Energy & CO_2 Reduction
from Roadmap to Implementation

Concrete stappen voor het verduurzamen van industriële processen
Online inspiratietour: Proces efficiency
Bilfinger Tebodin

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1 | What is it all about?

2 | Initiation assessment & planning of the Net Zero Roadmap

3 | Implementing the roadmap: Design & Build

What is it all about

There is a necessity to become ‘more sustainable’ in the industry. By setting goals and defining ambitions, steps can be taken

Trends

EU Fit for 55
Reduce 55% of CO_2 emissions by 2030
And climate neutrality by 2050*

Lots of companies lack a plan and targeted approach

1. ***Define ambitions***
The first step starts with yourself and what you would like to achieve

2. ***Get started!***
Roll out the ambitions and start practicing what you preach

3. ***Seek collaboration and assistance***
By looking for like-minded companies the chances for success will increase

Plan to action:
step by step approach to reach the ambitions and goals

*https://www.consilium.europa.eu/en/policies/green-deal/

The CO_2 Masterplanning is used to define a CO_2 roadmap and identify the measures needed to meet the ambitions of the company

CO_2 Masterplanning

Initiation, assessment, and planning + **Optimization & Modification**

Energy / CO_2 savings potential

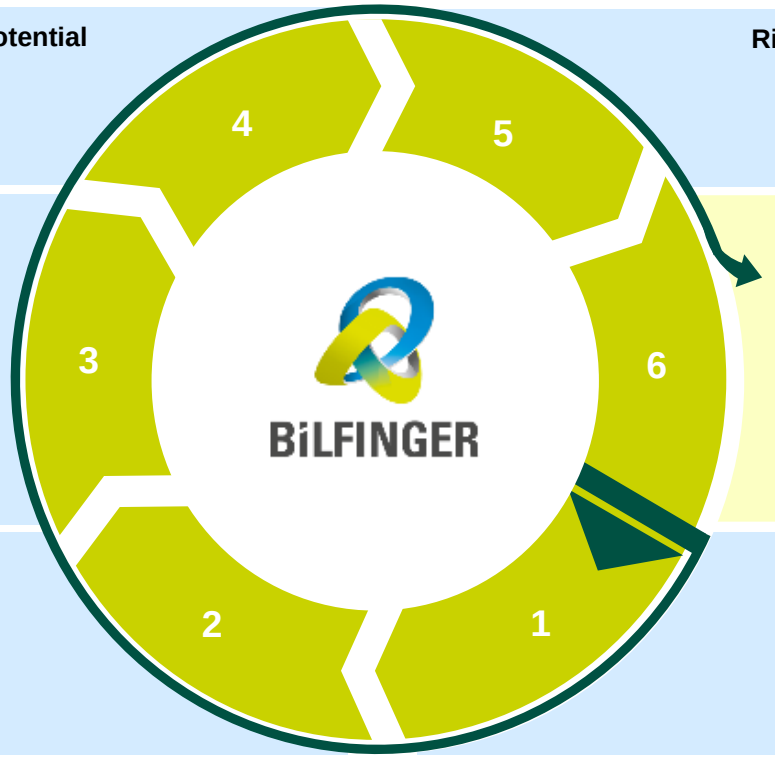
Risks, opportunities & cost

Environmental analysis

NetZero roadmap

Base case analysis

Process analysis



Design & Build
(various types of project deliveries)

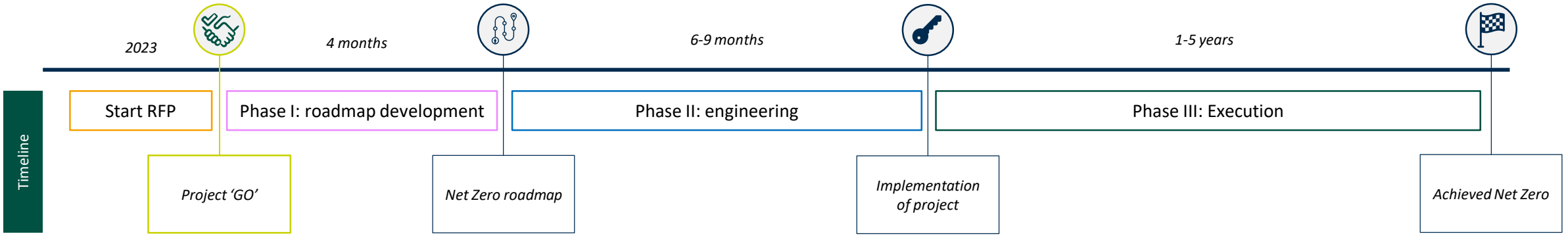
Operate & Maintain
(energy-related add-on services)

Customizable toolbox → focused on **sustainable improvements**

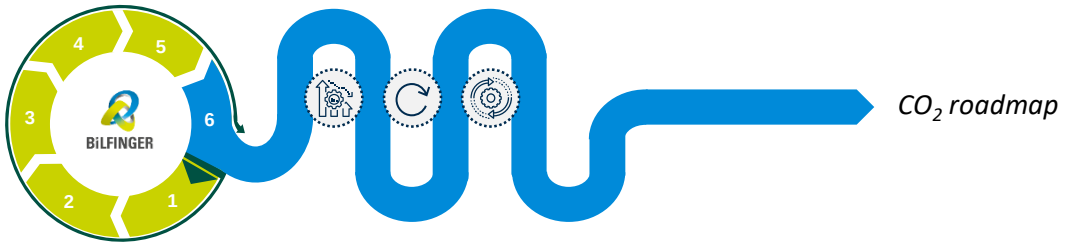
Timeline

Next steps

Net Zero timeline:



Deliverables of roadmap development



CO_2 roadmap

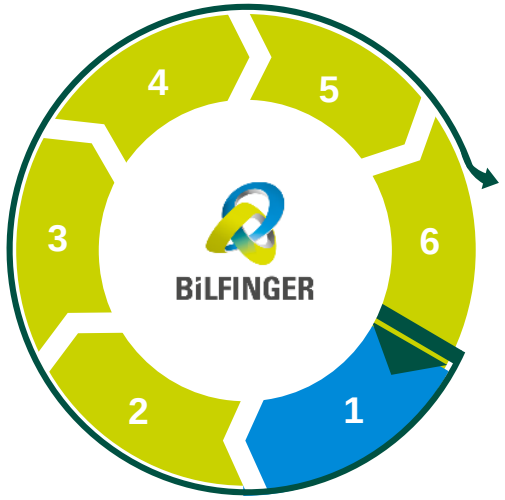
- Brief but thorough **Management report** following the **CO_2 master planning approach**
- A **document** with the most relevant **data transition and saving measures (+/- 50%)**
- A **schematic draft** with the proposed integration of **the main transition technologies**
- *A **draft** for a **personalized implementation plan** (phase II)*

Initiation, assessment, and planning

The first step of the CO_2 Masterplanning is used to identify critical process parameters and collect required data

CO_2 Masterplanning

Initiation, assessment, and planning



1

Process Analysis

- Process flow diagram
- Critical process parameters
- Best Available Techniques
- Alternatives and Variants

In the process analysis, the first step is **initiated** in which **critical process parameters** and **required data is collected**

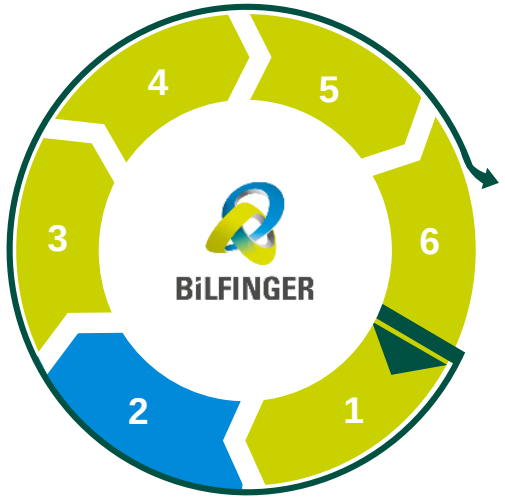
- Identify stakeholders
- Material balance
- Energy balance
- Site characteristics
- Required time for this step is approximately 4 weeks

Customizable toolbox → focused on **sustainable improvements**

In the second step of the CO_2 Masterplanning starting points are identified and verified

CO_2 Masterplanning

Initiation, assessment, and planning



2

Base case analysis

- Energy scan
- Site visit
- Emission registration
- Expert judgement

In this step, the **starting points** for the roadmap will be formulated
Moreover a **site visit** will be planned in which the starting points can be **verified and confirmed**

Kick off presentation

Starting points

Identifying scope 1, 2 & 3 emissions

Required time for this step
Approximately 1 week

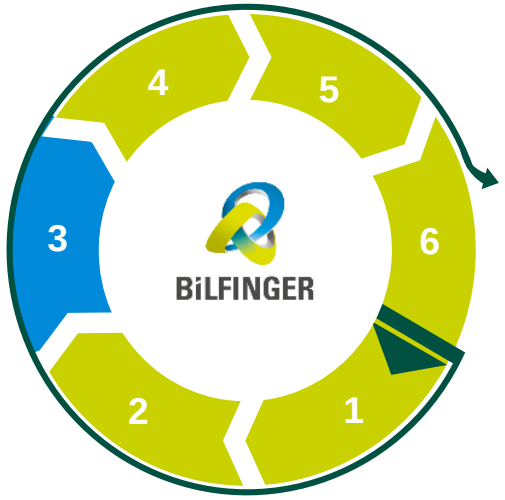
Site visit (1 week)

Customizable toolbox → focused on **sustainable improvements**

The environmental analysis identifies potential opportunities in the surrounding area of the site, with taken into account regional/national plans and legislation

CO_2 Masterplanning

Initiation, assessment, and planning



3

Environmental analysis

- Context outline
- Stakeholders
- Regional vision / initiatives / potential
- Laws and regulation

In the environmental analysis, **potential for collaborations** and **opportunities** in the surrounding area of the site are identified
Moreover, **legislation and regional / national development plans** are taken into account in order to come with a site specific strategy
The analysis can be used as a **strategic tool** that identifies which **internal and external factors** can impact the performance of the company

Stakeholder analysis

Market trend analysis

Regional / National development plans

Overview plot plan with explanation

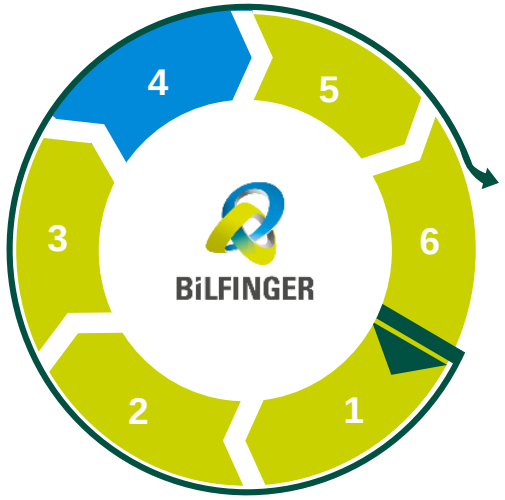
Required time for this step
Approximately 2 weeks

Customizable toolbox → focused on **sustainable improvements**

The potential analysis identifies the measures that have potential to be implemented in the final roadmap

CO_2 Masterplanning

Initiation, assessment, and planning



4

Potential analysis

- Process optimization
- Renewable energy
- New energy technologies
- Ecodesign – circularity

In the potential analysis, **potential measures** that can be implemented in the roadmap can be identified
These measures regard **energy saving, reduction, or transition measures** on scope 1+2 or measures to promote a **circular approach** regarding scope 3 emissions

Process optimization

Circular design

Renewables and green energy sources

Required time for this step
Approximately 2 weeks

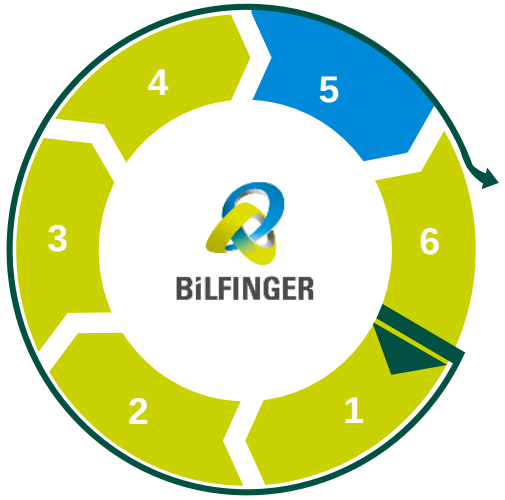
Define list of CO_2 reduction measures (long list)

Customizable toolbox → focused on **sustainable improvements**

Risks, opportunities and costs related to the identified measures are defined

CO_2 Masterplanning

Initiation, assessment, and planning



5

Risks, opportunities and costs

- Lock-in
- Availability / continuity
- Market developments (CO_2 price / Grants)
- CAPEX / OPEX

The fifth step identifies **potential risks, opportunities, and costs** that come with implementation of the proposed measures of step 4
These assets depend on the **availability, market developments and location**

Availability

CAPEX / OPEX indication (+/- 50%)

Market developments

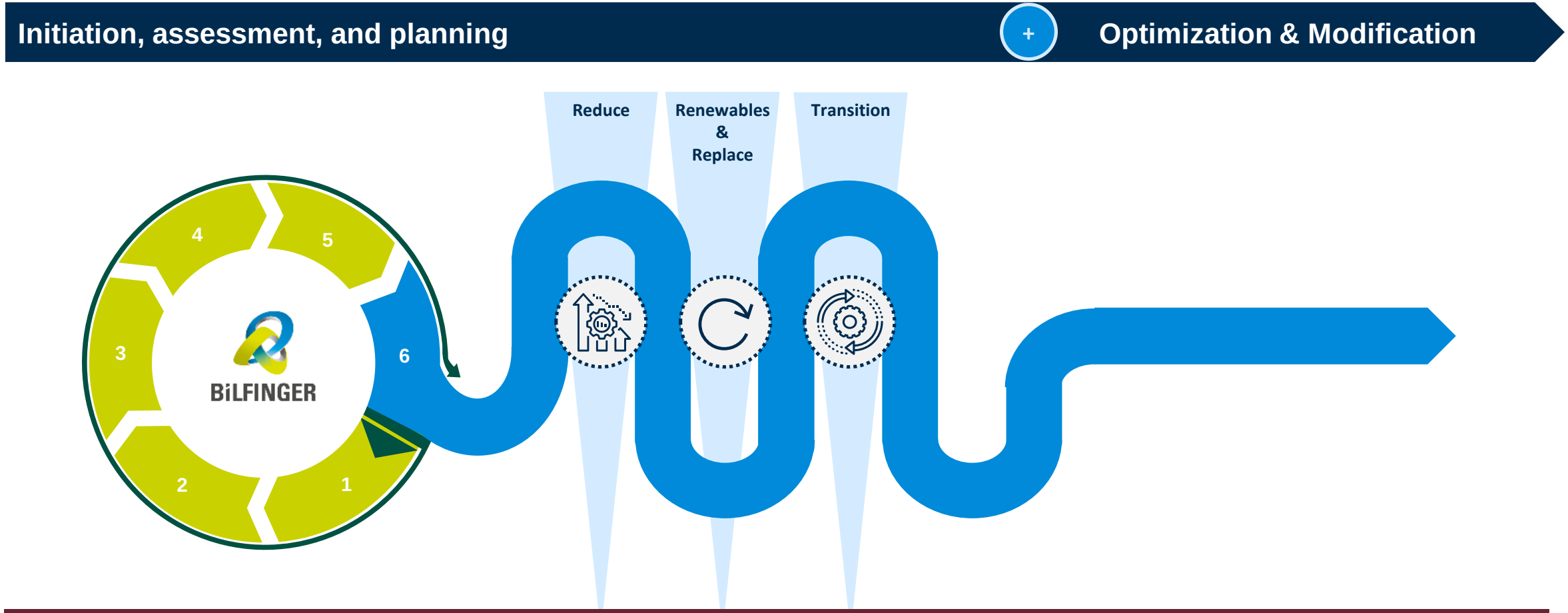
Required time for this step
Approximately 1 weeks

Decide on final CO_2 reduction measures (short list)

Customizable toolbox → focused on **sustainable improvements**

The CO_2 roadmap includes technical measures that reduce, replace and facilitate the transition to reduce CO_2 emissions

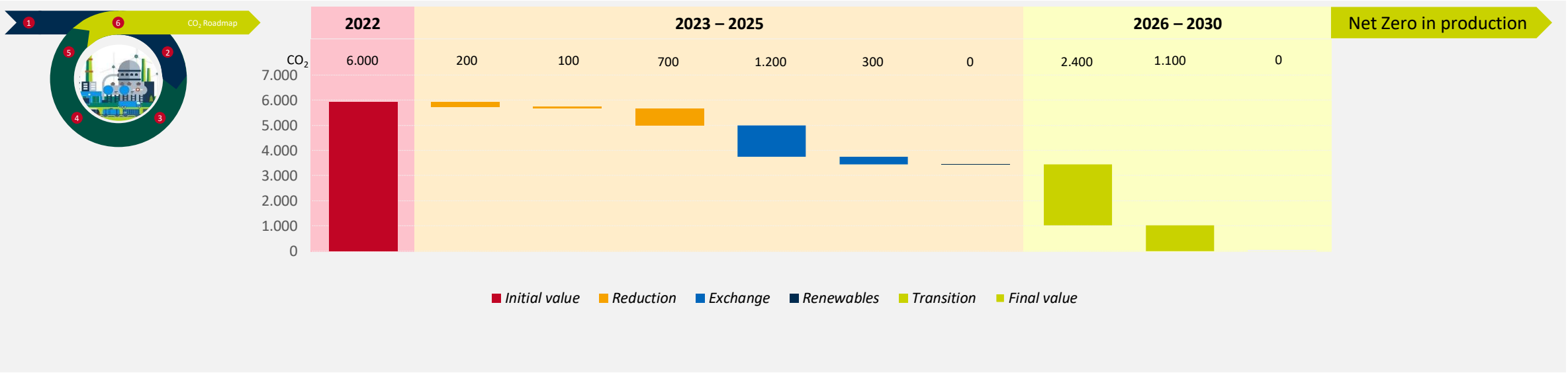
CO_2 Roadmap



Customizable toolbox → focused on **sustainable improvements**

The resulting roadmap consists of measures prioritised based on the type of measure, costs per ton of CO_2 reduction and ease of implementation

CO_2 reduction



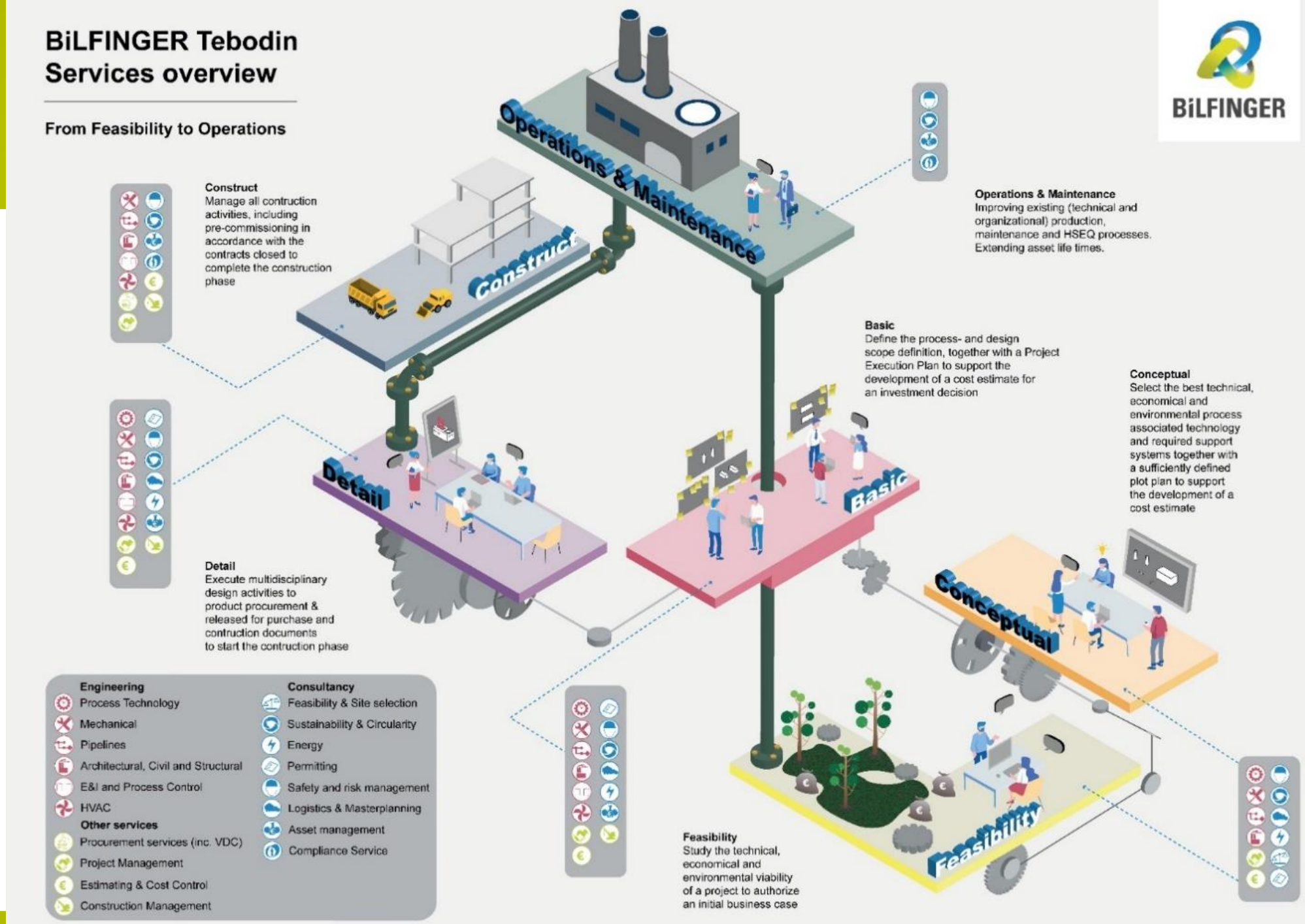
Measure number		Measure title	CAPEX in € (accuracy -40%/+40%)	Cost per ton CO^2 reduction [euros/ton]	Simplicity	Implementation period
1	Reduction 1		50.000-100.000	-150	+	2023-2025
2	Reduction 2		low (<50 000)	-100	+	2023-2025
3	Reduction 3		1 000 000	-50	+\--	2023-2025
4	Exchange 1		1 000 000 - 1 500 000	-20	+\-	2023-2025
5	Exchange 2		500 000	-10	+	2023-2025
6	Renewables 1		300 000 - 400 000	0	+	2023-2025
7	Transition 1		800 000 - 1 000 000	100	+	2026-2030
8	Transition 2		2 500 000 - 3 500 000	250	+\--	2026-2030

+	*Easy to implement*
+\-	*Medium hard to implement*
+\--	*Hard to implement*
-	*Difficult to implement*

Implementing the roadmap Design & Build

From feasibility to Operations

- Operations & Maintenance
- Construct
- Detail
- Basic
- Conceptual
- Feasibility



BILFINGER

Undisclosed industrial client (ongoing global support)

Client has the ambition to become Net Zero in production in 2030 for all their production sites worldwide

Scope

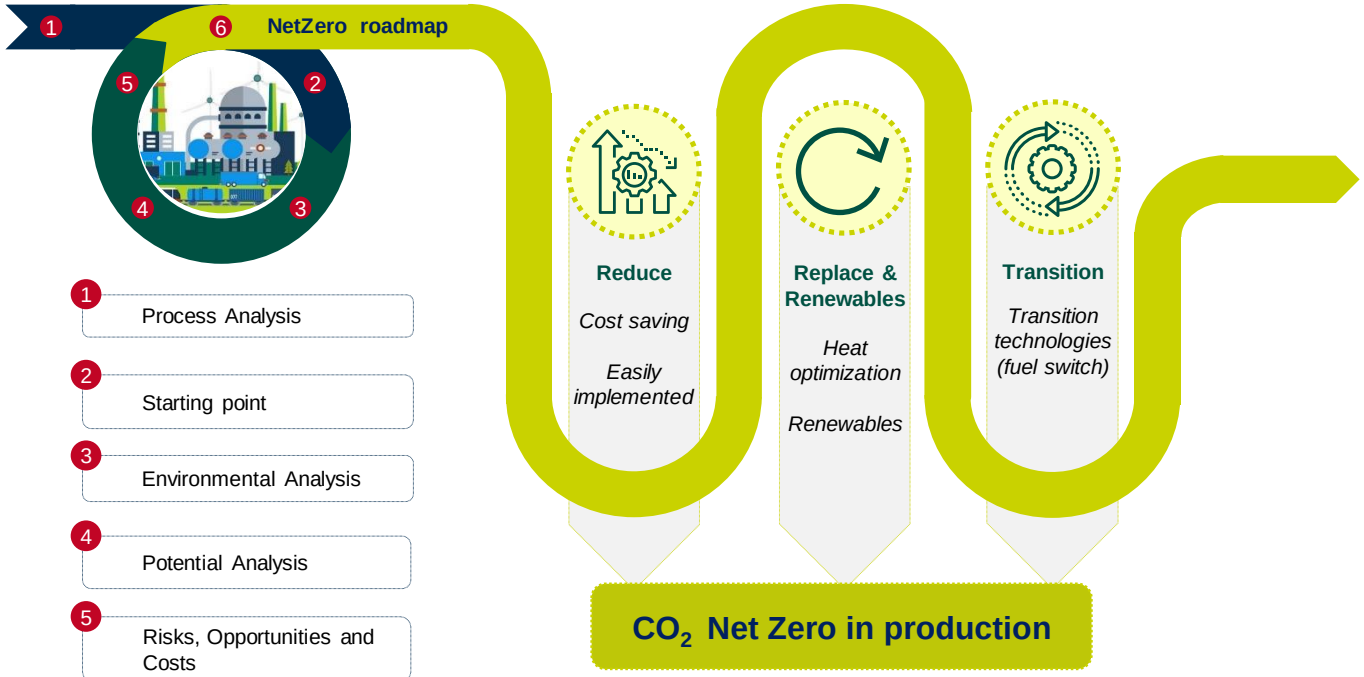
Consultancy & feasibility, conceptual, and basic engineering by Bilfinger Tebodin; Implementation by Bilfinger Life Sciences

Budget

*Investment cost per site estimated at ± **€ 6 - 9 million** (CAPEX ±40% in phase I)*

Status

- *13 sites finished phase I of the project*
- ***International** scope of work (e.g. Serbia, Netherlands, Americas)*
- *The road to Net Zero includes measures based on **'reduce', 'replace', and 'transition'***
- *So far the measures identified result in **6 – 20 kton CO_2 reduced** per year*



BILFINGER
DSM

Customer challenge

- DSM has an energy savings target to achieve 15% final energy savings in the period 2015-2025

Our solution

- Bilfinger performed 3 quick scan energy audits.
- We developed site specific road maps to improve energy efficiency.
- Focus areas were steam, cooling, compressed air systems, heat integration and waste heat recuperation, energy management.

Benefits

Cost Reduction: >100k€ p.a.

Energy: - 15%

BILFINGER
Friesland Campina

Customer challenge

- Identification and development of energy saving measures and waste heat recuperation
- Part of framework of Encore program for 14 Friesland Campina dairy plants

Our solution

- Example Beilen: 3 quick scan saving measures have been identified, specified and implemented
- 1: avoiding 72 kton/yr of CO2 emissions
- 2: avoiding 270 kton/yr of CO2 emissions
- 3: saving 110 000 kWh/yr of electricity.
- Example Aalter
- avoiding 100 kton/yr of CO2 emissions

Benefits

Cost Reduction

>100k€ p.a.

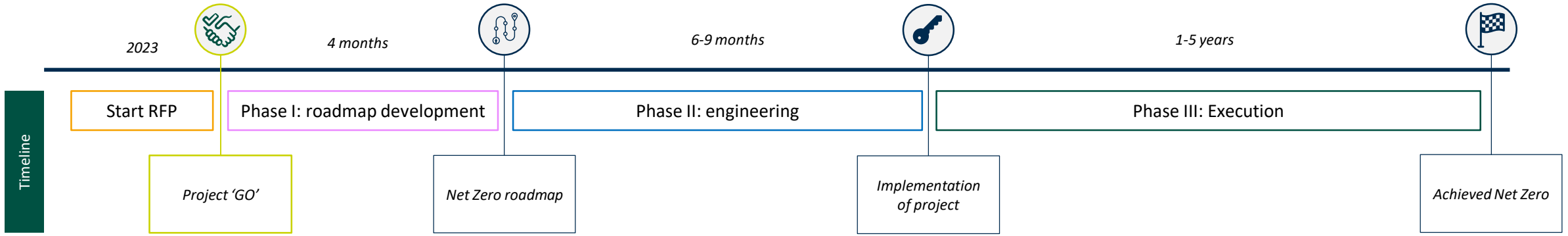
Energy

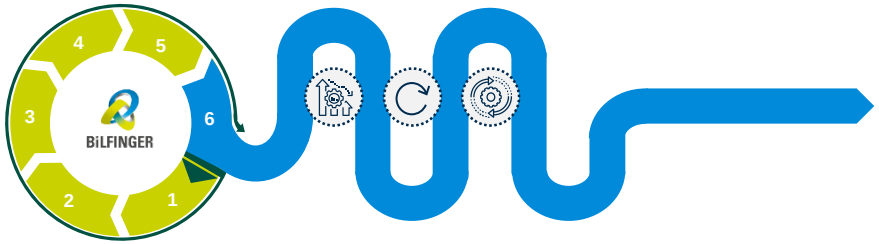
- 15%

Timeline

Next steps

Net Zero timeline:





CO_2 roadmap

Optimized single-source full-service solution eliminating interface losses, providing clear responsibilities as well as highly efficient supplier management

WE MAKE IDEAS WORK

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Our services

Consultancy

- Asset management & maintenance
- Environment
- Energy
- Logistics
- Process integrity & safety
- Industrial sustainability
- Compliance management
- Authority engineering & permitting
- Feasibility
- Due diligence

Design & Engineering

Conceptual, basic and detailed engineering in all relevant disciplines:

- Civil, structural and architectural
- Building services
- Pipelines and infrastructure
- Electrical,
- instrumentation and process control
- Energy
- Piping
- Logistics
- Mechanical
- Process

Project Management

- Management of EPCm services
- Estimating and cost control
- Scheduling and progress control
- Quality and safety assurance
- Commissioning management and assistance
- Program management

Procurement

- Project purchasing, expediting and inspection
- European tenders
- (non) production related purchasing
- Performance based maintenance / tendering
- Contract management

Construction Management

- Construction quality, health, safety and environment (QHSE) management
- Site management
- Construction supervision
- planning, cost and progress control