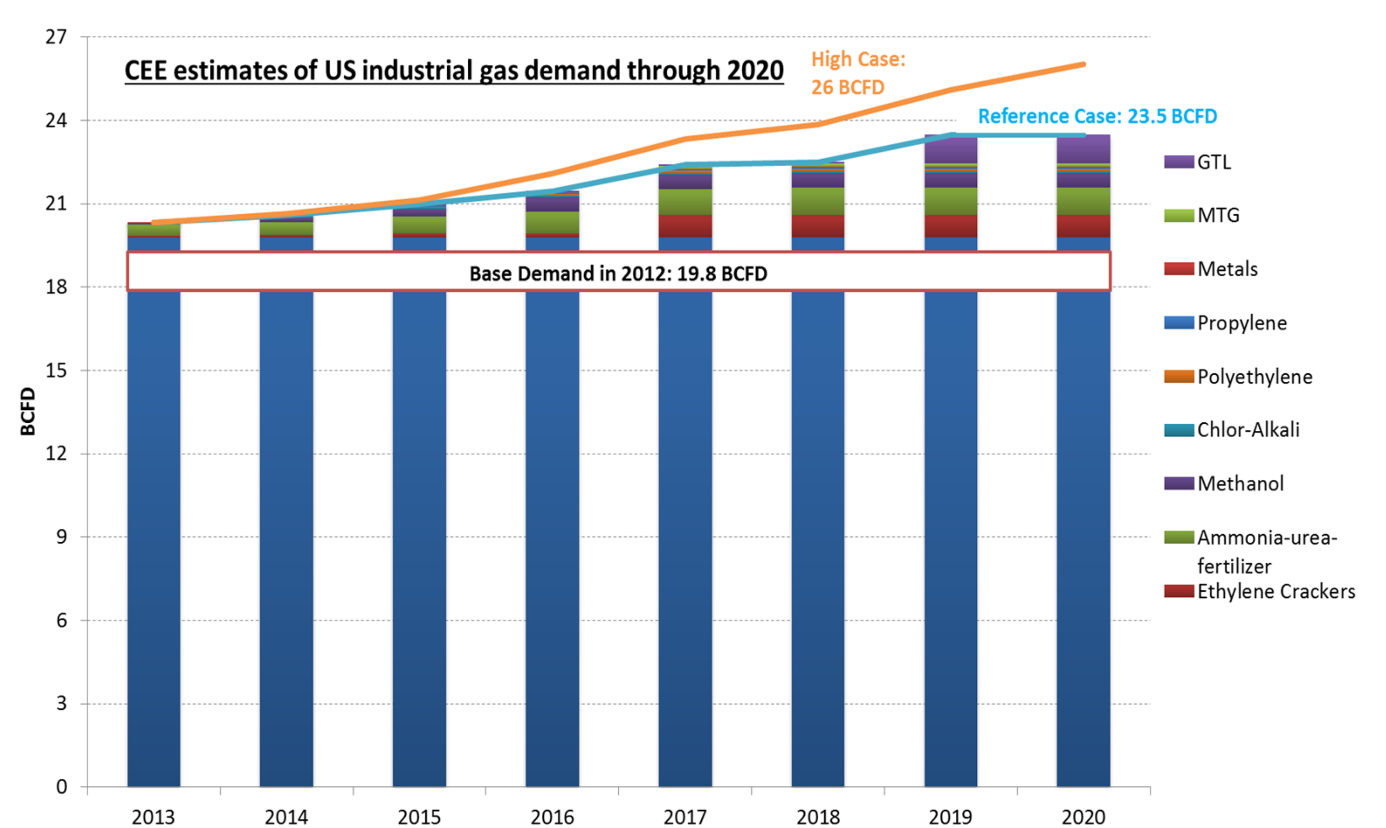
Industrial Gas Demand in the U.S. - How much will it be?



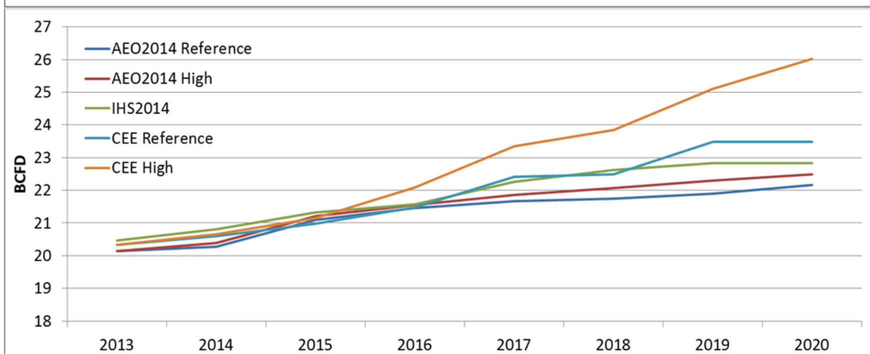
CEE Industrial Projects Database
CEE developed a comprehensive inventory of 144 projects (2013-2020) in gas-intensive industries such as ethylene, methanol, ammonia, urea, nitrogen fertilizer, and gas-to-liquids (GTL) among others (see chart).

CEE Reference Case
Includes projects that are completed, in FEED, obtaining permits, under construction or otherwise in progress.

- Number of projects: 103
- Total investment: $83 billion
- Total gas consumption: **23.5 BCFD**, an increase of 3.7 BCFD from 2012, or ~19%

CEE High Case
Includes all projects in CEE Reference case, and ones that are under consideration or planning.

- Number of projects: 144
- Total investment: $121 billion
- Total gas consumption: **26 BCFD**



EIA AEO2014 Reference

- Demand increases from 21 BCFD in 2013 to **22.2 BCFD** in 2020.
- Does not include any large-scale GTL facilities.

EIA AEO2014 High Oil & Gas Resource

- Demand reaches **22.5 BCFD** in 2020.
- Largest growth in food, paper, bulk chemicals and glass sectors.

IHS Monthly Gas Briefing Outlook (May 2014)

- Demand continues growing over the next few years and peaks at **22.8 BCFD** in 2019-2020

CEE database covers a subset of industries, but our **bottom-up** approach to gas-intensive sectors captures the expected growth as predicted in **top-down** macro models of EIA and IHS; and yields much higher growth in the unlikely case of all projects going forward. *Watch for updates of our industrial projects database*.

CEE CENTER FOR ENERGY ECONOMICS
Bureau of Economic Geology
Jackson School of Geosciences, The University of Texas at Austin

CEE Reference Case: Project types and capacity in major gas-intensive industries

	Expansion		New		Relocation		Restart		Total	
	Capacity	Counts	Capacity	Counts	Capacity	Counts	Capacity	Counts	Capacity	Counts
Ethylene Crackers (mt/yr)	3,096,000	9	6,244,000	5					9,340,000	14
Methanol (mt/yr)			3,190,000	3	1,907,000	2	780,000	1	5,877,000	6
Ammonia-urea-fertilizer (mt/yr)	5,599,010	5	7,540,480	10			500,000	1	13,639,490	16
GTL (bpd)			103,300	5					103,300	5
Grand Total		14		23		2		2		41

Ethylene represents a total of $26 billion worth of investment across 14 facilities. The total incremental capacity of these project is 9.3 million metric tons per year (mt/yr).

- 5 are planned to be new builds, online by 2017; 9 are plant expansions, online by 2015.
- 3 projects are completed ($1.9 billion).
- 8 projects are in progress (equipment procurement and/or construction), which represent $11 billion investment and 5.4 million mt/yr of capacity.
- 3 are in FEED or permit stages ($13 billion).
- 8 other projects are in various stages of planning with a total announced capacity of 6 million mt/yr (not included in the reference case).

22 **methanol and ammonia** plants are expected for a total investment of $18 billion and a production increase of 20 million mt/yr.

- 6 methanol plants with 5.9 million mt/yr of capacity are expected ($3.5 billion). All of the projects are either completed or already in progress, expected to be online between 2014 and 2016.
- The remaining roughly $14 billion encompasses 16 ammonia, urea, and fertilizer plants. Many of the larger plants will be multipurpose, producing product mixes of ammonia, urea, UAN and methanol.
- 3 of these projects are completed ($4 billion); 10 are currently in progress ($5.5 billion); and 3 are in FEED and permits ($4.8 billion).
- 7 other projects are in planning stages (not included in the reference case).

Among all 7 **GTL** projects, 2 of them are in planning, 5 are in either FEED or permits status, including the large-scale GTL plant at Lake Charles by SASOL (96,000 bpd, 93% of total GTL capacity). No project is under construction at the time of writing.

- 5 GTL plants beyond planning stages would entail $14.7 billion in investment for a production capacity of 103,300 bpd of diesel and jet fuel.
- We are cautious on the large-scale project. Shell abandoned plans to build a similar GTL plant in Louisiana because of high costs and gas price uncertainty among other reasons. EIA does not include large-scale GTL.

Project Status and Investment ($ million)

	FEED		Permits		In Progress		Completed		Total		Consideration & Planning	
	Inv. $m	Counts	Inv. $m	Counts	Inv. $m	Counts	Inv. $m	Counts	Inv. $m	Counts	Inv. $m	Counts
Ethylene Crackers	8,000	2	5,123	1	11,113	8	1,895	3	26,131	14	13,817	8
Methanol					3,355	5	150	1	3,505	6	2,500	3
Ammonia-urea-fertilizer	2,442	2	2,400	1	5,485	10	4,060	3	14,387	16	7,070	7
GTL	14,230	3	500	2					14,730	5	3,000	2
Grand Total	24,672	7	8,023	4	19,953	23	6,105	7	58,753	41	25,387	19

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