

IMAP OCTOBER 2018



Oil & Gas

IMAP M&A SECTOR REPORT



Oil and Gas Sector in Numbers

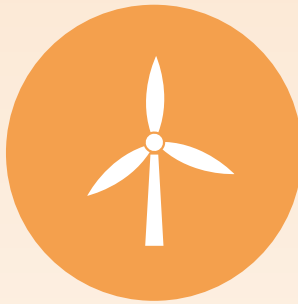
12.1x
MEDIAN
TRANSACTION
MULTIPLE EV/EBITDA



Higher Industry Multiples

- Relatively high transaction multiples in the oil and gas sector from 2017 to 1H2018, most likely due to increasing oil prices and improved financial performance since the downturn in 2014.

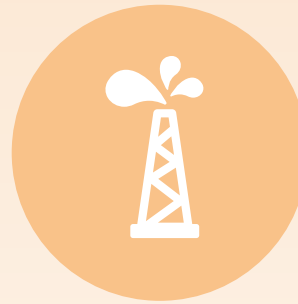
13.7x
MEDIAN
TRANSACTION
MULTIPLE EV/EBITDA



Alternative Energy Gains

- Even higher transaction multiples in the alternative energy sector relative to the oil and gas sector from 2017 to 1H2018, reflecting the differences in market outlook.

60.5%
INCREASE IN OIL
PRICES SINCE LAST
YEAR



Oil Prices Up

- The average price per barrel of Brent crude oil increased from USD 46.4 to USD 74.4, comparing June 2017 with June 2018.

68.1%
CROSS-BORDER
TRANSACTIONS WITH
EUROPEAN TARGET
COMPANY



More Cross-Border Deals

- Europe is characterized by an international deal climate, with 68.1% of transactions from 2017 to 1H 2018 being cross-border.



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Market Outlook and Executive Summary



- The oil and gas sector is still in the process of stabilizing since the downturn in 2014.
- M&A activity slowed down in terms of transaction volume and transaction value in 2H 2017 and 1H 2018, most likely due to an increase in geopolitical risk, a cautious attitude due to the recent downturn and firms focusing on improving earnings rather than engaging in M&A.
- Valuation multiples of recent transactions since January 2017 are relatively high in the oil and gas sector and even higher in the alternative energy sector.
- Oil prices have been increasing rapidly over the last year and pressured by the U.S. and other non-OPEC countries, OPEC decided to increase production in June 2018 in order to contain oil prices.
- Geopolitical risks have increased, with more conflicts in the Middle-East, as well as global trade tensions between major economic powers causing more uncertainty in the market. For example, political issues in Venezuela and Libya have substantially lowered production.
- With oil demand continuing to grow rapidly and investments being deferred during the oil price crash of 2014, the industry could struggle with a supply crunch in the near future, a projection shared by the CEOs of Total, Eni and Saudi Aramco.
- Coal demand is expected to peak around 2028, while oil demand is expected to peak in 2037. Gas demand continues to grow modestly.
- Global M&A in the oil and gas sector is expected to increase in 1H 2018 as financial performance is improving, oil prices have increased and companies are increasingly changing their portfolio of assets.
- Technological disruptions such as electric vehicles, autonomous vehicles, ride-hailing, storage technology and solar PV technology are changing the energy and transportation sector dramatically.

Source: McKinsey & Company, Deloitte U.S. Oil and Gas Outlook 2018, Bloomberg, PWC Oil and Gas Trends 2018-2019, EY Oil & Gas, New York Times, U.S. Energy Information Administration (EIA)

Industry Trends and Developments



Oil prices

- Oil prices have increased from USD 46.4 to USD 74.4 (a 60.5% increase) per barrel of Brent crude oil, when comparing the average price in June 2017 with June 2018.
- Main factors contributing to the rapid increase in oil prices:
 - Production cuts from OPEC which began at the end of 2016.
 - Geopolitical issues, for example, Venezuela and Libya have lowered production significantly.
 - Global oil demand is still increasing, albeit at a decreasing rate.
- Under pressure by the U.S. and other non-OPEC countries, OPEC announced an increase in its production as of June 2018 in order to manage the fast increase in oil prices.



Global energy demand

- Global energy demand growth is expected to decelerate, taking into account:
 - Africa, India, China and other developing countries in Asia drive global energy demand growth, due mainly to population growth and economic expansion.
 - Aging workforce will cause a downward pressure on economic growth.
 - Falling energy intensity due to higher end-use efficiency.
- Electricity demand is expected to grow 4 times faster than all other energy sources up to 2050, due mainly to the increase in electric vehicles, growing economies in Asia and Africa and technological changes.
- The long-term energy demand will be the most diversified energy mix ever, including: oil, gas, coal, nuclear, hydro and renewable energy.



U.S. shale producers

- U.S. shale oil producers achieved significant cost reductions, forced by the market downturn in 2014.
- It appears that these cost reductions are more permanent than previously expected, with break-even costs across major U.S. shale oil players 30% to 50% lower than early 2015.
- U.S. shale natural gas producers have structurally lowered costs as well.
- U.S. shale oil and gas production and exports have strongly increased, with this expected to continue.

Risks and uncertainties in the oil and gas sector



Source: McKinsey & Company, PWC Oil and Gas Trends 2018-2019, BP Energy Outlook 2018, U.S. Energy Information Administration (EIA)

Industry Trends and Developments



Digitalization

- Advanced analytics, machine learning, drones and virtual simulation can significantly increase production, lower unit costs and increase safety, among other benefits. For example:
 - Real-time monitoring and data will improve maintenance regimes, as well as help detect underperformance of wells and anomalies during drilling.
 - Extensive data on efficiency and emissions allows better monitoring of health, safety, security and environment (HSSE) performance and compliance.
 - Data-driven monitoring of condition status allows better prediction and mitigation of equipment failure.
- The traditional oil and gas industry is changing rapidly due to digitalization, and the U.S., with the Permian basin in particular, are at the cutting edge of digitalization.
- The adoption of digitalization across the globe will be crucial and determine the future industry players.



Scarcity of young talent

- Due to the downturn in 2014, the sector experienced a large reduction in workforce of approximately 400,000 experienced and valuable employees.
- Millennials are entering sectors other than the oil and gas sector.
- Nonetheless, this group is projected to comprise roughly 75% of the labor force in 2025, as older workers retire, creating a 'brain drain'.
- The sector as a whole is forced to create a more attractive working environment in order to attract and retain new talent.



Deepwater exploration

- Deepwater exploration has lower production costs than onshore shale resources and will remain an essential source of global oil supply.
- The Gulf of Mexico (GOM) is one of the largest deepwater oil sources ever discovered, although success rates are significantly lower relative to other deepwater exploration wells.
- The GOM has proven to be a resourceful deepwater location and will become more important in the future, though technological developments will be critical in order to make it more viable.



Rise of renewables

- 2016 was the first year in which net annual capacity additions of solar and wind exceeded gas and coal.
- It is expected that new-build solar and wind farms will be more economical than gas and coal in almost all countries as of 2020.
- Solar and wind will contribute over 80% of new capacity, with China and India contributing more than half.

Source: McKinsey & Company, PWC Oil and Gas Trends 2018-2019, BP Energy Outlook 2018, U.S. Energy Information Administration (EIA)

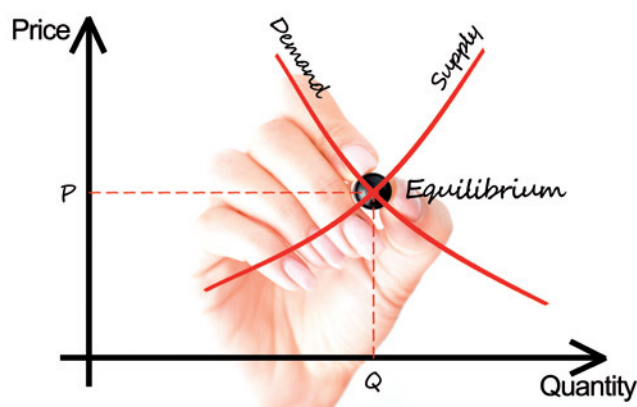
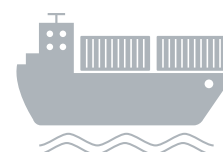
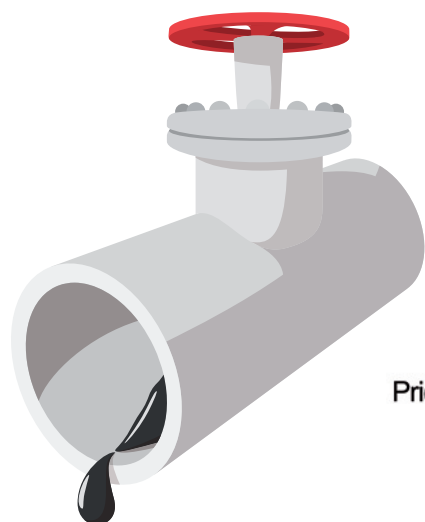
Supply and Demand in the Global Oil Market

Supply

- Under pressure by the U.S. and other non-OPEC countries and after a long period of production cuts, OPEC decided to increase global oil supply again as of June 2018.
- U.S. shale oil production and export strongly increased over the last years and this is expected to continue.
- Geopolitical issues in Venezuela and Libya have lowered production substantially. Further geopolitical risks in the Middle-East and global trade wars could further lower the global oil supply.
- As of 2017, the volume of new oil and gas discoveries was at its lowest point since the 1950s and it is getting more and more difficult to find large discoveries.

Demand

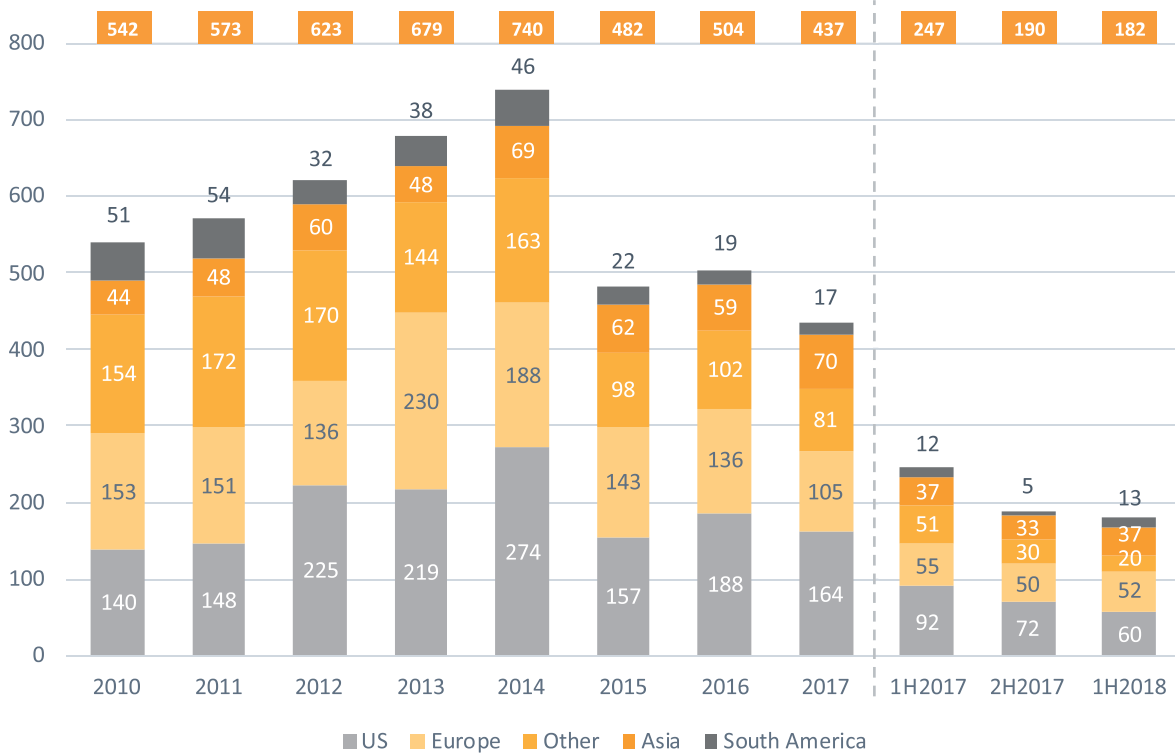
- Global energy demand is expected to increase (at a decreasing rate), thereby increasing oil demand.
- The (petro)chemical industry and the transport sector contribute the most in oil demand.
- Long-term oil demand will decrease due to electrification and efficiency improvements.
- According to the base case scenario in McKinsey's Global Energy Perspective, global oil demand is expected to peak in 2037.



Source: McKinsey & Company, Deloitte U.S. Oil and Gas Outlook 2018, PWC Oil and Gas Trends 2018-2019, New York Times, U.S. Energy Information Administration (EIA)

Global M&A Activity - Transaction Volume

Transaction volume

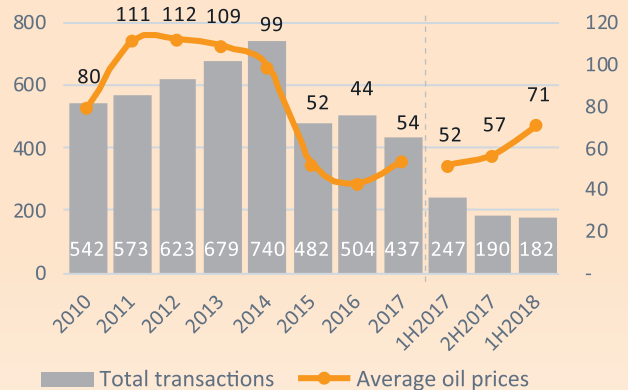


Source: Zephyr, KPMG M&A Predictor 2018

Number of global transactions by world region of target company from January 2010 to June 2018. Includes transactions with a transaction value higher than EUR 25 Million and with the status 'completed-confirmed'. The world region 'Other' contains transactions for the most part, with target companies based in Canada and Australia.

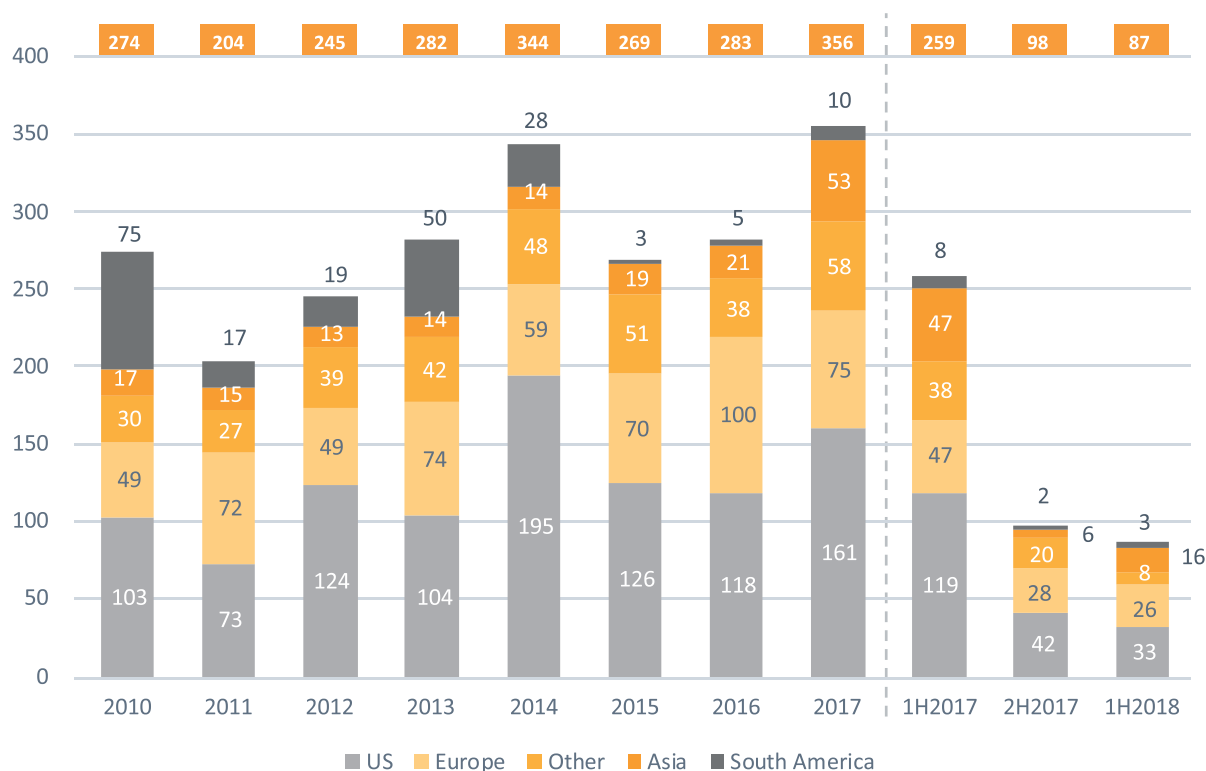
- Global transaction volume peaked in 2014 with 740 deals, followed by a sharp decrease in the following years.
- Transaction volume has been declining since 2017, with 182 transactions in the first half of 2018, most likely due to:
 - Geopolitical tensions causing uncertainty in the market.
 - The sector is still in the process of stabilizing, focusing on earnings growth rather than M&A.
- The reduction in M&A activity in 2018 is in line with a 10% reduction in M&A appetite in the oil and gas sector, as outlined by the KPMG 2018 M&A Predictor.

- While oil prices are recovering since the oil price crash in 2014, transaction volume remains low, as shown below.



Global M&A Activity – Transaction Value

Transaction value (EUR Billions)



Source: Zephyr

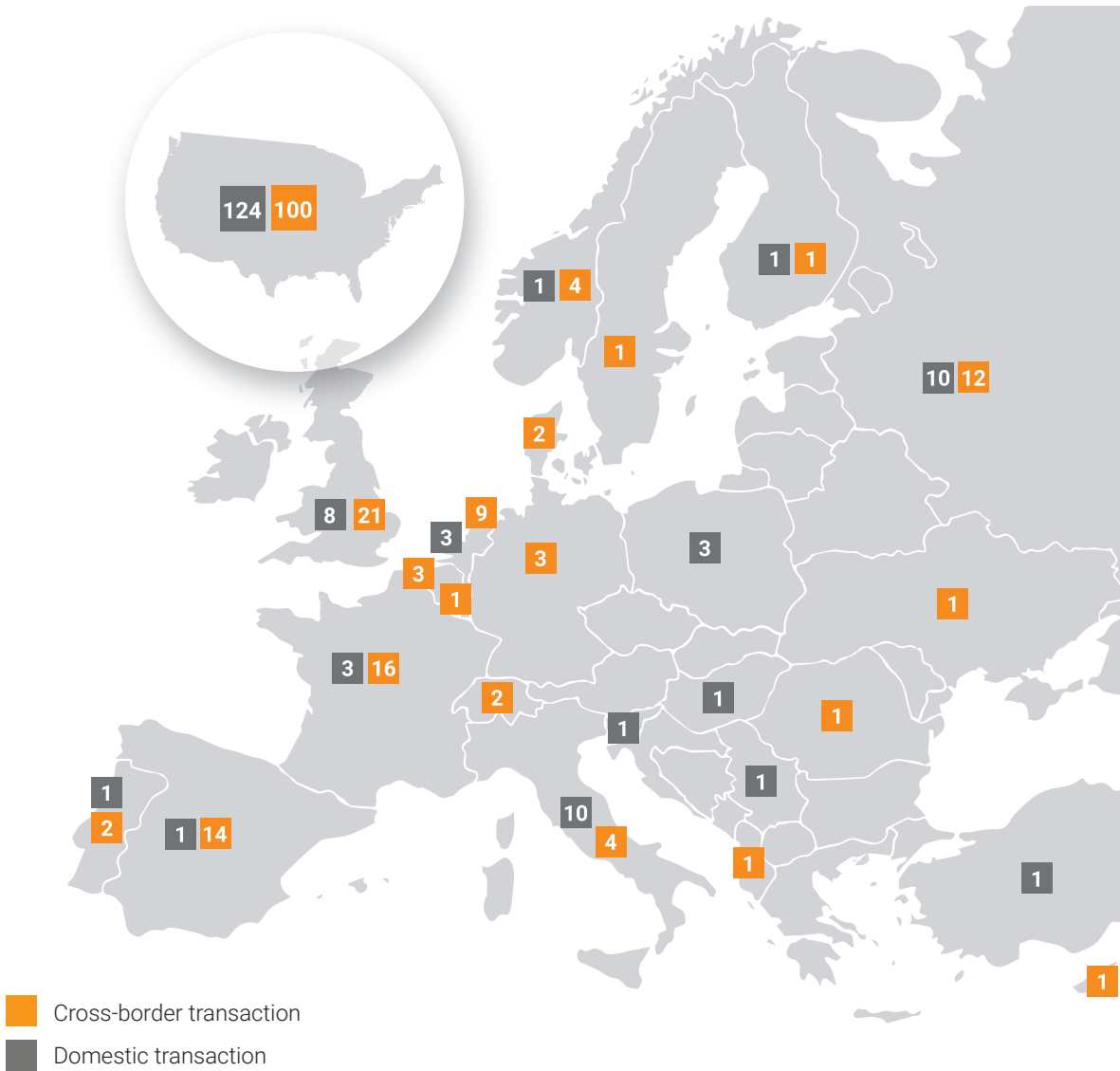
Global transaction value by world region of the target company over January 2010 to June 2018. Includes transactions with a transaction value higher than EUR 25 Million and with the status 'completed-confirmed'. Reported in Billions of EUR (€). We follow Zephyr's definition of 'deal value' as: "This will be the consideration paid for the actual stake acquired." The world region 'Other' contains transactions for the most part, with target companies based in Canada and Australia. Note that yearly transaction value is sensitive for large deals, hence the results should be interpreted carefully.

- Transaction value peaked in both 2014, with EUR 344 billion and in 2017, with EUR 356 billion.
- Transaction value was extremely high in 1H 2017 compared with 2H 2017; 57% of the total transaction volume in 1H 2017 accounted for 73% of the total transaction value.
- Transaction value significantly dropped after the first half of 2017, with the second half of 2017 reaching EUR 98 billion and the first half of 2018 amounting to EUR 87 billion.
- In addition, the number of extremely large deals in 2H 2017 and 1H 2018 remained low.
- The U.S. is the most active M&A region, in terms of both transaction volume and transaction value.
- M&A activity in South America has been decreasing since 2010, in terms of transaction volume and transaction value.

Europe and U.S. M&A Activity

Domestic and cross-border transactions

Number of domestic and cross-border transactions per country for Europe and the U.S. with a minimum deal value of EUR 25 Million between January 2017 and June 2018.



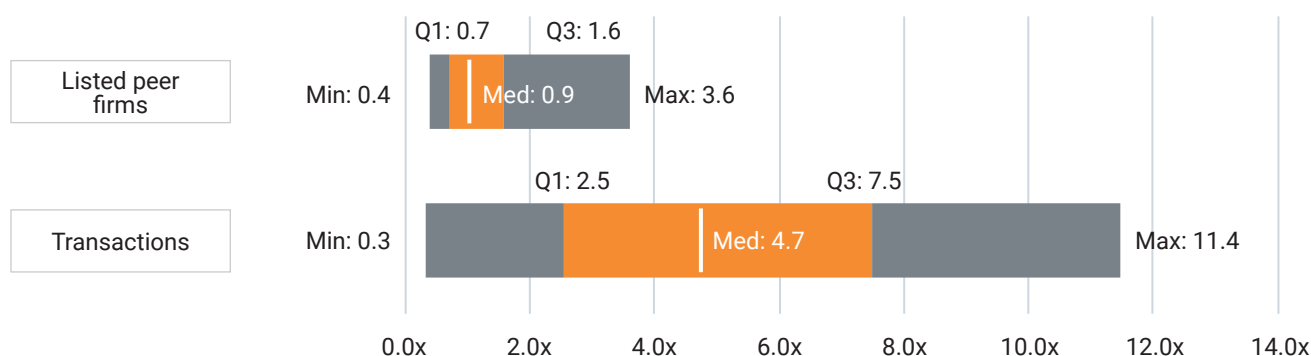
Source: Zephyr

- The map shows 141 transactions in Europe and 224 transactions in the U.S., categorized by domestic and cross-border transactions.
- Europe is characterized by an international climate, with 68.1% of transactions being cross-border.
- Cross-border transactions play a smaller role in the U.S., with 44.6% of transactions involving a foreign buyer.
- Financial investors were involved in 32.6% of the transactions in Europe between the start of 2017 and 1H 2018, whereas this was the case for 24.1% of the transactions in the U.S.

Valuation Summary – Oil and Gas

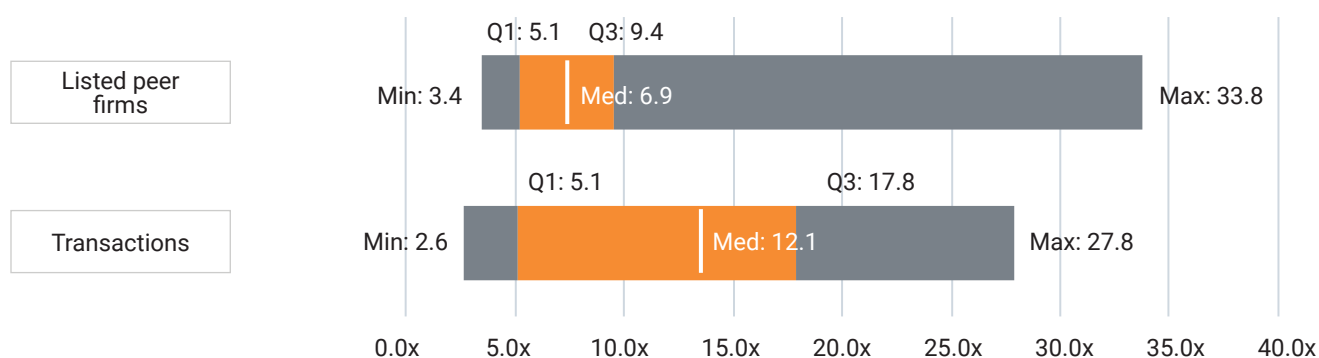
EV/Revenue multiples (x)

EV/Revenue multiples for listed peer firms and worldwide transactions with known multiples from January 2017 to 31st July 2018. MergerMarket sector classification 'oil and gas exploration and production': "Companies that engage in the exploration and production of oil and gas."



EV/EBITDA multiples (x)

EV/EBITDA multiples for listed peer firms and worldwide transactions with known multiples from January 2017 to 31st July 2018. MergerMarket sector classification 'oil and gas exploration and production': "Companies that engage in the exploration and production of oil and gas."



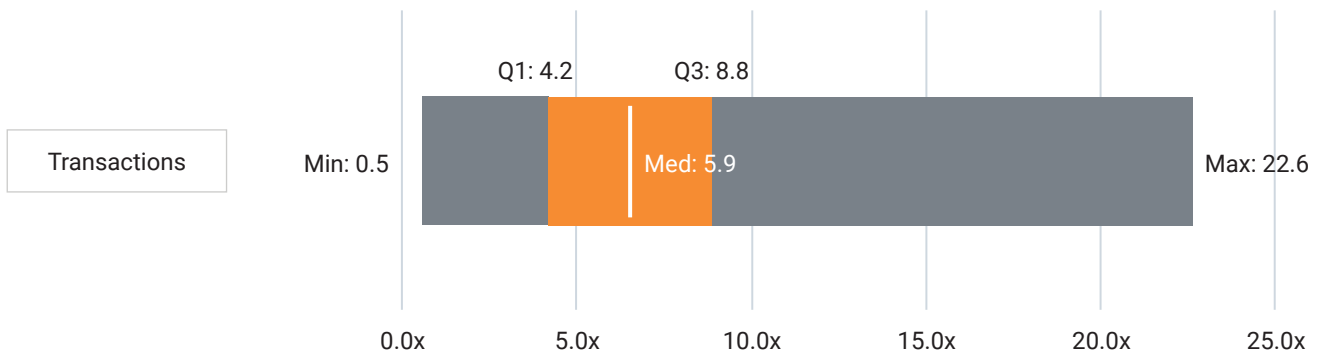
Source: MergerMarket, Orbis

- A comparable company and transaction analysis shows relatively high EV/Revenue and EV/EBITDA multiples in the oil and gas sector.
- Valuation multiples have improved since last year's report by IMAP, most likely due to recovering oil prices, an improved market outlook and improved financial performance since the downturn in 2014.
- While transaction volume and transaction value are both down, valuation multiples are relatively high, with the median EV/Revenue and EV/EBITDA multiple of 4.7x and 12.1x, respectively.
- Average EV/Revenue multiples for listed peer firms and transactions are 1.3x and 5.3x, respectively.
- Average EV/EBITDA multiple for listed peer firms is 8.8x, whereas this is 12.0x for worldwide transactions.
- Please see the Appendix for a detailed overview of included transactions and listed firms.

Valuation Summary – Alternative Energy

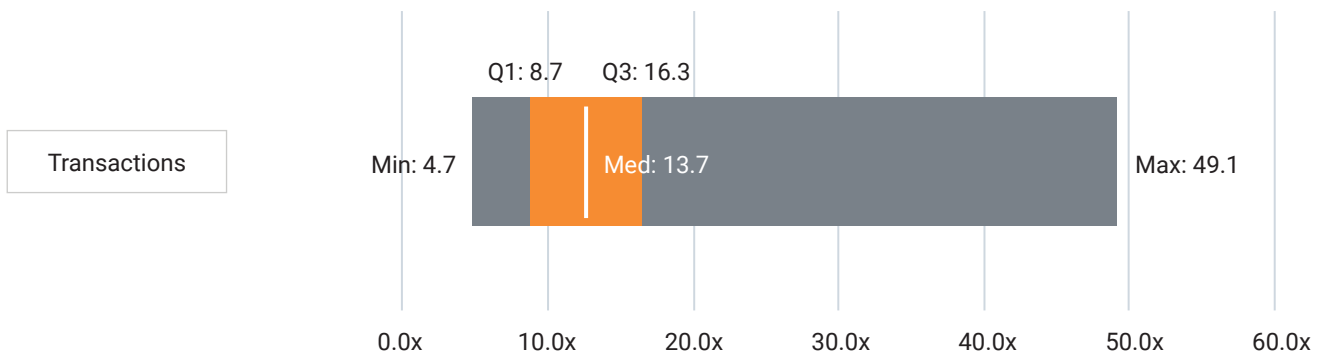
EV/Revenue multiples (x)

EV/Revenue multiples for listed peer firms and worldwide transactions with known multiples from January 2017 to 31st July 2018. MergerMarket sector classification 'alternative energy': "Companies that produce energy from sources other than traditional fossil fuels. Examples include solar, wind, hydro and nuclear energy."



EV/EBITDA multiples (x)

EV/EBITDA multiples for listed peer firms and worldwide transactions with known multiples from January 2017 to 31st July 2018. MergerMarket sector classification 'alternative energy': "Companies that produce energy from sources other than traditional fossil fuels. Examples include solar, wind, hydro and nuclear energy."



Source: MergerMarket, Orbis

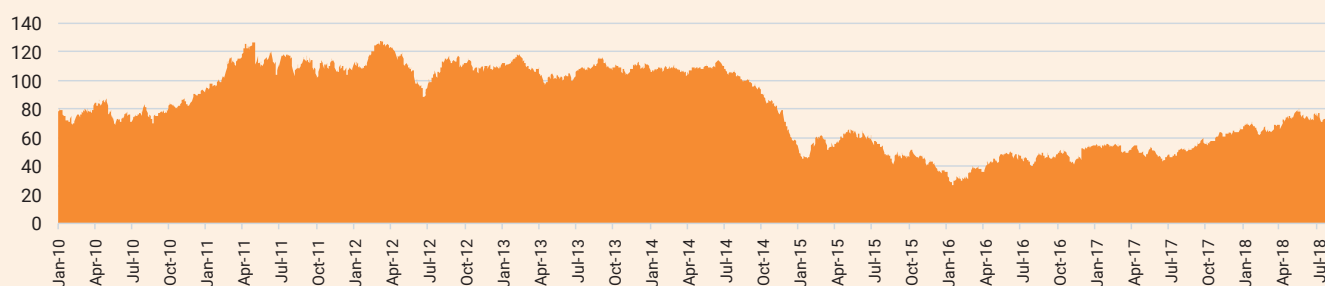
- The comparable transaction analysis shows even higher EV/Revenue (5.9x) and EV/EBITDA (13.7x) multiples in the alternative energy sector, in comparison to the oil and gas sector.
- Higher transaction multiples show that, on average, acquirers are willing to pay more for target companies in the alternative energy sector compared to the oil and gas sector.
- High valuation multiples in the alternative energy sector reflect the high level of technology, excellent market outlook and growth potential of the sector.
- Average EV/Revenue and EV/EBITDA multiples for worldwide transactions in the alternative energy sector are 6.7x and 16.0x, respectively.
- Please see the Appendix for a detailed overview of included transactions and listed firms.

Oil Price

Brent crude oil – historical spot price

- Oil prices are up by 60.5% when comparing the average price per barrel of Brent crude oil in June 2017; USD 46.4, to June 2018; USD 74.4.
- At the time of publication, oil prices are slightly above USD 70 per barrel.
- Several major oil and gas companies have indicated that oil prices are likely to decline during the second half of 2018.
- Additionally, McKinsey Energy Insights' base case scenario forecasts Brent crude oil around USD 55 per barrel at the end of 2018, while other industry experts even lower oil prices at the end of 2018.
- The U.S. Energy Information Agency is expecting that U.S. crude oil output will rise to 11 Million barrels per day at the end of 2018, surpassing Russia at 10.95 Million, making it the largest producer in the world.
- Due to electrification and improved efficiency, oil demand is expected to peak around 2037.

Historical spot price per barrel of Brent crude oil from January 2010 to 13th August 2018, based on daily historical prices. Reported in USD (\$).



Source: U.S. Energy Information Administration (EIA), McKinsey & Company, BP Energy Outlook 2018

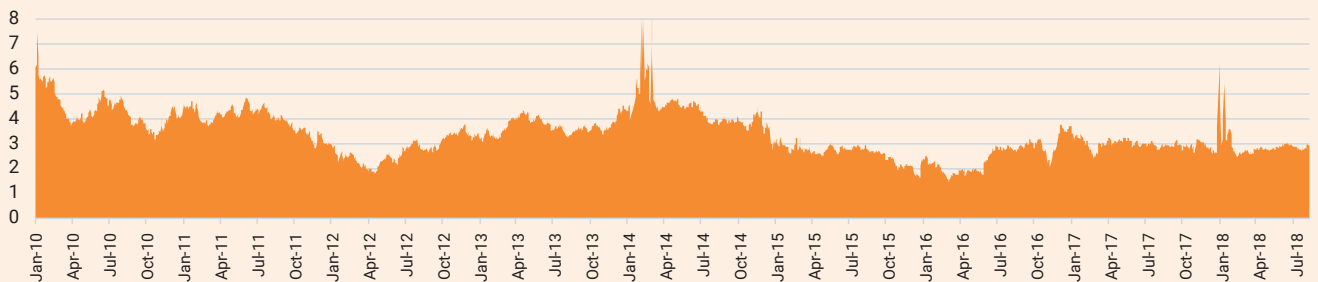


Gas Price

Henry Hub natural gas – historical spot price

- Fluctuations in gas prices have less impact on the oil and gas industry than fluctuations in oil prices.
- Natural gas prices are affected by short-term supply and demand shocks, such as pipelines or gas fields shutting down and an increase in demand during the winter, usually peaking during the winter months.
- Gas demand is expected to grow strongly through to 2050, due for the main, to the expansion of LNG and the role of gas as a transition fuel.
- While gas demand gradually decreases in the building and transport sector, gas demand increases in the industry and power sectors.
- In addition, China's policy to stimulate the use of gas in industry and power will significantly influence expected gas demand.

Historical spot price per million Btu of Henry Hub natural gas from January 2010 to 13th August 2018, based on daily historical prices. Reported in USD (\$).



Source: U.S. Energy Informant Administration (EIA), McKinsey & Company, BP Energy Outlook 2018

Selected IMAP Transactions

Royal Dutch Shell – GI Energy

- Royal Dutch Shell's affiliate, Shell New Energies, made a strategic investment in GI Energy and acquired a majority interest.
- IMAP Falls River Group (FRG) acted as exclusive financial advisor to GI Energy, a leading provider of on-site energy solutions in North America.
- It is Shell's 6th investment in distributed energy resources since the beginning of 2017.
- Shell's New Energies business was created in 2016 to explore commercial models supporting the world's energy transition.
- GI Energy's relationship with Shell means the company can combine its development strengths with Shell's appetite for long-term asset ownership, their balance sheet and ability to solve commodity pricing challenges.
- With advancements in technology and cost improvements, the distributed energy model (microgrids*) will be increasingly embraced in the US and globally. The GI Energy deal validated this trend, seeing strong and wide interest from multi-billion-dollar infrastructure funds and technology/internet companies, to equipment manufacturers and utilities.
- IMAP's Global Energy Group collaborated on evaluating the deal and identifying potential buyers, providing IMAP FRG with global intelligence on renewable energy market trends, recent M&A activity, relationships with active acquirers and insights on approach to valuation.
- IMAP FRG generated tremendous global interest in the opportunity, with over 30 potential partners signing confidentiality agreements. Multiple indications of interest were received and IMAP FRG closed the transaction within six months.



Source: MergerMarket, Neptune Energy website and Total SA website.

* Microgrids are small networks of electricity users with a local source of supply that is usually attached to a centralized national grid, but able to function independently.

Tom Chadwick, CEO, GI Energy:

"IMAP FRG ran a very efficient and seamless process which ultimately produced a strategic partner that was an ideal fit for our vision. Of note was the speed in getting the job done, unbelievably fast."

Selected IMAP Transactions

Value Enhancement Partners – InterDam

- Private equity firm Value Enhancement Partners (VEP) acquired a majority stake in InterDam Holding B.V. as of December 2017.
- IMAP Netherlands acted as advisor to InterDam during this transaction.
- InterDam is engaged in the design, manufacturing and supply of blast and fire protection solutions, including doors, walls and windows.
- The company is active in both on- and offshore, serving mainly refineries, oil and gas platforms and offshore wind substations.
- It holds a leading position worldwide, with certified and unique products.
- InterDam has an outstanding client portfolio, with renowned players in the energy market who are engaged in multi-billion projects.
- InterDam reached a revenue of approximately EUR 45 Million and employed in the region of 45 people in 2016.
- IMAP Netherlands collaborated with IMAP's Global Energy Group to gauge interest with foreign potential buyers.
- IMAP Netherlands received interest from both strategic- and financial buyers, distributed multiple Information Memoranda and received several non-binding offers.
- Private equity firm VEP is a long-term operational and strategic partner, active mainly in the manufacturing and trade sector, making it an excellent partner for InterDam.

ENERGY & UTILITIES 💡



Private Equity
AMSTERDAM, NETHERLANDS

Acquired Majority Control of
Business Operations
















Manufactures fire and blast doors,
walls and windows
RIDDERKERK, NETHERLANDS



ADVISED ON SALE OF COMPANY

Credentials from Across IMAP

<p>ENERGY & UTILITIES</p>  <p>Multi-national oil & gas company NETHERLANDS</p> <p>Acquired Majority Control of Business Operations</p>  <p>Provider of on-site distributed energy solutions UNITED STATES</p> <p>IMAP ADVISED ON SALE OF COMPANY</p>	<p>ENERGY & UTILITIES</p>  <p>Private equity firm UNITED STATES</p> <p>Acquired Majority Stake In</p>  <p>Land management for oil companies UNITED STATES</p> <p>IMAP ADVISED ON SALE OF COMPANY</p>	<p>ENERGY & UTILITIES</p>  <p>Oil and gas ARGENTINA</p> <p>Combined with</p>  <p>PETROLERA EL TREBOL Oil and gas (Trefoil Holdings) NETHERLANDS</p> <p>IMAP ADVISED ON PURCHASE OF COMPANY</p>	<p>ENERGY & UTILITIES</p>  <p>Oil and gas UNITED KINGDOM</p> <p>Acquired 50% Interest</p> <p>Versus Petroleum</p> <p>UK North Sea Licence UNITED KINGDOM</p> <p>IMAP ADVISED ON PURCHASE OF COMPANY</p>
<p>ENERGY & UTILITIES</p>  <p>Private Equity AMSTERDAM, NETHERLANDS</p> <p>Acquired Majority Control of Business Operations</p>  <p>Manufactures fire and blast doors, walls and windows RIDDERKERK, NETHERLANDS</p> <p>IMAP ADVISED ON SALE OF COMPANY</p>	<p>ENERGY & UTILITIES</p>  <p>Leading power utility in Japan JAPAN</p> <p>Acquired 44% of Equity Interest</p>  <p>Planned natural gas power plant UNITED STATES</p> <p>IMAP ADVISED ON INVESTMENT</p>	<p>ENERGY & UTILITIES</p>  <p>Renewable power platform TORONTO, CANADA</p> <p>Acquired Majority Control of Business Operations</p>  <p>Third largest energy generator in Colombia MEDELLÍN, COLOMBIA</p> <p>IMAP ADVISED ON SALE OF COMPANY</p>	<p>ENERGY & UTILITIES</p>  <p>Mining group MELBOURNE, AUSTRALIA</p> <p>Secured Long-term Power, Based on the Construction of a New CCGT Plant</p> <p>Kelar S.A.</p> <p>Power generator SANTIAGO, CHILE</p> <p>IMAP FINANCIAL ADVICE ON BIDDING PROCESS</p>
<p>ENERGY & UTILITIES</p>  <p>Midcap integrated oil and gas company MOSCOW, RUSSIA</p> <p>Acquired 100% of Business Operations of</p>  <p>Oil refinery IZHEVSK, UDMURT REPUBLIC, RUSSIA</p> <p>IMAP ADVISED ON PURCHASE OF COMPANY</p>	<p>ENERGY & UTILITIES</p>  <p>Distributes electricity in 11 municipalities VAUGHAN, ONTARIO, CANADA</p> <p>Merger with</p>  <p>Electricity distribution in 4 municipalities CANADA</p> <p>IMAP ADVISED ON MERGER</p>		

Microgrids – a top contender in the race to provide a solution to rising disruption in the evolving global power market

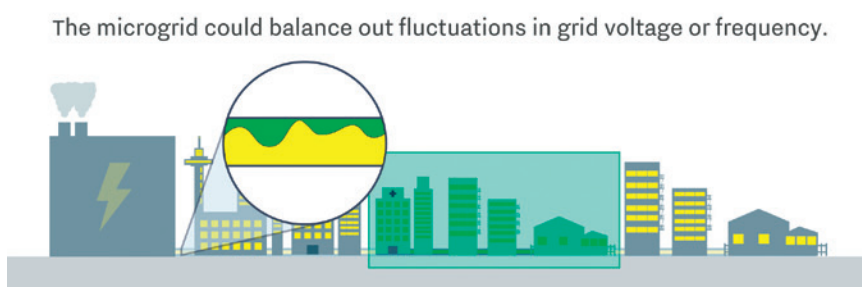
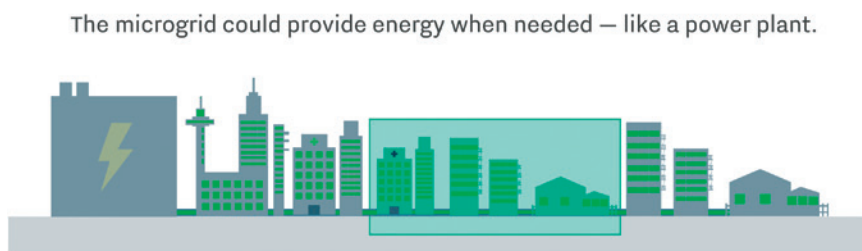
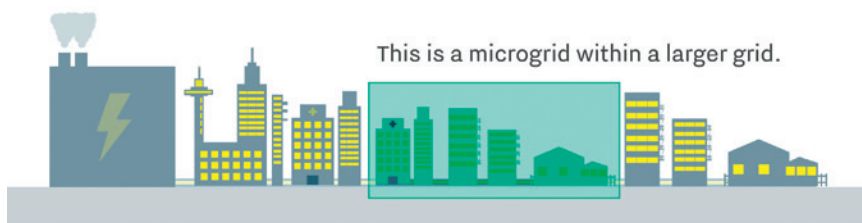
We are currently seeing disruption across the entire energy sector. With traditional electricity generation giving way to sustainable and cost-effective alternatives, renewables and storage look to be where future growth opportunities lie. Therefore,

it is not surprising that more and more large players are taking a serious look at alternatives such as microgrids, which have the potential to dramatically transform the way in which we both produce and consume energy.

CALLS FOR A GREENER, MORE RESILIENT AND RELIABLE SOURCE OF POWER SUPPLY

So what is the big deal with microgrids? The concept of course, is not a new one. Indeed, before they were joined into regional and national grids, the earliest electricity networks were essentially microgrids. Both consist of power generation, distribution and controls. However, there are many key factors that set microgrids apart, the first being reliability. Local energy grids, known as microgrids, are small scale, self-sustaining power networks. Therefore, they have the capacity to work in parallel with and independently from the national grid. When needed, microgrids can disconnect from the grid and function autonomously. By means of isolating their generation nodes and power loads from disturbance, they can operate without affecting the integrity of larger grids. In addition, during peak usage, storms and power outages or in case of a grid failure, they also have the capability to feed power back to the grid. In today's modern world, providing high-quality power to facilities such as hospitals or data centers is crucial, where even the briefest outage can be highly detrimental.

Perhaps more importantly though, is the fact that unlike traditional grids, microgrids can be powered by and integrate with, renewable energy sources. Though they can be run by traditional means including generators and batteries, the focus is now on finding and integrating greener, sustainable energy sources, such as wind and solar power, geothermal, waste-to-energy, small hydro and combined heat and power (CHP).



Source: www.vox.com/energy-and-environment

Microgrids have the benefit of being able to make use of local resources that are perhaps too small or unreliable for traditional grids. In addition, by closely linking power generation and power use, microgrids can be more efficient.

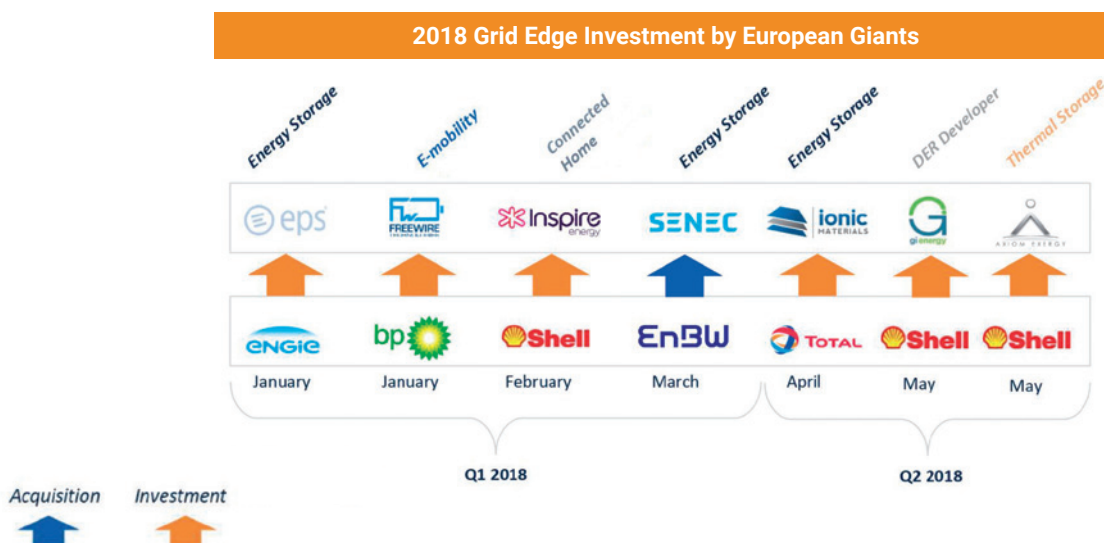
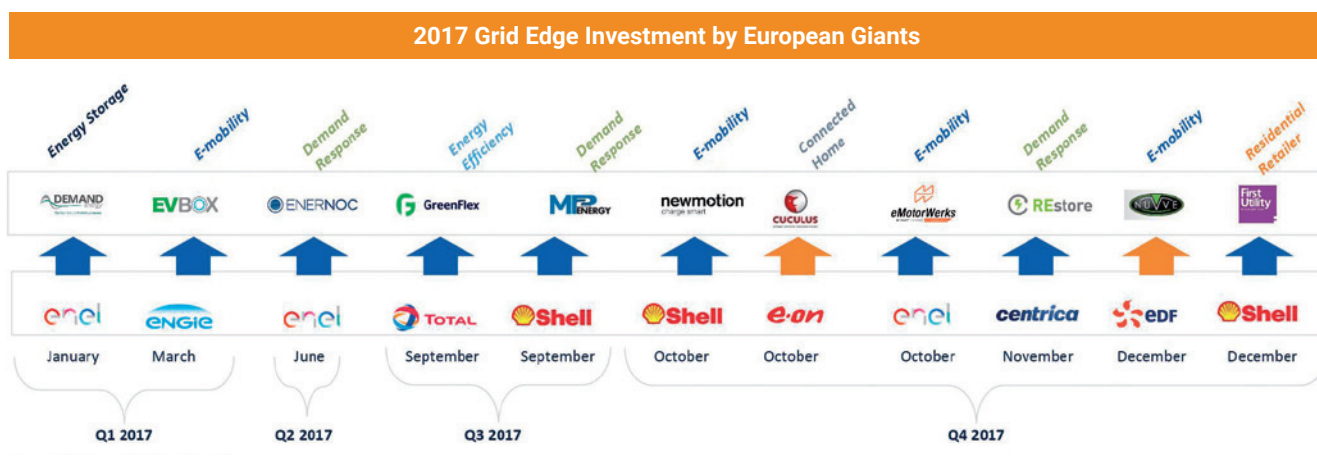
ACQUIRING COMPETENCIES AS OPPOSED TO GROWING ORGANICALLY

With advancements in technology and cost improvements, it is likely that microgrids will be increasingly embraced across the globe as utility companies look to make targeted

investments in environmentally sound solutions for the future. Indeed, it appears that many utility giants have been on a grid edge shopping spree recently, with significant investments related to energy storage.

Shell's investment in microgrids and distributed energy in their recent acquisition of a majority stake in GI Energy, which IMAP Falls River Group (FRG) recently advised on, validates this trend. The oil major made the acquisition through Shell New Energies, a business it launched in 2016 to explore commercial models that support the world's energy transition.

As more large players embrace the new trends and begin to reinvent themselves, we could see an increase in large acquisitions in the near future. By investing out with their core business, companies can look to de-risk their business model and in some cases, compensate for declining revenue streams. Recent M&A activity indicates that rather than growing organically, companies are proactively buying into companies and markets.



Source: GTM Research Grid Edge Data Hub.

Image Credit: GreenTech Media

Clean Disruptions in Energy & Transportation

S-curve adoptions could be happening quicker than we think

CLEAN DISRUPTIONS

- Historically, technological disruptions follow an S-curve and the technology is adapted exponentially at the first half of the S-curve.
- S-curves are getting steeper and technological developments are adapted even faster than before, driving cost curves of new technologies down rapidly.
- Tony Seba considers five main 'clean disruptions' that could rapidly change the energy and transportation sectors:
 - Batteries (technology)
 - Electric vehicles (technology)
 - Autonomous vehicles (technology)
 - Ride-hailing (business model)
 - Solar (technology)
- TaaS-model (transport as a service) with ride-hailing will decrease the total fleet significantly and increase vehicle utilization rate, leading to more efficiency.
- To illustrate, some islands have already switched from diesel-generation to being 100% solar-powered since solar-generation (and storage) is already more economical than diesel-generation.
- Self-driving taxis are already available in Singapore.
- While McKinsey projects oil demand to peak in 2037, Tony Seba predicts the peak in oil demand in 2020 and a long term equilibrium price at USD 25 per barrel.



- The solar PV (photovoltaic) cost curve has been decreasing by approximately 11.5% per year, while the solar PV installed capacity has grown at a CAGR of approximately 40% from 2000 to 2016.
- According to PWC, 69% of corporations are actively pursuing solar PV purchases for energy generation since it is more economical.
- The cost of unsubsidized solar PV generation on rooftops will drop below the cost of transmission in the upcoming years, making it highly attractive for corporations as

well as households to switch to self generation with the distributed energy model. This development threatens the centralized power generation system and thus energy generation using natural gas, coal and nuclear.

- Technological disruptions are in progress, and the speed of adoption will determine developments in the near future.

Source: Tony Seba (Stanford University) speech in Boulder, Colorado, awarded the 2017 Sunshine award by Clean Energy Action, filmed by Colorado Renewable Energy Society.



Appendix 1/5

Transactions: Oil and gas

Date	Target	Acquiror	Acquired stake (%)	EV (EUR M)	Revenue (EUR M)	EBITDA margin (%)	EV/Revenue	EV/EBITDA
Aug/18	AAG Energy Holdings Limited A HKEX listed company active in the exploration and development of coalbed methane in China	Xinjiang Xintai Natural Gas Co., Ltd. Chinese company engaged in selling of natural, liquified petroleum, and gases throughout China	51%	375	69	79.9%	5.4x	6.8x
Jul/18	RSP Permian Inc. Acquisition, exploration, development and production of unconventional oil and gas reserves	Concho Resources Inc. Acquisition, development and exploration of oil and natural gas properties	100%	7,666	670	63.8%	11.4x	17.9x
Jul/18	EQT Corporation's Appalachian Basin Assets Listed US integrated energy company, involved in natural gas supply, transmission and distribution	Diversified Gas & Oil Plc Listed UK-based company, engaged in the production of natural gas and crude oil	100%	494	211	64.6%	2.3x	3.6x
May/18	Spartan Energy Corp. Engaged in the business of oil and gas exploration, development, acquisition and production	Vermillion Energy Inc. Listed Canadian energy company	100%	850	284	38.7%	3.0x	7.7x
May/18	Naturgy Supply, commercialization and distribution of natural gas and electricity	CVC Capital Partners Limited UK-based private equity firm	20%	36,515	5,053	31.4%	7.2x	23.0x
Mar/18	Maersk Olie Og Gas A/S Oil and gas exploration company	Total S.A. Integrated oil and gas company	100%	6,325	4,478	55.1%	1.4x	2.6x
Feb/18	MPLX LP Owns, operates and develops crude oil, refined product, and other midstream assets	Marathon Petroleum Corporation Oil refinery and petroleum products retailing business	40%	27,783	2,458	40.7%	11.3x	27.8x
Jan/18	Hindustan Petroleum Corporation Ltd Indian oil refining and marketing company	Oil and Natural Gas Corporation Limited Indian company engaged in oil exploration and production activities	51%	9,942	31,196	6.8%	0.3x	4.7x
Jan/18	Songa Offshore ASA Engineering expertise and technical solutions provider to the offshore oil and gas industries	Transocean Ltd Provider of offshore contract drilling services for oil and gas wells	100%	2,745	715	59.8%	3.8x	6.4x
Nov/17	Rice Energy, Inc Gas exploration and production company	EQT Corporation Integrated energy company involved in natural gas supply, transmission and distribution	100%	6,875	739	39.2%	9.3x	23.7x
Oct/17	Phillips 66 Partners LP Ownership, operation, development of fee-based crude oil, refined petroleum product, and more	First Reserve & Tortoise C.A. LLC & Stonepeak I.P. Private equity firms agreed to acquire a 5.4% stake via private placement	5%	6,531	690	76.8%	9.5x	12.3x

Source: Mergermarket

Appendix 2/5

Transactions: Oil and gas

Date	Target	Acquiror	Acquired stake (%)	EV (EUR M)	Revenue (EUR M)	EBITDA margin (%)	EV/Revenue	EV/EBITDA
Sep/17	Teekay Offshore Partners L.P. Providing marine transportation, oil production, storage, long-distance towing and other services	Brookfield Business Partners L.P. Canadian investment company	60%	3,321	1,094	49.9%	3.0x	6.1x
Sep/17	Trilogy Energy Corp. Exploration and production of oil and gas	Paramount Resources Ltd. Exploration and production of oil and gas	85%	726	129	34.3%	5.6x	16.4x
Aug/17	Petrolera El Trebol SA Oil and gas exploration services	Phoenix Global Resources Plc. Investment company focused on the oil and gas sector	100%	728	123	36.0%	5.9x	16.5x
Jun/17	ONEOK Partners L.P. Production of oil and gas as well as processing, gathering, storage and transmission of natural gas	ONEOK Inc. Oil and gas production, natural gas processing, gathering, storage and transmission	60%	21,635	8,465	19.1%	2.6x	13.4x
May/17	Sterling Resources (UK) Ltd. Exploration, development and production of crude oil and natural gas	Oranje-Nassau Energie B.V. Exploration and production of oil and gas	100%	108	45	46.1%	2.4x	5.2x
Apr/17	Clayton Williams Energy Inc. Exploration and production of oil and natural gas	Noble Energy Inc. Exploration, production, acquisition and marketing of oil and gas	100%	3,056	275	58.0%	11.1x	19.2x
Apr/17	International Petroleum Corporation (Spin-off) Canadian oil and gas exploration company	Lundin Petroleum AB (shareholders) Swedish oil and gas exploration company	100%	486	194	59.7%	2.5x	4.2x
Feb/17	Spectra Energy Corp Engaged in gas transmission, storage, gathering, processing and distribution	Enbridge Inc Energy transportation and distribution of crude oil and liquids pipeline system	100%	37,069	4,791	42.2%	7.7x	18.3x
Feb/17	Columbia Pipeline Partners LP Operates and develops a portfolio of pipelines, storage and related midstream assets	Columbia Pipeline Group Inc. Operator, developer and owner of a portfolio of pipelines, storage and related midstream assets	53%	3,140	1,219	51.5%	2.6x	5.0x
Jan/17	Maurel et Prom SCA French petroleum and gas company	Pertamina (Persero), PT Exploration and production of oil, gas and geothermal energy	100%	1,298	276	38.8%	4.7x	12.1x
Jan/17	Williams Partners L.P. Infrastructure company providing midstream natural gas services	Williams Companies Inc. Energy infrastructure company	32%	50,813	7,110	40.3%	7.1x	17.7x
Jan/17	Rosneft Oil Company OAO Oil and gas exploration company	Consortium led by Qatar Investment Authority Comprised of Qatar Investment Authority and Glencore	20%	77,241	63,783	24.6%	1.2x	4.9x

Source: Mergermarket

Appendix 3/5

Transactions: Alternative energy

Date	Target	Acquiror	Acquired stake (%)	EV (EUR M)	Revenue (EUR M)	EBITDA margin (%)	EV/ Revenue	EV/ EBITDA
Jun/18	8pint3 Energy Partners LP Owns, operates and acquires solar energy generation projects	Capital Dynamics AG Assets management firm that invests in PE funds and clean energy infrastructure	100%	1,331	59	74.6%	22.6x	30.3x
May/18	Acciona Termosolar Group Owns concentrated solar Power generation plants in Spain	ContourGlobal L.P. Develops, acquirers and operates electric power and district heating business	100%	962	147	74.8%	6.5x	8.7x
Mar/18	Infrastructure & Energy Alternatives LLC Engineering, procurement and construction company in the renewable energy sector	M III Acquisition Corp. US blank check company formed to make acquisitions by M-III Partners	100%	297	582	10.8%	0.5x	4.7x
Feb/18	Alterra Power Corp. Operating, developing, exploring and acquiring geothermal energy project	Innergex Renewable Energy Inc Operator of renewable power generating facilities	100%	548	58	60.8%	9.5x	15.6x
Dec/17	TerraForm Global Inc. Company that owns and operates clean energy projects	Brookfield Asset Management Inc. Canadian asset management company	100%	1,171	203	39.0%	5.8x	14.8x
Dec/17	ErgyCapital S.p.A. Italian investment firm focused on the renewable energy sector	Intek Group S.p.A. Italian diversified holding company	51%	61	14	49.9%	4.3x	8.6x
Oct/17	Frendy Energy SpA Operator of hydroelectric power plants	Edison S.p.A. Power generation company engaged in exploration, production and sale of hydrocarbons	100%	18	1	24.8%	12.2x	49.1x
Oct/17	TerraForm Power Inc. Owner and operator of clean power generation assets	Brookfield Asset Management Inc. Canadian asset management company	39%	5,368	621	50.8%	8.6x	17.0x
Sep/17	BIOX Corporation Company that designs, builds, owns and operates biodiesel production facilities	FP Resources Limited & CFFI Ventures Inc. Canadian investment holding companies	65%	55	78	1.8%	0.7x	39.6x
Sep/17	Energy Development Corporation Phillipines company engaged in the exploration, development and operation of geothermal energy	Consortium for Energy Development Corp. Formed by Macquarie Infrastructure and Real Assets and GIC Pte Ltd	48%	3,124	655	60.6%	4.8x	7.9x

Source: Mergermarket

Appendix 4/5

Transactions: Alternative energy

Date	Target	Acquiror	Acquired stake (%)	EV (EUR M)	Revenue (EUR M)	EBITDA margin (%)	EV/Revenue	EV/EBITDA
Aug/17	EDP Renovaveis S.A. Renewable energy company	Energias de Portugal S.A. Company engaged in the distribution and generation of electricity	5%	8,688	1,453	80.6%	6.0x	7.4x
Jul/17	Magacela Solar 1, S.A.U. Engaged in generation, transmission and distribution of solar electric energy	Solaria Energia y Medio Ambiente S.A. Engaged in renewable energy sector, with activities in solar energy.	100%	62	7	84.2%	9.4x	11.2x
Jul/17	Ormat Technologies Inc Provider of alternative and renewable energy technology	ORIX Corporation Listed Japanese company engaged in financial services	22%	3,209	629	46.5%	5.1x	11.0x
Jul/17	FUTUREN SA French provider of energy from renewable sources	EDF Energies Nouvelles SA French company engaged in services of electricity power plants	100%	394	57	49.4%	6.9x	14.1x
Jul/17	WGL Holdings Inc. Provides clean, efficient and diverse energy solutions	AltaGas Ltd. Energy infrastructure company engaged in acquiring and growing gas and power infrastructure	100%	6,227	2,096	18.4%	3.0x	16.1x
Jun/17	Pattern Energy Group Inc. Develops, constructs, owns and operates renewable and transmission energy	Public Sector Pension Investment Board Canadian state-owned pension investment managing firm.	10%	3,152	336	52.0%	9.4x	18.0x
May/17	Canvest Environmental Protection Group Co. Ltd. Engaged in development, management and operation of waste-to-energy plants	Shanghai Industrial Holdings Limited HKEx-listed company engaged in investments in various sectors	13%	1,194	202	42.2%	5.9x	14.0x
May/17	Jiangsu Dingyang Green Tech Electric Co. Ltd. Engaged in solar power station investment, installation and operation	Roshow Technology Co. Ltd. Listed Chinese company engaged in electromagnetic wire products	100%	102	28	36.1%	3.7x	10.3x
Mar/17	Trina Solar Limited Chinese photovoltaic cell producer	Consortium for Trina Solar Ltd. Acquisition vehicle formed by Mr. Jifan Gao and Industrial Bank Co. Ltd.	95%	2,085	2,778	10.3%	0.8x	7.3x
Feb/17	Lincs Wind Farm Limited Owns and operates wind farms	Green Investment Group Limited Engaged in infrastructure investments in the energy sector	75%	1,116	133	62.4%	8.4x	13.5x

Source: Mergermarket

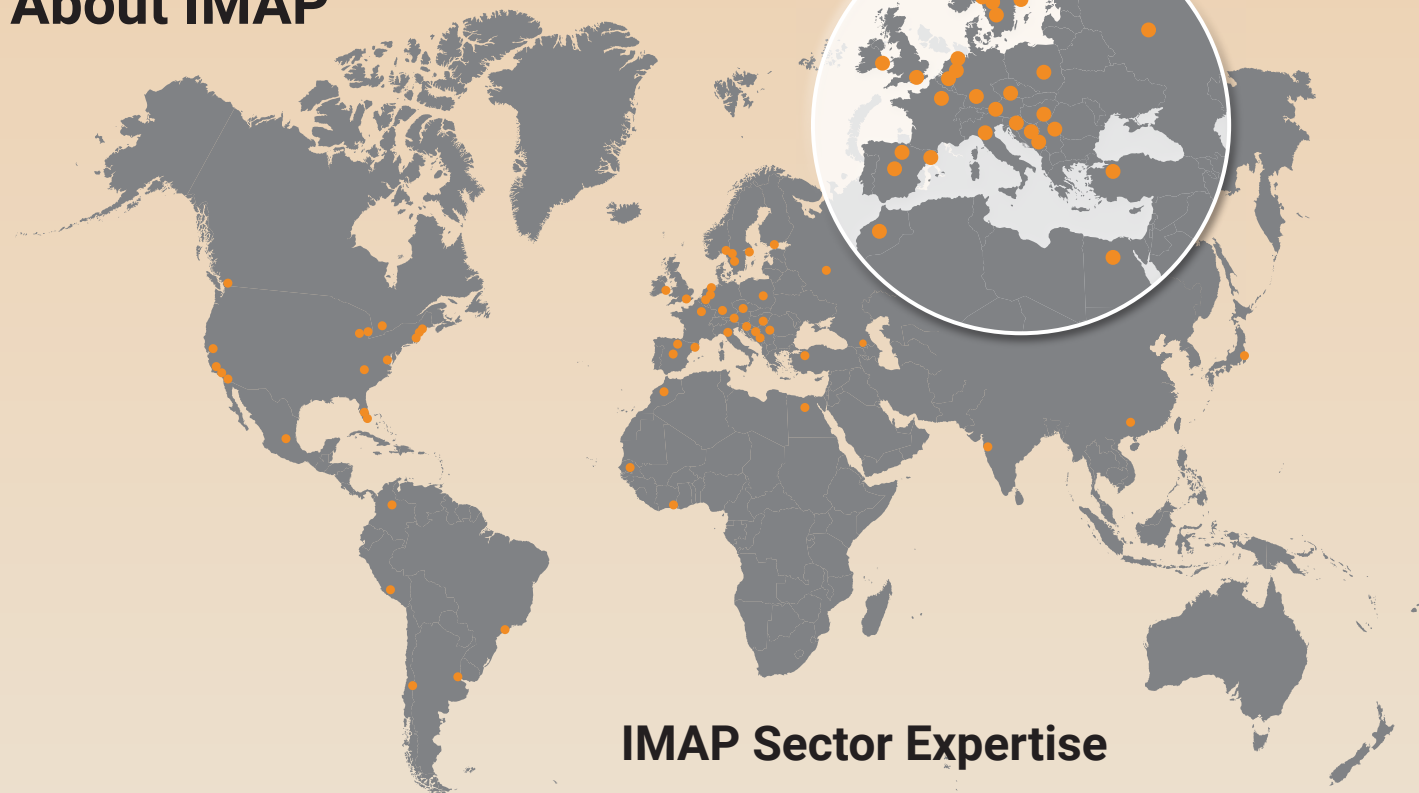
Appendix **5/5**

Listed peer valuations: Oil and gas

Company Name	Market capitalization (EUR M)	Net debt (EUR M)	Enterprise value EV (EUR M)	Revenue (EUR M)	EBITDA margin (%)	EV / Revenue	EV / EBITDA
Royal Dutch Shell	248,543	56,329	304,872	263,040	15.9%	1.2x	7.3x
BP Plc	128,929	32,446	161,375	207,040	10.4%	0.8x	7.5x
Chevron Corporation	205,290	29,181	234,471	116,078	21.4%	2.0x	9.4x
ExxonMobil Corporation	300,707	-414	300,293	204,415	16.5%	1.5x	8.9x
Total SA	147,609	7,240	154,849	147,813	15.5%	1.0x	6.7x
Eni SpA	60,860	20,179	81,039	66,919	23.2%	1.2x	5.2x
ConocoPhillips Company	73,018	11,531	84,549	25,087	18.3%	3.4x	18.4x
Sinopec	103,663	2,680	106,342	290,350	9.0%	0.4x	4.1x
Petrochina	183,148	42,149	225,297	258,138	15.6%	0.9x	5.6x
LUKoil	51,370	3,886	55,256	80,680	14.0%	0.7x	4.9x
Valero Energy	42,993	2,605	45,598	81,003	5.9%	0.6x	9.5x
Petrobras (Petróleo Brasileiro SA)	65,081	74,579	139,660	76,562	27.6%	1.8x	6.6x
Gazprom	46,029	32,582	78,611	88,962	22.7%	0.9x	3.9x
Marathon Petroleum Corporation	31,592	8,563	40,155	64,414	8.1%	0.6x	7.7x
PTT Public Company Limited	39,305	7,707	47,012	51,811	17.6%	0.9x	5.2x
Rosneft	61,970	50,147	112,117	79,868	10.6%	1.4x	13.2x
Equinor ASA (Statoil)	77,712	20,586	98,299	52,552	36.8%	1.9x	5.1x
Indian Oil Corporation	19,828	6,497	26,325	63,554	8.5%	0.4x	4.9x
Enterprise Products Partners L.P.	54,194	21,172	75,366	25,204	19.1%	3.0x	15.7x
Repsol S.A.	27,358	9,685	37,043	41,242	12.6%	0.9x	7.1x
OMV	15,710	3,414	19,124	20,222	17.7%	0.9x	5.3x
Saipem SPA	4,570	1,367	5,937	9,038	19.3%	0.7x	3.4x
Petrofac	2,431	527	2,959	5,512	4.4%	0.5x	12.2x
Schlumberger Limited	79,549	14,135	93,685	26,237	10.6%	3.6x	33.8x
Average						1.3x	8.8x
Median						0.9x	6.9x

Source: Annual Reports, Orbis

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