

DISH TYPE SOLAR THERMAL COLLECTOR

Geumchul as an Innovative Solar Energy System Provider

www.gcenergy.co.kr

03. 2023



ABOUT US

Name	Geumchul
Established	Jun. 20, 2020
CEO	Eun-Suk Jeong
Employees	18 Employees
Location	Naju-si, Jeollanam-do, Republic of Korea
Product	Dish Type Solar Thermal Collector (Hae.Balagi)
Capacity	30 Units/Month ('22) → 100 Units/Month ('23)



※ Geumchul holds seven(7) Domestic Patents and two(2) International Patents under examination



ABOUT US

2020



JUN

Company established

2021



MARCH

Signed Technology License Agreement w/ "KEPCO"

2021



JUN

Developed Proto-type Solar Thermal Collector

2021



JUL

Completed Workshop and established R&D Center

2022



JAN

Qualified ISO 9001, 14001

2022



MAY

Delivered 2 Sets of Hae.Balagi to BAT Korea

2022



AUG

Site Validated 2 Sets of Hae.Balagi w/ BAT Korea

2022



AUG

Nominated as an Innovative Item by PPS (Gov. Agency)

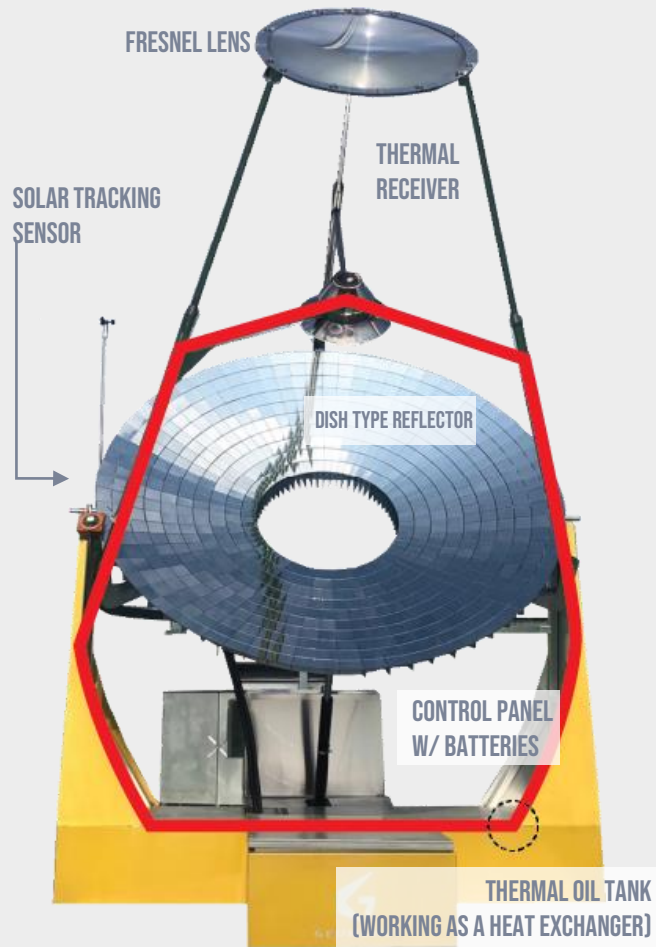
GLOBAL BENCHMARKING PROJECTS ... W/DISH TYPE SOLAR THERMAL COLLECTOR



MARICOPA SOLAR PLANT 1,500KW PEORIA, ARIZONA, USA

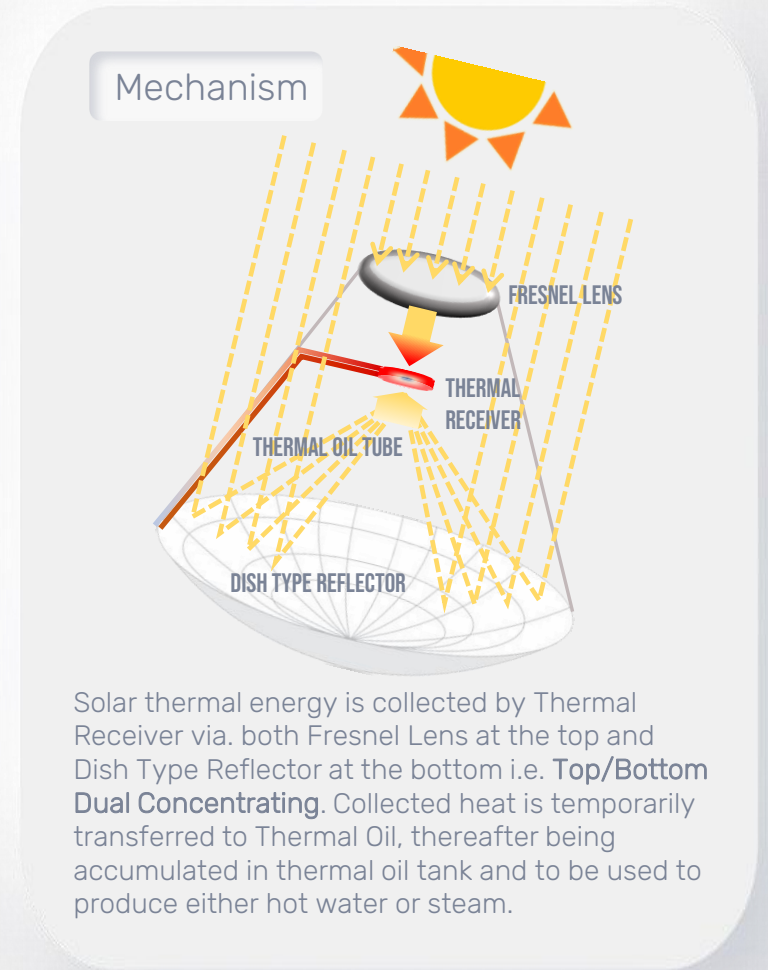
- The first utility-scale commercial CSP plant operating in the US.
- Total 1,500 kW (60 Sets x 25 kW/Set) ... power generation by Stirling Engine
- SunCatcher Parabolic Dish Type Solar Energy Collector (Dish Diameter : 11.6m)
- Start commercial operation : 2010

PRODUCT SPECIFICATION



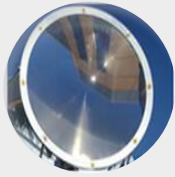
Product Name	Hae.Balagi 3.0 / Hae.Balagi 4.2 Dish type Solar Thermal Collector
Mechanism	Top/Bottom Dual Concentrating Automatic Solar Tracking
Working Fluid	Thermal Oil (Heat Transfer Medium)
Working Temp.	Thermal Receiver : >2,600°C Thermal Oil : ~300°C
Foot Print	Hae.Balagi 3.0 : 3.0 mW x 3.0 mL Hae.Balagi 4.2 : 4.2 mW x 4.2 mL
Weight	Hae.Balagi 3.0 : Approx. 1.0 ton Hae.Balagi 4.2 : Approx. 1.3 ton
Monitoring/Control	IoT TouchPNL w/Smart Phone App.
Self Power Source	Solar Panel & Batteries (Solar Panel can be installed remotely.)
Expected perf.	It's performance depends on site location, system configuration, application & number of units to be installed. Please contact the following person in GEUMCHUL with site Information and specific requirements. Minsup Oh Head of Strategic Biz. Division/GEUMCHUL T +82 10 4333 4322 / oh8248@gcenergy.co.kr
Storm Protection	Dome Tent Blind System (Option)

※ SOLAR PANELS CAN BE INSTALLED EITHER ON-SKID OR REMOTELY.



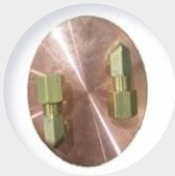
Solar thermal energy is collected by Thermal Receiver via both Fresnel Lens at the top and Dish Type Reflector at the bottom i.e. **Top/Bottom Dual Concentrating**. Collected heat is temporarily transferred to Thermal Oil, thereafter being accumulated in thermal oil tank and to be used to produce either hot water or steam.

MAJOR COMPONENTS



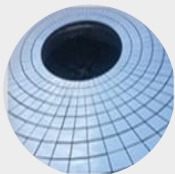
FRESNEL LENS

- Thin and flat optical lens located at the top with narrow concentric grooves
- Tracking the accurate position of the sun and collecting solar thermal energy



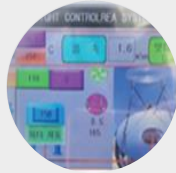
THERMAL RECEIVER

- Circular copper plate located between Fresnel lens and reflector
- Collecting heat from both top/bottom side, and heating up thermal oil



DISH TYPE REFLECTOR

- Parabolic dish type reflector with 700~1,000 pieces of mirror plate
- Located at the bottom and concentrating solar thermal energy on receiver



MOITORING & CONTROL PANEL

- lot Touch Panel to overally monitor and control the whole system
- Linked with smartphone application enabling remote monitoring /control



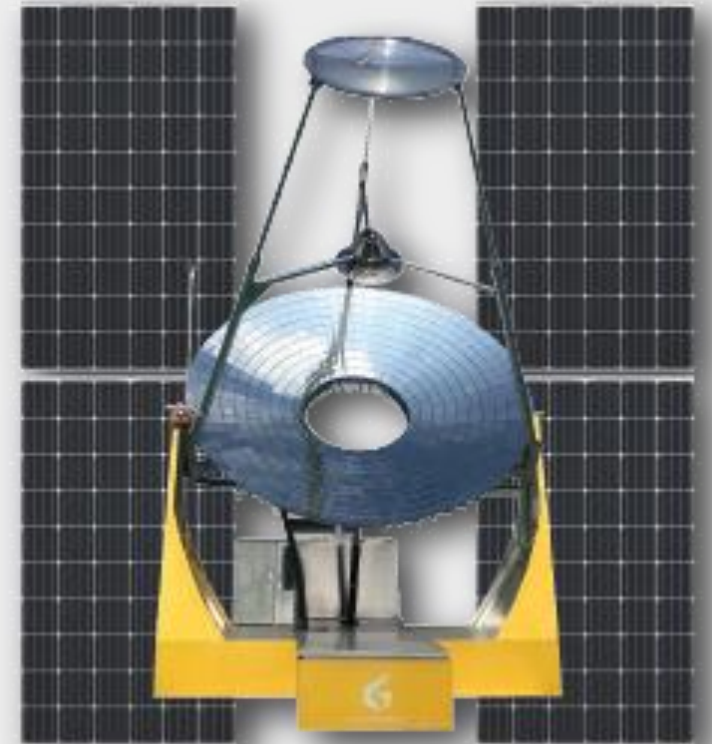
SOLAR PANEL

- Independent power source ... power to IoT Touch Panel, hydraulic motors
- Surplus power to be stored at the battery or to be used for other use



THERMAL OIL TANKS (WORKING AS A HEAT EXCHANGER)

- Shell & tube type heat exchanger to produce steam or hot water
- Integrated in rotating skid ... no additional space required



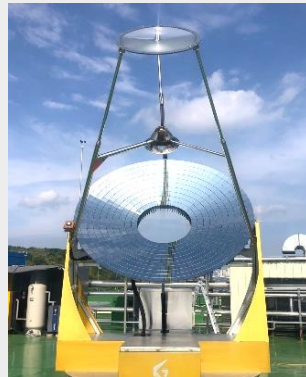
PRODUCT OVERVIEW

HAE.BALAGI (Geumchul's Dish Type Solar Thermal Collector)

- An innovative dish type solar thermal collection system that Geumchul had developed based on the source technology from KEPCO & KOPTI ("KEPCO" Korea Electric Power Corporation, "KOPTI" Korea Photonics Technology Institute)
- World's first and only top/bottom dual concentrating solar thermal collection mechanism (Thermal receiver is located in between Fresnel lenses and dish reflector.)
- Hybrid type combining dish type solar thermal collector and conventional solar panel (No external power is required)
- Compact modular & fully packaged design ... easy to install and operate (Applicable to remote areas with poor energy infra)
- More suitable for higher temperature (~150°C) hot water or steam demand (able to meet thermal demand from various industry)

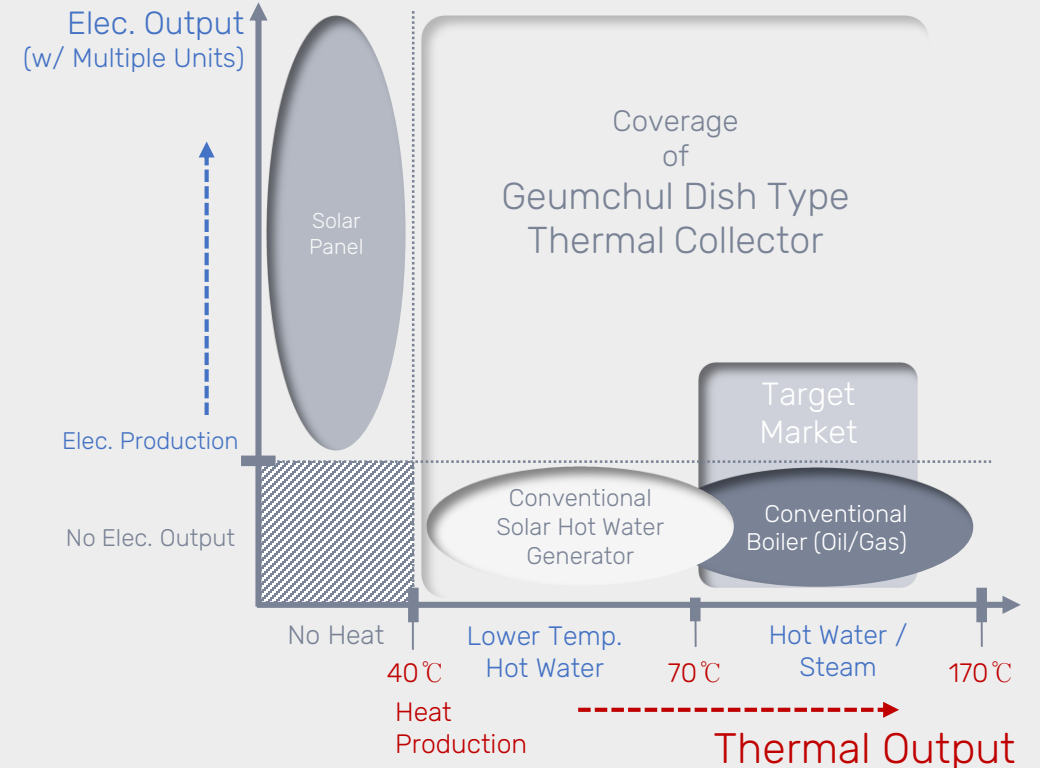


Installed Base : BAT Korea Sacheon Factory (2 Sets)



PRODUCT POSITIONING

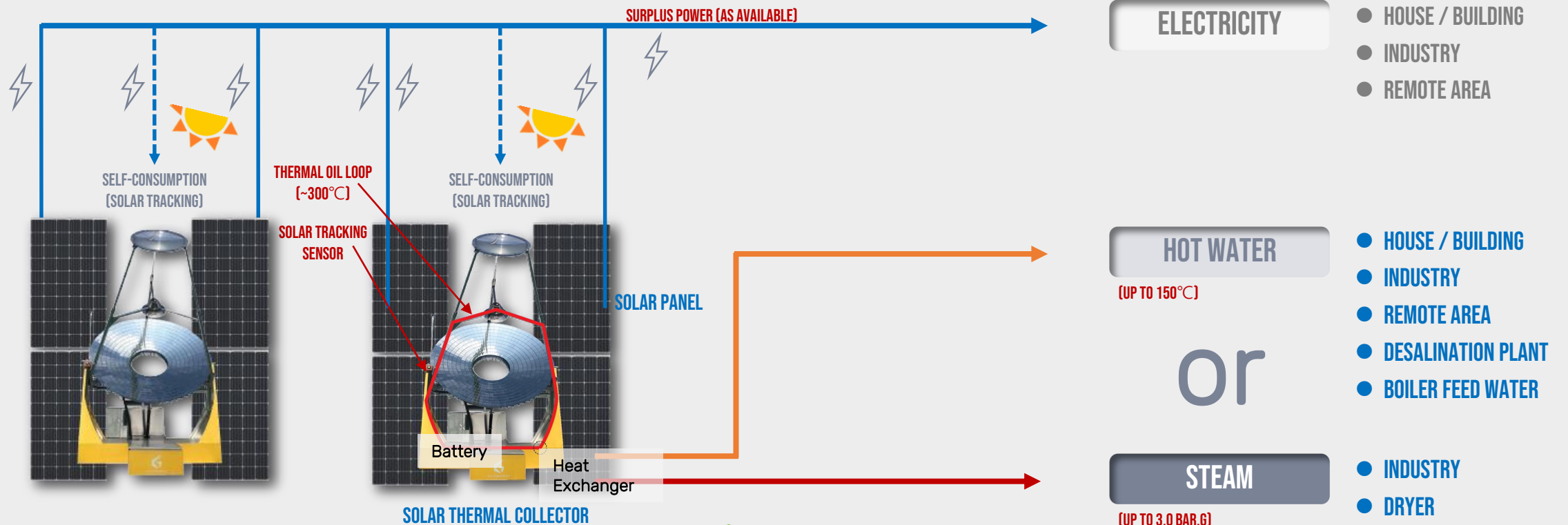
- ✓ Surpass the capability of conventional solar hot water generators
- ✓ More focus on large thermal energy consumers than households
- ✓ Developing various applications e.g. air-conditioning, desalination



SYSTEM OVERVIEW

HYBRID TYPE SOLAR THERMAL COLLECTOR COMBINING **DISH TYPE SOLAR THERMAL COLLECTOR** WITH **SOLAR PANEL**

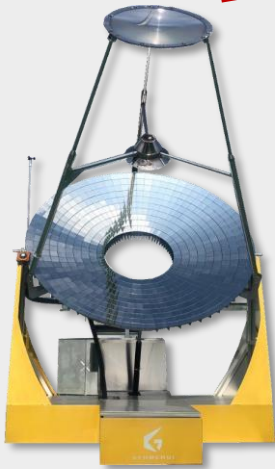
- ✓ Dish type solar thermal collector with top/bottom dual concentrating mechanism ... suitable for high temperature (~150°C) thermal demand
- ✓ Independent system with automatic solar tracking function driven by solar panel as an integrated part ... no fuel, no external power required



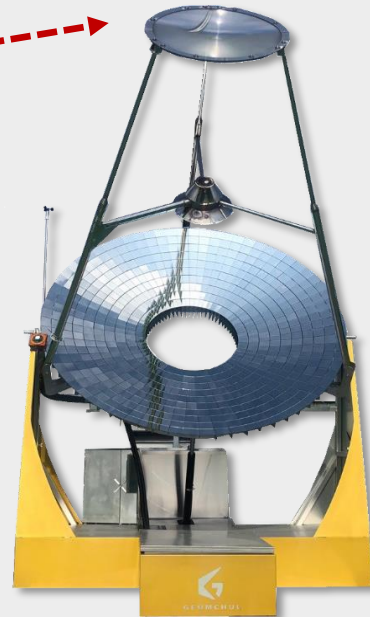
SCALE-UP & UPGRADE PLAN

- Hae.Balagi 3.0 is compact and easy to handle at site ... suitable for smaller or medium amount of thermal needs (~150 Gcal per year)
- Hae.Balagi 4.2 will be more suitable for sizable project ... to meet larger thermal needs (~300 Gcal per year) or power generation use

EXISTING MODEL HAE.BALAGI 3.0



SCALE-UP & UPGRADE MODEL (1Q '23) HAE.BALAGI 4.2



- Dia. of dish **3.0m**, dia. of Fresnel lens **1.0m**
- Compact ... suitable for smaller thermal needs

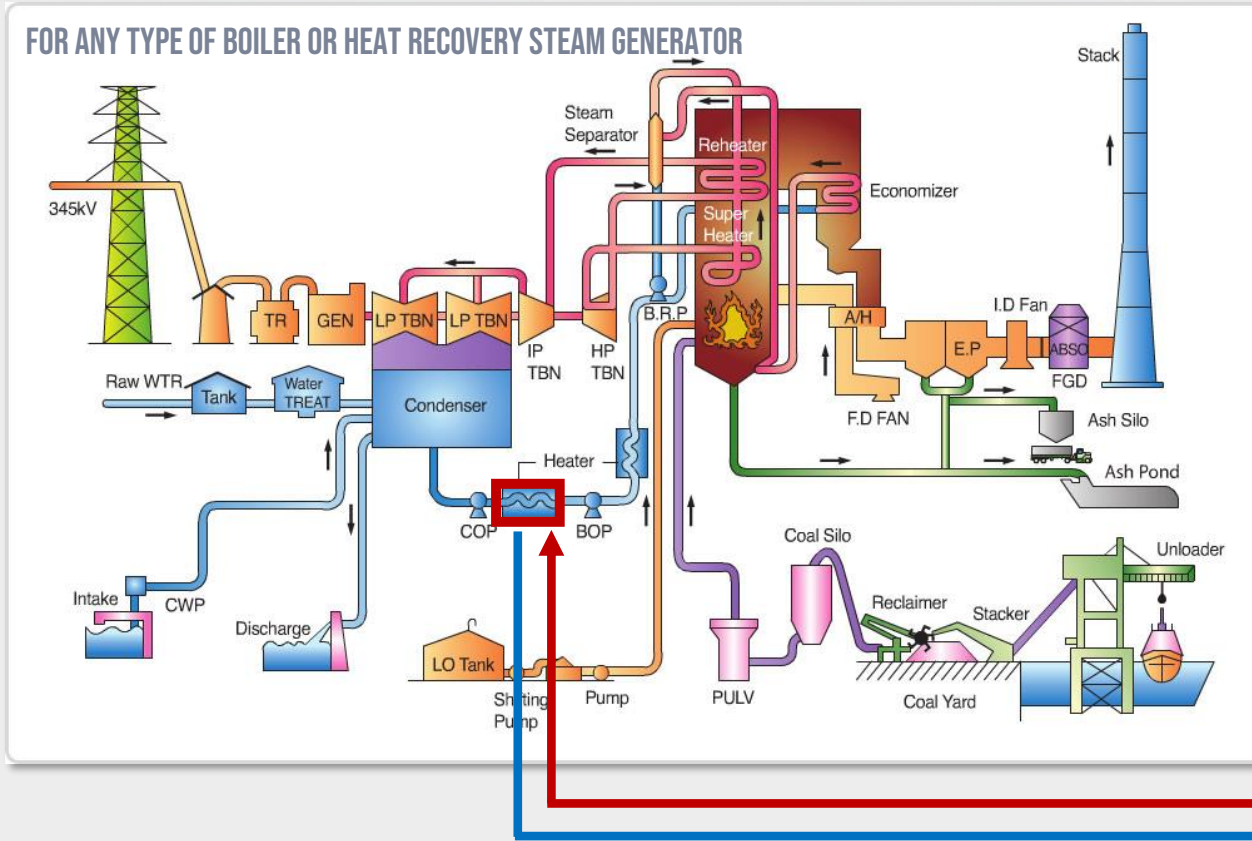
- Dia. of dish **4.2m**, dia. of Fresnel lens **1.4m**
- 2 times larger capacity than Hae.Balagi 3.0
- Upgrade in entire heat exchanging system



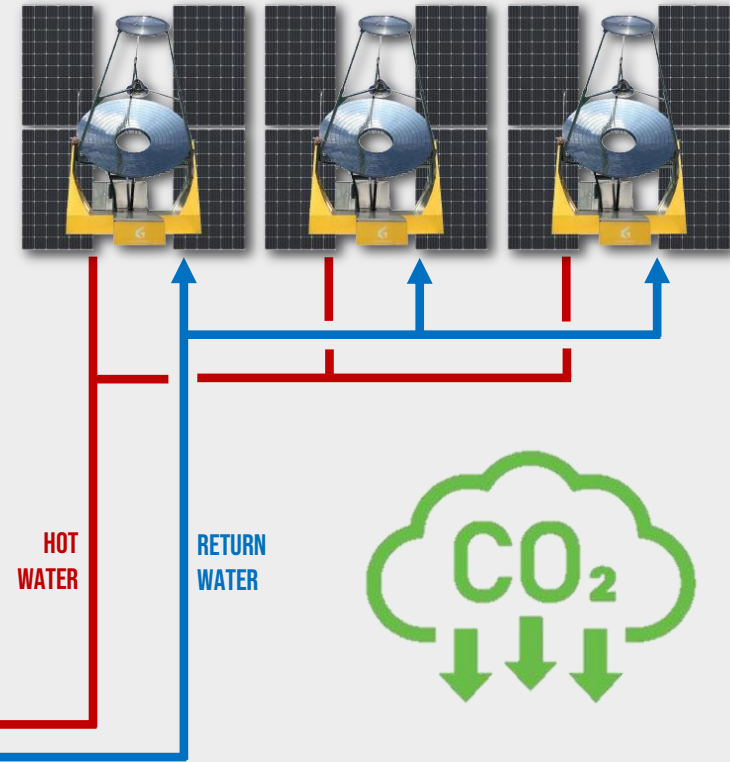
Local R&D / Supporting Infra



MAJOR APPLICATIONS ... “BOILER/HRSG FEED WATER HEATING”



HYBRID TYPE SOLAR THERMAL COLLECTORS



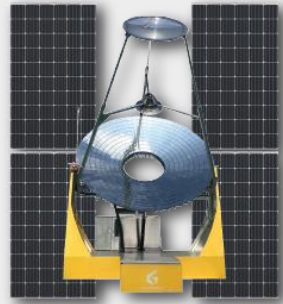
“Supplementary Heating for Boiler/HRSG Feed Water”



- ① Working as an **Economizer**
- ② Save Fuel Consumption & Cost
- ③ Reduce CO₂ (less fossil fuel use)

MAJOR APPLICATIONS ... “AIR CONDITIONING”

DISH TYPE SOLAR THERMAL COLLECTOR (HAE.BALAGI)



- Best Fit to MENA (Air-conditioning)
- Solar Tracking (1.5 x Fixed Type)
- Independent (No External Power)
- Compact Design (Easy to Install)
- User-friendly (IoT & Smartphone)

SOLAR PANEL



DISH TYPE SOLAR THERMAL COLLECTOR



SYSTEM CONFIGURATION

HOT WATER
70~100°C

RETURN WATER
55~60°C

*SAVE THE ENERGY FOR AIR-CONDITIONING
WHEN THE SUN IS AVAILABLE !!*



SOLAR ASSISTED CHILLER

SOLAR ASSISTED CHILLER (WHICH CAN BE CONNECTED WITH SOLAR THERMAL COLLECTOR)



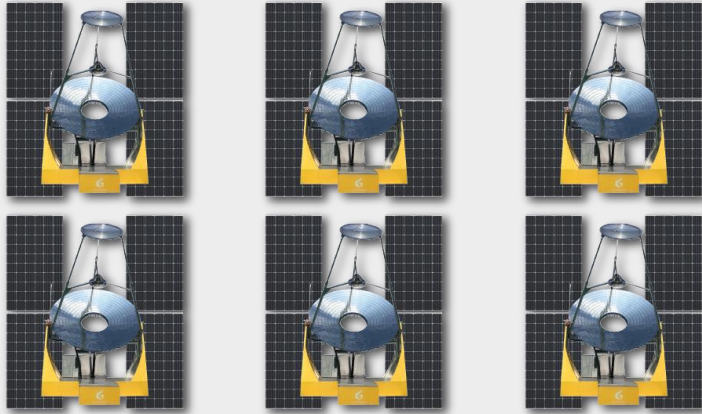
HOT WATER & ELECTRIC HYBRID ADAPTION CHILLER



HOT WATER ABSORPTION CHILLER

MAJOR APPLICATIONS ... “SEA WATER DESALINATION”

HYBRID TYPE SOLAR THERMAL COLLECTORS (HAE.BALAGI)



SUPPLY : HOT WATER (80~85°C)

RETURN : COOLED WATER (60~65°C)

FRESH WATER GENERATOR PACKAGE (BY EVAPORATION PROCESS)



OPERATION PHILOSOPHY (NO FUEL IS REQUIRED !!)

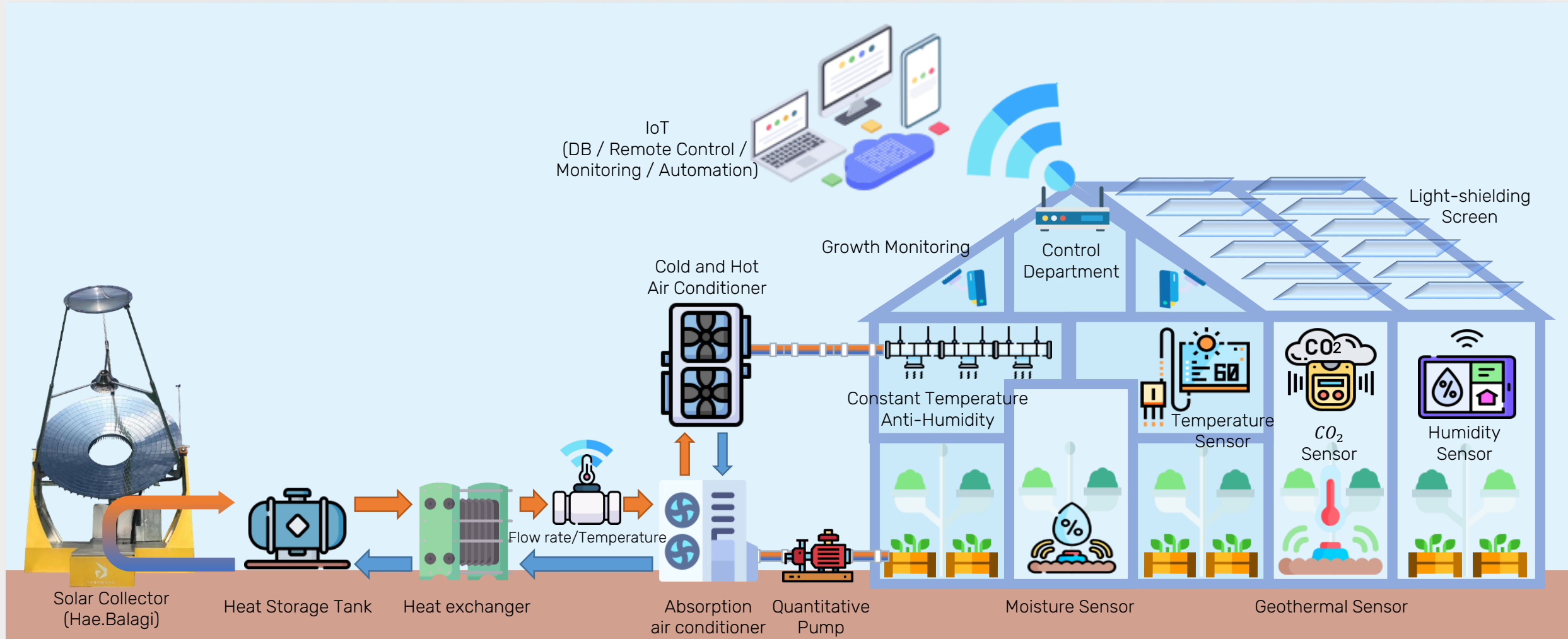
- This solution can produce fresh water from sea water by evaporating and condensing sea water in vacuum condition, which evaporation heat source is hot water (80~85°C) heated by Dish Type Solar Thermal Collectors (including solar panel) via. thermal oil.
- Evaporation chamber in the Fresh Water Generator is being kept in vacuum condition by water ejector driven by part of incoming sea water flow.
- Most of sea water flow is converted into vapor when it is vaporized by the heat from Dish Type Solar Thermal Collector in vacuum condition, thereafter such vapor is changed into fresh water throughout condensing process. Eventually, fresh water is pumped by fresh water pump to each consumer as needed.
- In the meantime, non-condensable gases and brines should be extracted, collected and discharged separately.

ECO-FRIENDLY METHOD FOR FRESH WATER GENERATION



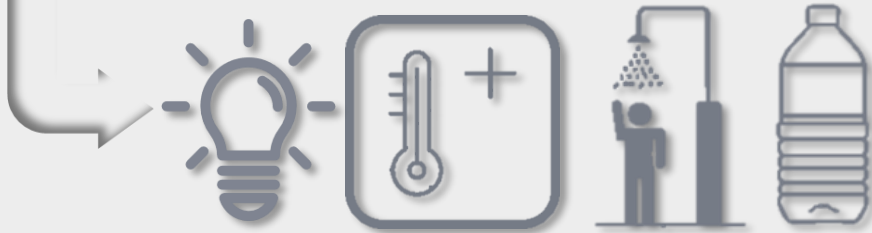
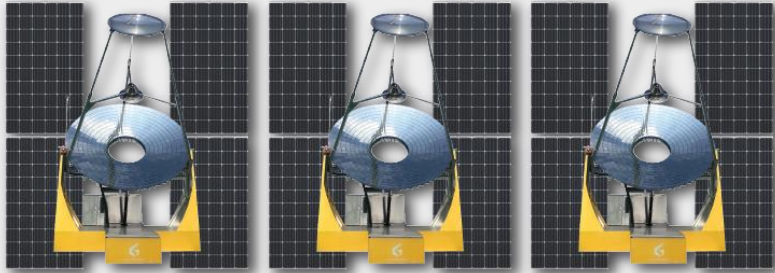
- Proven desalination process
- No membranes are required
- No high pressure pump required
- Minimal power consumption
- Lowest operation cost
- Best fit for islands & deserts (near seashore)

MAJOR APPLICATIONS ... "SMART FARM/GREENHOUSE/LIVESTOCK INDUSTRY"



MAJOR APPLICATIONS ... “REMOTE AREAS WITH POOR ENERGY INFRA”

HYBRID TYPE SOLAR THERMAL COLLECTORS



Completely Independent System

With no external power/fuel supply required



SALES STATUS

Region	Customer	Needs	Q'ty	Remarks
Korea	BAT Korea (Sacheon, 1 st)	Steam	2 Sets	Delivered & installed(May '22)
	Samhwa Salt	Hot Water	5 Sets	Signed the Contract (May '22)
	JEIP Institute	Steam	1 Set	Delivered & installed (Nov '22)
	R-materials	Hot Oil	1 Set	Signed the Contract (Aug. '22)
	Busan National Univ	Hot Oil	1 Set	Signed the Contract (Oct. '22)
	Chonnam National Univ	Hot Water	2 Sets	Contract to be signed in Dec. '22
	BAT Korea (Sacheon, 2 nd)	Hot Water	1 Set	Contract to be signed in Dec. '22
	KGA	Hot Water	2 Sets	Contract to be signed in DEC. '22
	Public Procurement Service	Hot Water	00 Sets	Sole-source nego. To be in 1Q '23
	Smart Farm(s)	Hot Water	00 Sets	Expecting the order(s) in 1Q '23
	Others	(Later)	00 Sets	Various industries
Overseas	BAT Global Network	(Later)	000 Sets	Benchmarking BAT Korea case
	UAE #1	(Later)	1 Set	Local validation test to be in '23
	UAE #2	(Later)	00 Sets	Expecting the order in 1Q '23
	Uzbekistan	Hot Water	00 Sets	MOU signed in Aug. '22
	Saudi Arabia	Desal	000 Sets	Proposal submitted
	Other Asia, MENA Countries	(Later)	000 Sets	Recruiting local partners



MOA SIGNING WITH CHAINTECH ... DUBAI, OCT. 2021



MOA & P/O (2 SETS) SIGNING WITH BAT KOREA ... JAN. 2022

INSTALLED BASE / BAT KOREA SACHEON FACTORY

... "STEAM PRODUCTION"



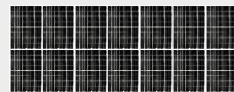
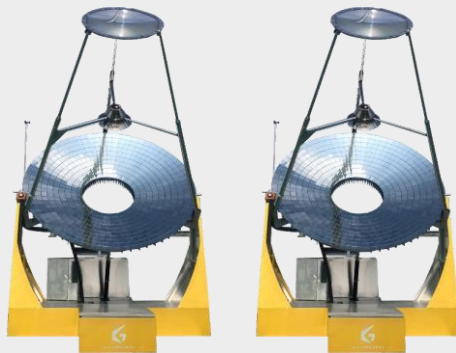
BAT GROUP (BRITISH AMERICAN TOBACCO GROUP)

Global No.1 Tobacco Company – Dunhill / Kent
 Established in 1902, London, 50 Factories in 40 Countries
 53,000 Employees, Revenue 32,000 M\$ in 2019

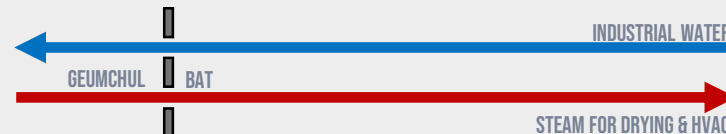
BAT GROUP (BRITISH AMERICAN TOBACCO GROUP)

Head Office in Soul, Factory in Sacheon, Gyeongnam
 Established in 1990, 1,000 Employees, 320 B.KRW in 2020

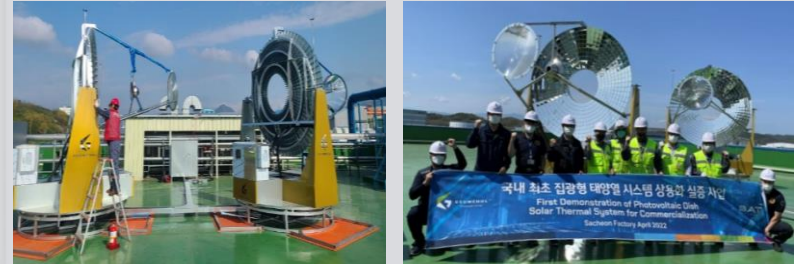
- ✓ Jan. 2022 ... MOA & P/O (2 Sets) Signing between BAT Korea & Geumchul
- ✓ Mar-Aug. 2022 ... 2 Sets of **Hae.Balagi 3.0** delivered, installed & validated
- ✓ Dec. 2022 ... Expecting additional order for 1 Unit for air-conditioning use



INSTALLED REMOTELY



※ SOLAR PANELS WERE INSTALLED AT REMOTE AREA BY THE REQUEST FROM BAT KOREA.



BIRD'S EYE VIEW



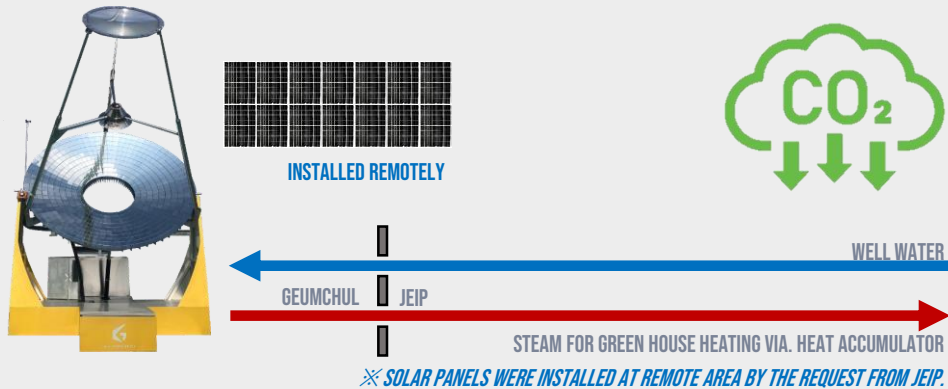
INSTALLED BASE / JEIP WONJU SMART FARM

... "STEAM PRODUCTION"



JEIP (JEOLLANAM-DO ENVIRONMENTAL INDUSTRIES PROMOTION INSTITUTE)

- Established in 2021, located in Kangjin-gun at southern part of Korea
 - Promote environmental industries in Jeollanam Province in Korea
 - Implementing "Smart Farm Project" in Wonju-city in Korea
 - Needed Geumchul's Dish Type Solar Thermal Collector to product steam
- ✓ Placed an order to Geumchul in Aug. 2022 for 1 Set of **Hae.Balagi 3.0**
 - ✓ Delivered 1Set in Nov. 2022 and will start commercial operation Dec. 2022
 - ✓ Steam produced by Hae.Balagi will be heating Heat Accumulator of JEIP
 - ✓ Heat Accumulator will supply the necessary heat to the green house



AWARD/CERTIFICATION

**SELECTED AS 2022 BEST PRODUCT OF INNOVATION
BY PUBLIC PROCUREMENT SERVICE OF KOREA**
조달청 우수혁신제품 지정 (2022년 8월)



주식회사 금철의 태양열집열기 '해.발아기'가 기획재정부/조달청의 위탁을 받아 한국조달연구원에서 주최한 2022년 제2차 혁신제품 스카우터 데모데이 결과 '혁신시제품'으로 지정되었습니다. '혁신시제품'이란 기획재정부와 조달청에서 정한 기준과 절차에 따른 심사를 거쳐 혁신성을 인정받은 제품으로서, 지정 기간 3년 동안 공공기관이 직접 수의계약을 통해 구매할 수 있으며, 조달청 예산으로 구매하여 공공기관이 사용할 수 있는 시범사업의 대상이 되는 등 여러가지 혜택이 부여됨. (자세한 내용은 당사 홈페이지 참조)



미래지향적 공공조달정책 개발을 통한 국가경쟁력 강화
한국조달연구원
KOREA INSTITUTE OF PROCUREMENT

수신자 수신자 참조
(경유)

제 목 2022년 제2차 혁신제품 스카우터 데모데이 결과 안내

1. 귀 기관의 무궁한 발전을 기원합니다.
2. 우리원은 기획재정부·조달청의 위탁으로 혁신제품 스카우터 제도를 운영하고 있습니다. 이에 2022년 8월 10일-11일 개최한 '2022년 제2차 혁신제품 스카우터 데모데이 결과'를 아래와 같이 제출합니다.

- 아 래 -

- 가. 일시/장소: 2022년 8월 10일 - 11일 / 대전컨벤션센터 제1전시장
나. 평가대상: 2022년 2차 추천제품 중 사전평가에서 통과한 30개 제품
다. 평가결과: 1일차(8개), 2일차(17개) 총 25개 제품 합격
*상세내역은 붙임(2022년 제2차 스카우터 데모데이 결과(최종추천)) 참조
라. 향후계획
- 상위 25개 제품 대상 혁신시제품 지정 컨설팅 실시 및 지정 연계
- '혁신시제품' 지정 요건 등에 대한 교육 및 안내(혁신조달전문지원센터)

붙임1. 2022년 제2차 스카우터 데모데이 결과(최종추천)(별송), 끝.

(재) 한국조달연구원장

수신자 주식회사 엠디세이프 대표, (주)시프미러 대표, 주식회사 산앤지니어링 대표,
(주)넷비전텔레콤 대표, 주식회사 금철 대표, 주식회사 테에스엘 대표, 주식회사 에코인에너지 대표,
(주)한국파워셀 대표, (주)다윈디앤에스 대표, 주식회사 닷 대표, 주식회사 디과이 대표,
주식회사 바업 대표, 주식회사 볼트크리에이션 대표, 주식회사 신진알씨에스 대표, 주식회사 위투업 대표, 지술코퍼레이션 주식회사 대표, 주식회사 하이 대표, (주)세니켈 대표,
다이나메드(주) 대표, 주식회사 수켄텍 대표, 시너지에이아이 주식회사 대표, (주)에스피에드 대표, (주)레이션 대표, 이-솔테크 대표, 주식회사 인프리에드코리아 대표, 조달청장

08/24 08/24 08/24
연구관 김희배 부연구위원 장승규 본부장 김병건

별첨자
시행 한조연-혁신조달-1373 2022.08.24 접수
우 06230 서울 강남구 인주로 305 (역삼동, 백안빌딩) 3층 / http://www.kip.re.kr
전화 02-796-8234/5450 팩스 02-567-3510 / haegi7777@kip.re.kr / 공개

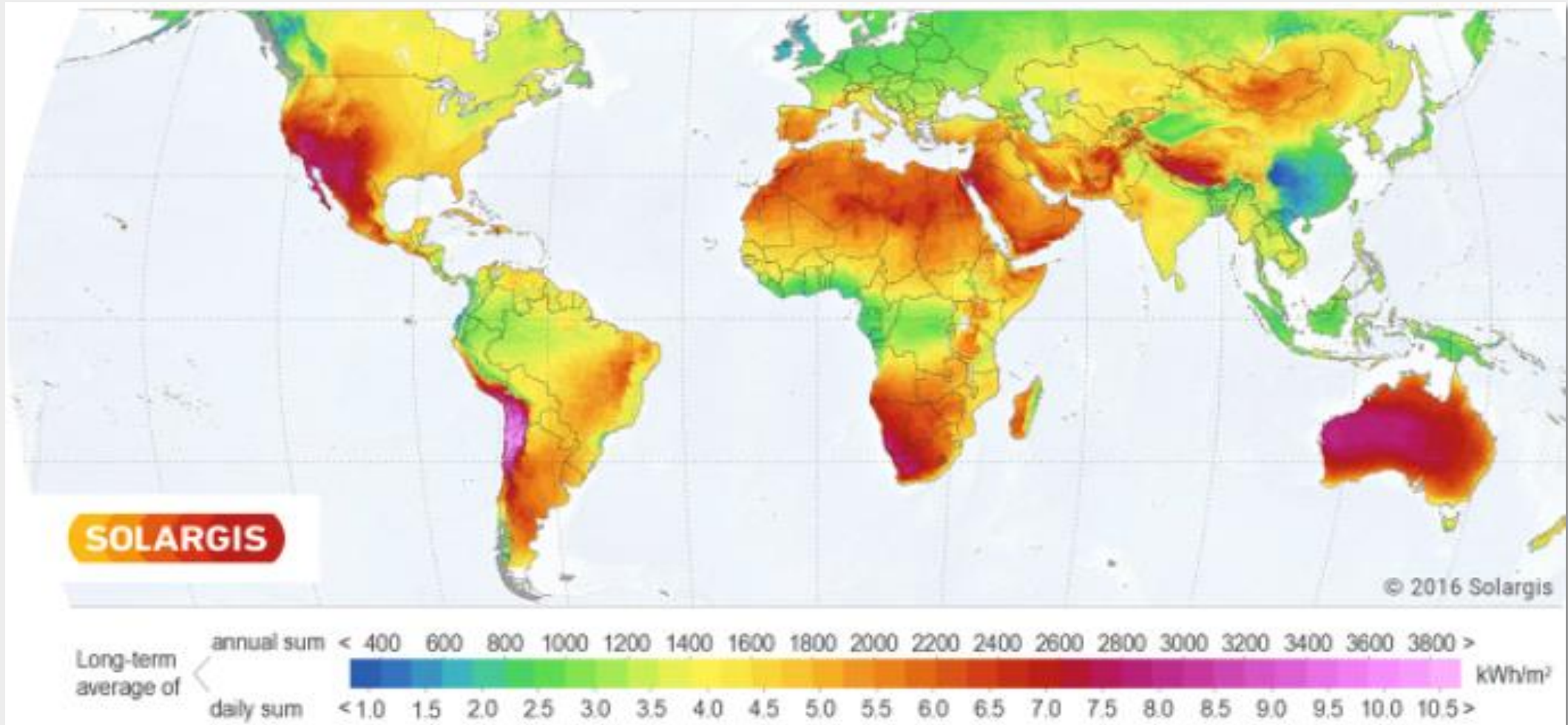
'22년 제2회 스카우터 데모데이 결과(최종추천제품)

□ 1일차(8개) : 드론·로봇·미래차, 디지털, 환경·탄소중립

순번	신청분야	제품 사진	추천 제품(기업) 명
1	드론로봇		(엠디세이프) 자율주행&자율충전이 가능한 복합 삼군 시로봇
2	디지털		(시프미러) 하프미러 및 헤이즈 마킹판 일체형 장치를 활용한 방법/안전 목적의 태양광 스마트 반사경
3	디지털		(산앤지니어링) 지능형 해상교통정보서비스 표시장치(e-Nav 표시장치)
4	디지털 (국민생활)		(넷비전텔레콤) 24시간 감시가 가능한 AI 기반 불법카메라 탐지 장치 (CamEye)
5	환경 ·탄소중립		(금철) 상하 2중 집열방식 태양열 집열기(해.발아기)
6	환경 ·탄소중립		(테에스엘) 설정온도의 물을 즉시 공급하고 온도를 자동으로 제어하는 물 절약형 수전(스마트 수전)
7	환경 ·탄소중립		(에코인에너지) 이동가능 모듈형 IoT 폐플라스틱 열분해 화학적 재활용장치
8	환경 ·탄소중립		(한국파워셀) AI Solution을 통해 리튬 배터리의 실시간 모니터링과 불량 및 화재 사전 예측이 가능한 리튬 배터리 팩 (Battery Pack) 및 에너지저장시스템 (ESS)



GLOBAL SOLAR THERMAL ENERGY POTENTIAL



THANK YOU

Minsup Oh

Head Director of Strategic Business Division

E. oh8248@gcenergy.co.kr T (Direct). +82-70-4617-0508 M. +82-10-4333-4322