PROTECTING THE FUTURE

ACHIEVING ESG GOALS WITH RESPONSIBLE O&G INVESTMENT

US$121T ESG INVESTORS DRIVING SECTOR AGENDA

42%
of Global GHG Emissions generated by the Oil & Gas industry

US$2.2T
Market Cap Loss of Oil & Gas Majors, before COVID-19

US$50-70T
investments to achieve the UN Sustainable Development Goals by 2030

US$30-60T
investments to achieve Net-Zero by 2050

100% Efficiency
along the value chain is required to achieve Net-Zero

THE PROBLEM

Climate Change, Environment & Impact on Society.

Oil & Gas industry generates 42% of global **Green House Gas (GHG) Emissions**, with 20% Scope 1 under their direct control.

Upstream ›40% of industry Scope 1 Emissions using 20-year Global Warming Potential.

- 5% Flaring
- 10% Drilling & Operations
- 85% Fugitive & Venting[I]

Environmental, Social, and Governance (ESG) focused investors are becoming dominant and Climate Goals are core. The sector risk profile for investors had increased dramatically. The result is US$2.2T loss of Oil & Gas Majors[II] Market Cap, before COVID-19.

No investments in fossil fuel industries that do not have a clear **ESG** and sustainability agenda.

ESG SECTOR AGENDA

US$121T collective **Assets under Management (AuM)** of the 3,826 signatories of the UN supported **Principles for Responsible Investment (PRI)** in support of UN 2030 Sustainable Development Goals initiative[III].

US$50-70T investment needed to achieve the UN Sustainable Development Goals by 2030[IV].

Achieving **Net-Zero Emissions** by 2050 would cost an estimated US $30-60T of additional investments, or 1-1.5% of glo-bal gross domestic product per year[V] .

Complete replacement of hydrocarbons as a source of energy in the short and medium term is not feasible. Therefo-re, it is imperative that industry stops the *"Business as Usual"* and achieves Net-Zero.

THE SOLUTIONS

The **Net-Zero Emissions** goal has to be achieved to solve the Climate Change, Environment & Impact on Society.

Net-Zero Emissions can be achieved with 100% efficiency, which requires digitalisation, integration & technology.

The PM Lucas technology solution allows full

- Monitoring,
- Reporting,
- Verification and,
- Mitigation

of **GHG** by tracing product flows at the molecular level from reservoir pore space to the sales point.

To achieve client timelines and cost effectiveness targets, PM Lucas applies our proprietary technology to integrate your proven & existing industry processes to optimise operations and meet your **ESG** goals.

ACHIEVE NET-ZERO THROUGH 100% EFFICIENCY.
ACHIEVE 100% EFFICIENCY THROUGH DIGITALISATION, INTEGRATION & TECHNOLOGY.

WELL-TO-COMBUSTION GHG EMISSIONS RANGE

11.6% Upstream	**0.7%** Crude Transport	**6.1%** Refining	**0.5%** Product transport	**81.1%** Combustion

Hydrocarbon molecules are too valuable, they should be neither lost nor wasted!
Reduce emissions along the value chain to conserve hydrocarbons for end-use.

THE VISION - NET-ZERO ALONG VALUE CHAIN & LIFE CYCLE

EMISSIONS REDUCTIONS
- CCS
- Hydrogen
- Renewables

SCOPE 1
(Direct) Emissions from operations that are owned or controlled by the reporting company.

SCOPE 2
(Indirect) Emissions from the generation of purchased or acquired electricity, steam, heating, or cooling consumed by the reporting company.

SCOPE 3
(Indirect) All indirect emissions (not included in Scope 2) that occur in the value chain of the reporting company, including both upstream and downstream emissions.

THE GREEN FUTURE

Global environmental awareness is driving the Oil & Gas industry to reach **Net-Zero Emissions** and decarbonisation along the entire hydrocarbon value chain and life cycle of its assets.

This environmental awareness is translating into concrete action by both institutional investors and credit institutions who fund the industry. This is reflected in statements by investors, such as:

"... for an investor with a focus on environmental, social and governance factors ... you can't invest in a fossil fuel company unless it has promised and has a clear agenda to transform into something more sustainable, ..."[VI]

The imperative for the Oil & Gas industry, is that there is over **US$121T** of institutional investor AuM pursuing **ESG** goals and, in particular, adherence to the Paris Agreement on Climate Change. They expect compliance by the companies in which they directly invest, as well as by the companies that they may fund, invest in, or supply. *"Business as Usual"* is not among the possible choices for the industry anymore.

Accurate, timely and verifiable **GHG** emission measurement, reporting and mitigation is becoming an industry imperative, as the regulatory and societal cost of non-compliance is becoming too burdensome.

The continuing reliance on hydrocarbons for energy implies finding and producing more hydrocarbons, faster, cheaper, and greener ... in a capital constrained industry that is under pressure from society and regulatory entities.

THE PM LUCAS VISION

PM Lucas believes in the future of Hydrocarbons, Natural Gas and Hydrogen as a base of our civilization which can only be reached through achievement of **ESG** objectives.

We are convinced in the success of the Oil & Gas industry achieving their **ESG** goals and being what they always have been, successful drivers of progress and wealth generation in our civilization.

Hydrocarbons are too valuable to be burned and used as base energy. The environment is impacted by hydrocarbon-based emissions. Our civilization must reach **Net-Zero Emissions** for a prosperous and safe future.

We are entering a new age in resource extraction and where we will need to protect our future, and this is by controlling our emissions and achieving these ambitious **ESG** goals.

MARKET CAP – THE LOST US$2.2T

While the Oil & Gas industry has always been cyclical, driven by global economic growth rate and investment cycles, and has always introduced new technologies to reduce risk and increase profitability, the global climate-warming driven targets for **GHG** reductions pose new technological challenges for the industry, increase future capital and operating costs, and reduces available financing sources.

The sector risk profile for investors had increased dramatically, with uncertain long term demand and stranded asset risk leading to lower valuations and reduced allocation in investor portfolios.

This is reflected in the Oil & Gas majors[II] losing **US$2.2T** (69%) in market capitalisation since their most recent high oil price-based peaks – before the impact of COVID-19 and the oil price war. The current COVID-19 induced economic crisis is having dramatic impact across many sectors, including the Oil & Gas industry. In the case of the Oil & Gas industry, many governments are proposing economic recovery funds tied to climate initiatives, thus increasing the pressure on the industry.

The **GHG** targets are also an opportunity for the industry to increase efficiency by reducing excess loss or consumption of hydrocarbons during the extraction and processing phases. The challenge is to have actionable information to be able to achieve these efficiencies.

All industry operations generate **GHG** emissions which represent potential inefficiencies and lost profits. Identification of the sources, accurate quantification of the avoidable emissions, and remediation of the sources of avoidable emissions will lead to improved operational efficiencies and additional profits from the increased hydrocarbons available for sale. Current industry practices allow for an accurate estimate of emissions from process fuel consumption and flaring, but do not accurately estimate **GHG** emissions from fugitive emissions and venting of methane.

PM Lucas has an ongoing case study in which a company had over 16% of produced hydrocarbons that did not reach sales point.

Lost cash flow due to flaring, combustion & fugitive emissions were estimated **US$1B** over a ten-year period. PM Lucas estimates that if the emissions **ESG** goal was in place and achieved, 60-80% of these losses would have been recoverable with an investment of less than **US$0.1B**.

Going forward, due to new environmental regulations and scrutiny by the regulators, the risk of environmental fines would significantly magnify the economic losses.

PM LUCAS CARBON ACCOUNTING SOLUTION

The PM Lucas technology solution allows full
- Monitoring,
- Reporting,
- Verification and,
- Mitigation

of **GHG** by tracing product flows at the molecular level from reservoir pore space to the sales point.

The heart of PM Lucas' novel, innovative and transparent carbon accounting technology is the seamless connection of Oil & Gas industry standard subsurface and surface numerical simulation and modelling technologies. It integrates seamlessly with existing proven industry processes and technologies from companies such as *Schlumberger, Halliburton, Siemens, Honeywell, Rockwell, Rock Flow Dynamics (RFD), SAP, AspenTech, Computer Modelling Group (CMG), Microsoft, Amazon Web Services (AWS),* and others.

PM Lucas is partnering with leading companies, research institutions and experts to provide, deliver and implement tailored solutions serving each client's **ESG** requirements as well as digitalisation, integration, and technological needs.

Basing our solution on a complete compositional material balance ensures that all hydrocarbon molecules are accounted for, whether sold, consumed in drilling, operations, and processing, flared, vented, or lost to fugitive emissions.

We use distributed and secure modern cloud technologies for the data intensive and variable computational requirements.

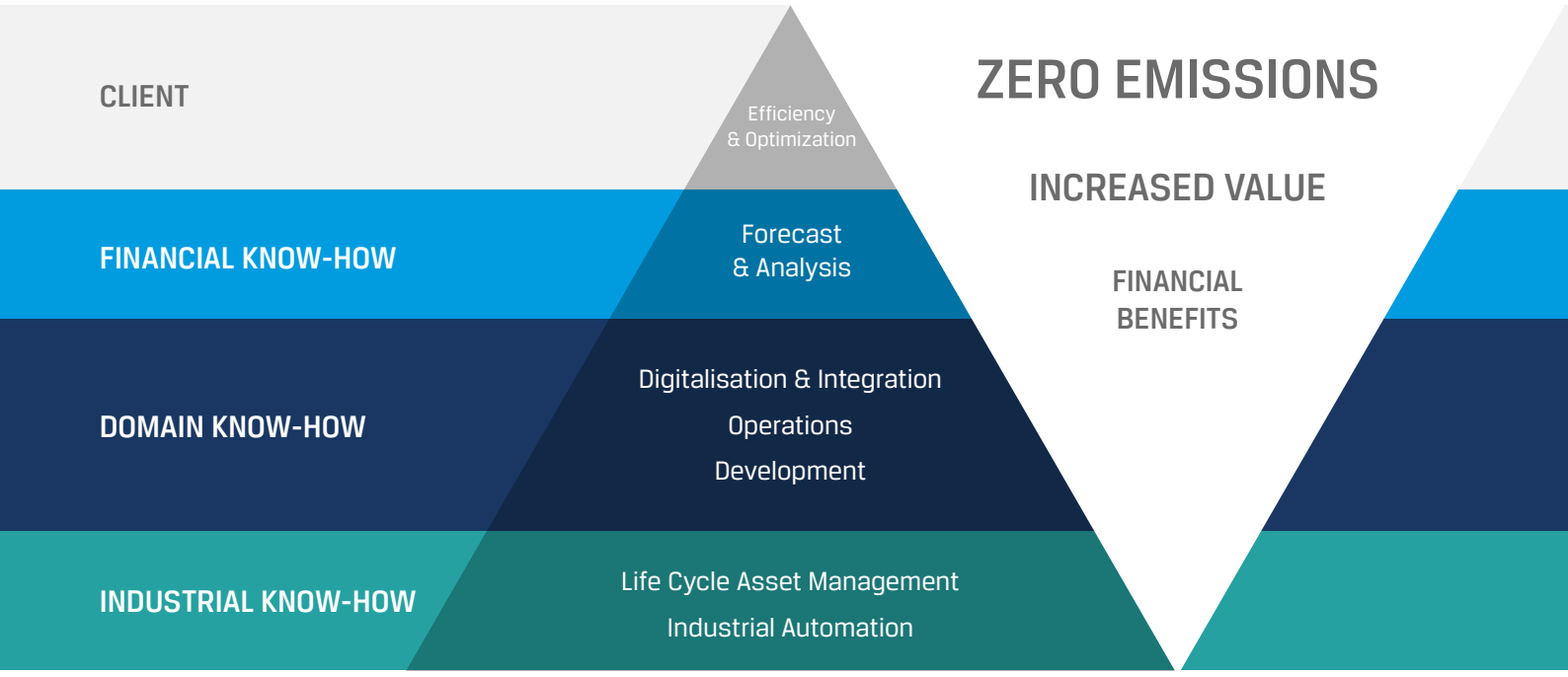
We are able to identify and quantify upstream operations emissions with a level of accuracy that is currently unmatched by, what we consider as very approximate and incomplete estimates of the top-down and bottom-up approaches used by industry, regulators, and climate scientists.

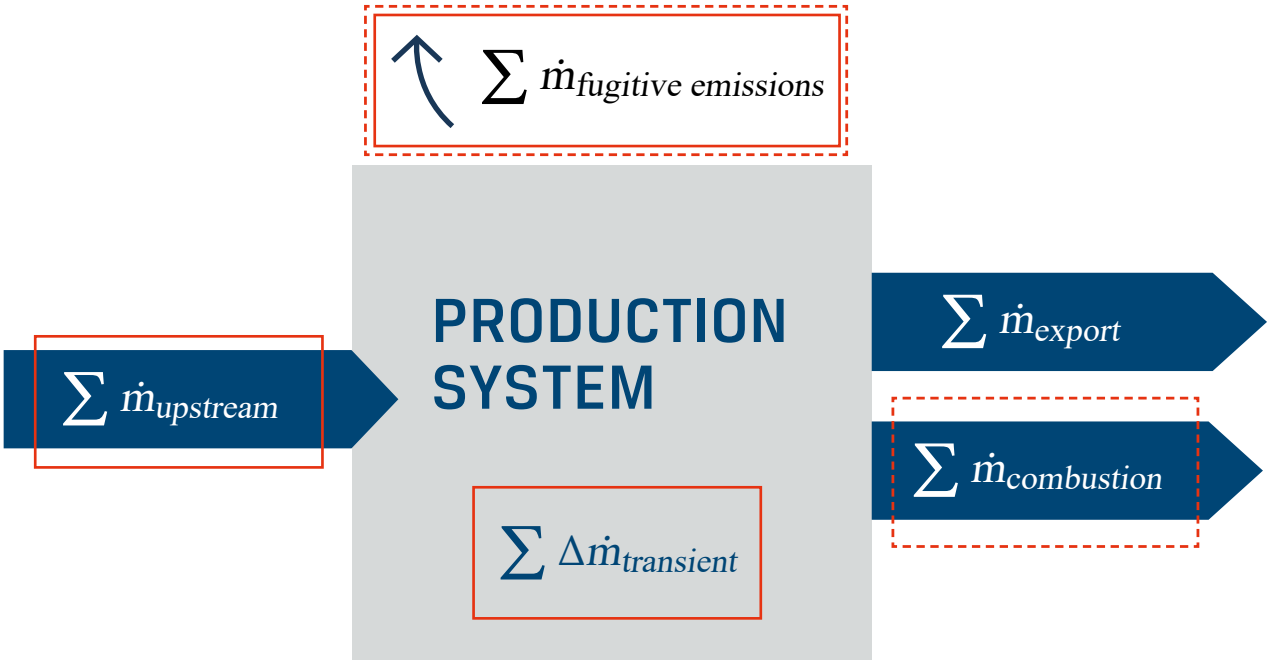
The solution is applicable in any jurisdiction or regulatory environment and can be used for both greenfield and brownfield projects.

All project sizes rely on our unique ability to integrate subsurface and surface facility simulators to provide verifiable predictive analytics and forecasts, with larger projects benefiting from the integration of available real-time operational and process data feeds.

The PM Lucas digital solutions build on vertical integration of business processes. They span from the industrial automation foundation, over asset and plant life cycle assessment & management, considering **CAPEX** and **OPEX** related domain specific know-how and expertise to incorporate **Enterprise Resource Planning (ERP)**. This provides the solution to achieve the client's **ESG** goals, operational excellence, increased efficiency & value. Operational, process, expert, financial and other data from all over the business processes are utilized to boost efficiency in environmental, financial, process, operational & execution aspects.

DRIVING CUSTOMER VALUE





Now for the first time, PM Lucas technology can assist the industry to connect subsurface and surface measurements and modelling, a capability that would give them a complete vision and decision support tool set.

The problem with many digitisation efforts to date is that they are often operating in domain knowledge silos, or even being led by data experts with no Oil & Gas industry specific domain knowledge.

For the company to achieve **ESG** goals the entire management structure needs to make proper decisions. All of executive and operational management needs correct integrated information available in real-time based on holistic views that go across all fields of domain knowledge and are integrated with the company's financial and enterprise resource planning, **ERP** systems.

This is only possible through combining all available measurements with full model (subsurface and surface) integration. Models can give answers and insights where no measurements are available. Furthermore, models, calibrated to past observations, can be used to predict future behavior of the investigated system.

PM Lucas has managed to turn the pitfall of numerical simulation models, namely the fact that they idealise the modelled processes, into the advantage to understand, control & manage all processes in the life cycle. As such, increasing the efficiency of the asset and, as a result, putting emissions under control to achieve **ESG** goals.

By comparing and calibrating the idealised numerically modelled hydrocarbon value chain to direct (e.g. compositional and mass flows) and indirect observations (e.g. processed satellite images), the difference pinpoints losses and unaccounted hydrocarbons.

In such a way, for the first time in the history of this industry, emissions will be quantified and located.

PM Lucas has over 25 years of project experience in all facets of Oil & Gas industry subsurface and surface activities, which gives it unique insight for assisting in creating cost effective digitalisation based operating management systems that integrate all relevant enterprise and technical systems.

PM Lucas' integrated domain know-how and technology objective is to put the emissions under control, achieving the **ESG** objectives and as a result increasing the cash flow, profitability of each individual asset.

COMPANY PROFILE – WHO WE ARE

PM Lucas is an **Environmental Committed** Engineering and Technology Company, focused on delivering Leading-Edge Energy Technology Solutions to meet the needs of the world's Energy Companies in their quest for **Net-Zero emissions** and achieving their overall **ESG** goals.

PM Lucas delivers Integrated Technology & Project Solutions to meet the industry challenges of being environmentally sustainable, economically viable, technically robust and reliable.

For over 25 years PM Lucas has proven to be a reliable and innovative technology integrator.

Integrating the **Subsurface Technology & Surface Technology** our expertise and success are documented by our track record close to **1,000** contracts or **70,000,000** man hours of work covering the complete Domain Cycle of the Upstream Energy Industry. Single consulting specialist to complete turnkey EPCC solutions in excess of US$200 million.

Our expertise in understanding the reservoir underpins our capabilities to span both subsurface and surface development as well as their implementation and operation:

- G&G & Reservoir Studies 〉200
- Subsurface Engineering Projects 〉500
- Turnkey Drilling 〉500,000 m
- Drilling Management 〉2,500,000 m
- Well Interventions 〉50,000
- Surface Technology Projects 〉300

PM Lucas understands that the focal point is the reservoir and ensures that the reservoir engineering results feed directly into the surface engineering and technology implementation, thus providing an **Integrated Technology & Project Solution** conforming to **ESG** goals.

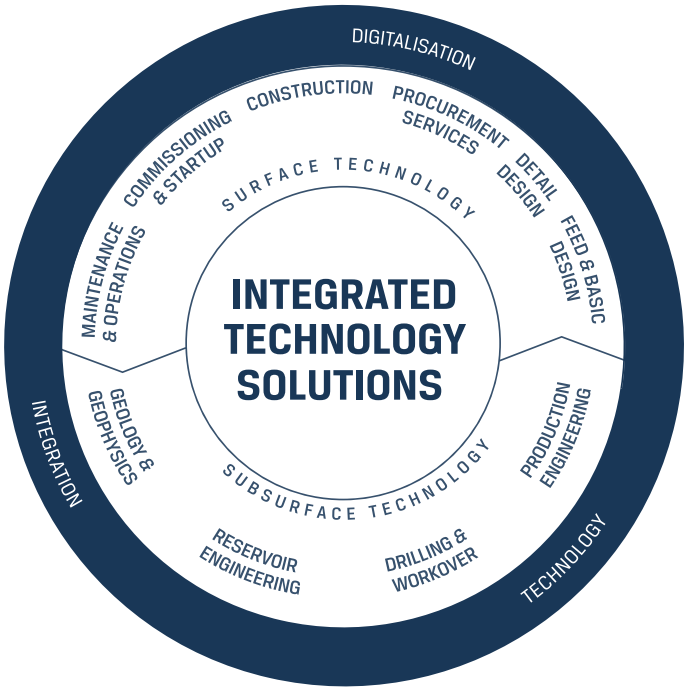
International Certification

PM Lucas is accredited by **TÜV NORD**:

- ISO 9001 Quality Management System
- ISO 14001 Environmental Management System
- ISO 45001 Occupational Health and Safety
- ISO 50001 Energy Management

PM Lucas Partners & Technologies

We are partnering up with world technology leaders, such as **SIEMENS, SAP, Amazon Web Services (AWS)**, to provide technically scalable and financially viable integrated solutions to achieve for the clients overall **ESG** goals and reach **Net-Zero emissions**.



We are experts in all standard industrial technologies from world leaders such as Schlumberger, Halliburton, Siemens, Honeywell, Rockwell, Rock Flow Dynamics (RFD), SAP, AspenTech, Computer Modelling Group (CMG), Amazon Web Services (AWS) and Microsoft.

Our Presence & Future

PM Lucas, through strategic investments based on our Client's **ESG** needs, will continue to be a Leading-Edge Energy Technology Solutions Provider.

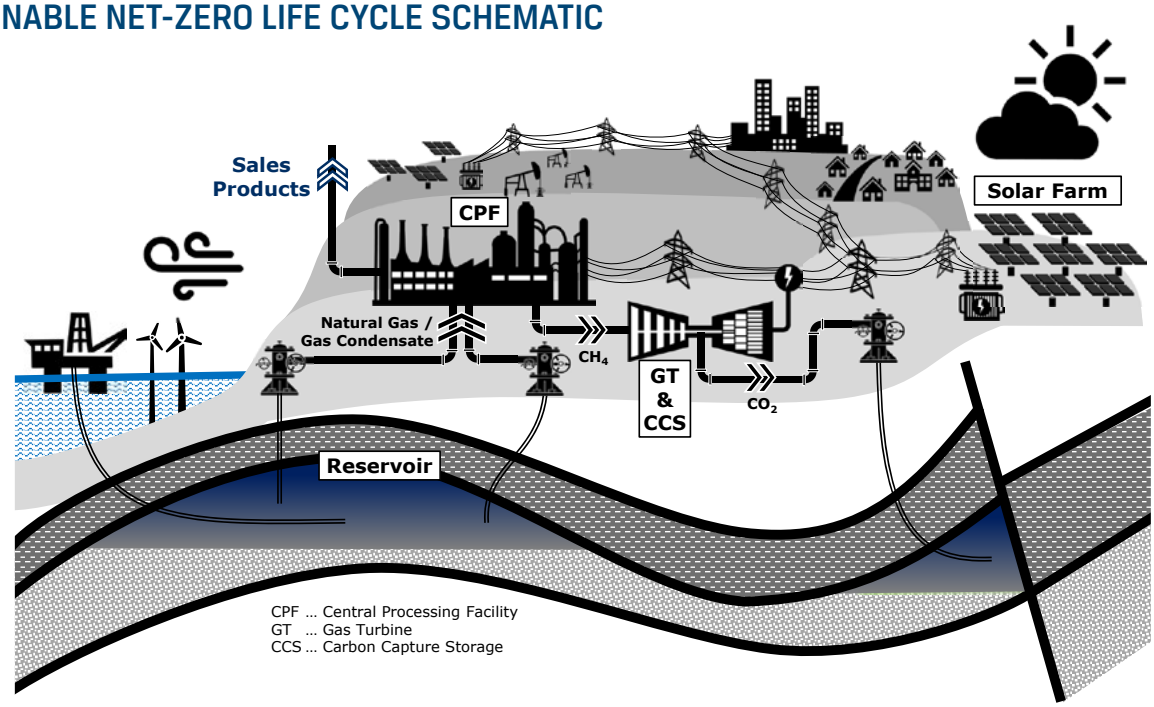
In the context of the energy industry aligning itself to Paris Agreement emission cut targets, we can provide state of the art solutions for achieving

Net-Zero in Scope 1 & 2 Emissions

building on our track record of subsurface and surface projects and combining our expertise with the implementation of renewable energy sources such as photovoltaic or geothermal energy to make an energy assets life-cycle **Net-Zero**.

Building on successful and comprehensive digitalisation of the energy value chain monitoring, reporting and verification systems will be implemented to identify mitigation targets, develop mitigation strategies, and continuously monitor and report the success in achieving the client's **ESG** responsibilities.

SUSTAINABLE NET-ZERO LIFE CYCLE SCHEMATIC



ESG FOCUSED RESEARCH & DEVELOPMENT

All our R&D is focused on assisting the Oil & Gas and other associated sectors to achieve their **ESG** objectives, improving their domain activities through:

- digitalisation
- integration
- technology

to achieve **Net-Zero Emissions** and protect the future.

PM Lucas operational expertise is supplemented by our own active R&D department located on the premises of the **Montanuniversität, Leoben (MUL), Austria.** PM Lucas is cooperating with two of the leading petroleum engineering departments in the world, those at **MUL** and **Texas A&M University (TAMU).** Our intention is to extend cooperation further to all institutions that have **ESG** focused research as their core value.

PM Lucas is also in collaboration with many **ESG** centred leading-edge international technology institutions and leading technology industry partners such as **Siemens** and **SAP** and are currently evaluating together with **AWS** integration into existing **AWS** Cloud & Machine Learning Infrastructure in order to acquire unprecedented speed, storage & scalability. Our solution is vendor neutral, and we have the ability to work with all client chosen vendors.

Our **ESG** centred R&D efforts are focused on mitigation of **GHG** emissions in the upstream Oil & Gas industry, carbon capture, hydrogen production and storage and geothermal energy recovery.

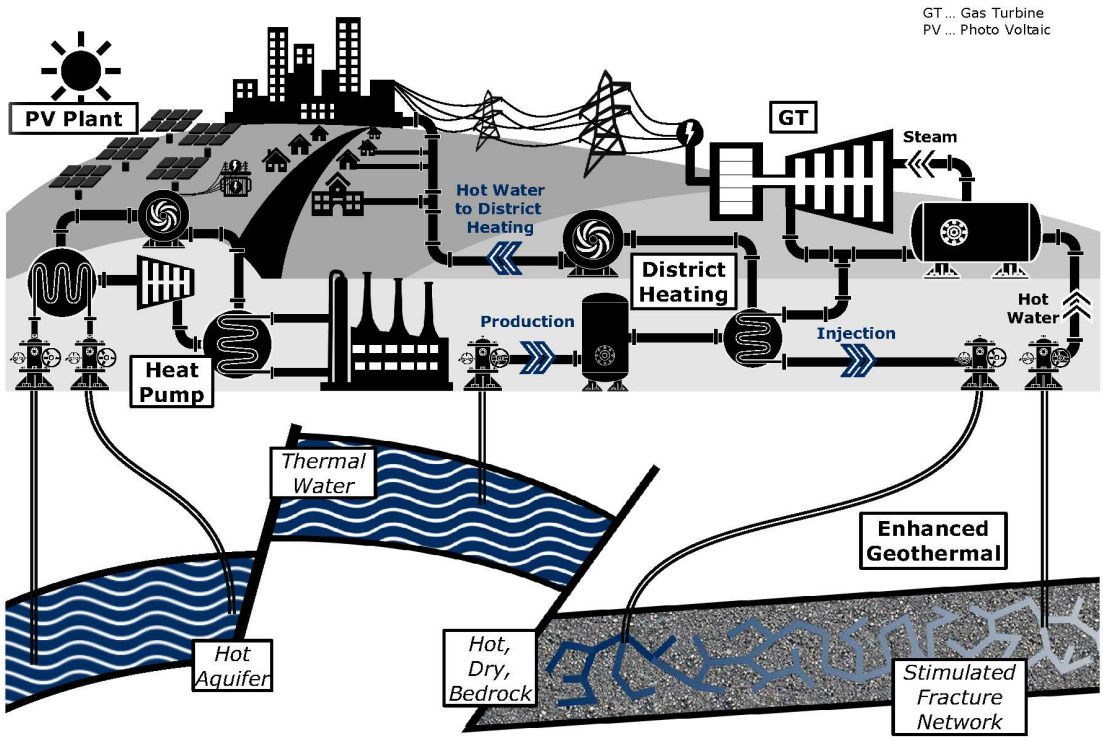
The use of geothermal energy recovery potential allows both industry & municipalities to lower their carbon footprint & to achieve their **ESG** goals.

PM Lucas long-term experience in geology & geophysics, reservoir, production & process engineering is the foundation for development & implementation of geothermal energy recovery technologies & systems.

The R&D department lever-ages the hands-on-experience together with the company's subsurface and surface engineering discipline track record gained during the past decade on projects, including CO2 transportation and sequestration.

Close collaboration with PM Lucas Digital Technology Department results in continuous improvement of the integrated technologies and solutions for data collection, storage, interpretation, reporting & visualization. Business processes are fully documented and translated to digital models to provide **ESG** centred operational excellence management systems.

GEOTHERMAL ENERGY RECOVERY



PM Lucas' Automated Real-time Data Collection system connects to various data sources on the field (instrument sensors, SCADA systems, OPC Servers) and is capable transferring millions of data points automatically into a high frequency data base (data historian). The Digital Oil Field (DOF) architecture enables combining of real-time and manually captured data into a main Operations Data Base. Related business processes will define how particular data will be captured and processed through the process workflows and RACI matrices.

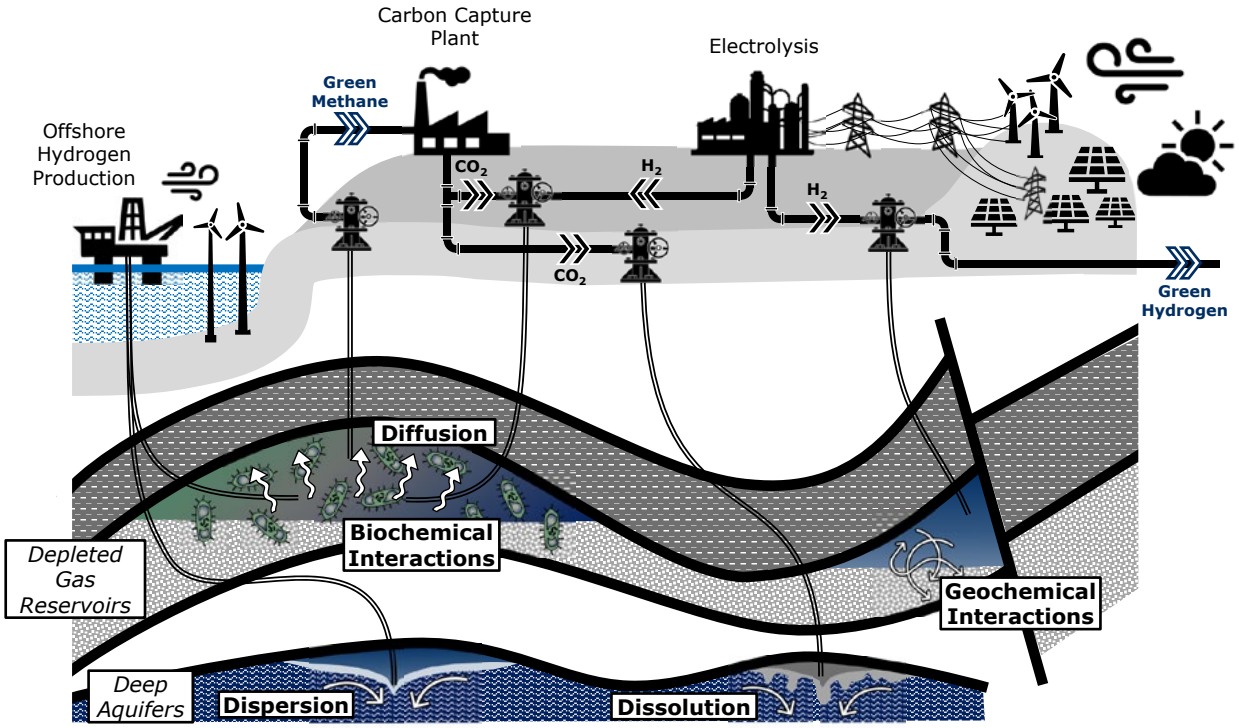
One of our focus areas is integrated numerical simulation, spanning from the subsurface (pore space) to surface facilities (sales point, CO2 capturing site, power grid, etc.) and vice versa, depending on production or injection/ sequestration operation.

This requires sophisticated, specialised modelling tools especially when it comes to **Carbon Capture Sequestration (CCS)** and **Underground Hydrogen Storage (UHS)** projects, in order to correctly assess the long-term impact of high concentrati-ons of CO2 and/or H2 on the reservoir/caprock/ wellbore integrity. Thus, geochemical, and biological interactions, as well as hydrodynamical interactions with the reservoir rock and brine, but also the entire well completion, have to be addressed by numerical simulation models.

None of the industry standard reservoir simulation packages on the market can be used. PM Lucas' proprietary multipurpose reservoir simulation package offers dedicated **UHS** and **CCS** modules. The combination of both modules also allows modelling of "green methane" production from bio-methanization taking place in the reservoir, helping to achieve climate centred **ESG** goals. Our simulation tools and workflows can be applied from lab scale, over pilot well/single well facilities, to full field/plant operations.

This integrated technology enables a dynamic life cycle analysis, matching of past and actual asset performance, forecasting of the future and evaluation of what if scenarios. This ensures performance in alignment with **ESG** goals. Depending on available instrumentation, near-real-time modelling, forecasting, and reporting is also offered.

SUSTAINABLE LIFE CYCLES - CCS & UHS SCHEMATIC



PM Lucas R&D is also initiating, financing, supporting, and mentoring, together with the **MUL** and **TAMU**, PhD candidates research and related MSc thesis works targeting improved **ESG** performance.

PM Lucas **ESG** R&D and educational efforts are a core element to change the mindset of students and engineers, and as such to change the culture of the industry. PM Lucas believes that the whole industry has to be driven by **ESG** and it cannot be a concern of the executive suite alone.

Currently assigned research topics are in the areas of **UHS** and bottom-up **GHG** emissions assessment to make the next leap in technological advances happen. PM Lucas is reaching out beyond classical industry engineering skills by incorporating the latest advances, such as satellite imagery, data mining and cloud computing.

All PM Lucas R&D activities are directed and linked towards providing unmatched **ESG** services & tools. To achieve this, we study the entire Oil & Gas value chain and related business pro-cesses. In addition to the topics mentioned above, the investi-gated subjects cover industrial automation, material sciences, business administration & data management. Whenever gaps are identified we will develop solutions connecting, integrating & improving available technologies, workflows & products.

GLOSSARY

AuM	Assets under Management.
Bio-methanization	is the formation of methane by microbes.
Caprock	is a harder or more resistant rock type overlying a weaker or less resistant rock type. Caprock is generalized to any nonpermeable formation that may prevent oil, gas, or water from migrating to the surface.
CAPEX	Capital expenditure or capital expense is the investment an organization or corporate entity makes to buy, maintain, or improve its fixed assets, such as buildings, vehicles, equipment, or land.
Carbon Capture and Sequestration (CCS)	is the process of capturing waste carbon dioxide (CO2), transporting it to a storage site, and depositing it where it will not enter the atmosphere. Usually, the CO2 is captured from large point sources, such as a cement factory or biomass power plant, and normally it is stored in an underground geological formation. The aim is to prevent the release of large quantities of CO2 into the atmosphere from heavy industry. It is a potential means of mitigating the contribution to global warming and ocean acidification of carbon dioxide emissions from industry and heating.
Cloud infrastructure	Computer system resources which enable cloud computing.
Cloud computing	is the on-demand availability of computer system resources, especially data storage (cloud storage) and computing power, without direct active management by the user. The term is generally used to describe data centres available to many users over the Internet.
Compositional	A methodology in numerical simulation that describes the fluids as a mixture of individual molecules and their properties and not as liquid and vapour phase only.
Data Base (DB)	Organized collection of data, generally stored and accessed electronically from a computer system.
Data Mining (DM)	A process of discovering patterns in large data sets involving methods at the intersection of machine learning, statistics, and database systems.
Decarbonisation	Efforts and processes to minimize output of greenhouse gas (GHG) emissions into the atmosphere, specifically carbon dioxide.
Digital Oil Field (DOF)	refers to a digital replica of physical oil field asset, its processes, people, places, systems and devices. The digital representation provides both the elements and the dynamics of how the elements of the asset operate and live throughout its life cycle. The connection between the physical model and the corresponding virtual model is established by generating real time data using sensors.
Downstream (petroleum industry)	The downstream sector is the refining of petroleum crude oil and the processing and purifying of raw natural gas, as well as the marketing and distribution of products derived from crude oil and natural gas. The downstream sector reaches consumers through products such as gasoline or petrol, kerosene, jet fuel, diesel oil, heating oil, fuel oils, lubricants, waxes, asphalt, natural gas, and liquefied petroleum gas (LPG) as well as hundreds of petrochemicals.
ESG	Environmental, Social and corporate Governance, factors indicating the sustainability and ethical impact of an investment.
Flaring	Burning off flammable gas released by safety valves during unplanned over pressuring of plant equipment and/or during plant or partial plant start-ups and shutdowns, often used for the planned combustion of gases over relatively short periods and/or dispose of large amounts of unwanted associated petroleum gas, possibly throughout the life of an oil well.
Fugitive (Emissions)	Emissions of gases or vapours from pressurized equipment due to leaks and other unintended or irregular releases of gases, mostly from industrial activities. As well as the economic cost of lost commodities, fugitive emissions contribute to air pollution.
Geochemistry	The science that uses the tools and principles of chemistry to explain the mechanisms behind major geological systems such as the Earth's crust and its oceans.
Green House Gases (GHG)	Green House Gases are gases that absorb and emit radiant energy within the thermal infrared range. Green House Gases cause the greenhouse effect on planets. The primary Green House Gases in Earth's atmosphere are water vapour (H2O), carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), and ozone (O3).
Hydrodynamics	Is a subdiscipline of fluid mechanics that describes the flow of fluids — liquids and gases which are in motion.
Hydrogen production	The family of industrial methods for generating hydrogen gas.
Hydrogen storage	Any of several methods for storing hydrogen for later use.
Life cycle analysis	Methodology for assessing environmental impacts associated with all the stages of the life cycle of a commercial product, process, or service.
Machine Learning (ML)	The study of computer algorithms that improve automatically through experience. It is seen as a subset of artificial intelligence. Machine learning algorithms build a model based on sample data, known as "training data", in order to make predictions or decisions without being explicitly programmed to do so.
Midstream (petroleum industry)	The midstream sector involves the transportation (by pipeline, rail, barge, oil tanker or truck), storage, and wholesale marketing of crude or refined petroleum products.
Net-Zero	The balancing of carbon dioxide emissions with removal (often through carbon offsetting).
Numerical simulation	is the process of mathematical modelling, performed on a computer, which is designed to predict the behaviour of or the outcome of a real-world or physical system.

GLOSSARY

Value chain	is a set of activities that a firm operating in a specific industry performs in order to deliver valuable products (i.e., goods and/or services) to the market.
OPC Server	Software specific to special hardware that provides methods for many different software packages (as long as it is an OPC Client) to access data from a process control device.
OPEX	An operating expense, operating expenditure, operational expense, operational expenditure is an ongoing cost for running a product, business, or system.
Paris Agreement	The 2015 agreement related to the United Nations Framework Convention on Climate Change.
Pore space	Very small void spaces in the subsurface rock, which can be either filled with hydrocarbons and/or water (brine).
Power grid	is an interconnected network for delivering electricity from producers to consumers.
RACI matrices	RACI is an acronym derived from the four key responsibilities most typically used: responsible, accountable, consulted, and informed. It is used for clarifying and defining roles and responsibilities in cross-functional or departmental projects and processes. There are a number of alternatives to the RACI model.
Reservoir rock	is a subsurface pool of hydrocarbons contained in porous or fractured rock formations.
Satellite imagery	Images of Earth collected by imaging satellites.
SCADA systems	Supervisory Control and Data Acquisition (SCADA) is a control system architecture comprising computers, networked data communications and graphical user interfaces (GUI) for high-level process supervisory management, while also comprising other peripheral devices like programmable logic controllers(PLC) and discrete proportional-integral-derivative (PID) controllers to interface with process plant or machinery.
Scope 1 (Emissions)	Emissions from operations that are owned or controlled by the reporting company.
Scope 2 (Emissions)	Emissions from the generation of purchased or acquired electricity, steam, heating, or cooling consumed by the reporting company.
Scope 3 (Emissions)	All indirect emissions (not included in Scope 2) that occur in the value chain of the reporting company, including both upstream and downstream emissions.
Subsurface simulator	or reservoir simulator, is a software tool in the area of reservoir engineering in which computer models are used to predict the flow of fluids (typically, oil, water, and gas) through porous media.
Surface facilities simulator	Software used to simulate the material and energy balances of chemical process plants.
United Nations (UN)	is an intergovernmental organization with 193 member states.
Unaccounted hydrocarbons	Hydrocarbons that are produced from the reservoir formation, but for whatever reason of "loss" did not reach sales point.
Upstream (petroleum industry)	The upstream sector includes searching for potential underground or underwater crude oil and natural gas fields, drilling exploratory wells, and subsequently drilling and operating the wells that recover and bring the crude oil or raw natural gas to the surface.
Venting	is the intentional and controlled release of gases containing alkane hydrocarbons - predominately methane - into earth's atmosphere.
Well completion	is the process of making a well ready for production (or injection) after drilling operations. This principally involves preparing the bottom of the hole to the required specifications, running in the production tubing and its associated down hole tools as well as perforating and stimulating, as required.

[I] McKinsey & Company "The Future is now: How oil and gas companies can decarbonize", 01.2020

[II] Oil Majors sample includes Exxon Mobil, Chevron, Royal Dutch Shell, PetroChina, Total, BP, Petrobras, Sinopec, CNOOC, ConocoPhillips, Equinor, Eni, Occidental Petroleum

[III] PRI 2021 Annual Report

[IV] UNCTAD World investment report 2014

[V] Energy Transitions Commission, Making Mission Possible - Delivering a Net-Zero Economy, September 2020

[VI] Bloomberg, 17 November 2020