

ABB Service

Extending the life cycle of your assets

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Who we are

How we can help

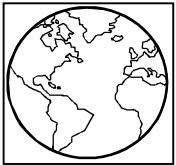
Predictive maintenance

How does 2017 look?

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Global Domain Knowledge, Local Execution

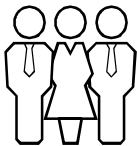
Service at ABB



+200
Service Centers
in **89** countries



414 bn
Installed Base



~ 21 800
employees

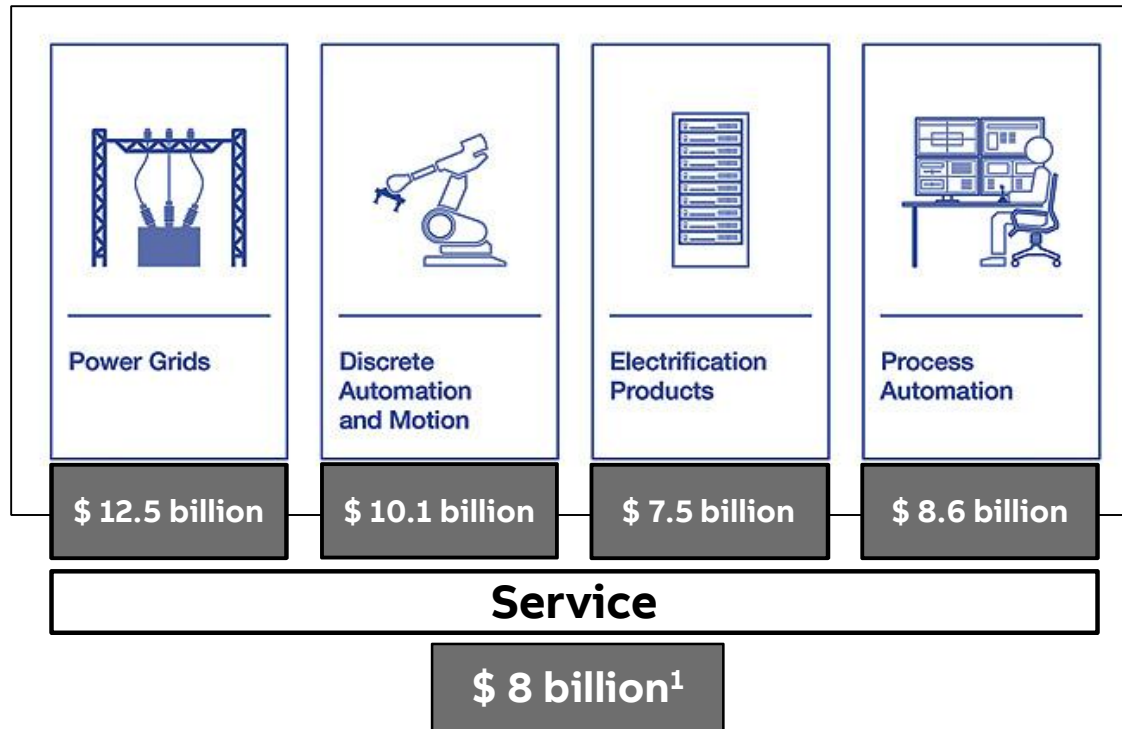


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Sharing Common Goals



Cut complexity

Fewer interfaces. Less time wasted. Simplified service interaction.



Control and reduce cost

More predictability. Fewer surprises. Reduce cost through cost planning



Maximize capital

Extend capital life. Reduce risk. Optimize maintenance activities.



Increase productivity

Increase speed, quality and throughput. Optimize production and reduce waste.

Simplify processes to reduce cost, maximize capital, ensure safety and increase production.

Leveraging ABB Service / customer partnerships

Helping our Customers with the Challenges they Face

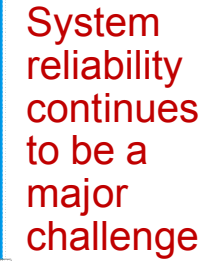


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Supporting the Complete Life Cycle



Rapid Response

- Repairs
- Spares and consumables
- Replacement
- Training
- Service agreements



Lifecycle Management

- Installation, commissioning, and end-of-life services
- Maintenance
- Extensions, replacements, upgrades and retrofits
- Training
- Spares and consumables
- Service agreements



Operational Efficiency

- Engineering and consulting
- Maintenance
- Advanced services
- Extensions, upgrades and retrofits
- Training
- Service agreements



Performance Improvement

- Advanced services
- Engineering and consulting
- Extensions, upgrades and retrofits
- End of life services
- Service agreements

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Reducing the Total Cost of Ownership

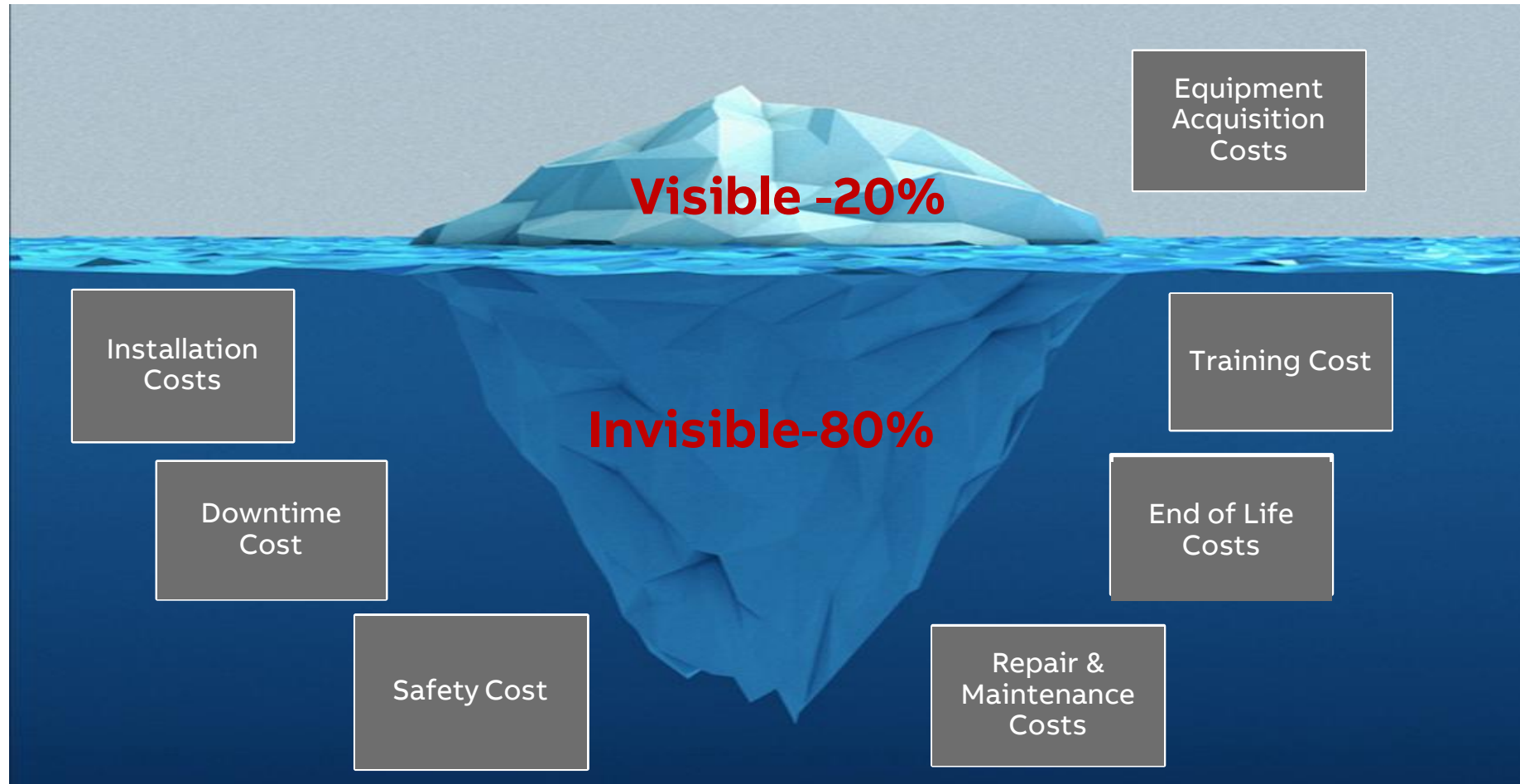
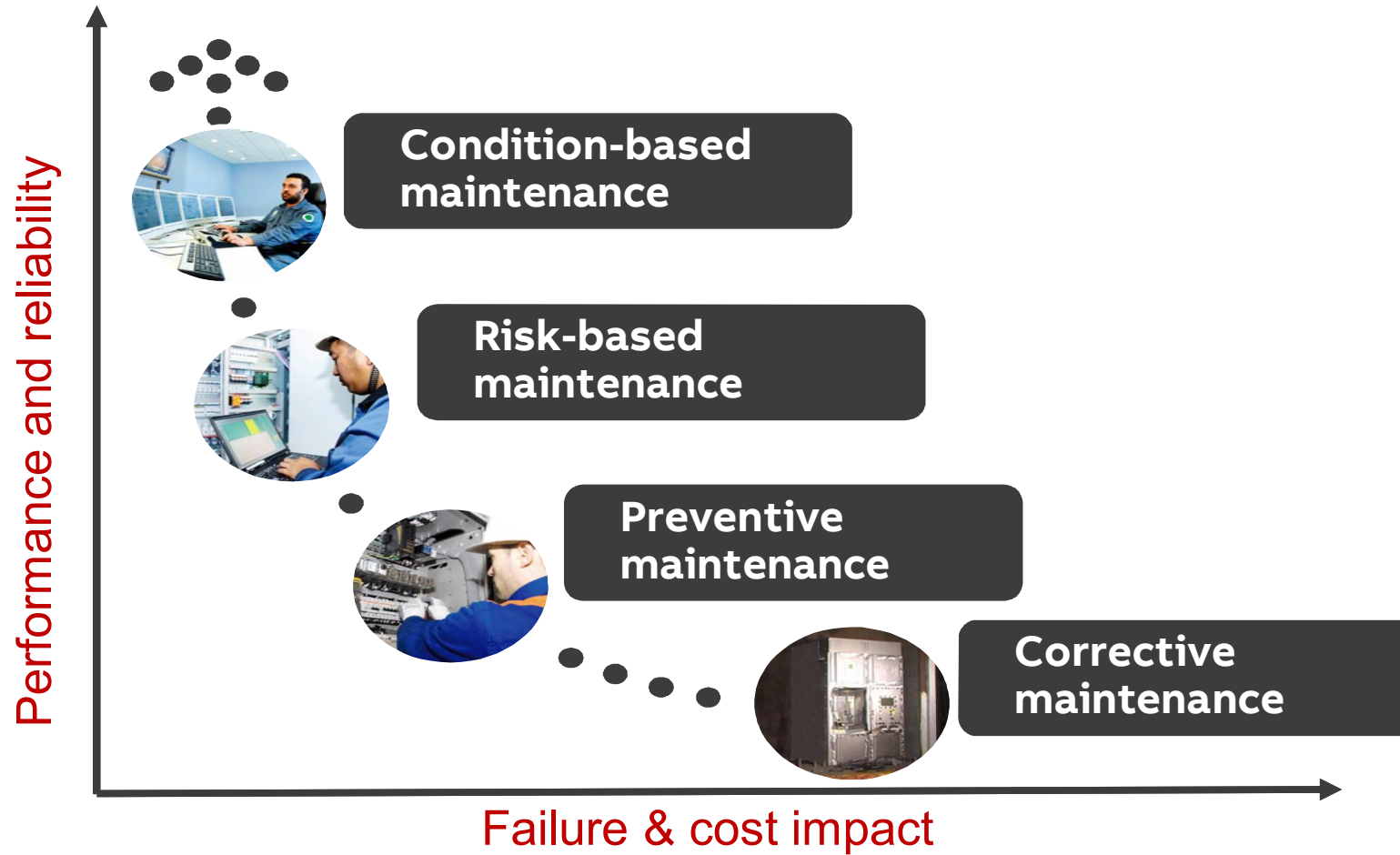


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Moving Toward Condition-Based Maintenance



How to save money? Really!

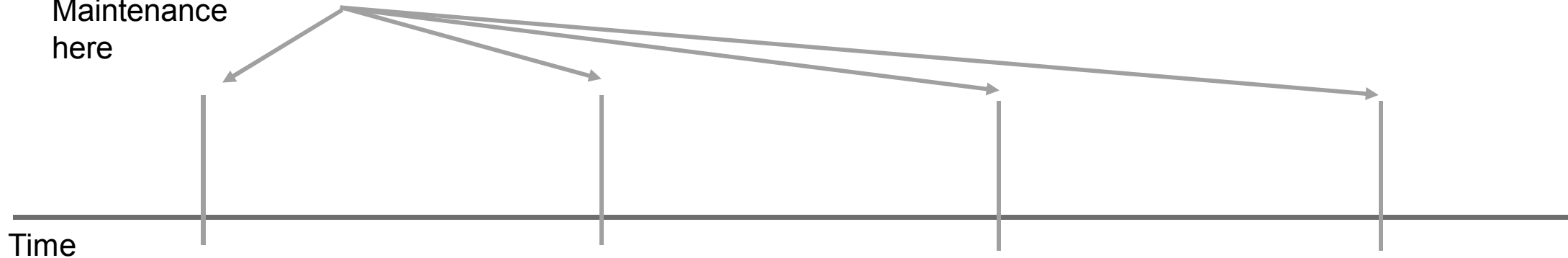
Plant/Manufacturing sites are doing projects that save them money

The cheapest car, is the one you already own.

– If you take care of it “properly”, it will be less expensive than if you don’t

Changing Oil

Maintenance
here



Pros

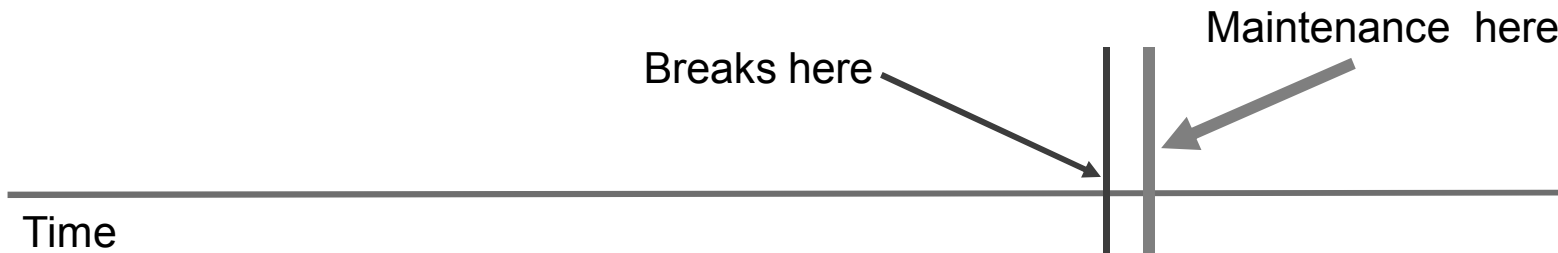
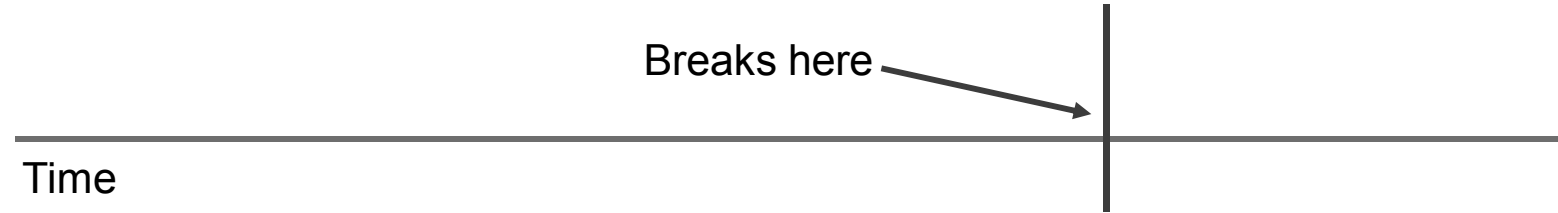
- Stops or significantly delays unexpected downtime

Cons

- Are you over-maintaining?

1. Run to break maintenance schedule

Pros & cons



Pros

- Saves initial outlay of maintenance \$\$

Cons

- Costs more over long term
- Increases downtime

Which approach is best?

Approach 1 - Preventative Maintenance:

- An ounce of prevention is worth a pound of cure
- A stitch in time saves nine
- Rather be safe than sorry

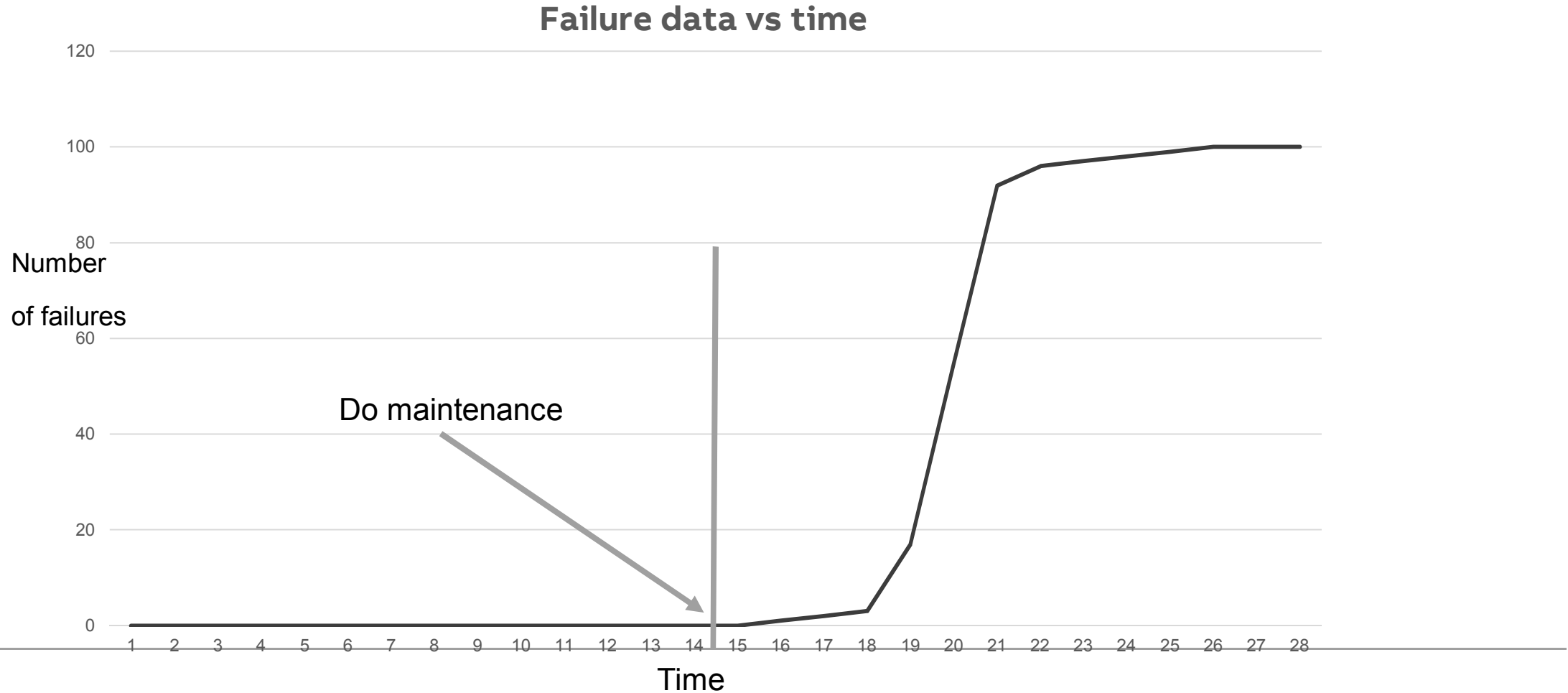
Or

Approach 2 - Lets just wait until it fails

- We'll have the attention and can get the resources
- May be too late
- Cost and time to fix may be much higher than expected

3. Data based maintenance schedule

All pros



How can you get a payback on Preventative Maintenance?

1. Doing the PM's only when really needed (less often)
2. Savings in problems avoided

How is this done?

–1. Better diagnostics

- Amperage draw on chiller motors

–2. Recommended PMs based on your unique situation

- Prescribed maintenance (“Smart” oil change light)
- Consistent approach across facilities

–3. PM's based on global experience

- Adaptive database (timing belt example)

Today's technologies eliminate “run to break” and replace it with “service right before break”

What does the future look like?

Automated service, monitoring, predictive

Currently:
One controls one



Automated service:
One controls many
-more efficient service delivery, lower cost



The future:

- One person using automated tool gaining huge efficiencies
- Spend thousands to save ten thousands

How to save maintenance \$\$\$

Automated service - better than manual approach

Consistent service implementation across all sites

“Service only when needed” versus “over servicing”

Ensure that work orders and associated maintenance get completed

Measure the return from Preventative Maintenance (PM) spend

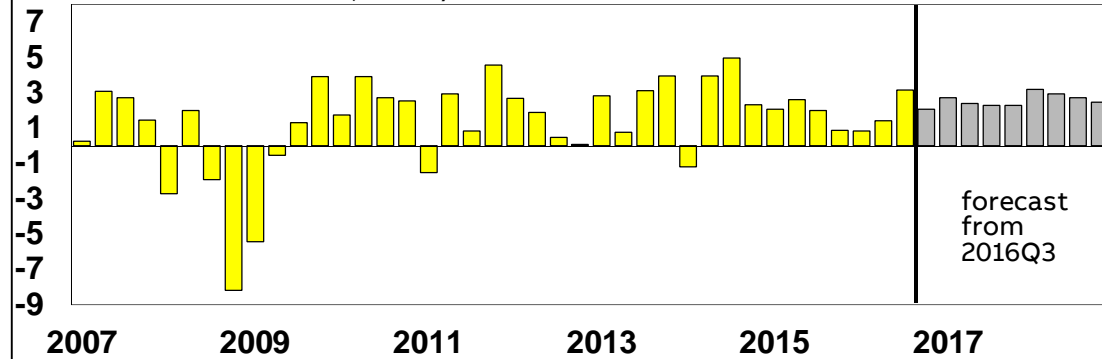
Technology will help us get incredible efficiencies from PM investments

U.S. Macro Economic Overview

Weaker 2016 than expected

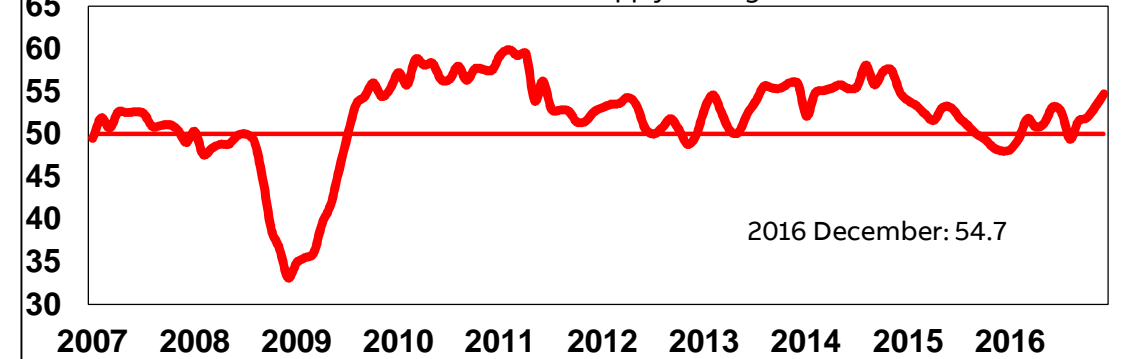
Real GDP, annual % change

Sources: BEA, NEMA/BIS simulation of IHS Markit macro model



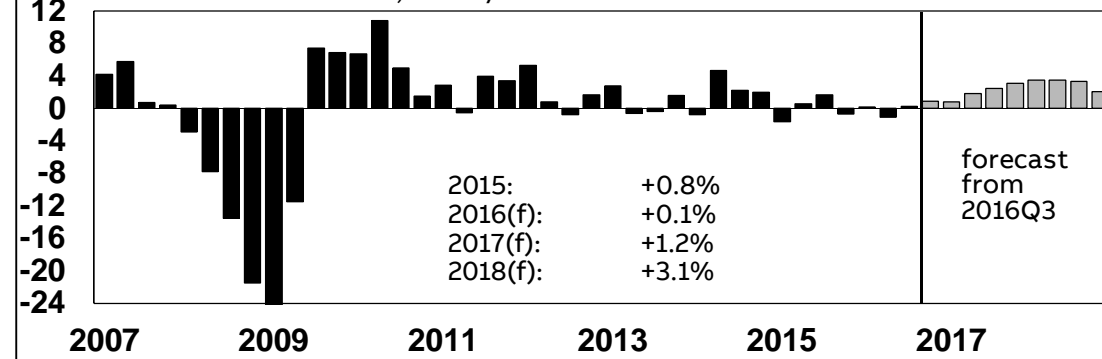
ISM mfg. index, >50 = impr. conditions

Source: Institute for Supply Management



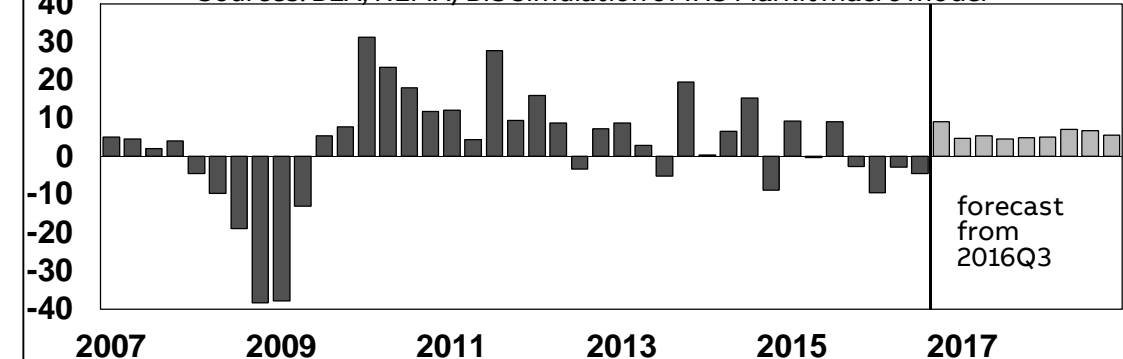
Industrial production, mfg., annual % change

Sources: FRB, NEMA/BIS simulation of IHS macro model



Real equipment investment, annual % change

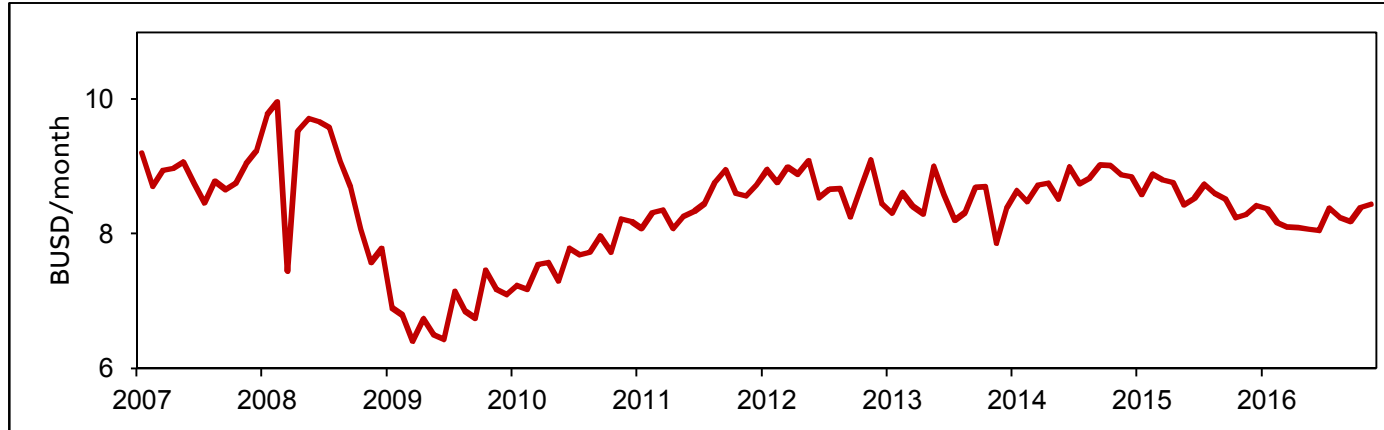
Sources: BEA, NEMA/BIS simulation of IHS Markit macro model



2016 U.S. Electrical Industry Market

New Orders Electrical Equipment, billion \$, SA

Source: Census Bureau

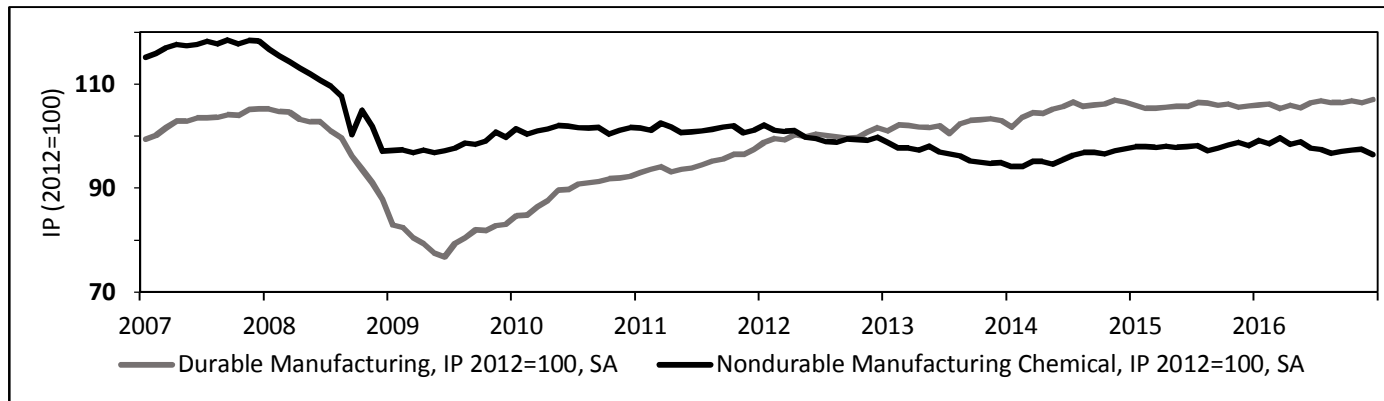


View of ~\$100B product market data based on electrical supplier peer group reported:

- Industry showing significant downward trend 2016
 - 17 of last 19 months were year-over-year declines
 - All sectors but lighting declined
- ABB and every major supplier contributes data:

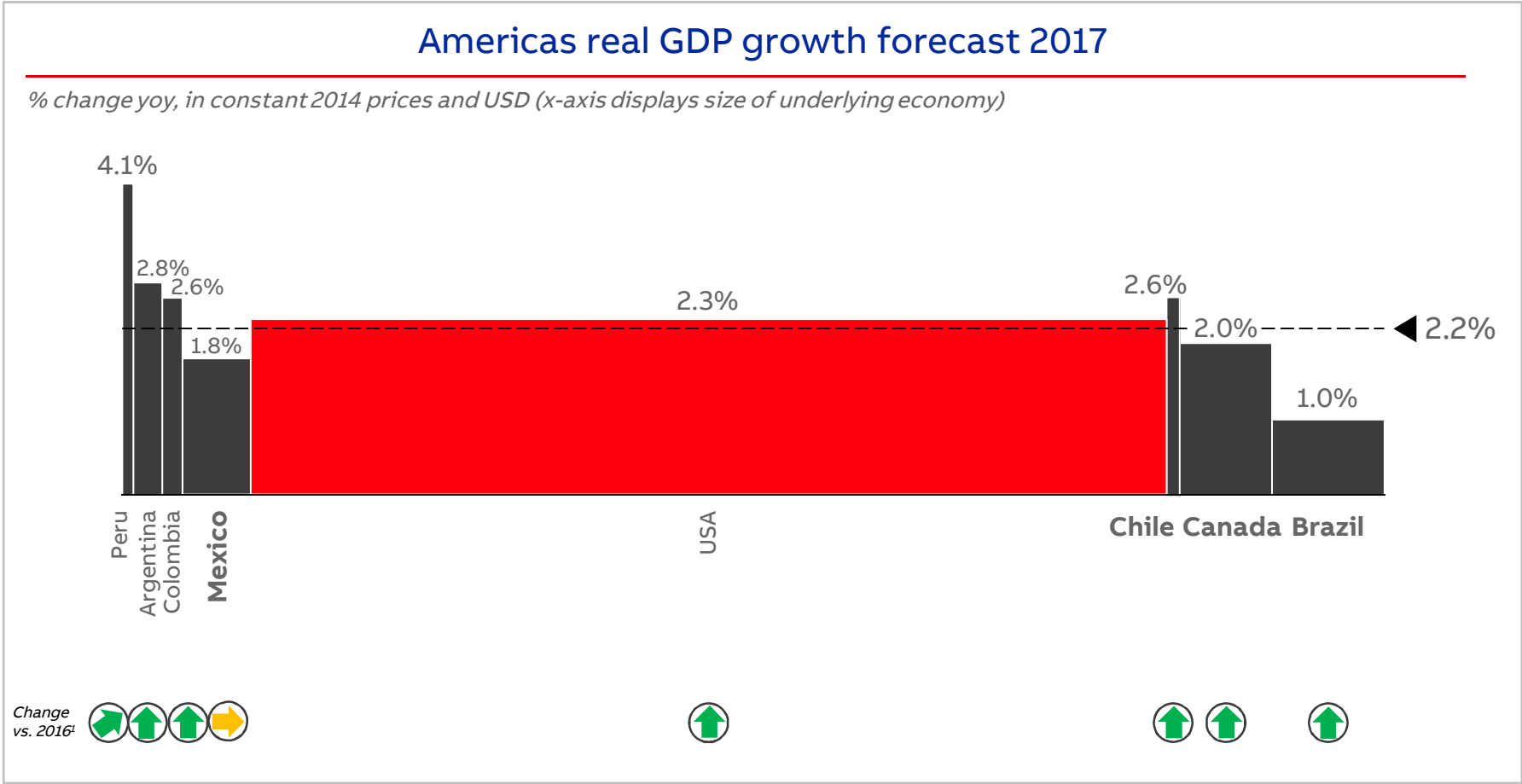
Industrial Manufacturing, SA

Source: Federal Reserve



Americas GDP outlook 2017 by geography

United States expected to accelerate



Note 1: Moderate up/down = +/- 0.2-0.5%p, Strong up/down = Greater +/- 0.5%p; flat arrow in case less than 0.2%p difference
Note 2: GDP forecasts generally upwards biased, the more the further the date lies into the future
Source: EIU, ABB

United States

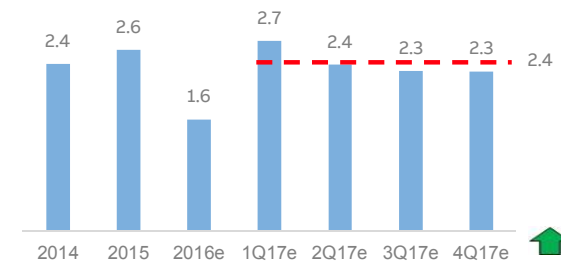
Key macro economic indicators

Economic outlook

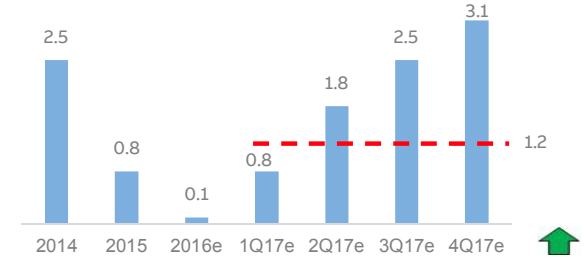
- Strength in Consumer spending from low energy costs, more disposable income & healthy employment. Positive outlook for domestic investment policies, such as taxes & infrastructure, but uncertain trade policies.
- **O&G** ... OPEC cuts, supply & demand imbalances tightening, better cost positions for U.S. companies, increasing rig counts (WSJ). Different views of trajectory – “NAM E&P spend increases 27% in 2017, after 38% decline in 2016” (Barclays), but Deloitte cites “slow road back”, continued uncertainty
- **Industrial expansion** from low natural gas prices, both industrial & utility spending in **Mid-stream** (pipelines) - 275 new **Chemical** projects announced in 2016 ... 60% are FDI, combined value of more than \$170bn.
- **Mining** ... gold faces near-term headwinds, industrial metals bottomed, miners begin to spend, possibly on deals, uncertainty remains (Bloomberg)
- Growth continues in **Food & Bev, Packaging, Automotive, Factory Automation** ... Ford announcing increased investment
- **Water** investment ... steady growth from aging plants, regulations, critical shortages & distribution losses ... ~ \$530B spend 2016 – 2025
- **Data Center** expansion driven by IoT, mobility. IoT & analytics accelerating.

Growth in the 2% - 2.5% range may be new “normal”, more downside than upside.
Industrial spend – especially OGC, Mining, appears to have “bottomed”.

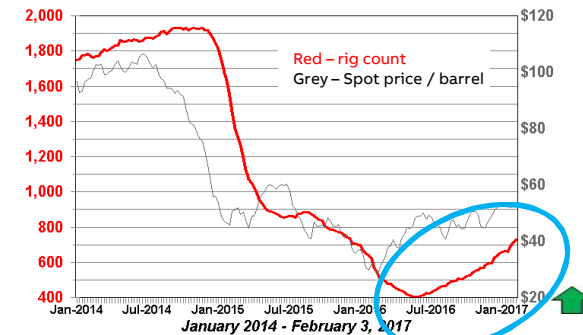
GDP (% change)



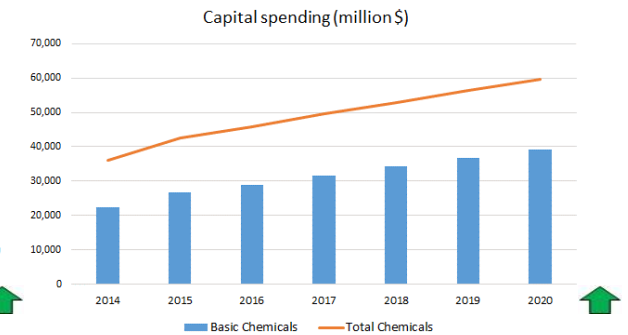
Industrial production (Manufacturing) (% change)





























Active oil rigs & spot prices








Chemical industry capex



2017 U.S. Market Trends

	Utility ~ \$20B total market			Industry ~ \$50B total market							Transport & Infrastructure ~ \$20B total market		
Sector	T&D	Conventional Generation	Renewables	Oil, Gas & Chemical	Water	Mining & Metals	Pulp & Paper	Auto	Manuf	Food & Bev	Transport	Buildings	Data Centers
													
Market Outlook 2017													
GDP%	GDP 2016: +1.6%; 2017 forecast: +2.4%												
Key Trends	<ul style="list-style-type: none">• Low load growth continues; industrial & building efficiency advancing• Transmission spending to peak in 2017• Coal retirements continue, gas additions slow down• Utility scale wind & solar decrease from drop in pipeline, though off-shore wind developing• Microgrids & energy storage accelerate, from small base• Reduced costs drive continued spend for residential & commercial PV			<ul style="list-style-type: none">• Slow O&G recovery starts; spend grows across value chain, starting with increased E&P capex; mid-stream & downstream continue strength; Trump support for Keystone, Dakota• Some water spending pushed into 2017; growth increases despite lower federal funding due to local utilities passing costs to users for necessary investments• Mining bottom was 2016 except coal, which continues decline; investment in replacement equipment, mine safety & productivity accelerate• No change in pulp & paper• Auto production drops in 2017 but EV launches are accelerating; Trump may impact spend in US vs MX or CA• Manufacturing starts slowly; followed by rebound due to appliances, machinery, industrial automation & IoT spending• F&B growth continues driven by regulatory compliance & food safety							<ul style="list-style-type: none">• Numerous EVCI projects announced by federal govt as well as utilities• Residential construction remains strong but growth slows, influenced by rising interest rates• Improving economy and state / local govt spending will lift non-residential construction• Data Centers continue strong growth but cloud adoption is mixed - a “wild card”, could accelerate even further• Businesses dramatically accelerating use of smart connected devices ... 33% over next 12 months		

Growth rate		>5%		+2 to 5%		-2 to 2%		-2 to -5%		<-5%
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2017 U.S. macro

Dynamics driving opportunity

Utilities

~ \$160B T&D capex 2017 – 2020

IOU investment in gas T&D to average
~20B/year 2016 – 2020

149 natural gas generation projects with
a total value of ~50B to kick-off between
2017 - 2020

2015 tax extension driving extra 19 GW
wind and 20 GW solar by 2021

~ 52 GW solar capacity to be installed
2017 – 2020

Industry

~ \$190B chemical industry investment
2017 – 2020

Food & beverage companies spending
\$32B in capex this year

~ 12,000 robots ordered in the U.S. in 1H
2016

Mid-stream capex ~ \$35B annually
through 2020

Transport & Infrastructure

~ \$23B (2015) capex by Google, Amazon,
Microsoft & Facebook growing 29% in
2016

~ \$530B municipal water infrastructure
spend 2016 – 2025

Energy Storage grew 267% in 2015,
expect \$2.5B market by 2020

California announced \$1B eV charging
expansion with utilities

IoT connected 'thing ' growth 15-20B devices by 2020
President Trump Infrastructure plan, coupled with corporate tax reduction

Positive trends for growth

Key issues driving Trump in 2017

Campaign rhetoric meets governing reality

Trade: Trump protectionist tendencies collide with business interests and Trump role as dealmaker

- US has withdrawn from TPP; NAFTA renegotiation likely
- Tariffs on Chinese and Mexican imports and bilateral FTAs with UK, Japan possible

Infrastructure Investment: Up to \$1T in value, funded by taxpayers and incenting private investment

- Will investment move beyond roads/bridges?

Environmental Regulations: Certain to relax enviro regulations impacting industrial development

- Withdrawal from Paris not assured; market dynamics, tech continue shift away from coal

Tax Reform: Republican-driven¹ reform designed to reduce overall tax burden

- Key issues: lower rates, change foreign earnings rules, 100% asset expensing; eliminating net interest expense deduction
- Trump plan and Republican blueprint overlap, not identical (e.g. border adjustment tax)

Repeal or remove Obamacare Health Law¹:

- Stands to reduce future administrative burden but add near-term unwinding costs
 - But what replaces it?

Scenario planning for ABB impact is underway

\$1T in U.S. Infrastructure Investment Faces Challenges

Lobbying begins for major projects - Trump possibly slashing size to \$550B

Top 50 Infrastructure Projects Wish List Circulating Washington

Electricity: 7 projects, \$17B project cost

- Champlain Hudson Power Express, Fort Mojave Solar, Army Corps Hydroelectric Plants, TransWest Express Transmission, Clean Line Plains and Eastern, Chokecherry Wind Energy

Oil and Gas: 2 projects, \$50B

- Alaska Pipeline & LNG, Atlantic Coast Pipeline

Rail and Transit: 9 projects, \$45B

- Amtrak NY/NJ Gateway, Chicago RPM, Boston MBTA Green Line, Detroit M-1 Rail, Maryland Purple Line, NYC Subway, Cotton Belt

Locks and Dams: 9 projects, \$11B

- Ohio River, Mississippi River, Monongahela River, New Orleans

Water: 4 projects, \$8B

- Huntington Beach Desalination Plant, Cadiz Water Conveyance, Cleveland Project Clean Lake, Augustin Plains Ranch Pipeline

Ports, Airports, Roads and Bridges, Other: 19 projects, \$28B

¹ Trump requires that any infrastructure plan be funded by a combination of direct government spending and incentivized private investments (e.g. tax breaks)

ABB Service

Your Service Partner for Performance Improvements



With a global installed base and domain expertise, our services improve operational efficiency, reliability and performance of your systems and equipment across the complete lifecycle while lowering environmental impact.





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