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수소에너지 VC 소개
(수소 에너지 밸류체인 개발 프로젝트)

2024년 2월 22일 (목)

황지현 교수

Hydrogen Energy Value Chain Technology

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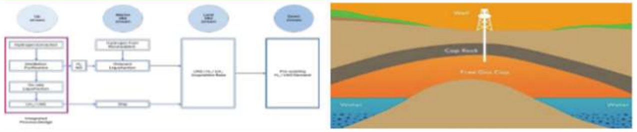
H_2 Production → **H_2 Storage / Transport** → **H_2 Utilization**

H_2 Production

Hydrogen As Primary E-Source

Natural H_2 Exploration and Production (Onshore & Offshore)



Hydrogen As Secondary E-Source

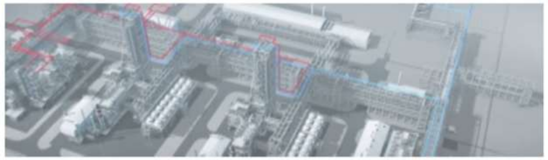
Blue H_2 Production (SMR, ATR, CCS) (Onshore & Nearshore)

Hydrogen As Secondary E-Source

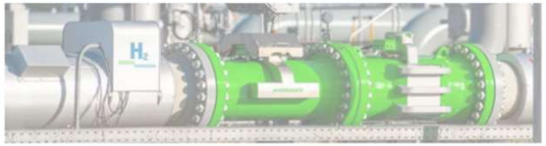
Green H_2 Production (Electrolysis) (Onshore & Offshore & Nearshore)

H_2 Storage / Transport

LH_2 with Cryogenic Liquefaction



Hydrogen Pipeline



Hydrogen Truck for Land

Hydrogen Ship/Vessel for Marine

H_2 Utilization

H_2 Refueling Station & H_2 Mobility

H_2 Import Terminal

H_2 Turbine

Chemicals (Steel, NH_3, etc.)

Hydrogen Value Chain Optimization (LCA & Safety)

Hydrogen Energy Value Chain Development

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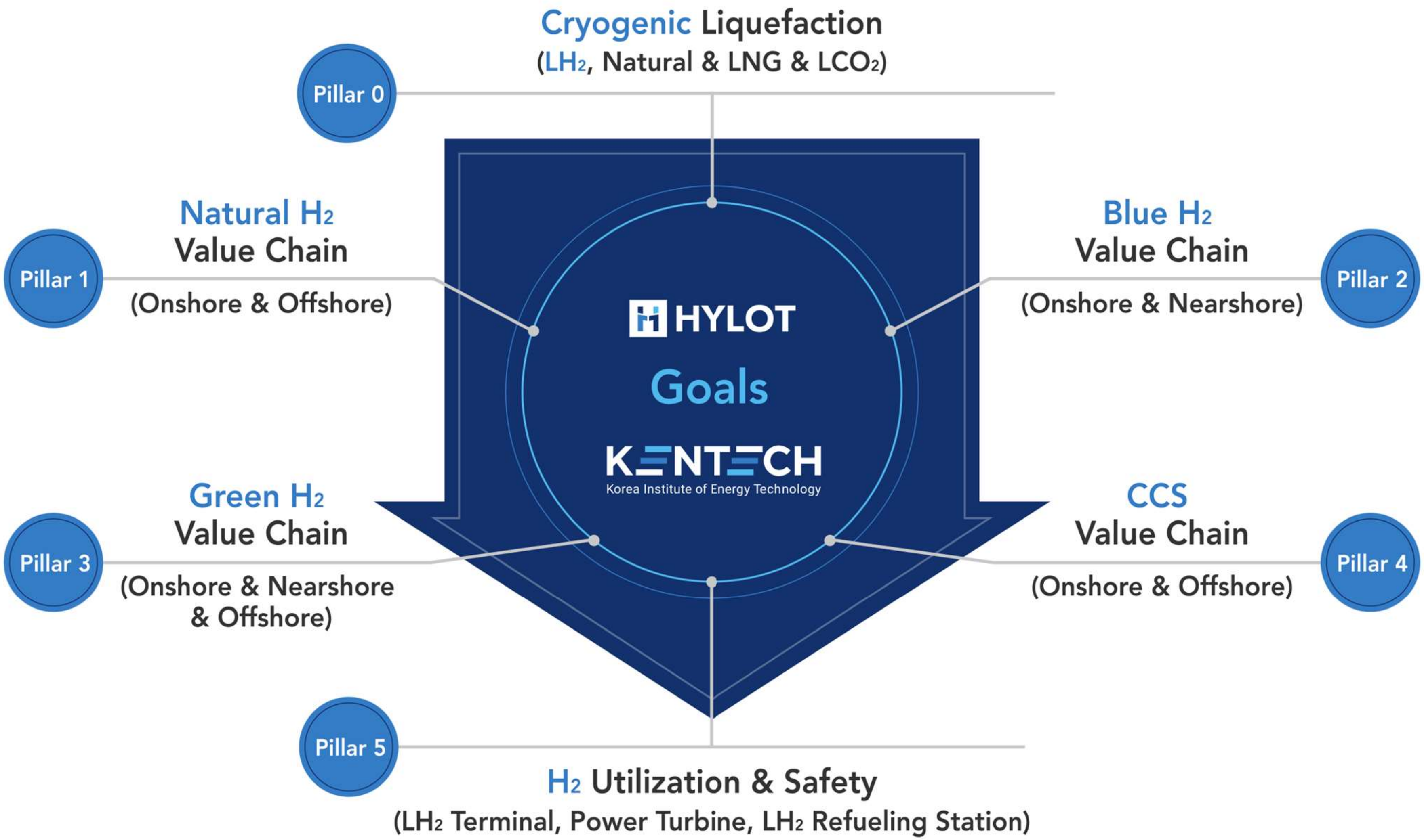
World Leading R&D Lab for HYdrogen Liquefaction & Value Chain Optimization Technologies(HYLOT)



Leading Professor

Hydrogen Energy VC – Hydrogen Syllabus

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1. 수업 계획표(Weekly Plan)

: “Hydrogen Value Chain Development”

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
강의 1		**현장**	**프로젝트 1 (Concept)**				**PT1**	**강의 2 / 프로젝트 2 & 3 (White&Green)**			**현장**	**PT2**	**강의 3 / 프로젝트 4 (Blue)**		**PT3**
담당교수: 황지현															

강의 1 – 수소 전주기 밸류 체인 기술 소개 (2주)

1주차-1	1주차-2	2주차-1	2주차-2
OT, 전주기 밸류체인	수소 생산 기술	수소 저장 & 운송 기술	수소 활용 기술

프로젝트 1 – 수소 밸류 체인 개념 개발 (4주) – 교수자 / 학생설계프로젝트

생산: 천연수소, 그린 수소, 블루 수소, 청록 수소, 그레이 수소 => 비교 분석 후 팀별 선정

공급(저장&운송): 수소 액화, 수소 합성, 고체화, 액상유기수소운반체 => 비교 분석 후 팀별 선정

활용: 에너지 (연료전지, 수소터빈, 수소엔진 등), 석유화학, 제철 등 => 활용처 지정에 따른 선정

최적조합: 수소 생산-공급-활용 전주기 밸류 체인 관점 기술 최적 조합 선정 (팀별 타당성 평가)

강의 2 – 천연 / 그린 수소 밸류 체인 프로젝트 소개 (2주)

1주차-1	1주차-2	2주차-1	2주차-2
OT, 천연 / 그린 수소 밸류체인	핵심 천연 / 그린 수소 기술 (I)	핵심 천연 / 그린 수소 기술 (II)	천연 / 그린 수소 밸류체인 프로젝트

프로젝트 2 & 3 – 천연/그린 수소 밸류 체인 프로젝트 개발 (3주) – 교수자 / 학생 설계프로젝트

프로젝트 명: 세계 천연수소 개발 / 전남 신안 해상 풍력 연계 그린 수소 에너지 섬 개발 팀별 프로젝트

강의 3– 블루 수소 밸류 체인 프로젝트 소개 (2주)

1주차-1	1주차-2	2주차-1	2주차-2
OT, 블루 수소 밸류체인	핵심 블루 수소 기술 (I)	핵심 블루 수소 기술 (II)	블루 수소 밸류체인 프로젝트

프로젝트 4– 블루 수소 밸류 체인 프로젝트 개발 (2주) – 교수자 / 학생 설계프로젝트

프로젝트 명: 대한민국 블루 수소 인프라 개발 팀별 프로젝트

2. 외부활동 계획표

2-1. 외부강의

1) **독일 프라운호퍼 (Klemens 박사)** – 수전해 기술 소개 (1시간, 영어) - 4주차

2) **독일 Linde / 뮌헨공대 (Alexander 교수)** – 수소액화 기술 소개 (1시간, 영어) - 5주차

3) **독일 프라운호퍼 (Carsten 박사)** – 수소연료전지 기술 소개 (1시간, 영어) - 6주차

4) **독일 안할트 대학교 (Holz 교수)** – 수소 밸류체인 소개 (1시간, 영어) - 7주차

5) **SK E&S (전경문 부사장)** – 그린 / 블루 수소 및 액화수소 기술 소개 (1시간, 한글) – 4주차

6) **두산 에너빌리티 (김재갑 상무)** – 액화 수소 및 수소 터빈 기술 소개 (1시간, 한글) – 14주차

2-2. 현장학습

1) **두산 에너빌리티** – 창원 블루 수소 플랜트, 수소액화플랜트, 가스 터빈 생산 현장 견학 – 3주차 또는 4주차

2) **한양** – (천연 수소 및 그린 수소 개발용) 광양 묘도 액화수소 도입터미널 현장 견학 – 12주차

Team Project 1 – Hydrogen Value Chain Concept Development

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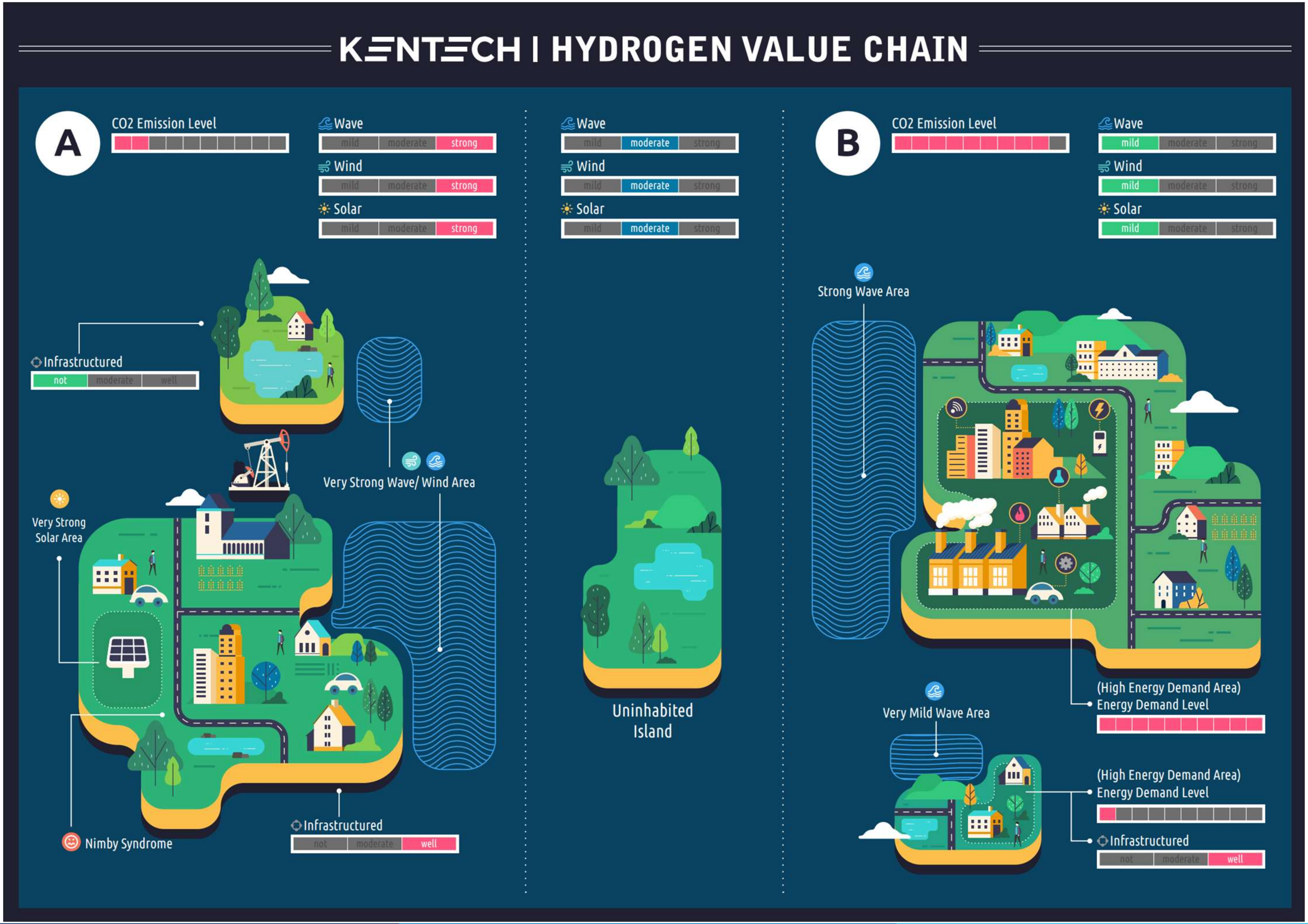

Team Project 1 – Hydrogen Value Chain Concept Development (Production)

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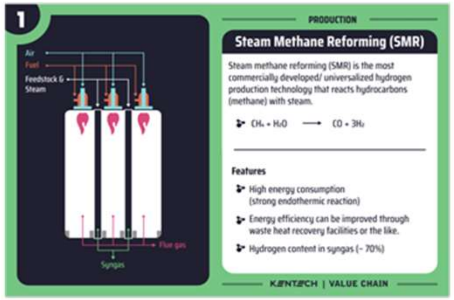

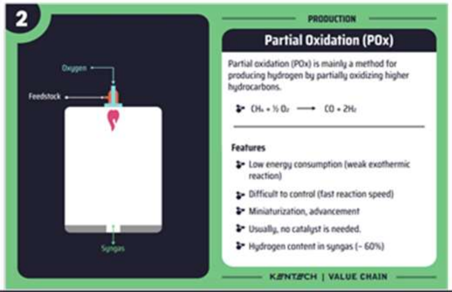

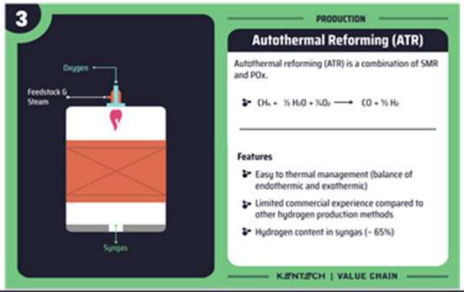

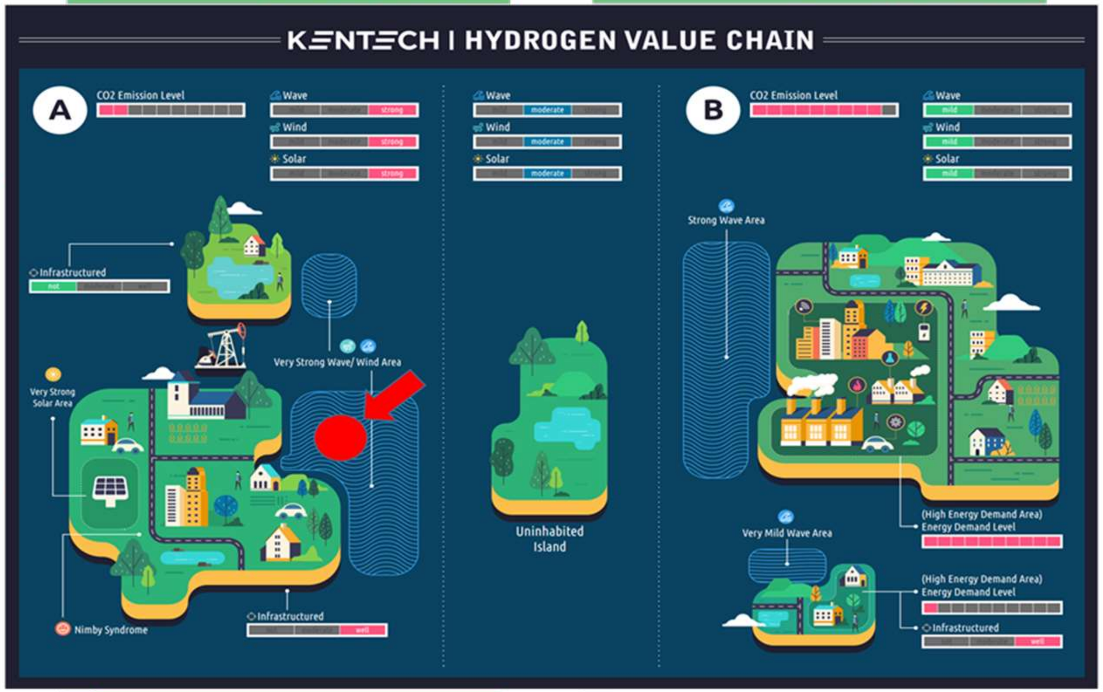

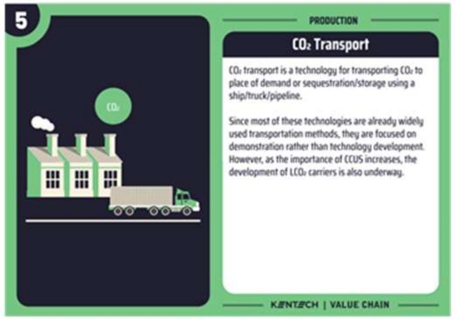

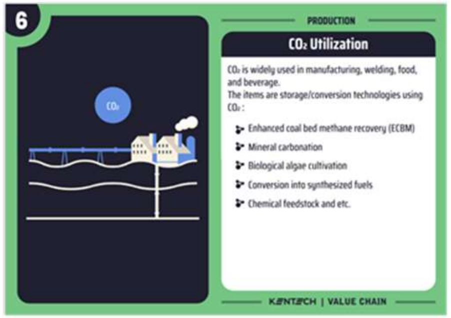

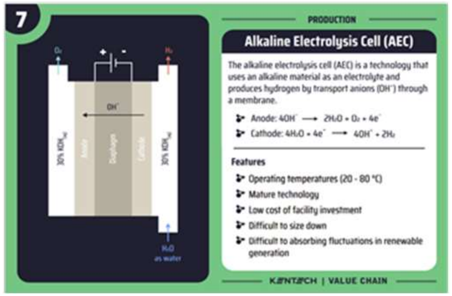

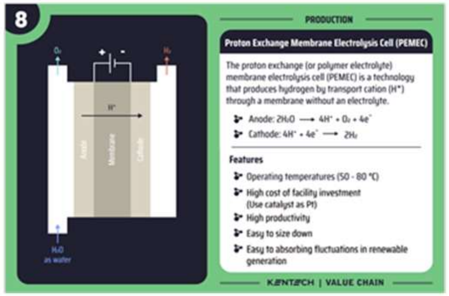

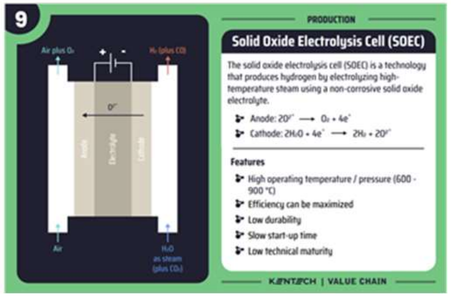

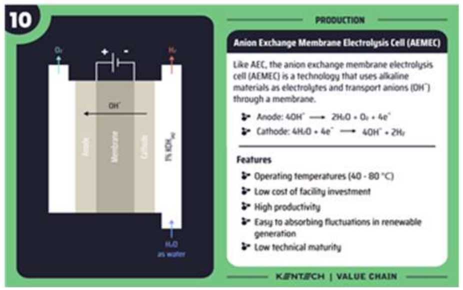

White (Natural) Hydrogen Production ?

Team Project 1 – Hydrogen Value Chain Concept Development (Storage & Transportation)

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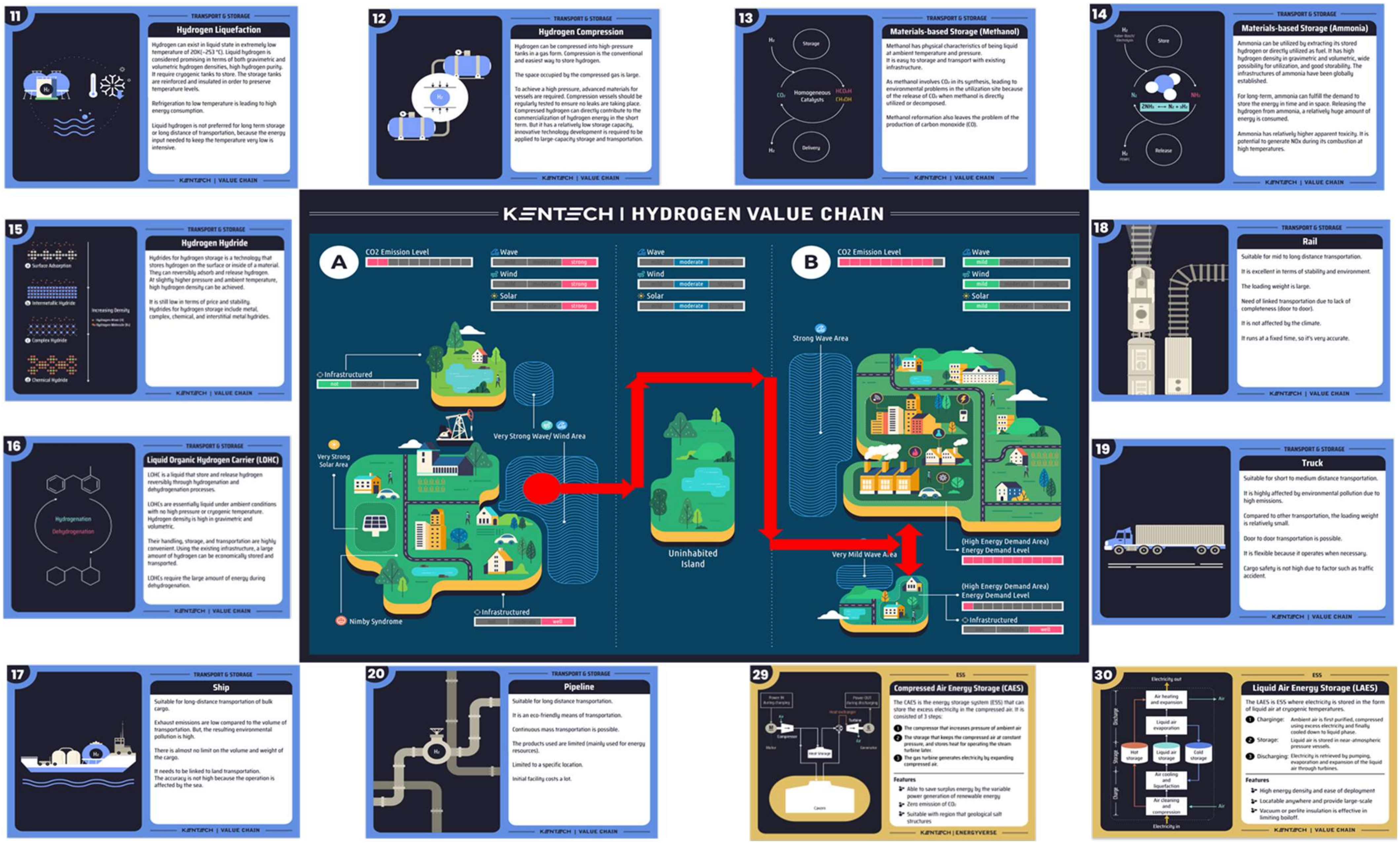

Team Project 1 – Hydrogen Value Chain Concept Development (Utilization)

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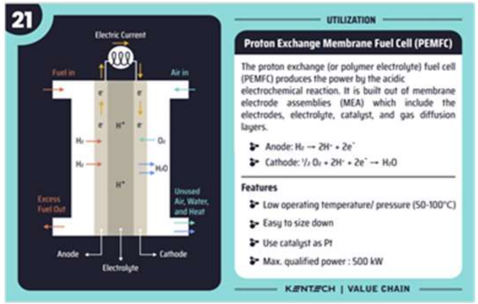

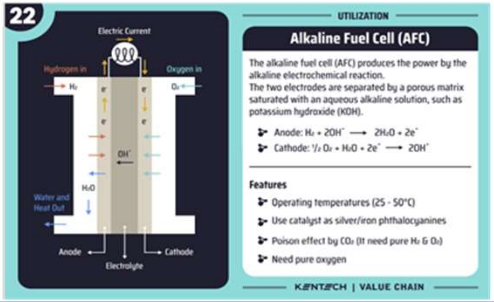

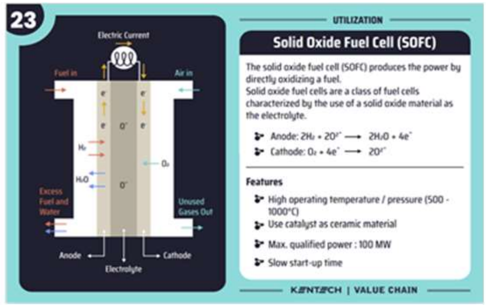

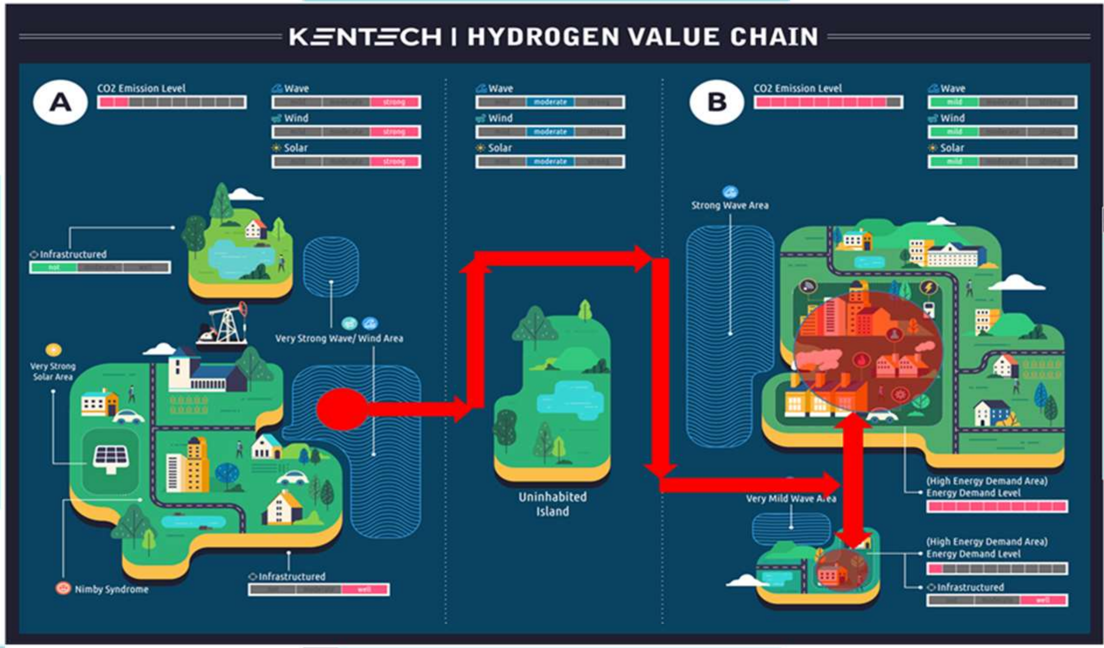

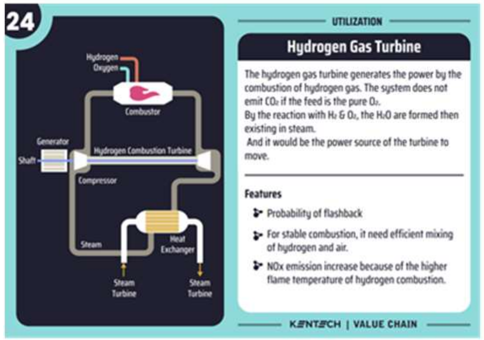

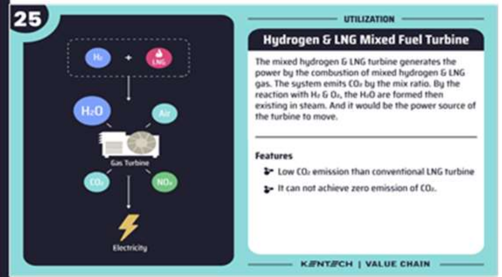

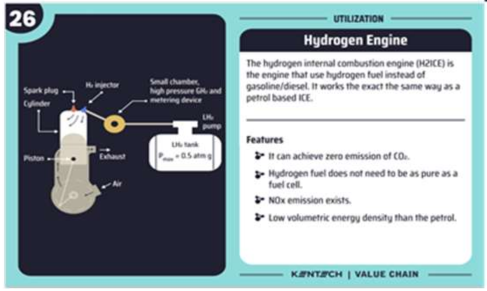

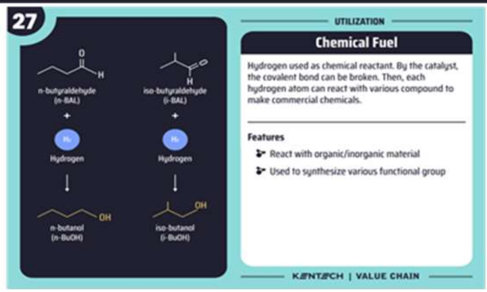

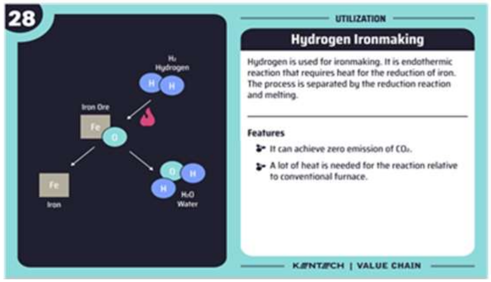

Team Project 1 – VC Promotion Video on Youtube & Feedbacks

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KENTECH Visionary Course (Hydrogen Energy)

Team Project 2 – White (Natural) Hydrogen Value Chain Development (World Natural Hydrogen Project Development)

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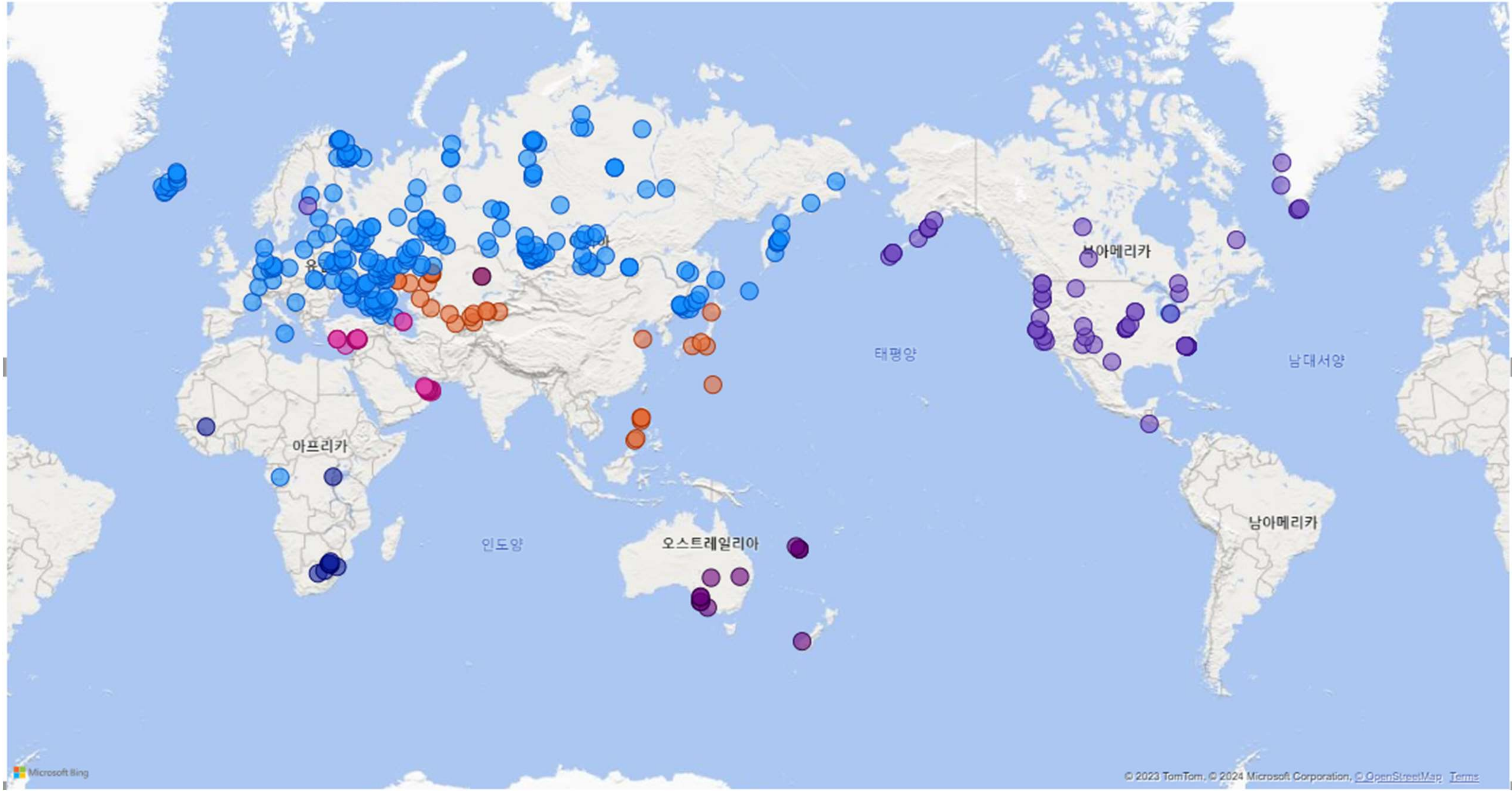
Region, Lat(위도) 및 Long(경도)

Region ●(공백) ●Africa ●Asia ●Europe ●Middle East ●North America ●Oceania



Team Project 2 – White (Natural) Hydrogen Value Chain Development (World Natural Hydrogen Project Development)

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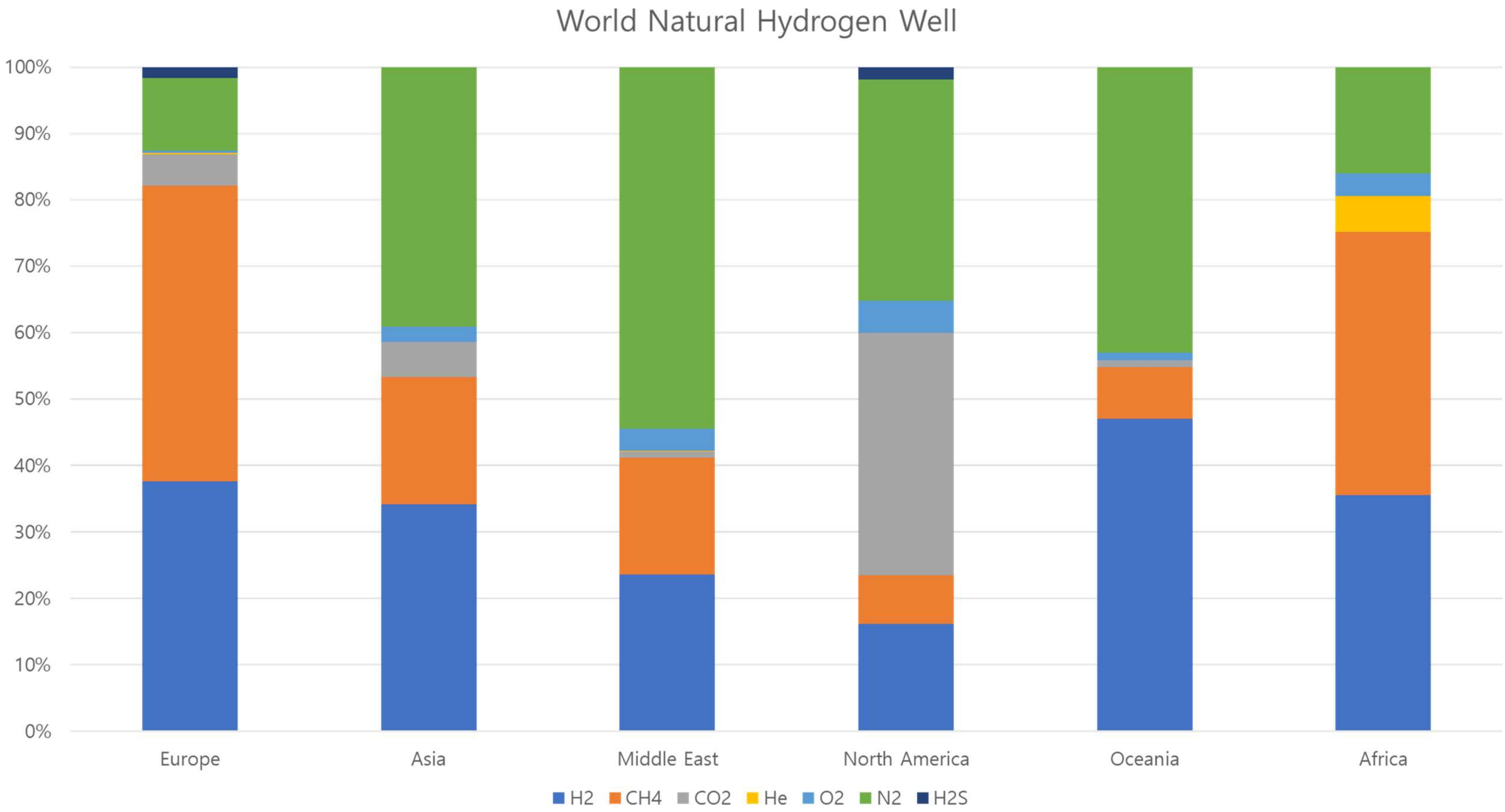

Team Project 2 – White (Natural) Hydrogen Value Chain Development (World Natural Hydrogen Project Development)

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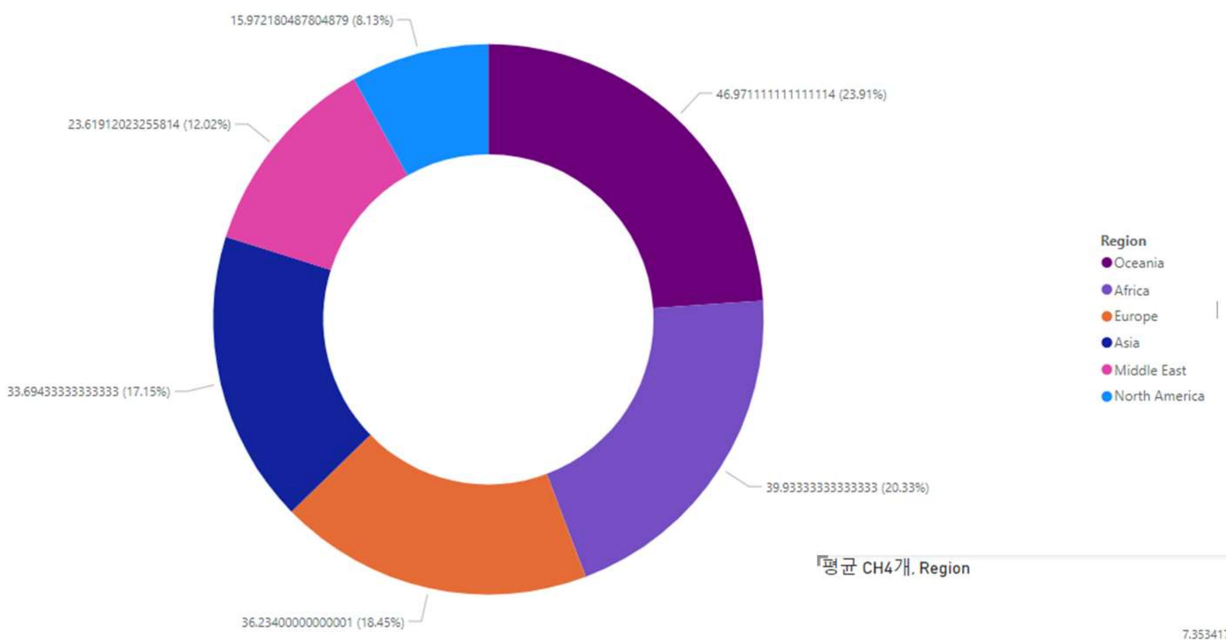
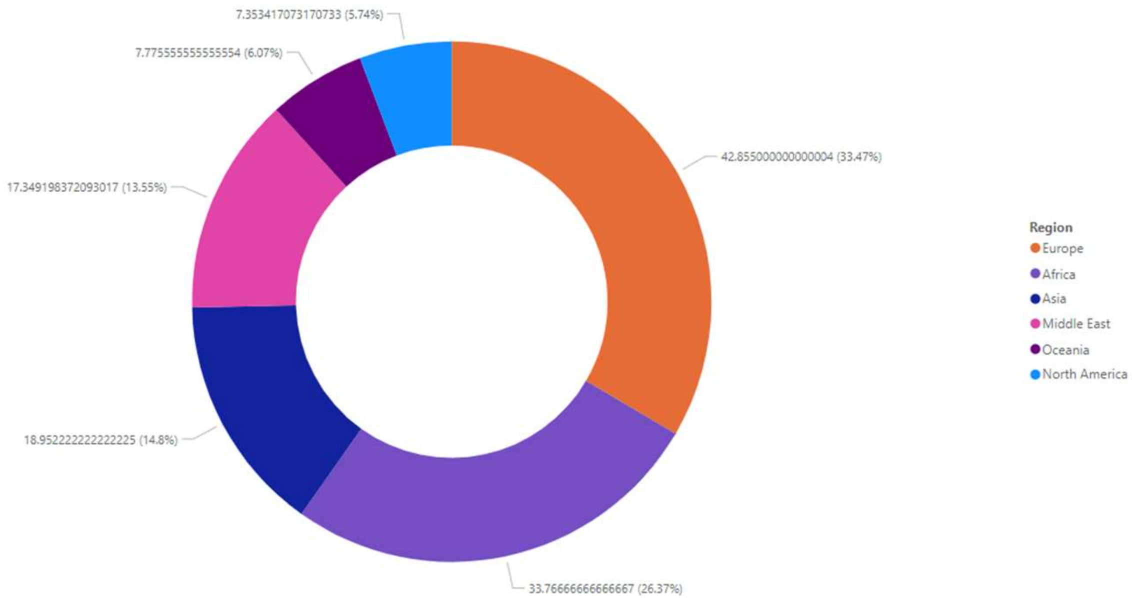
평균 H2개. Region



평균 CH4개. Region



Team Project 2 – White (Natural) Hydrogen Value Chain Development (World Natural Hydrogen Project Development)

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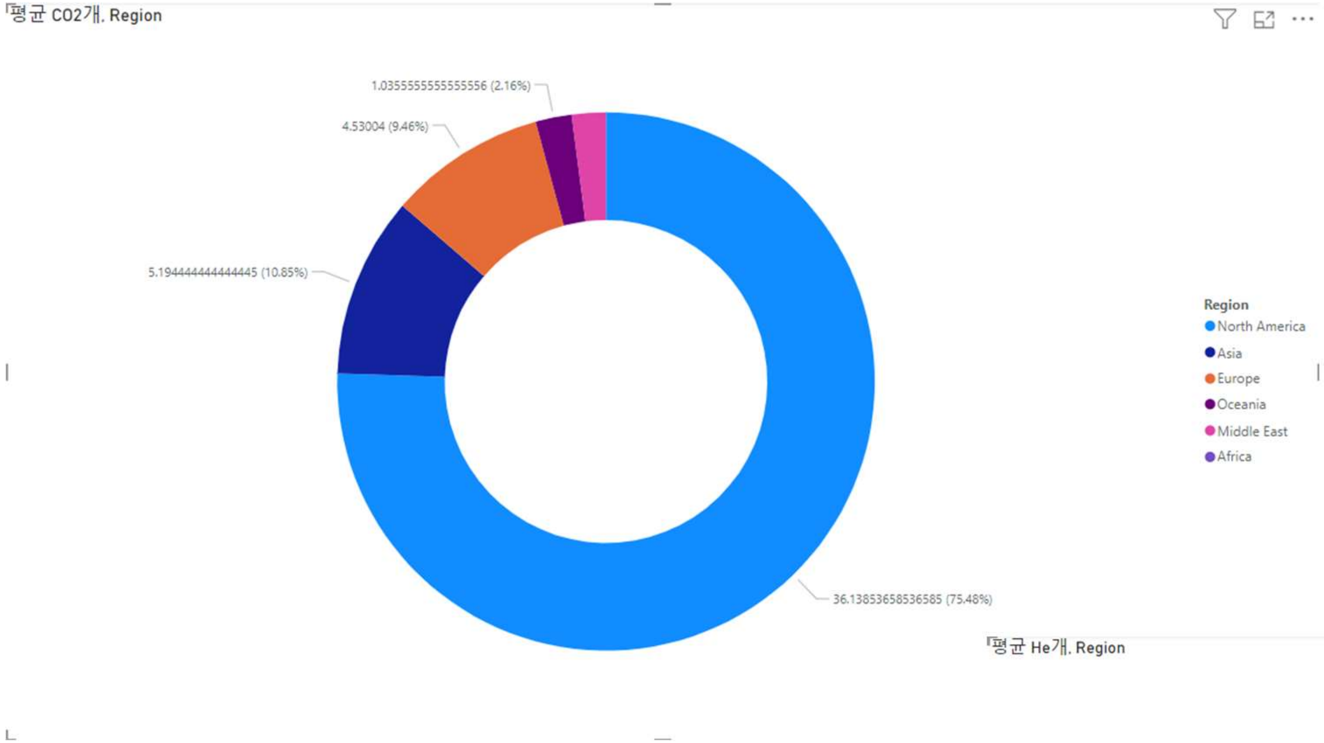

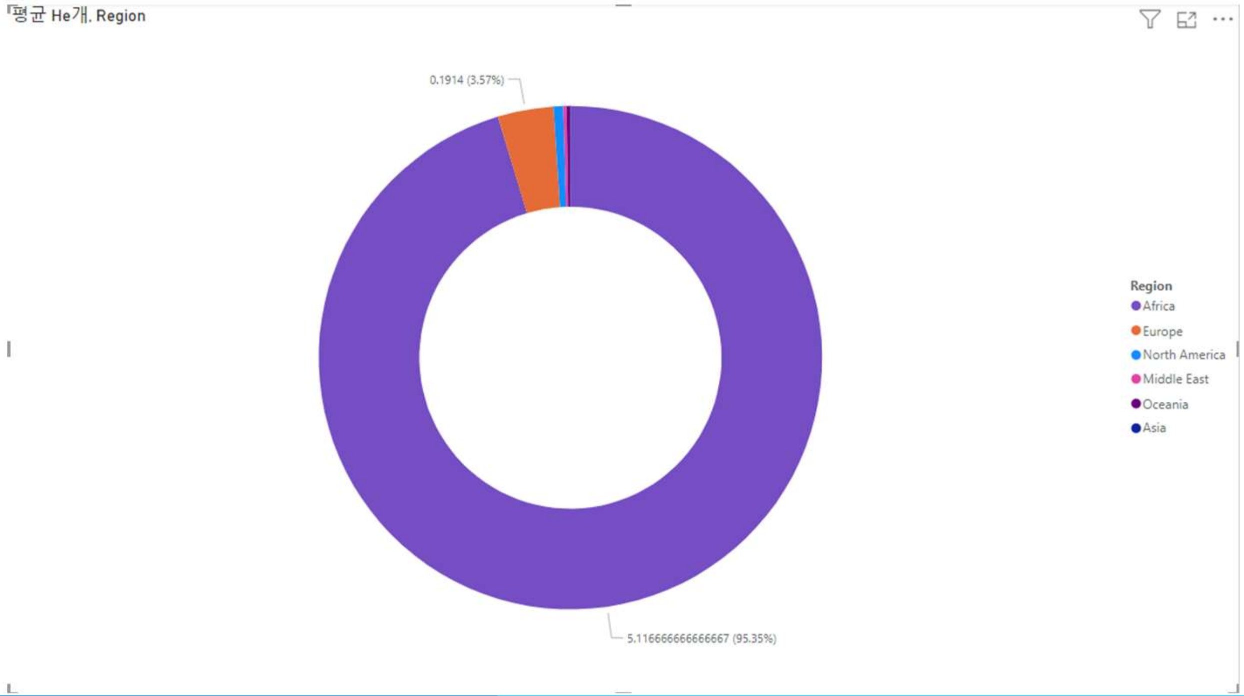

Team Project 2 – White (Natural) Hydrogen Value Chain Development (World Natural Hydrogen Project Development)

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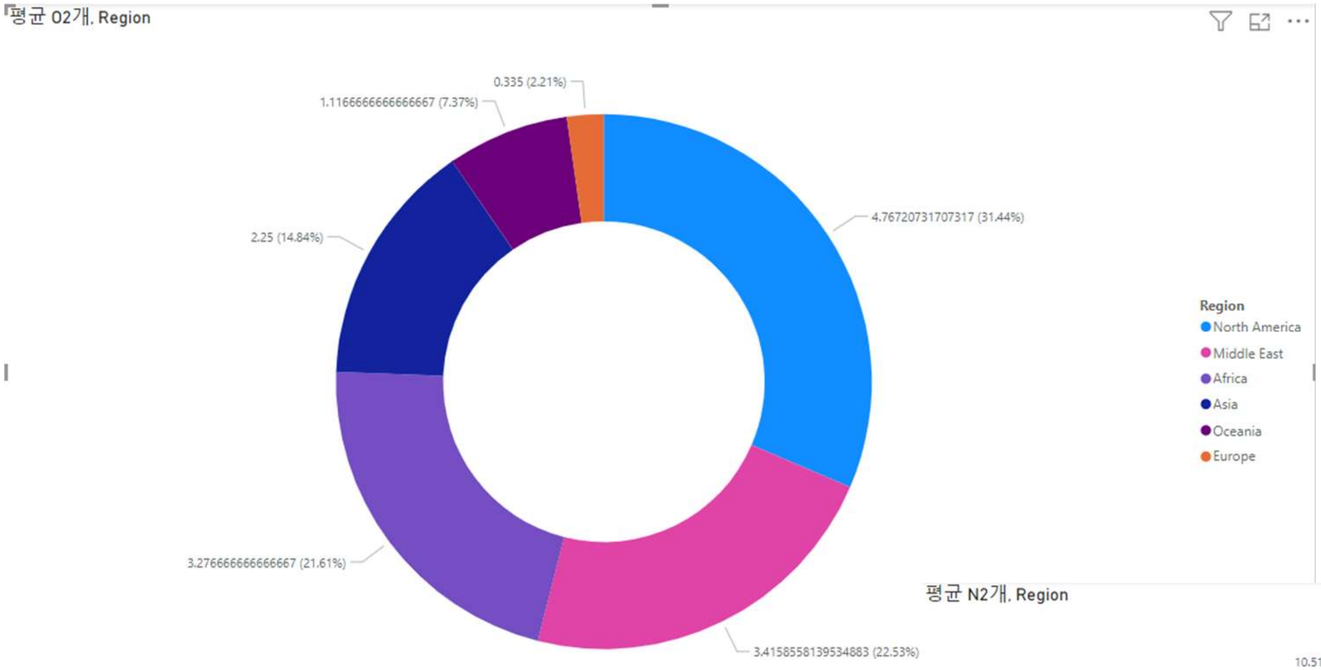

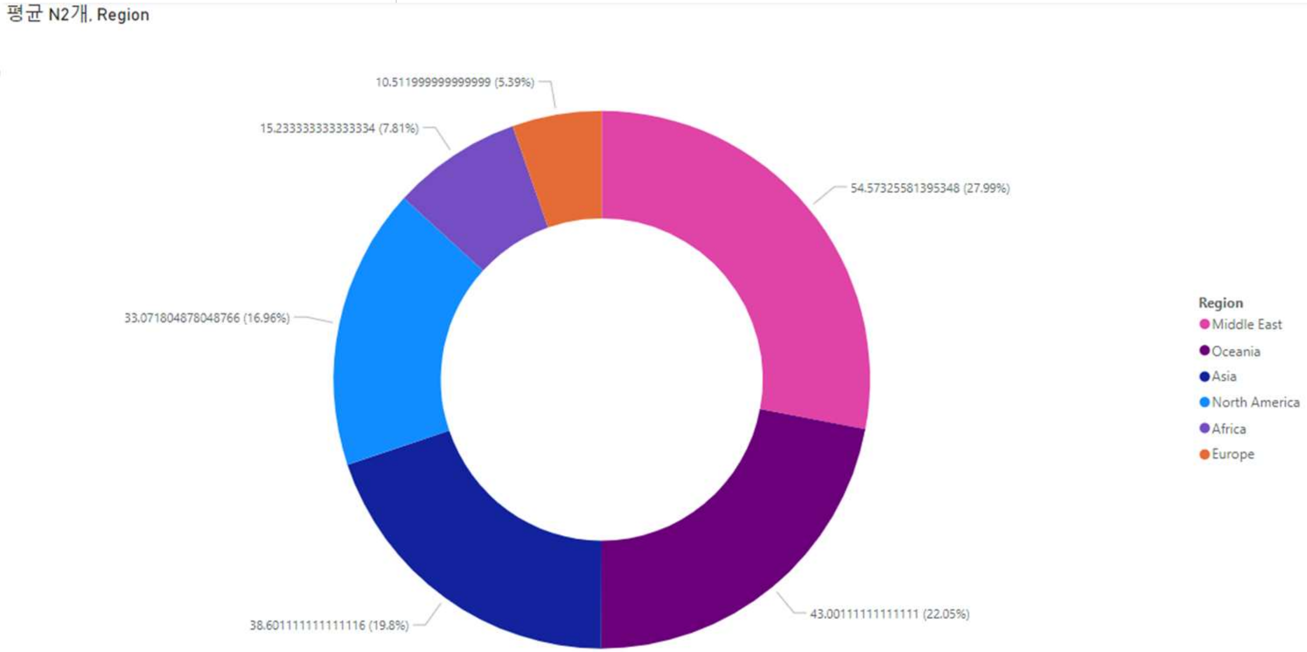

Team Project 2 – White (Natural) Hydrogen Value Chain Development (World Natural Hydrogen Project Development)

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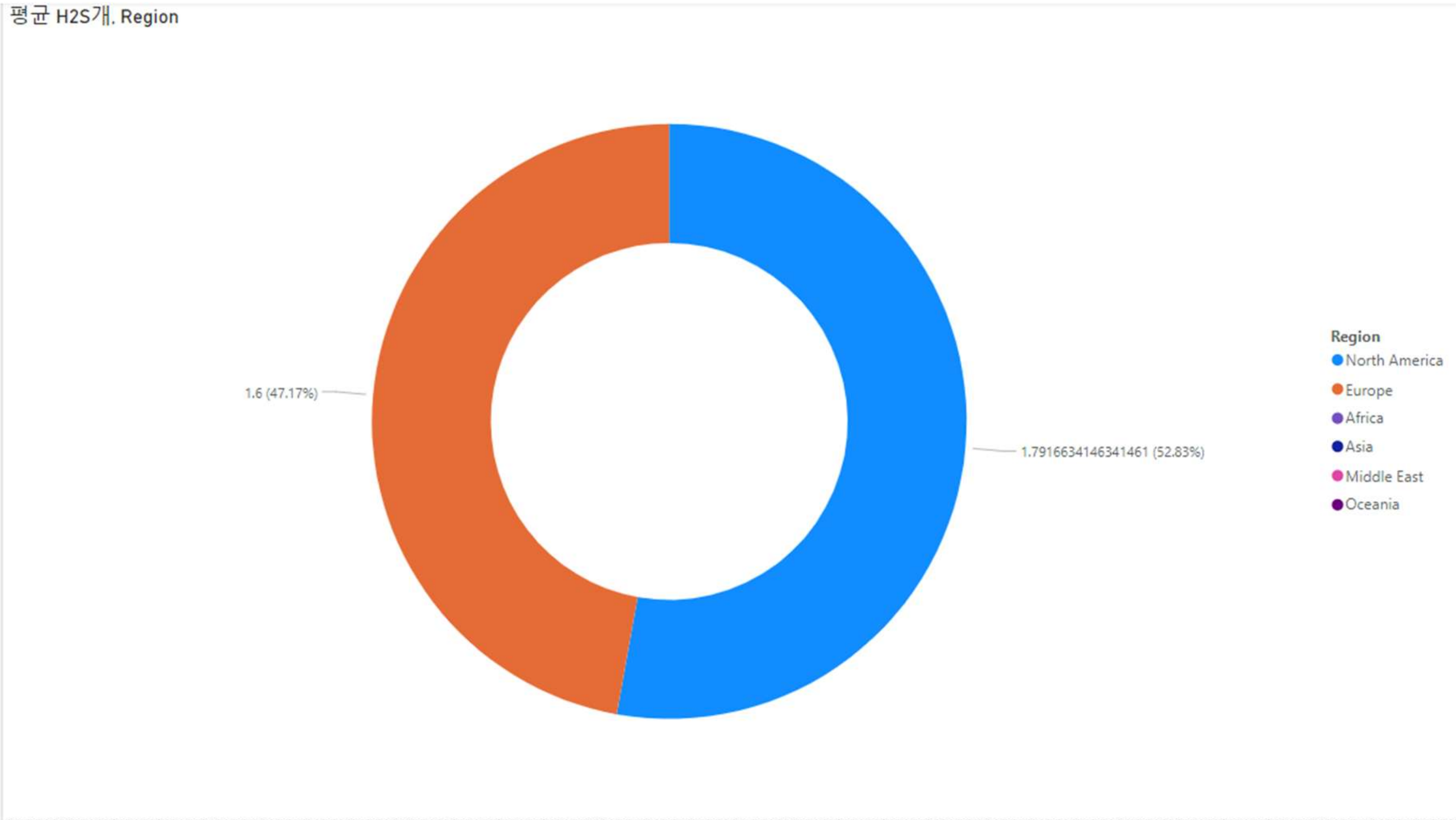

Team Project 3 – Green Hydrogen Value Chain Development (Green Hydrogen Energy Island Development)

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Team Project 3 – Green Hydrogen Value Chain Development (Green Hydrogen Energy Island Development)

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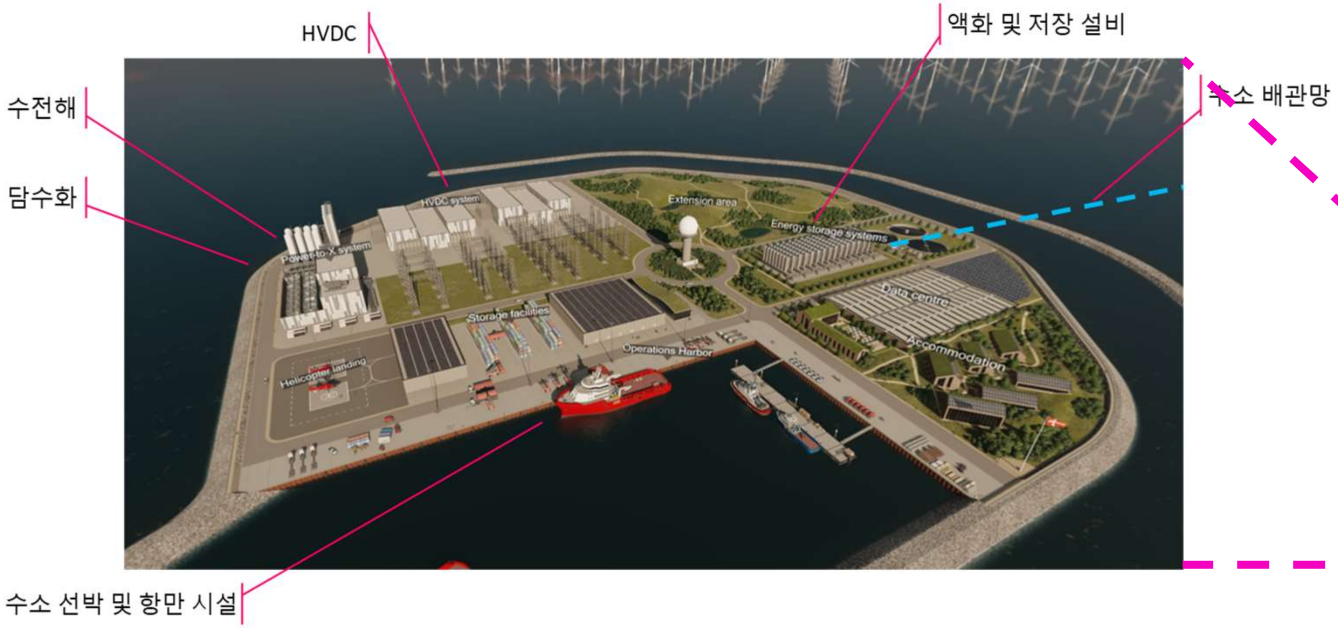

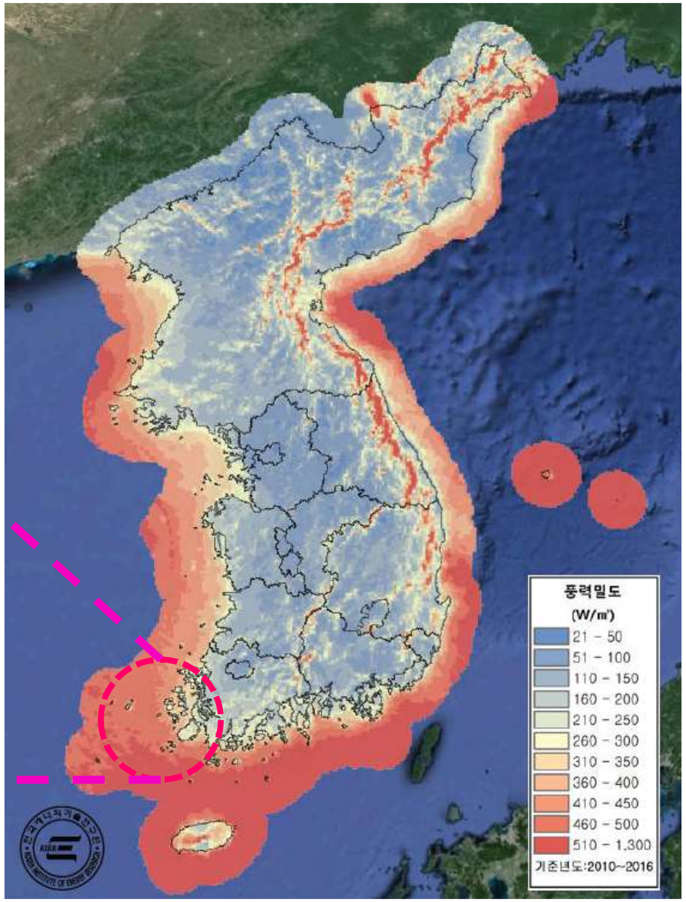

Team Project 4 – Blue Hydrogen Value Chain Development (Blue Hydrogen Development in South Korea)

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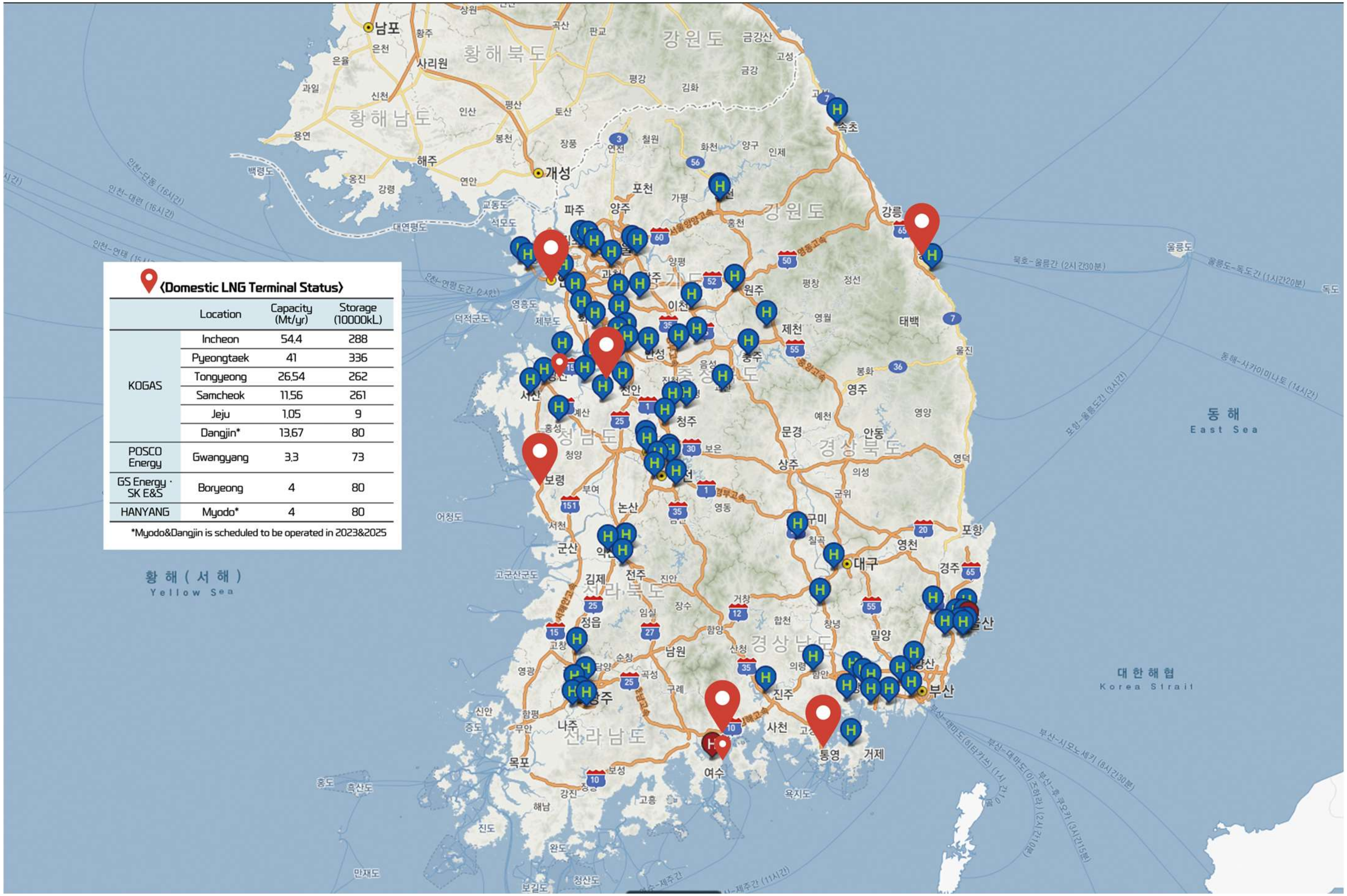

〈Domestic LNG Terminal Status〉

	Location	Capacity (Mt/yr)	Storage (10000kL)
KOGAS	Incheon	54.4	288
	Pyeongtaek	41	336
	Tongyeong	26.54	262
	Samcheok	11.56	261
	Jeju	1.05	9
	Dangjin*	13.67	80
POSCO Energy	Gwangyang	3.3	73
GS Energy · SK E&S	Boryeong	4	80
HANYANG	Myodo*	4	80

*Myodo&Dangjin is scheduled to be operated in 2023&2025

Team Project 4 – Blue Hydrogen Value Chain Development (Blue Hydrogen Development in South Korea)

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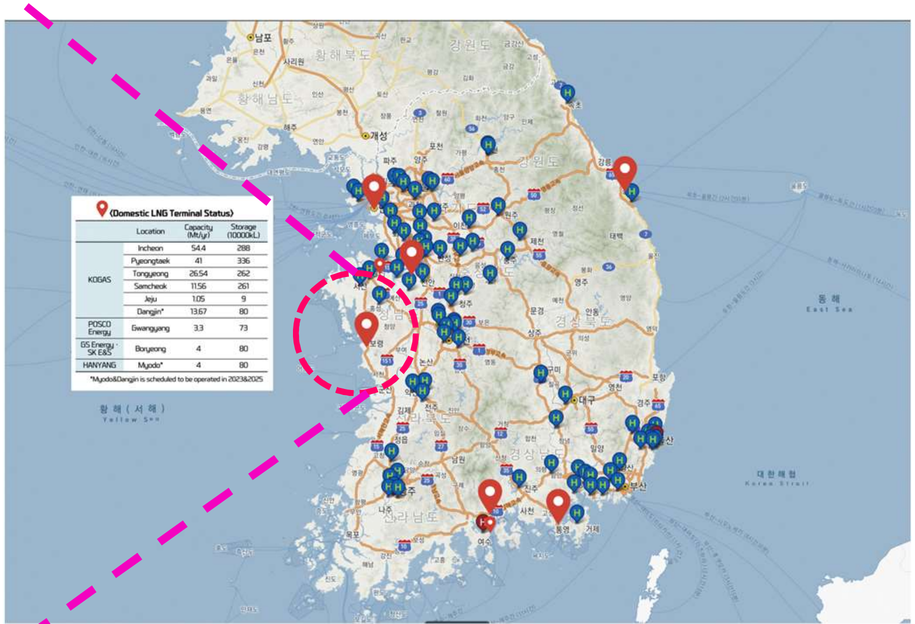

	Location	Capacity (Mt/yr)	Storage (10000kL)
KOGAS	Incheon	54.4	288
	Pyeongtaek	41	336
	Tongyeong	26.54	262
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	Jeju	1.05	9
	Dangjin*	13.67	80
POSCO Energy	Gwangyang	3.3	73
GS Energy · SK E&S	Boryeong	4	80
HANYANG	Myodo*	4	80

*Myodo&Dangjin is scheduled to be operated in 2023&2025