



**Goldman Sachs
Houston Chemical Intensity Days**

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In addition to U.S. GAAP financial measures, this presentation includes certain non-GAAP financial measures including EBITDA, and Adjusted EBITDA. These non-GAAP measures are in addition to, not a substitute for or superior to, measures for financial performance prepared in accordance with U.S. GAAP. Definitions of these measures and reconciliation of GAAP to non-GAAP measures are provided in the appendix to this presentation.



Growing leadership position driven by world-scale assets, advantaged cost position, and broad portfolio of chlorine derivatives and outlets

No. 1

The World's Chlorine Leader



The No. 1 global chlor alkali producer with largest chlorine production capacity.



The No. 1 global supplier of epoxy materials.



The No. 1 global producer of membrane caustic soda and chlorinated organics.



The No.1 North American seller of chlorine, bleach and hydrochloric acid.



The Evolving Chlor Alkali Sector

1. Long-term structural change
2. Near-term fundamentals
3. Closer look at chlorine derivatives and caustic soda



Long term, structural changes in chlor alkali are leading to improved supply and demand fundamentals and growth opportunities

Structural changes in chlor alkali sector provides growth opportunities on both sides of ECU (chlorine and caustic soda)



Minimal global capacity additions and announcements to meet growing demand



Large proportion of production by large, integrated producers after major industry consolidation



Energy and ethylene cost advantage for U.S. Gulf Coast producers over global competitors



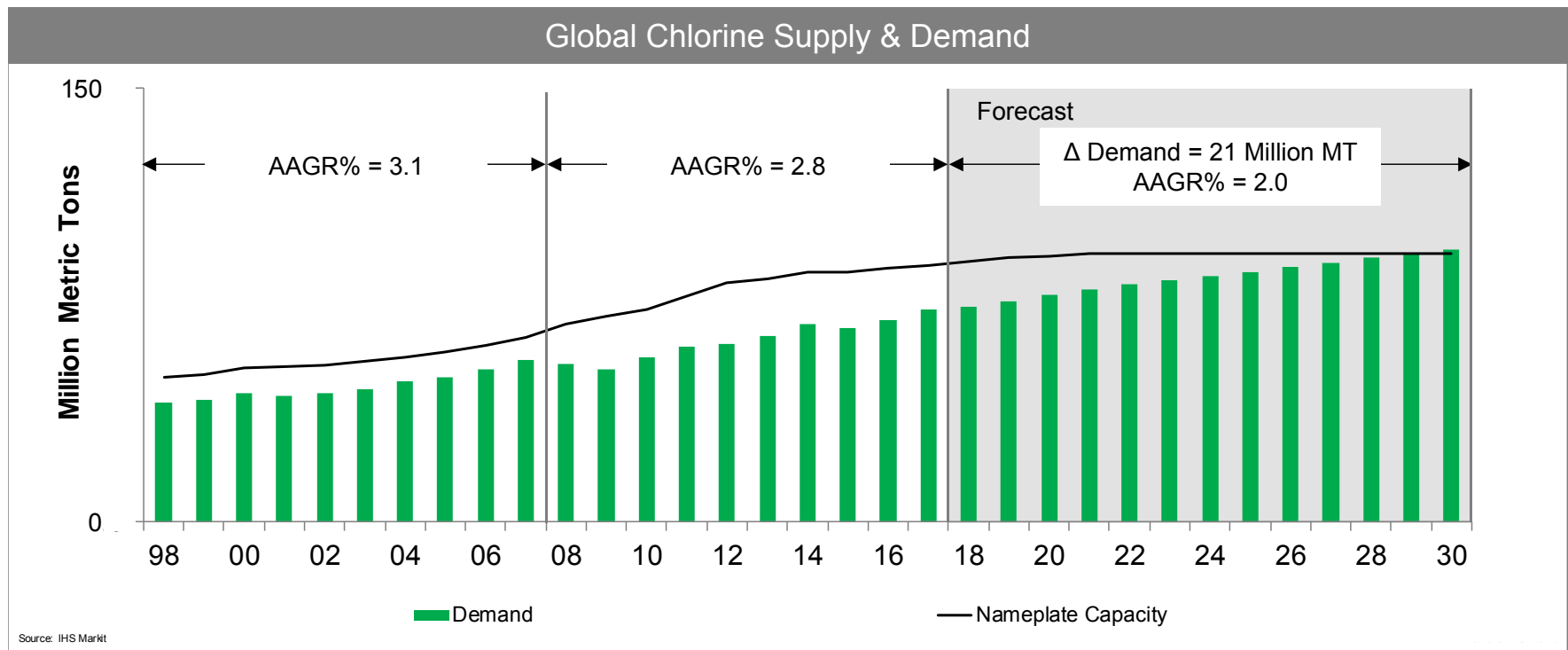
Increased caustic soda and chlorine derivative exports from the U.S. Gulf Coast



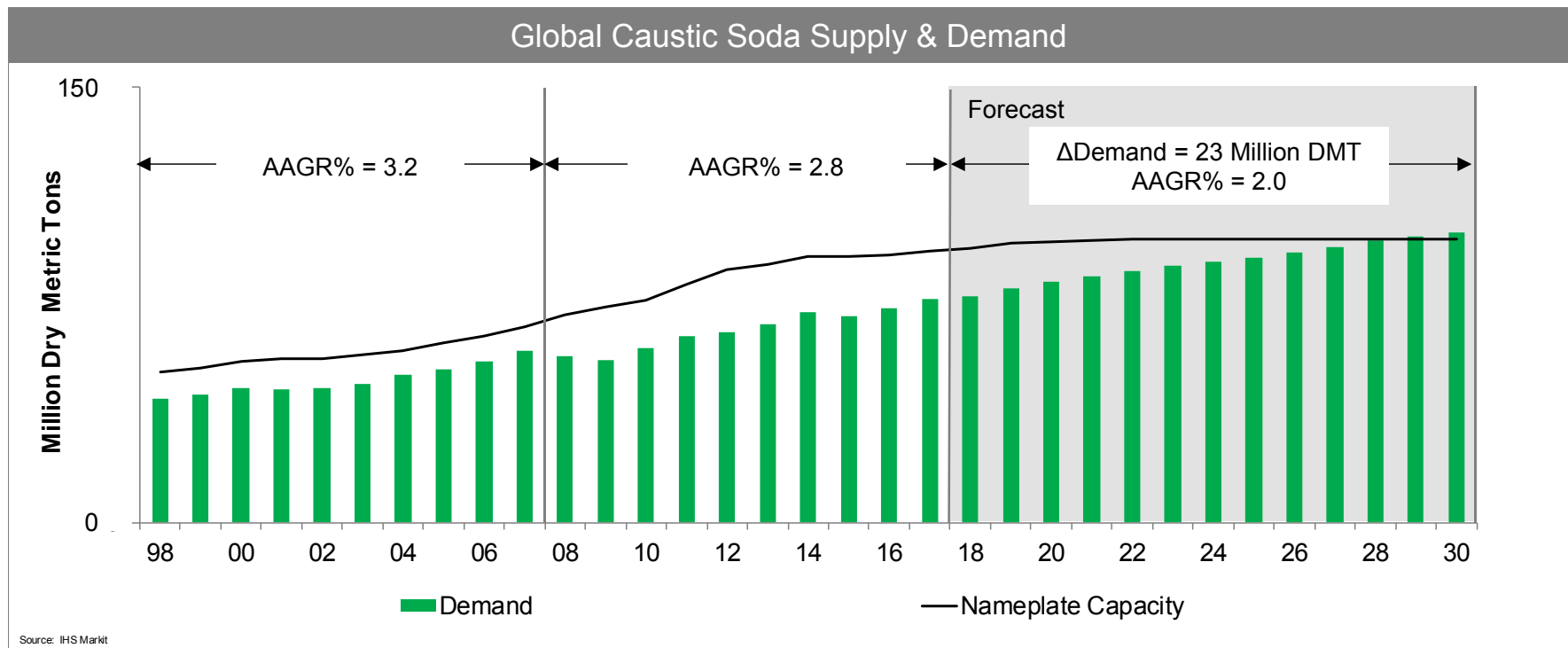
Current industry economics do not support significant near term world-scale chlor alkali capacity investments



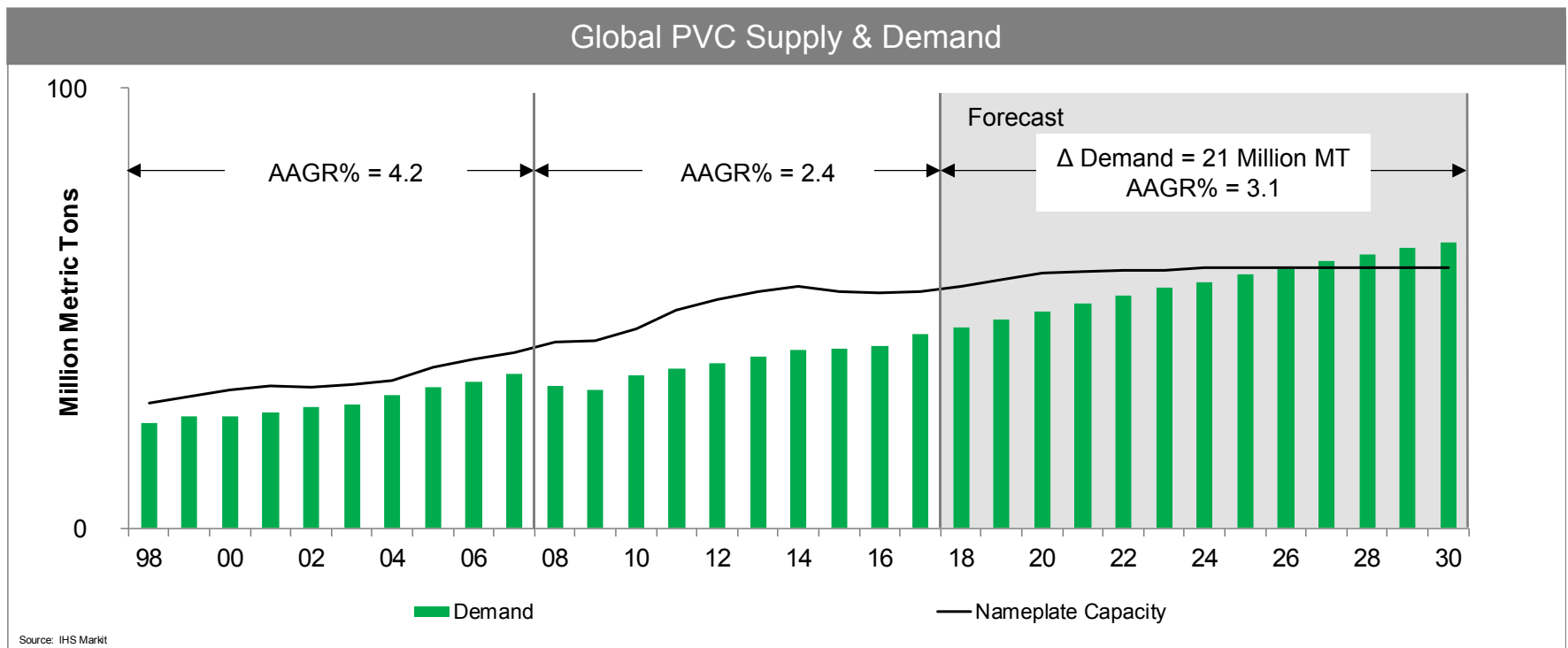
Chlorine demand is forecast to increase by 21 million metric tons between 2018 and 2030.



Global caustic soda demand is forecast to grow 23 million dry metric tons from 2018 to 2030.

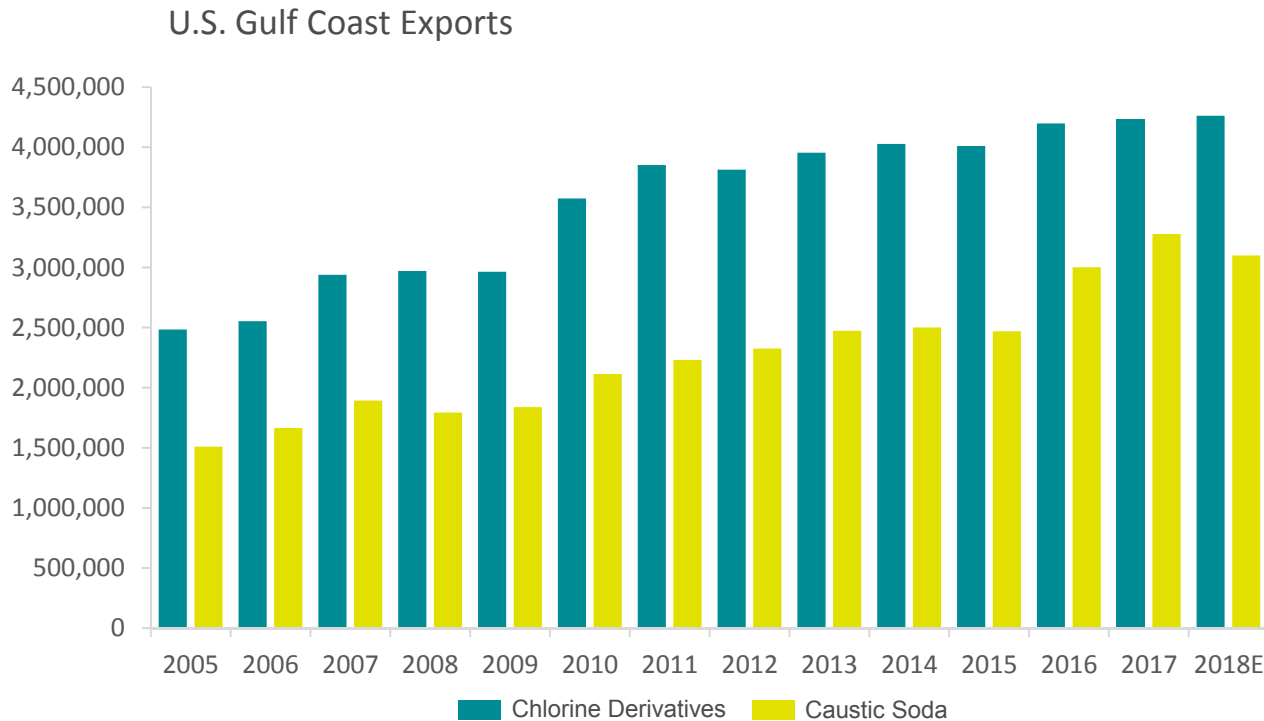


PVC demand is forecast to increase by 21 million metric tons between 2018 and 2030.





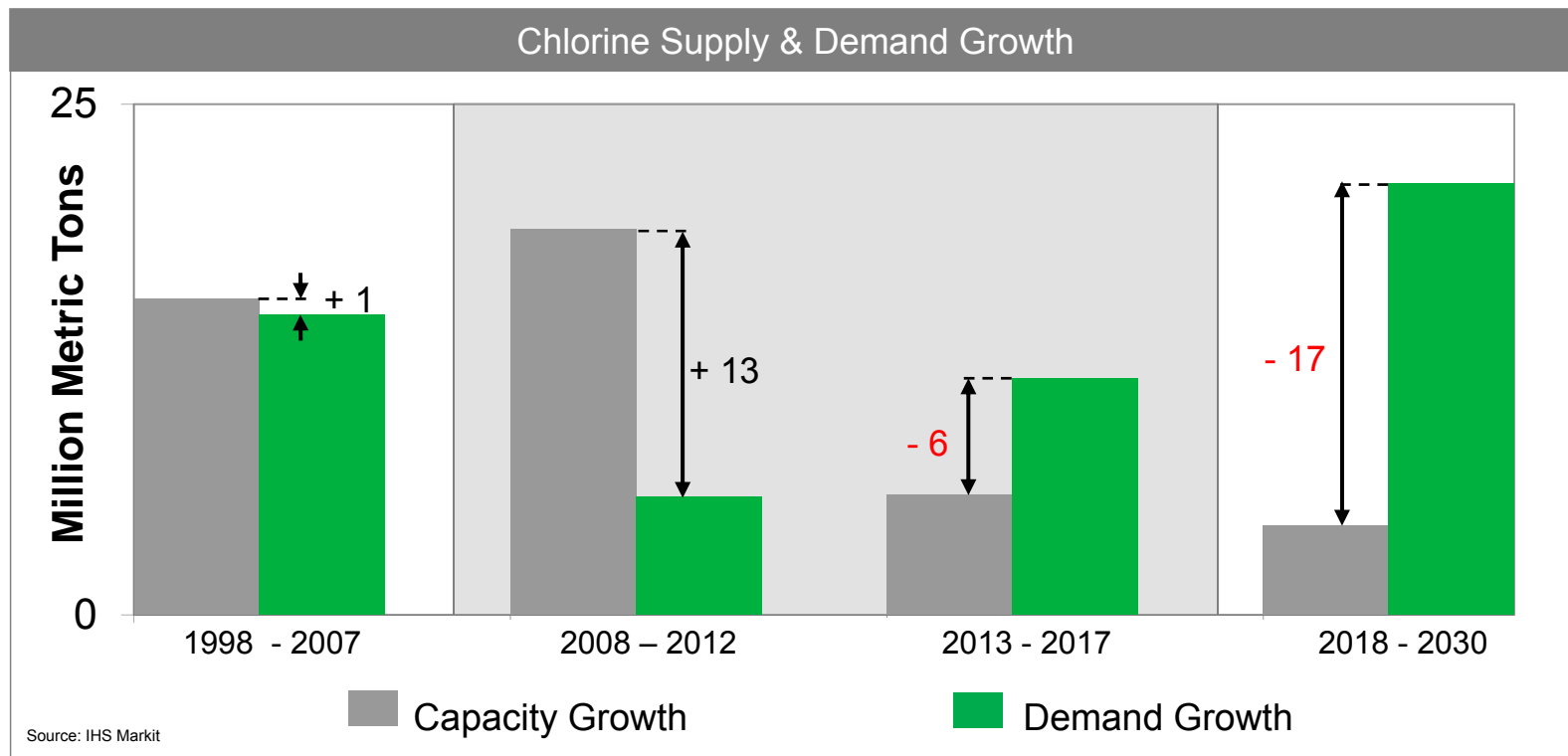
U.S. Gulf Coast exports of chlorine derivatives and caustic soda have expanded significantly since the early 2000s and should continue that upward trend over the next several years



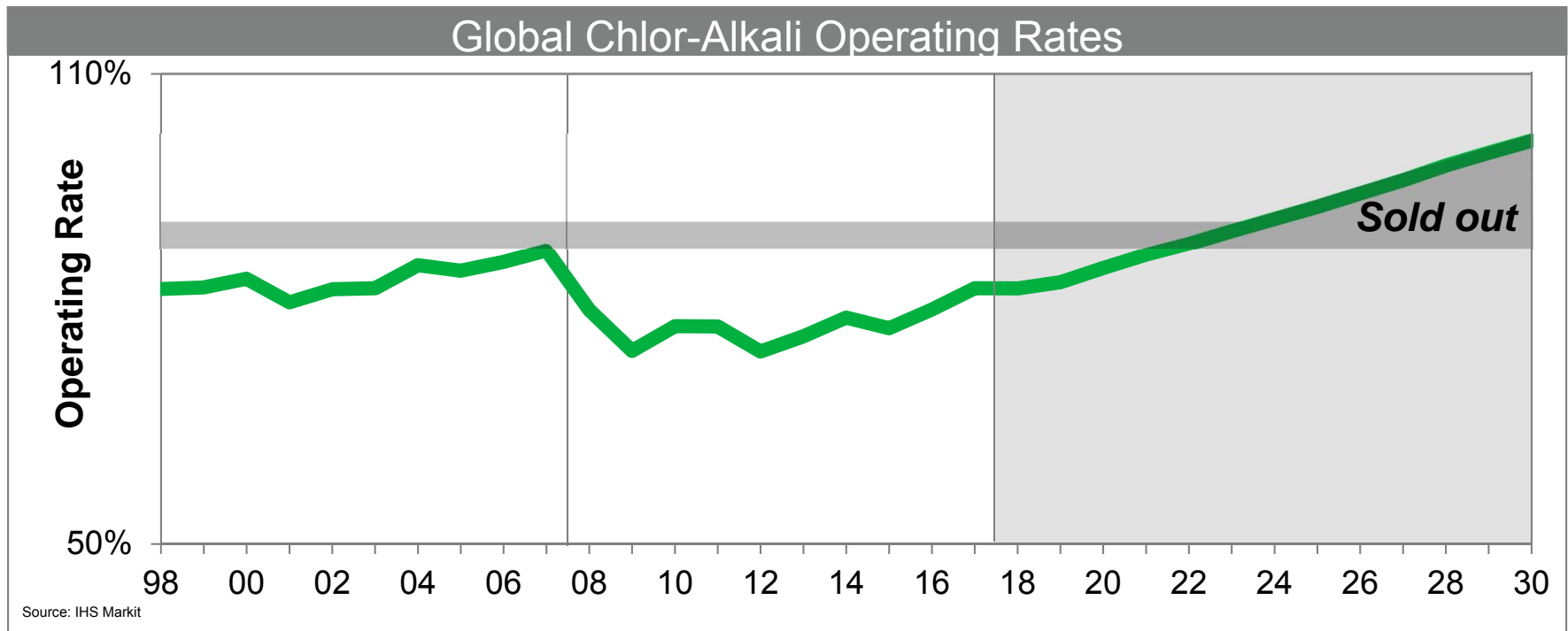
- Exports of chlorine derivatives have increased more than 75% since 2005 – led primarily by growth in vinyl exports
- Similarly, caustic soda exports have grown more than 100% over the same time period – even with the slight down drift experienced in 2018
- Forecasted global demand growth, coupled with a competitive cost position will allow U.S. gulf coast suppliers to play an increasing role in the global marketplace

Source: IHS Markit, Tecnon Orbischem, Olin Estimates

Chlorine demand growth has exceeded capacity growth since 2013 and will accelerate through 2030 if additional capacity is not added.



Global operating rates have improved since 2012 and are projected to reach sold out conditions by 2023.



2030 PVC demand growth requires 21 integrated world scale plants, which will also satisfy approximately half of the forecast caustic demand growth.

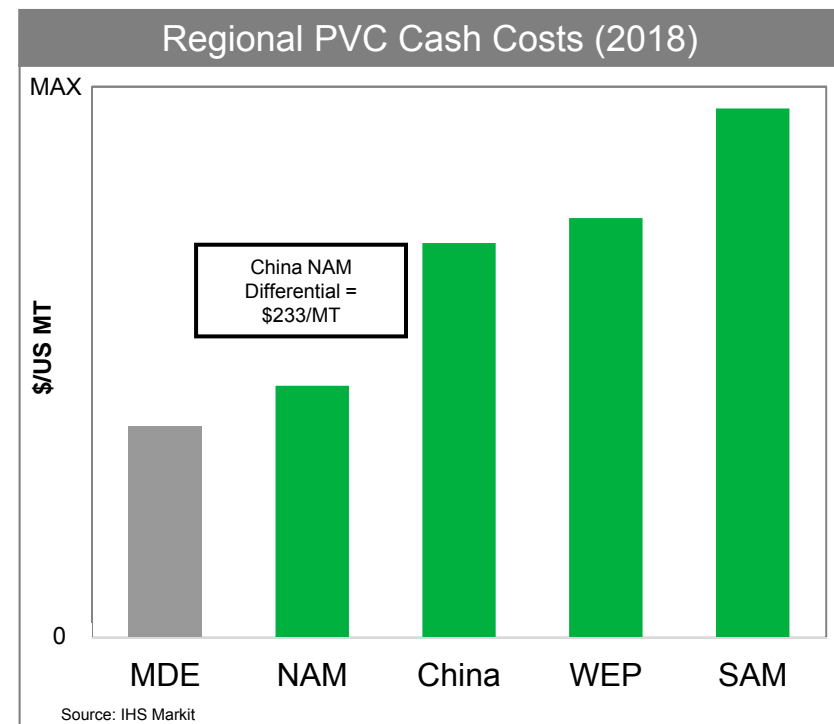
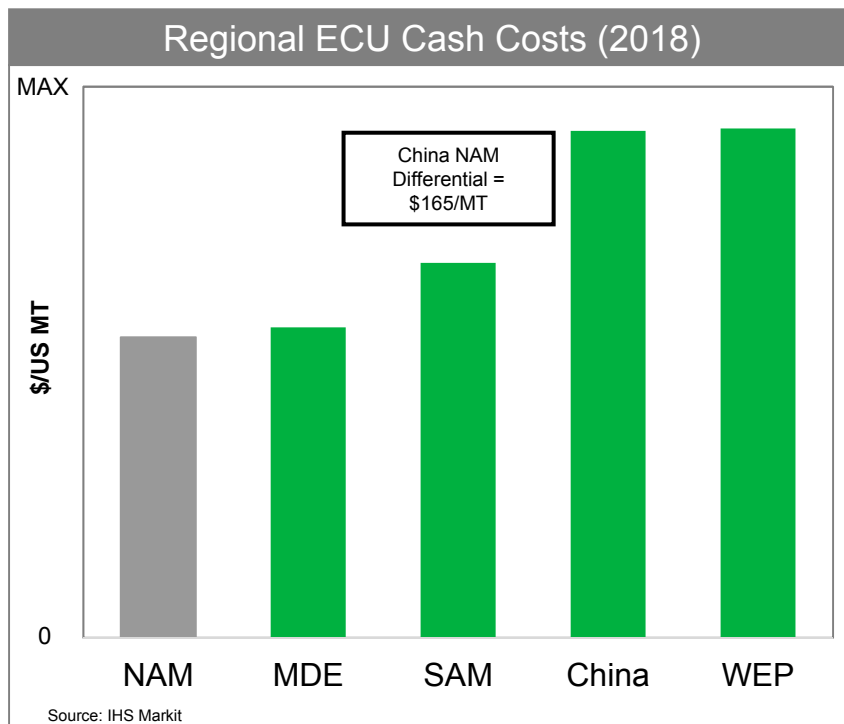
2018-2030 PVC Demand Growth (MT)	Required World Scale Plants ¹	Capital Required per World Scale Plant (\$US B) ¹	Total Required Expenditure (\$US B)
21 million	21	\$5 - \$6	\$105-126

	Demand (Million MT) ²		
	Chlorine	Caustic	PVC
2018-2030 Demand Growth	21	23	21
Addressed by Required CA-PVC World Scale Plants	10.5	11.5	21
Addressed by Additional Investments	10.5	11.5	0

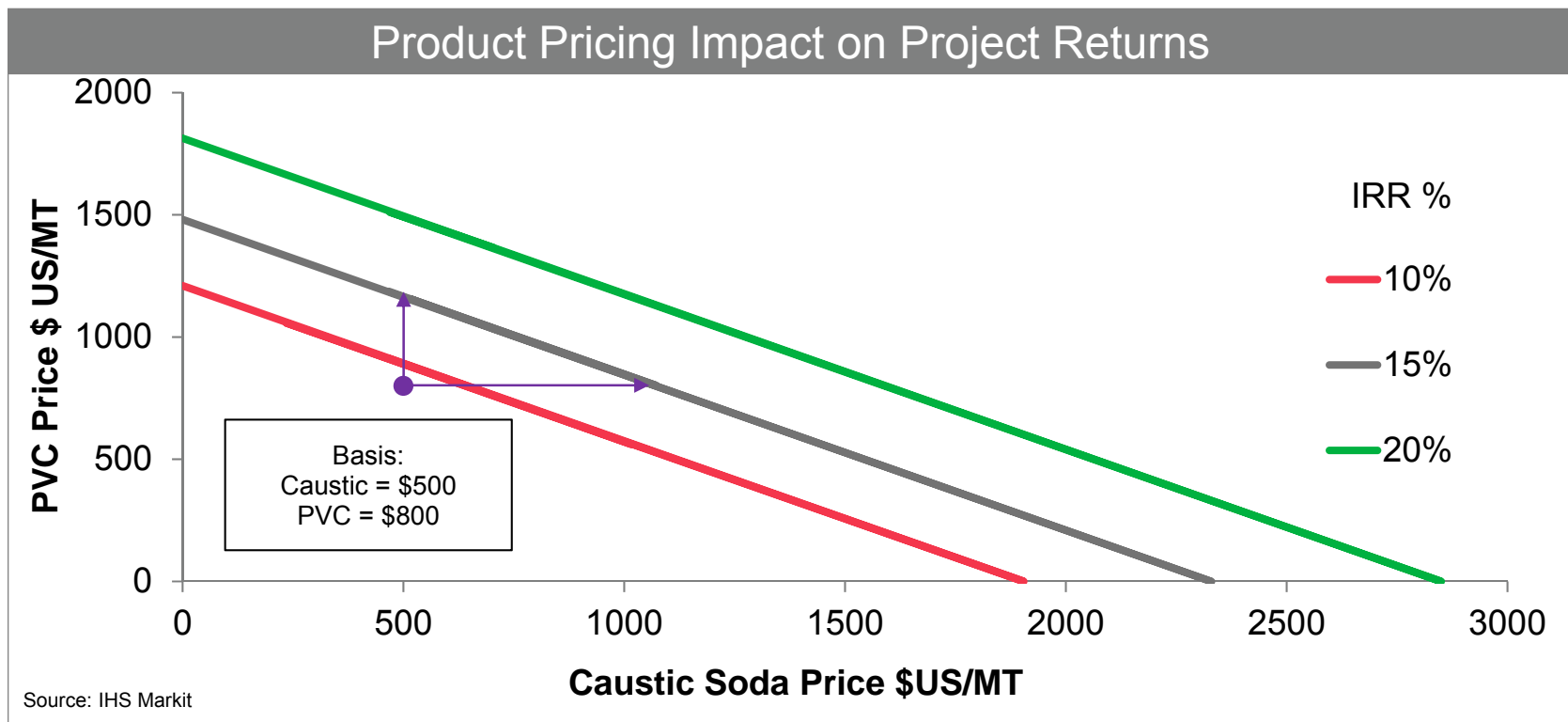
1. Assumes facility built in USGC

2. Does not include demand for non-PVC chlorine derivatives

From a cash cost perspective, the Middle East and North America are the most attractive locations because of low cost feedstock and fuel.



Using a basis of \$500/MT caustic and \$800/MT PVC, the internal rate of return for a world scale facility is less than 10%. To achieve more attractive returns, product prices must increase.





Summary of IHS Markit's industry and investment outlook

- Demand growth for chlor alkali has consumed excess capacity
- No world-scale chlor alkali projects have been announced
- Small debottlenecking projects have been announced or have commenced
- New investment will require a significant capital commitment and integration into chlorine derivatives
 - IHS Markit forecasts 21 world-scale plants will be needed to meet PVC demand growth at a cost of \$5 to \$6 billion per plant
 - Additional capital investment will be required to satisfy demand growth beyond PVC
- Reinvestment economics for world-scale, integrated capacity has not been attained
- Chlor alkali and chlorine derivative economics must achieve and sustain reinvestment levels to drive capacity additions

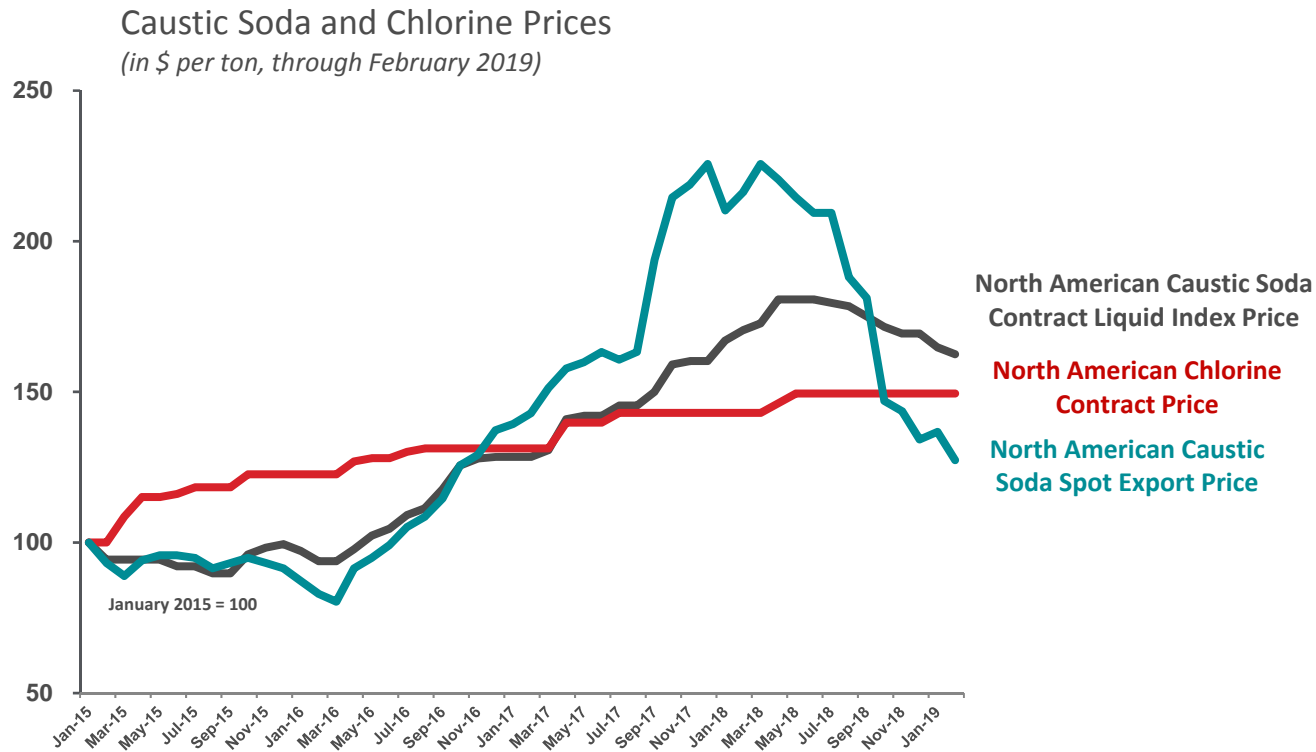


The Evolving Chlor Alkali Sector

1. Long-term structural change
2. **Near-term fundamentals**
3. Closer look at chlorine derivatives and caustic soda



Near-term fundamentals for the Chlor alkali sector are constructive



Source: IHS Markit / Tecnon OrbiChem

- Since 2015, chlorine, North American caustic soda and export caustic soda pricing have increased 49%, 65% and 37%, respectively
- Expect domestic and export caustic soda prices to improve from current levels in 2019
- Expect improvement in chlorine pricing in 2019
- Despite normal and short-term supply and demand disruptions, long-term fundamentals in the chlor alkali industry remain intact



Consistent with upward pricing momentum, monthly operating rates were above 90% for half of 2018

	2016	2017	2018
January	81%	89%	84%
February	85%	83%	93%
March	84%	91%	86%
April	81%	87%	87%
May	85%	82%	92%
June	84%	94%	94%
July	87%	95%	93%
August	84%	90%	94%
September	84%	85%	88%
October	82%	85%	82%
November	84%	92%	86%
December	87%	88%	91%
Annual Average	84%	88%	89%
Months above 90%	0	5	6

- Industry operating rates have increased since 2016
- Frequency of high operating rate months is increasing
- More vulnerability to supply and demand “events” during high utilization months

Source: Chlorine Institute



The Evolving Chlor Alkali Sector

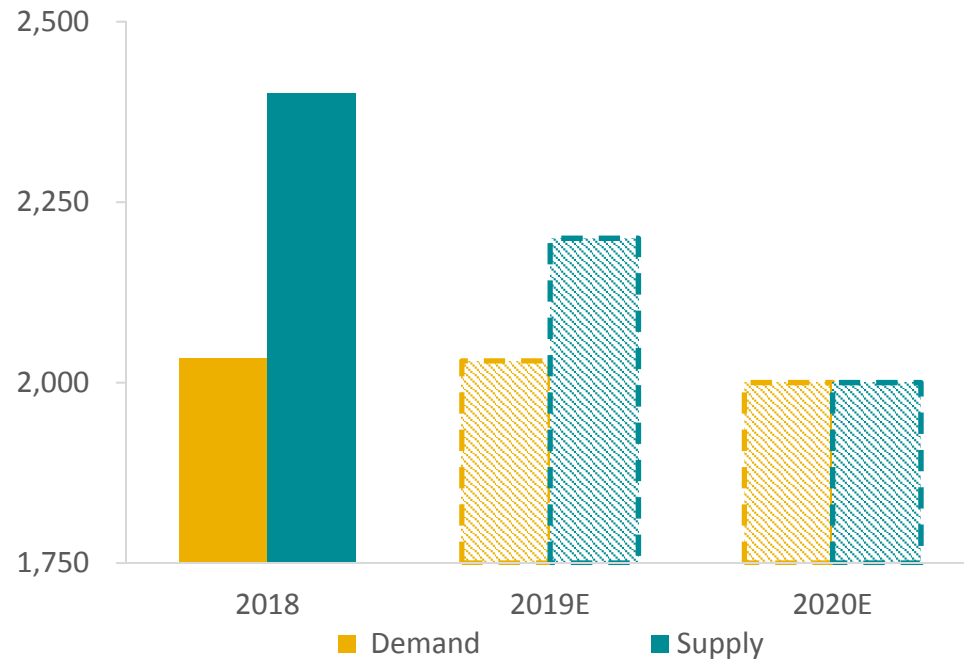
1. Long-term structural change
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Merchant chlorine expected to tighten as chlorine continues shift to integrated derivatives, leading to higher value for chlorine

North America Merchant Railcar Chlorine Supply and Demand

(in thousand tons)



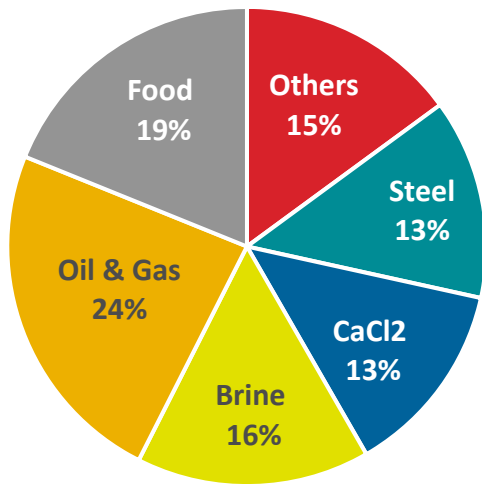
Source: Olin estimates

- North American merchant chlorine supply and demand expected to be in balance by 2020
- Improved supply and demand dynamics expected to lead to uplift of chlorine value

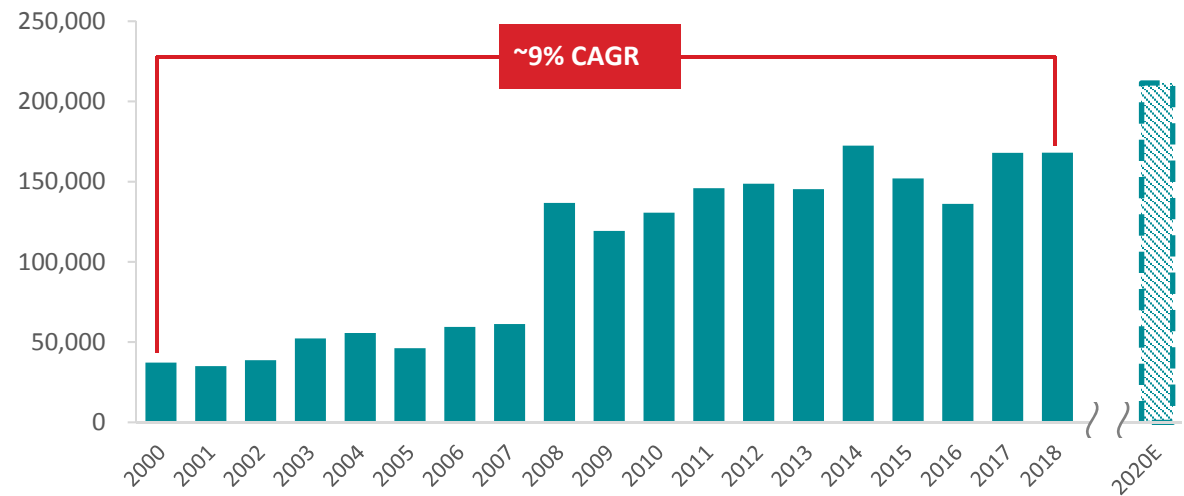


Strong demand is increasing value of HCl

2018 Merchant HCl Industry Demand
(as a percentage of 1.8MM tons)



Olin HCl Volume
(sales volume DST)



Oil, natural gas and steel are key drivers of demand growth

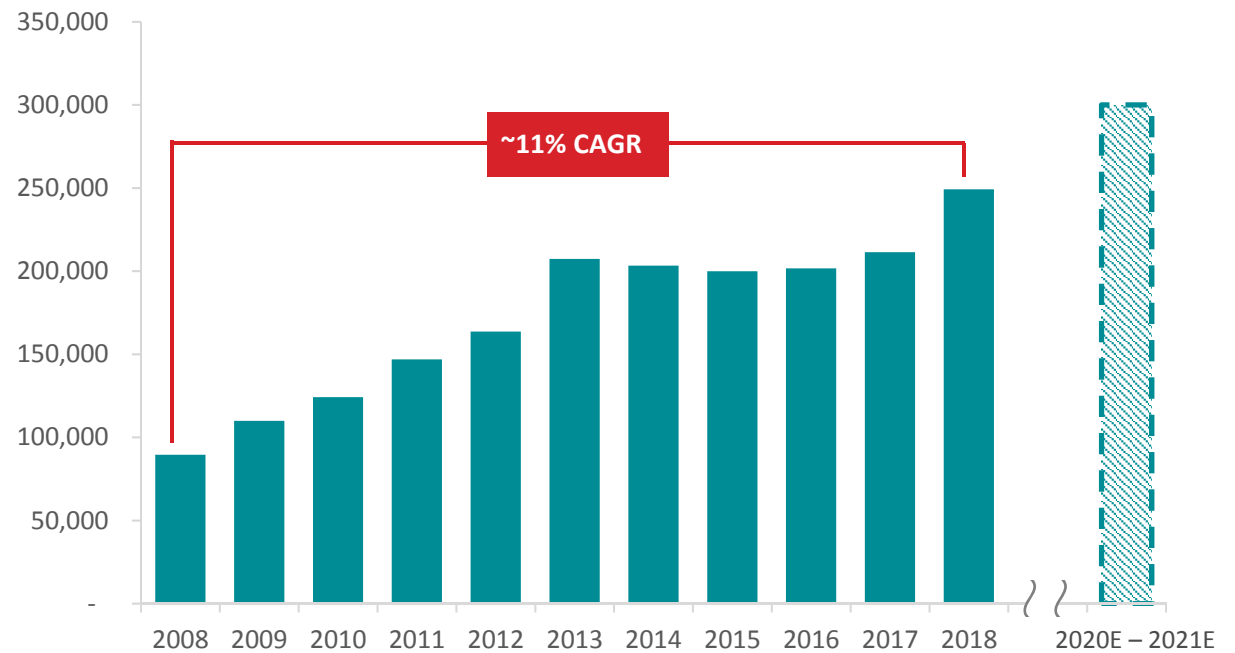
Source: Olin estimates



Ongoing changes in the North American **bleach** sector is driving demand growth

- Ongoing water treatment shift from chlorine to bleach
- Non-integrated bleach producers shifting to buy vs. make

Olin Bleach Sales
(in short tons)

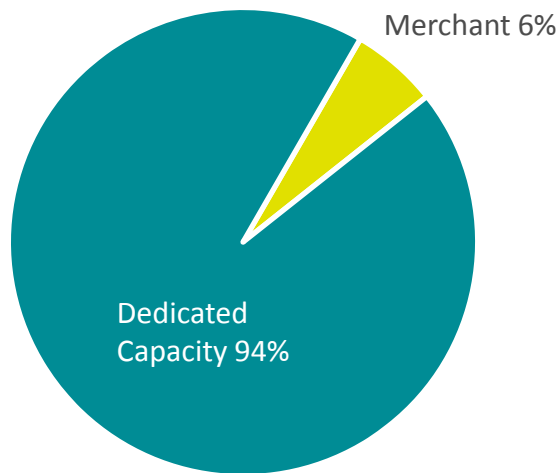


Source: Olin estimates



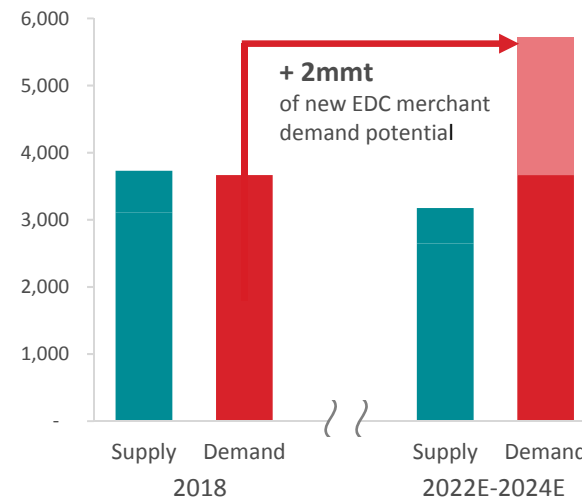
EDC demand is expected to grow over the next five years

Global EDC Industry Production
(in thousand tons)



- Vast majority of EDC volume is dedicated, used by integrated producers to make PVC

Merchant EDC Supply and Demand
(in thousand tons)



- Global supply is projected to decline by ~500KT as swing suppliers expand their own PVC capacity
- Extensive demand growth from non-integrated PVC producers

- New PVC plants contemplated in Asia are non-integrated
- Estimated new merchant requirements are roughly 2 million tons

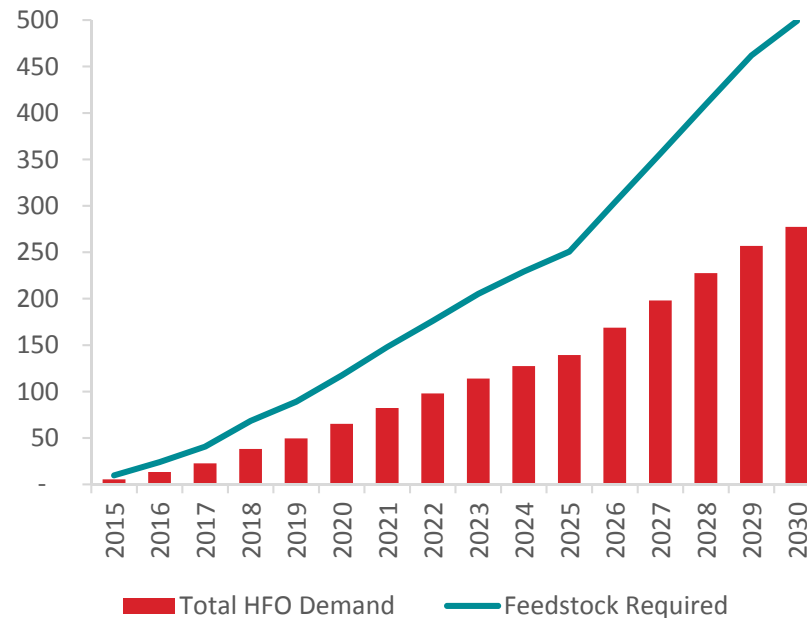
Source: Olin estimates



Growth of next generation refrigerants driving significant opportunity for **chlorinated organics**

- Solvents and refrigerants are the major outlets for chlorinated organics
- Solvents demand is regional and stable
- Refrigerants demand is global and evolving with significant growth potential
 - New generation of refrigerants projected to grow rapidly
 - Next generation refrigerants require carbon tetrachloride

HydroFluoro-Olefin (HFO) Feedstock versus Feedstock Supply
(in thousand tons)

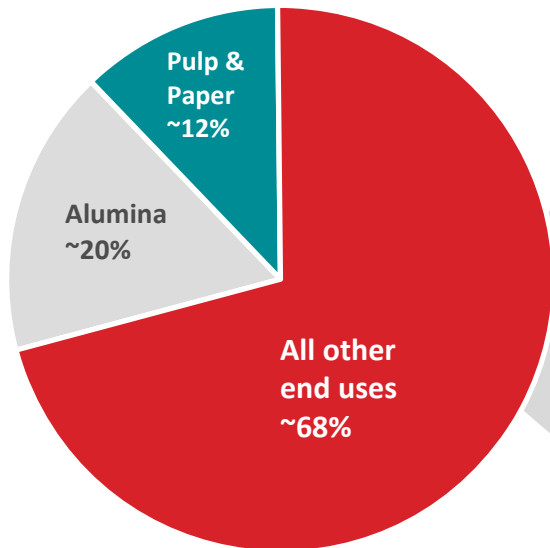


Source: Olin estimates



Caustic soda has diverse base and healthy outlook

2018 World Caustic Soda Demand
(as a percentage of total 80MM tons)



Raw Materials

- Sodium lauryl sulfate (soap)
- Sodium cyanide (mining, nylon)
- Super absorbent polymers (diapers)
- Sodium hydrosulfide (pulp, mining)
- Sodium benzoate (food)
- Monosodium glutamate (food)
- Epoxy resins (adhesives)

Processing Aid

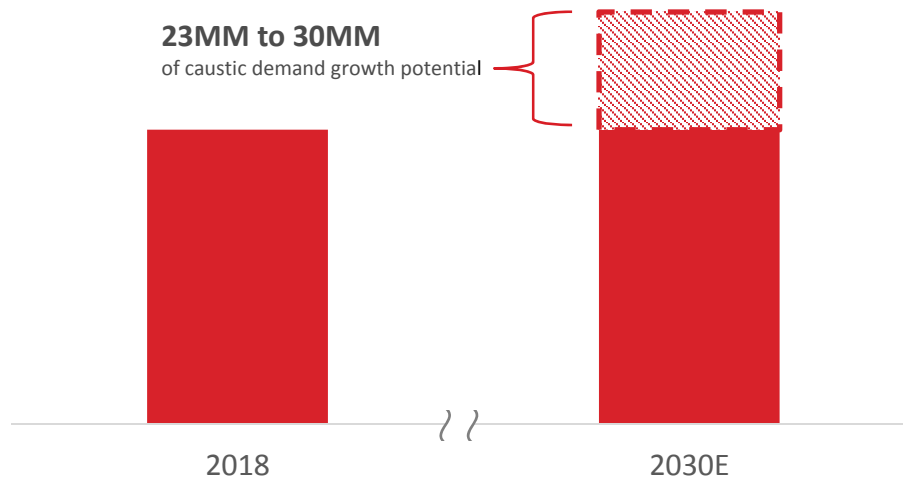
- Alumina (infrastructure, construction, consumables)
- Pulp and paper (packaging, paper, print)
- Polycarbonate (electronics)
- Textiles (clothing)

Caustic soda is consumed to make a wide variety of end-uses but is not the primary input



Global caustic soda supply and demand expected to tighten through 2030

Global Caustic Soda Demand Growth
(in dry metric tons)

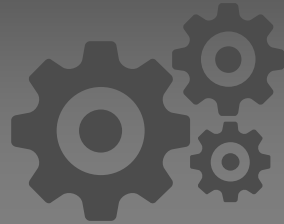


- Steady demand growth tied to consumables, population, and disposable income
 - e.g.: Transportation, food packaging, shipping boxes, soap, textiles and diapers
- Demand growth as high as 30MM dry metric tons using 20-year historical growth rate vs. 2%
- Higher caustic soda demand growth vs. chlorine will drive caustic soda prices to incentivize new supply

Security of supply will become a key priority as caustic soda demand exceeds current capacity



Structural changes in chlor alkali sector driving opportunities on both side of the ECU



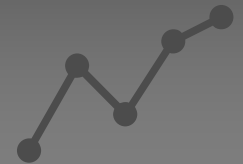
U.S. caustic and chlorine derivative export growth is needed to meet the world's needs



Minimal global capacity additions and announcements to meet growing demand



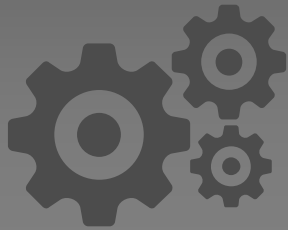
Current industry economics do not support significant near term world-scale chlor alkali capacity investments





Un-matched global chlor alkali portfolio to benefit from healthy demand growth forecasted on both sides of ECU

Olin has leadership positions in each chlorine derivative and caustic soda



Structural changes underway, driving growth opportunities for Olin's well positioned chlor alkali platform



Strong industry position and leading cost advantage expected to yield significant EBITDA growth over next several years

