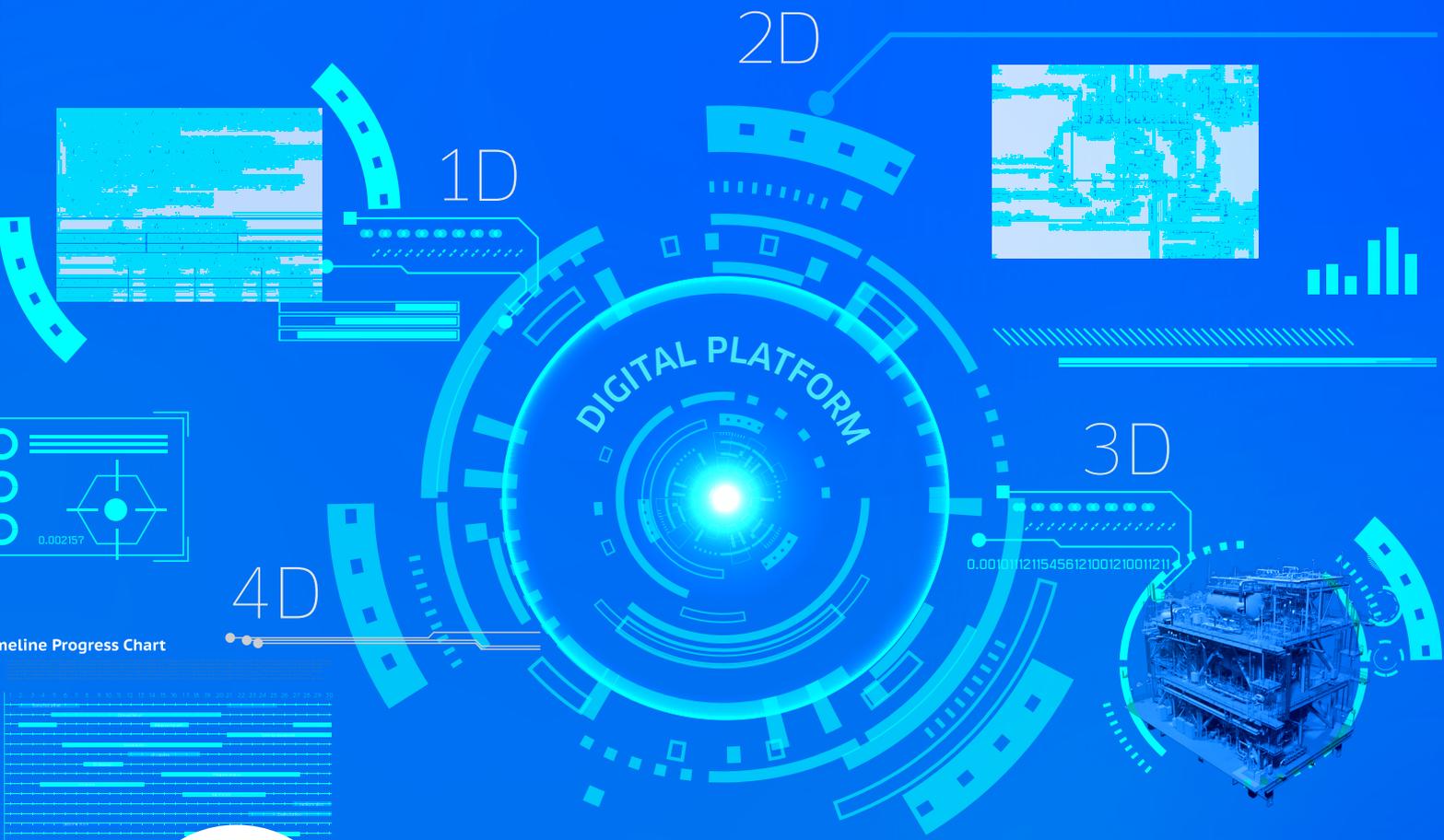


Where energies make tomorrow ●

Digital business acceleration

White paper



TECHNIP
ENERGIES

Contents

What digital business acceleration means to Technip Energies	3
Digital transformation is accelerating in the energy industry	4
Our journey: from doing digital to being digital	4
Data is the backbone of the digital transformation	5
Digital project execution	6
Digital services	8
Digital value beyond efficiency and additional revenue streams	10
People make the transformation happen	11

What digital business acceleration means to Technip Energies

We have long recognized digital as a major driving force in our industry to increase efficiency and productivity. The energy transition has brought new meaning to digital, making it a game-changer in promoting the structural change needed to accelerate the shift to a low-carbon future. Digitalize to decarbonize has become an imperative, powered by accurate, objective, and accessible data.

At Technip Energies, energy transition is our business. Therefore we are fully invested in harnessing the power of digital in this journey. With a solution-oriented approach that connects data across the entire project life cycle, we make sustainable changes to the way we operate, broaden opportunities, and support new business models.



Digital transformation is accelerating in the energy industry

Our once conservative industry is transforming itself rapidly and the trend is accelerating on the back of the energy transition. Digital is now much more than an opportunity for more efficient and flawless operations; it is a necessity, especially as the energy industry undergoes structural changes and fundamentally rethinks traditional ways of working and business models. How do we address decarbonization at scale of a sector such as liquefied natural gas

(LNG), industrialize new energy sources like Floating Offshore Wind, or join up the dots across various industries to enable the circular economy? While there are no simple answers to these questions, we know that success in this new context lies in our ability to capture and connect data and leverage its full value in the right collaborative environment.

Our industry's digital ecosystem is still fragmented and very dynamic.

There is an array of players pitching different solutions to contractors like us and to our clients: from software giants to pure digital, equipment and control systems, product lifecycle management, and digital engineering players. On top of that, contractors are now faced with strong competition and even disruption from new digital entrants in their areas of operation.

Our journey: from doing digital to being digital

Technip Energies has taken a pragmatic yet forward-looking approach towards digital. We have the ambition to fully embrace digital capabilities as a core enabler of sustainable and profitable business performance: from revenue growth to improved internal efficiency, enhanced collaboration across the entire value chain, and creation of new business models.

We are progressing our journey to become Digital along three strategic goals:

- **Data and digital foundations:** strengthen our data culture and data

management practice to create more data-driven business value

- **Digital project execution:** establish digital project management practice as a competitive differentiator
- **Digital services:** lead digital services for the energy transition covering the entire plant's life cycle.

Our Executive Committee is fully committed to these efforts, as strong executive-level sponsorship is key to promote and sustain transformation.



Data is the backbone of the digital transformation

As engineering and technology organizations undergo digital transformation, they face the challenge of revisiting their core work processes to connect all key applications with the relevant digital infrastructure across the enterprise. This requires a shift from a document- and tool-centric approach to a fully data-centric approach, starting with the definition of common data models, data governance, and data technologies. This shift started in the early 2000s, with the rapid development of engineering design software, and the consequent need to better manage the information shared between different disciplines and throughout different project phases. In addition, customer requirements in terms of data handover have become more prescriptive and complex.

What data-centric means for us

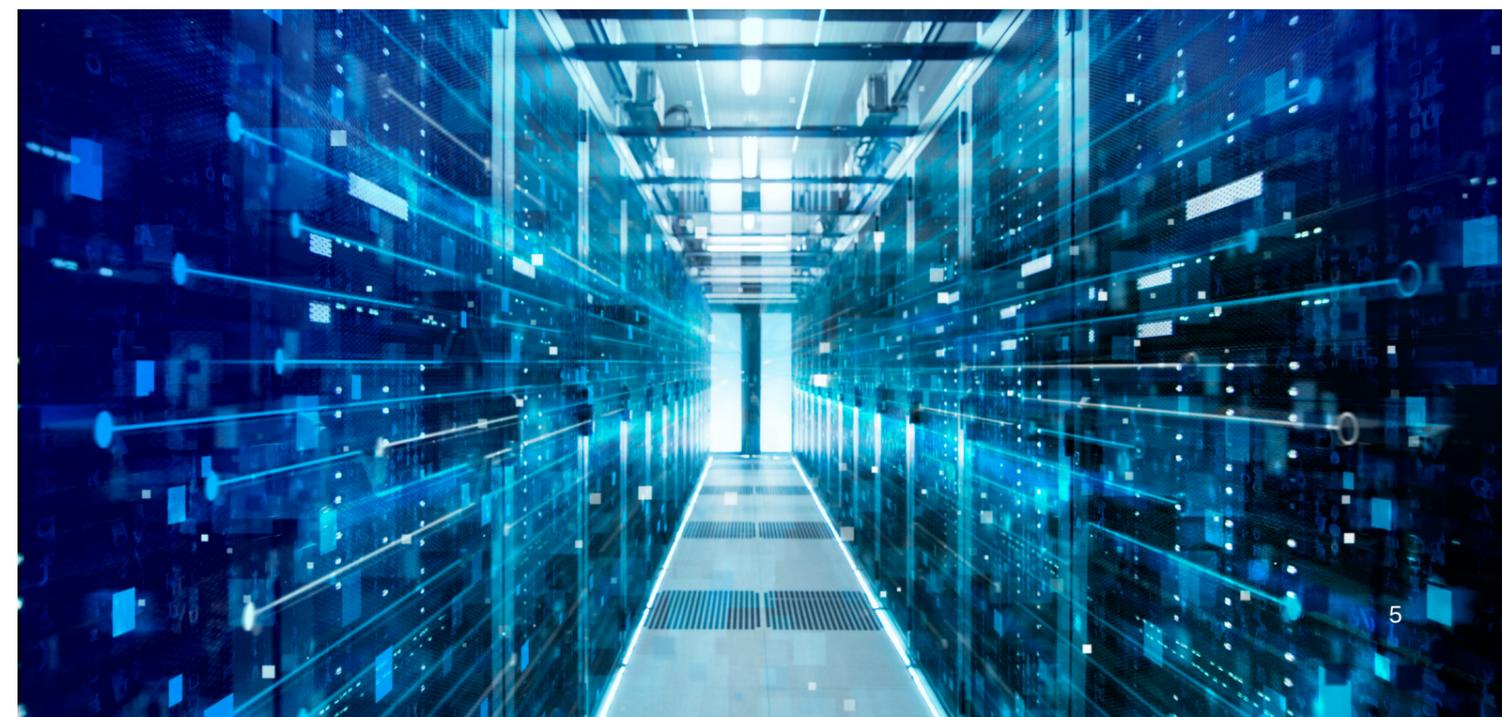
Let's illustrate it with the engineering discipline. Today, engineering progress on projects is based on document issuance and is strongly monitored by a gating process. Tomorrow, it will rely on data (information embedded in documents). This will not change the gate itself, but rather organize the information flow with full transparency, a single source of truth that all stakeholders across functions can access and trust. By reducing duplication, structuring and smoothing data flow, and allowing interface between different systems, we increase workflow efficiencies and improve collaboration between project teams, clients and supply chain. In this way we accelerate and de-risk project delivery.

We created an Information Management department in our Paris operating center more than 10 years ago.

Its mission was, and is, to ensure consistent data flow between tools and meet client data handover requirements.

Similar efforts are being implemented globally across all activities and disciplines to achieve overall consistency and seamless data flow between teams during the full life cycle of projects or product management. Being data-centric leads to breaking siloes induced by geographies, organization design, disciplines, applications, and projects.

As we adopt a much more standardized way to engineer our solutions, we enable more re-use and deliver greater operational efficiencies. This approach is a real game-changer and is particularly relevant as we shift from large-scale bespoke Engineering, Procurement, and Construction (EPC) to smaller size and energy transition projects with a need for productization and repeatability.



Creating value with our data

Data is not gold, but rigorous and well used data can be transformational for efficiency and new growth opportunities, thus fueling a competitive advantage. For this reason, our focus is on developing use cases on our core business: projects and services. These cases will lead to direct and indirect data monetization, and better understanding of our clients' asset

operations. Here are some of the key areas in which efficient data management can be a game-changer for T.EN:

- Easy access to past project data for accurate and fast estimation of current and future projects. This can be achieved through implementation of advanced enterprise search and data mining tools that enable us to contextualize data from various sources.
- Integration of project data for painless reporting, reduction of manual data handling and associated man-hour cost and quality issues, leading to better monitoring of project KPIs.
- Data-driven solutions powered by new technologies like artificial intelligence (AI) to create insights for plant performance improvement, including emissions reduction.

Digital project execution

With our recognized operational excellence in managing EPC and technology projects of all types, in all kinds of (extreme) environments and across all geographies, one could argue that we already know how to deliver projects efficiently. While this is true, we see further opportunities to improve speed, quality, reliability, and predictability of delivery while fostering collaboration with our clients and the full supply chain. We believe we can achieve the full harmonization of our project methods and tools by the end of 2023.

maximizing re-use opportunities on projects, which leads to significant reductions in cycle time. SPEED™ is already in use on several units including Carbon Capture and Storage (CCS) and Hydrogen and Acid Gas removal. We are currently expanding this approach to other priority technologies.

signature, material maintenance and preservation tracking, monitoring of subcontractors' scope of work, Punch-List Items management, etc. Deployed on all our construction sites and yards, it leverages 20 years of feedback and data from 50 referenced projects and now has more than 2000 active users around the world. We are also developing best practices on visual intelligence technologies for specific use cases, such as construction progress analysis, conformity checks and personnel safety monitoring.

- **Smarter and digitalized data-driven processes orchestrated through one single project platform, global and deep transformation including:**
 - Creation of global integrated conceptual and physical data models
 - Streamlining and digitalization of more than 150 processes; and
 - Configuration and connection of our product lifecycle management (PLM) to our suite of engineering, authoring, project control, enterprise resource planning (ERP), procurement and construction tools.

A toolbox for Digital Project Management

In addition to efficient data management practices, we are building and deploying a full toolbox of digital solutions to establish a true digital project management practice that will help us to continuously differentiate ourselves. This toolbox complements the suite of authoring tools we have used for years to design and deliver EPC projects. Let's have a closer look at some of those solutions:

- **Ready to use standard libraries:** with our SPEED™ model, we are taking system engineering to the next level,

- **Smart tools for Construction:** EasyPlant® suite is T.EN's in-house construction platform, enabling collaborative management of all construction activities until client handover: planning, progress tracking, quality inspections management through digital

Adding to our digital capabilities

Technip Energies has selected Aras – a leading global provider of software technology which provides the most powerful low-code platform with applications to design, build, and operate complex products – to support our energy-transition strategy. We will leverage their Aras Enterprise SaaS platform to achieve full data-centric deployment of our project methods and tools. **Read more here.**



Delivering digital twin assets

A digital twin is a digital representation of a physical asset and its dynamic behavior over its life cycle. It is initiated at the engineering phase and progressively enriched during the project with increasing data and process simulations to create an as-built digital twin. During operations, we can use the digital twin to connect to and ingest live operational data in context, using it to visualize data and create insights, simulate the asset's future behavior to minimize greenhouse gas emissions (GHG) and reduce time in operations, or train operators to perform specific tasks and support safe working practices. In summary, a digital twin will help increase the performance throughout the asset's entire life cycle. Building digital twins requires connecting data models and creating a digital continuity throughout the life cycle and integrating multiple data sources, including real-time data.

T.EN's aim is to deliver digital twin-ready assets and plants to our clients. We already provide different components for specific systems (e.g. interconnection between process diagrams, project lists and 3D model or dynamic process simulations) or use cases (operate in virtual reality manual valves and visualize immediate impact on analog gauges). In addition, we are making progress towards defining, in collaboration with our clients, standard functional specifications for digital twin assets.

Digital by Design from concept to handover and operations

Setting the foundations of data-driven operations very early in the project life cycle enables us to maximize value creation. As we design and build energy solutions for our clients, we systematically integrate Digital from project inception phase, taking operational requirements into

account from the start and allowing a feedback loop. Not only are our clients more and more prescriptive in setting digital requirements, but we are increasingly aware of the importance of digital solutions to drive efficiency. They connect all project phases and enable a project's success and repeatability for the next set of projects, leading to significant time savings, reduced risk, and increased competitiveness.

Prioritizing today's investments in digital technologies will help deliver new energy projects faster and de-risk investments. We have a unique opportunity to be digital by design as we develop and scale up new energy solutions such as low carbon H₂ or Floating Offshore Wind. We believe this is the only path to achieve the transition to clean energy production and true optimization.

Digital services

Technip Energies is meeting the digital technology demands of the energy industry by offering dedicated tools that connect engineering with data. Employing virtual plant technology and sensors that track real-time data, our global digital services team is forging ahead on new frontiers to optimize monitoring, modeling, maintenance, and security for our clients.

Beyond by T.EN™, a new strategic business

Our goal is to become a leader in digital services for the energy transition throughout the life of a plant. Our 60 years of extensive knowledge in the energy industry put us in a unique position to deliver digitally enabled lifecycle services to our clients, from concept optimization to advisory services, assistance to project delivery, decarbonization, and plant performance improvement.

Beyond by T.EN™ is the umbrella name for our full suite of digital services. "Beyond" conveys the idea of pushing

the limits to transform our clients' experience and meet their evolving needs, and transition beyond oil and gas and our core EPC business.

Although we are mostly renowned for our EPC and technology expertise, we are excited to tackle the challenge of developing a services culture and be recognized as a services provider by our clients. To achieve this, we build on our strong foundations and adopt a startup approach to develop new digital products that our clients need. In practical terms, we take the following actions:

- Leverage our unique integrator position and knowhow to develop suites of solutions that address our clients' broad challenges, such as asset and product life cycle decarbonation in traditional markets or life of field services, including digital twin in our Floating Offshore Wind business;
- Promote a stronger client-centric approach and transform our client experience with true digital interaction;
- Set up a dedicated business to address the specificities of



digital services with a particular skillset (business expertise, digital technologies and product marketing) and the right focus to address these new markets; and

- Strategically engage with the right technology partners with the ambition to grow our offering beyond our core expertise.

A services offering that spans the full asset life cycle and T.EN's expertise

Let's look at four of our existing solutions across the value chain:

- **Gen-CAT™:** our proprietary carbon calculation suite of tools to assess direct and indirect scope 1, 2 and 3 emissions throughout the full project life cycle and enable our clients to make carbon-conscious choices. Our goal is to ensure optimal decision making during the early phases of engineering, when there is the biggest opportunity

to minimize carbon impact. Assessing the carbon footprint during project execution is then a must to guarantee that we deliver on our promises and are able to report regulatory KPIs. Putting carbon assessment at the core of project execution and disclosing this information to our clients is an opportunity to continuously look for additional optimization opportunities with them during the entire project life.

- **Plant Operator Digital Simulator (PODS):** a leading-edge immersive and interactive in-house training solution that couples a traditional Operator Training System (OTS) with a virtual reality environment. It enables simultaneous and collaborative training for both field and central control room operators. PODS is designed to provide the most realistic interactive training in an inherently safe environment. Typically, PODS combines several expertise domains: process safety and modeling, advanced system engineering, human factors engineering, maintenance and

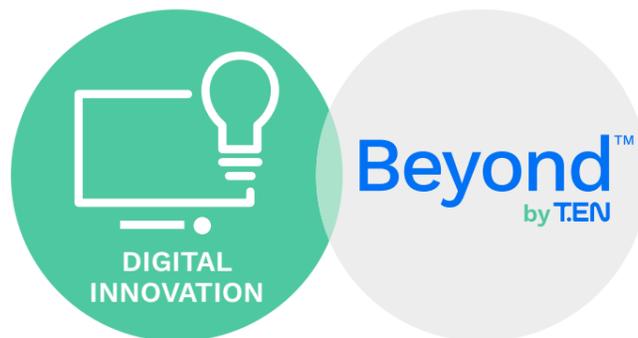
automation and interactive real-time 3D simulation.

- **Spyro® Asset Management (SAM):** a major advancement for ethylene plant operators with a global ethylene market of 230 clients equipped with our proprietary technologies, SAM is based on real-time plant data advanced analysis combined with decades of technology expertise. This service continuously monitors operations and advises on optimized plant settings. This allows us to anticipate maintenance, maximize product value and minimize environmental impact. SAM relies on Technip Energies' fundamental design and engineering knowledge of ethylene plants, historical operational data and AI and machine learning (ML) expertise.
- **Advanced robotic assistance for project delivery and operations:** In a context where low-manning or unmanned assets are drivers to increase efficiency and lower risk exposure, Cybernetix – a

Technip Energies company with a 35-year track record in robotics systems integration and remote surveillance data acquisition deployed in onshore, offshore, subsea and nuclear industries – bridges digital and robotics via:

- Cyxpro®, a robot supervision software enabling both autonomous missions mode and remote manual handling mode; and
- CyXense® suite, a robotic supervision system used to manage a fleet of robots executing autonomous or teleoperated inspection, maintenance or repair tasks on low unmanned installations.

Digital services is a key area of growth and value creation across many industries, in particular in the energy sector where access and processing of the right data, combined with advanced domain knowledge, is the silver bullet for optimal efficiency and sustainability from design to project delivery and asset operations.



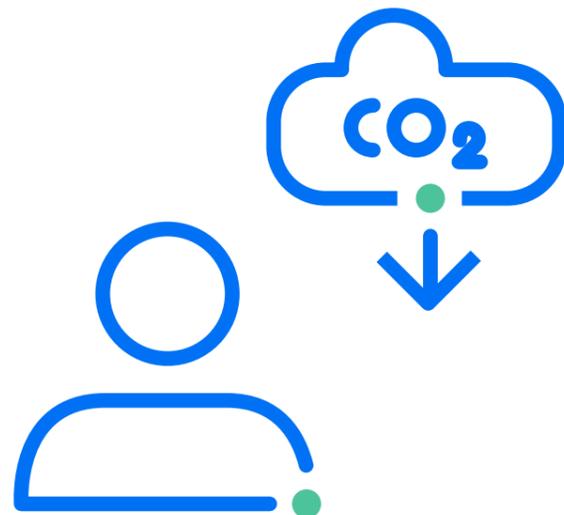
Digital value beyond efficiency and additional revenue streams

The opening statements of this white paper alluded to the fact that digital transformation is accelerating alongside the business model shift induced by the energy transition. But digital is also reciprocally a key enabler for this energy transition and part of the solution in several ways. At T.EN, innovative digital and data-enabled solutions help drive the journey towards a carbon neutral future:

- **Digital solutions to support carbon conscious choices** during Appraise and Conceptual phases: Carbon footprint is becoming a key decision criterion for clients, together with CAPEX, OPEX and schedule and very likely a prerequisite criterion in the short term. T.EN is also becoming more selective in picking opportunities that align with its Environmental, Social, and Governance

(ESG) goals and strategic ambitions towards greener energy solutions. Our GenCat™ solution offers the ability to compute carbon footprint and make informed decisions.

- **Digital solutions to minimize emissions during asset operations**, coupling real-time in situ measurements and AI-powered algorithms to recommend best parameters to operators.
- **Digital solutions to support a holistic approach to decarbonization of our flagship activities** such as LNG or hydrogen.
- **A systematic data-driven approach to measure and improve all our ESG KPIs** such as Scope 1, 2 and 3 emissions.



People make the transformation happen

We are scaling up our digital capabilities to deliver our ambition. This translates into a fit-for-purpose digital organization with the recent creation of a digital services factory and a data office.

Our digital services factory is responsible for developing and running all digital services products for our clients in line with our digital services strategy. The data office, in partnership with our IT, ensures that both the data governance and data strategy support Technip Energies' digital strategy. It promotes data culture through communities and training programs

and works with our business units to identify and prioritize use cases on data such as AI applied to solve specific business problems.

The transformation of the energy industry is the only way forward, and it represents great opportunities for all of us. It requires commitment from our entire industry and, beyond it, our governments and civil society.

Working at Technip Energies today is being part of the solution. We have a strong vision to accelerate the energy transition and an important part to

play in this journey. We are upskilling and reskilling our workforce in energy transition and digital topics, while hiring talents from other industries to gain different perspectives. More and more employees want to apply their skills in companies that are shaping the future, and Technip Energies is one of them.

The future will be greener and more digital. At T.EN we are committed to sustaining the pace of those two critical and intimately linked transformations to create a better tomorrow.



Technip Energies N.V.

ORIGINE, 2126 boulevard de la Défense, CS 10266
Nanterre CEDEX
92741
France

A company incorporated under the laws of The Netherlands,
with its corporate seat in Amsterdam, and registered with
the Dutch Chamber of Commerce under number 76122654