
DEQ
VIRGINIA DEPARTMENT OF
ENVIRONMENTAL QUALITY

FORECASTING POINT SOURCE EMISSIONS

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3: 2016 EMISSON MODELING PLATFORM DEVELOPMENT PLAN

- **FOR VADEQ IN THE NON EGU GROUP**
- **TASK – PROJECT NON EGU VIRGINIA POINT SOURCE EMISSIONS LIKELY IN 2023 & 2028**
- **BASIS – 2016 BETA INVENTORY**

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4: 2016 BETA VIRGINIA POINT SOURCE INVENTORY

	EGUS	NON EGUS			
Type	WITH CEMS	EGU NON CEMS	NON EGUS	OIL & GAS	AIRPORTS & RAIL YARDS
SOURCES	34 → 6	32	296	15	494
LINE ITEMS	5,088	1,806	26,471	1,798	46,578
GREENHOUSE GASES – 3 Pollutants, TONS (Percent)					
GHG, CO2 E	[32,008,998] (70)	→ 45,207,564 (99)		154,813 (0.3)	505,606 (1)
PRECURSORS - 7 Pollutants, TONS (Percent)					
OZONE	28,933 (25)	10,716 (9)	55,151 (47)	1,189 (1)	21,556 (18)
PARTICULATES	14,680 (32)	1,472 (3)	29,445 (63)	30 (0.1)	927 (2)
OTHER POLLUTANTS - 137 Pollutants, TONS (Percent)					
TRI	843 (12)	438 (6)	5,034 (70)	33 (0.5)	801 (11)
OTHERS	4,440 (38)	694 (6)	6128 (53)	45 (0.4)	294 (3)
All Emissions	48,896(0.1)	13,320 (0.03)	45,303,322 (98)	156,110 (0.3)	529,184 (1.1)
DEALT BY	EGU COMMITTEE	CURRENT ASSIGNMENT			SUB GROUP

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5: 2016 POINT SOURCE INVENTORY ANALYSIS

- **OF THE FIVE TYPES INCLUDED IN THE INVENTORY, THREE TYPES COVER 98 PERCENT OF ALL EMISSIONS**
- **SIX POINT SOURCES ARE COMMON TO 'EGU CEMS' & 'EGU NON-CEMS'**
- **GHG EMISSIONS FROM SOURCES INCLUDED IN 'EGU CEMS' COVER 70 PERCENT OF ALL GHG INCLUDED AMONG 'NON EGU' TYPES**
- **THERFORE, IN PROJECTING EMISSIONS FROM NON EGU COMPONENT OF THE INVENTORY, FOR SATISFACTORY DEPENDABILITY IT IS IMPORTANT TO CONSIDER THE IMPACT OF ALL THE POINT SOURCES, INCLUDING 'EGU CEMS'**

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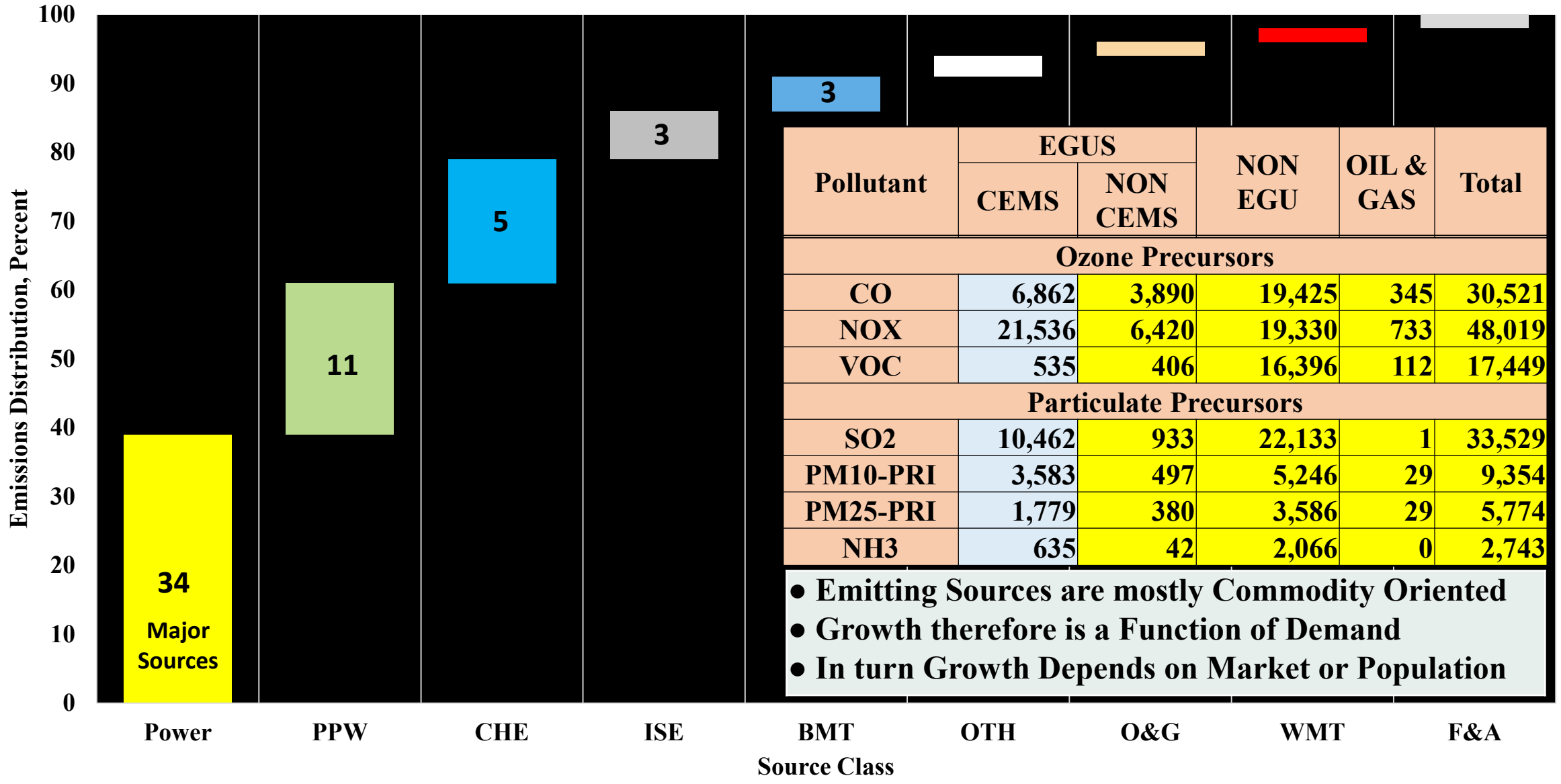
6: CRP EMISSIONS DISTRIBUTION AMONG DIFFERENT CLASS OF POINT SOURCES



Pollutant	EGUS		NON EGU	OIL & GAS	Total
	CEMS	NON CEMS			
Ozone Precursors					
CO	6,862	3,890	19,425	345	30,521
NOX	21,536	6,420	19,330	733	48,019
VOC	535	406	16,396	112	17,449
Particulate Precursors					
SO2	10,462	933	22,133	1	33,529
PM10-PRI	3,583	497	5,246	29	9,354
PM25-PRI	1,779	380	3,586	29	5,774
NH3	635	42	2,066	0	2,743

- Emitting Sources are mostly Commodity Oriented
- Growth therefore is a Function of Demand
- In turn Growth Depends on Market or Population

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7: EMISSION CHARECTERISTICS OF ALL POINT SOURCES IN 2016

- **FROM AIR QUALITY, REGIONAL HAZE, AND CLIMATE POINTS OF VIEW, OF MAIN CONCERN ARE CRITERIA AIR POLLUTANTS AND GREENHOUSE GASES THAT INDUCE:**

  (A) OZONE [CO, NOX, & VOC],
  (B) PARTICULATES [SO2, PM10,PM2.5 & NH3],
  (C) GHG [CO2, CH4, & N2O]

- **FIVE CLASS OF SOURCES ACCOUNT FOR 95 PERCENT OF SUCH EMISSIONS:**

  1. POWER (POWER:40%),
  2. PULP, PAPER & WOOD PRODUCTS (PPW:21%),
  3. CHEMICALS (CHE:20%),
  4. METALS, IRON & STEEL, & ENGINEERING (ISE:9%) &
  5. BUILDING MATERIALS (BMT:5%)

- **ALL THESE ARE COMMODITIES & DEMAND DEPENDS ON MARKET IN TURN ON POPULATION**

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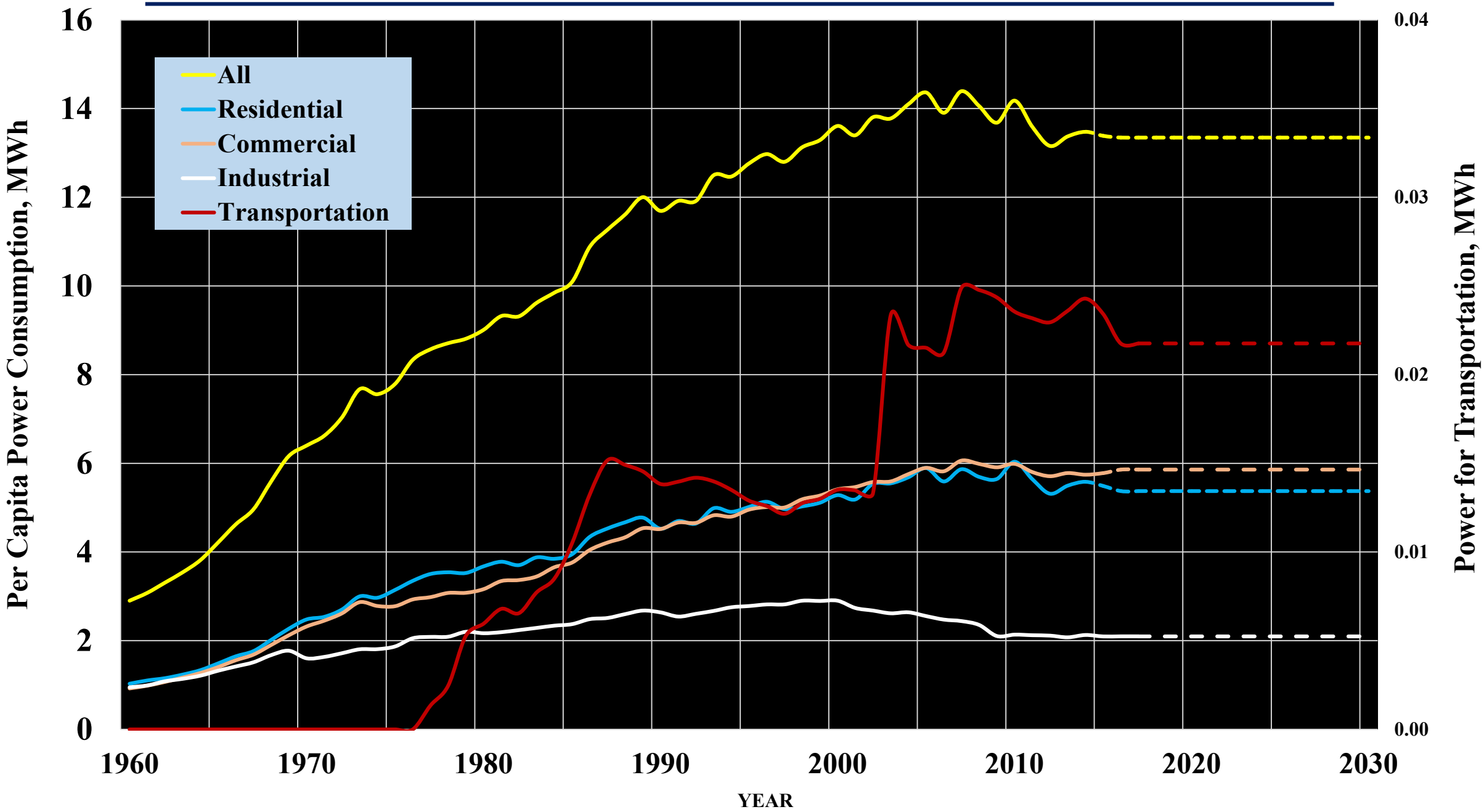
8: HISTORIC & FUTURE POWER CONSUMPTION BY SECTORS



9: APPROACH TO PROJECTING GROWTH

- **EVIDENCE IS COMPELLING TO PRESUME THAT FUTURE DEMAND FOR POWER CAN BE REASONABLY PREDICTED ON THE BASIS OF CURRENT PER CAPITA CONSUMPTION**

- **LIKEWISE IT IS ALSO REASONABLE TO PROJECT FUTURE DEMAND FOR OTHER COMMODITIES TO ACCOUNT FOR GROWTH IN POPULATION**

- **ANOTHER WAY – FOLLOW TOP DOWN APPROACH; BASED ON AEO PROJECTIONS ON ENERGY USE PARSED TO REGIONAL & STATE LEVEL**

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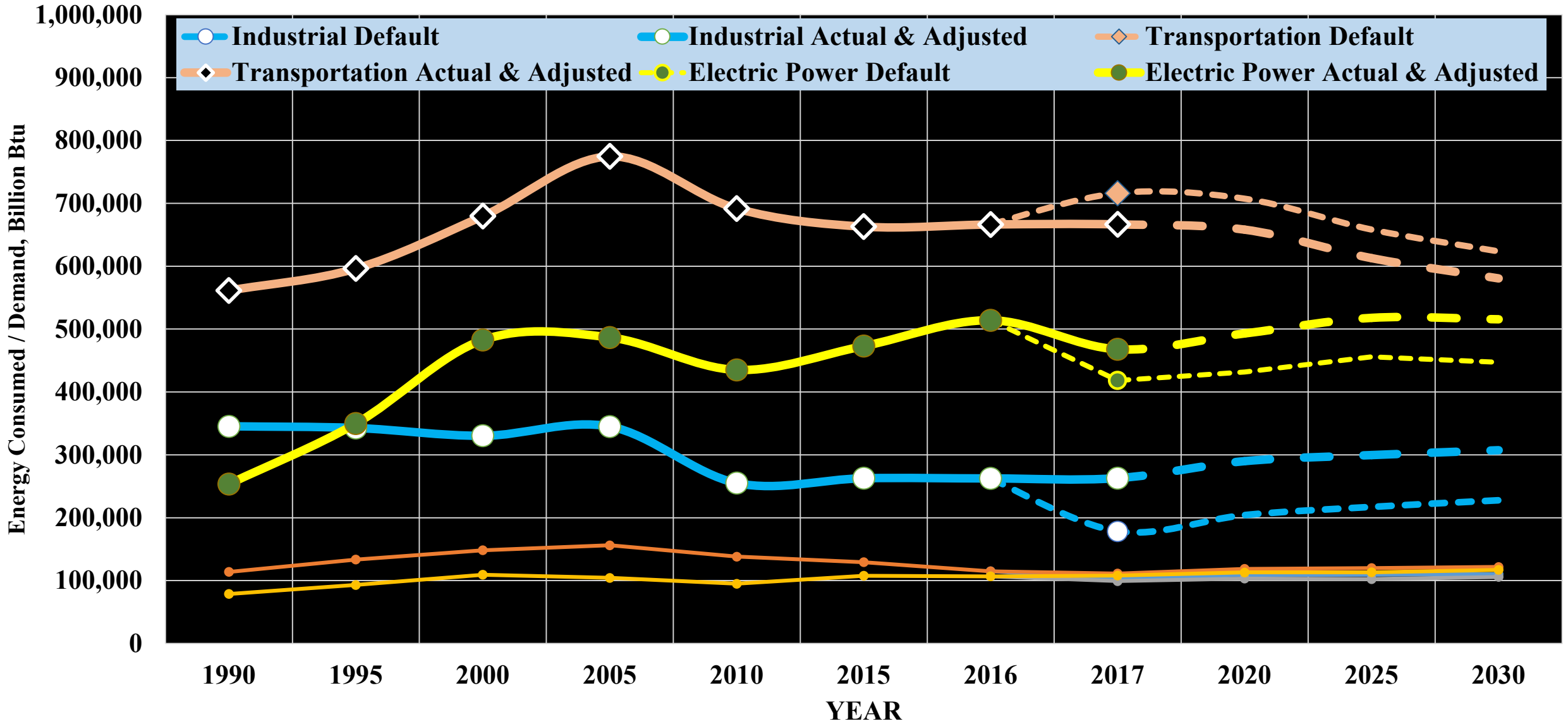
10: Default & Adjusted Energy Demand for GHG Estimation



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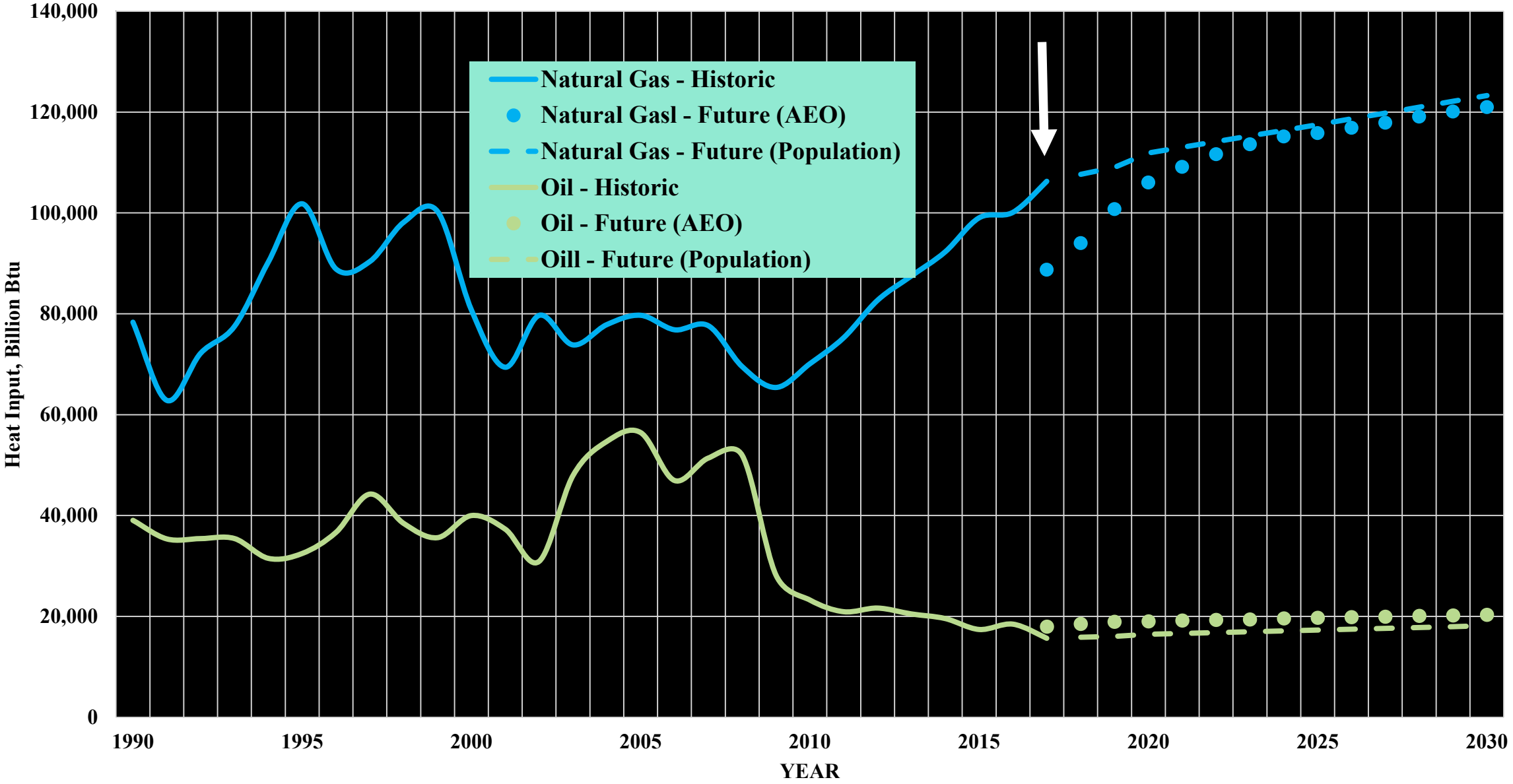
11: HISTORIC CONSUMPTION AND PROJECTED DMAND FOR GAS & OIL FOR INDUSTRY



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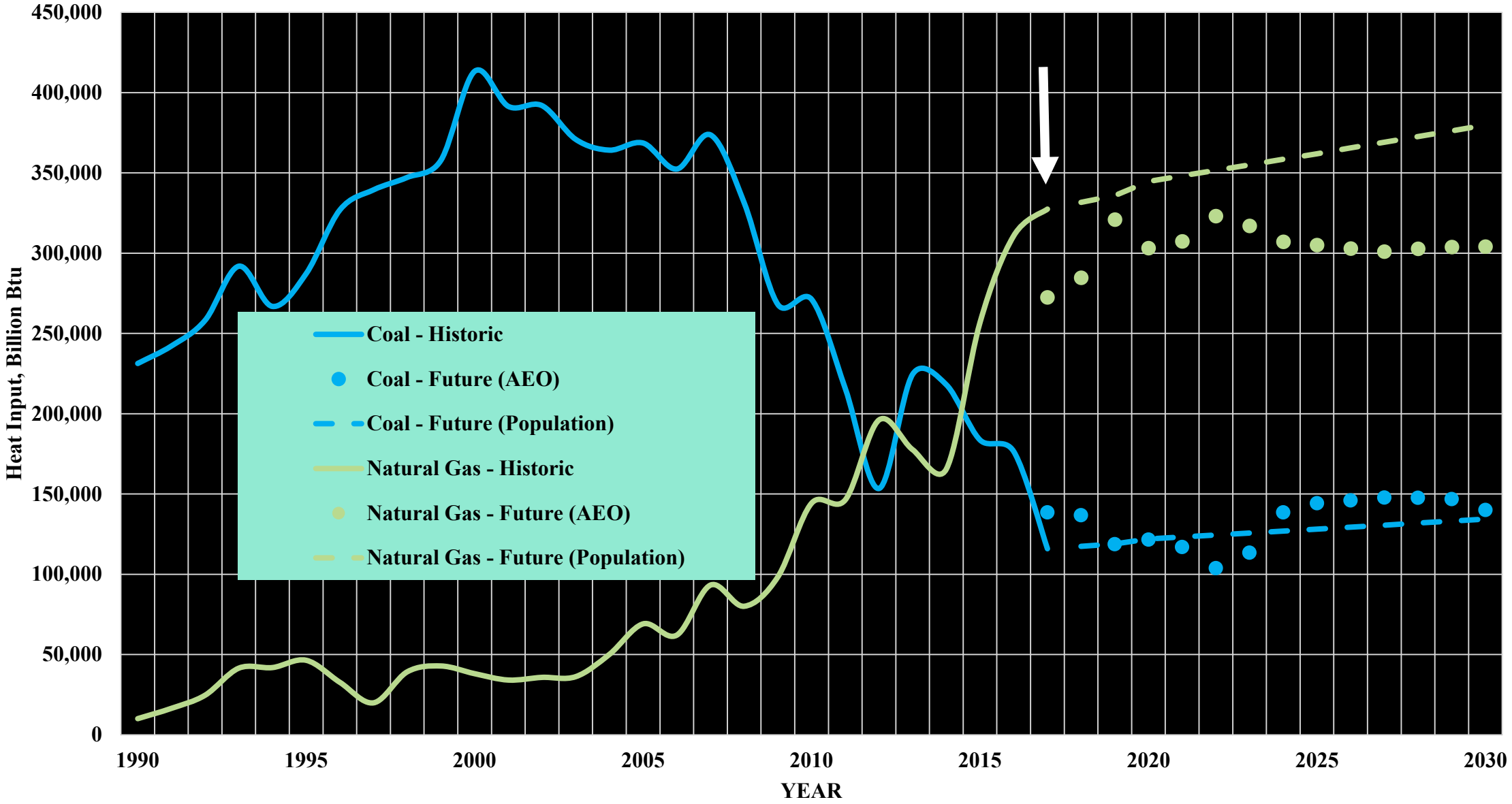
12: HISTORIC CONSUMPTION AND PROJECTED DEMAND FOR COAL & NATURAL GAS POWER



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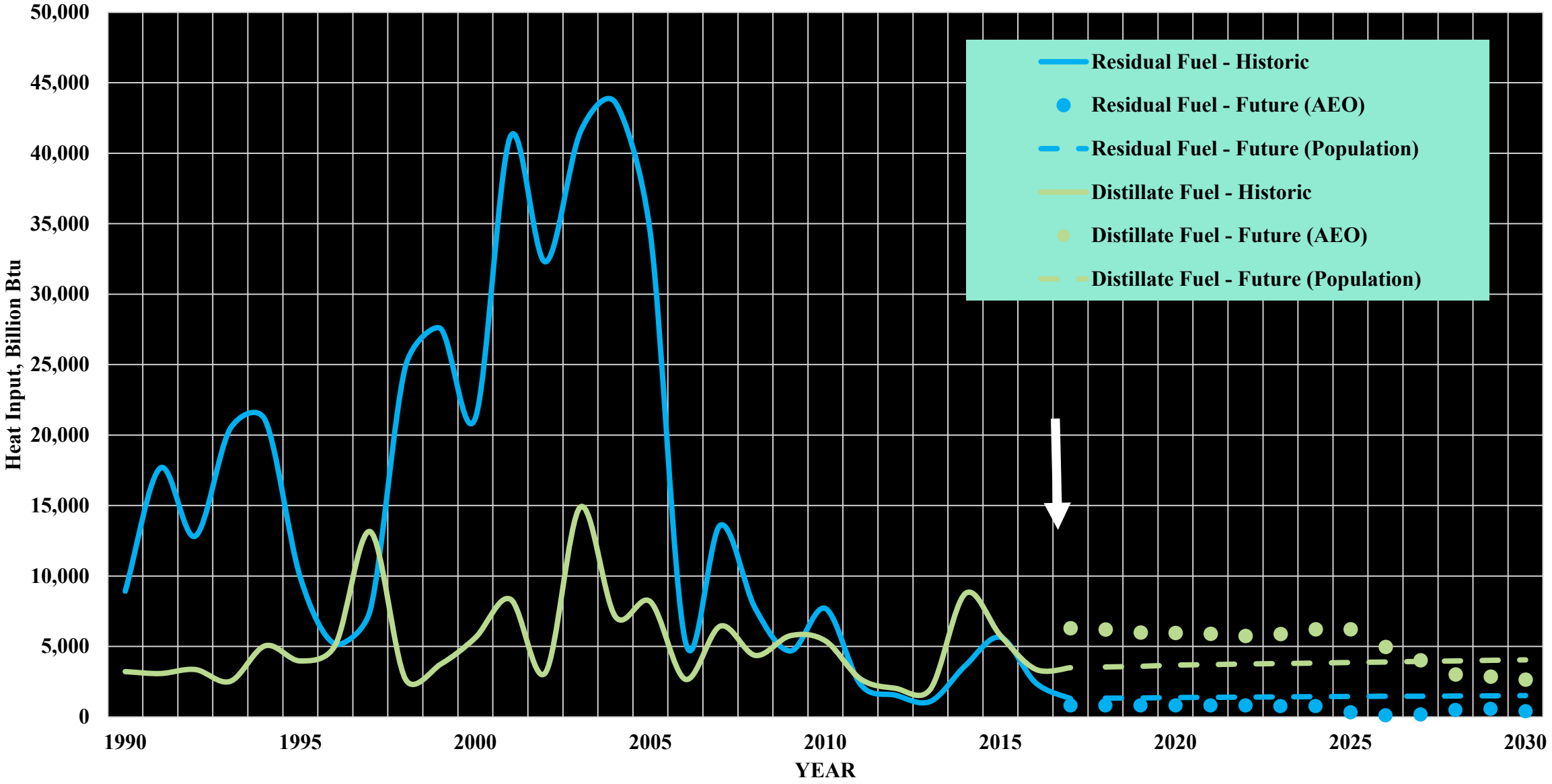
13: HISTORIC CONSUMPTION AND PROJECTED DEMAND FOR LIQUID FUELS FOR POWER



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14: GUIDELINES FOLLOWED IN PROJECTING FUTURE GROWTH

- Follow the Past Performance of each Source (2011 – 2017)
- Based on the Latest Year (2017) Product Output / Core Raw Material Input, Project the Future Performance till 2030 to Grow with the Population
- Based on the Projected Product Output (or Input), Pro-Rate the Associated inputs @ 2016 Levels for each SCC
- Emissions are thus Projected for each Line Item (2016 BETA) for the Corresponding SCCs
- Based on Projected Emissions for 2023 & 2028 Growth Rates for each line item are computed Corresponding to 2016 Emissions

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15: GUIDELINES (Contd.)

- For EGUs Likely Demand is Pro-Rated to Maintain Constant Per-Capita Usage (2017) Except for Dominion Power Sources that Cater 80% of State's Demand
- For Dominion Sources Power Availability is Computed Based on the estimated –
    1. Unit Equivalent Availability Factor (EAF) &
    2. Unit Net Capacity Factor (NCF)

  taken from their 2016 Integrated Resource Plan

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16: GUIDELINES (Contd.)

- **Specific to each Source Known Likely Changes are Incorporated with Respect to:**

1. **Unit Closures**
2. **Control Changes**
3. **Fuel Switch**
4. **Changes in the Fuel Mix Based on the Past Trend (2011- 2017) &**
5. **Other Permitted Changes**

For Permanently closed Plants Growth Rates are Zeroed out

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17: SAMPLE SECTION OF THE COMPUTATION SPREADSHEET

A	B	C	D	E	F	K	L	M	N	O	R	W
			SCC	Pollutant	2011	2016	2017	2018	2019	2020	2023	2028
					8,110	8,412	8,522	8,632	8,742	8,917	9,186	9,641
PLANT OPERATING DATA								Projections				
Product, tons			30301513		733,718	450,109	625,632	L5*M3/L3	M5*N3/M3	N5*O3/N3	Q5*R3/Q3	V5*W3/V3
Million Cubic Feet Burned			10200601		1,186	805	896	L6*M$5/L$5	M6*N$5/M$5	N6*O$5/N$5	Q6*R$5/Q$5	V6*W$5/V$5
Million Cubic Feet Burned			10200603		696	167	666	L7*M$5/L$5	M7*N$5/M$5	N7*O$5/N$5	Q7*R$5/Q$5	V7*W$5/V$5
Tons Produced			30300922		733,718	900,218	1,251,264	L8*M$5/L$5	M8*N$5/M$5	N8*O$5/N$5	Q8*R$5/Q$5	V8*W$5/V$5
Industrial Processes			30301513		733,718	450,109	625,632	L9*M5/L5	M9*N5/M5	N9*O5/N5	Q9*R5/Q5	V9*W5/V5
Industrial Processes			30301513		733,718	450,109	625,632	L10*M6/L6	M10*N6/M6	N10*O6/N6	Q10*R6/Q6	V10*W6/V6
Tons scrap processed			30400739			167,632	167,632	L11*M$5/L$5	M11*N$5/M$5	N11*O$5/N$5	Q11*R$5/Q$5	V11*W$5/V$5
Tons handled			30400760		42,372	31,369	40,798	L12*M$5/L$5	M12*N$5/M$5	N12*O$5/N$5	Q12*R$5/Q$5	V12*W$5/V$5
Vehicle-Miles Travelled			30502011		538,363	466,966	466,966	L13*M$5/L$5	M13*N$5/M$5	N13*O$5/N$5	Q13*R$5/Q$5	V13*W$5/V$5
Million Gallons Cooling Water			30600701		28,119	28,119	28,119	L14*M$5/L$5	M14*N$5/M$5	N14*O$5/N$5	Q14*R$5/Q$5	V14*W$5/V$5
2016 BETA DATA					Projections							
Em, TPY	Type	Agcy Unit	SCC	Pollutant	2011	2016	2017	2018	2019	2020	2023	2028
75.78	nonegu	2	10200601	NOX	111.69	75.78	84.36	$A17*M6/$K6	$A17*N6/$K6	$A17*O6/$K6	$A17*R6/$K6	$A17*W6/$K6
1.46	nonegu	5	10200603	OC	6.07	1.46	5.80	$A18*M7/$K7	$A18*N7/$K7	$A18*O7/$K7	$A18*R7/$K7	$A18*W7/$K7
1.09	nonegu	4	30300922	PM10-PRI	0.89	1.09	1.52	$A19*M8/$K8	$A19*N8/$K8	$A19*O8/$K8	$A19*R8/$K8	$A19*W8/$K8
1,867.95	nonegu	1	30301513	CO	1,522.46	1,867.95	2,596.37	$A20*M9/$K9	$A20*N9/$K9	$A20*O9/$K9	$A20*R9/$K9	$A20*W9/$K9
13.50	nonegu	1	30301513	SO2	11.01	13.50	18.77	$A21*M10/$K10	$A21*N10/$K10	$A21*O10/$K10	$A21*R10/$K10	$A21*W10/$K10
0.31	nonegu	6	30400739	PM-CON	0.44	0.31	0.31	$A22*M11/$K11	$A22*N11/$K11	$A22*O11/$K11	$A22*R11/$K11	$A22*W11/$K11
0.06	nonegu	13	30400760	PM25-PRI	0.09	0.06	0.08	$A23*M12/$K12	$A23*N12/$K12	$A23*O12/$K12	$A23*R12/$K12	$A23*W12/$K12
0.73	nonegu	7	30600701	PMFINE	0.73	0.73	0.73	$A24*M13/$K13	$A24*N13/$K13	$A24*O13/$K13	$A24*R13/$K13	$A24*W13/$K13
0.24	nonegu	7	30600701	SO4	0.24	0.24	0.24	$A25*M14/$K14	$A25*N14/$K14	$A25*O14/$K14	$A25*R14/$K14	$A25*W14/$K14

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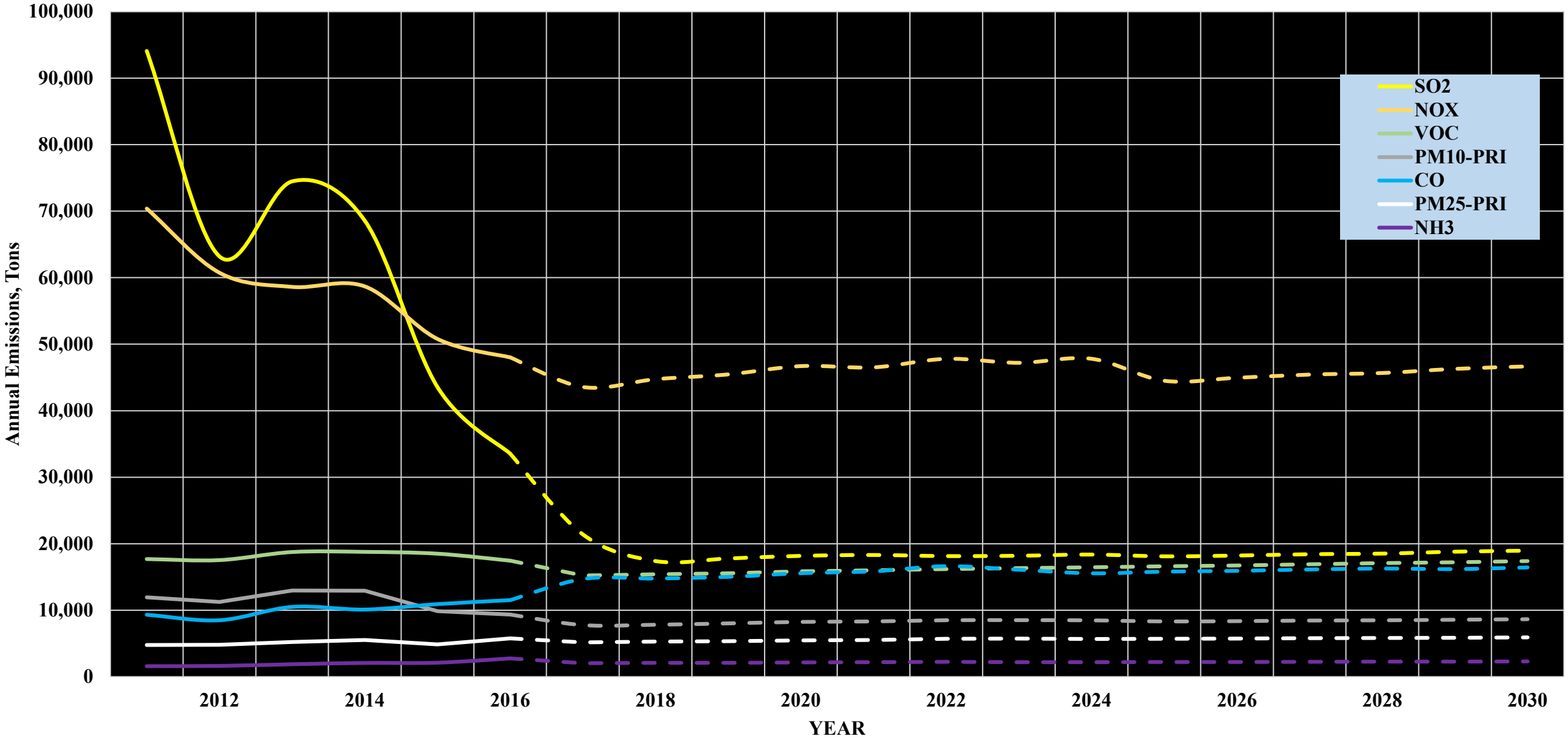
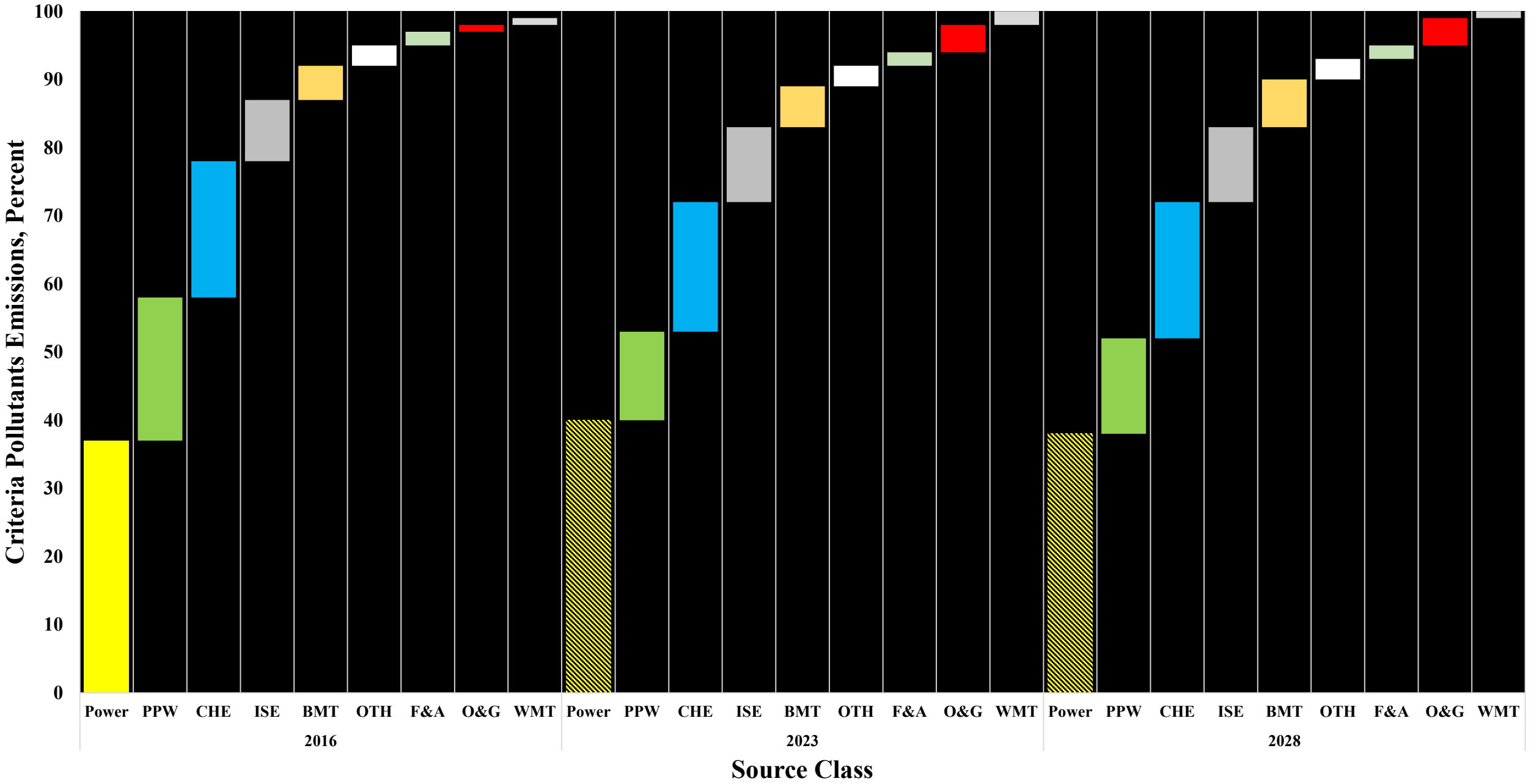
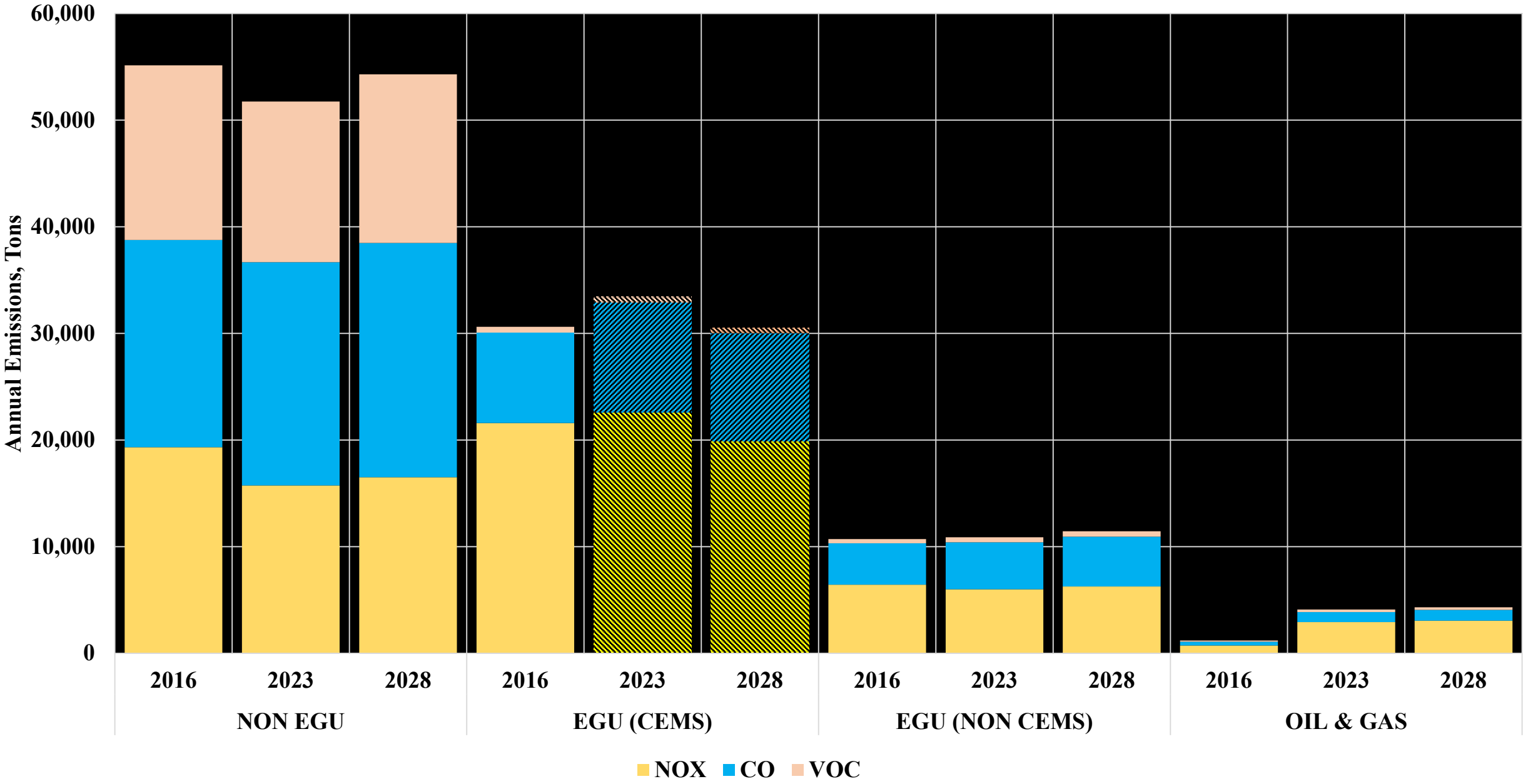
18: TRENDS IN THE PROJECTED ANNUAL EMISSIONS



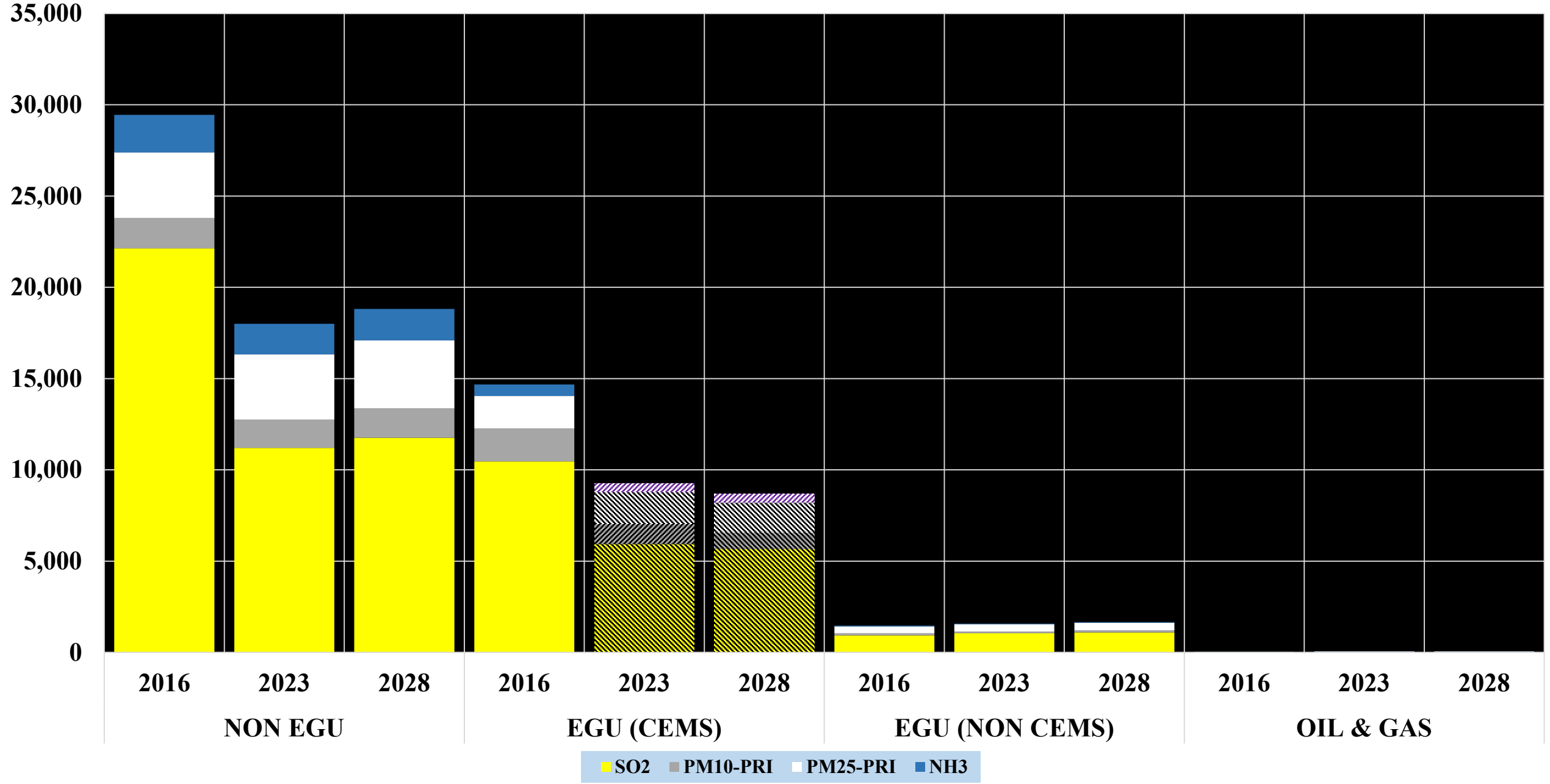
19: SHARE OF PROJECTED EMISSIONS FROM MAJOR SOURCE TYPE



20: OZONE PRECURSOR EMISSIONS FROM POINT SOURCES



21: PARTICULATE PRECURSOR EMISSIONS FROM POINT SOURCES



22: GREENHOUSE GASSES (GHG)

- **GHG Emissions are Projected as an Extension of 2011 – 2016 Values Reported by Individual Sources to EPA Mandated by GHGRP Pro-Rated on the Basis of Projected Output or Corresponding Fuel/Inputs**

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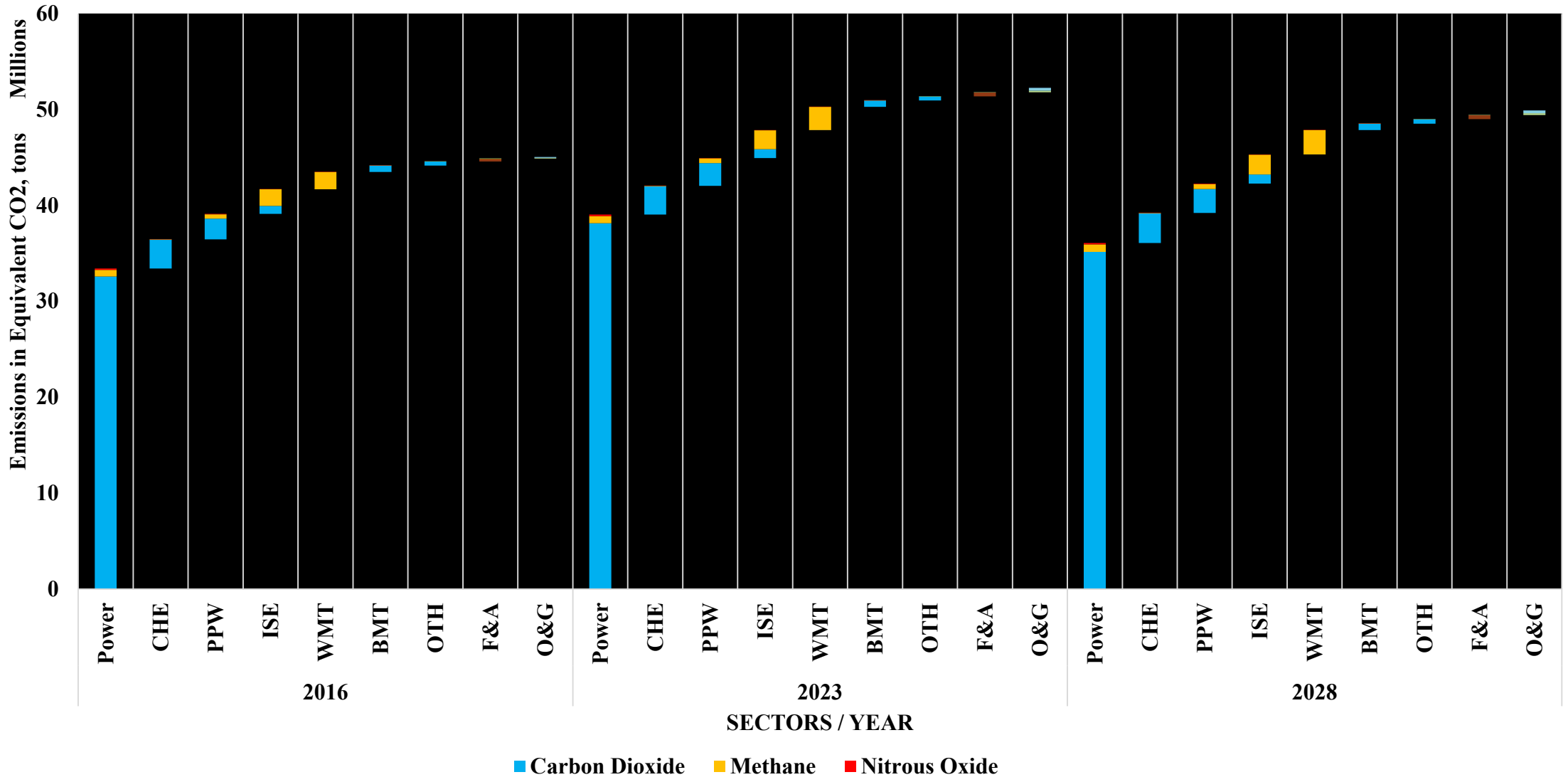
23: SHARE OF GHG EMISSIONS AMONG SOURCE TYPE



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24: ALTERNATE PROJECTIONS

- **In the Foregone Display Emissions from Major EGUs (EGUCEMS) were Held as a Place Holder to Make the Non EGU Inventory as Accurate & Dependable as Possible;**
- **There are 34 Power Plants segregated under EGUCEMS**
- **ERTAC Output (EGU Committee would be Guided) on these EGUs & Also the Forecast in the Dominion 2018 IRP Tuned to Meet Federal CO2 Program are Compared**
- **In the Dominion IRP 2018 the Values of EAF & NCF Factors are Changed (from IRP 2016) to Optimize GHG Emissions**

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25: ALTERNATE PROJECTIONS (Contd.)

- Besides Output from ERTAC
- 32 EGUs with CEMS are 22 of Dominion & 10 Independent Sources;
- Dominion Facilities have 2 sets of Outputs (IRP 2016 & IRP 2018);
- Other Sources Have One Output – Growth Related to Increase in Population
- Results of All the Four Scenarios are compared:-
  - 1. Demand Based on Population Growth
  - 2. Guided by Dominion IRP 2016 Forecast
  - 3. Based on Dominion IRP 2018 Projection and
  - 4. ERTAC Output

  With Historic Data for 2011 to 2017

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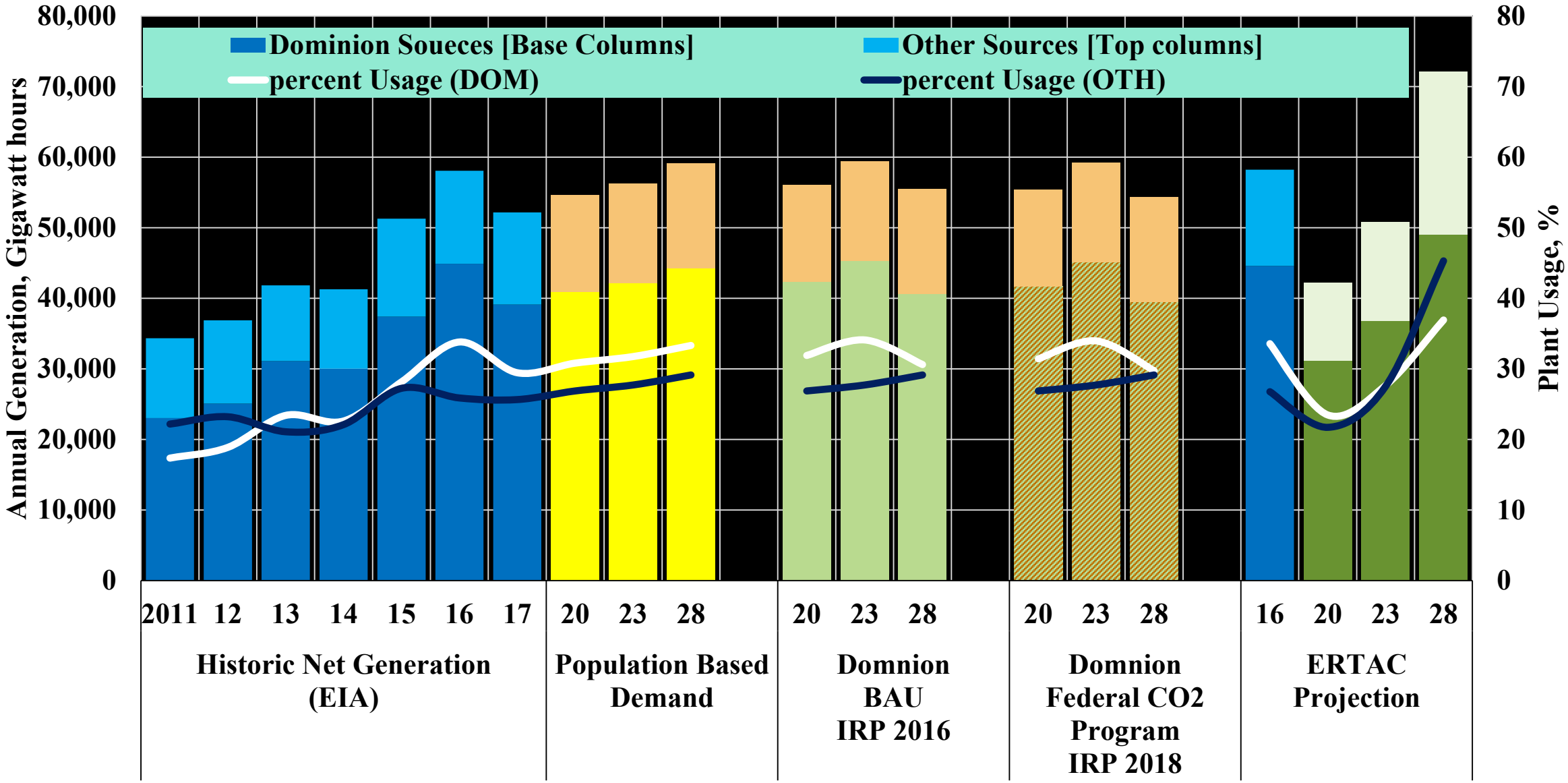
26: COMPARISON OF PROJECTED GENERATION FROM EGUCEMS



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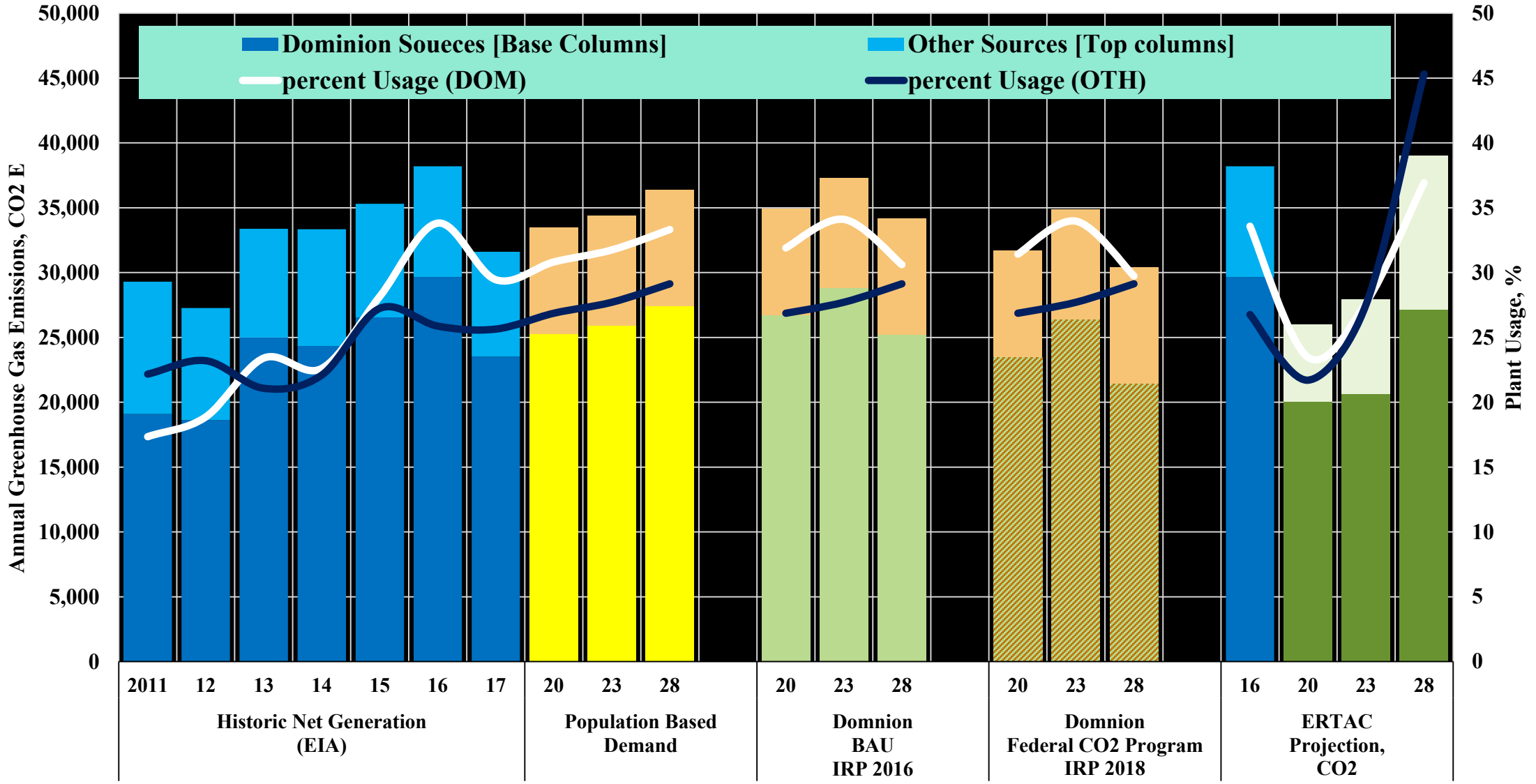
27: COMPARISON OF PROJECTED GHG EMISSIONS FROM EGU CEMS



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28: ACKNOWLEDGMENTS

Wish to place on record my sincere thanks to:

- **EPA to serve on Non-EGU Group**
- **DEQ & MARAMA for facilitating my participation in the Seminar**
- **Personally Caroline Farkas (EPA), Thomas Ballou & Doris Mcleod (DEQ)**

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