NIMEC LIMITED

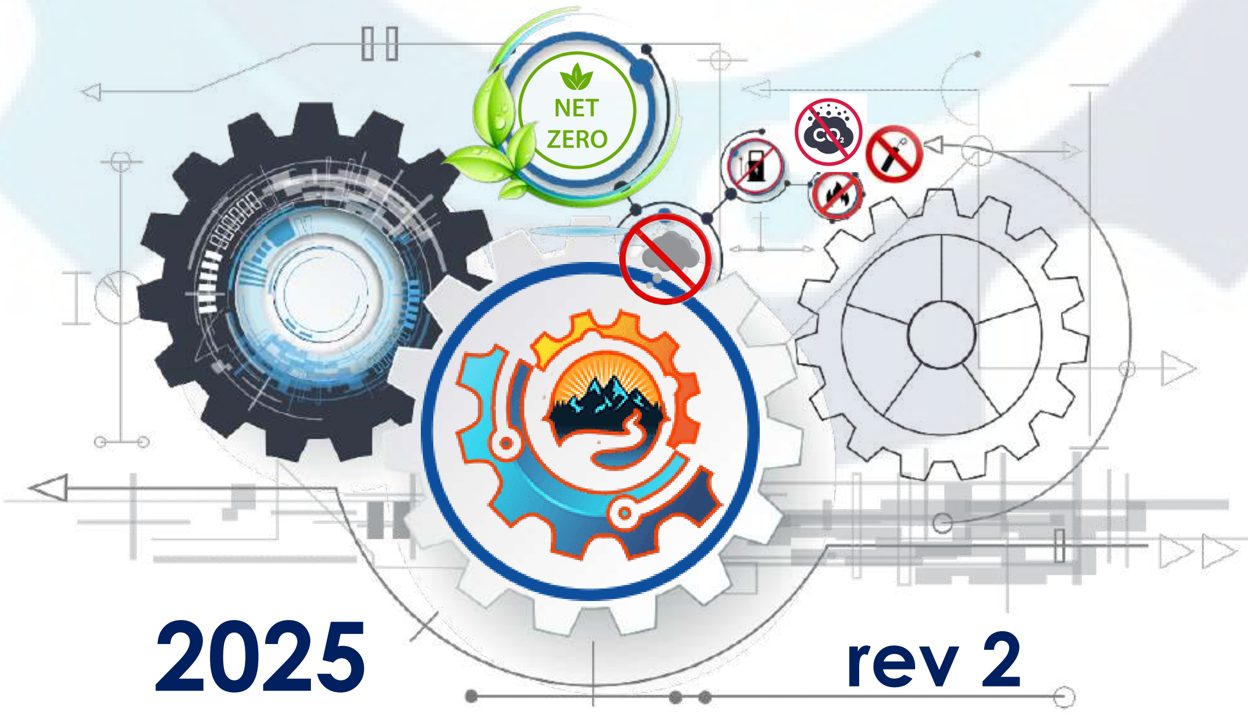
Fast-Easy-Amazing

Product and Technology Presentation

Zero carbon emissions

Stable power generation

Modular structure



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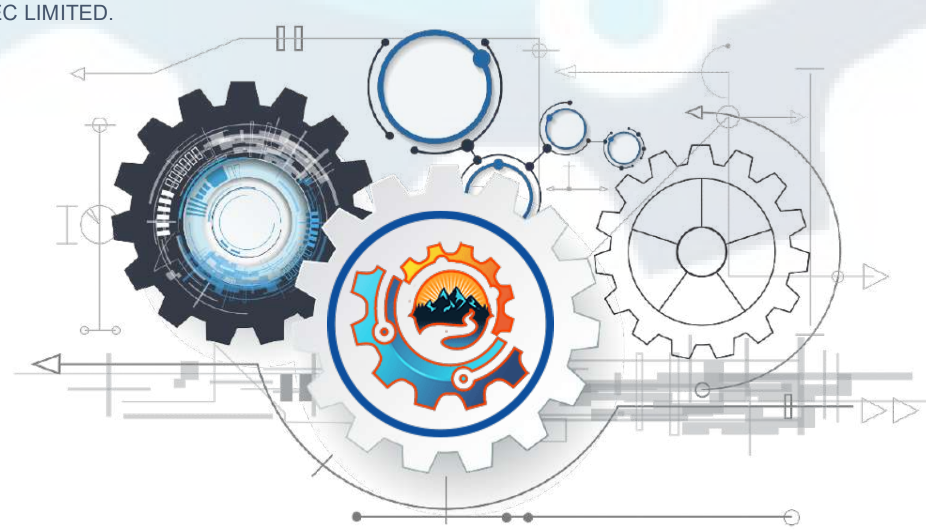
Содержание



1. Introduction

This document presents NIMEC's systematic approach to creating autonomous power units—modular, reliable, and ready for deployment in a wide range of environments. We do not invent new equipment; rather, we redesign the way existing components interact.

All NIMEC technical solutions are based on well-studied and decades-proven components—permanent magnets, inertial masses, industrial electronics, turbines, and alternators. Our distinction lies in how these elements are interconnected.

We develop an architecture where standard components unlock new levels of efficiency, autonomy, and durability.

NIMEC power units are designed for extended autonomous operation and intended to provide stable energy supply across diverse conditions—from urban facilities and industrial sites to remote locations, offshore platforms, and mobile applications. Each system is built using mass-produced components, without any unique or unproven parts.

The generating modules are easily scalable and can be integrated into existing infrastructure or operate entirely independently.

This document contains the fundamental operating principles of NIMEC power units, key definitions and calculations, descriptions of components and possible configurations, as well as examples of applications across various sectors—from electricity generation and mobile transport to the transition toward a carbon-neutral economy.

2. Physical Principles of Operation

The NIMEC power system is grounded not in speculation but in physics. In this section, we examine in detail the physical principles underlying the operation of the power unit. There is no place here for pseudoscience — all principles are based on established laws of mechanics, electromagnetism, and energy conversion.

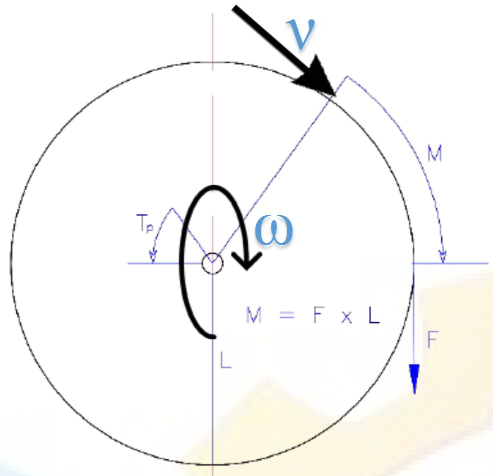
We demonstrate how standard components—from the flywheel to the magnetic system—form a closed engineering architecture capable of delivering stable and reproducible performance.

This is not a "perpetual motion machine" or an attempt to violate the second law of thermodynamics. It is the result of rigorous engineering and a precise understanding of interactions within a closed system with minimal losses.

2.1. Key Definitions

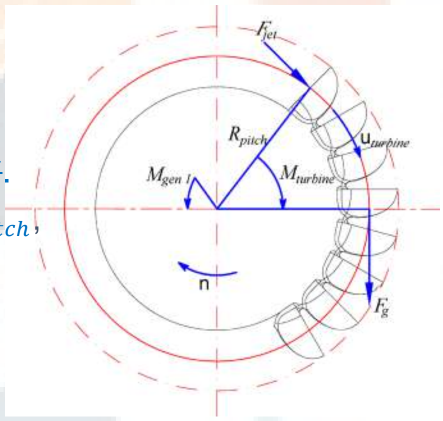
This section presents a diagram illustrating the action of the main forces from the perspective of classical mechanics, along with definitions of all key physical quantities used in the subsequent calculations.

In addition to the diagram and definitions, this section also provides the main parameters and notations necessary for precise mathematical modeling of the power unit. This ensures a unified understanding of the quantities used and facilitates subsequent analysis and calculations.



Magnetic motor flywheel

ω - angular velocity is the rate at which an object rotates or revolves around an axis.
$\boldsymbol{\nu}$ - linear velocity is the rate of change of linear displacement; in our case, it is the speed of the edge of the wheel.
P - power is the amount of energy transferred or converted per unit of time.
F - force is an influence that can change the velocity of an object unless opposed by other forces.
$T(M)$ - torque is the rotational equivalent of linear force.
L - distance (lever) is a simple machine consisting of a beam or rigid rod pivoted on a fixed axis or fulcrum.
G - gravity imparts weight to physical objects. $g = 9.80665\, {}^{m}/_{s^2}$ - the nominal "average" value at the Earth's surface, known as the standard acceleration due to gravity by definition.
n – rotational speed in revolutions per minute (RPM).
m – net mass in kilograms (kg). Power in watts: $P = T \cdot \omega$,
Force in newtons: $F = mg$. Torque in newton-meters:
$T = F \cdot L$, Angular velocity in radians per second: $\omega = \frac{2\pi n}{60}$.
Gravitational torque in newton-metres: $M_{gravity} = \rho Q g R_{pitch}$,
ρ — fluid density (kg/m³), Q — flow rate (m³/s), R_{pitch} — radius for calculations of the bucket wheel (m).
Impulse torque for one bucket in newton-metres:
$M_{imp} = \eta_i \rho Q(\nu_{jet} - \upsilon_{turbine})(1 - cos\alpha)R_{pitch}$, where:
v_{jet} - jet velocity at nozzle outlet (m/s), $u_{turbine}$ - turbine bucket velocity (m/s), α — jet deflection angle in degrees,

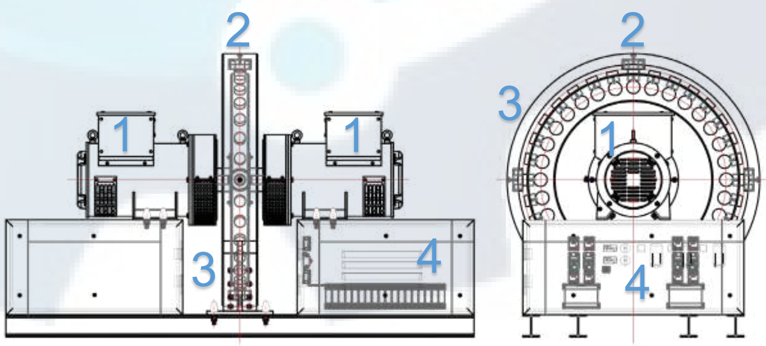


Pelton turbine bucket wheel

$\eta_i \approx 0.9$ — empirical impulse loss coefficient accounting for splashing, turbulence, partial misalignment, etc. Values typically range from 0.9 to 0.98 for well-designed systems. This coefficient corrects for imperfect impulse transfer, not the overall turbine efficiency. Torque from the secondary (reflected) jet in newton-metres: $M_{ref} = \rho Q\left(k\nu_{jet} - \upsilon_{turbine}\right)R_{pitch}$, where: k ≈ 0.85 for smooth stainless steel (low wet friction).

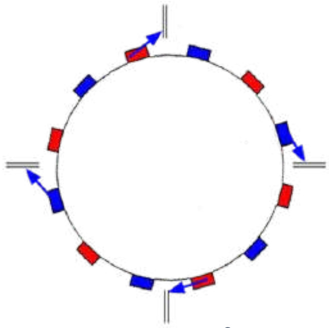
2.2. Operating Principle

A generator using permanent magnets consists of: **1** - two generators rotating in opposite directions (one clockwise, one counterclockwise), **2** - electromagnets that control the magnetic field and rotation, **3** - a flywheel with fixed permanent magnets, **4** - a control unit that manages the operation and power supply of the electromagnets.

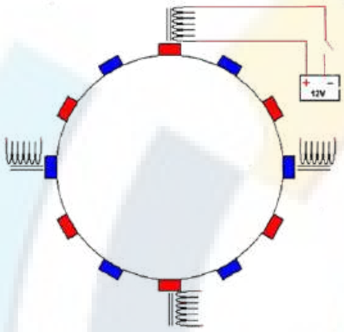


generator schematic with magnetic motor

To minimize mechanical losses, the couplings mounted on the generator shafts are attached directly to the flywheel of the magnetic motor.



pure use of magnetic energy



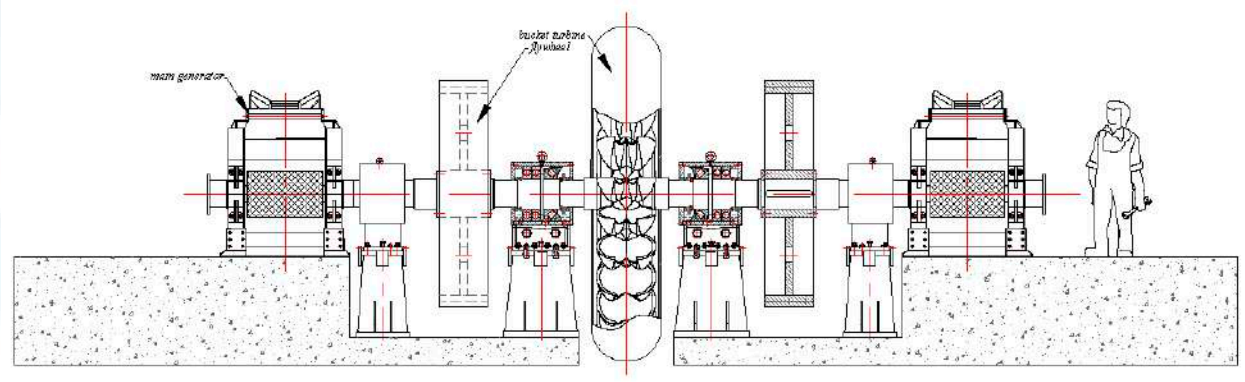
trigger for pulsed activation of the

The diagram shows a power unit based on the interaction of permanent magnets and electromagnets. Its operating principle is built on alternating attraction and repulsion of magnetic fields, achieved through precise synchronization of their interaction.

The key engineering distinction of the NIMEC magnetic motor compared to most analogues lies in the force distribution between the permanent and electromagnets. In typical designs, electromagnets perform the main work, leading to high energy consumption and reduced efficiency. In contrast, the NIMEC system relies primarily on powerful permanent magnets to carry the mechanical load, while electromagnets operate in a pulsed mode — used only for brief corrections of magnetic interaction and control of the cycle.

During operation, the electromagnetic coils generate an induced EMF due to their interaction with the magnetic field of the rotating permanent magnets. The NIMEC system is designed to efficiently capture and utilize this induced energy, minimizing losses and enhancing overall energy efficiency.

This approach significantly reduces overall energy consumption while maintaining stable mechanical performance.



Turbine Module Schematic

The operational principle of the NIMEC LIMITED Hydro-Gravitational Module is based on a closed-cycle system utilising a circulating heavy fluid. This fluid is directed onto the buckets of a Pelton turbine, where its kinetic and potential energy is efficiently converted into mechanical work. The turbine is mechanically coupled to permanent magnet generators, enabling continuous electrical power generation. After passing through the turbine, the fluid is returned to the upper section of the system via hydraulic cylinders driven by compressed nitrogen. The nitrogen pressure is maintained by compressors powered by integrated magnetic motors. This establishes a closed-loop energy cycle: the heavy fluid circulates through the system, spinning the turbine shaft connected to the generators. In this configuration, magnetic energy is primarily used to sustain fluid circulation, enabling a self-contained power module with minimal losses and no need for external fuels.

The use of a heavy fluid with high specific gravity enables more efficient conversion of gravitational potential into mechanical energy. The system is optimised for continuous operation with minimal energy loss and does not require external supply or discharge of the fluid.

2.3. Unit Calculations

This section presents the basic calculations that form the mathematical model of the system's operation. These calculations demonstrate the fundamental feasibility and confirm the complete energy autonomy of the generating modules. The assumptions used are in line with classical physical laws and engineering practices, allowing for an objective assessment of the system's potential across various scales and configurations.

2.3.1. Calculation of a 1000 kW Magnetic Generator

The rotational speed is n = 750 rpm.

To minimise energy consumption during the interaction between the electromagnet and permanent magnets, a U-shaped core was chosen. The core material is Permendur (Fe-Co-V), which has a saturation induction of up to 2.35–2.4 T, significantly exceeding the performance of conventional structural and electrical steels. The system is designed with a calculated induction in the core of 2.0 T.

The use of a U-shaped core implies two rims (flywheels) in the system. We determine the number of permanent magnets on the rim as N = 30. The number of electromagnets in the module is M = 15.

Now, let us calculate the switching frequency of one electromagnet:

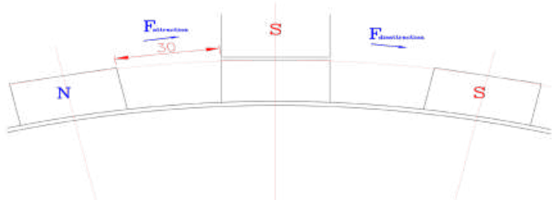
$$f = \frac{nN}{60M} = \frac{750 \cdot 30}{60 \cdot 15} = 25\ Hz$$

The obtained switching frequency of 25 Hz per electromagnet corresponds to a low-frequency pulsed mode, which is acceptable and technically justified for the selected massive U-shaped electromagnet core. This is due to the high lifting force of a single coil (from 1500 kg) and its pulsed operation with magnetic saturation up to 2 T. Such a frequency ensures efficient control of magnetic interaction without overheating and allows for precise calculation of coil and switching circuit parameters.

The calculated angular velocity is ω = 78.54 rad/s. Knowing the power and angular velocity, we determine the required theoretical torque M_{theor} = 12,733 Nm (rounded up). Since the alternator couplings are mounted directly to the rotor wheel without a shaft, shaft losses are neglected. Based on the mechanical efficiency of permanent magnet alternators (0.98), the actual required torque is M_{real} = 12,993 Nm (rounded up).

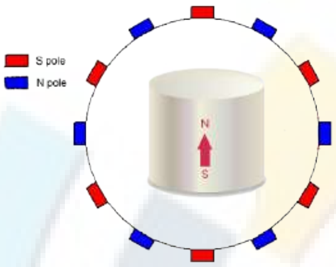
The diameter of the rotor rim of the magnetic motor is 1.24 m. This diameter ensures reliable placement of cylindrical magnets with a diameter of 100 mm and a height of 100 mm so that the magnets protrude 10 mm above the rim surface. Given that the rim is made of non-magnetic material (such as aluminum or its analogue), this arrangement ensures maximum interaction of the permanent magnet's magnetic field with the electromagnet core. The resulting lever arm from the point of magnet interaction to the alternator shaft centre is equal to the radius of the circle formed by the magnet tips: R = 0.63 m.

Knowing the required torque and radius, the total required force is calculated as F_{total} = 20,624 N (rounded up). With two rims and fifteen magnets, there are 30 points of interaction. Therefore, the required force per point is F = 688 N (rounded up).



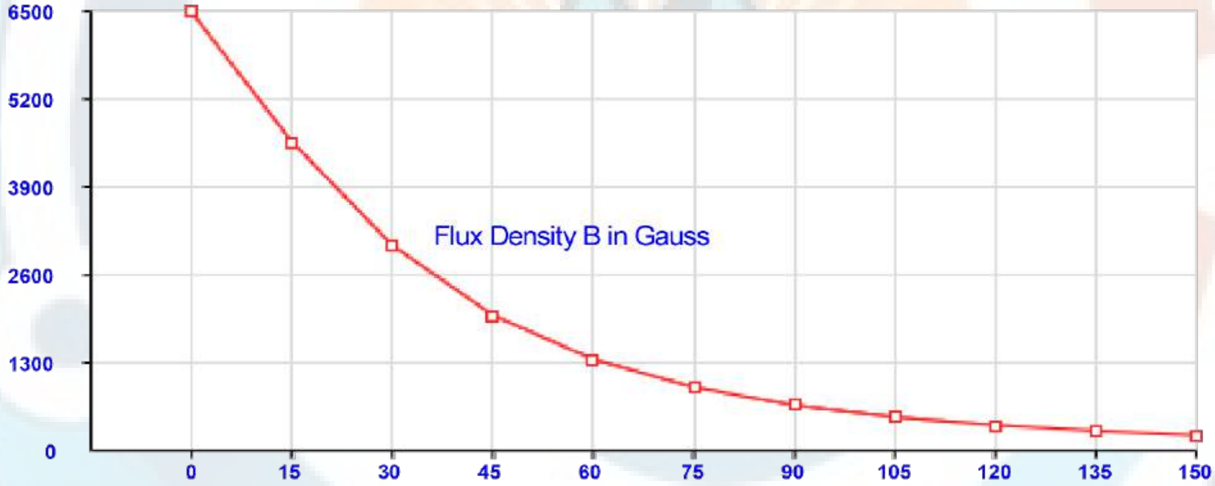
Magnet Interaction Diagram

The installation angle of the permanent magnets on the rotor rim is set at 12°, which provides a spacing of 30 mm between mounting holes along the circumference. This angle is chosen based on manufacturing feasibility and the strength characteristics of the aluminum rim, ensuring that the minimum wall thickness at the depth of the holes remain no less than 12 mm. This prevents overlap of hole walls and ensures structural integrity during rotation.



Magnet Arrangement Diagram on the Rim

Knowing the overall dimensions of the magnet, we determine its other parameters: the material is NdFeB ($Nd_2Fe_{14}B$), as it is the most energy-dense among all commercially available types. Its residual magnetic induction reaches 1.48 T, coercive force is at least 836 kA/m, and the maximum magnetic energy density exceeds 390 kJ/m³. We select grade N52M. The holding force F_h = 759.8 kg or F_h = 7451 N. $B_0 = 6484.58$ Gs $B_r = 14500$ GS



Dependence of Magnetic Force on Distance

Before proceeding with further calculations, we define the system's operation and magnetic interactions. In the initial configuration, with the electromagnet turned off, one permanent magnet is positioned opposite the electromagnet's core due to attraction forces, with two adjacent permanent magnets symmetrically placed on either side. The central magnet's attraction force is significantly stronger than that of the side magnets, whose forces weaken each other due to mutual repulsion from the central magnet. In this state, the system reaches equilibrium, and no torque is generated.

When the electromagnet is energized with the opposite pole, it repels the central magnet and simultaneously increases attraction on the side magnets. In practice, the attraction force dominates, maintaining symmetry, resulting only in slight vibration but no rotation.

To eliminate this effect, the electromagnet coil is raised 10 mm above the core edge, and one side of the core is shielded with an aluminum insert. This configuration causes attraction and repulsion forces on the shielded side to mutually cancel out. Since this setup is used, only the active attraction force from the unshielded side will be considered in further calculations.

We then determine the magnetic induction at a 30 mm gap, applying the field decay law from the magnet surface with distance:

$$B'_{(30)} = B_0(\frac{d}{d+2z})^3 = 1583.1\ Gs$$
$$B''_{(30)} \approx 2680\ Gs$$
$$B_{(30)} = \frac{B'_{(30)} + B''_{(30)}}{2} = 2131.55\ Gs$$

where d is the diameter of the permanent magnet in millimeters; z is the gap between the magnets in millimeters. Now, we calculate $F_{(30)}$:

$$F_{(30)} = F_0(\frac{B_{(30)}}{B_0})^2 = 805\ N\ \approx 402\ N$$

we take half of the calculated value to account for lateral magnetic interactions. Next, we determine the minimum force contribution required from the electromagnet:

$$F_{el\ mag} \geq F - F_{(30)} = 688N - 402N = 286\ N$$

The optimal core diameter of the U-shaped electromagnet is set at 110 mm. This choice is based on engineering recommendations and IEC 60404-8-4 standards, which specify a core-to-permanent magnet size ratio between 1.1 and 1.2. This size ensures uniform magnetic flux distribution, minimizes material saturation at the edges, and provides optimal coverage of the magnetic field from the permanent magnet, which has a diameter of 100 mm.

Given the numerous assumptions in the calculation model and the need to avoid significant deviations from practical data, we accept the lifting force of a single pole piece of the electromagnet as 1500 kg, corresponding to the total lifting force of the assembled U-shaped magnet at 3000 kg.

We verify our calculations and select an electromagnet from manufacturers: an electromagnet with a lifting force of 30,000 N (3000 kg), 24 V DC voltage, and a power consumption of 90 W. The total power consumption is then P_{imp} = 15 electromagnets × 90 W = 1350 W.

Thus, with a calculated mechanical output of 1000 kW at the shaft and total energy consumption of just 1350 W for the electromagnet system, the NIMEC power unit demonstrates exceptional efficiency. This is not theoretical speculation or speculative science — it is a practical engineering solution grounded in real physical laws and commercially available components.

The key to this performance lies in the fundamental shift of energy roles. In most conventional magnet-based motors, weak permanent magnets are supported by powerful electromagnets, resulting in significant electrical power consumption and heat losses. The NIMEC architecture reverses this logic: powerful permanent magnets are responsible for the main force generation, while the electromagnets only act momentarily to correct and synchronize the magnetic interaction — operating in brief pulses rather than continuous mode.

This strategic use of the magnetic field allows the system to initiate and maintain mechanical rotation with minimal energy input, without requiring active continuous force from the electromagnets. It is not about violating known physics — it is about designing within them more intelligently. The high lifting force of each electromagnetic coil (up to 1500 kg per pole), combined with optimal positioning and magnetic geometry, enables stable, high-torque operation with extremely low input power.

There is no need to invent exotic materials or untested technologies. Everything used in the NIMEC generator is either off-the-shelf or derived from well-established industrial standards. The result is a system that provides high power output with low operating costs, excellent reliability, and the potential to redefine expectations for autonomous energy generation. This is not future potential — this is a working solution today.

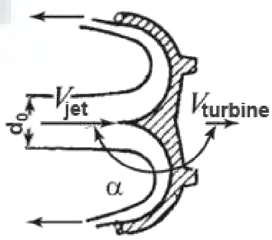
2.3.2. Calculation of a 10 MW HydroGravitational Module

To begin the calculation, we must first define the input parameters. The first step is to determine the specifications of the alternator:

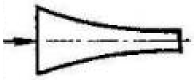
Parameter	Main Generator
Type	Horizontal synchronous AC
Rated power, kW	5000
Rated speed, rpm	750
Max speed, rpm	900
Number of phases	3
Rated line voltage, V	1140
Rated current, A	2532.3
Max current, A	3200
Winding connection	Y
Magnet type	NdFeB N52M
Rated torque, Nm	64636.2
Starting torque, Nm	1292.7
Insulation class	H
Insulation resistance	100 MΩ (min, at 500 VDC)
Protection class	IP54
Winding material	100% copper
Bearings	SKF or equivalent
Max weight, kg	6000

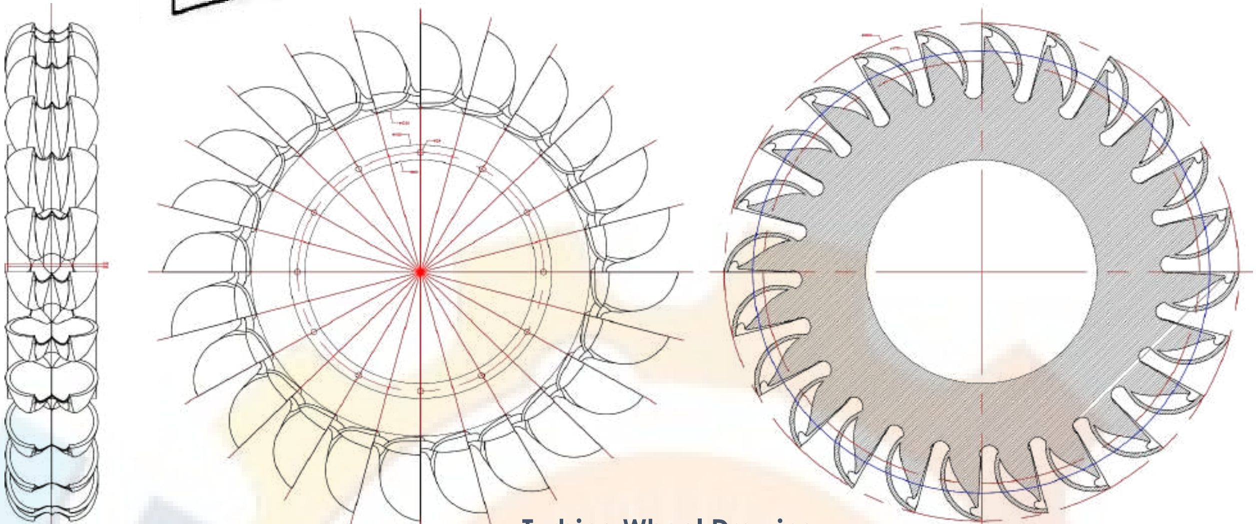
We consider mechanical shaft losses with a coefficient k_1=0.990 and turbine efficiency η=0.900, from which the required hydraulic power is derived as follows:

$$P_{hydro} = (\frac{5000+5000}{0.990})/0.900 = 11224\ kW \text{ (rounded up)}$$



Given the target rotational speed, we calculate the angular velocity as ω=78.54rad/s. The diameter of the circle formed by the central jet impact points is 1.777 m, which gives a pitch radius R_{pitch}=0.8885 m. From this, we determine the linear velocity of the turbine wheel's perimeter $v_{pitch} = .69.78\ m/$ According to the law of conservation of momentum, the jet velocity should be approximately $v_{jet} = 139.57\ m/s$The jet deflection angle is taken as α=150°, hence cosα=−0.866. As the working fluid, a 70% aqueous solution of zinc iodide (ZnI_2, CAS 10139-47-6) is used due to its high specific gravity $\rho = 2540\ kg/m^3$

A conical  nozzle is employed, coefficient is $\varphi = 0.97$



Turbine Wheel Drawing

Knowing the required hydraulic power and the angular velocity, we can calculate the necessary torque: M_{hydro}=142,909Nm (rounded up). Based on the formulas above and the understanding that the total torque is the sum of impulse torque, gravitational torque, and reflected jet torque — $M_{hydro} = M_{imp} + M_{gravity} + M_{ref}$ we determine the required flow rate of the heavy fluid:

$$Q = \frac{M_{hydro}}{\rho R_{pitch}\left(g + \eta_i\left(v_{jet} - v_{turbine}\right)(1 - cos\alpha) + \left(kv_{jet} - v_{turbine}\right)\right)} = 0.360\ m^3/s$$

Knowing the flow rate, we determine the head:

$$H = \frac{P_{hygro}}{\rho Q \eta g} = 1390\ \mathrm{m}$$

Next, we calculate the required pressure of the heavy fluid:

$$p_0 = \rho g H = 34641976\ Pa$$

To select the appropriate hydraulic pump, we convert the flow rate to liters and the pressure to bar: Q = 21,600 L/min p_0 = 347 bar (rounded up).

Below are the specifications of a compressor that meets all requirements and is compatible with magnetic drive:

Model	F.A.D. [1]			Intake pressure	Shut-down pressure [2] min. | max		No. of stages	Speed approx.	Motorpower	Net weight approx.	
	l/min	m³/h	cfm	bar	bar	bar		rpm	kW	kg	lbs
GIB 52.12-315-520	21700	1302	766	10	200	500	4	1485	315	6000	13200

3. System Components

This section provides a detailed overview of all key structural elements comprising the system. The objective is to confirm that the entire configuration is built exclusively from standard components widely used in industry and readily available on the open market. This is essential not only for technical feasibility but also for repeatability and scalability.

Each element — including permanent magnets, electromagnets, generators, the flywheel, control systems and power supply — has commercially available equivalents supplied by leading manufacturers.

The complexity of the system arises not from the uniqueness of its parts, but from their precisely engineered interaction. Such modularity simplifies assembly, maintenance, and system upgrades, while also allowing independent verification of each functional unit..

3.1. Alternators

Alternators can be classified by the method of magnetic field generation: permanent magnet generators (PMG) and electromagnetically excited generators (EG). For the magnetic motor configuration considered, preference is given to permanent magnet alternators. This decision is based on a technical analysis of the key characteristics of both technologies and their suitability for systems operating under variable rotational speeds.

In PMGs, excitation is provided by permanent magnets installed in the rotor. This eliminates the need for excitation current, slip rings, and brushes, reducing the number of moving parts and simplifying the design. Such a configuration enables a stable magnetic field across a wide range of rotational speeds, starting from as low as 20 RPM, which is especially important in systems with variable loads and irregular dynamics.

By contrast, EG-type alternators require an external power source and brush assemblies, increasing mechanical complexity and reducing reliability. These systems also operate over a narrower speed range and require continuous excitation current regulation to maintain stable output voltage.

In terms of efficiency, PMGs typically offer superior performance — up to 99%, compared to 80–85% for excitation-wound machines. They also exhibit a higher power factor and lower thermal losses. Moreover, PMG designs are generally more compact and lighter for the same output power.

Overall, PMG alternators deliver higher energy efficiency, simplify operation, eliminate components with limited-service life (such as brushes), and are more resilient to load fluctuations. These advantages make them the most appropriate choice for a magnetic motor system, where reliability, modularity, and minimal energy conversion losses are of critical importance..

3.2. SuperCapacitors

In pulse-based systems such as the magnetic motor, key performance parameters include charge/discharge rate, permissible current, thermal stability, and service life. Against this background, a comparison between the two primary technologies — lithium-ion batteries and supercapacitors — clearly demonstrates the superiority of the latter for the application in question.

Supercapacitors provide high power density and are capable of delivering large currents in extremely short bursts, which is critical for powering electromagnets in pulse mode. Unlike batteries, supercapacitors are virtually unrestricted in terms of discharge current and can release stored energy instantly without degradation, allowing for stable and repeated coil actuation without overheating or loss of performance.

In terms of charging speed, supercapacitors significantly outperform batteries. They can reach up to 80% of their rated capacity within a matter of minutes, whereas lithium batteries require much longer even with fast-charging techniques, which themselves reduce battery lifespan.

Reliability under operating conditions is another critical advantage. Supercapacitors contain no flammable components, are not prone to thermal runaway, and do not require complex protection systems. In contrast, lithium-ion batteries carry risks of overheating and require sophisticated management to ensure safety — a crucial factor in systems subject to varying thermal loads and vibration.

The service life of supercapacitors is also significantly greater. Typical devices offer over 20,000 charge/discharge cycles without substantial loss of capacity, whereas lithium batteries rarely exceed 1,000–2,000 cycles under strict operating conditions.

Therefore, given the pulse-based nature of the load, high switching frequency, and the requirements for durability and safety, the use of supercapacitors instead of traditional batteries is the most technically sound solution.

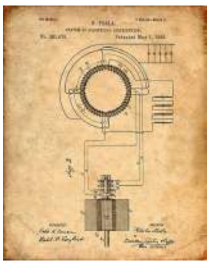
3.3. Compressor

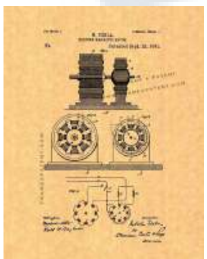
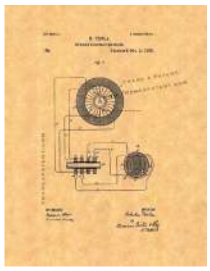
The use of compressors with a working pressure of 350 bar and nitrogen as the operating medium is a well-established practice across various industrial sectors. Such compressors are commonly employed in the gas industry, energy systems, mechanical engineering, and other fields where reliable high-pressure operation is required. These are standard production units manufactured by leading global suppliers, which confirms both their technological maturity and operational reliability. The component is not unique and can be readily integrated into a wide range of technical systems.

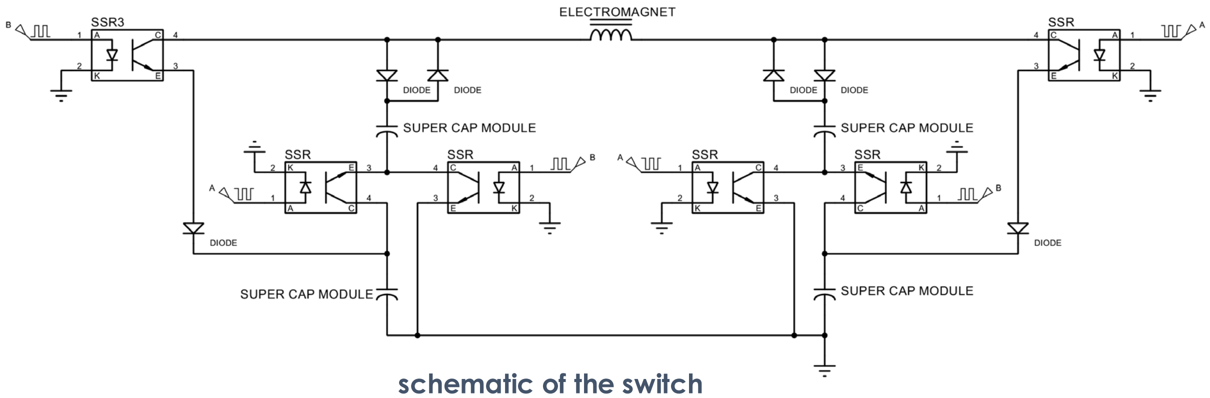
3.4. Control System

At the core of the control architecture is the NIMEC T-Switch module — an advanced pulse switching unit developed on the basis of Tesla circuit principles. It provides precise synchronisation of the electromagnets with the rotor's motion and enables minimised energy consumption while maintaining a stable magnetic impulse. The control system is built using industrial-grade components and is designed for integration into any module configuration.

The Tesla Switch — originally conceptualised by Nikola Tesla — is based on a unique scheme for managing current flow between multiple sources and a load. The underlying idea involves exploiting the reversible nature of electric motors and capacitive storage (in Tesla’s version — capacitors) to achieve continuous energy exchange without complete dissipation. This approach not only powers the load but also enables partial recovery of energy back to the source, thereby improving overall system efficiency.

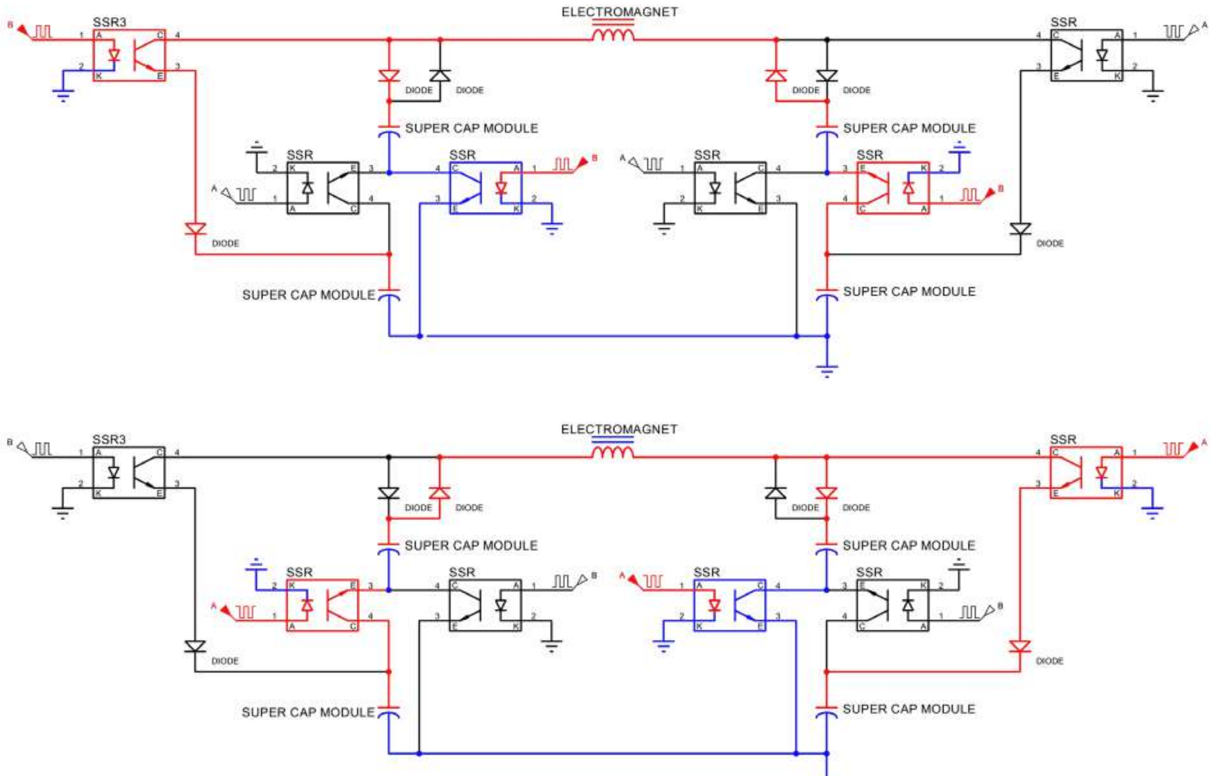




schematic of the switch

The use of supercapacitors within the switching unit is critical due to their ability to charge and discharge rapidly, handle high current loads, and retain capacitance over time. Unlike batteries, they are highly resistant to frequent cycling and can deliver energy instantaneously, making them an ideal component for circuits involving pulsed or bidirectional current. In the context of the magnetic motor, supercapacitors enable effective capture and utilisation of back EMF, thereby improving the overall efficiency and operational stability of the entire system.



schematic of the switch work

During the operation of electromagnets, an electromotive force (EMF) inevitably arises in their windings due to changes in magnetic flux. In conventional systems, this energy is typically dissipated; however, in our configuration, it is captured and stored using supercapacitors. Owing to their fast response time and ability to efficiently absorb pulsed energy, supercapacitors enable partial energy recuperation. This significantly extends the operational cycle on a single charge and improves the overall energy efficiency of the system.

4. Application areas

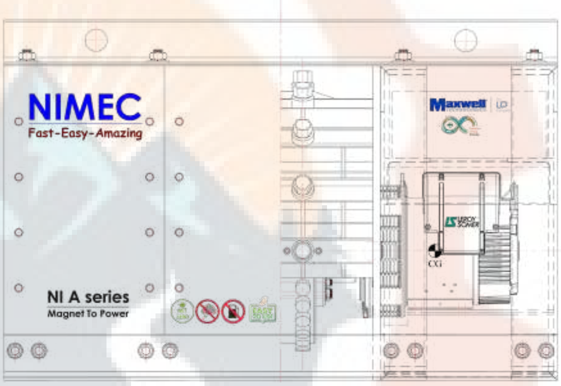
The “Application Areas” section highlights the versatility and adaptability of NIMEC solutions. It outlines the key domains where our technologies deliver efficient, reliable, and environmentally responsible energy — from large-scale industrial facilities to mobile platforms and carbon neutrality initiatives.

4.1. Electricity Generation

This section outlines the advantages of applying NIMEC magnetic technologies for power generation without the use of fossil fuels or harmful emissions. Permanent magnets act as a reliable and long-lasting energy source, ensuring stable operation without frequent replacement or maintenance, making the system both environmentally friendly and economically efficient.

4.1.1. Units with a Magnetic Power Core

NIMEC energy modules with magnetic battery systems represent a ready-to-use, plug-and-play solution. These units require no connection to external power sources and operate without fossil fuels. Energy is produced through the interaction of permanent magnets and pulsed electromagnetic activation.



Each module is housed in an industrial-grade, sound-insulated enclosure. Standardised dimensions — 1800 mm in width, 1800 mm in height, and 2200 mm in length — ensure compliance with transport regulations, simplifying logistics and installation. Although the external dimensions remain the same, module weight varies depending on rated power output, ranging from 200 kW to 1 MW.

Only high-quality materials and components from recognised manufacturers are used within the units. This ensures reliable operation across a wide range of conditions — from autonomous industrial sites to critical infrastructure applications.

4.1.2. Hydro-Gravitational Modules

This system represents the world’s first modular power plant based on Container-Based Power technology. It is an innovative, fully autonomous electricity generation station, assembled from six High Cube 40 ft containers. The plant is delivered in a Plug & Play format.

We utilise a Pelton turbine because it is one of the most efficient impulse hydro turbines, ideally suited for operation under high head conditions. It converts the kinetic energy of a high-velocity jet into mechanical rotation with minimal losses. Pressurised fluid is directed through a nozzle and strikes the turbine buckets mounted on the periphery of the runner.

Thanks to the specially designed casing, the reflected jet from the buckets is redirected and re-applied to the runner — with the dense fluid reversing nearly 180°, enabling maximum energy transfer and generating strong torque.

Our system employs a heavy working fluid — a 70% solution of zinc iodide (ZnI_2, CAS 10139-47-6) — chosen for its high density. This allows optimal utilisation of Earth's gravitational force and highly efficient conversion into shaft rotation. By feeding the heavy fluid from above onto the Pelton turbine buckets, we achieve outstanding overall system efficiency.

The fluid is completely safe for the environment and circulates within a sealed, closed-loop circuit, ensuring sterile operation and significantly extending equipment lifespan. The use of a heavy fluid also provides a key advantage: the required volume of working medium is significantly lower compared to conventional water-based systems, simplifying design and reducing operational costs.

The use of a reduced volume of heavy fluid, combined with modern materials, has enabled the implementation of high-speed hydraulic and pneumatic cylinders. These cylinders efficiently receive energy from compressed air and transfer it to the heavy fluid to maintain continuous circulation. Powerful compressors compress nitrogen, which also circulates in a closed loop.
This approach ensures consistently high gas quality, essential for the reliable and long-term operation of the compressors. Both the liquid and gas circuits operate in fully closed cycles.

The application of permanent magnet generators allows us to convert virtually 100% of mechanical energy into electricity with minimal losses. A unique engineering solution — combining two generators on a single shaft and employing a magnetic motor to drive the gas compression system — has enabled the creation of a closed-loop energy system. As a result, 100% of the energy generated is delivered to consumers, while the internal operational demands of the station are met by the magnetic motor and generator unit. This design enables truly autonomous, balanced, and highly efficient system operation, completely isolated from external conditions.

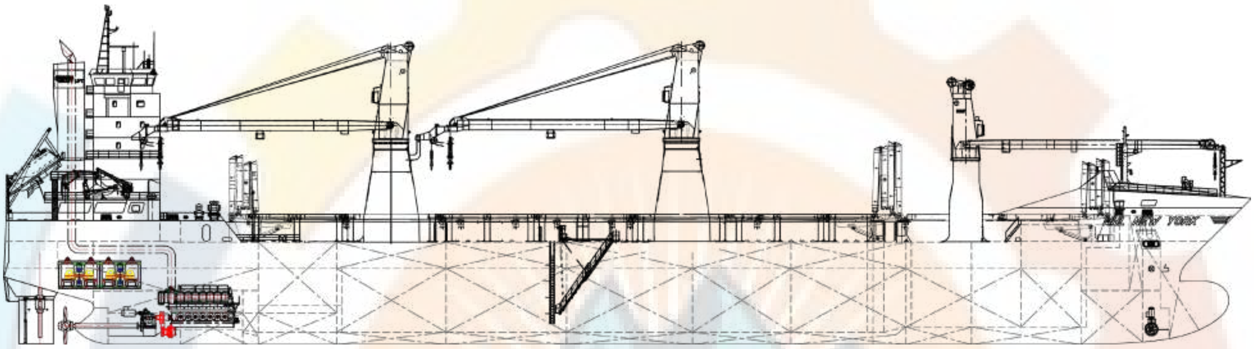
4.2. Mobile Applications

This section explores the potential use of NIMEC's autonomous energy modules in a wide range of mobile platforms — from marine and wheeled vehicles to unmanned aerial systems and advanced robotics. These modules offer a unique combination of compact design, high specific power, and complete independence from conventional fuel sources. Such features make them exceptionally well-suited for deployment in dynamic environments where space, weight, and energy autonomy are critical.

Thanks to their modular architecture and fast-response power delivery, NIMEC energy units integrate easily into hybrid or fully electric propulsion systems. For robotics, they enable extended operational time, reduced thermal footprint, and consistent power output during peak load conditions, which is particularly valuable for autonomous ground robots, robotic arms, drones, and mobile industrial platforms. Their vibration resistance and low maintenance requirements further ensure reliable performance in mobile and harsh-operating environments.

NIMEC modules are designed for long-term service and seamless integration, providing a stable and sustainable energy supply for mobile systems across defense, logistics, exploration, and industrial automation sectors.

4.2.1. Marine



Module Layout on Shipboard

We offer a unique solution that enables propulsion of a ship’s propeller without the use of a conventional marine internal combustion engine — and thus without consuming traditional fuel.

Our approach requires no structural modifications to the vessel: there is no need to remove or disable the existing propulsion system. All additional equipment is installed as an overlay, integrating seamlessly into the existing architecture without interfering with standard mechanisms. This enhances vessel reliability and provides dual independent propulsion options — selectable by the crew depending on operational or maritime conditions.

Only standard, marine-certified equipment is employed, sourced from globally recognised manufacturers, including: Bosch Rexroth — a global leader in marine hydraulics and drive systems, Danfoss Power Solutions — developer of reliable hydraulic motors for demanding applications, Parker Hannifin — supplier of hydraulic solutions for shipbuilding and maritime industries, Linde Hydraulics — manufacturer of high-efficiency pumps and hydraulic motors for marine vessels.

A properly rated hydraulic motor is connected either directly to the shaft or to the existing gearbox of the marine engine. In most cases — particularly for small to medium-sized vessels where the propeller power requirement does not exceed 800 kW — this setup fully aligns with the specifications of standard, time-tested and certified hydraulic motors. The typical operating speed of ship propellers, usually 200–300 RPM, is perfectly matched to the optimal working range of these motors.

The hydraulic motor is connected to the hydraulic power unit via high-pressure supply and low-pressure return lines. The configuration of the hydraulic station is selected individually based on the specifications of the chosen hydraulic motor, while utilising only standard, industrial solutions compliant with recognised marine standards.

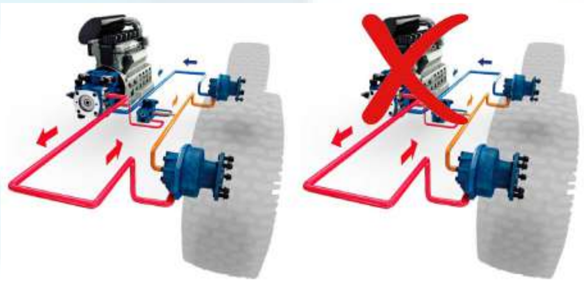
The hydraulic station is powered by electricity generated by our autonomous energy system. This system is based on the conversion of energy from the interaction between permanent magnets and electromagnets, providing a stable, reliable and environmentally friendly power supply — with zero emissions and no fuel consumption.

Transitioning a vessel to NIMEC technology significantly reduces operational costs by eliminating the need for traditional marine fuels and expensive exhaust treatment systems. In most cases, vessels operating without heavy fuel oil benefit from substantial savings on fuel expenditure, port fees, and environmental penalties. Maintenance costs are also lower due to the use of cleaner and simpler systems. Overall, this transition delivers considerable financial advantages and improves long-term cost-efficiency.

4.2.2. Land-Based Units

The NIMEC magnetic module is a fully autonomous energy unit that can be directly connected to both electric alternators and hydraulic pumps. This configuration allows efficient powering of generators and complex hydraulic systems — without the need for fuel, transmissions, or conventional internal combustion engines.

In land-based applications — particularly for tracked, wheeled, and specialised machinery — the NIMEC module offers a range of technological advantages:



Full autonomy: No internal combustion engine means no fuel, no exhaust emissions, and reduced maintenance requirements.

Maximum reliability: With transmissions and vulnerable mechanical components eliminated, the risk of breakdowns in field conditions is minimised.

Precise motion control: Hydraulic motors provide smooth or rapid actuation, precise speed regulation, and instant direction changes.

Silent and eco-friendly operation: Minimal noise and zero emissions make the system ideal for urban areas, warehouses, and sensitive environments.

Low observability: Near-zero thermal signature keeps the equipment invisible to thermal imaging and infrared targeting.

Operational resilience: Even with partial damage to the running gear (e.g. broken tracks), the machine remains mobile thanks to multiple drive points.

Rapid capacitor replacement: Under heavy load, a discharged supercapacitor module can be replaced within minutes with a pre-charged unit — keeping operations continuous.

NIMEC solutions are tailored for modern demands — enabling autonomous power for mobile equipment in the most demanding environments, including special operations, construction, logistics, and remote infrastructure.

4.2.3. Drones and Robots

In the rapidly advancing fields of robotics and autonomous systems, key requirements for energy sources include compactness, longevity, and high specific power. Conventional batteries remain limited in both runtime and operating temperature range, whereas NIMEC's magnet-based technologies open up entirely new possibilities for true autonomy.

The NIMEC magnetic power unit is a modular energy cell capable of reliably supplying power to high-load drives, sensor arrays, and computing modules. By combining high-strength permanent magnets with pulsed electromagnets and advanced supercapacitors, the system delivers exceptional energy efficiency with minimal losses.

The absence of chemically active components makes the system well-suited for extreme temperature environments and enables fully maintenance-free operation. This is particularly critical for reconnaissance or industrial drones, as well as robots deployed in radiation zones, chemically hazardous areas, or remote and inaccessible terrain.

With an ultra-low thermal signature and complete acoustic silence, the system ensures discreet operation in combat environments or noise-sensitive missions. At the same time, the design supports rapid module replacement of supercapacitors, making it ideal for extended autonomous deployments without interruption.

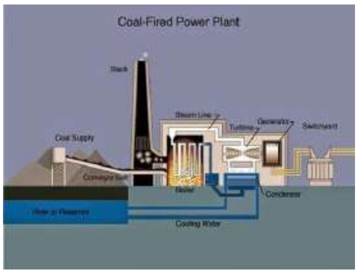
The integrated hydraulic system within the NIMEC unit also enables linear motion through flexible hydraulic cylinders — including those designed to mimic the function of human muscles. Thanks to high energy density and precisely timed pressure impulses, the system can serve as a hydraulic "heart" for autonomous robots, exoskeletons, and bionic mechanisms. Controlled contractions and extensions enable natural movement dynamics without the need for rigid actuators or external power sources.

This opens the door to truly resilient and self-sufficient machines capable of operating in the field without the need for recharging.

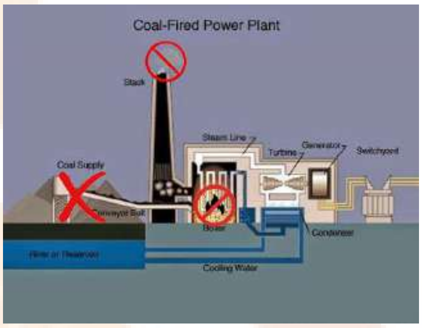
The NIMEC module sets a new benchmark in compact power delivery, enabling autonomous systems to operate without reliance on traditional energy sources.

It offers a scalable foundation for building mobile platforms that are fully self-sufficient, robust, and ready for deployment in the most demanding environments.

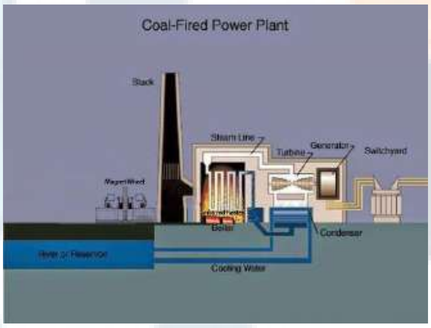
4.3. Net Zero Transformation



Modern coal and gas power plants operate on a universal thermodynamic principle: fuel is burned in a boiler to heat water into superheated steam, which then drives a turbine connected to an electric generator. Despite differences in fuel types, all such plants share the same critical component — a combustion chamber and a tubular water-heating boiler.



The operation of such boilers comes with serious operational limitations. Water is heated through heat transfer from the walls of tubes that are in direct contact with the flame. This process is uneven, often leading to overheating and burnout of the tubes, requiring frequent replacement. Additionally, starting the system requires heating the entire combustion chamber to its operating temperature, making shutdowns and restarts extremely costly and technically undesirable. The core issue lies in the physical nature of heat produced through the chemical reaction of combustion.



NIMEC offers a fundamentally new solution: replacing chemical heating with electric infrared heating. Infrared lamps generate thermal radiation closely resembling sunlight, which evenly penetrates the boiler and heats the water directly through the tubes via a combination of radiation and conduction. Unlike open flame, infrared heat does not cause local overheating, does not damage the structure of the tubes, and ensures a stable, uniform temperature throughout the chamber. Modern infrared emitters can deliver up to 20 kW/m², significantly surpassing the efficiency of traditional combustion and allowing the system to be easily scaled to meet any requirements.

Infrared lamps can be integrated into existing infrastructure — their installation inside the boiler chamber requires only minimal modifications, without the need to replace the entire system. As a result, the overall structure of the power plant remains unchanged, while the need for fuel, chimneys, and raw material storage and transportation is completely eliminated.

The energy required to power the infrared heaters is supplied by NIMEC units. This enables a clean and sustainable energy solution: no emissions, no coal or gas deliveries, and no environmental degradation. Only stable, autonomous, low-cost, and silent electricity production — fully compatible with today’s industrial-scale operations.

The retrofit requires minimal investment — only the boiler chamber is modernised, while the rest of the infrastructure remains intact. Fuel costs, delivery, and storage are completely eliminated. Operating costs are reduced: the lifespan of the boiler tubes increases significantly, and maintenance is minimal. Electricity from NIMEC units is virtually free, and the efficiency of infrared heating is superior. The result is a rapid return on investment and a sharp reduction in the cost of power generation.

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