Proyectos de Generación Híbridos y Herramienta PSS®DE para cálculo de LCoE

Siemens Energy Perú

Siemens Energy Peru

Leading the energy technology market of the country since 1996

Siemens Energy Main Offices

Location: Surquillo, Lima

Siemens Energy Service Center

Location: Lurín, Lima

Siemens Energy
Our businesses

Shape our energy landscape through connectivity, resilience, digitalization and decarbonization of the grid

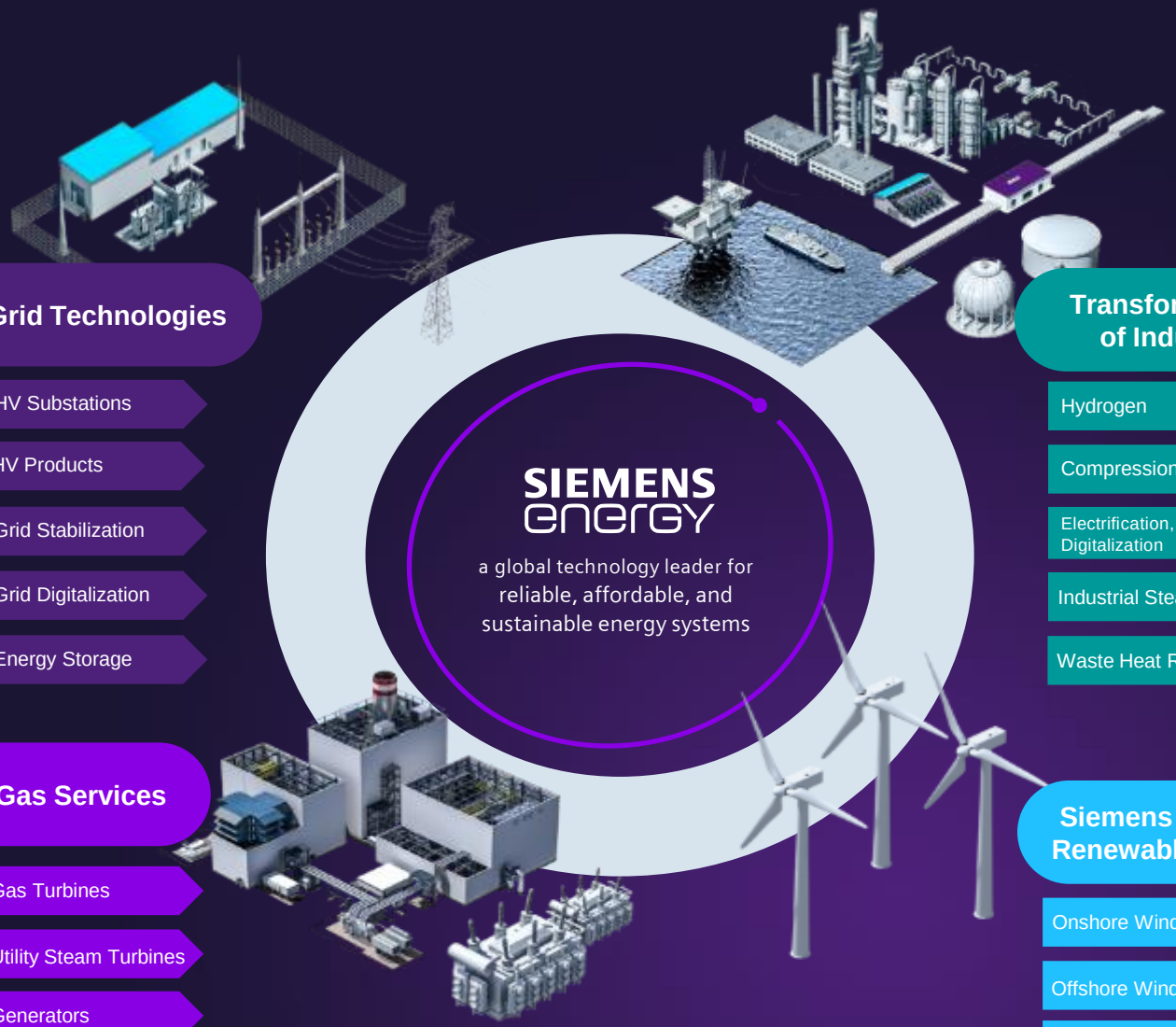
Grid Technologies

- HV Substations
- HV Products
- Grid Stabilization
- Grid Digitalization
- Energy Storage

Enhance and innovate conventional and renewable power supply and make the most of our energy sources to support the energy transition.

Gas Services

- Gas Turbines
- Utility Steam Turbines
- Generators
- Heat Pumps



Decarbonize industrial sector through focus on hydrogen and electrification, automation and digitalization (EAD)

Transformation of Industry

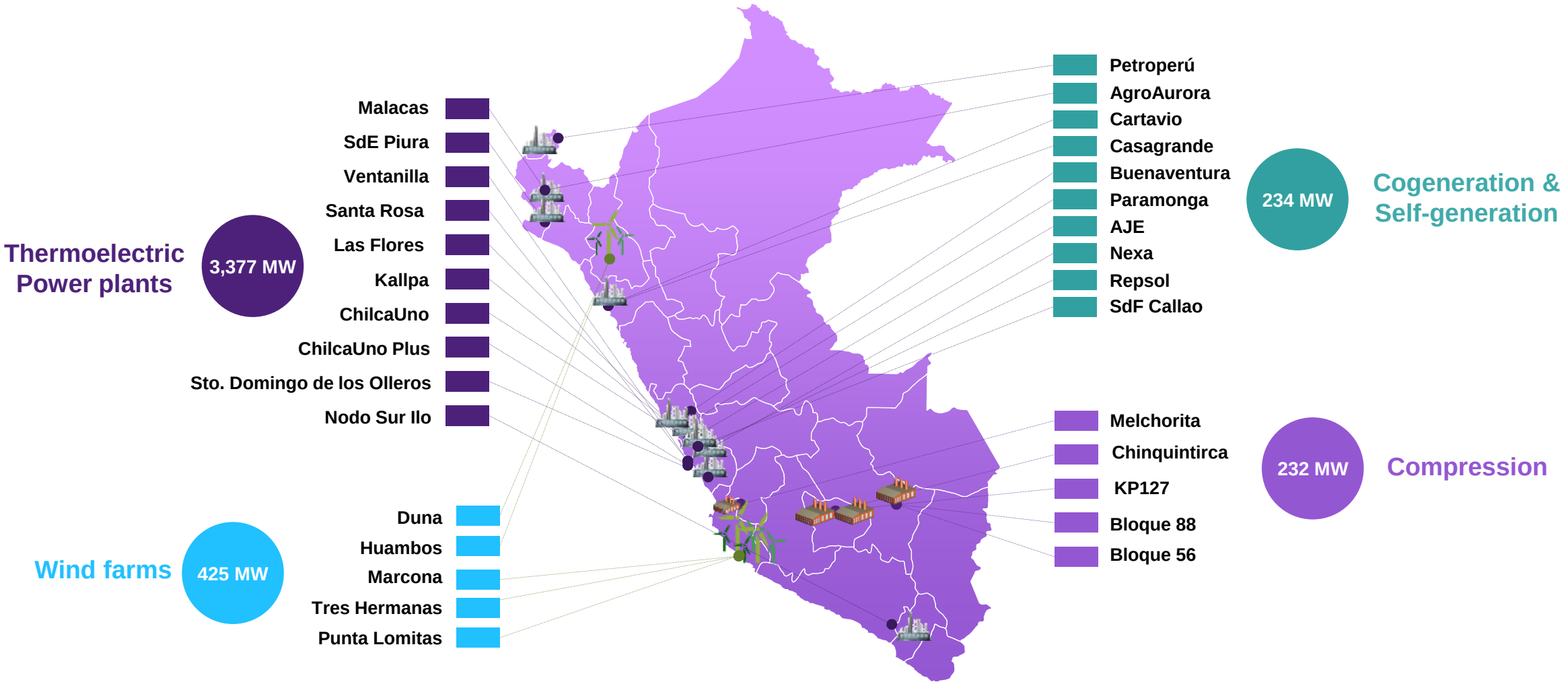
- Hydrogen
- Compression
- Electrification, Automation & Digitalization
- Industrial Steam Turbines
- Waste Heat Recovery

Provide the world's best offshore and onshore wind turbines

Siemens Gamesa Renewable Energy

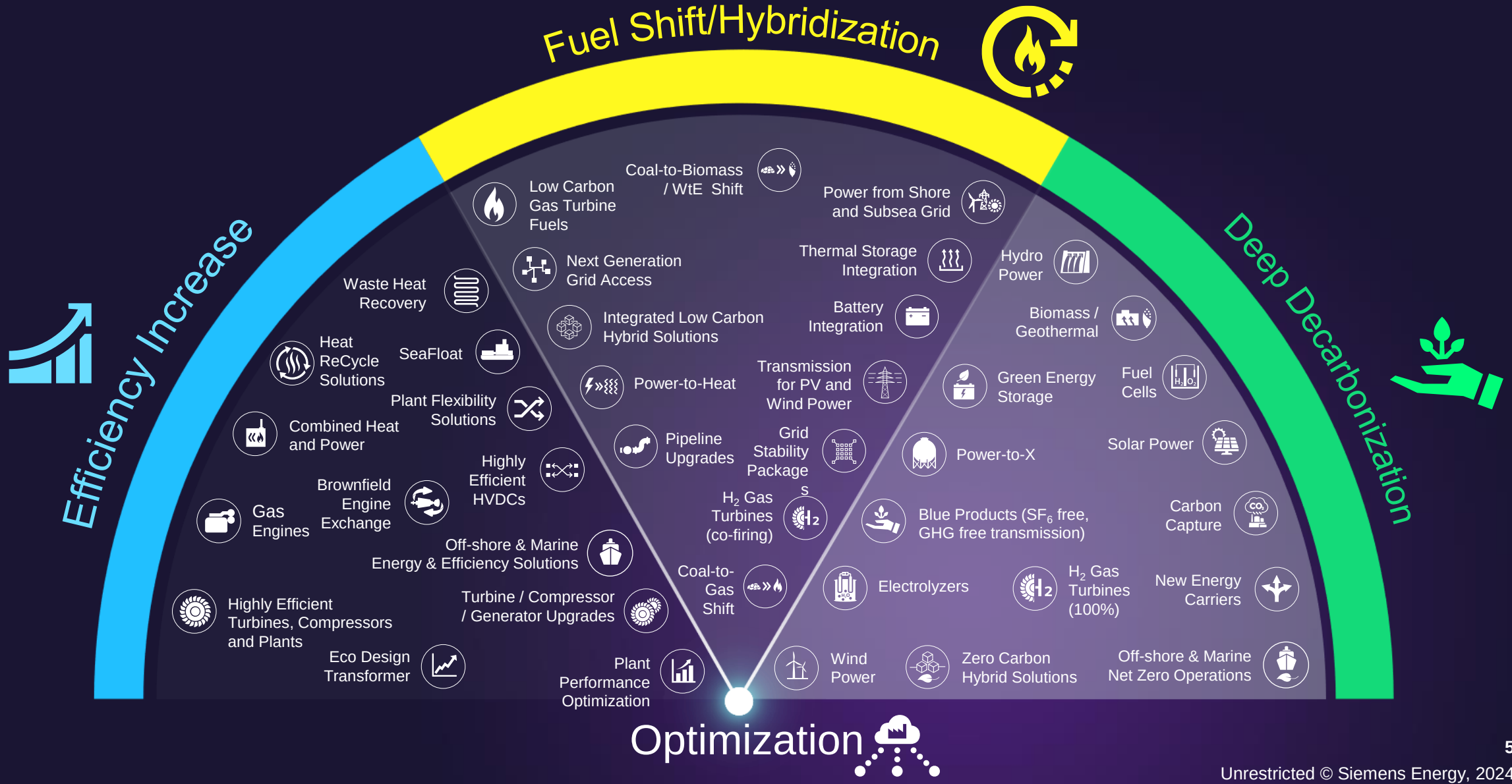
- Onshore Wind Turbines
- Offshore Wind Turbines
- PV Inverters

Leaders in Peru
with more than 4,300 MW of our power generation technology in operation



Siemens Energy offering

Provide a High range of Technologies toward Energy Transition



Energy System Design (ESD)

Overview & Examples

What is energy system design (ESD)?

ESD optimizes the design of an energy system with respect to a certain objective under given constraints.

Energy system

Combination of energy conversion units, energy storages, energy transfer lines, loads, renewables and others at multiple energy forms (multi-modal energy system)

Design

Technology selection, e.g.:

- Energy conversion units
- Energy storage units
- Energy transmission

Constraints

Constraints of the optimization problem, e.g.:

- Energy balances
- Part-load efficiencies
- Transmission capacities
- CO_2 emission limits
- Tax incentives/funding rules

Optimization

Solve a mixed-integer linear optimization problem (MILP)

Objective

Objective of optimization problem, e.g.:

- Minimize total expenditures
- Minimize CO_2/GHG emissions
- Minimize primary energy consumption

What is Energy System Design (ESD)?
Defining the techno-economic optimal energy system

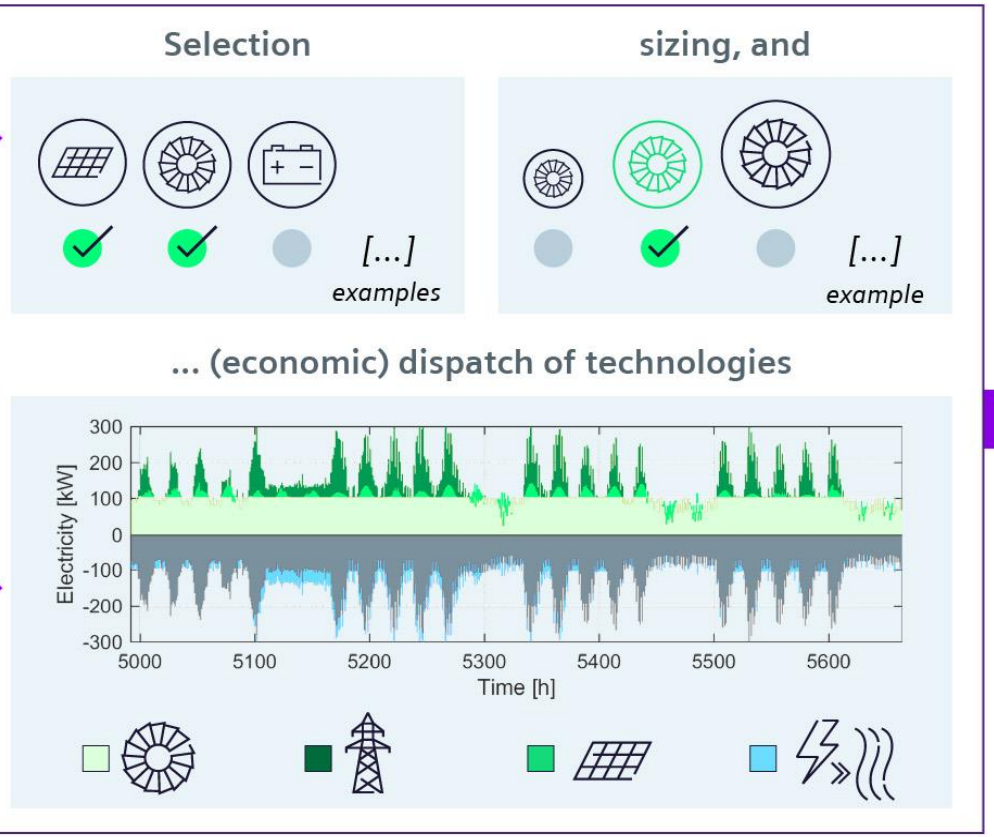
Technology related input data

- Performance models and parameters
- Component cost models

Site specific input data

- Optimization objective
  €/$ CO_2 PE
- Load profiles
- Commodity prices
- Renewable generation profiles
- Climate/weather data
- Technology pre-selection

Energy System Design



Results (output data)

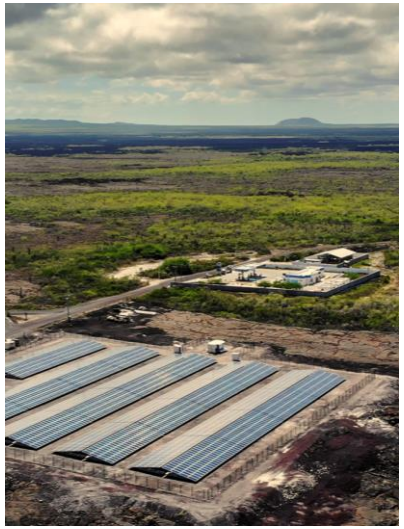
- Technology selection
- Optimal capacities
- Optimal operation schedule
- Economical and ecological data

Exemplary applications of Energy System Design

Hydrogen & PtX

Optimized technology selection and sizing of hydrogen and e-fuel synthesis plants powered by renewable energy.

- H_2 production in Germany
- E-Gasoline production in Chile
- Ammonia production in TX, USA
- E-Methanol production in Egypt



Hybrid Power

Combination of multiple technologies (renewables, energy storages, dispatchable generation) into one optimized energy system.

- Zero Carbon Power Plant in French Guiana
- American Naval Station
- Remote island grids
- Data Center in Middle East

Industrial Decarbonization

Evaluation of decarbonization potential of existing industrial plants. Developing a solid decarbonization roadmap to make existing infrastructure future-ready.

- Breweries in the EU, Africa
- Sugar factory in Middle East
- Pulp & board plant in Poland
- Graphite production in USA
- Zinc and Lead refining in Germany

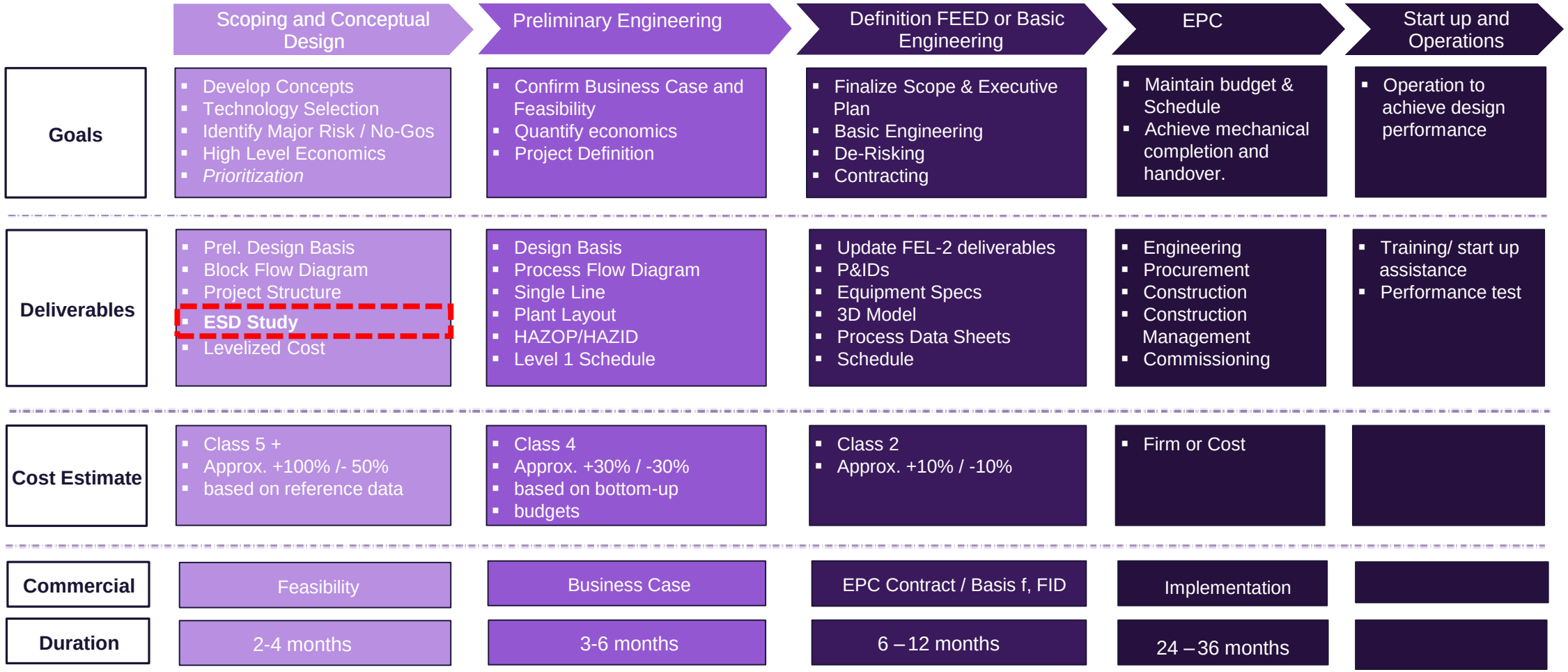
Power Plant Sites

Brownfield Transformation of existing assets like fossil power plants, considering local markets for electricity, district heating and process steam. Develop a robust decarbonization roadmap.

Coal-fired Power Plants in

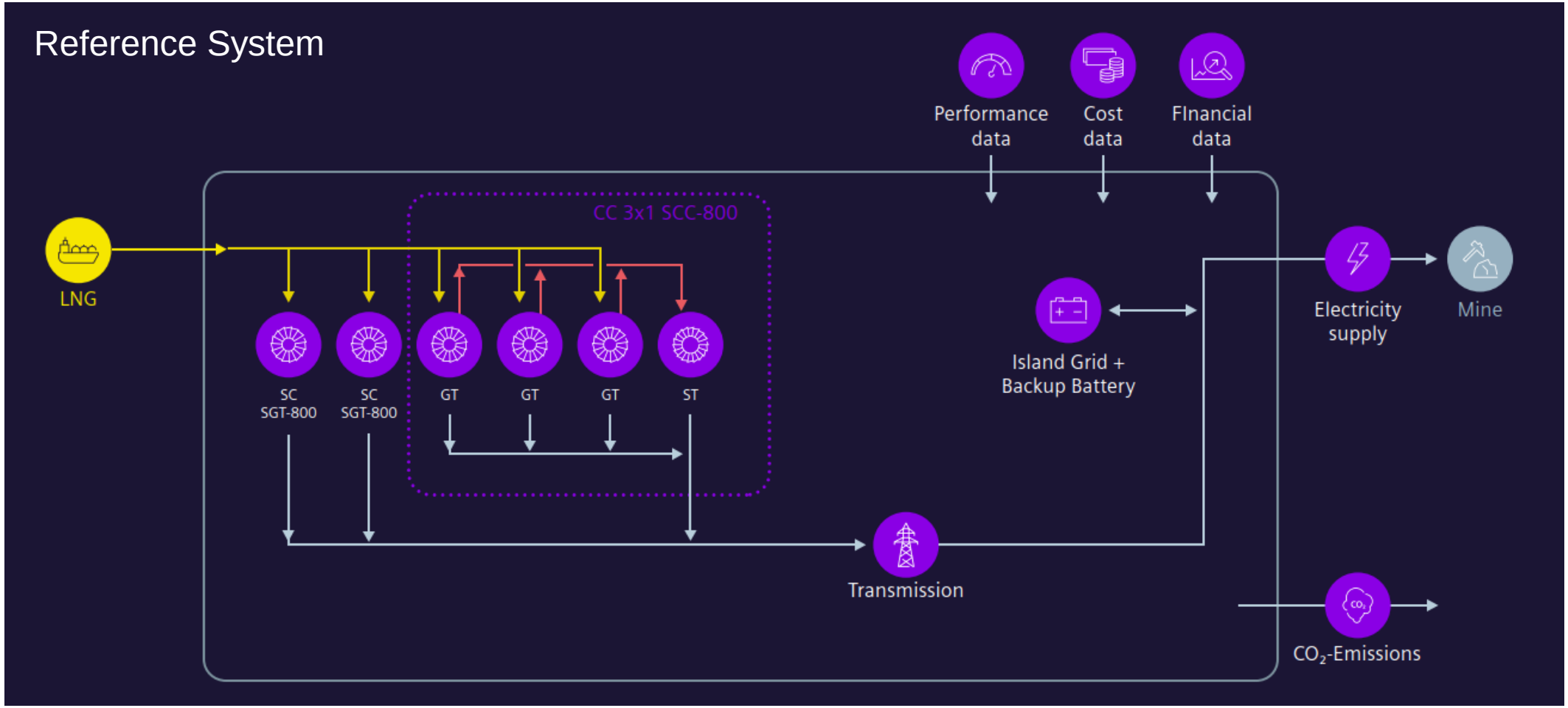
- Germany
- United Kingdom
- Netherlands

What is energy system design (ESD)?
Project Development - Timelines and Activities

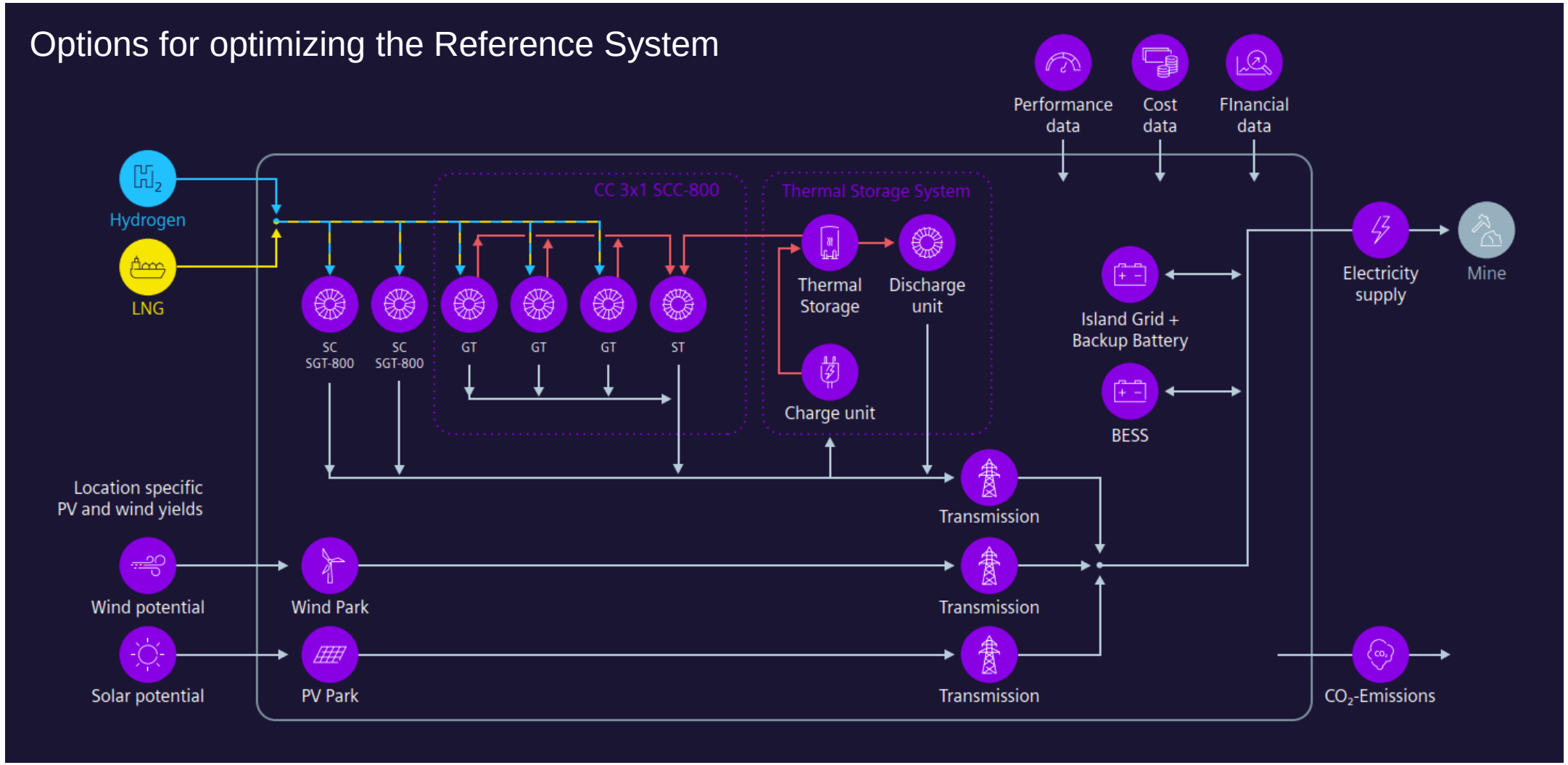


Example: Hybrid power plant design for a mine

New Mine with electricity demand between 180 and 220 MW and no grid connection in north-western Mexico



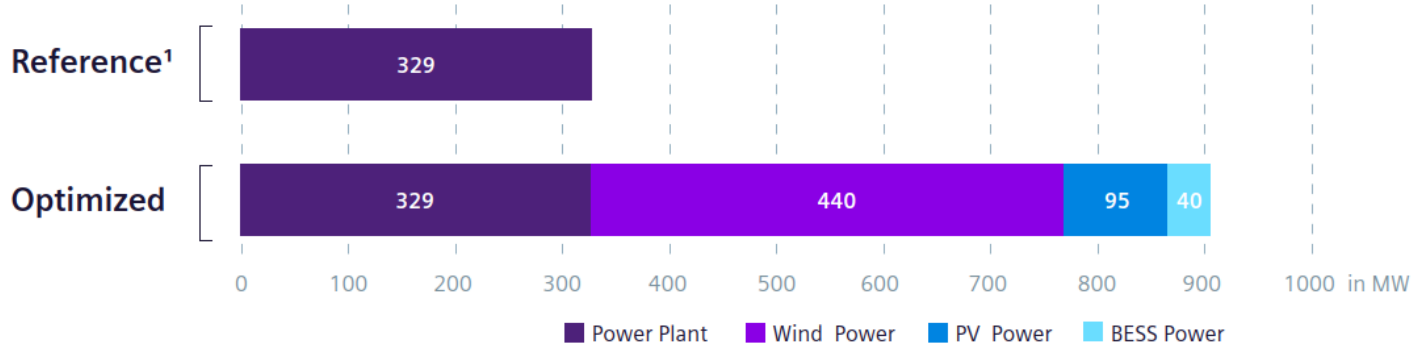
Optimization of the Energy System



Results of the Optimization of the Energy System

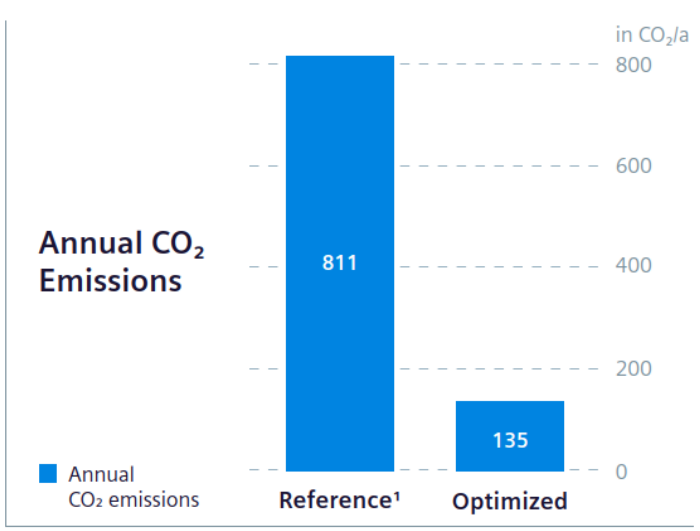
Installed Capacities

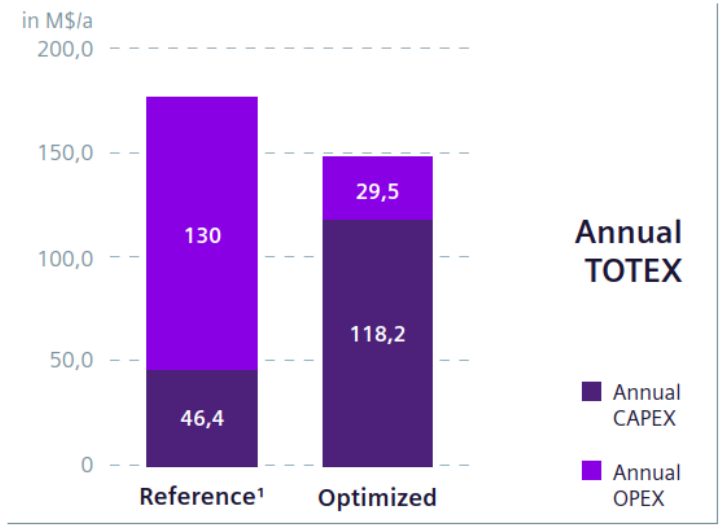
The optimized solution has a higher installed capacity because it includes a wind farm, a PV system, and an additional battery storage system



Annual TOTEX and CO_2 emissions

The hybrid power plant produces 82% less CO_2 emissions than the reference plant, at an annual cost that is 16% lower





Quick assessment shows high potential of lowering CO_2 emissions - 82% less CO_2 output compared to reference¹

Optimized solution shows 16% less annual costs, while decreasing operational expenditures by almost 80%

¹ LNG fired Power Plant; consisting of 2x SGT 800 Simple Cycle (113 MW) + 3x1 SGT 800 Combined Cycle (216MW), w/o renewable assets, WACC 7%, Lifetime under investigatio =20a, LNG price 9.4 $/MMBtu

PSS®DE (Power System Simulation – Distributed Energy)
leverages techno-economic simulation

SIEMENS energy

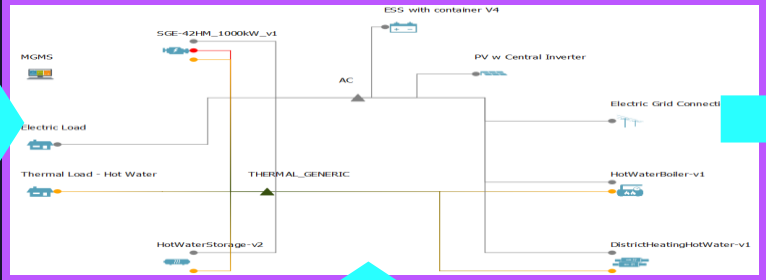
Siemens Energy portfolio

- **Automation, complex grid tariffs**
- **Loads (electrical, thermal, hydrogen)**
- **Gas/steam turbines, recip. engines**
- **Storage solutions (electrical, thermal)**
- **Hydrogen**
- **Renewable (Wind, PV, Hydroelectric)**

Customer drivers

- Cost pressure / new revenue streams
- Environmental footprint reduction
- Energy reliability / resilience

PSS®DE

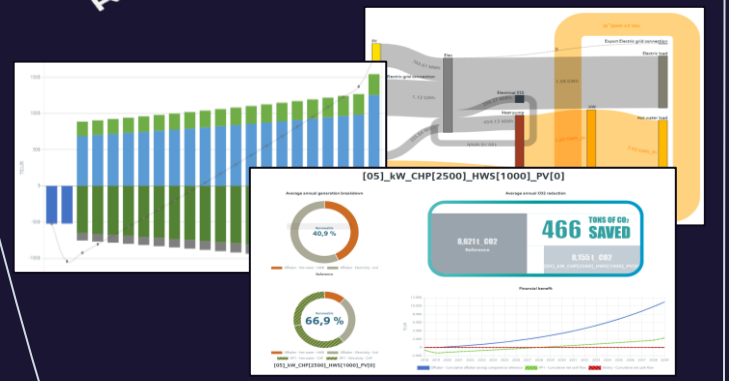


Project inputs

- Available resources (irradiation, wind)
- Load requirements (electrical + thermal)
- Business model & financial parameters

Quantified customer benefits

- Annual cost reduction
- Annual decrease in CO_2 emissions
- Financial benefit (LCoE, IRR, RoE)
- Generation breakdown



PSS®DE
Software simulation

Energy System Design

Ease decision-making for complex questions for your site

Increase revenue

In-depth analysis of site and technology setup to identify your potential **new revenue streams**

Optimal Solution

Data-based evaluation to tap the **full potential** of your existing assets and execution

CO_2 savings

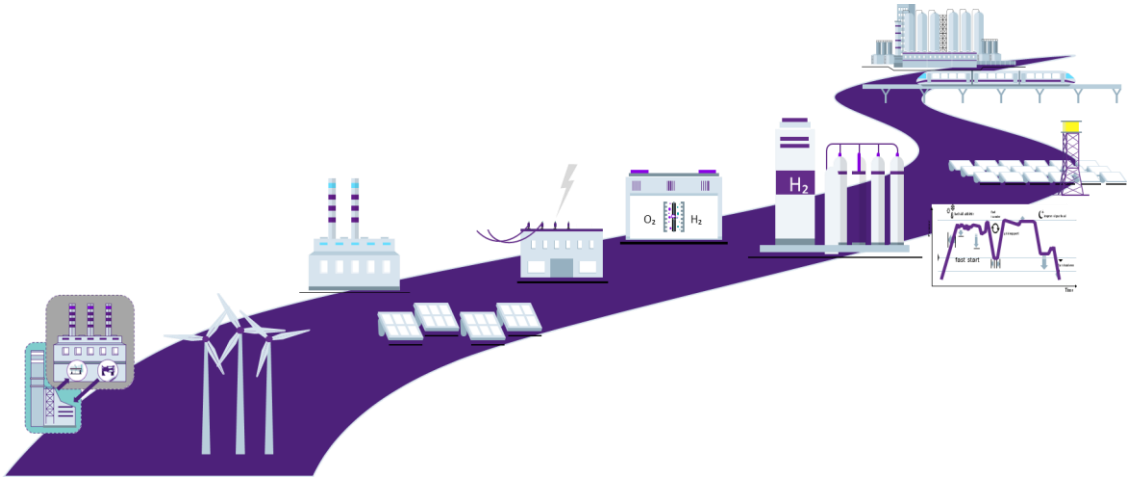
Usage of innovative bridging technologies to strive for your **NET ZERO**

Tailormade Solution

Creation of the optimal Energy System Design based on your Business Case and needs

Domain know-how

Precise modelling with **all-encompassing data** as experienced supplier



Sustainable partner

Your single point of contact from ideation over implementation to service

¡Muchas gracias!

Guillermo Diez

Siemens Energy
Desarrollo de negocios – South America

Av. Domingo Orué 971 Surquillo
Lima, Perú

Teléfono: +51 993 585 869
guillermo.diez@siemens-energy.com

siemens-energy.com/technical-consultancy