separate transactors 2.1 Separate transactors 2.1 Separate transactors 2.1 Separate transactors 2.2 Equipment Manufacturing 2.2 Equipment Manufacturing 2.2.1 Private equity expansion capital 2.2.2 Public markets 2.3 Projects 2.3 Separate transactors 2.4 44.0 72.1 100.6 124.2 110.3 143.7 180.1 148.5 170.6 170.6 170.5 170	egory	Year Unit	2004 \$bn	2005 \$bn	2006 \$bn	2007 \$bn	2008 \$bn	2009 \$bn	2010 Sbn	2011 Sbn	2012 \$bn	2011-12 Growth	2004-12 CAGR %
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2.1 Technology development 2.1.1 Venture capital 2.1.2 Government R&D 2.0 2.1 2.3 2.7 2.8 5.2 4.7 4.7 4.7 4.8 2.1 2.2 Equipment Manufacturing 2.2.1 Equipment Manufacturing 2.2.1 Private equity expansion capital 2.3 8 9.1 2.2 11.8 12.5 11.8 10.6 4.1 2.2 2.1 2.1 2.1 2.1 2.1 2.1 2.1 2.1 2												-16%	
2.1 Technology development 2.1.1 Venture capital 2.1.2 Covernment R&D 2.0 2.1 2.3 2.7 2.8 5.2 4.7 4.7 4.7 2.1.3 Corporate RB&D 3.0 2.9 3.3 3.0 4.0 4.0 4.0 4.8 4.8 2.1.2 Government R&D 3.0 2.9 3.3 3.0 4.0 4.0 4.0 4.8 4.8 2.1.2 Coperate RB&D 3.0 2.9 3.3 3.0 4.0 4.0 4.0 4.0 4.8 4.8 2.2 Equipment Manufacturing 2.2.1 Private equity expansion capital 3.1 0 3.0 3.7 6.8 2.9 3.1 2.6 1.4 2.2 Equipment Manufacturing 2.2.2 Public markets 3.3 8 9.1 22.2 11.0 12.5 11.8 10.6 4.1 2.3 Projects 2.3.1 Asset finance 3.4 44.0 72.1 100.6 124.2 110.3 143.7 180.1 143.8 3.8 9.1 22.2 11.0 12.5 11.8 10.6 4.1 3.1 Saset finance 3.1 Asset finance 3.2 1.3 Saset finance 3.2 1.4 Saset finance 3.3 Finance Of which re-invested equity 3.3 Sall distributed capacity 3.9 10.5 9.8 14.3 22.5 33.5 62.4 77.4 80.1 3.1 Total Financial Investment 3.2 3 Sall distributed RB&D, small projects 3.3 Saset RB&D, corporate RB&D, small projects 3.3 Saset RB&D, corporate RB&D, small projects 3.4 M&A Transactions 3.4 Private equity buy-outs 3.5 Private equity buy-outs 3.6 Saset RB&D, small projects 3.7 Saset RB&D, small projects 3.8 Saset RB&D, small projects 3.9 Saset RB&D, small projects 3.1 Private equity buy-outs 3.1 Private equity buy-outs 3.2 Public markets investor exits 3.3 Corporate M&A 2.4 7.9 12.7 2.4 1.0 2.6 4.7 0.1 0.4 3.3 Corporate M&A 2.5 3.2 9.3 1.2 0.2 0.3 3.7 33.9 40.9 42.3 1.2 0.2 0.3 3.7 33.9 40.9 42.3 1.2 0.2 0.3 3.7 33.9 40.9 42.3 1.2 0.2 0.3 3.7 33.9 40.9 42.3 1.2 0.2 0.3 3.7 33.9 40.9 42.3 1.2 0.2 0.3 3.7 33.9 40.9 42.3 1.2 0.2 0.3 3.7 33.9 40.9 42.3 1.2 0.2 0.3 3.7 33.9 40.9 42.3 1.2 0.2 0.3 3.7 33.9 40.9 42.3 1.2 0.2 0.3 3.7 33.9 40.9 42.3 1.2 0.2 0.3 3.7 33.9 40.9 42.3 1.2 0.2 0.3 3.7 33.9 40.9 42.3 1.2 0.2 0.3 3.0 0.3 0.2 0.3 3.0 0.3 0.2 0.3			70.7	80.7	155.0	204.7	201.0	202.0	200.0	302.0	200.7	-1076	2376
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Total New Investment 39.6 64.7 100.0 146.2 171.7 168.2 227.2 279.0 244.4 3 M&A Transactions 3.1 Private equity buy-outs 3.2 Public markets investor exits 0.0 1.4 2.7 4.2 1.0 2.6 4.7 0.1 0.4 3.3 Corporate M&A 2.4 7.9 12.7 20.4 18.0 21.5 18.0 29.5 7.1 3.4 Project acquistion & refinancing 5.4 12.8 18.4 30.4 34.9 37.7 33.9 40.9 42.3 4 New Investment by Sector 4.1 Wind 4.2 Solar 4.2 Solar 4.3 Biofuels 3.7 8.9 26.1 28.2 19.3 10.6 9.2 83.3 5.1 4.4 Biomass & w-t-e 4.5 Small hydro 1.5 4.6 6eothermal 1.4 0.9 1.4 1.8 18.1 14.1 13.2 13.7 12.9 8.6 4.7 Marine 0.0 0.1 0.9 0.7 0.2 0.3 0.2 0.3 5.8 War Investment by Geography 5.1 United States 5.7 11.9 28.2 34.5 36.2 23.3 34.6 54.8 36.5 5.8 Brazil 5.9 Fr.1 10.0 0.5 15.5 15.5 1.5 8.3 9.5 15.5 1.5 8.3 9.5 15.5 1.5 8.3 9.5 15.5 1.6 5.7 11.9 28.2 34.5 36.2 23.3 34.6 54.8 36.5 5.8 Brazil 5.9 Fr.1 15.5 8.3 9.5 15.5 1.5 8.3 P.5 11.5 8.3 9.5 15.5 5.8 Brazil 1.4 3.4 3.4 5.0 5.6 5.9 7.9 7.9 8.6 5.5 5.8 Brazil 1.5 8.3 9.5 11.5 8.3 9.5 15.5 1.6 5.9 7.1 5.3 3.5 15.5 5.8 Brazil 5.9 Fr.2 11.5 8.3 9.5 15.5 5.9 T.1.5 8.3 9.5 15.5 15.5 15.5 15.5 15.5 15.5 15.5												3%	26%
3 M&A Transactions 3.1 Private equity buy-outs 3.2 Public markets investor exits 0.0 1.4 2.7 4.2 1.0 2.6 4.7 0.1 0.4 3.3 Corporate M&A 2.4 7.9 12.7 20.4 18.0 21.5 18.0 29.5 7.1 3.4 Project acquistion & refinancing 5.4 12.8 18.4 30.4 30.4 34.9 37.7 33.9 40.9 42.3 4 New Investment by Sector 4.1 Wind 14.4 25.5 32.4 57.4 69.9 73.7 96.2 89.3 80.3 4.2 Solar 12.3 16.4 22.1 39.1 59.3 62.3 99.9 158.1 140.4 4.3 Biofuels 4.3 Biofuels 3.7 8.9 26.1 28.2 19.3 10.6 9.2 8.3 5.0 4.4 Biomass & w-t-e 6.3 8.3 11.8 13.1 14.1 13.2 13.7 12.9 8.6 4.6 Geothermal 1.4 0.9 1.4 1.8 1.8 2.7 3.5 3.7 2.1 4.7 Marine 0.0 0.1 0.9 0.7 0.2 0.3 0.2 0.3 0.3 0.3 Total 59.8 60.3 39.9 158.1 140.4 5.9 7.1 5.3 4.5 6.5 7.8 5.8 4.6 Geography 5.1 United States 5.7 11.9 28.2 34.5 36.2 23.3 34.6 54.8 36.6 55.9 55.3 AMER (excl. US & Brazil) 1.4 3.4 3.4 3.4 3.5 5.0 5.6 5.9 11.5 8.3 9.6 5.7 5.8 9.6 5.9 5.9 5.1 5.3 5.4 5.0 5.6 5.9 11.5 8.3 9.6 5.4 5.9 5.4 5.0 5.6 5.9 11.5 8.3 9.6 5.4 5.9 5.1 5.1 5.3 5.4 5.1 5.3 5.4 5.4 5.9 5.4 5.9 5.1 5.3 5.4 5.4 5.9 5.4 5.9 5.3 5.4 5.4 5.9 5.4 5.9 5.3 5.4 5.4 5.9 5.4 5.9 5.3 5.4 5.4 5.9 5.3 5.4 5.4 5.9 5.4 5.9 5.3 5.4 5.9 5.3 5.4 5.3 5.4 5.3 5.4 5.3 5.4 5.4 5.9 5.3 5.3 5.4 5.3 5.4 5.4 5.9 5.3 5.3 5.4 5.4 5.9 5.3 5.4 5.3 5.4 5.3 5.4 5.4 5.9 5.3 5.3 5.4 5.3 5.4 5.3 5.4 5.4 5.9 5.3 5.3 5.4 5.4 5.9 5.3 5.4 5.3 5.4 5.4 5.9 5.3 5.3 5.4 5.3 5.4 5.4 5.9 5.3 5.4 5.3 5.4 5.3 5.4 5.4 5.9 5.3 5.4 5.3 5.4 5.4 5.9 5.3 5.4 5.3 5.4 5.4 5.9 5.4 5.9 5.3 5.4 5.3 5.4 5.4 5.9 5.4 5.9 5.3 5.4 5.4 5.9 5.4 5.9 5.3 5.4 5.9 5.3 5.4 5.9 5.4 5.9 5.4 5.9 5.3 5.8 5.9 5.9 5.3 5.8 5.9 5.9 5.9 5.1 5.3 5.8 5.9 5.9 5.9 5.9 5.9 5.9 5.9 5.9 5.9 5.9		projects										-12%	26%
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3.3 Corporate M&A 3.4 Project acquistion & refinancing 5.4 12.8 18.4 30.4 34.9 37.7 33.9 40.9 42.3 4 New Investment by Sector 4.1 Wind 4.2 Solar 4.3 Biofuels 5.4 12.8 18.4 22.1 39.1 59.3 62.3 99.9 158.1 140.4 4.3 Biofuels 4.4 Biomass & w-t-e 4.5 Small hydro 5.6 Sector 4.7 Marine 5.7 11.9 28.2 34.5 36.2 27.2 279.0 244.4 5 New Investment by Geography 5.1 United States 5.7 11.9 28.2 34.5 36.2 23.3 34.6 54.8 36.5 5.2 Brazil 5.8 AMER (excl. US & Brazil) 5.9 Sector 1.0 12.7 12.8 18.0 29.5 7.1 18.0 29.5 7												200%	41%
3.4 Project acquistion & refinancing 5.4 12.8 18.4 30.4 34.9 37.7 33.9 40.9 42.3 4 New Investment by Sector 4.1 Wind 14.4 25.5 32.4 57.4 69.9 73.7 96.2 89.3 80.3 4.2 Solar 12.3 16.4 22.1 39.1 59.3 62.3 99.9 158.1 140.4 4.3 Biofuels 3.7 8.9 26.1 28.2 19.3 10.6 9.2 8.3 5.6 4.4 Biomass & w-t-e 6.3 8.3 11.8 13.1 14.1 13.2 13.7 12.9 8.6 4.5 Small hydro 1.5 4.6 5.4 5.9 7.1 5.3 4.5 6.5 7.8 4.6 Geothermal 1.4 0.9 1.4 1.8 1.8 2.7 3.5 3.7 2.1 4.7 Marine 0.0 0.1 0.9 0.7 0.2 0.3 0.2 0.3 0.2 20.3 0.3 5 New Investment by Geography 5.7 11.9 28.2 34.5 3												-76%	14%
4 New Investment by Sector 4.1 Wind 4.2 Solar 4.3 Biofuels 4.4 Biomass & w-t-e 4.5 Small hydro 4.5 Geothermal 4.6 Geothermal 4.7 Marine 5 New Investment by Geography 5.1 United States 5.7 Ill.9 5.8 Brazil 5.9 Fazil 5.1 United States 5.7 Ill.9 5.8 Brazil 5.9 Fazil 5.1 United States 5.7 Ill.9 5.8 Brazil 5.9 Fazil 5.7 Ill.9 5.8 Brazil 5.7 Sector States 5.8 States 5.9 Sector States 5.7 Ill.9 5.8 Sector States 5.8 Sector States 5.9 Sector States 5.7 Ill.9 5.8 Sector States 5.8 Sector States 5.9 Fazil 6.9 Fazil 6.9 Sector States 6.0 Sector States													29%
4.1 Wind 14.4 25.5 32.4 57.4 69.9 73.7 96.2 89.3 80.3 4.2 Solar 12.3 16.4 22.1 39.1 59.3 62.3 99.9 158.1 140.4 4.3 Biofuels 3.7 8.9 26.1 28.2 19.3 10.6 9.2 8.3 5.0 4.4 Biomass & w-t-e 6.3 8.3 11.8 13.1 14.1 13.2 13.7 12.9 8.6 4.5 Small hydro 1.5 4.6 5.4 5.9 7.1 5.3 4.5 6.5 7.8 4.6 Geothermal 1.4 0.9 1.4 1.8 1.8 2.7 3.5 3.7 2.1 4.7 Marine 0.0 0.1 0.9 0.7 0.2 0.3 0.2 0.3 0.3 Total 39.6 64.7 100.0 146.2 171.7 168.2 227.2 279.0 244.4 5 New Investment by Geography 5.7 11.9 28.2 34.5 36.2 23.3 34.6 54.8 36.0 <			3.4	12.0	10.4	30.4	34.8	31.1	33.8	40.8	42.5	476	2876
4.2 Solar 12.3 16.4 22.1 39.1 59.3 62.3 99.9 158.1 140.4 4.3 Biofuels 3.7 8.9 26.1 28.2 19.3 10.6 9.2 8.3 5.0 4.4 Biomass & w-t-e 6.3 8.3 11.8 13.1 14.1 13.2 13.7 12.9 8.6 4.5 Small hydro 1.5 4.6 5.4 5.9 7.1 5.3 4.5 6.5 7.8 4.6 Geothermal 1.4 0.9 1.4 1.8 1.8 2.7 3.5 3.7 2.1 4.7 Marine 0.0 0.1 0.9 0.7 0.2 0.3 0.2 0.3 0.3 Total 39.6 64.7 100.0 146.2 171.7 168.2 227.2 279.0 244.4 5 New Investment by Geography 5.7 11.9 28.2 34.5 36.2 23.3 34.6 54.8 36.0 5.2 Brazil 0.5 2.2 4.2 10.3 12.5 7.9 7.9 7.9 8.6			14.4	25.5	22.4	57.4	80.0	72.7	06.2	90.2	00.2	-10%	24%
4.3 Biofuels 3.7 8.9 26.1 28.2 19.3 10.6 9.2 8.3 5.0 4.4 Biomass & w-t-e 6.3 8.3 11.8 13.1 14.1 13.2 13.7 12.9 8.6 4.5 Small hydro 1.5 4.6 5.4 5.9 7.1 5.3 4.5 6.5 7.8 4.6 Geothermal 1.4 0.9 1.4 1.8 1.8 2.7 3.5 3.7 2.1 4.7 Marine 0.0 0.1 0.9 0.7 0.2 0.3	_												36%
4.4 Biomass & w+-e 6.3 8.3 11.8 13.1 14.1 13.2 13.7 12.9 8.6 4.5 Small hydro 1.5 4.6 5.4 5.9 7.1 5.3 4.5 6.5 7.8 4.6 Geothermal 1.4 0.9 1.4 1.8 1.8 2.7 3.5 3.7 2.1 4.7 Marine 0.0 0.1 0.9 0.7 0.2 0.3 0.2 0.3 0.3 Total 39.0 64.7 100.0 146.2 171.7 168.2 227.2 279.0 244.4 5 New Investment by Geography 5.1 United States 5.7 11.9 28.2 34.5 38.2 23.3 34.6 54.8 36.0 5.2 Brazil 0.5 2.2 4.2 10.3 12.5 7.9 7.9 8.6 5.4 5.3 AMER (excl. US & Brazil) 1.4 3.4 3.4 5.0 5.6 5.9 11.5 8.3 9.5 5.4 Europe 19.6 29.4 38.4 61.7 72.9 74.7 101.3 112.3												-40%	4%
4.5 Small hydro 1.5 4.6 5.4 5.9 7.1 5.3 4.5 6.5 7.8 4.6 Geothermal 1.4 0.9 1.4 1.8 1.8 2.7 3.5 3.7 2.1 4.7 Marine 0.0 0.1 0.9 0.7 0.2 0.3 0.2 0.3 0.3 Total 39.6 64.7 100.0 146.2 171.7 168.2 227.2 279.0 244.6 5 New Investment by Geography 5.1 United States 5.7 11.9 28.2 34.5 36.2 23.3 34.6 54.8 36.0 5.2 Brazil 0.5 2.2 4.2 10.3 12.5 7.9 7.9 8.6 5.4 5.3 AMER (excl. US & Brazil) 1.4 3.4 3.4 5.0 5.6 5.9 11.5 8.3 9.5 5.4 Europe 19.6 29.4 38.4 61.7 72.9 74.7 101.3 112.3 79.6												-34%	4%
4.6 Geothermal 1.4 0.9 1.4 1.8 1.8 2.7 3.5 3.7 2.1 4.7 Marine 0.0 0.1 0.9 0.7 0.2 0.3 0.2 0.3 0.3 Total 39.6 64.7 100.0 146.2 171.7 168.2 227.2 279.0 244.6 5 New Investment by Geography 5.1 United States 5.7 11.9 28.2 34.5 36.2 23.3 34.6 54.8 36.0 5.2 Brazil 0.5 2.2 4.2 10.3 12.5 7.9 7.9 8.6 5.4 5.3 AMER (excl. US & Brazil) 1.4 3.4 3.4 5.0 5.6 5.9 11.5 8.3 9.5 5.4 Europe 19.6 29.4 38.4 61.7 72.9 74.7 101.3 112.3 79.6													22%
4.7 Marine 0.0 0.1 0.9 0.7 0.2 0.3 0.2 0.3 0.3 Total 39.6 64.7 100.0 146.2 171.7 168.2 227.2 279.0 244.4 5 New Investment by Geography 5.7 11.9 28.2 34.5 36.2 23.3 34.6 54.8 36.0 5.2 Brazil 0.5 2.2 4.2 10.3 12.5 7.9 7.9 8.8 5.4 5.3 AMER (excl. US & Brazil) 1.4 3.4 3.4 5.0 5.6 5.9 11.5 8.3 9.5 5.4 Europe 19.6 29.4 38.4 61.7 72.9 74.7 101.3 112.3 79.6												-44%	5%
Total 39.6 64.7 100.0 146.2 171.7 168.2 227.2 279.0 244.4 5 New Investment by Geography 5.1 United States 5.7 11.9 28.2 34.5 36.2 23.3 34.6 54.8 36.0 5.2 Brazil 0.5 2.2 4.2 10.3 12.5 7.9 7.9 8.6 5.4 5.3 AMER (excl. US & Brazil) 1.4 3.4 3.4 5.0 5.6 5.9 11.5 8.3 9.4 5.4 Europe 19.6 29.4 38.4 61.7 72.9 74.7 101.3 112.3 79.5													30%
5 New Investment by Geography 5.1 United States 5.7 11.9 28.2 34.5 36.2 23.3 34.6 54.8 36.0 5.2 Brazil 0.5 2.2 4.2 10.3 12.5 7.9 7.9 8.6 5.4 5.3 AMER (excl. US & Brazil) 1.4 3.4 3.4 5.0 5.6 5.9 11.5 8.3 9.5 5.4 Europe 19.6 29.4 38.4 61.7 72.9 74.7 101.3 112.3 79.6												-12%	26%
5.1 United States 5.7 11.9 28.2 34.5 36.2 23.3 34.6 54.8 36.0 5.2 Brazil 0.5 2.2 4.2 10.3 12.5 7.9 7.9 8.6 5.4 5.3 AMER (excl. US & Brazil) 1.4 3.4 3.4 5.0 5.6 5.9 11.5 8.3 9.5 5.4 Europe 19.6 29.4 38.4 61.7 72.9 74.7 101.3 112.3 79.5			56.0	04.7	100.0	140.2	17 1.7	100.2	221.2	210.0	211.1	-1276	2076
5.2 Brazil 0.5 2.2 4.2 10.3 12.5 7.9 7.9 8.6 5.4 5.3 AMER (excl. US & Brazil) 1.4 3.4 3.4 5.0 5.6 5.9 11.5 8.3 9.5 5.4 Europe 19.6 29.4 38.4 61.7 72.9 74.7 101.3 112.3 79.6			5.7	11.0	20.2	24 5	38.2	22.2	24 8	54.0	28.0	-34%	26%
5.3 AMER (excl. US & Brazil) 1.4 3.4 3.4 5.0 5.6 5.9 11.5 8.3 9.5 5.4 Europe 19.6 29.4 38.4 61.7 72.9 74.7 101.3 112.3 79.5											5.4	-37%	34%
5.4 Europe 19.6 29.4 38.4 61.7 72.9 74.7 101.3 112.3 79.6													27%
												-29%	19%
5.5 Middle Fact 8 Africa 1 All 1 All 1 All 1 All 1 All 2 All 1 A	fle East & Africa		0.6	0.6	1.2	1.7	2.7	1.7	5.0	3.5	11.5		46%
											66.6	22%	50%
											6.5		13%
	-										29.0	22%	20%
											244.4	-12%	26%