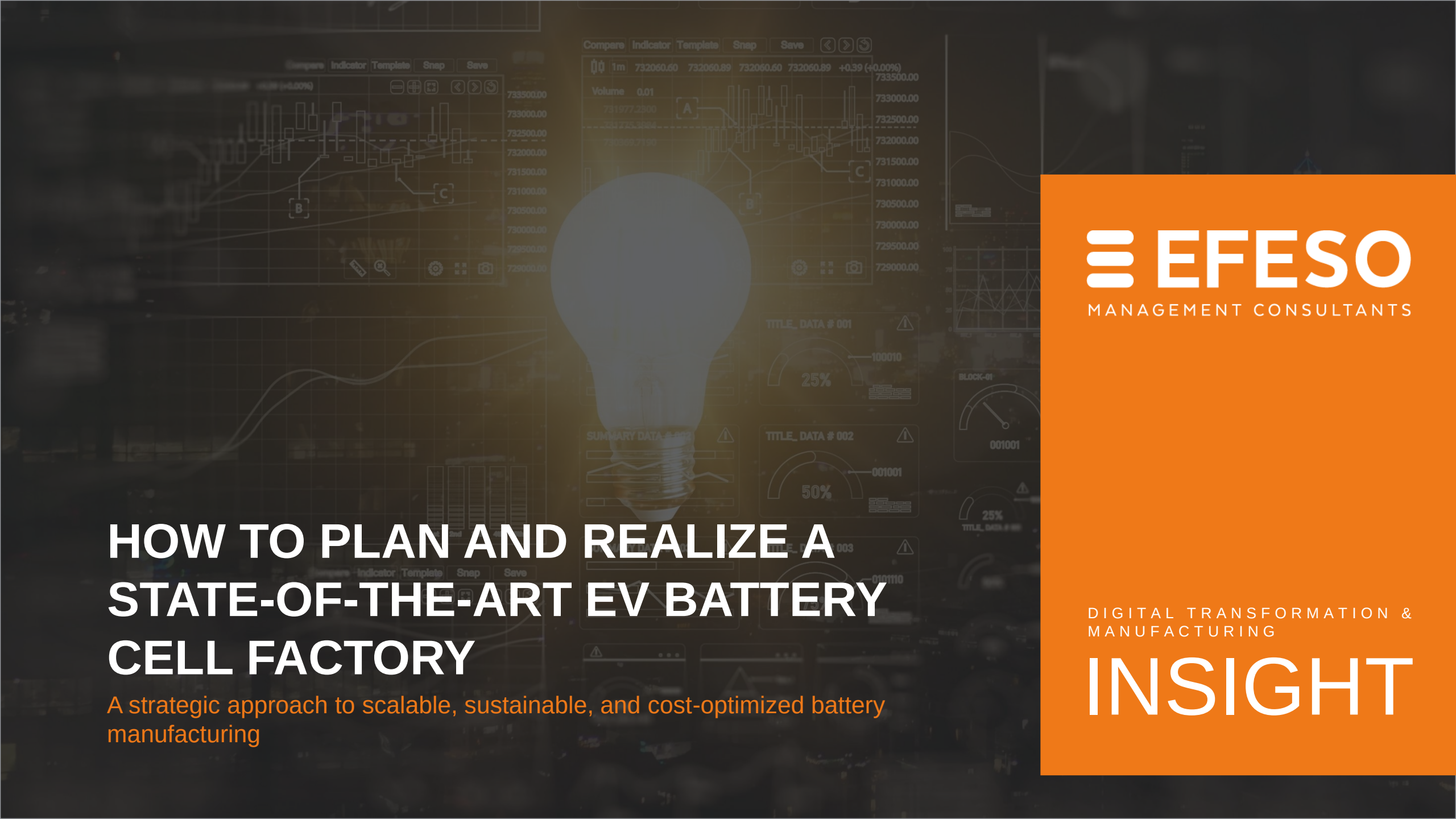


HOW TO PLAN AND REALIZE A STATE-OF-THE-ART EV BATTERY CELL FACTORY

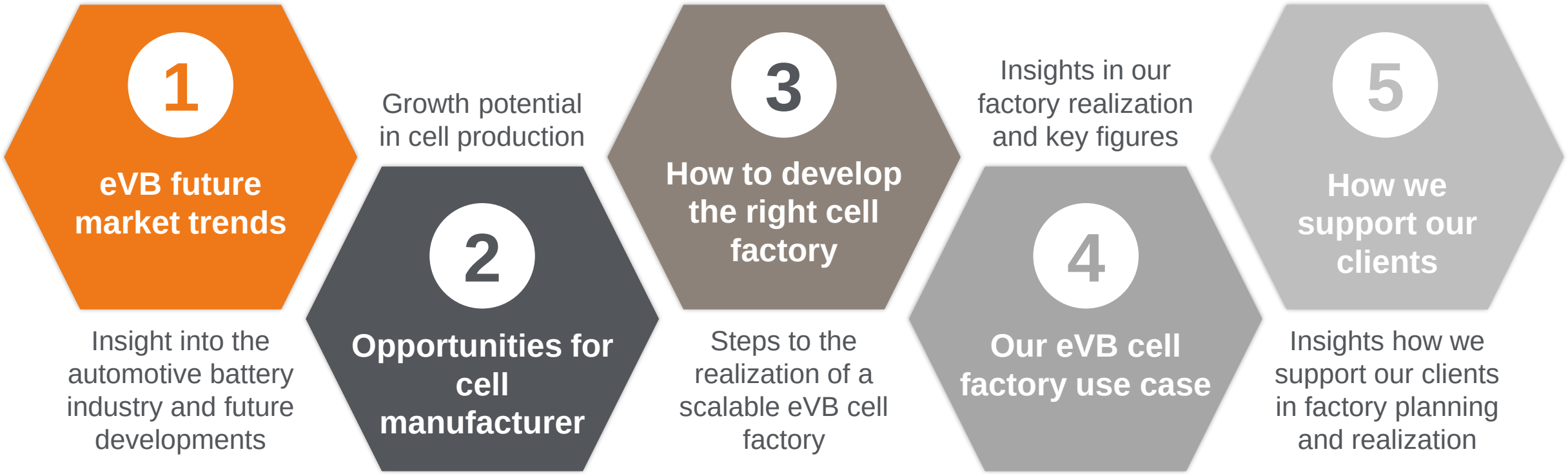
A strategic approach to scalable, sustainable, and cost-optimized battery manufacturing

EFESO
MANAGEMENT CONSULTANTS

DIGITAL TRANSFORMATION & MANUFACTURING

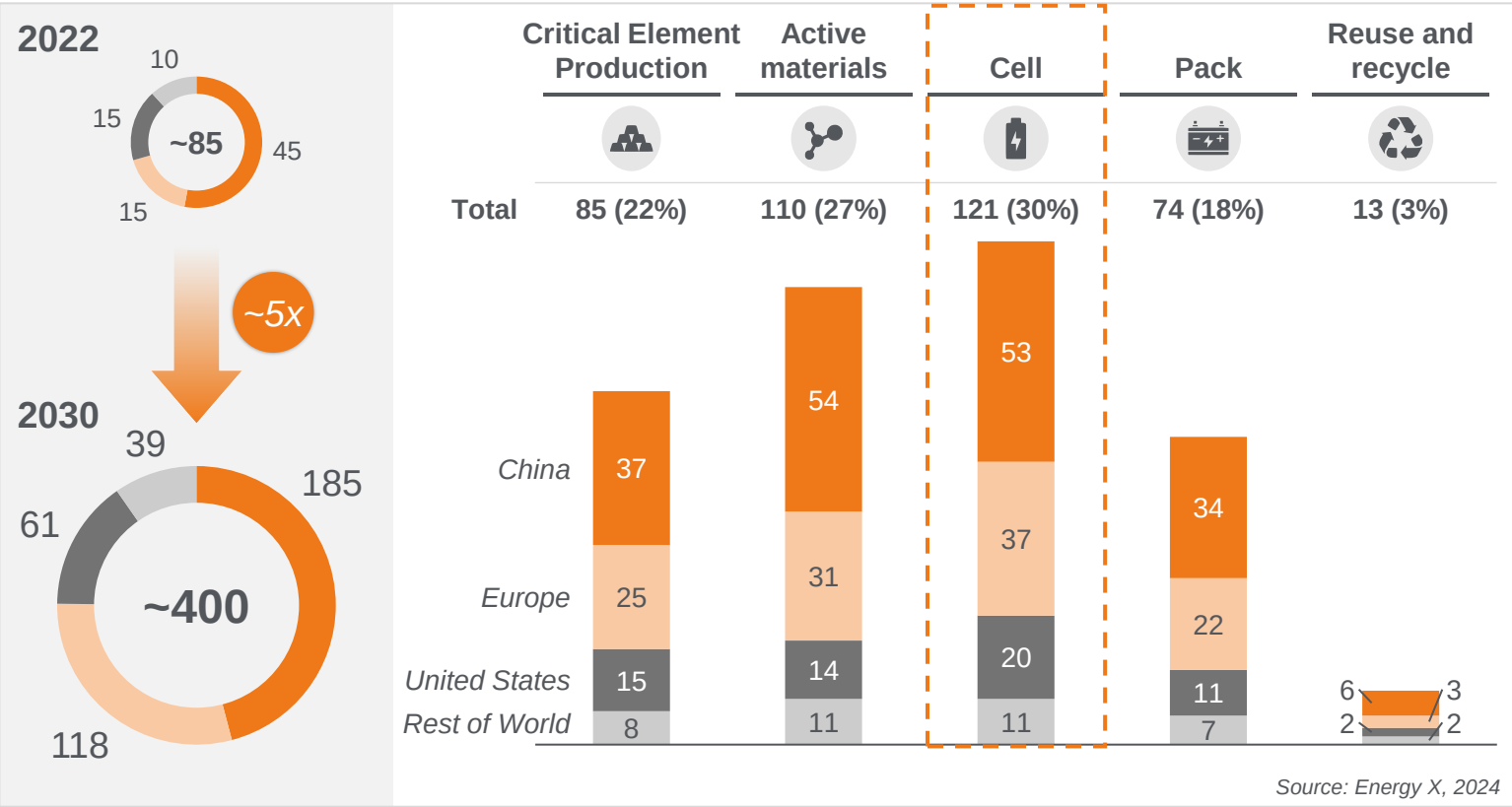
INSIGHT

Overview

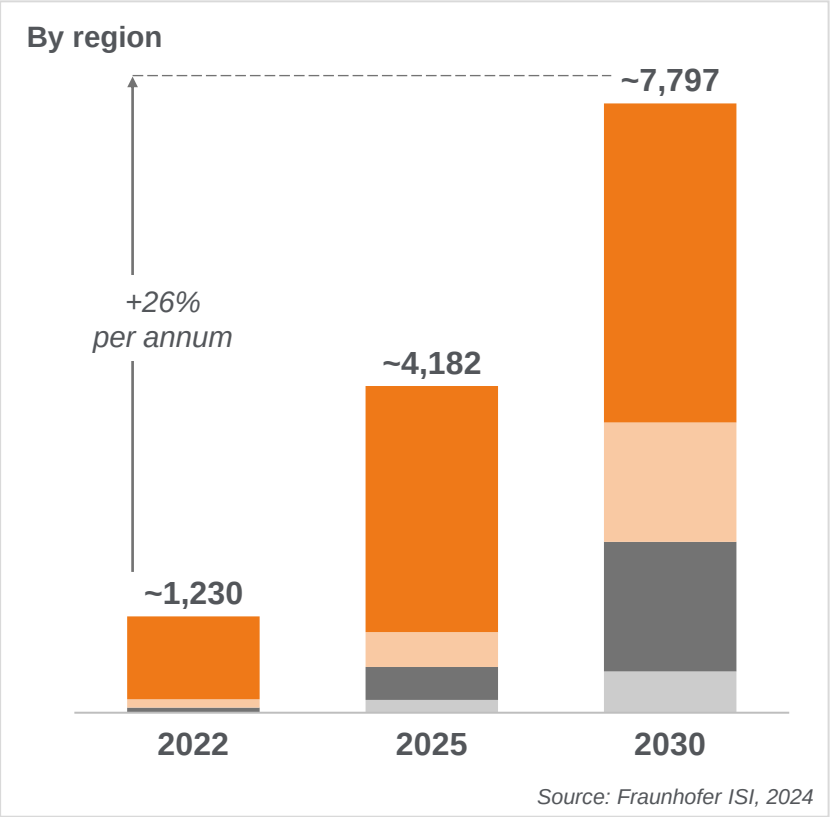

1
eVB future market trends
Insight into the automotive battery industry and future developments
Growth potential in cell production
2
Opportunities for cell manufacturer
3
How to develop the right cell factory
Steps to the realization of a scalable eVB cell factory
Insights in our factory realization and key figures
4
Our eVB cell factory use case
5
How we support our clients
Insights how we support our clients in factory planning and realization

The cell sector poised for highest value creation in the coming years – Europe leading in growth

Revenues, base case 2030, $ billion



Global Li-ion cell demand, GWh, Base case



Which cell is particularly in demand in Europe?

Rest of world | United States | Europe | China

Many factors create uncertainty for gigafactory investments (>50 GWh) amid political and market volatility

Reluctance to build large gigafactories

Market development
- Political uncertainty
- Extension of internal combustion cars
- Fluctuating demand

Financing difficulties
- Economic downturn
- High upfront investment
- Rising interest rates

Operating risks
- Risk of overproduction
- Long start-up times
- High level of complexity in coordination

Small cell factories

Flexibility
- Rapid response to changes in demand
- React faster to new technologies
- Regulatory changes are easier to keep up with

CapEx
- Low investment at the beginning
- Easy access to capital
- Lower interest and planning costs

Scalability
- Locally customizable solutions
- Avoidance of overcapacities
- Process optimization over time

Small but scalable factories should be built at the beginning to compensate for market uncertainty.

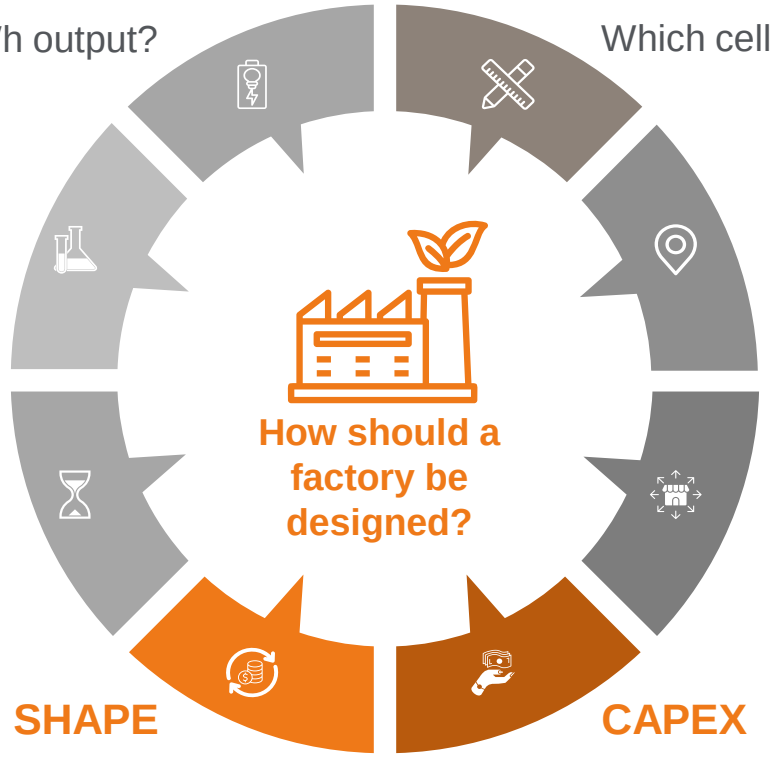
For a factory that meets the customer's requirements, key questions* must be asked and answered beforehand

INSTALLED CAPACITY
What should be the required GWh output?

CELL DESIGN
Which cell design should be manufactured?

CELL CHEMISTRY
Which cell chemistry should be used?

LOCATION
In which location and country will the factory be placed?



REALISATION TIME
How long does it take to complete the factory?

EXPANSION POTENTIAL
How much can the factory expand?

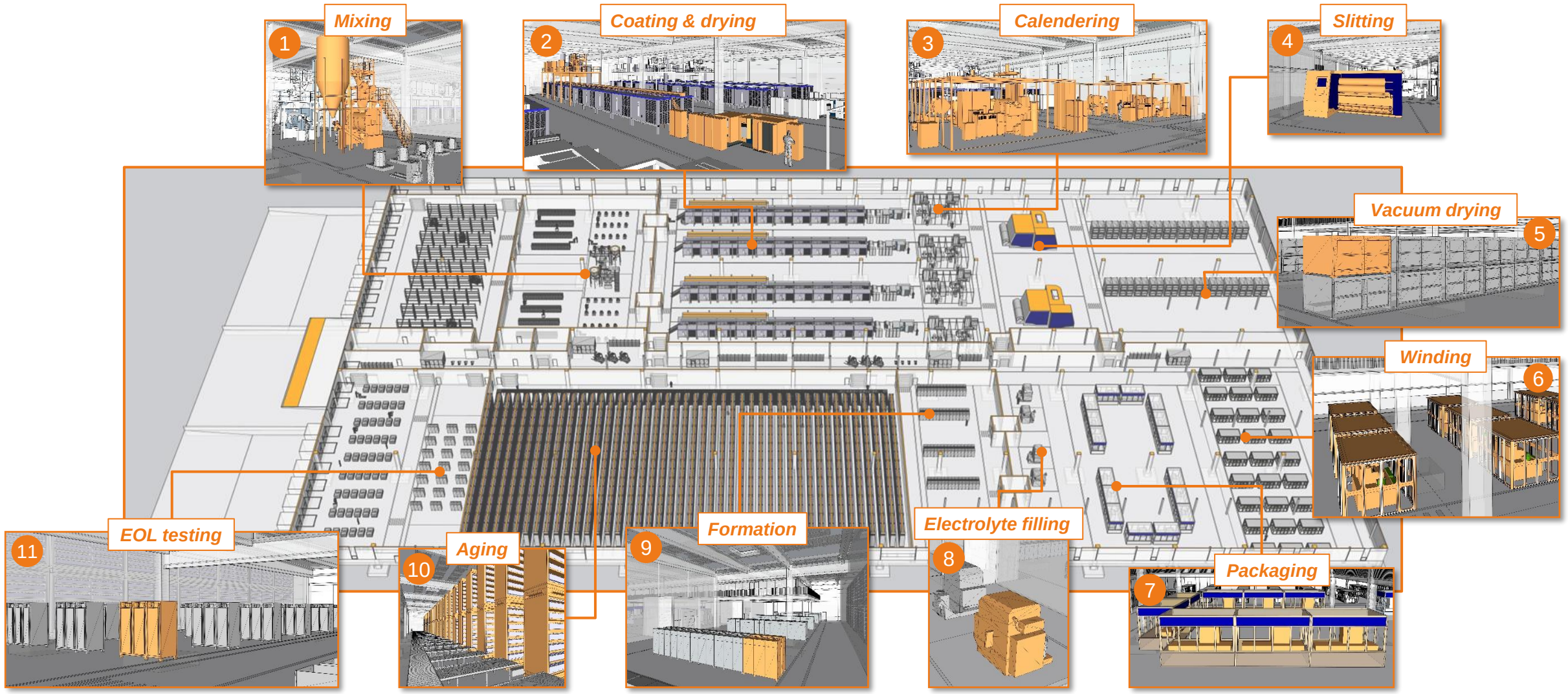
VALUE STREAM SHAPE
In which value stream is the factory arranged?

CAPEX
How high is the investment volume at the beginning?

We use our in-depth experience to support you in answering the key questions for client's factory concept.

*Only essential initial questions for rough selection; there are considerably more topics to be answered in planning

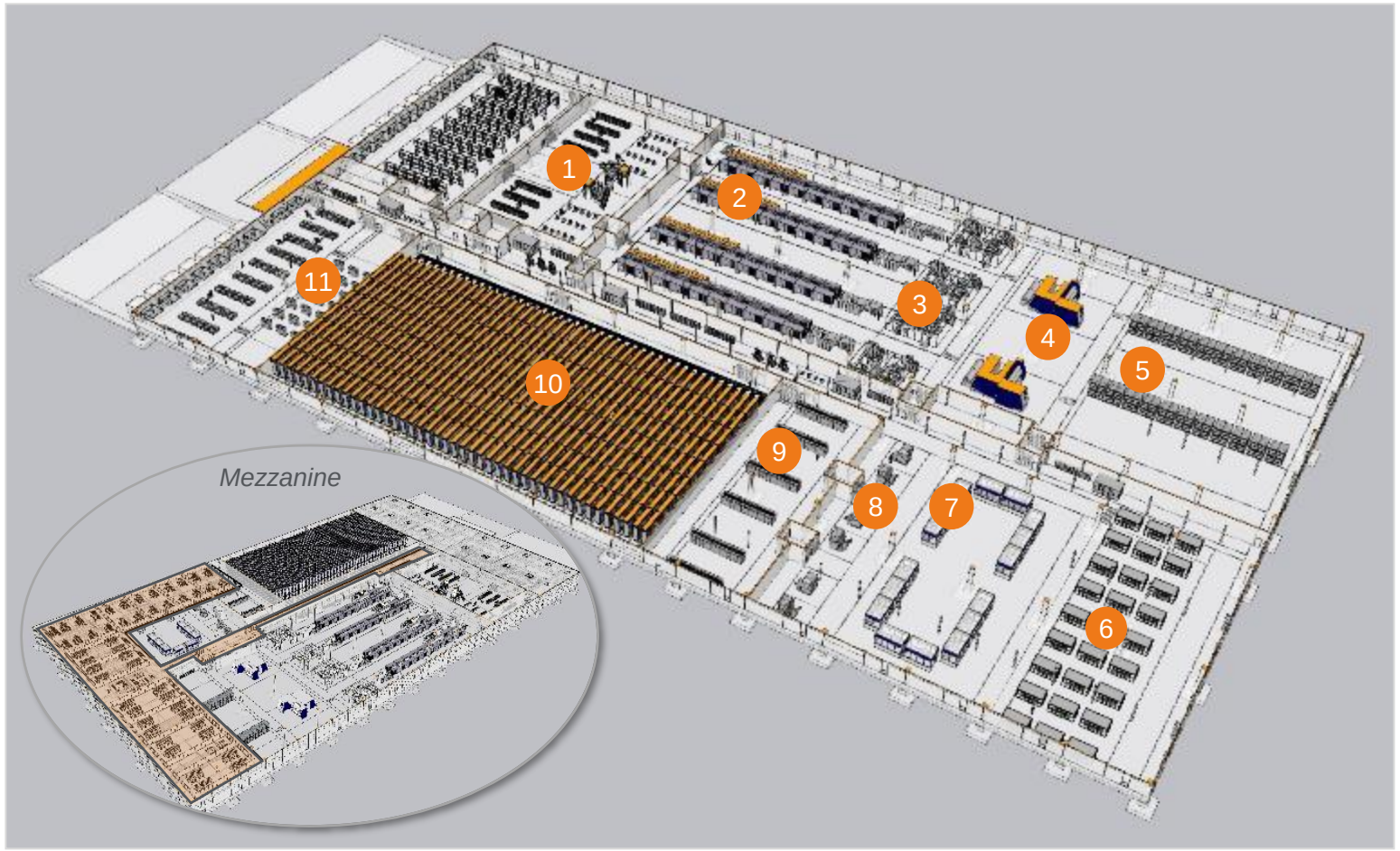
Machines for the eleven production steps carefully selected based on prior analysis



1 Mixing 2 Coating & drying 3 Calendering 4 Slitting 5 Vacuum drying 6 Winding
7 Packaging 8 Electrolyte filling 9 Formation 10 Aging 11 EOL testing

The eleven (11) different production steps are arranged in U-form on 28,000 m² and enable short distances with the best possible utilization of space

Insights of the EFESO eVB cell factory

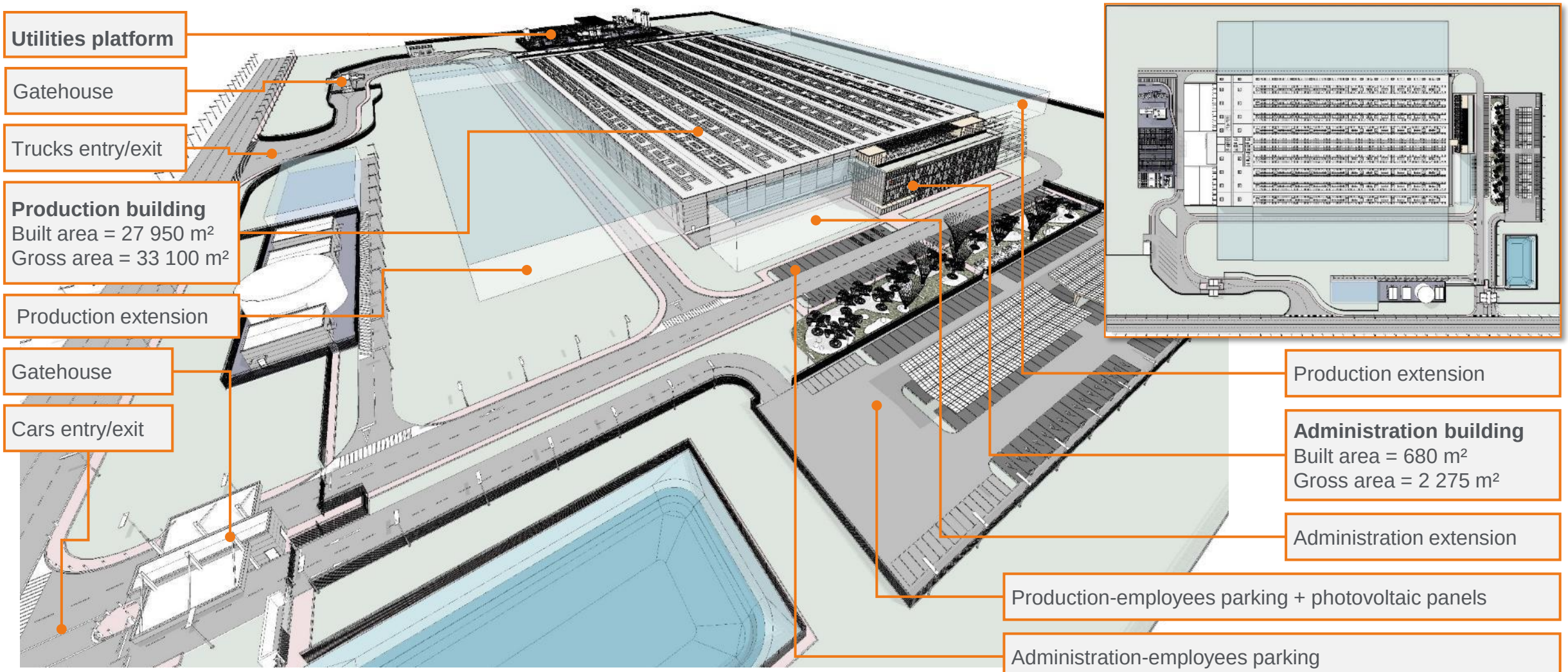


Key facts

- 5 GWh capacity p.a.
- ~ 137,500 m² property
- ~ 28,000 m² building area
- 1,931 cells/hour output rate
- 500 employees
- CapEx ~300 million EUR
- Fully automated aging warehouse
- Mezzanine level

1 Mixing 2 Coating & drying 3 Calendering 4 Slitting 5 Vacuum drying 6 Winding
7 Packaging 8 Electrolyte filling 9 Formation 10 Aging 11 EOL testing

The factory premises offer sufficient space for capacity expansion, including both production areas and the administrative building

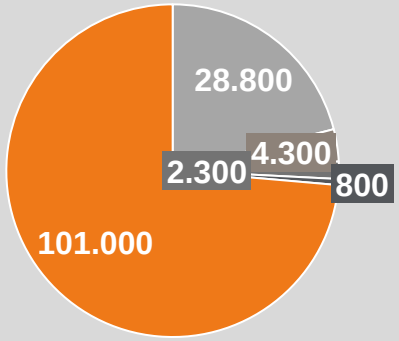


A 3D visual of the exterior factory premises, integrated into the strategic site design, enhances functionality, aesthetics, and supports informed planning

Project key figures: the overall costs for a 5 GWh factory with a floor space of 140,000 m² are estimated at approximately 300 million EUR

Areas [m²]

- Production area
- Logistic area
- Administrative area
- Technical area
- Outdoor area



~ ∑ 140,000 m²

Output rate

1,931 cells/h

Employees

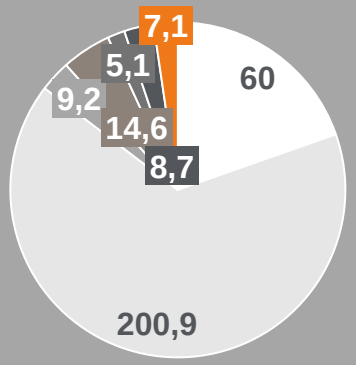
500

Realization time

2.5 years

Costs in m€

- Construction costs
- Systems and machines
- IT Infrastructure
- Utilities
- Logistics Equipment
- Planning, Enginering & PM
- Miscellaneous



~ ∑ 300 million EUR

Capacity

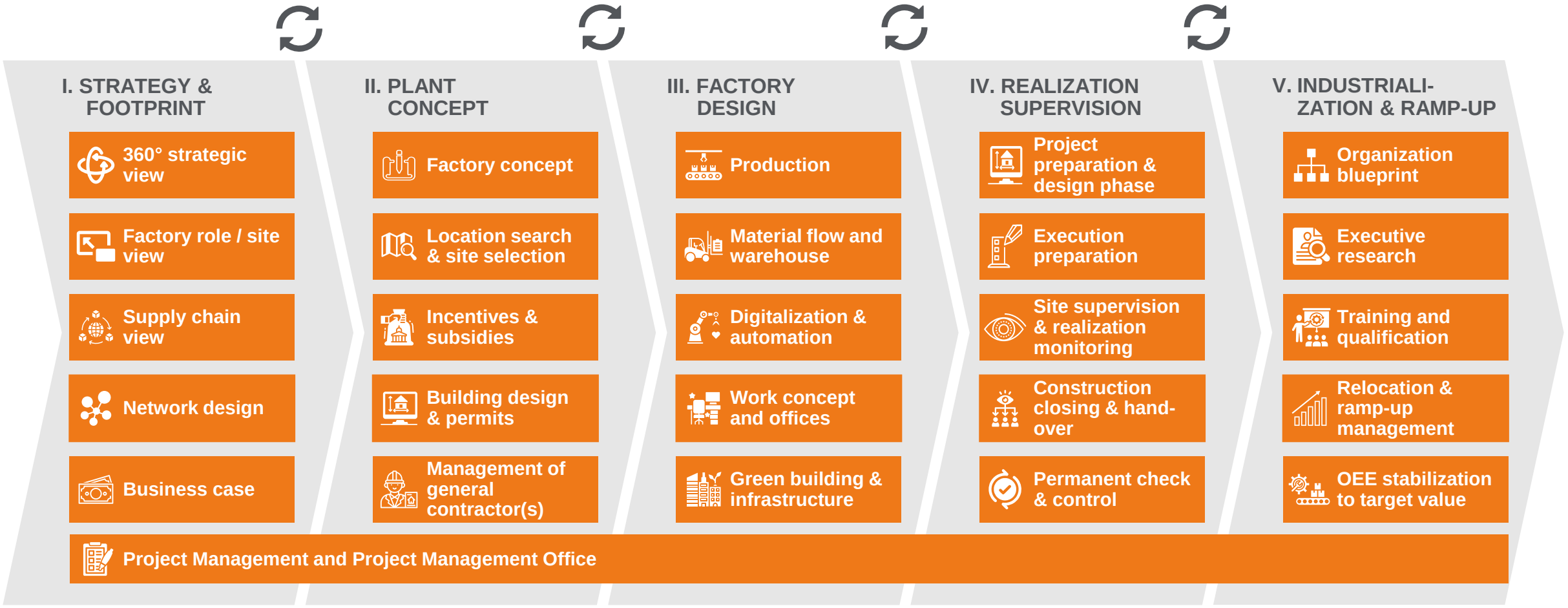
5 GWh/year

Sustainability

-100%
reduced CO_2 emissions

We have bundled, and expanded, our capabilities so that we can provide our customers with the best possible support, all the way from initial ideation to SOP

EFESO's 'one-stop shop' capabilities and service offerings for FACTORY PLANNING*



Topics are cross-phase and are only assigned for rough indication

*We support our customers holistically or in every phase in which our customer currently finds himself
OEE = Overall Equipment Effectiveness

The factory concept for eV battery cell production targets new customer groups and has great potential to realize a wide range of our service offerings

Target & approach

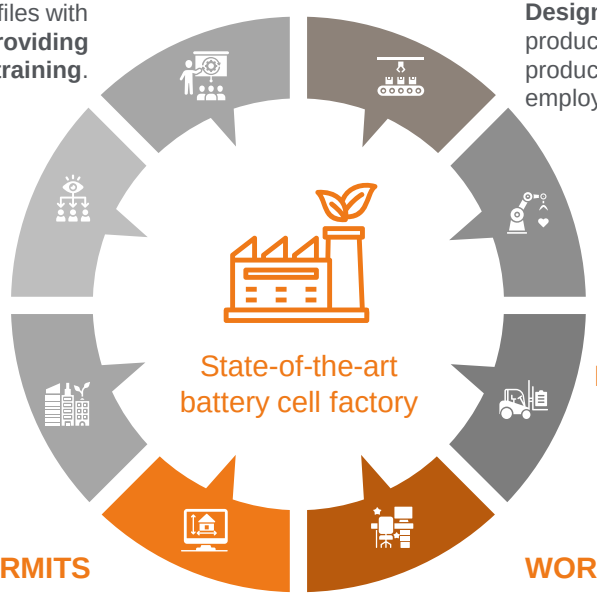
Target

Establish **a state-of-the-art battery cell factory** incorporating advanced manufacturing technologies, efficient production, optimized logistics and material flows, all while adhering to sustainability guidelines.

Approach

We leverage our expertise in battery cell technology and factory planning to develop a **3D factory visualization with precise cost calculations**, ensuring a solution that is ready for implementation.

Service offerings



TRAINING & QUALIFICATION

Matching requirement profiles with current employee skills and **providing targeted training**.

PRODUCTION

Design of assembly and machining tasks, production sequences and value streams, production layout, operating model, number of employees, as well as production steps and areas.

SITE SUPPORT & REALIZATION

Supervising site, manage projects, monitor all functions, and execute commissioning for building hand-over

DIGITALIZATION & AUTOMATION

Early planning for factory **digitization and automation**, as overall employee numbers – and their qualification levels - will depend on this.

GREEN BUILDING & INFRA

Integration of **sustainable construction and operation** into the overall concept, leveraging our considerable expertise.

MATERIAL FLOW AND WH

Planning and visualizing **material flow**, including buffers and warehouses, based on the production concept.

BUILDING DESIGN & PERMITS

Holistic **planning for building and infrastructure,** integrating all necessary disciplines, from concept to hand-over.

WORK CONCEPT & OFFICES

Tailoring **modern working models** to customer needs, considering offices and social spaces.

A **one-stop-shop solution**: Our combined expertise along all planning phases ensures maximum efficiency within the set up of the battery cell factory.

WH = Warehouse


EFESO
MANAGEMENT CONSULTANTS