

# 산업부문 온실가스 배출구조와 장기감축전략

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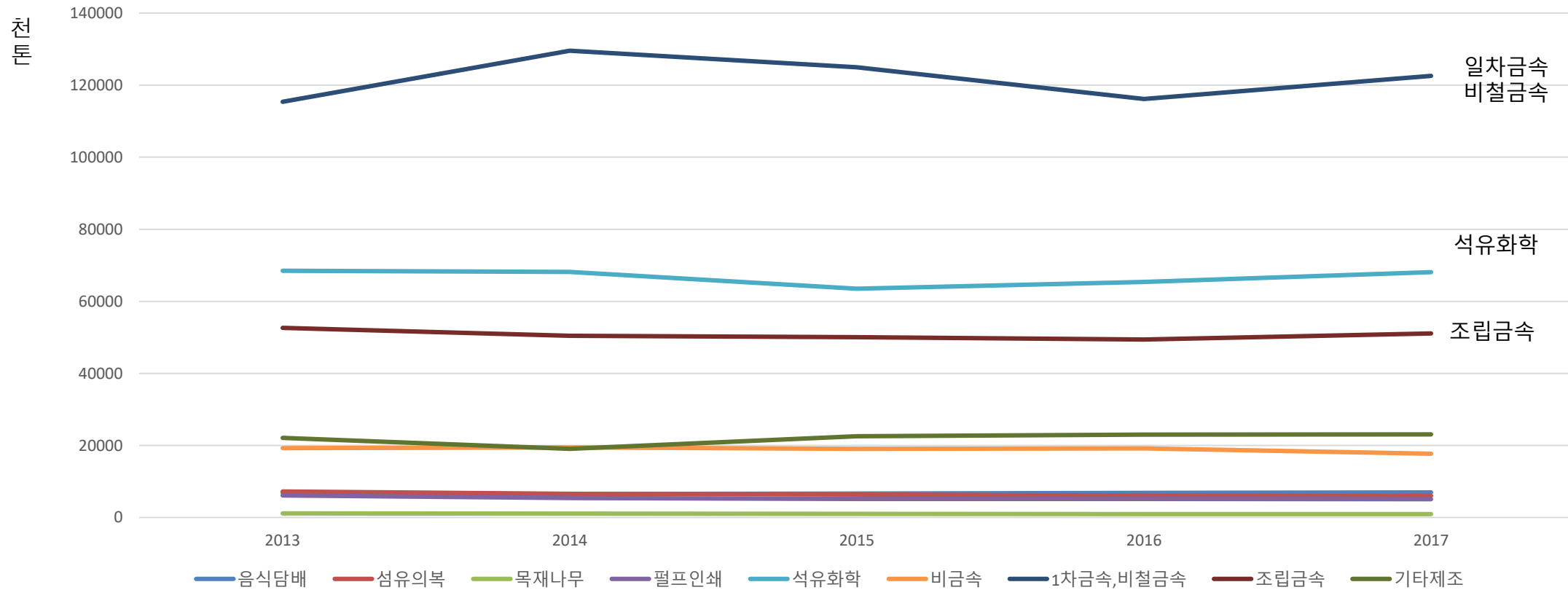
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1. 국내 산업부문 온실가스 배출구조
2. 국내 산업부문 온실가스 배출 요인분해
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4. 산업부문 온실가스 장기 감축전략

# 1. 국내 산업부문 온실가스 배출구조

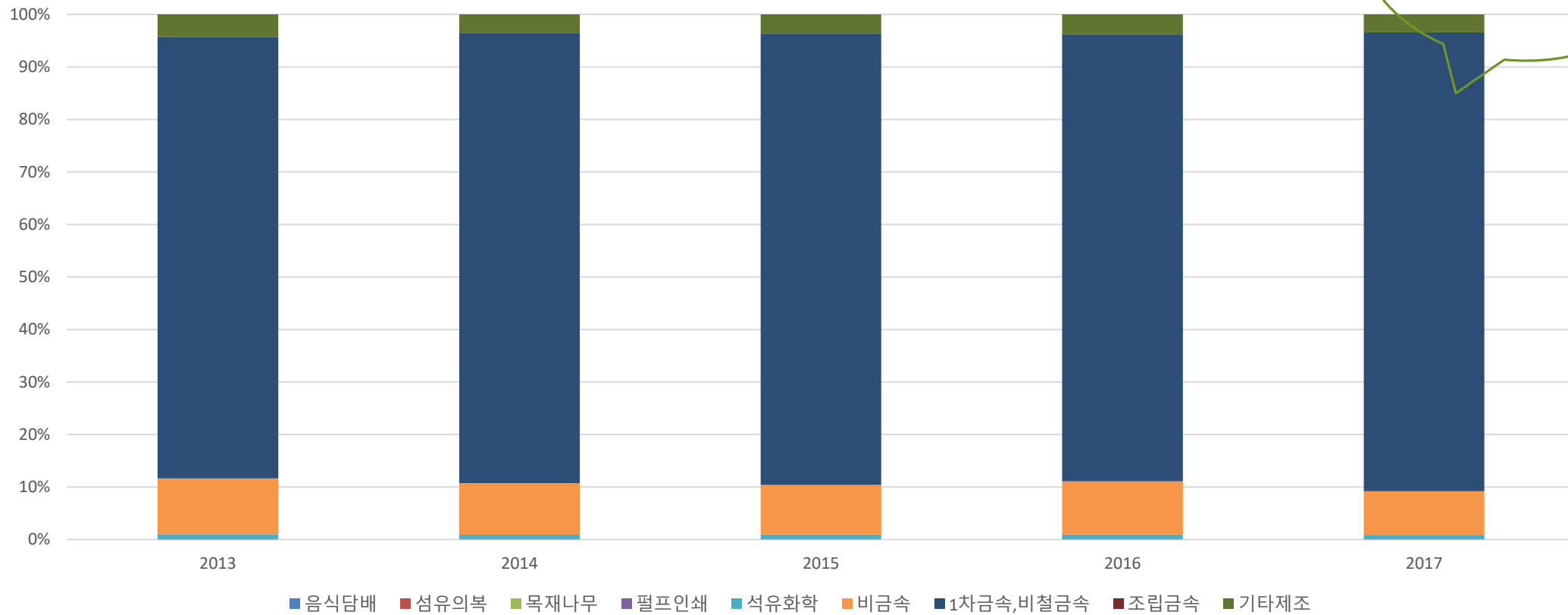
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# 산업별 에너지연소에 의한 온실가스 배출 추이 (간접배출 포함, 2013-2017)



# 산업별 석탄류 소비 비중(1000TOE 기준)

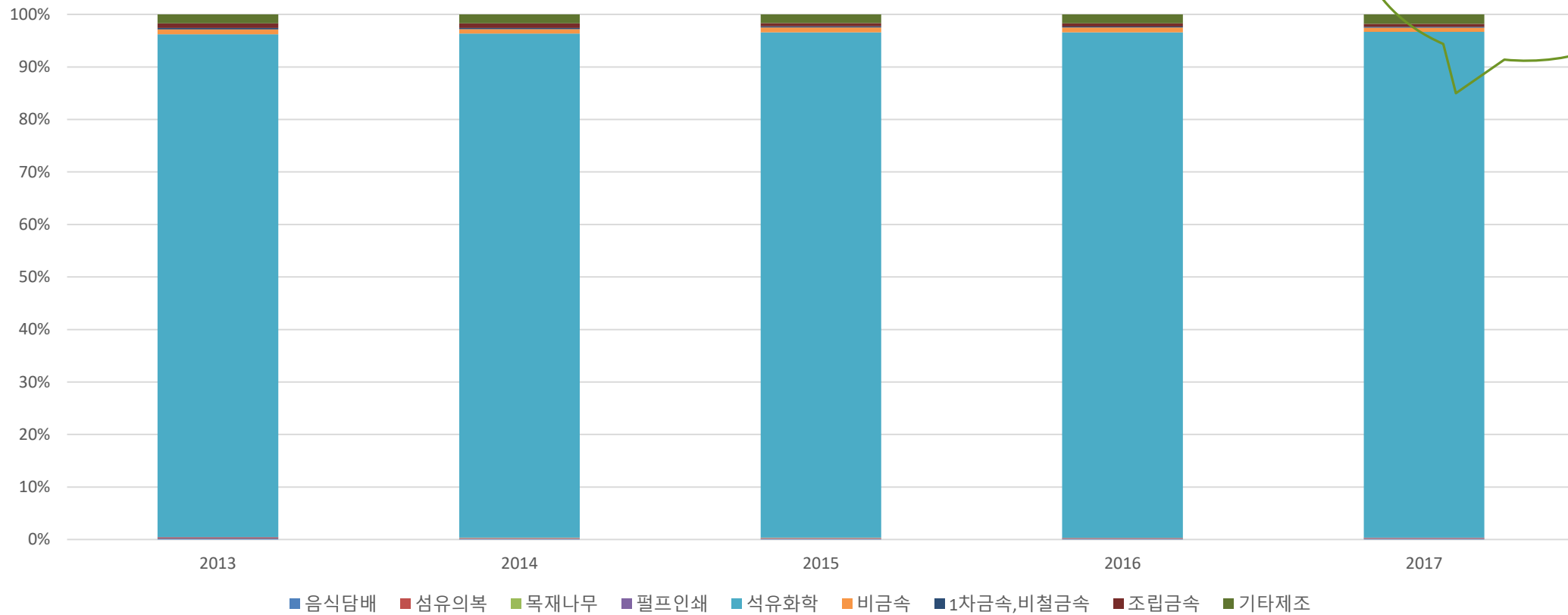
대부분의 석탄류 소비는 1차금속, 비철금속과 비금속 부문임



자료: 에너지통계연보

# 산업별 석유류 소비 비중(1000TOE 기준)

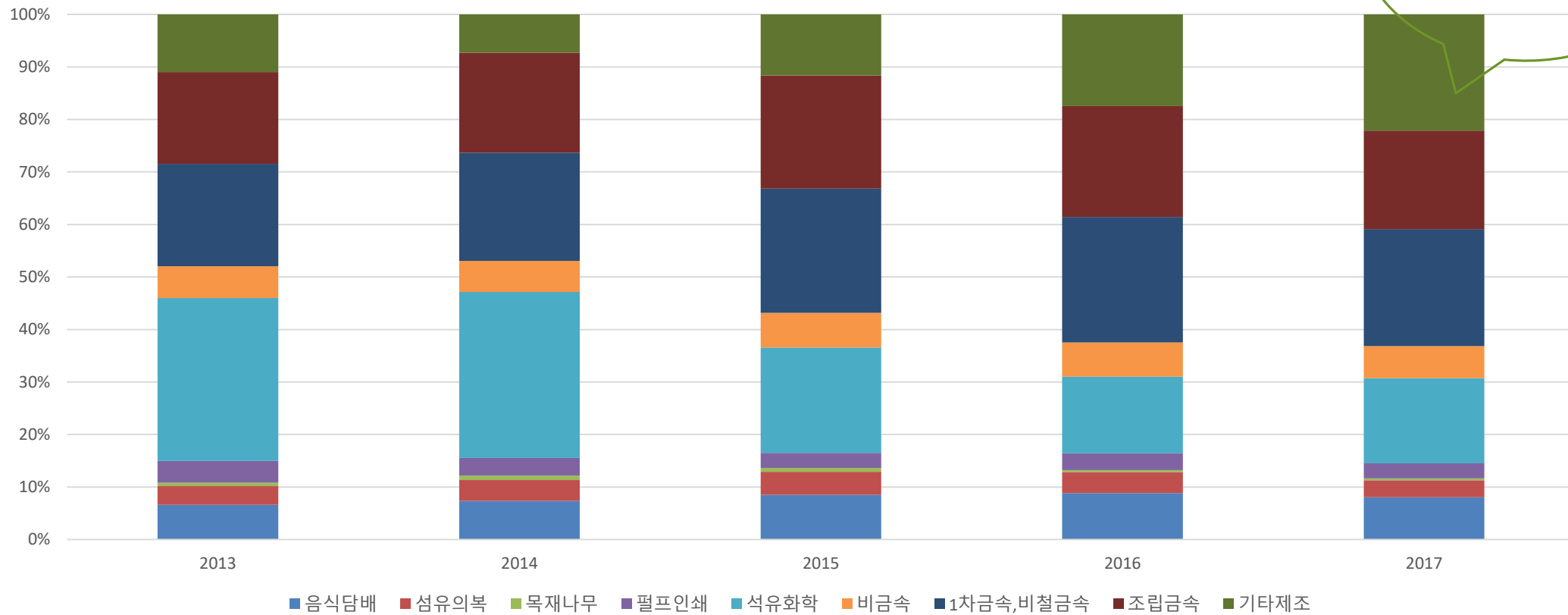
대부분의 석유류 소비는 석유화학 산업임.



자료: 에너지통계연보

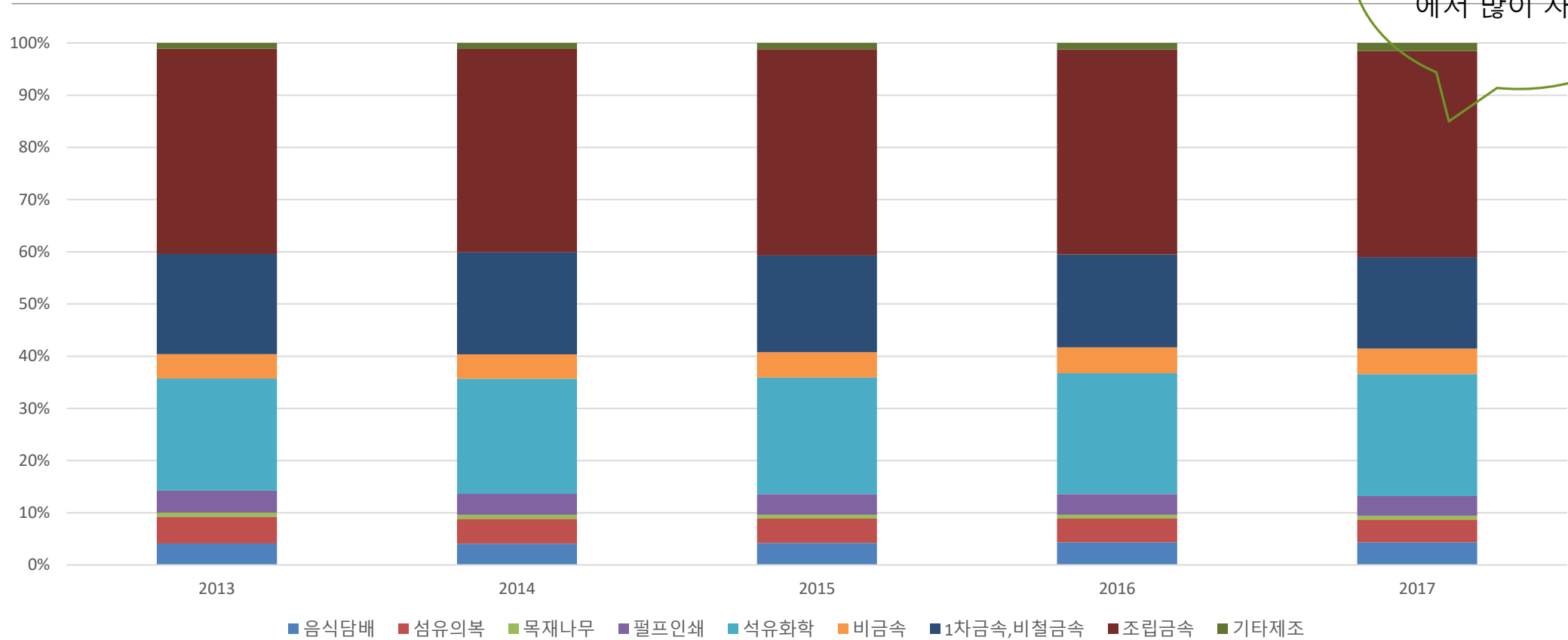
# 산업별 가스류 소비 비중(1000TOE 기준)

가스류는 다양한 산업에서 골고루 사용되고 있음.



자료: 에너지통계연보

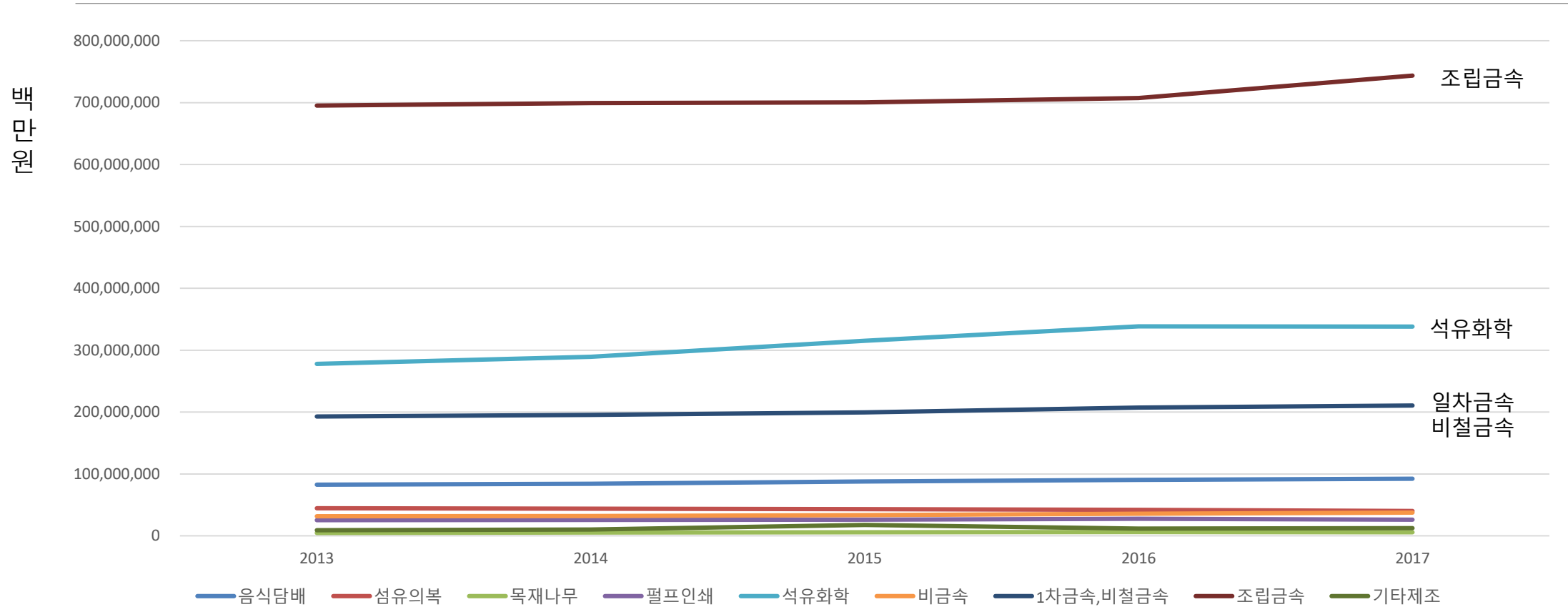
# 산업별 전력 소비 비중(1000TOE 기준)



자료: 에너지통계연보



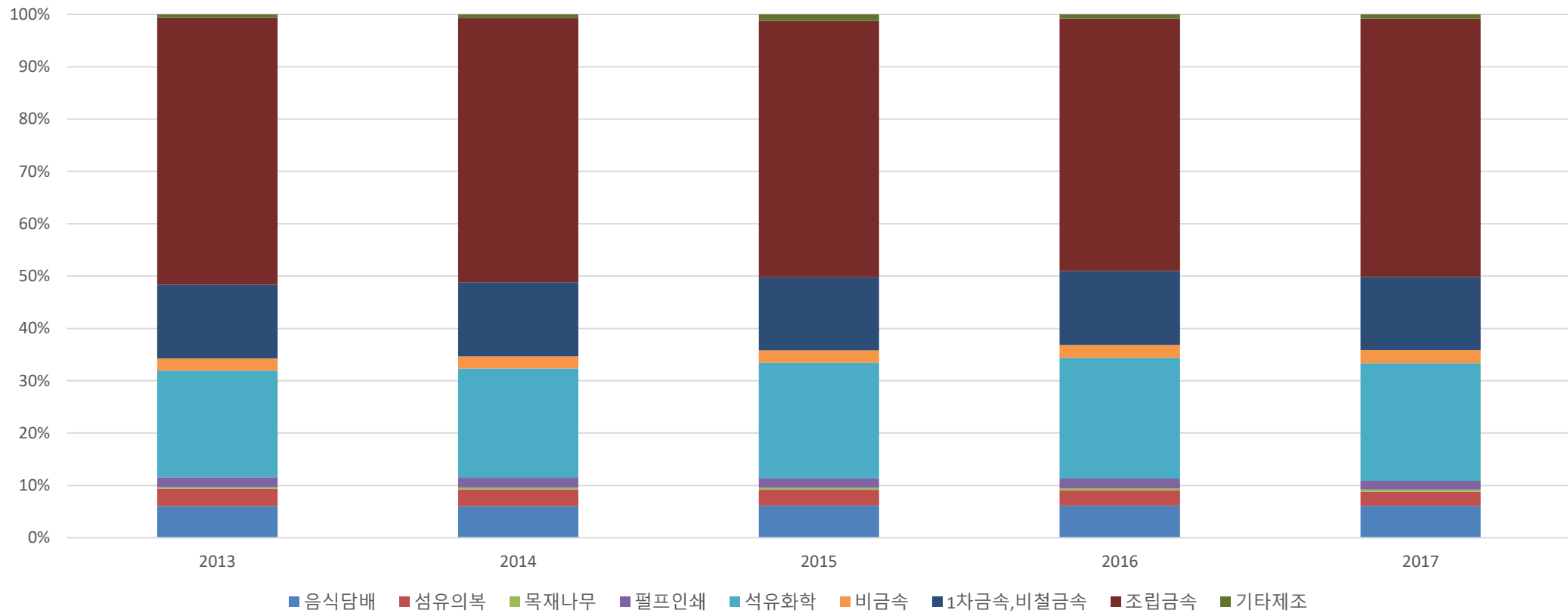
# 산업별 실질생산액 추이 (2013~2017)



자료: 통계청, 광업제조업조사

주: 산업별 생산액을 산업별 물가지수로 나누어서 실질생산액 도출

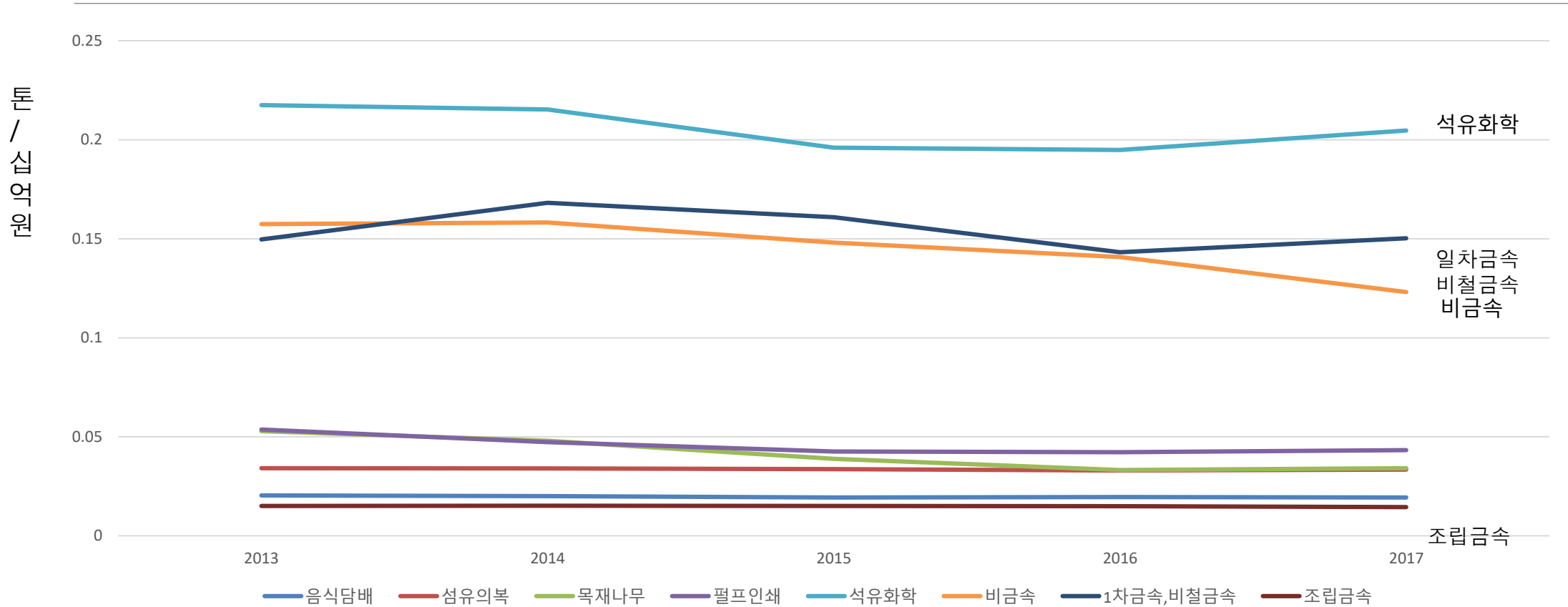
# 산업별 생산 비중 (2013~2017)



자료: 통계청, 광업제조업조사

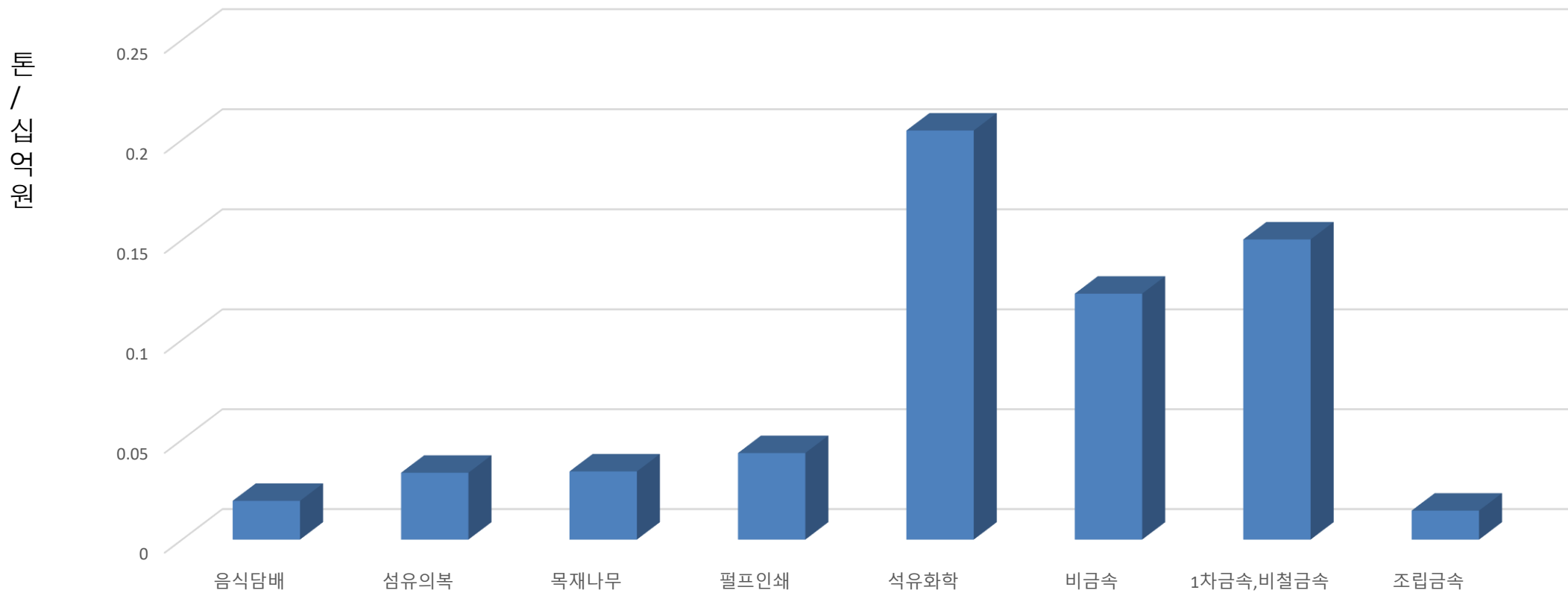
주: 산업별 생산액을 산업별 물가지수로 나누어서 실질생산액 도출

# 산업별 에너지집약도 추이 (2013~2017)



자료: 통계청 (광업제조업조사), 에너지통계연보

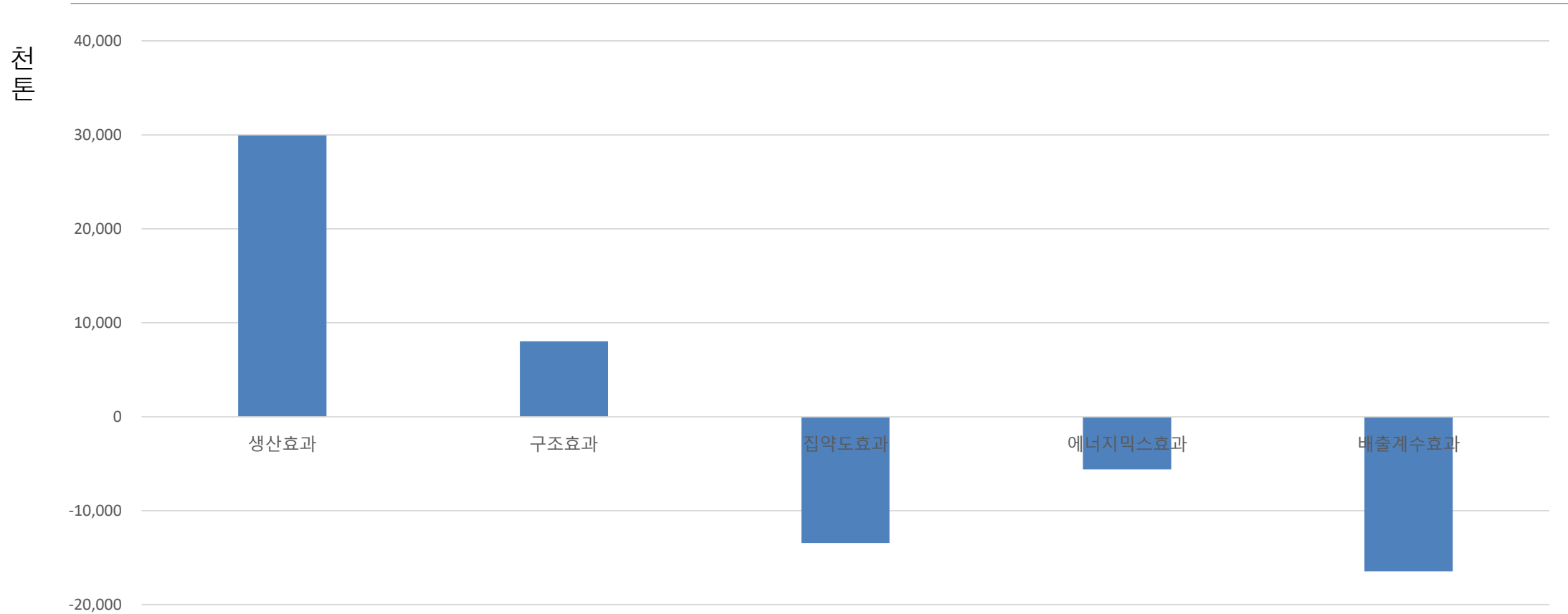
# 산업별 에너지 집약도 (2017)



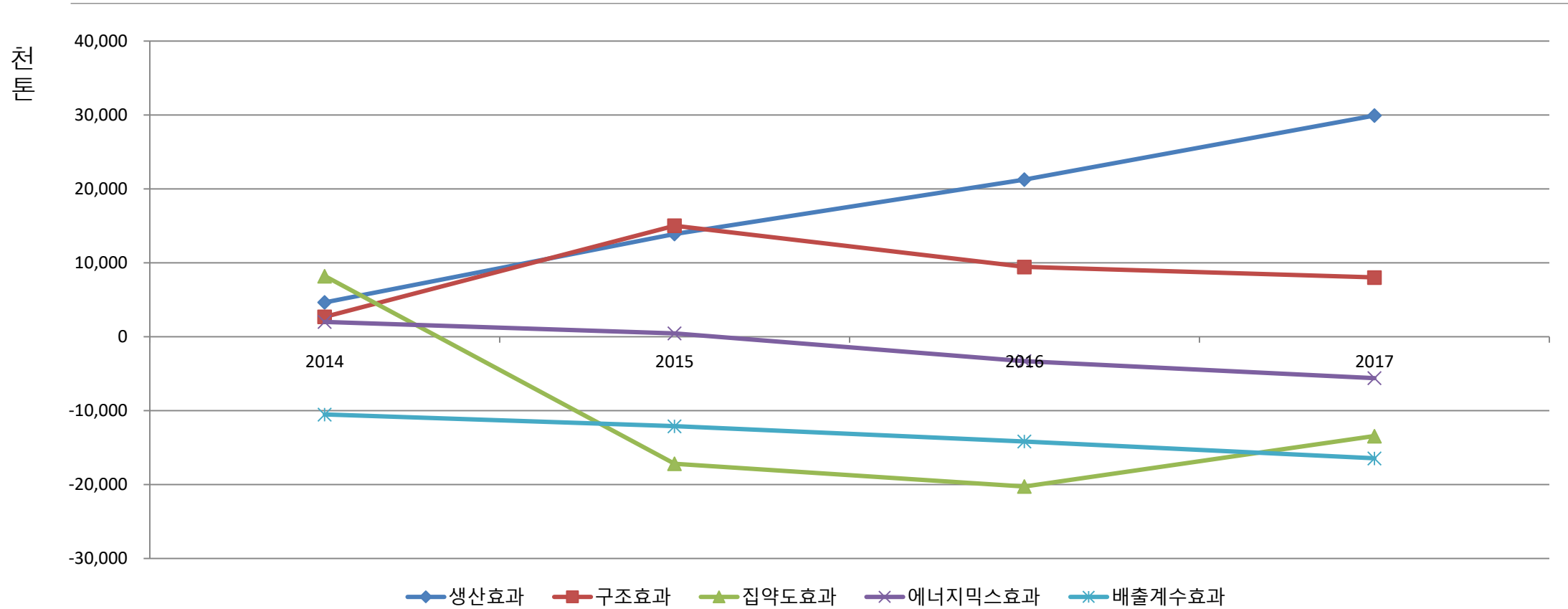
## 2. 국내 산업부문 온실가스 배출 요인 분해

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# 온실가스 배출 요인분해 분석 결과 (공급통계, 2013~2017)



# 요인분해 분석 결과 (공급통계, 기준연도 2013)



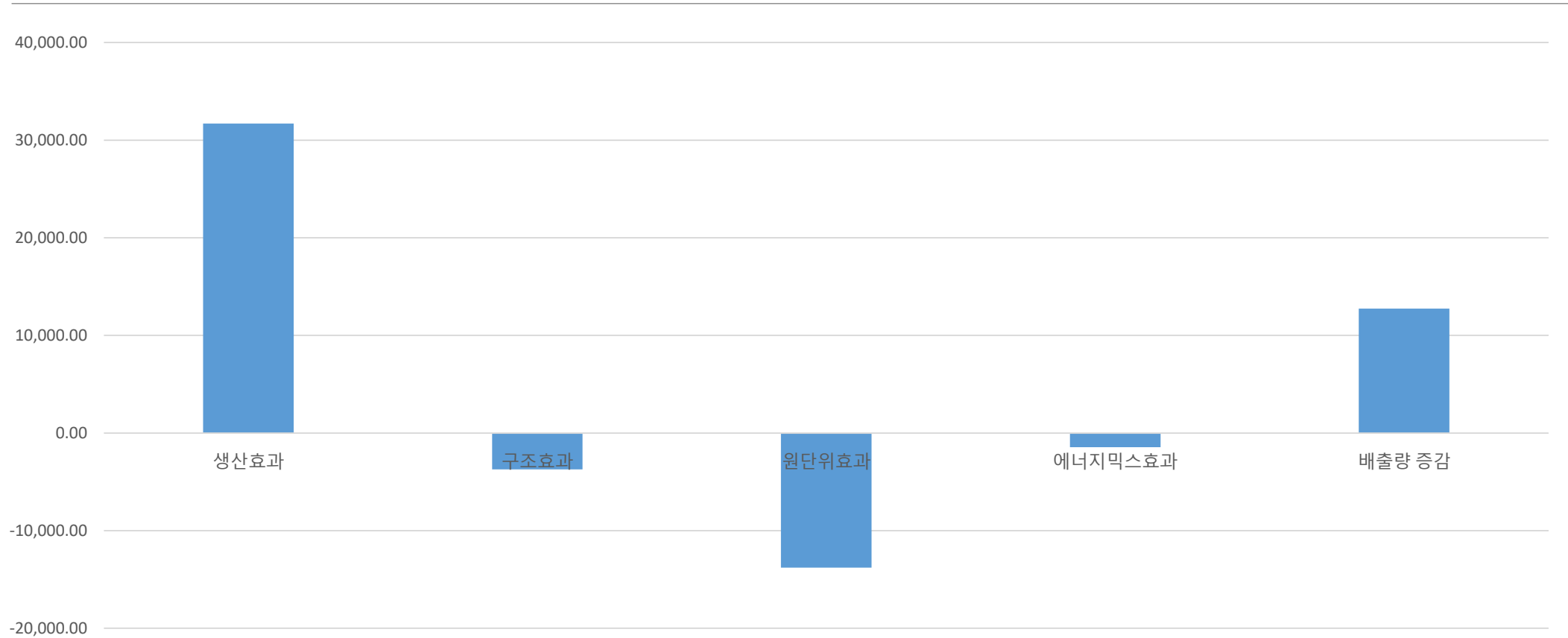
# 업종별 요인분해 분석 결과 (수요통계, 2015-2017)

기준 vs 비교	감축업종코드	감축업종명	생산효과	원단위효과	에너지믹스효과	배출량 증감
2015 vs 2017	01	광업	-33.69	80.25	-0.63	45.94
2015 vs 2017	02	음식료품	2,532.58	-1,779.80	243.27	996.05
2015 vs 2017	03	섬유	-1,498.92	809.16	-299.44	-989.20
2015 vs 2017	04	목재	820.39	-1,057.08	-73.70	-310.39
2015 vs 2017	05	제지	2,863.34	-1,882.98	-178.32	802.04
2015 vs 2017	06	정유	21,944.58	-16,965.19	-2,324.75	2,654.64
2015 vs 2017	07	석유화학	17,745.10	-13,911.42	828.37	4,662.05
2015 vs 2017	08	유리	-1,018.84	999.90	90.79	71.84
2015 vs 2017	09	요업	-737.85	580.60	-41.11	-198.37
2015 vs 2017	10	시멘트	11,868.04	-11,305.97	-138.46	423.61
2015 vs 2017	11	철강	-30,908.64	31,074.93	503.02	669.31
2015 vs 2017	12	비철금속	1,234.27	-732.88	-102.06	399.33
2015 vs 2017	13	기계	1,725.89	-841.11	359.96	1,244.74
2015 vs 2017	14	반도체	5,224.38	-3,398.88	-27.17	1,798.32
2015 vs 2017	15	디스플레이	-1,408.26	1,318.94	-42.86	-132.18
2015 vs 2017	16	전기전자	-410.78	1,301.81	24.08	915.11
2015 vs 2017	17	자동차	-626.76	533.60	-142.89	-236.05
2015 vs 2017	18	조선	-1,500.62	1,389.20	-196.79	-308.21
2015 vs 2017	19	기타제조	166.88	11.71	56.20	234.79

자료: 에너지관리공단



# 업종별 요인분해 분석 결과(수요통계, 2015-2017)

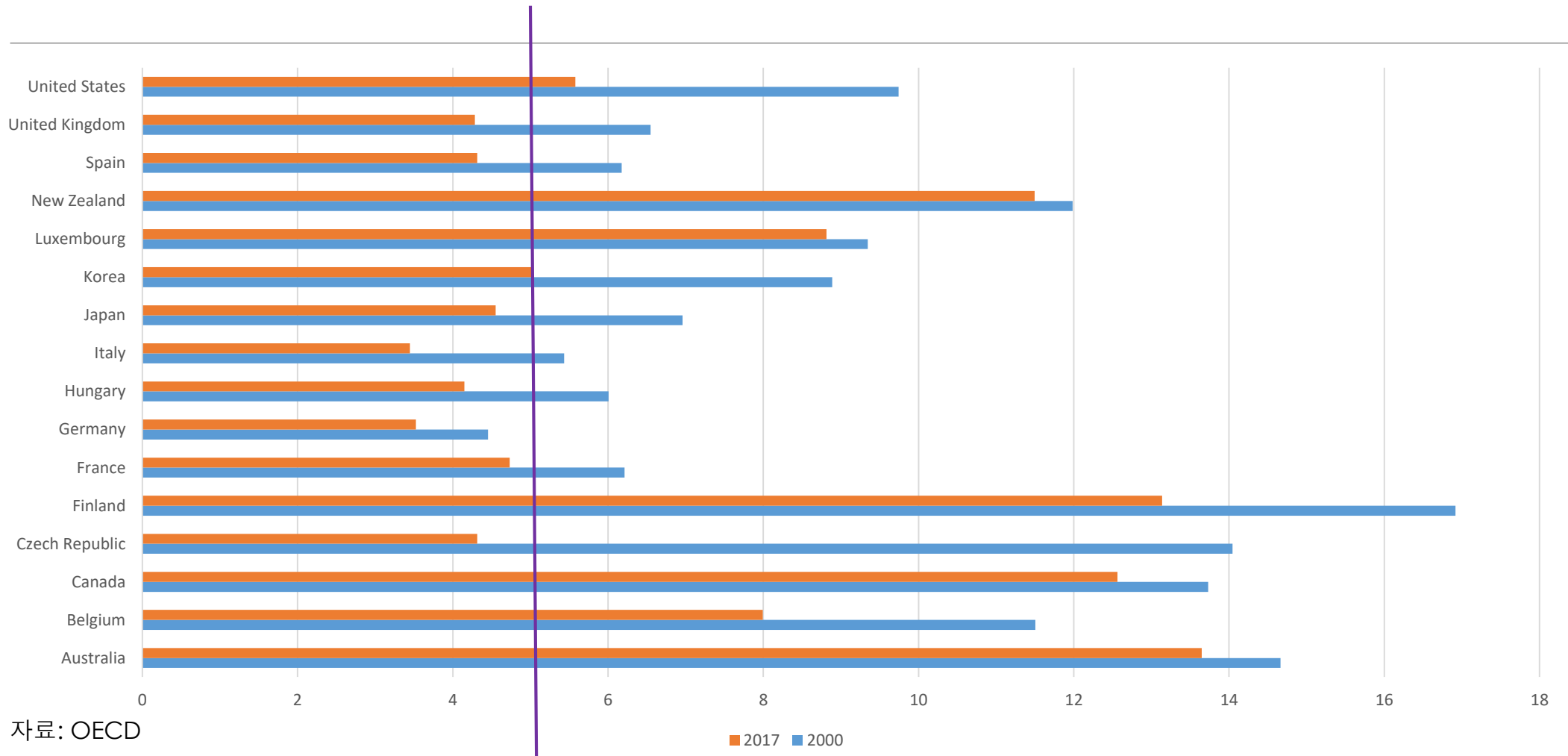


자료: 에너지관리공단

### **3. EU/일본 산업부문 온실가스 감축 전략**

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# OECD 주요 국가의 제조업 산업의 에너지효율 비교 (MJ/2010 USD PPP)



# European **Green** Deal Sustainable Industry

Achieving the EU's climate and environmental goals requires a new **industrial policy based on the circular economy**.



➤ From 1970 to 2017, the annual global extraction of materials **tripled** and it continues to grow.

Source: The International Resource Panel, [Global Resources Outlook](#), 2019



➤ More than **90%** of biodiversity loss and water stress come from resource extraction and processing.

Source: The International Resource Panel, [Global Resources Outlook](#), 2019



➤ EU's industry accounts for **20%** of the EU's emissions.

Source: European Commission, [EU Climate Action Progress Report 2019](#)



➤ Only **12%** of the materials used by EU industry come from recycling.

Source: [Eurostat](#), 2016 figures

# European **Green** Deal Sustainable Industry

**In March 2020, the EU will adopt an industrial strategy that will support the green transformation.**

- Industries must be helped to **modernise and exploit opportunities** domestically and globally.
- A key aim will be to stimulate the development of **new markets for climate neutral and circular products**.

The decarbonisation and modernisation of **energy-intensive industries such as steel and cement** is essential.

**The Commission will make a proposal to support zero carbon steel-making by 2030.**

- 기후중립 및 재활용 제품에 대한 신시장 형성
- 에너지집약적인 산업 (철강, 시멘트 등)의 탈탄소화와 현대화
- 2030년까지 제로카본 철강 제조에 대한 제안서 작성

# European **Green** Deal Sustainable Industry



Europe needs a digital sector that puts sustainability and green growth at its heart. Digitalisation presents new opportunities for:

- monitoring of air and water pollution,
- monitoring and optimising how energy and natural resources are consumed.

The Commission will explore the benefits for consumers of 'take-back' schemes.

This will incentivise people to bring back their devices – mobile phones, tablets or chargers for recycling.

The transition is an opportunity to foster sustainable and job-intensive economic activity.

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PDF ISBN 978-92-76-13680-4 doi:10.2760/1/2019-4

에너지 및 자원의  
소비에 대한 모니터  
링과 최적화에 디지  
털기술의 활용

자원재순환  
재활용

자료: OECD

# 일본의 부문별 장기 전략

## Section 1: Measures for Emissions Reductions

### 1. Energy: For energy transition/decarbonization, pursuing every option

- Utilizing renewable energy as the major power source
- Reducing CO<sub>2</sub> emissions from the thermal power in line with the long-term goals of the Paris Agreement
- Promoting CCS&CCU/Carbon Recycling
- Realizing a "Hydrogen Society"/battery/nuclear/energy efficiency

### 2. Industry: Decarbonized manufacturing

- Use of CO<sub>2</sub>-free hydrogen (e.g. a challenge towards "zero-carbon steel")
- Feedstock change (e.g. CCU including artificial photosynthesis and biomass utilization)
- Achieving drastic energy efficiency, and complete transition from fluorocarbons in mid-long term

### 3. Transport: the challenge of "Well-to-Wheel Zero Emission"

- Achieving the highest level of environmental performance of Japanese vehicles supplied worldwide by 2050
- Road/transport systems using big data and IoT

### 4. Community and Living:

Achieving carbon neutral, resilient and comfortable communities and living by 2050/creating the "Circulating and Ecological Economy"

- Capable communities and corporations to achieve carbon neutrality even before 2050
- Shift to carbon neutral living (encouraging technology development and dissemination to achieve net Zero Energy Buildings, equivalency in stock average of housing and office buildings/ shift of lifestyles)
- Carbon-neutral community building (urban city building, farming/forestry/fishing villages building, and development of distributed energy systems)

### 2. 산업 : 제조업의 탈탄소화

- CO<sub>2</sub> free 하이드로젠 사용
- (e.g, zero carbon steel에 대한 도전
- 인공적인 photosynthesis를 포함한 CCU
- 바이오매스 사용
- 획기적인 에너지 효율
- 장기적으로 fluorocarbons로 부터의 완전한 전환

자료: 일본 환경성



# 일본의 부문간 장기 전략

## Section 1: Promotion of Innovation

·Promoting innovation for practical application and wide usage of cross-sectoral decarbonization technologies leading to drastic reduction of GHG, achieving cost that allows commercialization for social application

### (1) Progressive Environment Innovation Strategy

- Setting clear goals such as costs, maximizing investment of public and private resources, discovering and creating technological seeds in and outside Japan, setting issues from demands, strengthening support that leads to commercialization
- Challenging R&D, and enhancing alliances among R&D institutes with facilitation of international joint R&D activities [Research and Development 20 for clean energy technologies(RD20)]
- Target setting and visualizing challenges for the practical use
  - Realizing hydrogen cost equivalent to existing energy: e.g. lowering manufacturing cost of CO<sub>2</sub>-free hydrogen to 1/10
  - CCU/carbon recycled products to be provided with costs equivalent to existing products, nuclear power(such as Reactor, Fusion)

### (2) Innovation in Economic and Social Systems/lifestyle

## Section 2: Promotion of Green Finance

·Appropriately “visualizing” corporate efforts in innovation etc. and mobilizing finance for innovation by financial institutions

### (1) Mobilizing green finance through TCFD\* disclosures and dialogues ※Task Force on Climate-related Financial Disclosures

- Industry: improving TCFD Guidance & Scenario Analysis Guide / Financial sector: Formulating a guidance on green investment
- Facilitating dialogue between industry and financial sector (TCFD Consortium)
- Promoting discussion and share the above initiatives with the world (TCFD Summit)

### (2) Promoting initiatives to expand ESG finance

- Initiatives for ESG finance (Support to the issuance of green bonds, encouraging local ESG finance), development of ESG Dialogue Platform, enhancing ESG finance literacy, ESG Finance High-Level Panel

## Section 3: Business-led Promotion of International Application, and International Cooperation

·Promoting competitive technologies and products with high environmental performance/ promoting co-innovation benefiting participants from both countries

### (1) Promoting international application of decarbonization technologies together with policy/institutional development and international rule-making

- Promoting international application of decarbonization technologies and reductions of GHG emissions through development of business environment by improving business environment including working for institutional development in partner countries leading international rule-making cooperating in building policy and institutional framework in partner countries and by international rule-making (e.g. establishing public and private-sector initiatives in ASEAN, and developing appropriate international frameworks for utilizing market-based mechanisms)

### (2) Strengthening Development and Investment of infrastructure that contributes to CO<sub>2</sub> emission reductions

- Development and investment of energy and city/transport infrastructure that contributes to CO<sub>2</sub> emission reductions in line with the long-term goals of the Paris Agreement (e.g. renewable energy such as offshore wind power and geothermal power, hydrogen, CCS&CCU/Carbon Recycling, smart cities)

### (3) Creating platforms for global scale decarbonized society building

- Supporting partner countries in the formulation of NDCs and mitigation measures, enhancing transparency in the overall supply chains

### (1) 환경 혁신 전략

- 공공 민간 투자의 명확한 목표 설정
- R&D 도전, 국제적인 공동 R&D연합전선 형성
- 목표 설정과 실용적인 용도에 대한 가시화 : 수소 비용 저감 실현
- CCU/탄소 순환 제품에 대한 비용 저감 등



## 4. 산업부문 온실가스 장기 감축 전략

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# 산업부문별 저탄소 구조 고도화

- 석유화학산업: 대부분 수송용 연료로 사용되는 석유류 소비가 상당부문을 차지하므로, 수송부문의 친환경차 보급확대는 석유화학 산업의 구조조정으로 이어짐.
- 철강산업: 산업부문에 사용되는 대부분의 석탄은 철강생산에 사용되므로 철강생산과정에서 발생하는 온실가스를 획기적으로 저감할 수 있는 기술개발이 관건
- 시멘트 생산과정에서 발생하는 온실가스 역시 저탄소 기술개발이 핵심
- 저탄소기술개발을 국가적인 차원에서 지원할 수 있는 체계마련 : 산학연 공동 기술개발
- 조립금속 산업은 대부분 전력을 수요하므로 이는 전력산업의 저탄소화와 연계 : 저탄소 전력생산은 산업부문의 온실가스 감축에 기여

# 장기감축 전략

## 온실가스 배출권 거래제

- 대부분의 에너지다소비 사업장 온실가스 배출권거래제 시행
- 산업부문 온실가스 목표 설정
- 할당방법 다양화, BM확대, 국제경쟁력 확보방안 동시에 고려
- 경매수입을 온실가스 감축 기술개발 재원으로 활용 (EU참고)

## 산업구조조정

- 신재생에너지 등 저탄소 산업 육성
- 디지털산업 육성, 디지털기술을 이용한 에너지와 자원에 대한 체계적 관리
- 자원 재활용 확대와 카본프리 제품 시장형성
- 친환경차량(전기자동차, 수소자동차)의 개발과 육성 그리고 보급확대

## 온실가스 감축 및 에너지 절약 기술개발 촉진

- 에너지다소비 산업에 대한 온실가스 감축 기술개발 지원 : 산학연 공동기술개발 체계 구축
- 특히 철강산업과 시멘트산업의 탈탄소화를 위한 기술개발 체계 마련, 민간 국제협력체계 구축
- 에너지집약도 개선: FEMS, EMS의 전면 확대시행, 공정개선, 기업에 대한 인센티브 제공