



/ K-UTEC AG Salt Technologies | Sondershausen | Germany

VALUABLE PRODUCTION FROM SEA WATER

Water – Salt – Fertiliser

August 2022 | ACHEMA 2022

K-UTEC
SALT TECHNOLOGIES

K-UTEC AG SALT TECHNOLOGIES



Competence in Salt

Foundation of Potash Research Institute of GDR

1951

Foundation of K-UTEC GmbH

1992

Spin-off of K-UTEC AG Salt Technologies

2008

Management Board

Dr Heiner Marx
Dr Markus Pfänder
Dr Sebastian Lüning

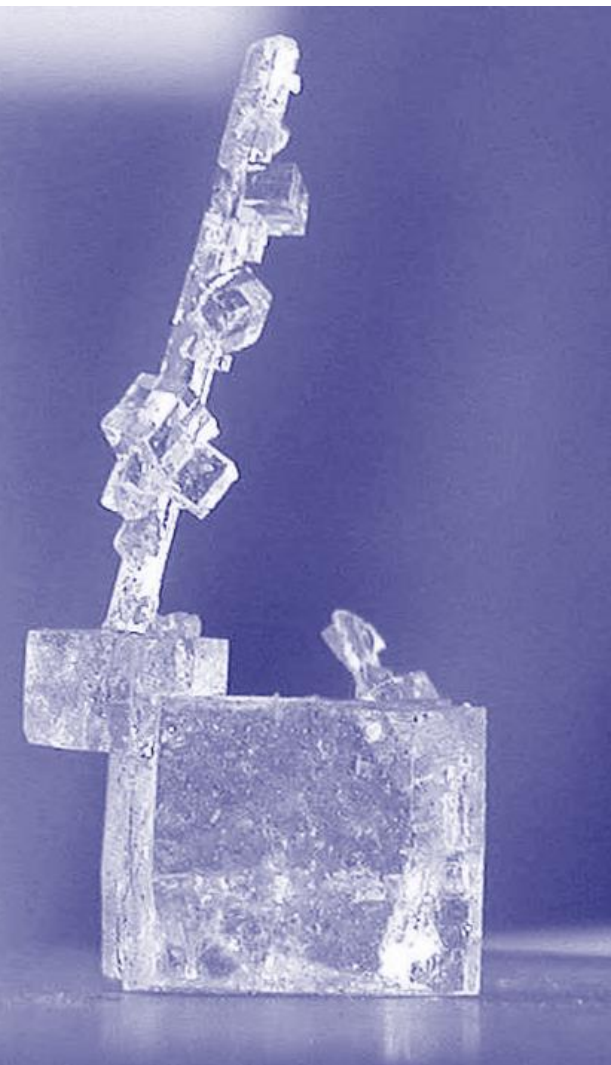
Employees

approx. 100



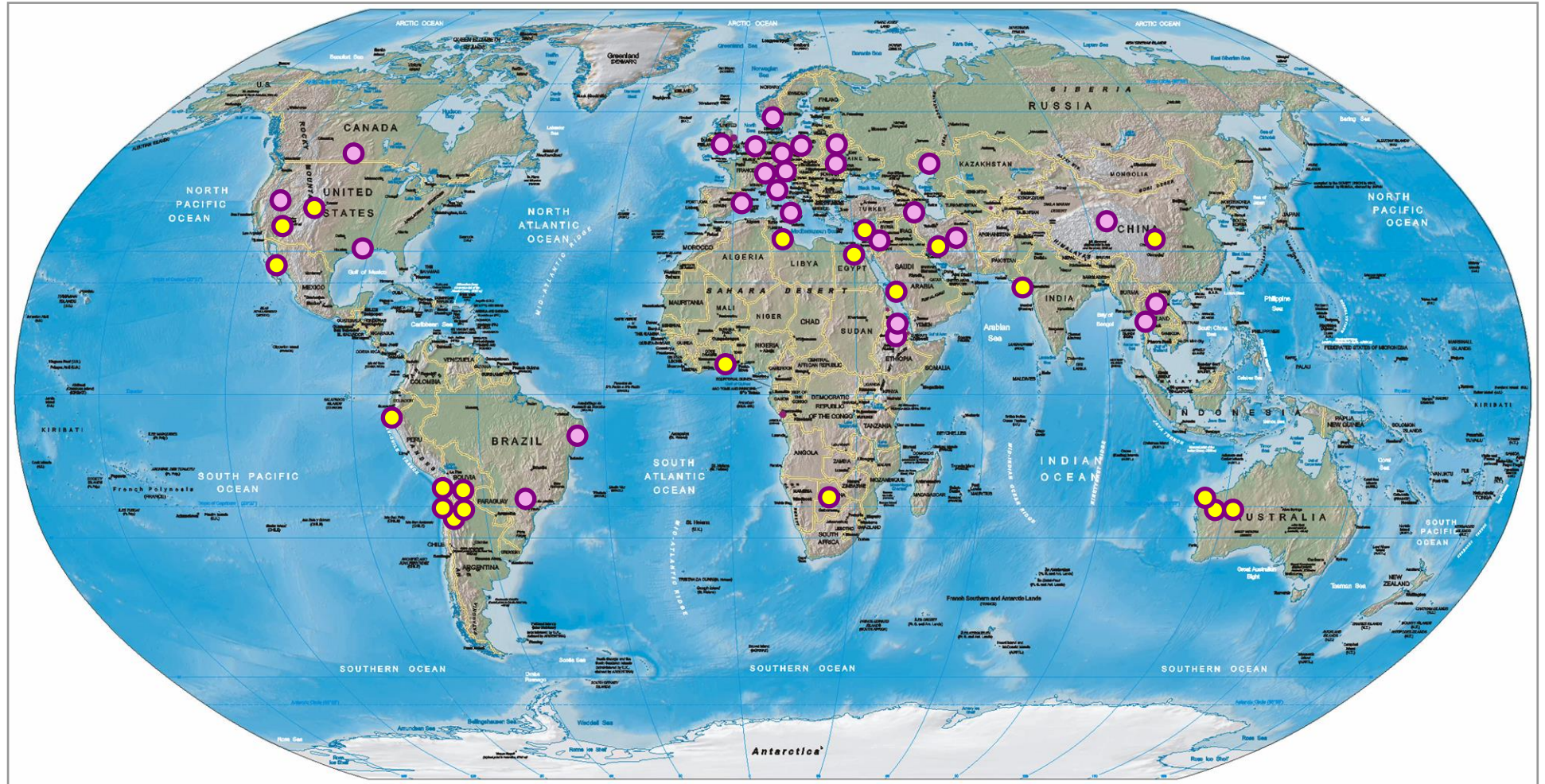
K-UTEC AG SALT TECHNOLOGIES

7 Decades Experience in Mineral Salt Industry



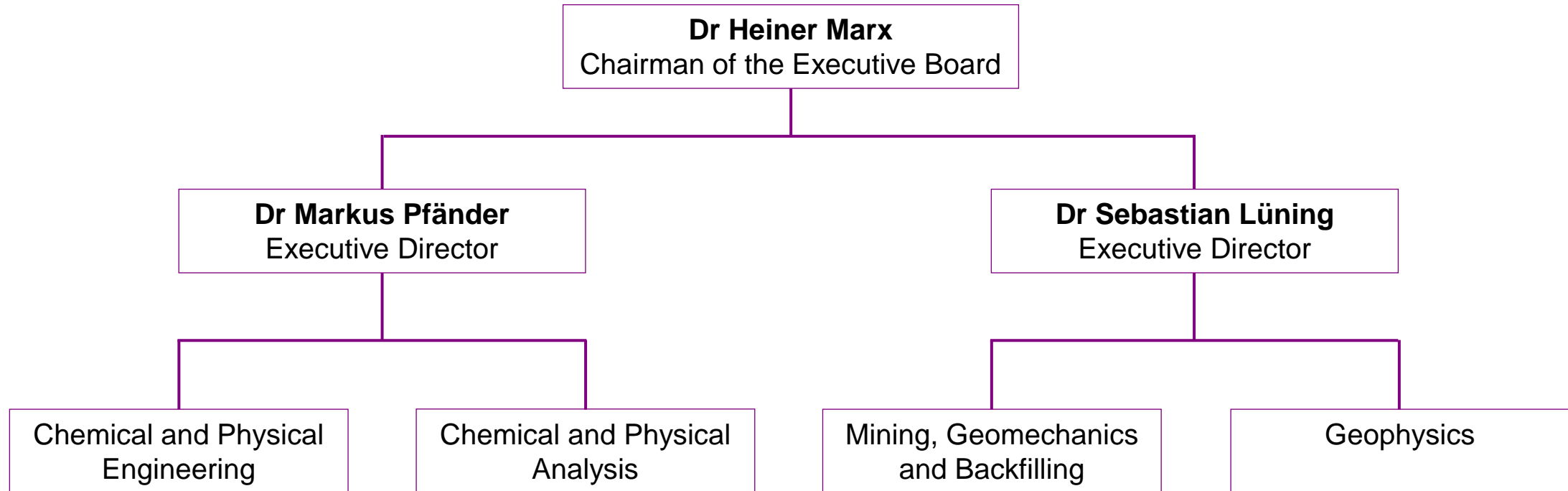
Projects Worldwide

- Australia
- Argentina
- Austria
- Belarus
- Bolivia
- Botswana
- Brazil
- Chile
- China
- Egypt
- Eritrea
- Ethiopia
- France
- Ghana
- Hungary
- India
- Iran
- Laos
- Mexico
- Peru
- Russia
- Saudi Arabia
- Spain
- Thailand
- Tunisia
- United Kingdom
- USA



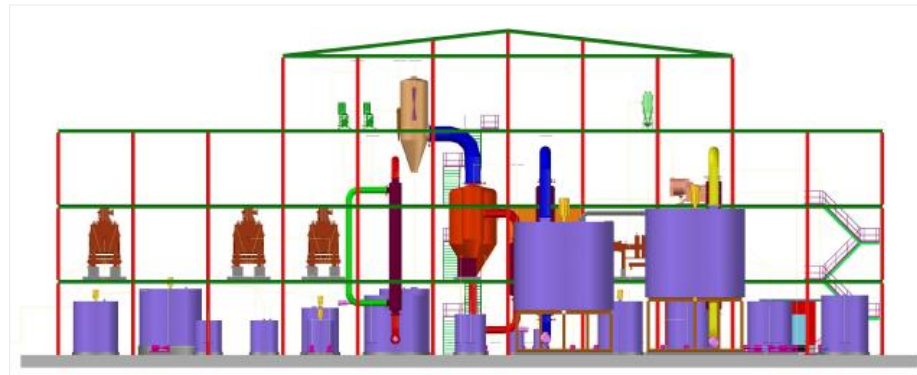
● Brine deposits ● Solid deposits

Company Structure





- Test work in laboratory and pilot scale
- Development of process routes
- Feasibility studies and economic project evaluation
- Supply of key equipment
- Basic engineering
- Support in plant installation, commissioning and training of staff





SALT PRODUCTION WORLDWIDE

(in 2019)

Based on Sea Water	120 Mio t/a
Based on Lake Brines	93 Mio t/a
Based on Rock Salt	80 Mio t/a
World, total	293 Mio t/a



Rock Salt Mining in Germany



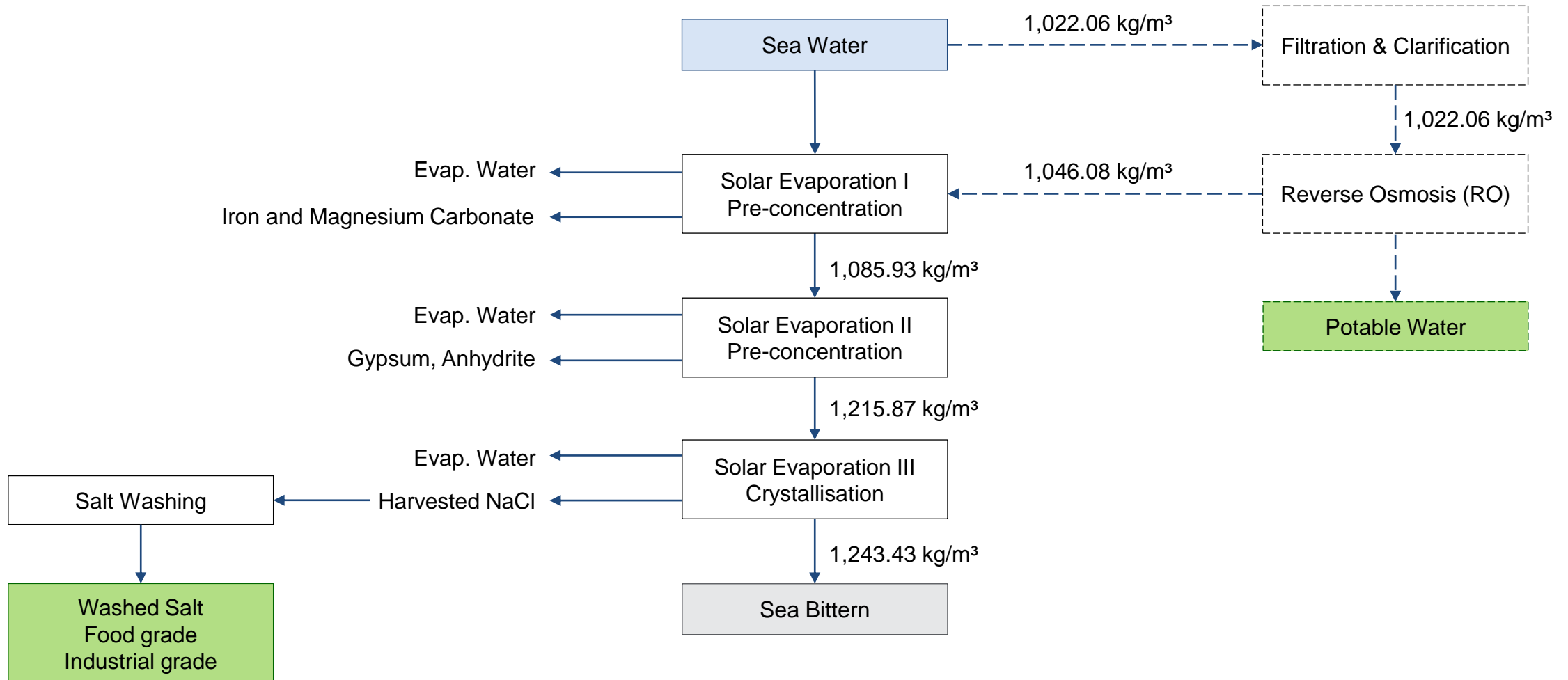
Salt Production from Inland Salt Lake



Sea Salt Plant at the Red Sea

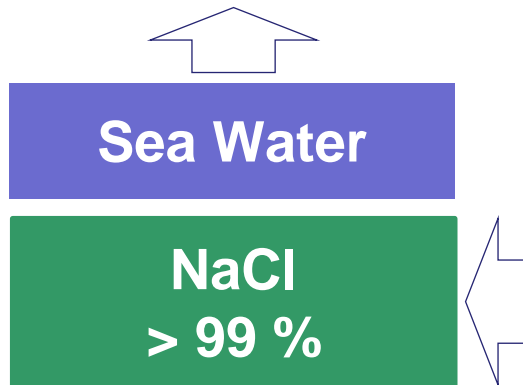
SEA SALT PRODUCTION

Main Process Steps



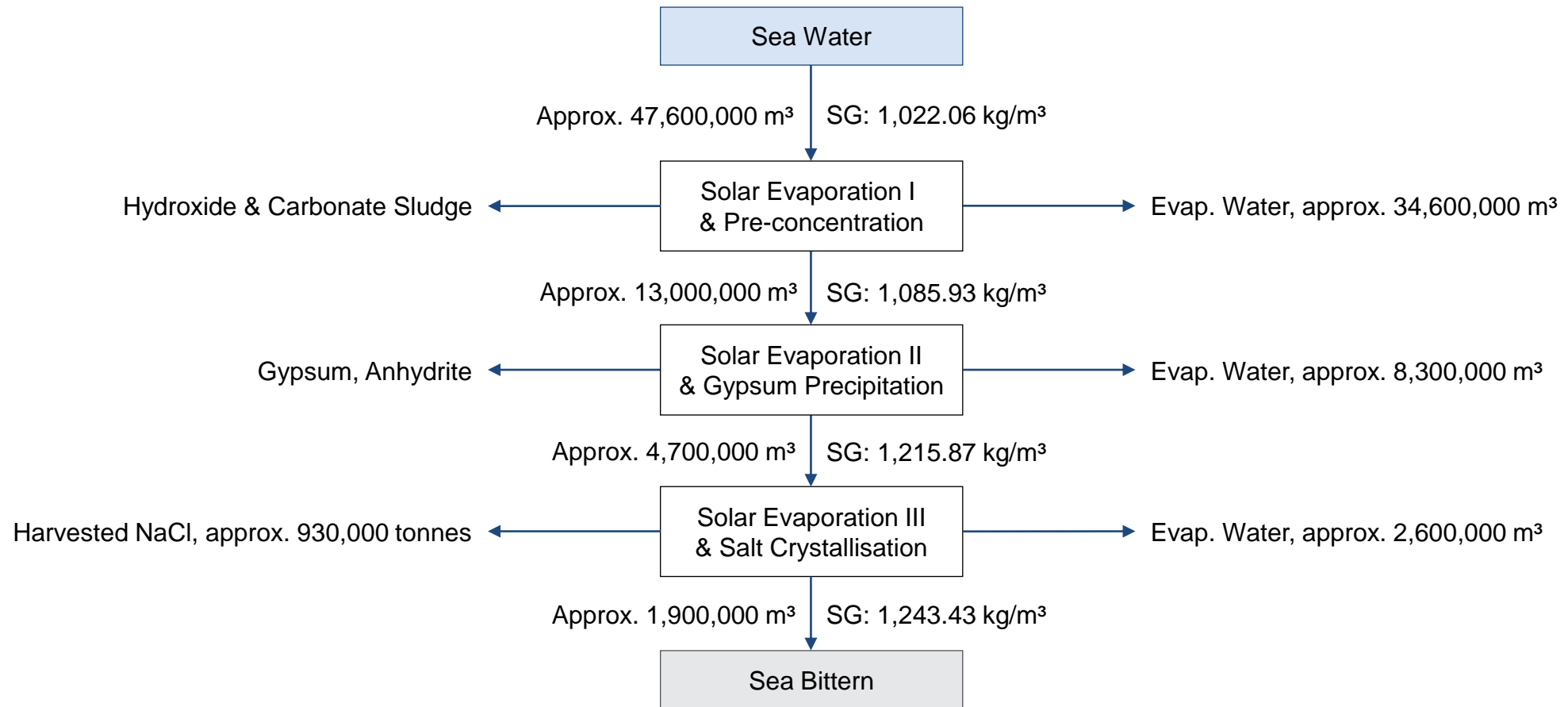
SEA SALT PRODUCTION

Main Process Steps



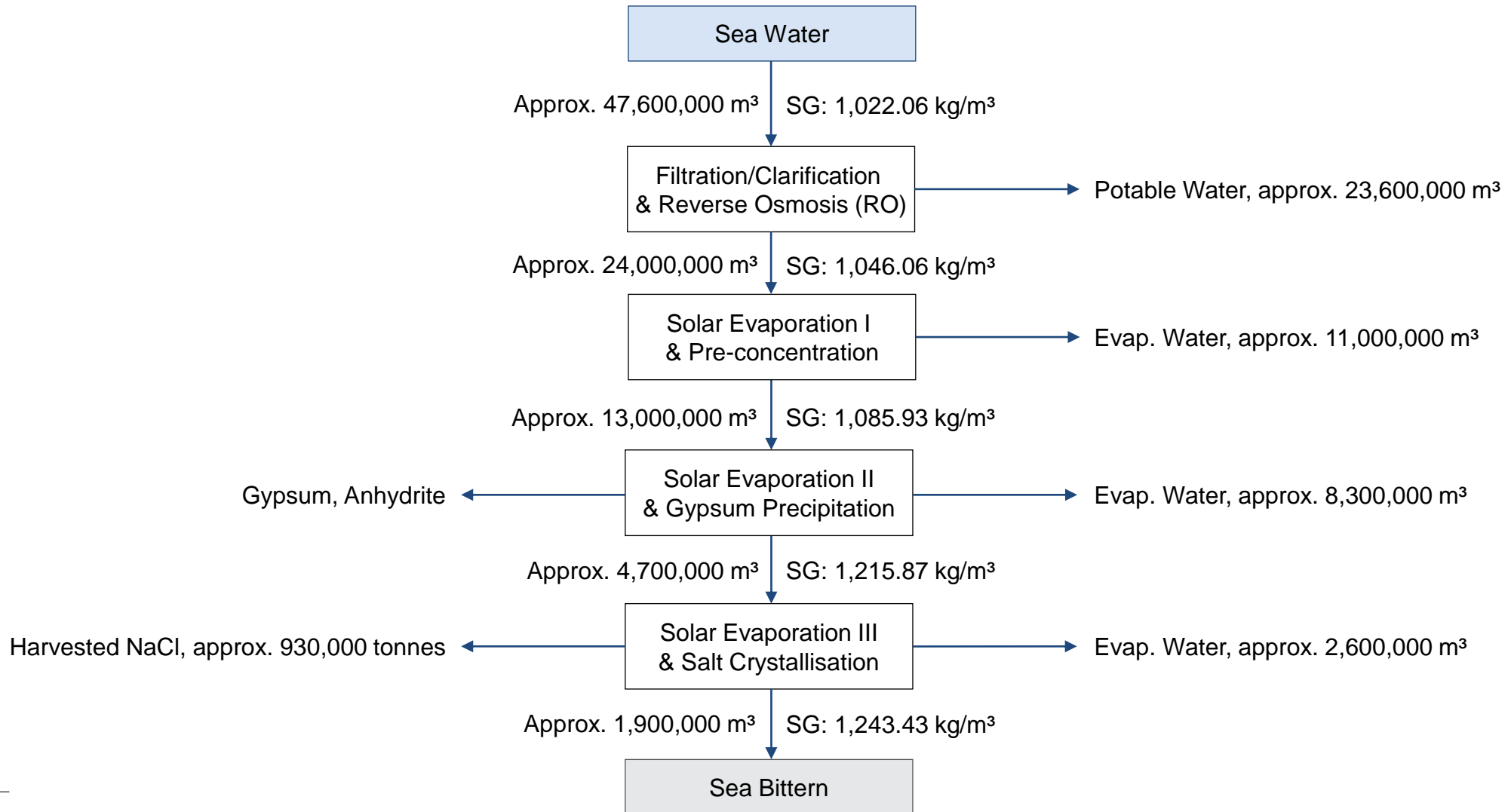
SEA SALT PRODUCTION

Main Figures | Basis: Production of approx. 1 Mio t sea salt per year



SEA SALT PRODUCTION

Main Figures | Basis: Production of approx. 1 Mio t sea salt per year and recovery of potable water



SEA SALT PRODUCTION

Comparison of Sea Salt Production Without / With Reverse Osmosis (RO)

Stage	Necessary Evaporation Area Without RO	Necessary Evaporation Area With RO
Pre-concentration	35.6 km ²	11.4 km ²
Gypsum precipitation	5.6 km ²	5.6 km ²
NaCl crystallisation	2.6 km ²	2.6 km ²
Total Area	43.8 km²	19.6 km²
Produced NaCl	930,000 tpa	930,000 tpa
Produced water	0 m ³	23,600,000 m ³

BITTERN PROCESSING

Composition and Potential Products

Composition of Remaining Bittern | Example

H ₂ O	890	g/l
NaCl	179	g/l
MgCl ₂	95	g/l
MgSO ₄	60	g/l
KCl	20.9	g/l
Br ₂	1.9	g/l
CaSO ₄	0.61	g/l
I ₂	3.6	mg/l



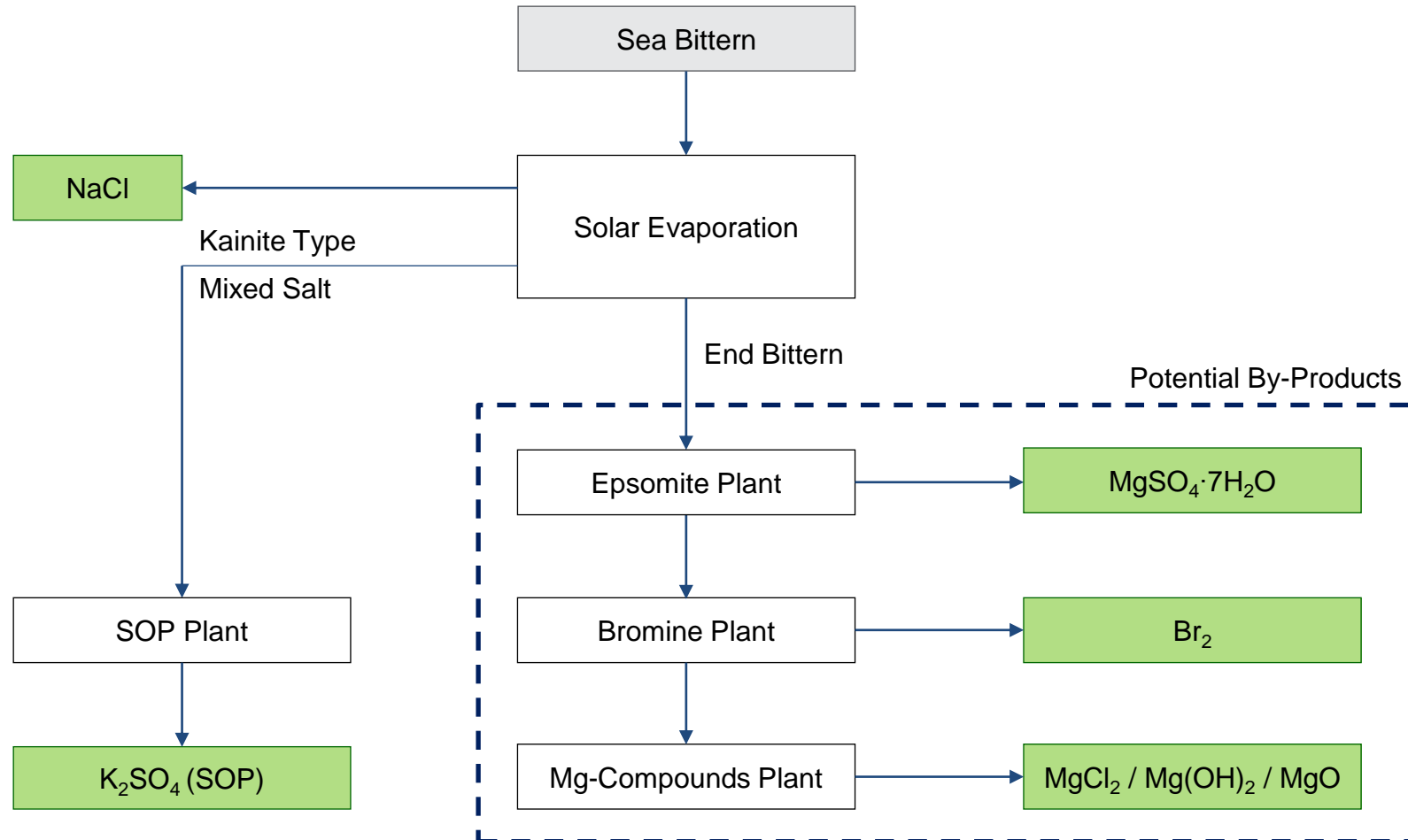
Discharge of Bittern

Potential Products

NaCl
 KCl (MOP) **or** K₂SO₄ (SOP)
 MgSO₄·7H₂O (Epsomite)
 MgCl₂·6H₂O | Mg(OH)₂ | MgO
 Br₂

BITTERN PROCESSING

Process Scheme for SOP Route



BITTERN PROCESSING

Quantities of Potential Products for SOP Route

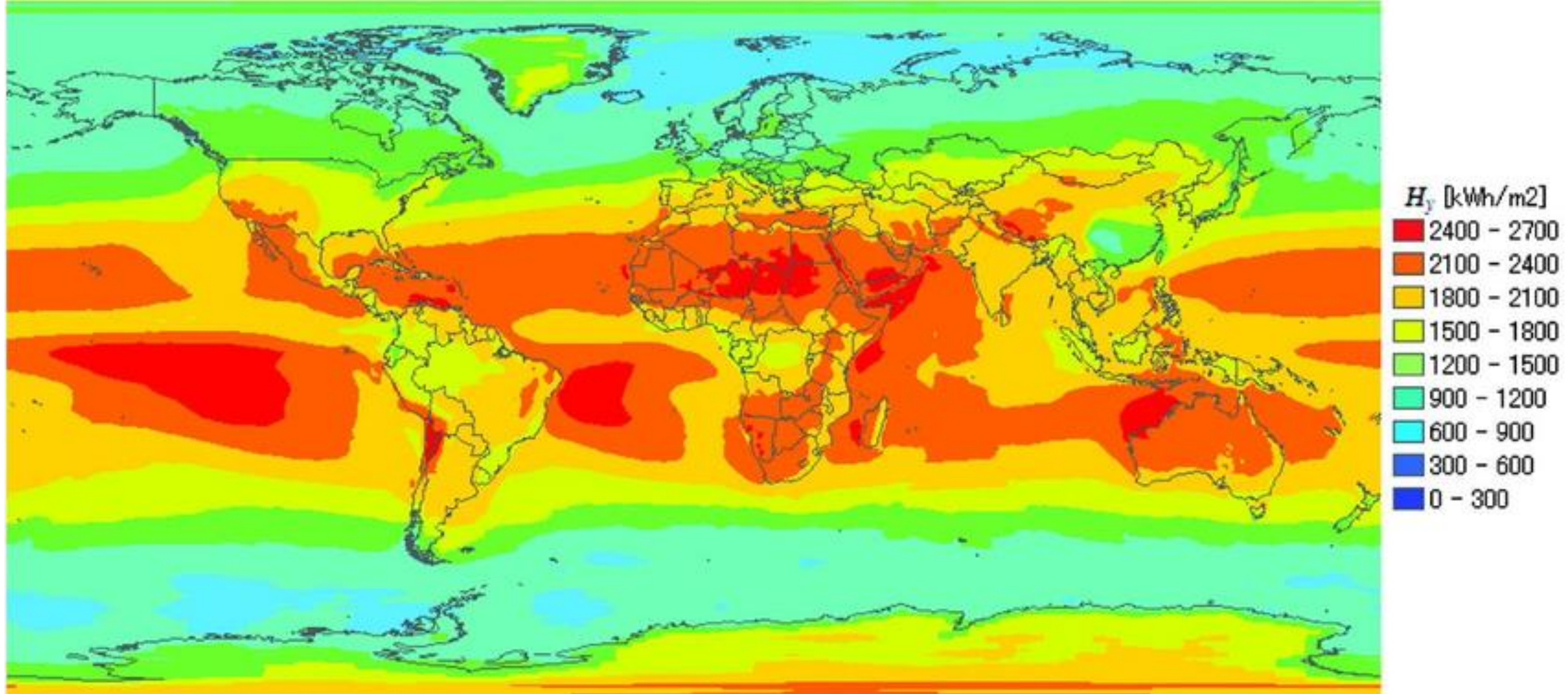
Based on 1 Mio Sea Salt Production	
Bittern	1,850 - 2,100 kt/a
NaCl	380 kt/a
K ₂ SO ₄ (SOP)	34 kt/a
MgSO ₄ ·7H ₂ O (Epsomite)	100 kt/a
Mg(OH) ₂	89 kt/a
Br ₂ (Bromine)	2.2 kt/a

└

1. Looking for suitable project sites (available area, soil, climate & weather, infrastructure)
2. Solar evaporation tests at potential project sites (class A pan with water and different brines)
3. Scoping study considering different process options
4. Pre-feasibility study for the selected process option

GENERAL APPROACH FOR PROJECT DEVELOPMENT

Looking for Project Sites | Global Solar Radiation



GENERAL APPROACH FOR PROJECT DEVELOPMENT

Solar Evaporation Tests at Project Site with Water and Different Types of Brine (Class A Pan)



Comprehensive Utilisation of Brines

- 2021 **Brine chemical recovery plant for the water innovation hub**
Scoping Design, Process Design, Basic Engineering; NEOM Company / Saudi Arabia
- since 2018 **Comprehensive utilisation of bittern from salt and soda ash production at Sua Pan, Botswana (SOP via Glaserite)**
Scoping Study, Process Design, Extended Process Design; BOTASH / Botswana
- 2018 **Comprehensive utilisation of sea bittern resulting from sea salt production in Western Australia**
Scoping Study; BCI Minerals / Australia
- since 2015 **Beyondie SOP project, Western Australia (SOP via Schoenite)**
Process Design and Basic Engineering, Key contract SOP plant, EPS services; KLL / Australia
- 2014 - 2015 **Recovery of valuable components from sea bittern resulting from sea salt production in Baja California, Mexico**
Scoping Study; Packsys S.A. / Mexico
- 2009 - 2015 **Production of K_2SO_4 and $MgSO_4 \cdot 7H_2O$ based on sea brine from Rann of Kutch**
Process Design, Basic Engineering, Commissioning; Archean / India
- 2011 - 2013 **Integrated plant to produce SOP, MgO, DCP and Bromine from Cañamac brine**
Process Design and Basic Engineering; SALSUD / Peru
- 2011 **Expertise for potential utilisation of waste brines in “Werra Revier” on a theoretical base and creation of suitable concepts**
Conceptual Study; K+S Kali GmbH / Germany

THANK YOU

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