

**BERNSTEIN**

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# The Impact of Iran's Return On Global Markets

Will It Change The Path Of Oil Market Rebalancing?

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**See Disclosure Appendix of this report for important Disclosures and Analyst Certifications**

# Agenda

- + **Iran Oil Production History and Production Overview**
  - + Iran Oil & Gas Production History
  - + Reserves and Production Overview
- + **The Return of Iranian Crude to the Market**
  - + Output Recovery So Far
  - + Recent Surge of Crude Exports
- + **Future Growth Options for Iran**
  - + Issues With a Quick Rebound of Iranian Production
  - + Future Growth Options
  - + The Path to Oil Market Rebalancing
- + **Conclusion**
- + **Appendix**

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## + Iran Oil Production History and Production Overview

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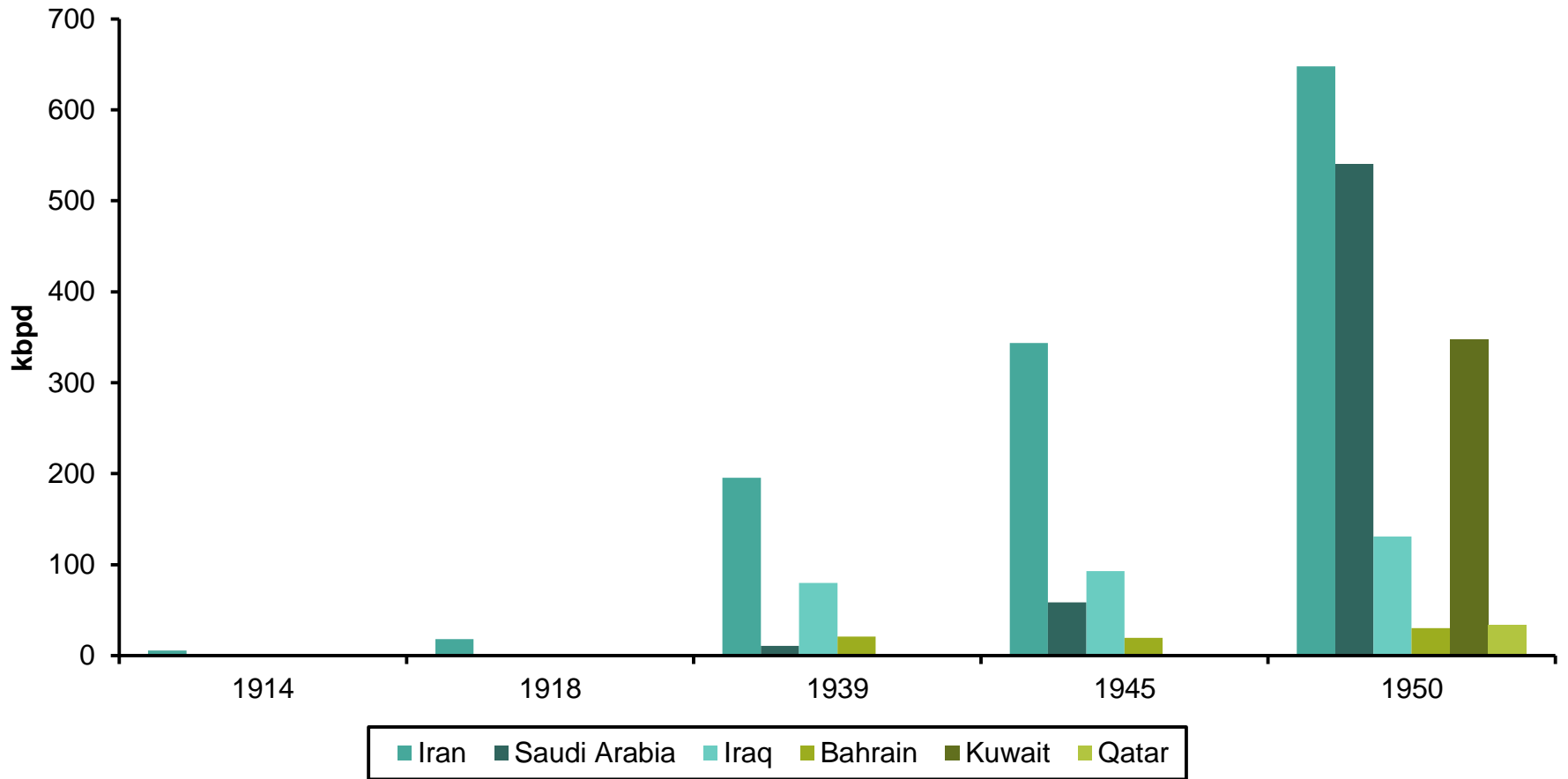
## + Future Growth Options for Iran

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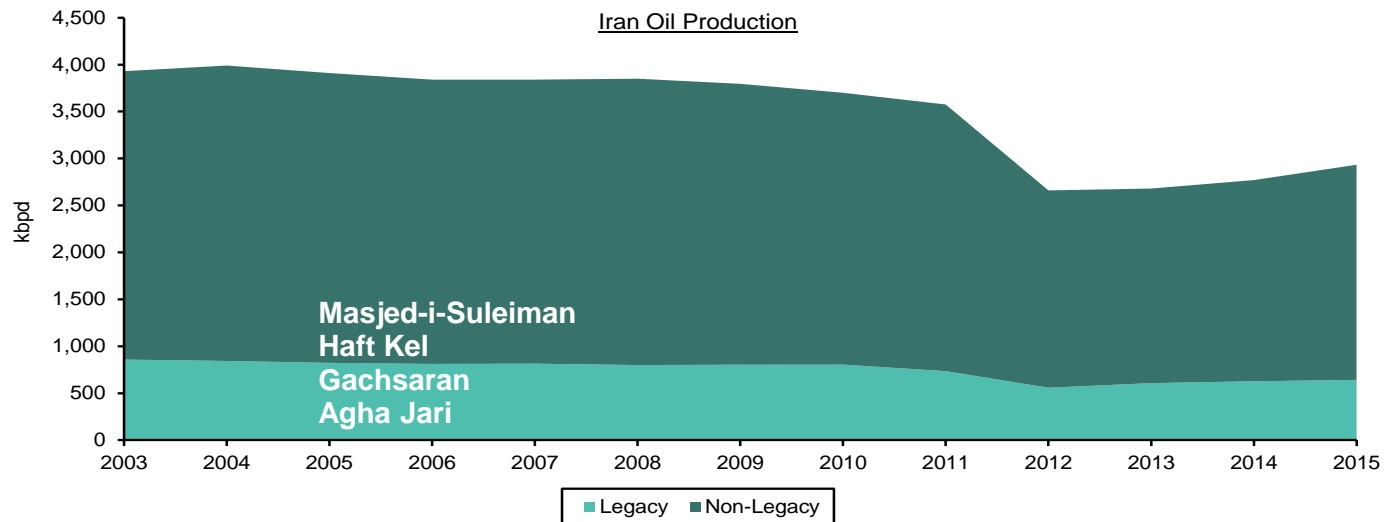
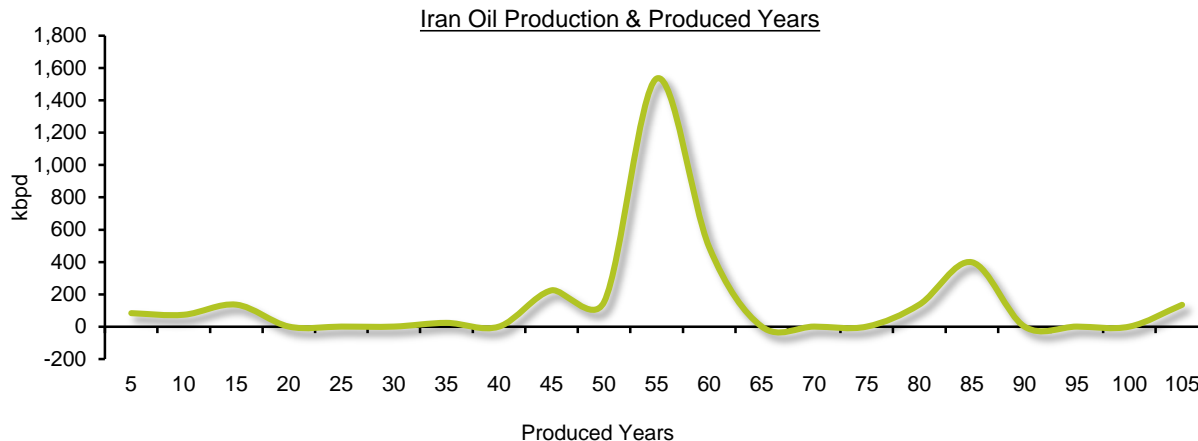
## + Appendix

# History of Oil Production in Iran: Saudis Catch Up to Iran Even After a 28yr Lag in Oil Development



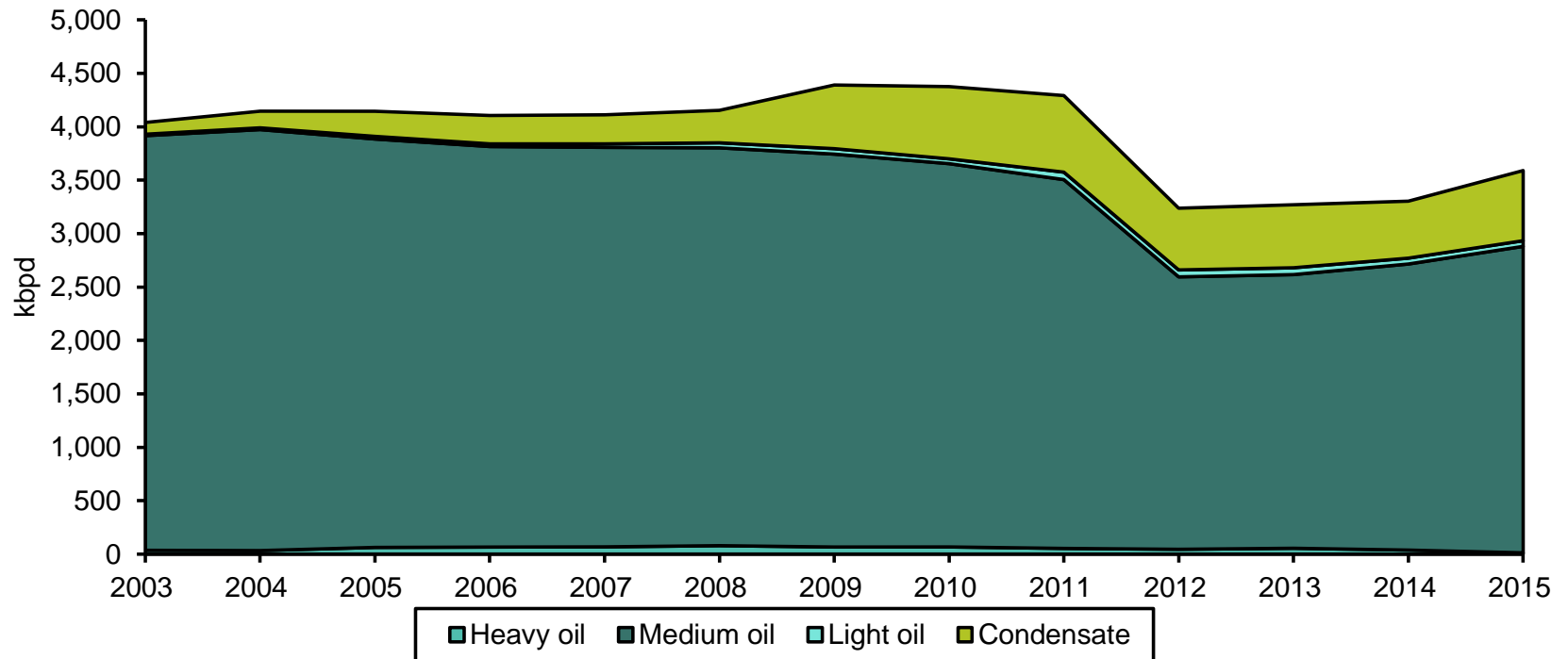
Source: BP Stats Review and Bernstein analysis

# Legacy and Associated Fields (pre-1950 production start) Still Provide a Sizable Amount of Oil Production



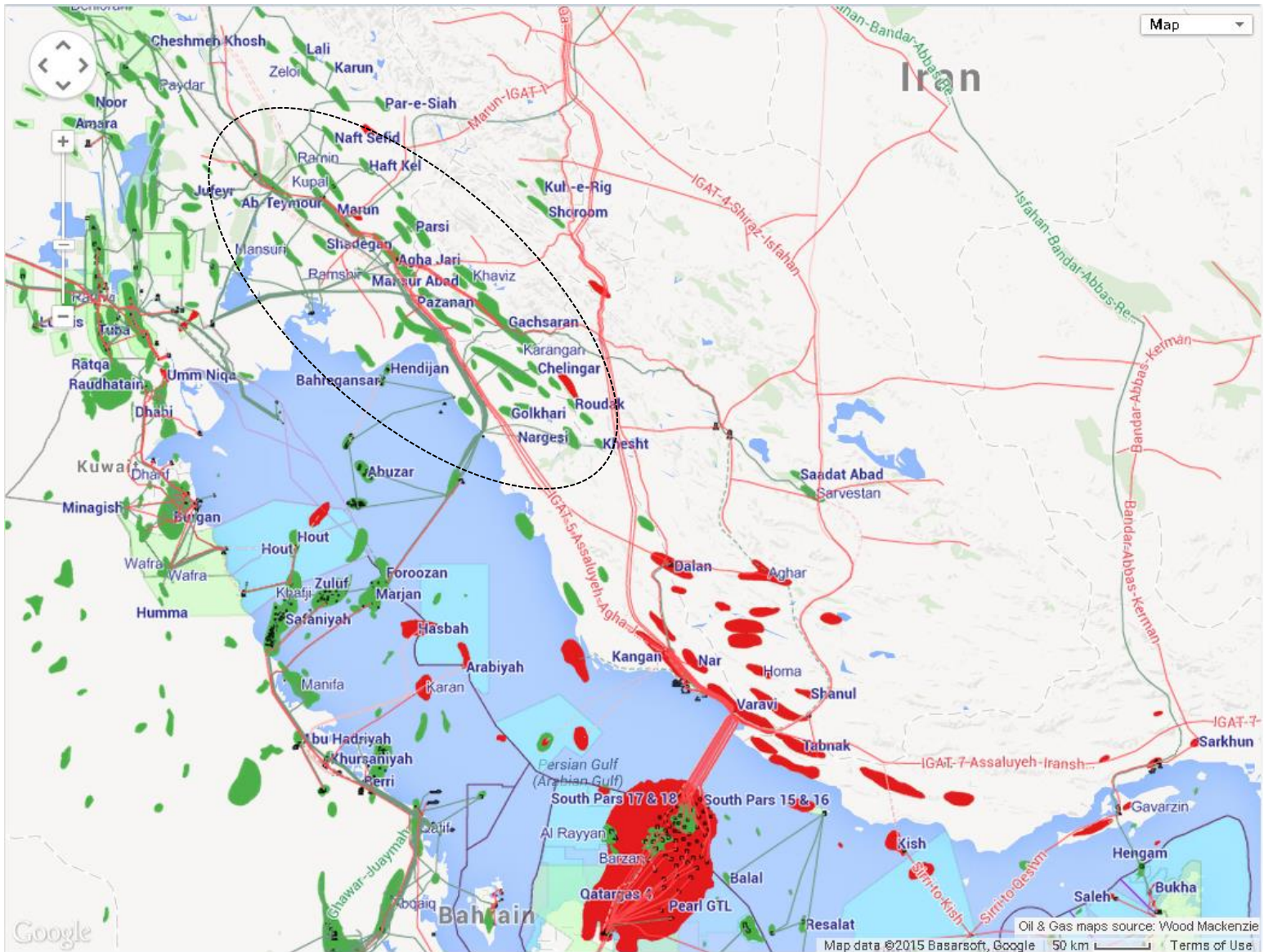
Source: Wood Mackenzie, IEA and Bernstein analysis

# Production Decline Has Been Most Evident Across “Medium Quality” Oil Producing Fields



Source: Wood Mackenzie, IEA and Bernstein analysis

# Major Fields of Iran



# Ahwaz, Marun, Gachsaran Combined Contributes to >40% of Iran Initial Reserves, and 1/3 of Oil Production

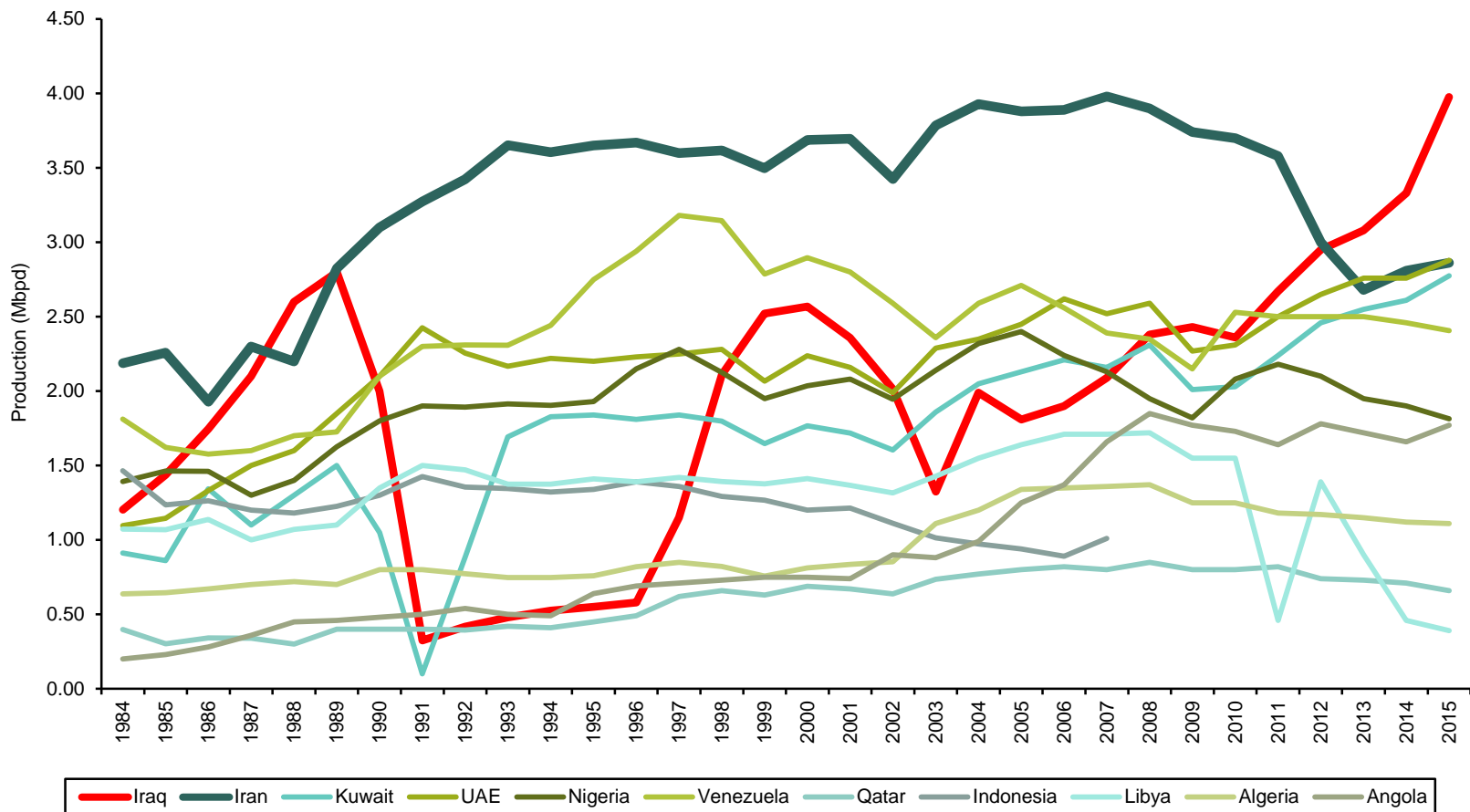
Field	Initial Reserves Oil (mmbbl)	% of Total
Ahwaz	15,539	17%
Marun Fields	14,432	16%
Gachsaran	13,020	14%
Agha Jari	8,572	9%
Karanj and Parsi	6,129	7%
IOOC Fields+	5,427	6%
Pazanan and Rag-e-Sefid	4,747	5%
Bibi Hakimeh	3,306	4%
Masjid-e-Suleiman Fields	2,294	2%
Gachsaran Operated Fields	2,175	2%
Doroud (NIOC)	1,778	2%
Ahwaz Area Fields	1,668	2%
Salman	1,330	1%
West Zagros Fields	1,288	1%
South Pars 6-8	1,286	1%
South Pars 9 & 10	1,068	1%
South Pars 15 & 16	1,017	1%
South Pars 4 & 5 (NIOC)	923	1%
South Pars 12 (NIOC)	831	1%
South Pars 2 & 3 (NIOC)	810	1%
South Pars 17 & 18	809	1%
South Zagros Fields	675	1%
Soroosh-Nowruz (NIOC)	607	1%
Azadegan South (NIOC)	519	1%
Darkhovin (NIOC)	516	1%
South Pars 1 (NIOC)	490	1%
Yadavaran (NIOC)	432	0%
Parsian Gas	399	0%
Azadegan North (NIOC)	323	0%
Jufeyr	151	0%
South Pars (Oil Layer)	94	0%
South Pars 12 (BB)	82	0%
Masjid-e-Suleiman (NIOC)	60	0%
<b>Total Initial Reserve</b>	<b>92,796</b>	

Field	Rem Liquids Reserves (mln BO)	Production (mln bopd)	R/P Life (Years)
Marun Fields	2,072	0.4	14
Gachsaran	3,044	0.3	26
Ahwaz	4,670	0.3	45
IOOC Fields+	2,005	0.3	21
Karanj and Parsi	1,660	0.2	20
Pazanan and Rag-e-Sefid	1,455	0.2	26
Agha Jari	922	0.1	19
Ahwaz Area Fields	714	0.1	15
South Pars 6-8	1,010	0.1	22
West Zagros Fields	689	0.1	16
South Pars 4 & 5 (NIOC)	599	0.1	15
South Pars 9 & 10	895	0.1	23
Masjid-e-Suleiman Fields	695	0.1	18
South Pars 2 & 3 (NIOC)	418	0.1	12
Gachsaran Operated Fields	1,295	0.1	45
Doroud (NIOC)	602	0.1	22
Bibi Hakimeh	421	0.1	20
Salman	516	0.1	25
South Zagros Fields	385	0.1	19
Darkhovin (NIOC)	360	0.0	20
South Pars 1 (NIOC)	363	0.0	21
South Pars 15 & 16	1,017	0.0	64
South Pars 17 & 18	809	0.0	54
Parsian Gas	282	0.0	20
Azadegan South (NIOC)	460	0.0	38
South Pars 12 (BB)	76	0.0	7
Yadavaran (NIOC)	420	0.0	61
Azadegan North (NIOC)	314	0.0	46
Soroosh-Nowruz (NIOC)	386	0.0	90
Yadavaran (BB)	25	0.0	8
Azadegan North (BB)	24	0.0	10
Masjid-e-Suleiman (NIOC)	55	0.0	37
Masjid-e-Suleiman (BB)	0	0.0	2
Sarajeh	0	0.0	1
South Pars 12 (NIOC)	831	-	nm
Jufeyr	148	-	nm
South Pars (Oil Layer)	94	-	nm
Azar and Changuleh	56	-	nm
<b>Total</b>	<b>29,787</b>	<b>3.3</b>	<b>25.1</b>



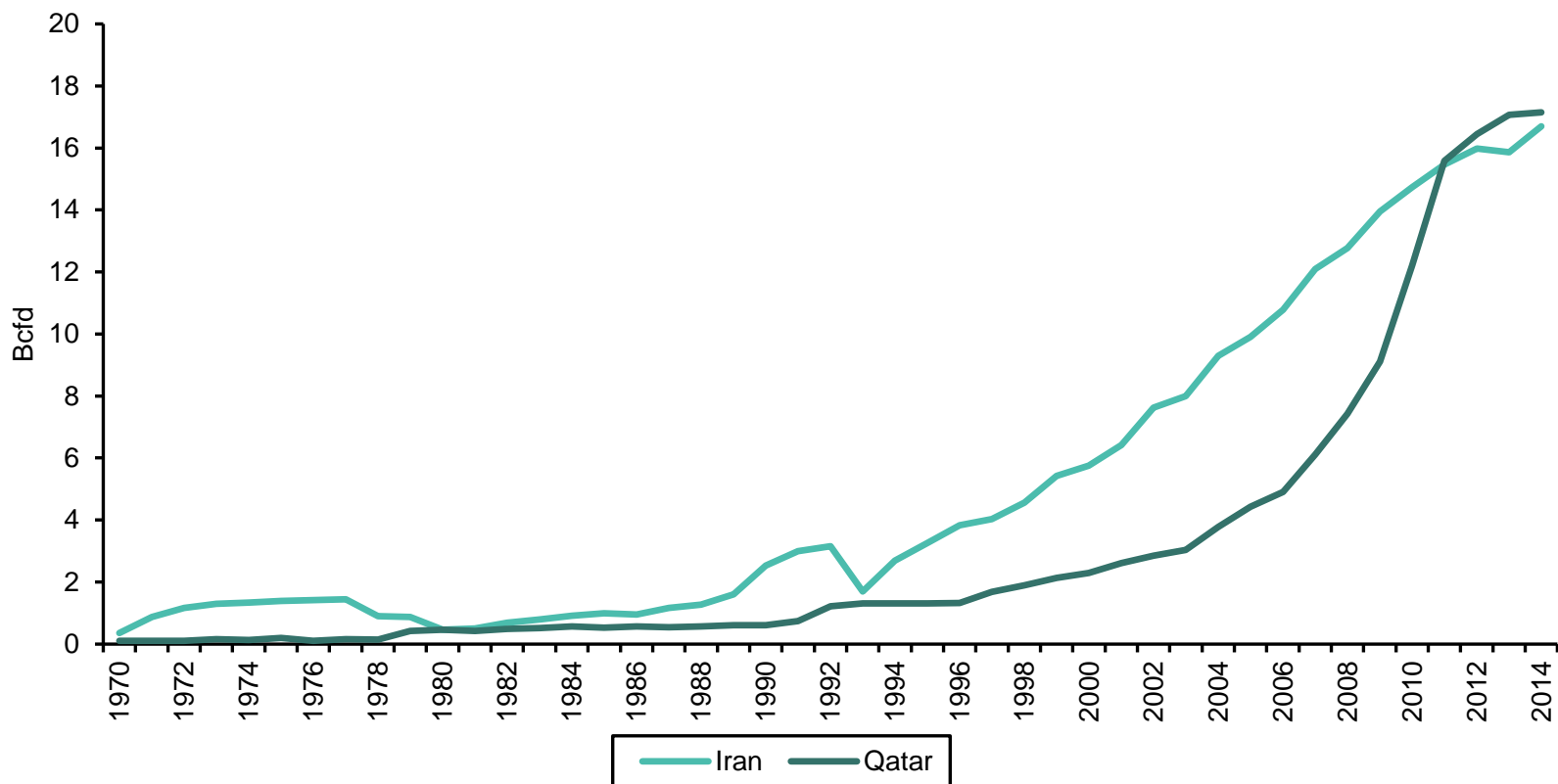
# Iran's Liquids Production Levels Haven't Recovered Since US Sanctions Post 1979

OPEC Production Ex Saudi (1984-2015)



Source: BP Stats Review and Bernstein analysis

# Gas Production Has Done Better Since Start of the Supergiant South Pars Field



Source: BP Stats Review and Bernstein analysis

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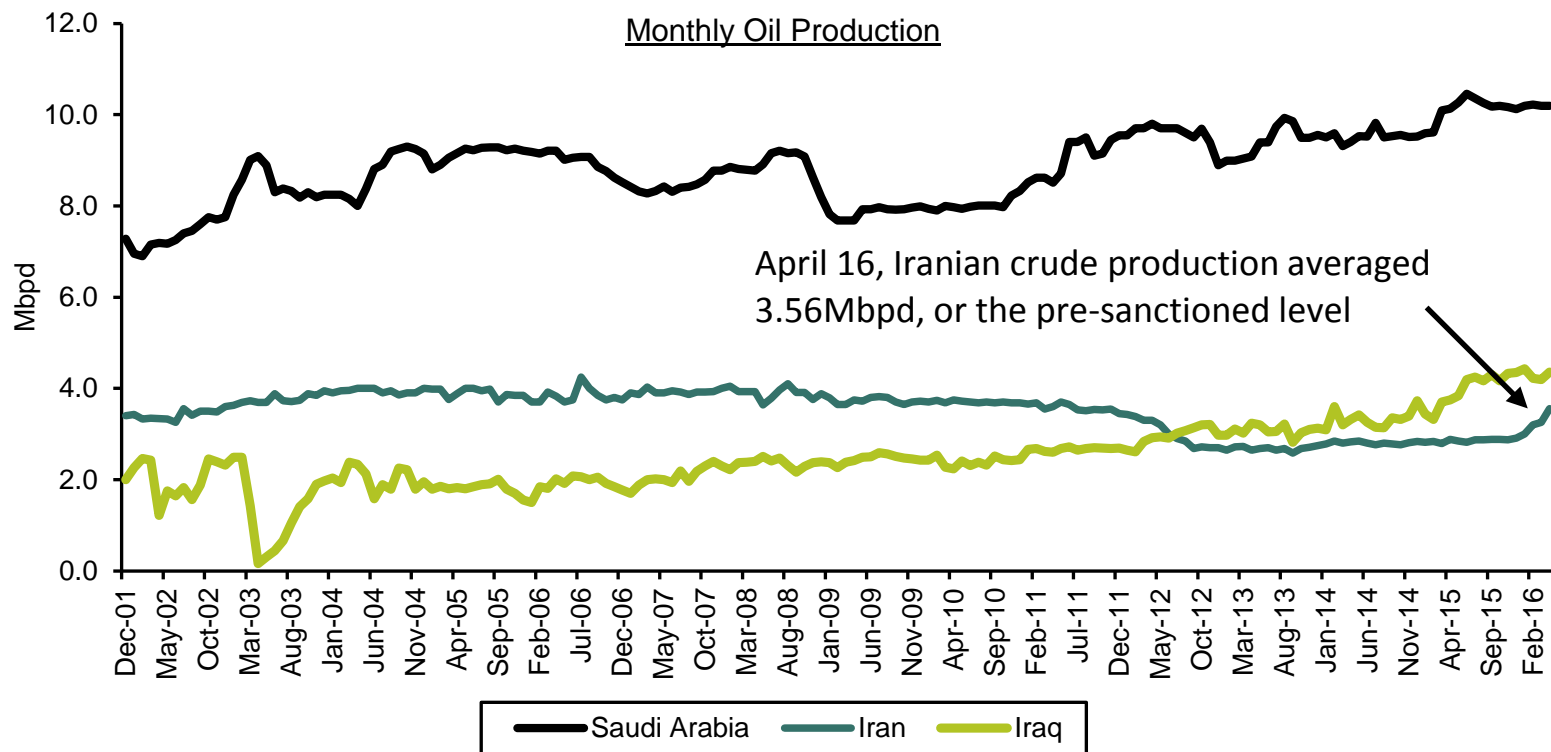
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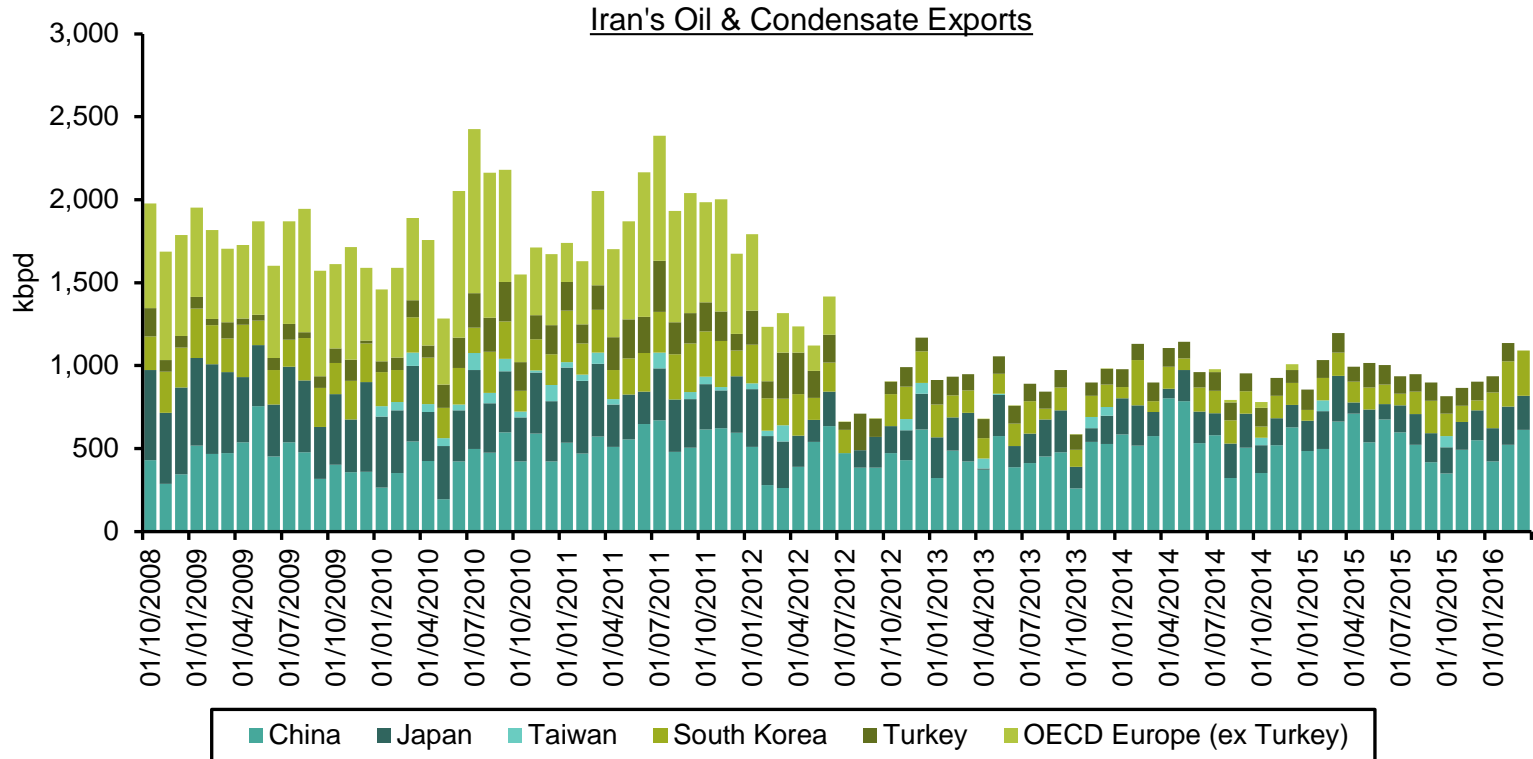
## + Appendix

# Iranian Oil Production is Now Back to the Pre-sanctions Level



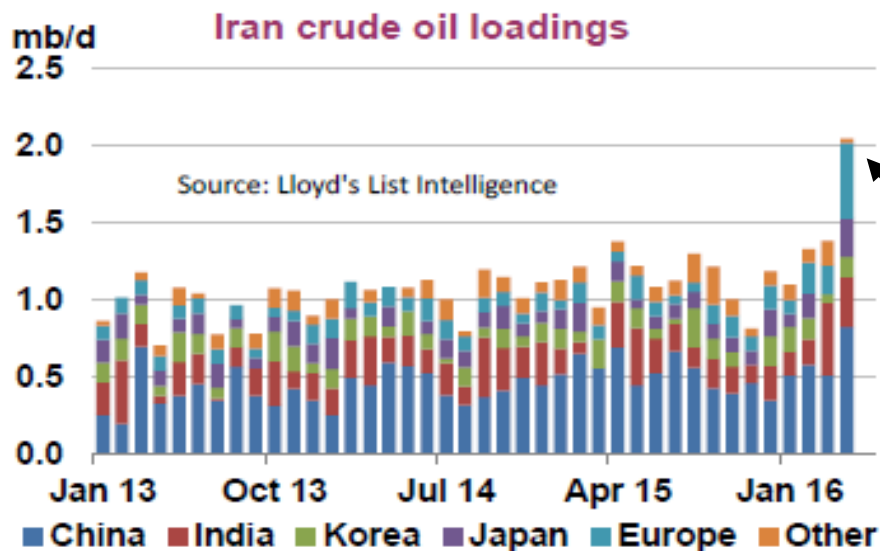
Source: IEA and Bernstein analysis

# Iran Exports to Asia and Turkey

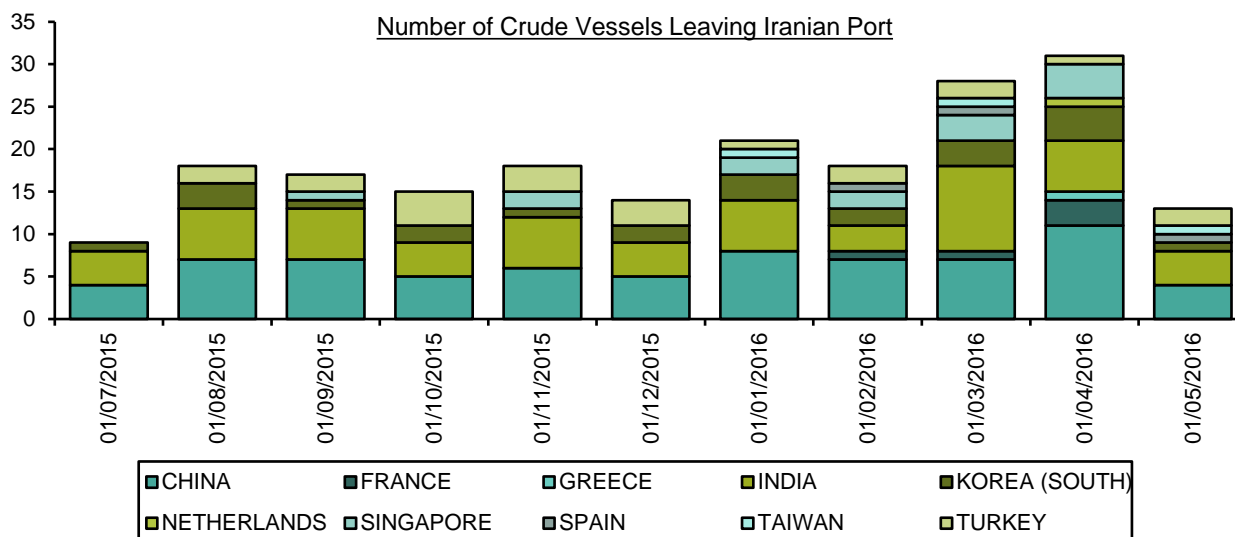


Source: Bloomberg and Bernstein analysis

# Iran Exports to Asia and Turkey – Recent Months

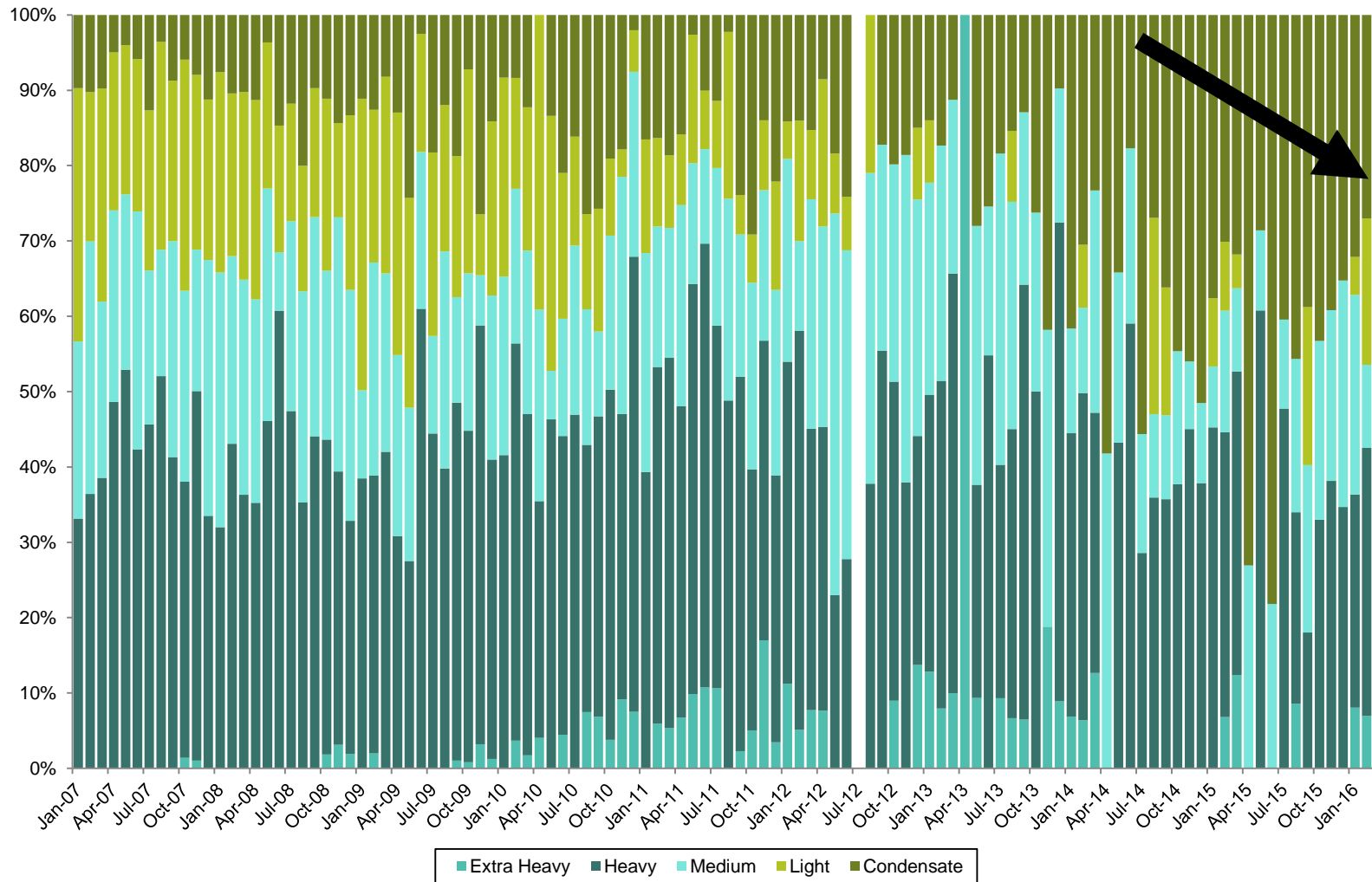


April 16, 500k bpd loaded by European buyers: TOTAL, Tupras, Iplom, Motor Oil



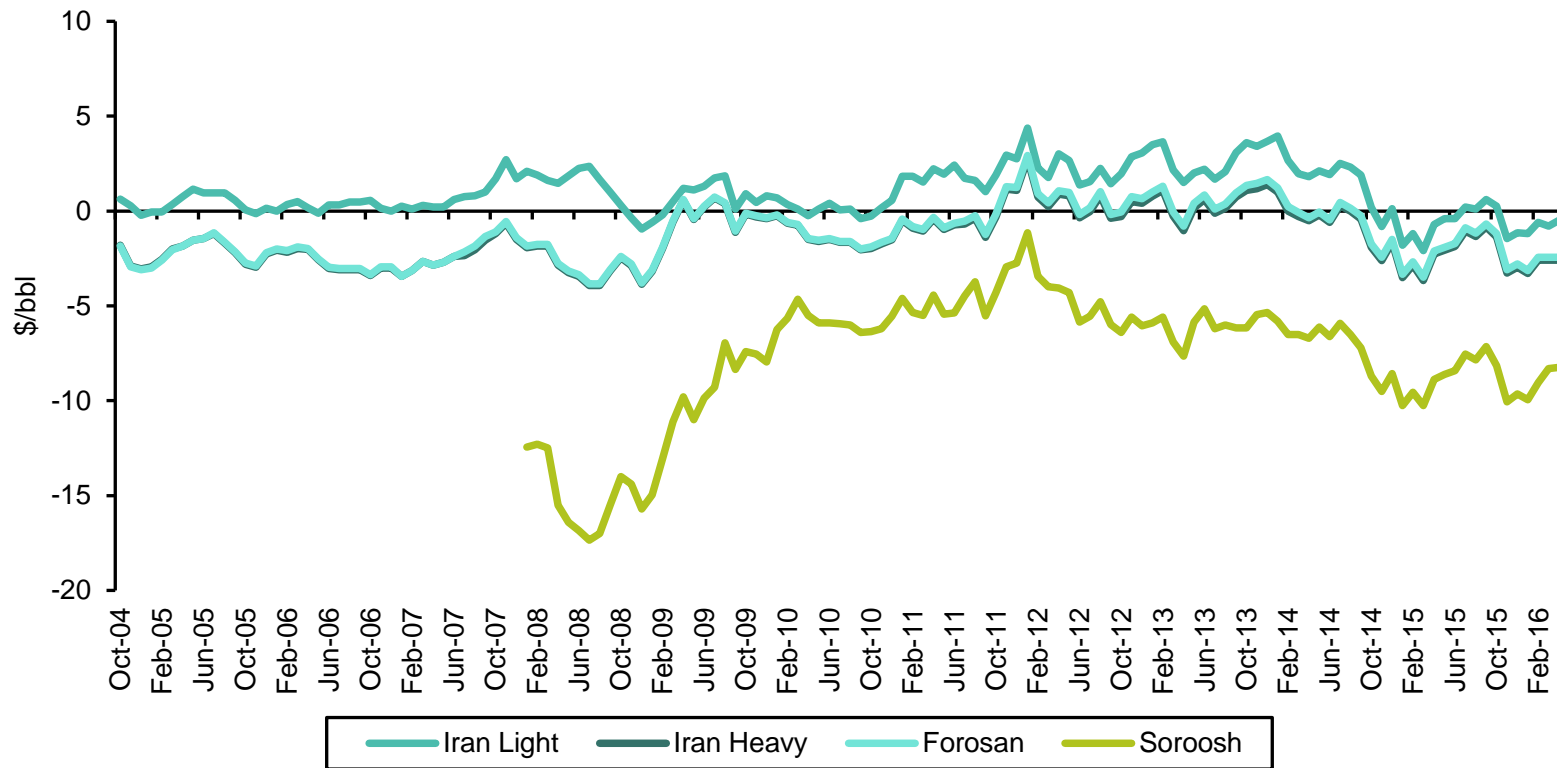
Source: IEA, Platts and Bernstein analysis

# Japan Has Been Importing Lighter Crudes/Condensates From Iran Since July 2012



Source: METI and Bernstein analysis

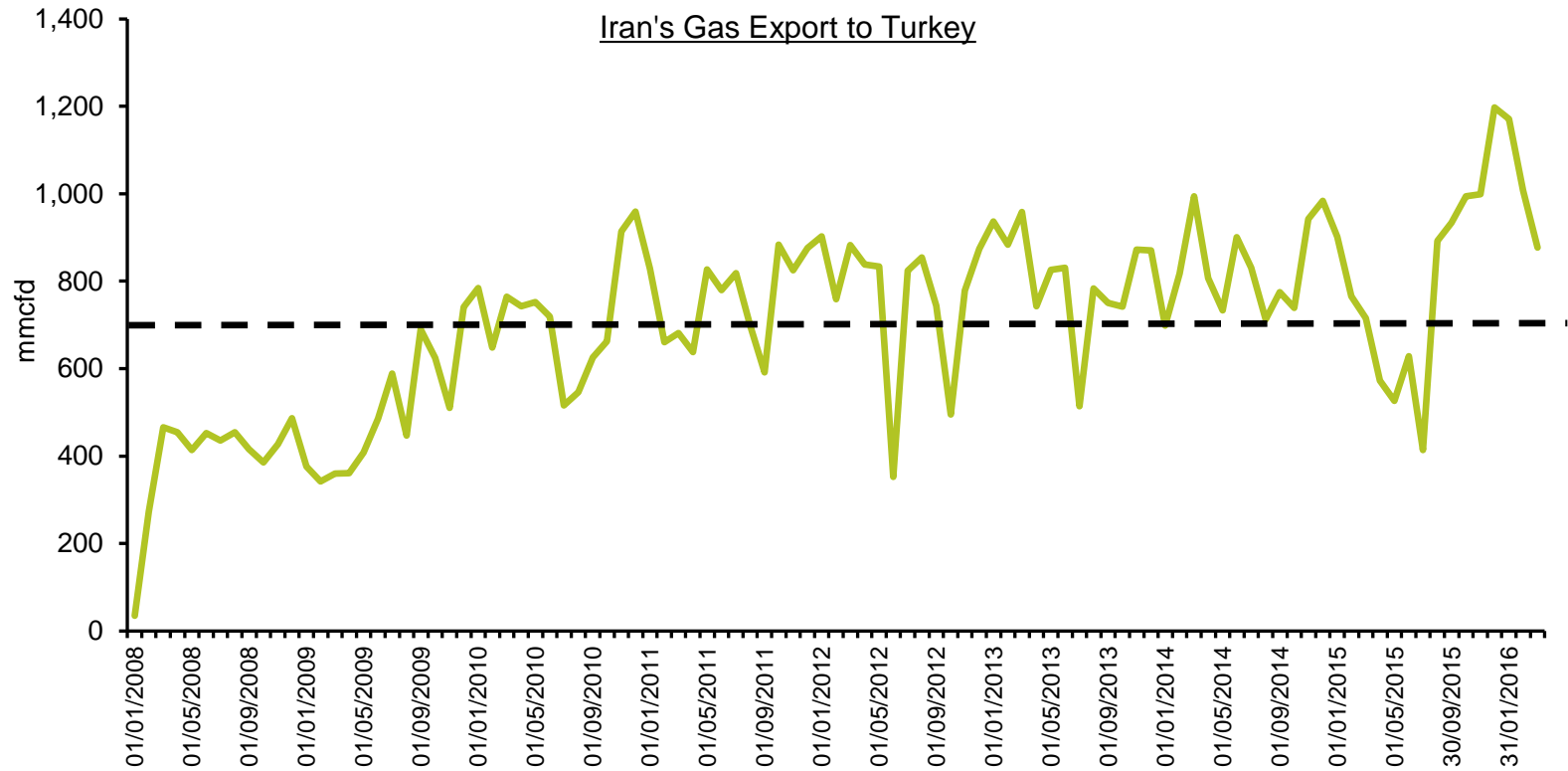
# Iranian Crude Price Differentials Show a Distinct Premium for Lighter Crudes



Source: Bloomberg and Bernstein analysis



# Iran Has Maintained Gas Exports to Turkey at Prices Higher Than Russia and Azerbaijan But Some Discount Is Expected

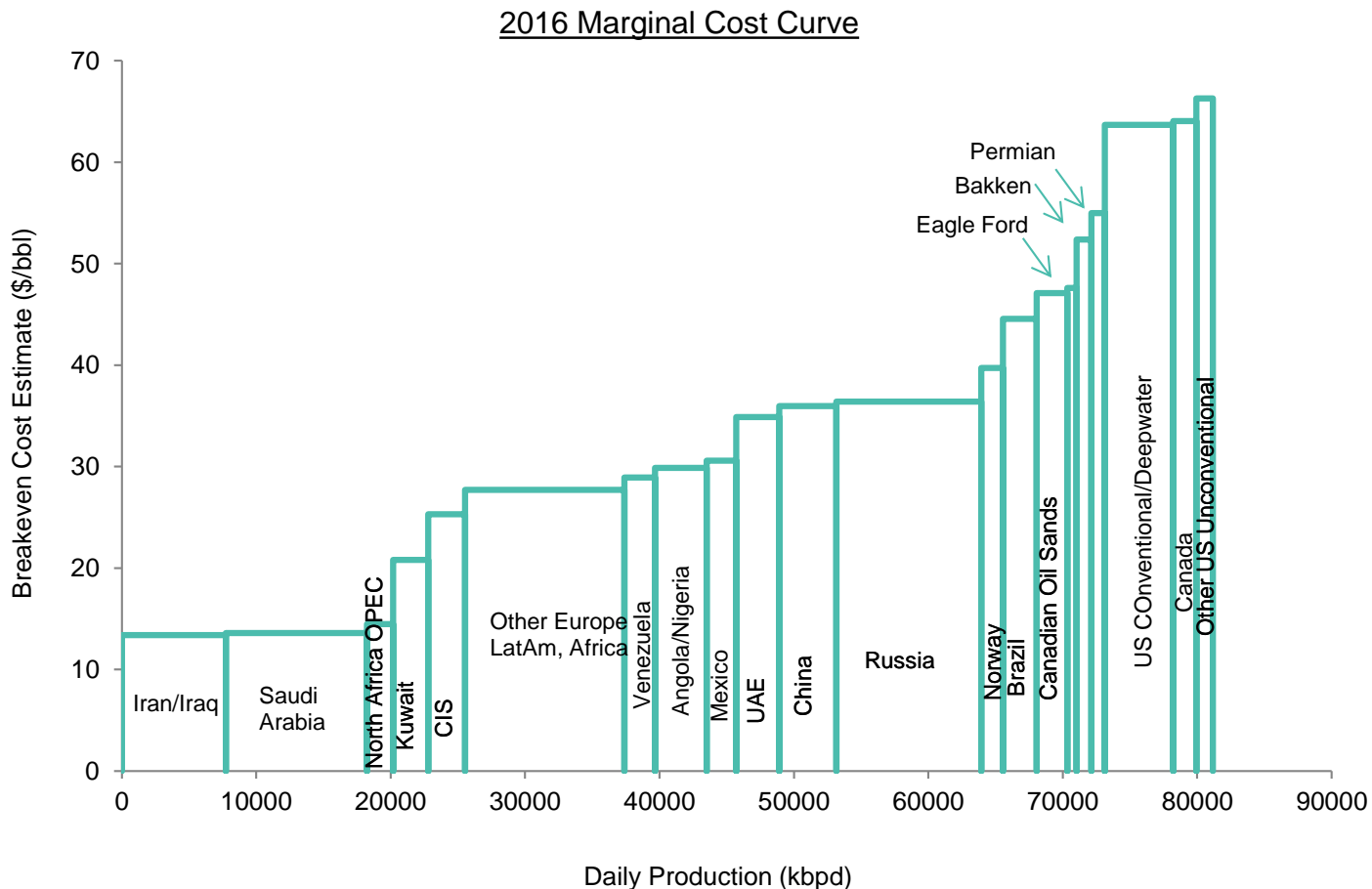


Source: EuroStat and Bernstein analysis

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# Iran Provides One of the Last Significant Openings for IOCs to Access Low Cost Conventional Resources



Source: Wood Mackenzie, Rystad and Bernstein analysis

# Issues With a Quick Rebound of Iranian Oil Production – Geological

## Characteristics /Issues

**Low permeability & low porosity** =>Low success rate for WAG and other EOR techniques

**Heavy oil and heavily faulted reservoir** =>High base viscosities and lack of fracture mapping has led to lower production

**Low formation strength, high water flows, lost circulation** =>Abnormal pressure and depth relationship with a high water flow led to significant operational issues including mud losses and damage to producing formation

## Fields/Regions

Sirri-A

Soroosh/Nowruz

Alborz/Sarajeh

Source: SPE presentations and papers, and Bernstein analysis

# Issues With a Quick Rebound of Iranian Oil Production – Operational

## Characteristics /Issues

**Landmines and unexploded ordinance** => Presence of explosives in and around field leading to drilling and production delays

**Reservoir thickness** => Accurate horizontal drilling required but previous usage did not lead to uplift in production rates

**Drill pipe issues** => Wellbore instability, differential sticking force, improper hole cleaning and the forming of drill-cutting beds especially in high angle wells

**Casing issues due to large pressure drops** => Significant reports of compaction and resulting well failures in Iran by NIOC

**Seismic data availability** => Lack of comprehensive seismic data for the region that would permit further drilling and appraisal

**Older well subsidence** => Subsidence and casing collapses in Iranian fractured reservoirs like Masjed-i-Suleiman which has large cap rock cracks and large pressure drops

## Fields/Regions

Azadegan

Bibi Hakimeh

Ahwaz/Abb-Taymoor

Gachsaran

High Zagros Belt

Masjed-i-Suleiman

Source: SPE presentations and papers, and Bernstein analysis

# Issues With a Quick Rebound of Iranian Oil Production – Operational (cont'd)

## Characteristics /Issues

## Fields/Regions

**Gas Injection/Lift** => Many fields presently on gas lift operations have had average production levels drop by a factor of 8 which was a result of high pressure drop, continuous increase of water cut and GOR

South West Iran

**Horizontal drilling experience** => In Iran 146 directional and horizontal wells have been drilled onshore and 16 offshore since 1997

South West Iran

**Fracturing experience** => Only three wells in Iran have been acid fracked and out of those one only started producing at an incremental rate of 200 b/d

South West Iran

**High specification oil rigs and trained crew** => Using Chinese rig which did not meet advertised specifications and failed at multiple stages of drilling causing delays. This was further complicated by the addition of inexperienced crews in the country

South West Iran

**EOR technique application** => Main problem with secondary recovery is the heterogeneity of carbonate reservoirs in Iran. Gas and water breakthroughs occur much faster for many Iranian fields leading to lower accumulative production

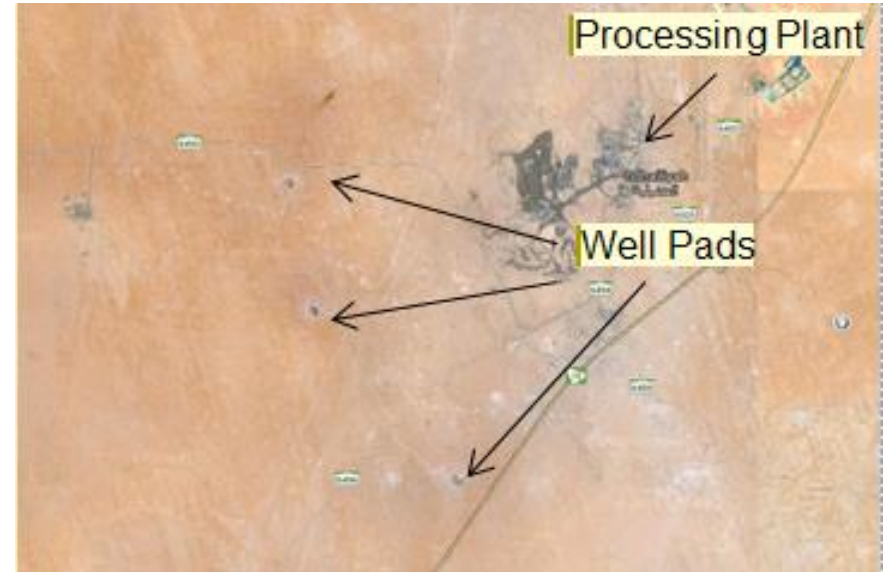
South West Iran

# Mountainous Iranian Terrain

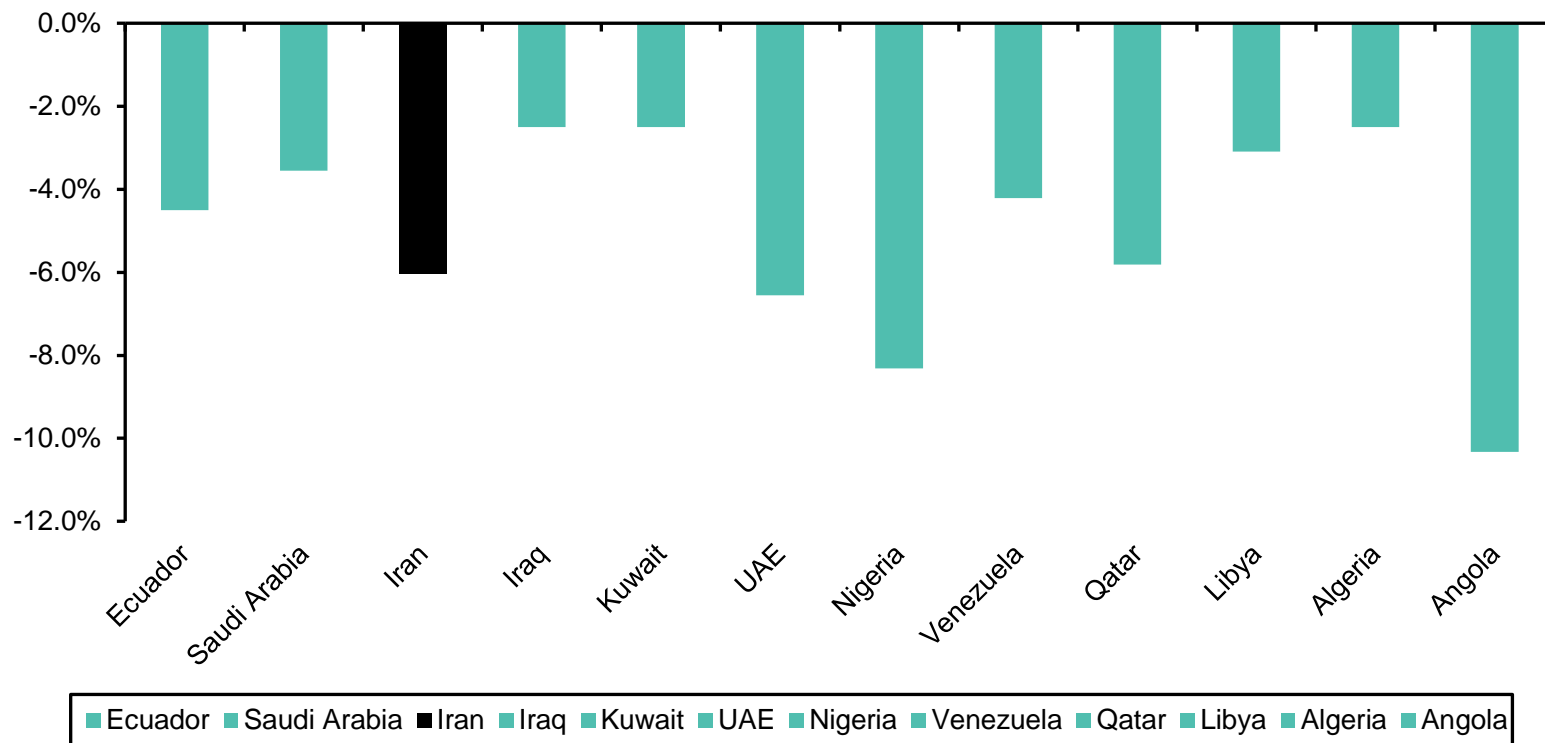
Gachsaran (Iran)



Uthmaniya (Saudi Arabia)



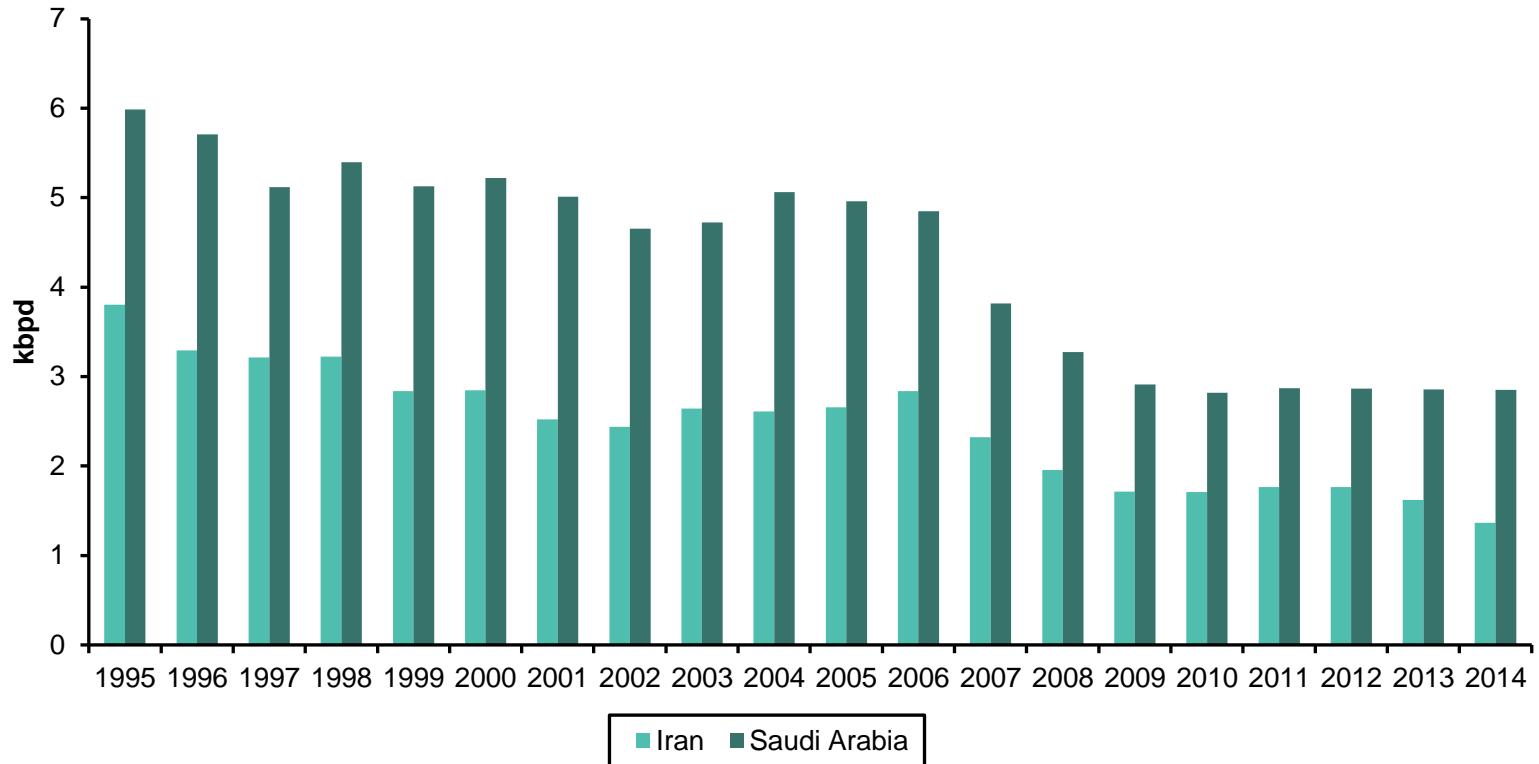
# Iran's Decline Rates Are Probably Mid-table Versus OPEC Peers



Source: IEA and Bernstein estimates

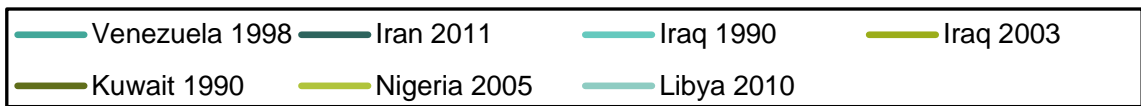
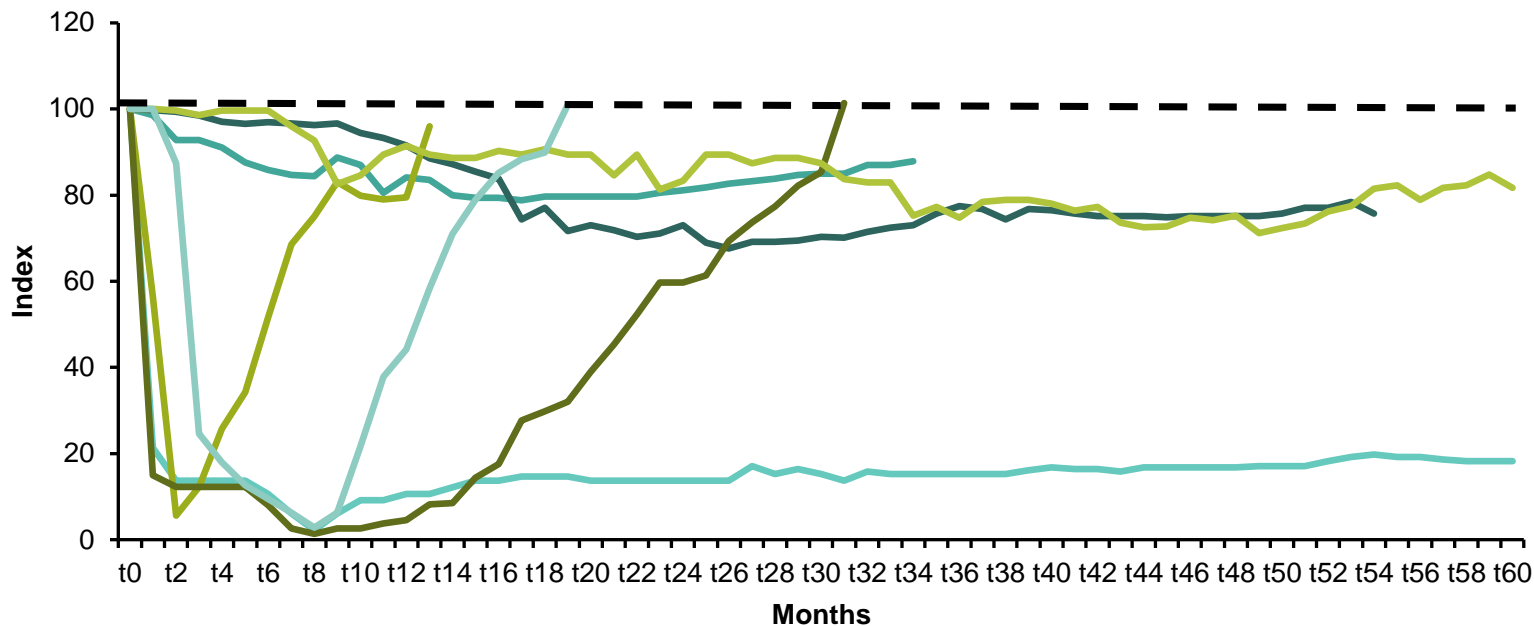


# Production Per Well Iran Vs Saudi Arabia



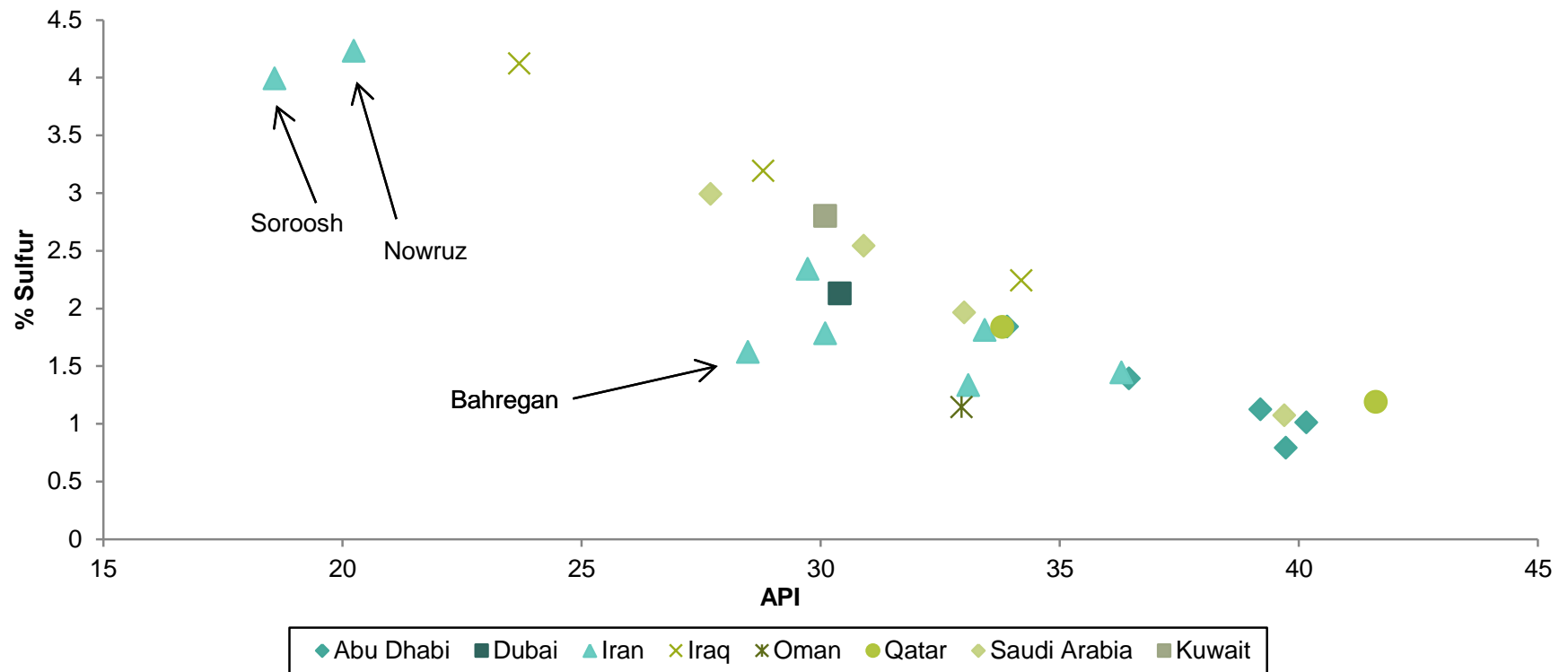
Source: OPEC and Bernstein estimates

# Historical Precedence: Production Doesn't Spring Back to Action After Big Shocks



Source: Bloomberg and Bernstein analysis

# New Iranian Crudes Are Generally Heavier With Higher Sulfur Content



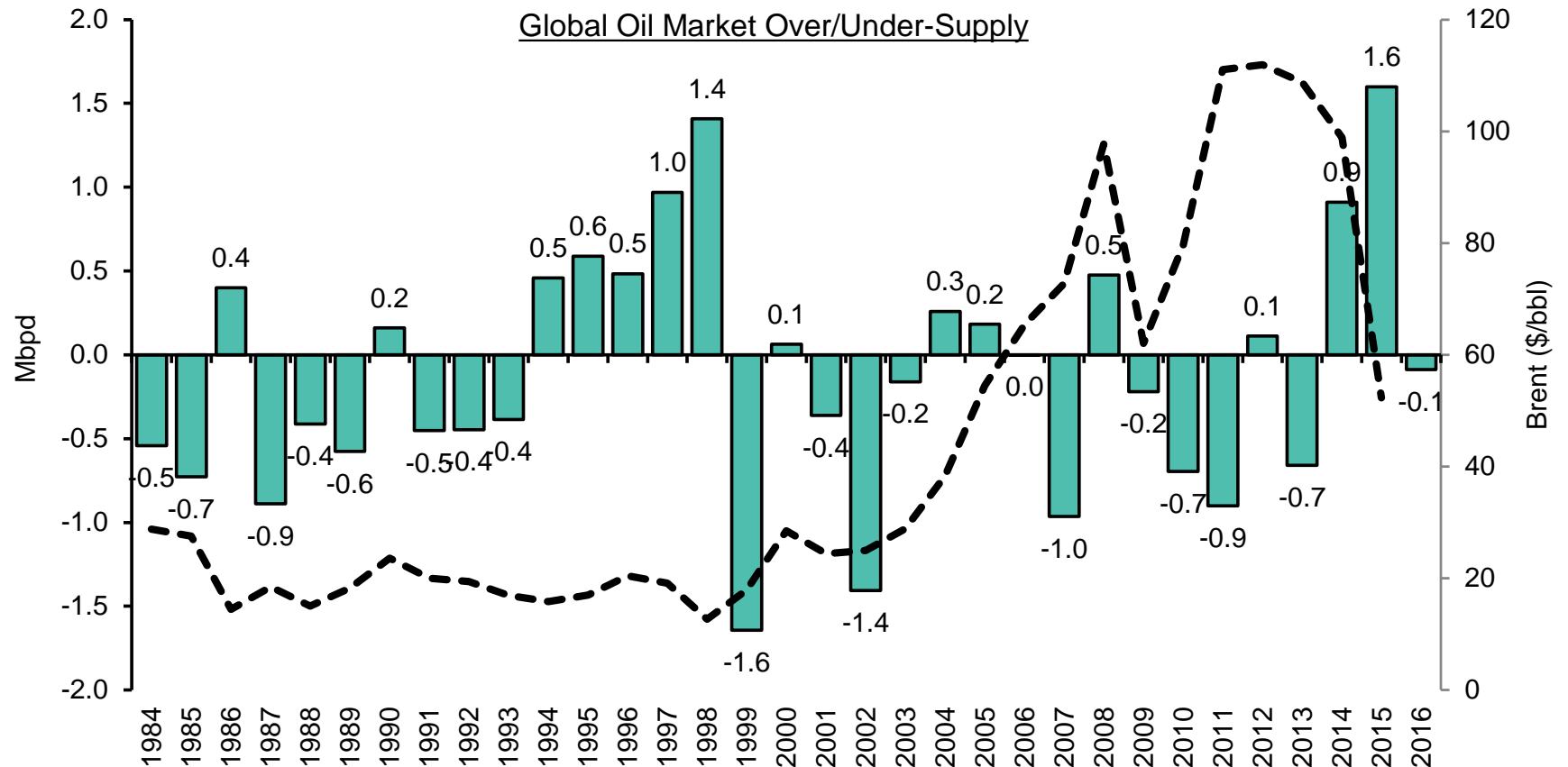
Source: NIOC, Company Assays, Bernstein analysis

# Proposed New Oil Field Developments Will Add <1Mbpd to Iranian Production by 2020

Project	Developer	Plateau Output (kbpd)	Estimated Plateau Year
Yadavaran phase 1	Sinopec	85	2016
Yadavaran phase 2	Sinopec	95	2019-20
Yadavaran phase 3	Sinopec	120	post 2020
Azar phase 1	NIOC subsidiaries	30	2016
North Yaran	Persian Energy	30	2016
South Yaran	NIOC subsidiaries	55	2018
North Azadegan phase 1	CNPC	75	2016-17
North Azadegan phase 2	CNPC	75	2019
South Azadegan phase 1	no developer	150	NA
South Azadegan phase 2	no developer	110	NA
Forouzan	NIOC subsidiaries	100	2017-18
South Pars (oil layer) phase 1	PEDCO	35	2017-18

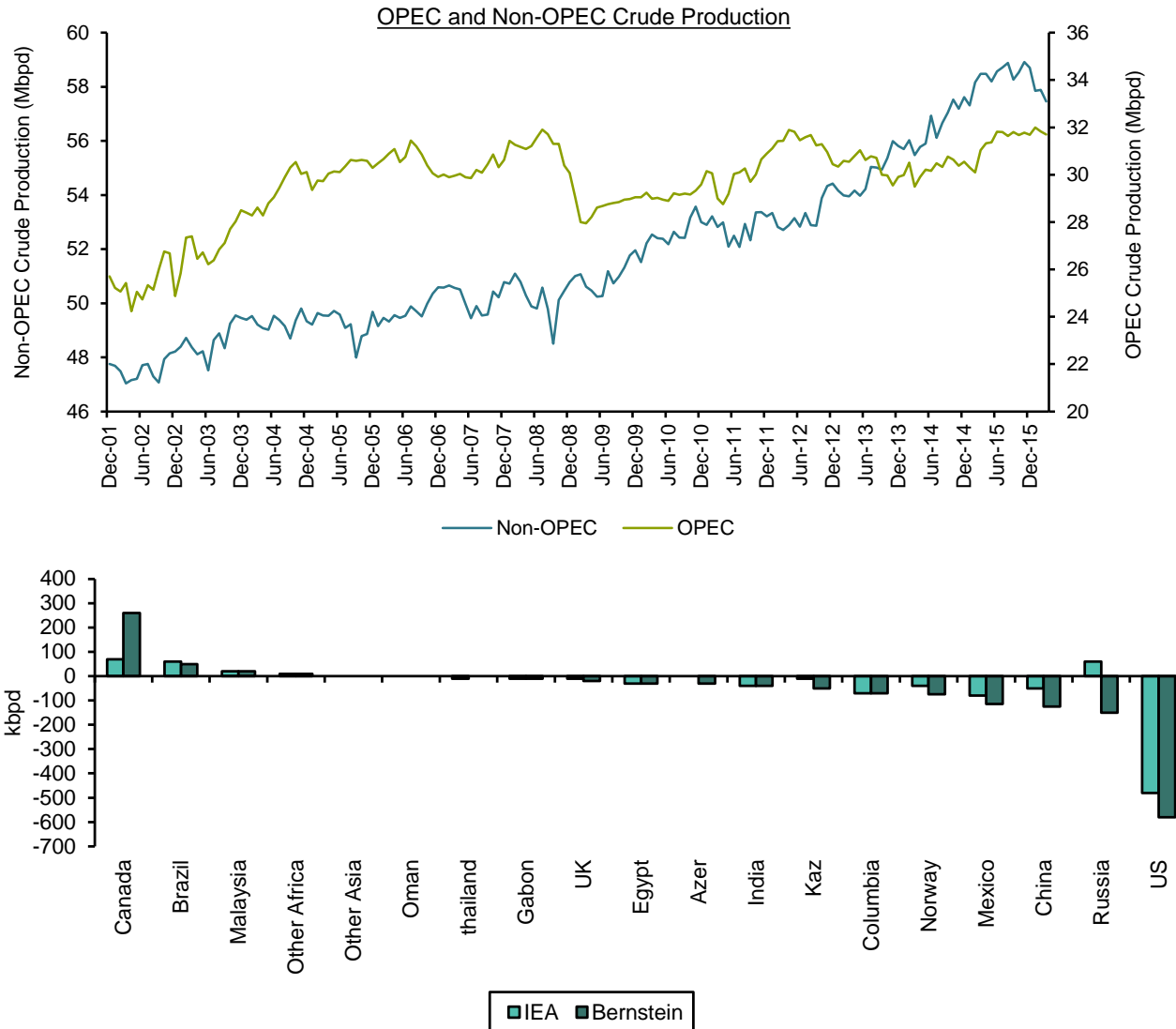
Source: EIA and Bernstein analysis

# Therefore Global Oil Market Will Continue to Tighten As We Head Into 2H



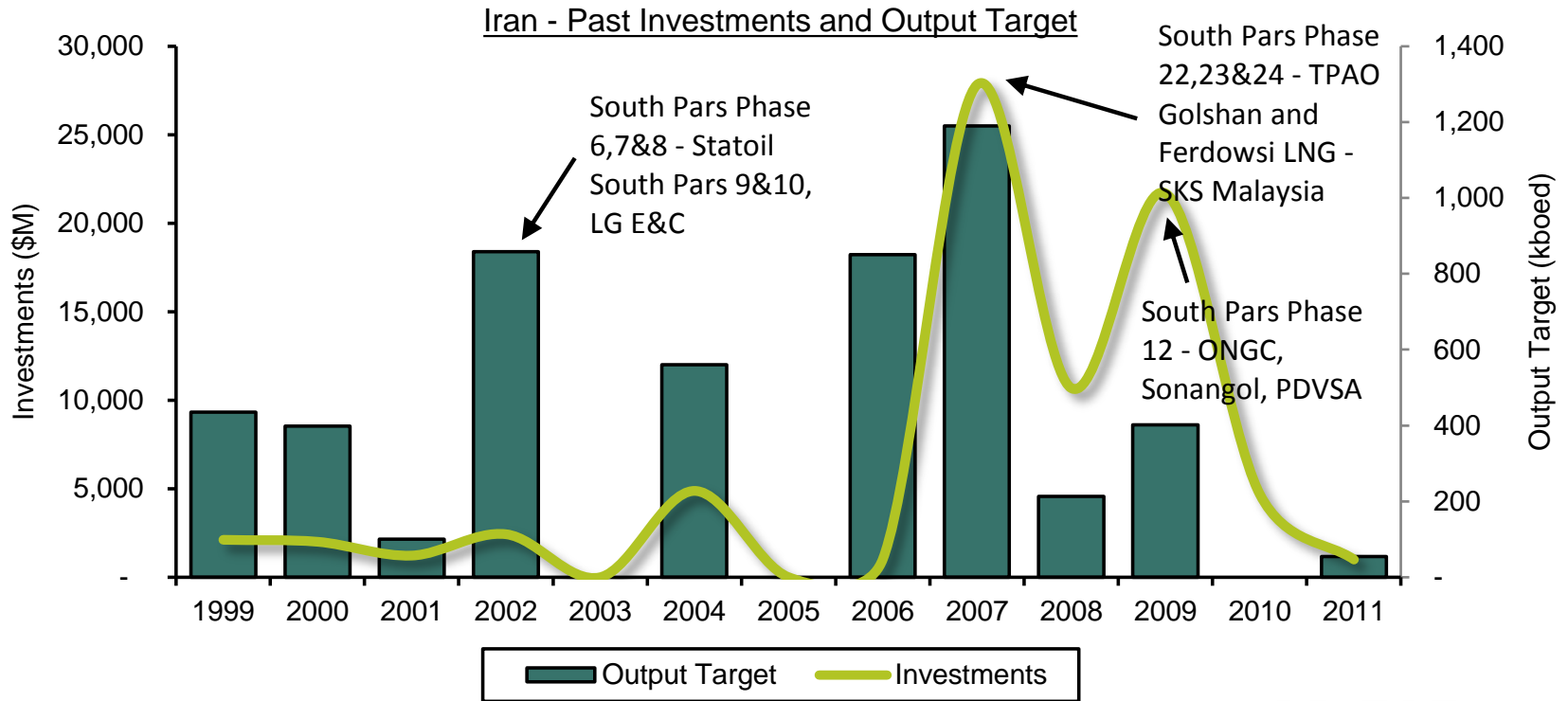
Source: IEA and Bernstein analysis

# The Path To Oil Market Rebalancing



Source: IEA and Bernstein analysis

# Past Investments in Iran Oil



BP, TOTAL,  
OMV, LukOil,  
Wintershall,  
Saipem?

Source: Company reports and Bernstein analysis

# Surveyed Responses – Oil Services

Company	Historical Activity in Iran (Post 2000)	Appetite for future participation	Appetite
<b>Amec FW</b>	- Activity conducted before sanctions - No specific contracts disclosed (by either AMEC or FW)	- "We are monitoring the progress of the implementation of the JCPOA." - "We believe Iran will offer opportunities in our chosen sectors in the future and will evaluate opportunities that may arise."	●
<b>Cape</b>	- No comment / disclosures of specific historical activity	- "We continue to monitor the sanctions situation carefully." - "Cape is at the early stages of evaluating the potential risk/reward profile that opportunities in Iran may offer in the future."	●
<b>CGG</b>	- Activity conducted before sanctions - Work in Iran (onshore / offshore) reported 2000-02 per Annual reports	- "Iran opening and future bid rounds will generate a need for the full spectrum of geoscience services." - "CGG has already put in place a strategic commercial active task force."	●
<b>Fugro</b>	- Evidence found of historical activities in Iran, per corporate website - One contract disclosed post 2000, a \$17mn 3D seismic survey on the Hormuz field	- "We are certainly interested to return there once all relevant sanctions have been lifted." - "It could relate to both onshore / offshore geotechnical and survey work."	●
<b>Lamprell</b>	- "Considerable" experience of work in Iran - No specific contracts disclosed	- "Iran could potentially be an attractive market." - "We are taking the first steps to ensure that we are well-positioned and ready to move at the appropriate time, once sanctions have been lifted."	●
<b>Petrofac</b>	- "Considerable" experience of work in Iran - No specific contracts disclosed	- "We see the potential for opportunities in the medium-term after sanctions are lifted."	●
<b>Saipem</b>	- Saipem highlighted at Q3'15 reporting their "long history" of operations in Iran - No disclosures of specific historical activity	- Saipem highlighted at Q3'15 the "further potential" in Iran in their Onshore E&C outlook	●
<b>Technip</b>	- Technip claims a "long history" in Iran until the sanctions imposed - One contract disclosed post 2000, a \$189mn Ethylene Plant Construction job.	- "We believe this is a market that could represent something significant for Technip." - "Until the sanctions are fully lifted, we will not reengage with customers."	●
<b>Tenaris</b>	- No comment / disclosures of specific historical activity	- "We will for sure be there for some of the complex fields that Iran needs to develop." - "We await the moment when will be clear to operate (ref. US Sanctions)."	●
<b>Vallourec</b>	- Activity conducted before sanctions - No specific contracts disclosed	- "Vallourec has clear intentions to rework with operators in Iran." - "Return to market may be fast on high end material (advanced premium/ high alloy) with no alternative supply under embargo."	●
<b>Akastor</b>	- No comment / disclosures of specific historical activity	- No commentary year to date - We expect some appetite for participation potentially through Fjords Processing and KOP Surface Products business units	●
<b>Aker Solutions</b>	- Activity conducted before sanctions - No specific contracts disclosed	- "We're open to doing business there again at some point given the right opportunity." - "Not actively looking right now."	●
<b>Hunting</b>	- No comment / disclosures of specific historical activity	- No commentary year to date - We expect some appetite for participation on account of onshore well completion services	●
<b>John Wood Group</b>	- No comment / disclosures of specific historical activity	- No commentary year to date - We expect some appetite for participation on account of onshore E&C services	●
<b>TGS</b>	- No comment / disclosures of specific historical activity	- "TGS would not comment on any country until such time as we announce a project or announce a vessel / seismic crew commitment."	●

Source: Bernstein analysis



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# Conclusion

- + **YTD Iranian crude production has been ramping up to the pre-sanction level**
- + **Iranian crude & condensate exports have also been growing steadily, with a recent surge in April**
- + **Future growth options for Iranian oil is however limited, due to:**
  - + **Geological and operational issues identified by petroleum engineers**
  - + **Lack of modern drilling and completion technology**
  - + **Higher decline rates than some other OPEC peers**
  - + **Limited future growth options**
  - + **Oil market therefore remains on its firm path to rebalancing as we head into 2H this year**
- + **Iran however remains one of the last significant openings for IOCs to access low-cost conventional resources**
  - + **So far oil majors remain cautious on re-entering Iran**
  - + **Oil services expressed greater enthusiasm than oil companies with around 75% of them seeing reasonable potential for work**

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# SPE Paper References

Characteristics	Category	Fields/Region	Issues	Papers Referenced
Low permeability & low porosity	Geological	Sirri-A	Low success rate for WAG and other EOR techniques	A. Taheri & V.A. Sajjadian, WAG performance in a Low Porosity and Low Permeability Reservoir, Sirri-A Field, I
HPHT, heavy oil and low oil recovery	Geological/Operational	Zaqeh	Use of In Situ combustion recovery method not available in Iran presently	H. Abolhoseini, Study on Ultimate Heavy Oil Recovery from Zaqeh Field in S.W. of Iran, Oct 2004, SPE
Landmines and unexploded ordnance	Operational	Azadegan	Presence of explosives in and around field leading to drilling and production delays	inzhang, L. Zhiping, An Integrated Approach to Improve Drilling Performance and Save Cost in North Azadegan I
Reservoir thickness	Operational	Bibi Hakimeh	Accurate horizontal drilling required but previous usage did not lead to uplift in production rates	A. M. Kalantari-Dahagi, J. Moghadasi, V. Golami, Applicability of Horizontal Drilling Techniques in Iran: A Field C
Heavy oil and heavily faulted reservoir	Geological	Soroosh/Nowruz	High base viscosities and lack of fracture mapping has led to lower production rates	
Slant drilling techniques	Operational	Ardeshir	Slant drilling techniques on conventional platforms led to lower than theoretical well performance	F.H. Creamer, J.E. Streifel, S.M. Farmanara, G.A. Feizy, The Development of the Ardeshir Field, July 1979, Jou
Low formation strength, high water flows, lost circulation	Geological/Operational	Alborz/Sarajeh	Abnormal pressure and depth relationship with a high water flow led to significant operational issues including mud losses and damage to producing formation	I. Abaie, H.J. Ansari, A. Badakhshan, A. Jaafari, History and Development of the Alborz and Sarajeh Fields of C
Drill pipe issues	Operational	Ahwaz/Abb-Taymoo	Wellbore instability, differential sticking force, improper hole cleaning and the forming of drill-cutting beds especially in high angle wells	S.A.R. Shoraka, S.R. Shadizadeh, M. Pordel Shahri, Prediction of Stuck Pipe in Iranian South Oil Fields Using M
Seismic data availability	Operational	High Zagros Belt	Lack of comprehensive seismic data for the region that would permit further drilling and appraisal	A. Bosold, J. Schober, W. Schwarzahns, A. Julapour, A.R. Ashrafzadeh, M. Ehsani, High Central Zagros (Iran), I
Storage and distribution infrastructure	Operational	Caspian Sea	No production from the Caspian. Lack of infrastructure present onshore in Iran close to the Caspian that can act as a hub for processing produced crude/gas in the area.	F. Kamali, Conceptual Approaches to Oil and Gas Production, Refining and Distribution from Iran reserves in Ca
Older well subsidence	Operational	Masjed-i-Suleiman	Subsidence and casing collapses in Iranian fractured reservoirs like Masjed-i-Suleiman which has large cap rock cracks and large pressure drops.	H.T. Nguyen, R.T. Kelly, D. Sodero, M.R. Niakan, Re-development Issues and Challenges for a Very Old Oil Field
Casing issues due to large pressure drops	Operational	Gachsaran	Significant reports of compaction and resulting well failures in Iran by NIOC.	M. Gorjian, M. moosavi, H. Memarian, H. Ajamzadeh, Shear Failure mechanism in oil wells due to reservoir com
Gas Injection/Lift	Operational	South West Iran	<p>1. Many fields presently on gas lift operations have had average production levels drop by a factor of 3 which was a result of high pressure drop, continuous increase of water cut and GOR. This has resulted in greater declines than modeled. Further economic modelling showed that any gas injection over 1 mmscfd has negative NPV even at \$80/bbl oil prices.</p> <p>2. Gas Injection resulted in increase of gas oil ratio (GOR) much before anticipated time Secondary recovery failed because of vast increase in GOR and has made field dynamics and oil production hard to model even though significant recoverable oil still remains.</p> <p>3. Acidizing of wells caused significant increases in oil recovery but these were very short-lived.</p>	<p>M. Ebrahimi, Gas Lift Optimization in One Iranian South Western Oil Field, June 2010, SPE</p> <p>F. namdarian, M.A. Taghanaki, A. Hashemi, Upscaled Pseudo-porosity Extracted from Impedence Column can effectively predict gas fingering in a dynamic model-A Gas Injection Case Study, Sep 2015, SPE</p> <p>H. Mehrabi, H. Rahimpour-Bonab, A. Navidtalab, Geochemistry as a Powerful Tool in Oil Exploration: A Case Study from the Karstified Reservoirs of the Middle East: SW Iran, Dec 2014, SPE</p>
Horizontal drilling experience	Operational	SW Iran	In Iran 146 directional and horizontal wells have been drilled onshore and 16 offshore since 1997.	F. Chao-Hui, Z. Hu, Y. Zhi-sen, T. Yu-qiang, Complication Circumstance Directional and Horizontal Wells Drillin
Fracturing experience	Operational	SW Iran	Only three wells in Iran have been acid fracked and out of those one only started producing at an incremental rate of 200 b/d	F. Roshanai Heydarabadi, J. Moghadasi, Hydraulic Fracturing in Iran-Lessons From our Case Histories, Jun 2011
Reservoir management	Operational	Issaran	The field is at a shallow oil depth and cannot be produced as cold production. It requires different reservoir management for three different/distinct production zones. The field also has low pressure and a very high water cut	M. Samir, Rejuvenation Issaran Field-case Study, Feb 2010, SPE
Natural Fracture Modeling	Operational	Kuh-E-Mond	Loss of significant production due to water cut if the natural fault structure is not well understood.	A. Shafiei, M.B. Dusseault, natural Fractures Characterization in a Carbonate Heavy Oil Field, Jun 2012, ARMA
Wellbore instability and high mud loss	Operational	Kupal	Wellbore instabilities, tight hole, severe losses were found in wells drilled. Unplanned liner used after total losses resulted in reaching the target zone with smaller liner and thus the production was not optimum	Y. Yousafi, M. Fazaelizadeh, G. Hareland, A. Kustamsi, S.A. Mirhaj, F. Shirkavand, Cost Evaluation for the First
High specification oil rigs and trained crew	Operational	SW Iran	Using Chinese rig which did not meet advertised specifications and failed at multiple stages of drilling causing delays. This was further complicated by the addition of inexperienced crews in the country.	H.F. Spoerker, M. Doschek, Performance Drilling Onshore Iran-Introducing New Concepts to a Mature Area, Feb
EOR technique application	Operational	SW Iran	Main problem with secondary recovery is the heterogeneity of carbonate reservoirs in Iran. Gas and water breakthroughs occur much faster for many Iranian fields leading to lower accumulative production.	G. Sobhi, M. Kiani, N. Alizadeh, Comparison and Investigation of Recovery Factor from Simulation of Water and
Safety and HSE implementation	Operational	Naft Shah	38 days to control a blowout in a conventional onshore reservoir.	M. Makvandi, K. Shahbazi, H. Bahmani, The Great Achievement in Well Control of one of the Iranian Wells, Oct 2



# Disclosure Appendix

## Disclosure Appendix

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## 12-Month Rating History as of 05/17/2016

### Ticker Rating Changes

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BP	O (RC) 09/10/15	M (IC) 08/03/10
BP.LN	O (RC) 09/10/15	M (IC) 08/03/10
CNE.LN	M (RC) 01/29/13	
E	O (RC) 06/14/13	
ENI.IM	O (RC) 06/14/13	
FP.FP	O (RC) 02/15/16	M (RC) 05/01/15
GALP.PL	O (RC) 05/26/10	
PMO.LN	O (RC) 06/28/12	
RDS/A	O (RC) 09/30/14	
RDS/B	O (RC) 09/30/14	
RDSA.LN	O (RC) 09/30/14	
RDSA.NA	O (RC) 09/30/14	
RDSB.LN	O (RC) 09/30/14	
RDSB.NA	O (RC) 09/30/14	
REP.SM	M (RC) 12/03/13	
STL.NO	O (RC) 12/03/13	
STO	O (RC) 12/03/13	
TLW.LN	O (IC) 01/22/09	
TOT	O (RC) 02/15/16	M (RC) 05/01/15

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Rating Guide: O - Outperform, M - Market-Perform, U - Underperform, N - Not Rated

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