WARNING

NOT PAINT
BY NUMBERS
JUST A FEW DOTS FOR YOU TO CONNECT IN YOUR MIND
The Internal Combustion Engine (ICE) is behind ~25% of global annual CO2 emissions.
Within 45 years (= 3 ‘car generations’) – in 2060 - we will all be driving electric cars. And, this is consistent with the <+2degC goal.
In 20 years, in 2035, to own a normal car (a car that requires a driver) will be like owning a horse; you only have it for sentimental reasons.
OUTLINE

- INTRODUCTION
- THIS WEEK IN HISTORY
- OIL PRICE: NOONE IS FIT@30-50
- E&P2.0
- LIKE!
- GLOBAL ENERGY OUTLOOK
- CREATIVE DESTRUCTION
- REFLEXIONES FINALES
Gravitational Waves Detected, Einstein Is Right
The Jetsons On The Way To

UT ENERGY WEEK 2062
We wanted flying cars, instead we got 140 characters.

—— Peter Thiel ——

Note: Thiel co-founded PayPal with Elon Musk and served as its CEO.
Oil prices will bottom at $20 soon. So says an indicator that has been correct for the past two years. Why oil should move back up to around $55 late this year.
Most Analysts Predict That Oil Prices Will Be Lower for Longer 2016, 2017, 2018, 2019, 2020?
$100/BBL

CAVALRY IS NOT COMING TO THE RESCUE

$100/BBL
JANUARY 21, 2016: MOODY'S PLACES 120 OIL & GAS COMPANIES ON REVIEW FOR DOWNGRADE"
• Oil prices will continue to fall in 2016
• In 2-3 years, the prices will rebound to ‘the new normal’ of $65-70 per barrel

“We really do imagine a band,” probably between $40 and $60 a barrel, he said. “I can see that band lasting for five to ten years. I think it’s fundamentally different.”

Crude prices of 50-70$/B not sustainable beyond 2017 (as global demand again overtakes supply)

- 2016: $62/BBL
- 2017: $79/BBL
- 2020: $113/BBL
TODAY: 1.5-2 MILL BOEPD TOO MUCH

Oil demand growth: 1.25 mill bopd per year

A VERY TALL ORDER

To add 25 mill boepd of new oil production (= 2 X KOSA’s current oil production) in just 4 years!

GLOBAL OIL PROD MILLION BOPD

Global natural decline is 5 mill boepd/yr

2016 2017 2018 2019 2020

95 90 85 80 75

+5 20
Plunging oil prices put question mark over $1.5tn of projects

Christopher Adams, Energy Editor
TOTAL expects >1.2mmbbl/d of demand growth in 2016

Cumulative industry project delays will result in a 5-10 mill b/d supply gap by 2020
MEXICO = E&P2.0
MEXICO BID ROUND NUMBER 4: ROUND 1.4
THE FIRST DEEP WATER ROUND IN MEXICO

- Blocks are in the PERDIDO and the SALINAS basins
- 10 DW (500-3000m WD) blocks (1500-3000+ sqkm) on offer
- Bid deadline to be announced in 3Q 2016
ABSOLUTELY NOBODY IN THE E&P ECO-SYSTEM IS
FIT@30-50

- INDIVIDUAL OPEC COUNTRIES: NO
- US, RUSSIA, BRAZIL, NORWAY: NO
- NOCs: NO
- MAJORS: NO
- INDEPENDENTS: NO
- SERVICE COMPANIES: NO
- CONTRACTORS: NO
- SUPPLIERS & VENDORS: NO
- UNIVERSITIES: NO
- PROFESSIONAL ASSOCIATIONS LIKE SPE, AAPG, SEG,: NO
SAUDI OIL MINISTER: I Don't Care If Prices Crash To $20 — We're Not Budging

Note: Saudi Arabia’s Oil Minister Mr. Ali al-Naimi
In Saudi Arabia, we recognize that eventually, one of these days, we are not going to need fossil fuels. I don’t know when, in 2040, 2050 or thereafter
Are we doing the right thing?
200 YEARS: PRICE OF ALL COMMODITIES
(10 YEAR AVERAGE RATE OF RETURN)

- VERY LONG HW & HF: +5 MILL B/D
- VERY HIGH OIL PRICE: >100 B/D
- VERY CHEAP MONEY: QE1, QE2, QE3
- TOO MUCH SUPPLY: +2 MILL B/D

WHY NO DISCIPLINE IN GOOD & BAD DAYS?

200 YEARS: PRICE OF ALL COMMODITIES
(10 YEAR AVERAGE RATE OF RETURN)
• VERY LONG HW & HF: + 5 MILL B/D
• VERY HIGH OIL PRICE: >100 $/D
• VERY CHEAP MONEY: QE1, QE2, QE3
• TOO MUCH GL. SUPPLY: +1.5 MILL B/D

SOLUTION? = DISCIPLINE IN GOOD & BAD TIMES

E&P 1.0

E&P+ | OIL PRICE UP

E&P 2.0

E&P+ | OIL PRICE DOWN
LET'S TAKE THE PULSE OF E&P RIGHT NOW
CUT SG&A COSTS
CUT STAFF
REDUCE INV (CAPEX)
STOP PROJECTS
DELAY PROJECTS
DIVEST ASSETS
RE-NEGOtiATE
CONTRACTS

E&P 2.0
TO MAKE E&P ‘FIT AT 50 $/BBL’
E&P2.0 EXAMPLES

ADVANCED OIL & GAS ‘MANUFACTURING’ MINDSET
- Standardization
- Industrialization
- Automation...
- E&P ala Southwest Airlines

COLLABORATION2.0
- = Darwin’s Blindspot
- A new competitive advantage
- Business is not always ‘war’
- In the future, the fittest are the best collaborators?
- Industry-Suppliers-Academia

DRILLING AUTOMATION = TNBT?
- ‘Watson’ and ‘Deep Blue’ are better and safer drillers
- Materials Science; lighter
- Safer with new technology (digital assistant – lifting)

THE INDUSTRIAL INTERNET OF EVERYTHING, BIG DATA, ANALYTICS
- Exploration (the signature of ‘elephants’ in the data)
- Operations: optimization of production

NEW BUSINESS MODELS EXAMPLE: OFFSH DRILLING RIGS
- Rig owners have skin in the game: X% of disc. value?
- Rig rate = f(oil price)?
- BOBs: Leased from GE?

RE-BALANCE GOV TAKE vs INV TAKE
MORE REALISTIC ‘PLUMBING SYSTEMS’

MORE REALISTIC FORECASTS & MORE VALUE CREATION

Source: Ross Formation Turbidite System, West Ireland
STEM & R&D
• Make the impossible possible
• Make the impossible affordable
LOOKING BACK AT E&P1.0 IN 10 YEARS?
WE’RE TEAMING UP
Global E&P Investment: 700-1000 Billion/Yr

YOU HAVE ‘CHANGING THE WORLD FOR THE BETTER’ IN YOUR JOB DESCRIPTIONS!

START WITH WHY
HOW GREAT LEADERS INSPIRE EVERYONE TO TAKE ACTION
SIMON SINEK
THE MORAL CASE FOR E&P

If we look at the big picture of fossil fuels (which provide 85% of the global energy supply in 2016) compared with the alternatives, the overall impact is to make the world a far better place.

2016 ENERGY SUPPLY FROM SOLAR, WIND AND GEOTHERMAL <2%
60 MINUTES

27 million new energy customers in 112.5 DAYS

Mini Quiz?
THE GLOBAL MIDDLE CLASS: +3 BILLION DURING 2010-30


Sources: UN, ExxonMobil
GLOBAL ENERGY MIX TO 2040

Solar + Wind + Biofuel: In 2040

IPCC: COAL IS THE ‘BLACK SHEEP’ OF THE FOSSIL FUEL FAMILY

Source: ExxonMobil The Outlook For Energy – A View To 2040

- Nuclear
- Hydro
- Gas
- Oil
- Coal
- Biomass
Concerns over running out of oil and gas have disappeared. There is no intrinsic reason why oil prices should be going up due to a perception of a limited supply of oil. By the time we stop using oil due to peak demand, there will still be trillions of barrels left.

Source: BP Technology Outlook 2015
RENEWED FOCUS ON

CLIMATE CHANGE

COSTS
HEALTH, WEATHER
CROPS, SEA LEVEL RISE...

SUSTAINABILITY

CLIMATE CHANGE

RENEWED FOCUS ON

CLIMATE CHANGE
IPCC: $< +2\, \text{degC}_0$ OR ELSE
G7 leaders agree to phase out fossil fuel use by end of century

German chancellor Angela Merkel announces commitment to ‘decarbonise global economy’ and end extreme poverty and hunger
E&P IS A BIG PART OF THE SOLUTION!!

- E&P provides energy while we develop substitutes
- E&P keeps lifting people out of poverty until substitutes can take over
  - Use natural gas instead of coal for electricity generation
  - Minimize CO2 emitted per boe produced (no flaring, ..)
- Use natural gas in combination with intermittent renewables (wind, sun, tidal, ..)
  - IOR with CO2
    - CCS
Feb. 16, 2005

The Kyoto global warming pact went into effect.

2012: The US emitted 291 million metric tons of CO2 less than its 1997 levels. This is a 5.2% reduction in CO2 emissions. It EXACTLY meets the Kyoto requirement!
The oil age will not end because we ran out of oil
The stone age did not end because we ran out of stones
Commercial sailboats did not stop sailing because we ran out of wind

The oil age will end because
- oil became too expensive
- alternatives became more attractive and/or
- climate issues made it imperative

Note: There are always surprising upsides in endings - for The Next Big Thing - while The Next Old Thing is doomed
NATURAL GAS

Current (High-carbon) Energy Mix

Future (Low-Carbon) Energy Mix

CEOs OF EUROPEAN IOC's

- Coal is the ‘black sheep’ of the FFF
- Natural gas is the substitute
- Boost natural gas use
- Introduce a global CO2 tax ASAP
GLOBAL OIL PRODUCTION (BBLs per year in billions)

Time (years)

THE ‘OIL AGE’

- 1859 (DRAKE)
- 2100?
This Week in History: February 16-19

February 19, 1878
Thomas Edison patents the gramophone
I'd put my money on the sun and solar energy. What a source of power! I hope we don't have to wait til oil and coal run out before we tackle that.
THOUGHT NO.1: THE NEAR LONG TERM

- Biofuels
- Other
- NGLs
- Tight oil
- Oil sands
- Deepwater
- New conventional C&C
- Developed conventional C&C

MILL BOEPD

- 2000
- 2016
- 2040

THOUGHT NO.2: THE FAR LONG TERM

- 1859 (DRAKE)
- 2100 ??

GLOBAL OIL PRODUCTION (Billions of Barrels/Year)

- Time
HIGH-TECH ~15,000 YEARS AGO

12,000 Year Old Arrowheads From The NEFUD DESERT of Saudi Arabia

AUSTIN 11,000 BC

TOM HELGE
IT'S A REVOLUTION
Some people see what is and say, WHY?
I dream things that never were and say, WHY NOT?
“Mankind’s ability to innovate, adapt and change is ultimately the most encouraging and optimistic aspect of human nature!”
This Week in History: February 16-19

February 16
1914
First airplane flight between LA and San Francisco
1885:

“ I CAN STATE FLATLY THAT HEAVIER THAN AIR FLYING MACHINES ARE IMPOSSIBLE ”

LORD KELVIN
The Wright Brothers

THE FIRST POWERED FLIGHT: DECEMBER 17, 1903
This Week in History: February 16-19

February 17
1878
In San Francisco, the first large city telephone exchange opened
THE CREATIVE DESTRUCTION OF THE TELEPHONE 1876-2016

Alexander Graham Bell
1876

Martin Cooper, Motorola
1973

~$10,000

Apple iPhone
2016
E&P: THEN vs NOW
February 16
1832
HMS Beagle reaches St. Paul’s Rock (Brazil)
DARWIN’S MAIN TAKEAWAY

“It is not the strongest of the species that survives, nor the most intelligent, but the one most responsive to change.”

-Charles Darwin, 1809

JANUARY 12, 1836
HMS BEAGLE WITH CHARLES DARWIN REACHES SYDNEY AUSTRALIA
The process in which technology and innovation create new ways of doing things and, in the process leave the old ways behind.
Joseph Schumpeter
CREATIVE DESTRUCTION
JULY 23, 1903
FORD MOTOR SELLS 1st MODEL A CAR

If I had asked people what they wanted, everybody would have said: A FASTER HORSE!
Joseph Schumpeter
CReative Destruction
February 17, 1996
World Chess Champion Kasparov beats IBM’s Supercomputer ‘Deep Blue’
DEEP BLUE BEAT KASPAROV IN NEW YORK CITY IN 1997
This Week in History: February 16-19

February 18, 1564
Michelangelo died in Rome

"Every block of stone has a statue inside it and it is the task of the sculptor to discover it."

The Future Of The Planet Depends On STEM And Innovation
February 19, 1904
Winston Churchill makes one of his most powerful and brilliant speeches (1.5hrs long)

SUCCESS IS NEVER FINAL!
"because the ones who are crazy enough to think that they can change the world, are the ones who do."

Steve Jobs (1955 - 2011)
1955-2011

STAY HUNGRY, STAY FOOLISH.
Sir Edmund Hillary

People do not decide to become extraordinary. They decide to accomplish extraordinary things.
‘ IT ALWAYS SEEMS IMPOSSIBLE UNTIL IT’S DONE ’
COLLECTING DOTS FROM VERY DIVERSE SOURCES
DIVERSITY

IS A BUSINESS IMPERATIVE

• More ideas & more ‘dots’ to connect
• Speeds up innovation
• Better decisions
• Better performance
• Premium valuation
• The Fittest = The Most Diverse
The Annual ‘Pumps & Pipes Conference: Energy+Medical+Space
"Man's mind once stretched by a new idea, never regains its original dimension"

Oliver Wendell Holmes
IMAGINATION IS MORE IMPORTANT THAN KNOWLEDGE!
INNOVATION = CURIOSITY + MAKING UNEXPECTED CONNECTIONS BETWEEN THINGS

- Old1
- Old2
- Old3
- New1
- New2
- New3
THE BIGGEST DANGER?
A FAILURE OF IMAGINATION!
WHY NOT?
It really is a great improvement

No thanks

We're busy
Question Posed To 1000 Successful 65-Year Old Ex-Professionals:
“Looking back over your life, what would you have done differently?”

#1

I should have taken more risks!

GARY HAMEL
Professor of Strategic Management
London Business School

- PASSION
- CREATIVITY
- INITIATIVE

http://www.youtube.com/watch?v=ac5Q-DHY7FI
HOW CAN I BEST FRAME THE DISCUSSION ABOUT THE FUTURE OF ENERGY?
Prof. Michael Porter
Harvard Business School
Porter’s 5 Competitive Forces
Government should leave business alone. The 'free market' or 'the invisible hand' will pick the winners.

"Are you sure this isn't the place where we should stop following the invisible hand of the market"
THREAT OF OIL, GAS, E&P BUYERS

THREAT OF SUPPLIERS (G&S, $, HED)

THREAT OF SUBSTITUTES

THREAT OF NEW ENTRANTS

E&P: INTERNAL RIVALRY
BETWEEN COMPANIES, COUNTRIES, OPEC-NO, ...

6-THREAT OF INVESTORS (NO TO FF, I DIVERSIFY)

7-INT. AGREEMENTS & GOVERNMENTS’
Laws, Quotas, Taxes, Incentives, Mandates, Regulations ...Pick The Winners?

PORTER’S 5 COMPETITIVE FORCES
A LOT MORE ENERGY R&D!

• Ramp up support for research on clean – energy technologies

• Invest in clean – energy: Government, industry and university research labs

• Funding: A low carbon tax that generates $25 billion annually, but not high enough to slow the U.S. economy

Source: Ted Nordhaus & Michael Shellenberger, WSJ, Nov.29, 2010
U.S. Home Electricity U.S. Penetration Rate vs Price Per kWh

From 0-100% U.S. Home El Penetration Rate: ~100 Years

Price (cents per kWh in 1998 dollars)

Penetration rate up due to reduced costs

% of U.S. homes with electricity

1886
LONDON GREAT SMOG OF 12-1952

- 4,000-12,000 people died prematurely
- 100,000 people were made ill because of the smog's effects
- It led to The Clean Air Act (CAA) in 1956
- CAA: Coal out and only smokeless fuels allowed in cities like London
Surgeon General Luther Terry holds a copy of the 387-page report that connected smoking to lung cancer and heart disease on Jan. 11, 1964.
Annual Adult Per Capita Cigarette Consumption In The US

1964 - ‘Peak Smoking’ In The US: 42%, 2014: 18%

Source: US Department of Agriculture, 1986 Surgeon General’s Report
“Nothing is stronger than an idea whose time has come”

VICTOR HUGO
What if it's a big hoax and we create a better world for nothing?

- Energy independence
- Preserve rainforests
- Sustainability
- Green jobs
- Livable cities
- Renewables
- Clean water, air
- Healthy children
- Etc. etc.
By 2030 (in 14 years), all new cars sold in Norway should be zero emission cars! New cars running on gasoline and diesel will not be allowed!

Source: Dagens Naeringsliv, February 3, 2016
E&P2.0 MEANS NAVIGATE SUCCESS IN

- **Efficient** E&P operations to produce sufficient oil & gas supply to meet growing global demand
- **Economic** E&P w/competitive ROI, BE, TSR
- **Environmentally sustainable** E&P: Maintaining the license to operate and the public’s trust
- **Education** about E&P: The public, attract the brightest STEM students, E&P employees
TRANSITIONS
• Energy companies’ investment portfolios will evolve over time in line with government policies
• Ultimately, national and international policies will determine how much of and which resources (coal, oil, gas, solar, wind, geothermal, biofuel, nuclear, hydro, NIY) will be produced!
122 Years Ago (1894)
Carl Benz received a US patent for the 1st gasoline-driven car
MODEL S BUSINESS LEASING
$408/mo. Including Gasoline And Tax Savings
ORDER
LEARN MORE

Nikola Tesla
DRIVERLESS CARS
(Volvo’s IntelliSafe Autopilot)
Remote Car Battery Charging Via Electromagnetic Fields
HYDROCARBON MOLECULES

ELECTRONS ELECTRICITY

J.J. Thomson (1897) Nobel Prize: 1906
The Nobel Prize in Physics 1921 was awarded to Albert Einstein for his discovery of the law of the photoelectric effect.
• No-one can predict the forward oil price
• Boom & Bust will continue
• Oil & Gas will be needed for many decades
• The industry must navigate success in 4E
• E&P2.0: An imperative, and everyone in the ‘E&P village’ must contribute – including UT
• Imagination is king; Incremental and radical E&P improvements urgently needed – from UT
• The invisible hand of the market will less and less pick the energy winners; gov. & int. agr. will!
• ‘Dot-collectors’ will experience more serendipity
• The fittest = the most diverse & the best collaborators
' The future is not a gift: It is an achievement. Every generation helps make its own future '
That's all Folks!
thank you
Mexico Deepwater GoM Overview

Map showing key locations:
- **SALINAS SURESTE**
- **PERDIDO**
- **MEXICAN RIDGES**
- **SALINAS SURESTE**

Key coordinates:
- **3000 DW**
- **300 SS**
- **41 DW**
- **2 SS**

Oceanic Crust and Shelf Margin indicated.
THE BIG PICTUE: MX DW IS A VERY LONG-TERM BUSINESS

Announcement

Block Awarded

Discovery Well

First Oil (7-10 years)

2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025-28

PRESIDENT EPN

PRESIDENT XXX

PRESIDENT YYY
Our Petroleum Engineering Forecasts That Are The Basis For Every Investment Decision - Are Increasingly Wrong!
Looks Like Systematic ‘Sugar Coating’ Or A Clear Bias Towards The Optimistic

RESERVES
- PRODUCTION
- COST
- SCHEDULE
Mr. Neeraj Nandurdikar
Director of IPA’s Global E&P Business

ABOUT THE LAST 40 E&P MEGAPROJECTS

E&P FORECASTS
- COST
- SCHEDULE
- PRODUCTION
- RESERVES
‘The person who will finally turn off the lights on the NCS is not yet born’