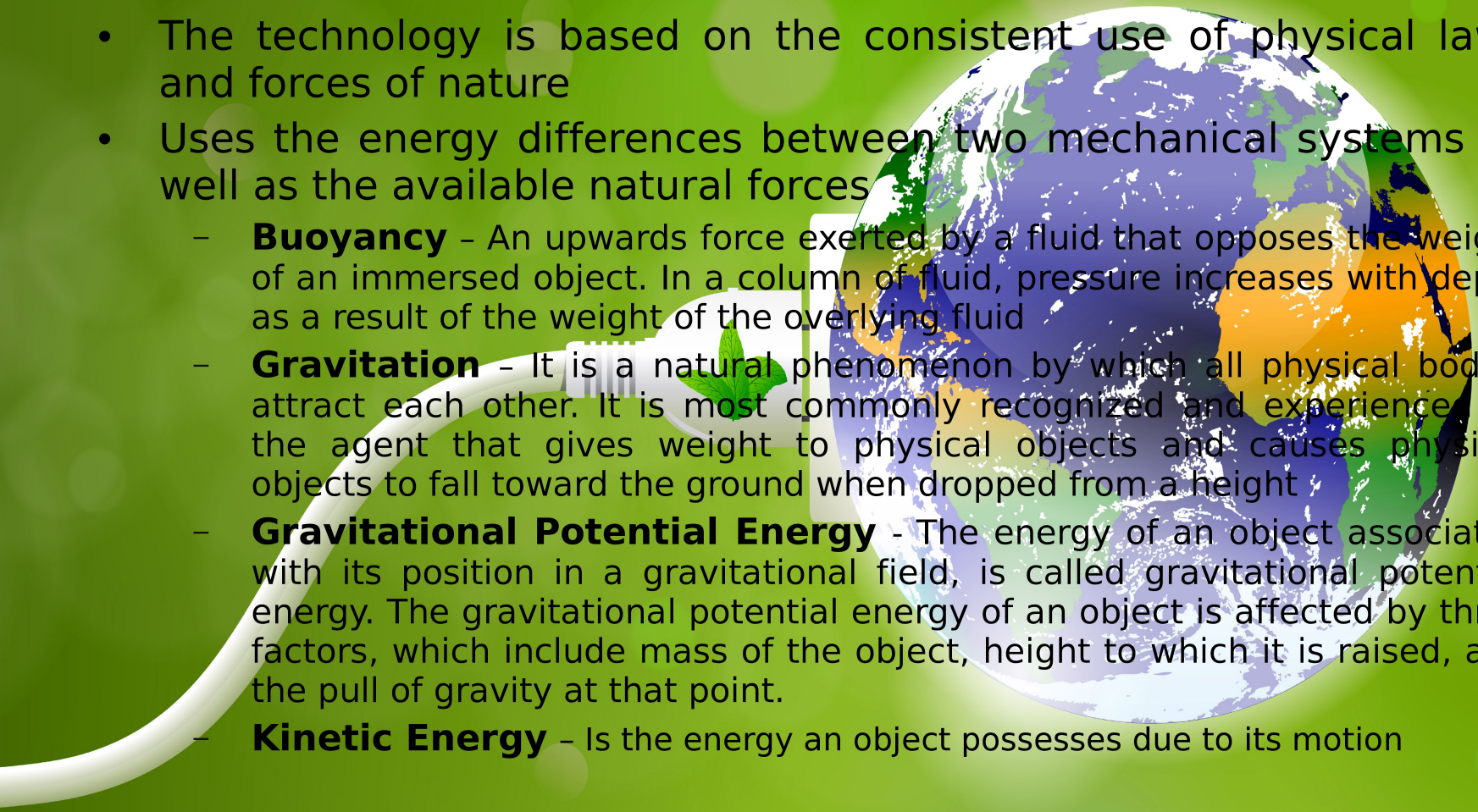
INVESTING IN RENEWABLE ENERGY

KINETIC POWER GENERATION

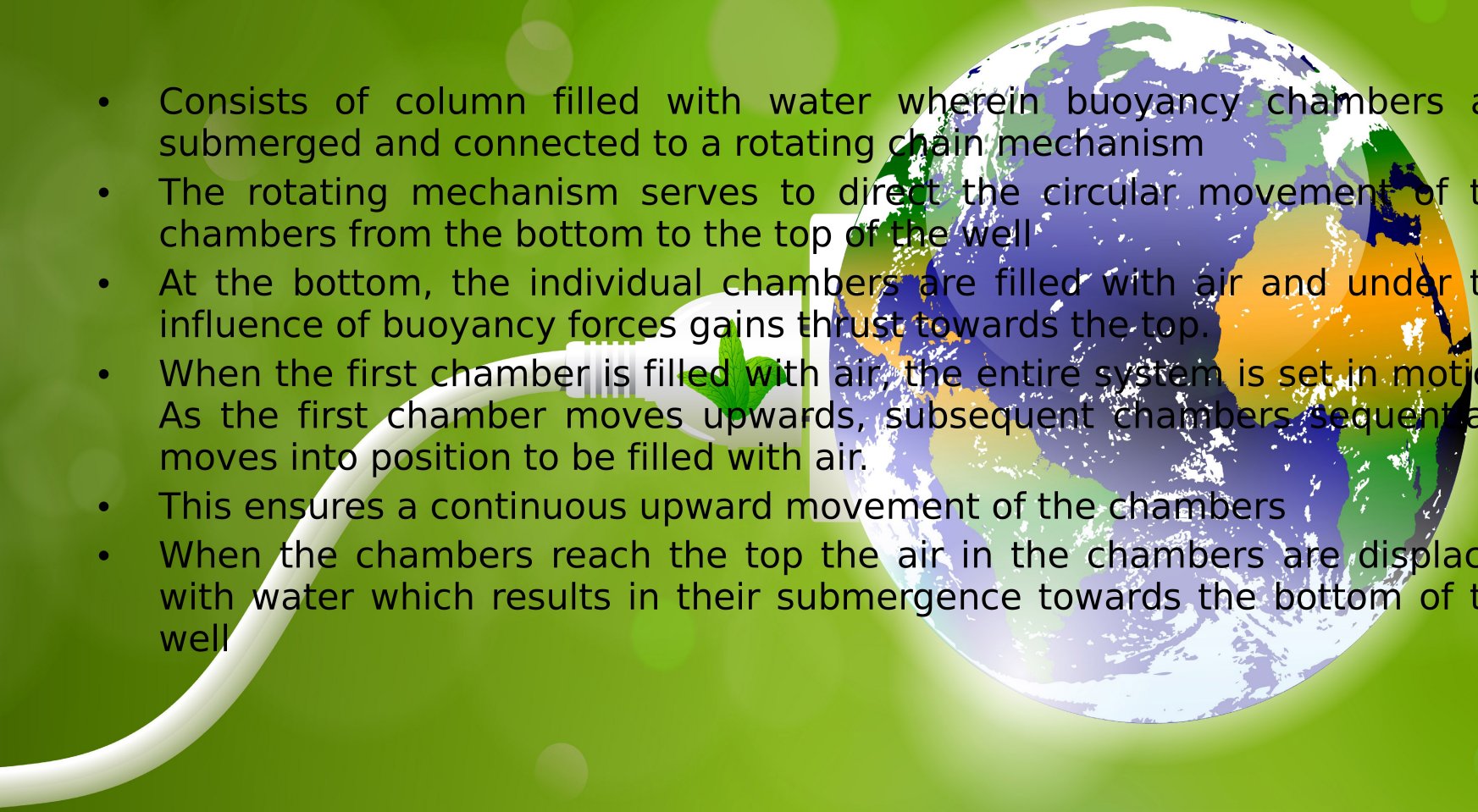
Technology

Technology Principles



- The technology is based on the consistent use of physical laws and forces of nature
- Uses the energy differences between two mechanical systems as well as the available natural forces
  - **Buoyancy** – An upwards force exerted by a fluid that opposes the weight of an immersed object. In a column of fluid, pressure increases with depth as a result of the weight of the overlying fluid
  - **Gravitation** – It is a natural phenomenon by which all physical bodies attract each other. It is most commonly recognized and experienced as the agent that gives weight to physical objects and causes physical objects to fall toward the ground when dropped from a height
  - **Gravitational Potential Energy** - The energy of an object associated with its position in a gravitational field, is called gravitational potential energy. The gravitational potential energy of an object is affected by three factors, which include mass of the object, height to which it is raised, and the pull of gravity at that point.
  - **Kinetic Energy** – Is the energy an object possesses due to its motion

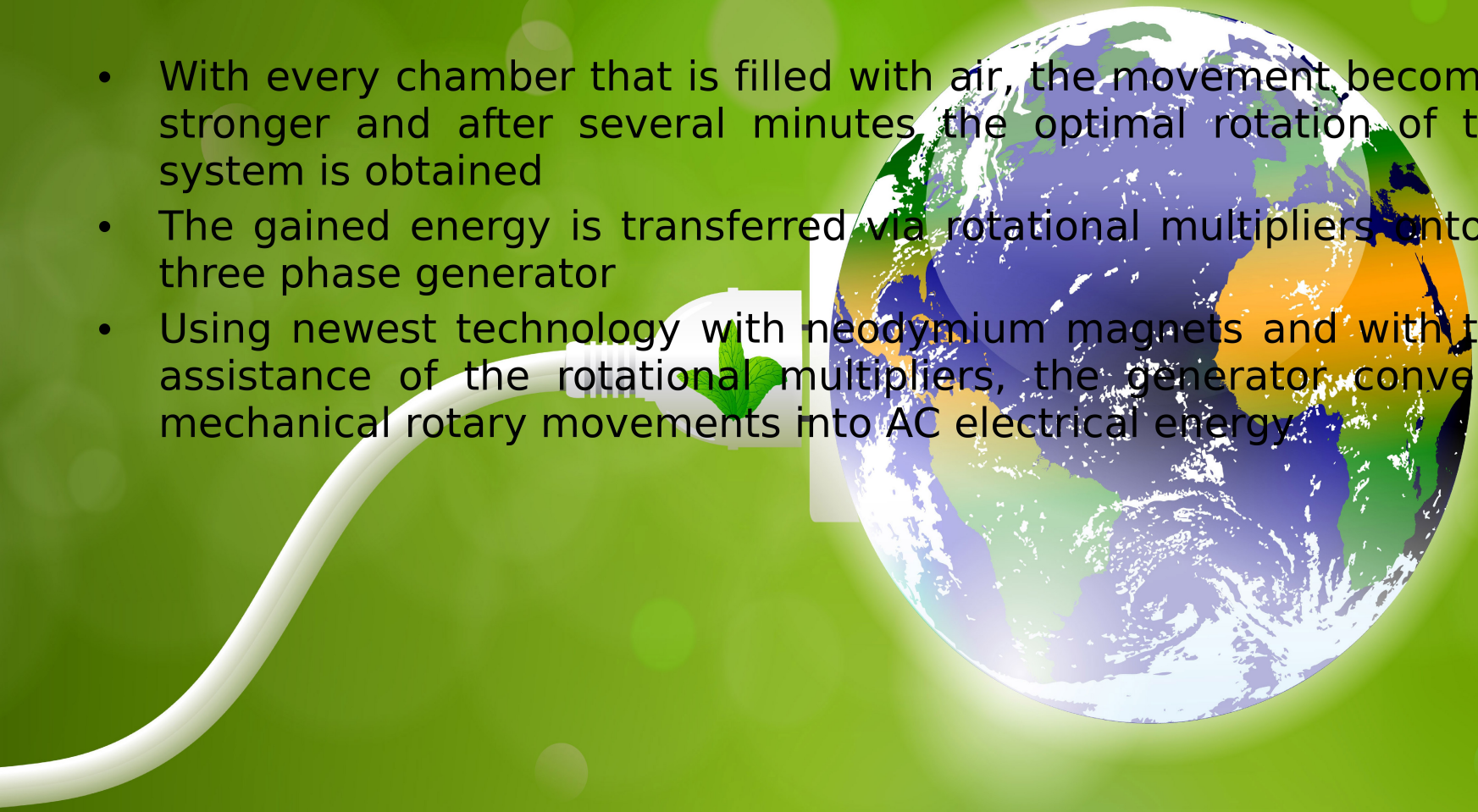
Technology Principles (2)



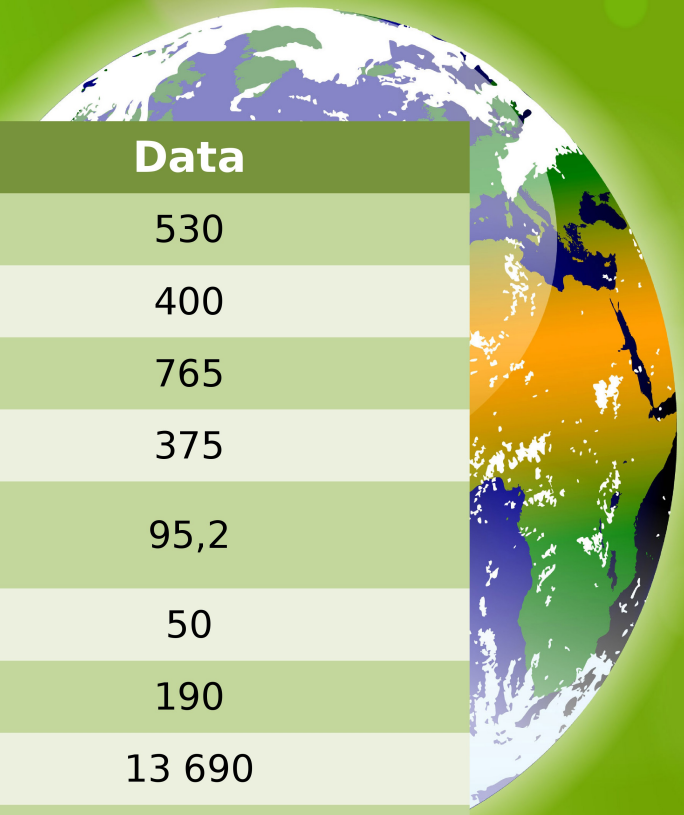
- Consists of column filled with water wherein buoyancy chambers are submerged and connected to a rotating chain mechanism
- The rotating mechanism serves to direct the circular movement of the chambers from the bottom to the top of the well
- At the bottom, the individual chambers are filled with air and under the influence of buoyancy forces gains thrust towards the top.
- When the first chamber is filled with air, the entire system is set in motion. As the first chamber moves upwards, subsequent chambers sequentially moves into position to be filled with air.
- This ensures a continuous upward movement of the chambers
- When the chambers reach the top the air in the chambers are displaced with water which results in their submergence towards the bottom of the well

Generator

- With every chamber that is filled with air, the movement becomes stronger and after several minutes the optimal rotation of the system is obtained
- The gained energy is transferred via rotational multipliers unto a three phase generator
- Using newest technology with neodymium magnets and with the assistance of the rotational multipliers, the generator converts mechanical rotary movements into AC electrical energy



Technical specifications (3)



Kinetic Power Plant Generator

No.	Parameter	Units	Data
1	Rated output power	kW	530
2	Rated output voltage	VAC	400
3	Rated current	A	765
4	Rated speed	RPM	375
5	Efficiency at rated speed	%	95,2
6	Frequency	Hz	50
7	Start torque	Nm	190
8	Torque at load	Nm	13 690
9	Max. working temperature	°C	130
10	Weight	kg	3000
11	Design lifetime	Years	25

Generator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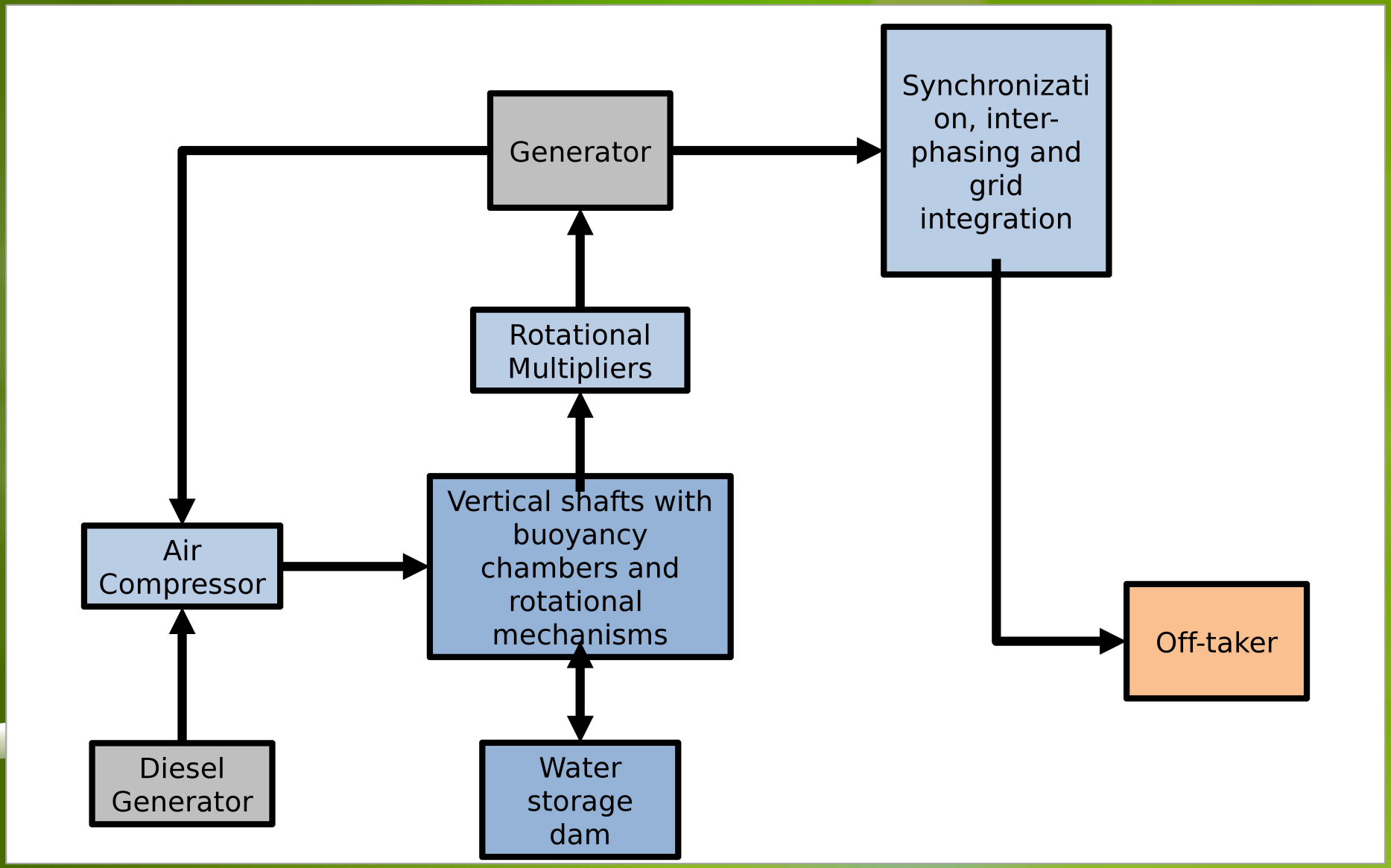
Environmental Impacts and benefits

- Renewable energy source
- Low carbon footprint
- Not dependent on exogenous power sources for example wind or the sun
- Clean green technology with no air emissions and minimum effluents
- Low visual impact
- Limited land-use when compared to alternative sources

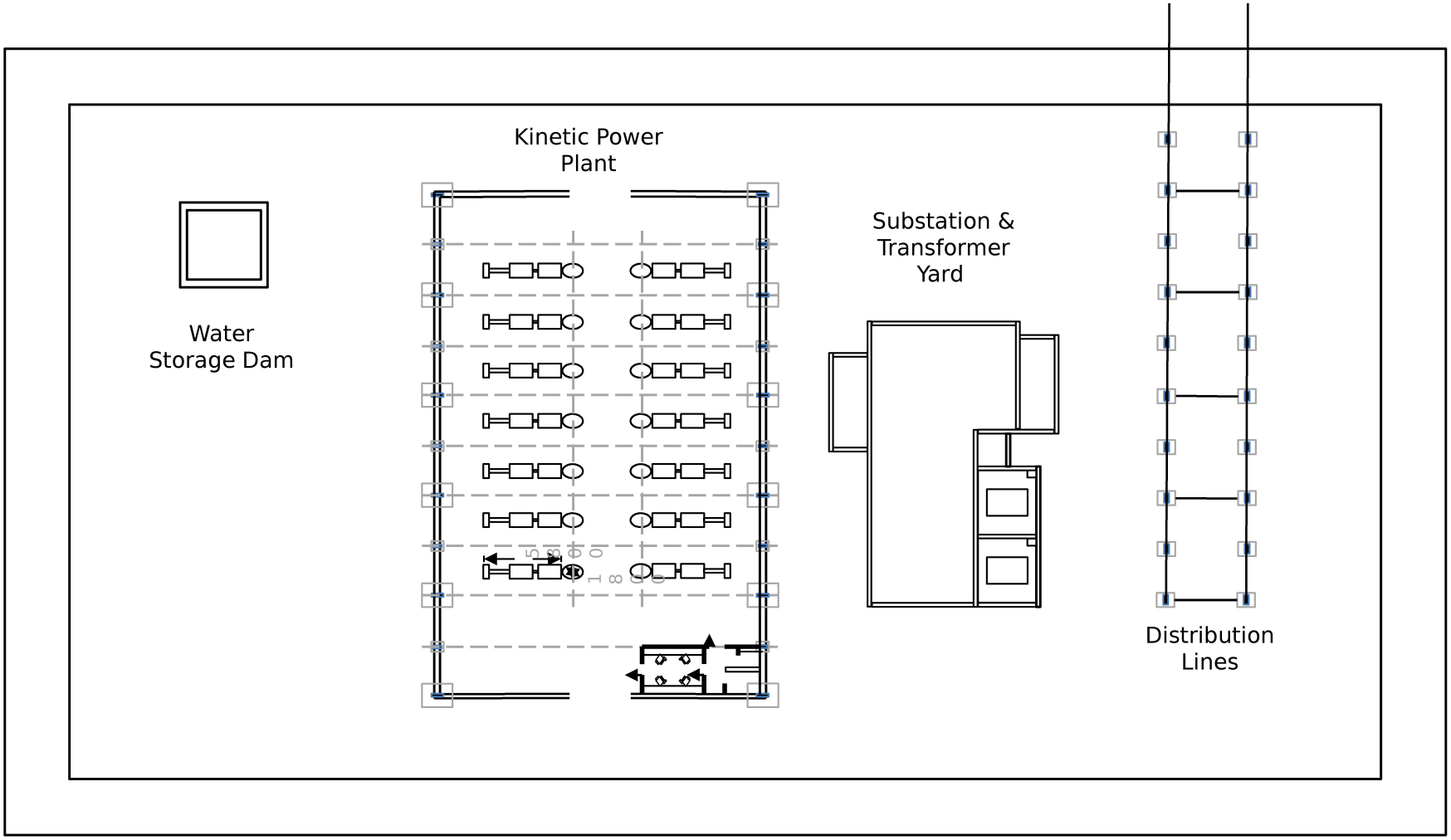
BASIC FLOW DIAGRAM



Typical installation
5 MW

General Arrangement

Typical 5 MW Installation – General Arrangement



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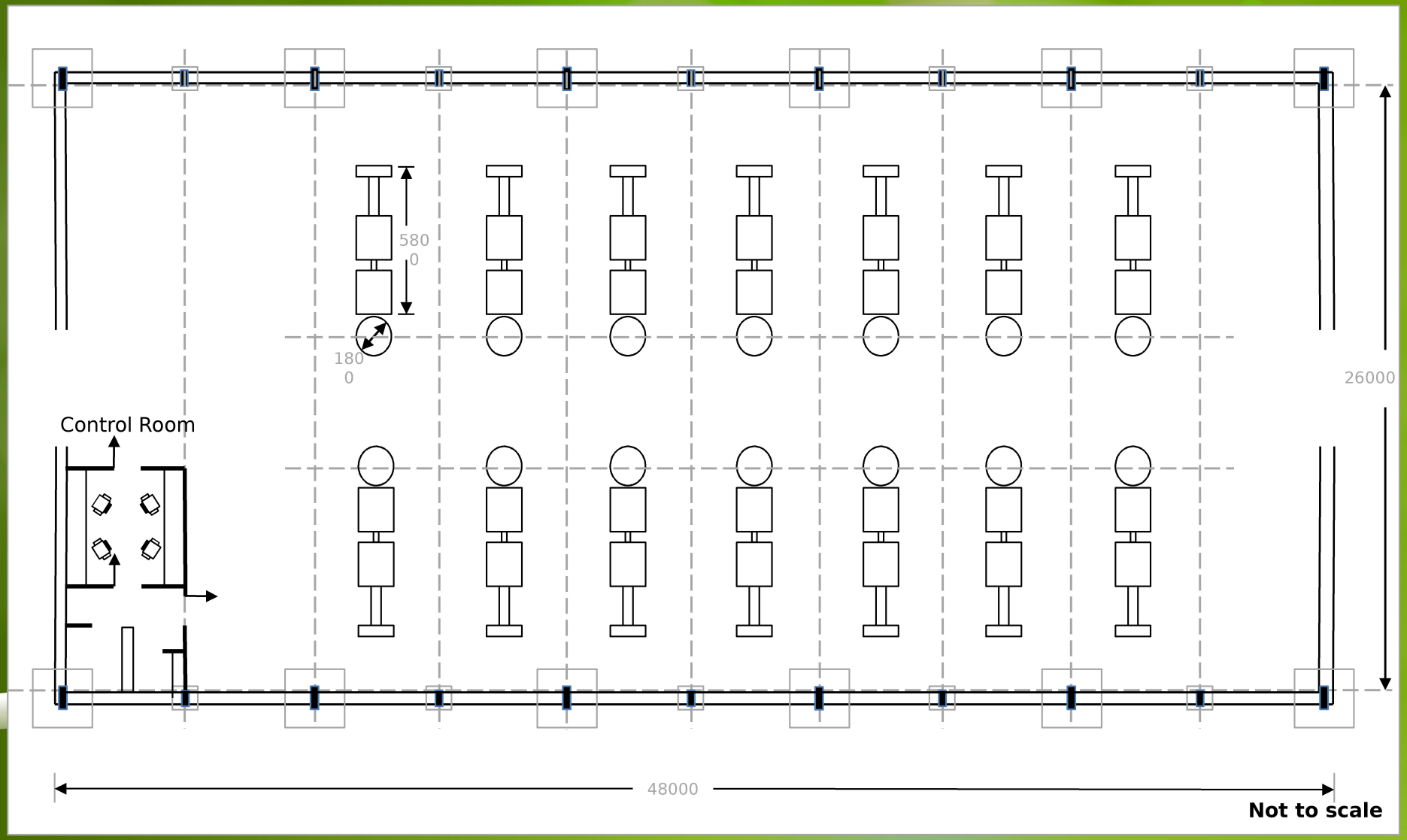
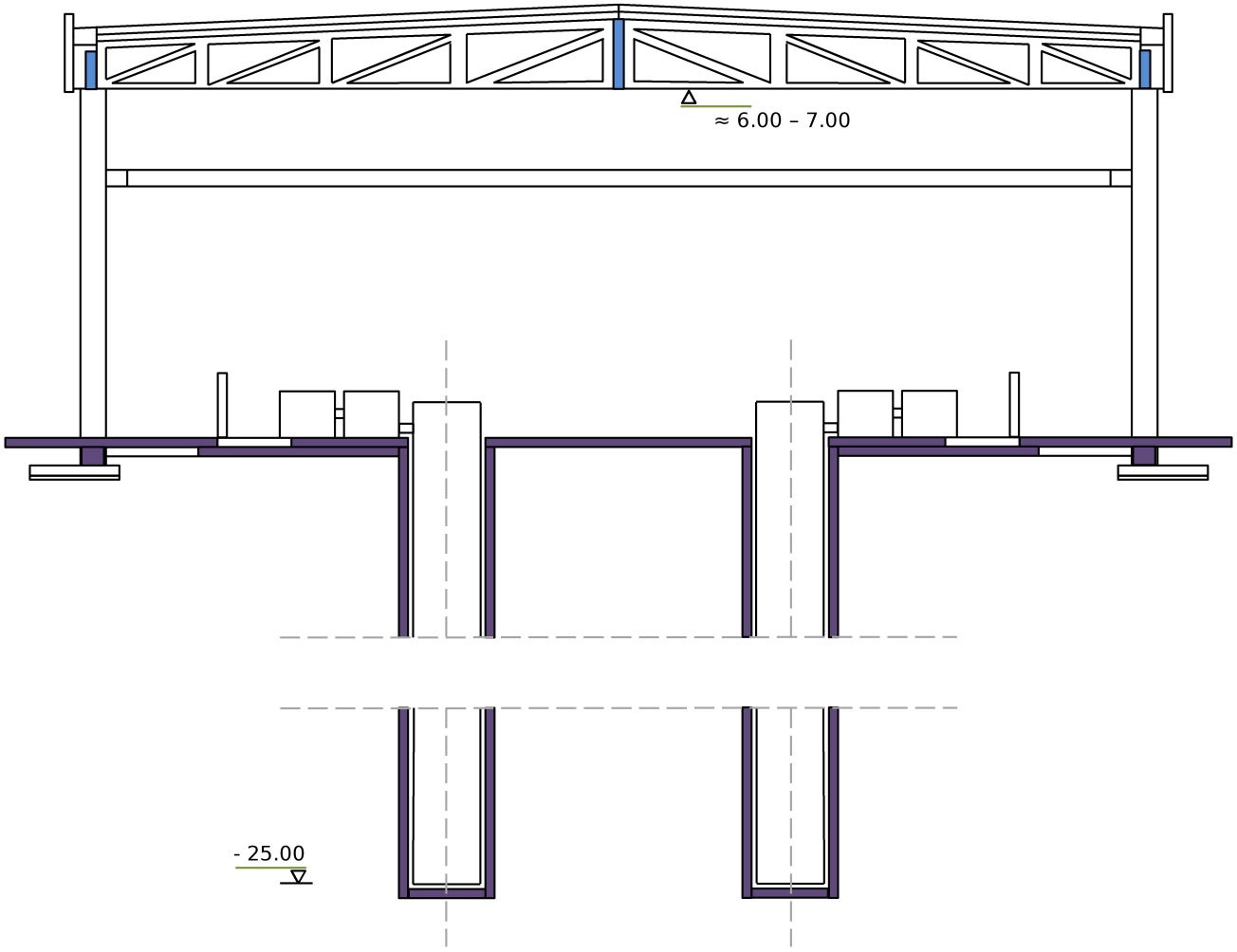
Technical specifications

Typical 5 MW Installation – General Arrangement



Technical specifications (2)

Typical 5 MW Installation – General Arrangement



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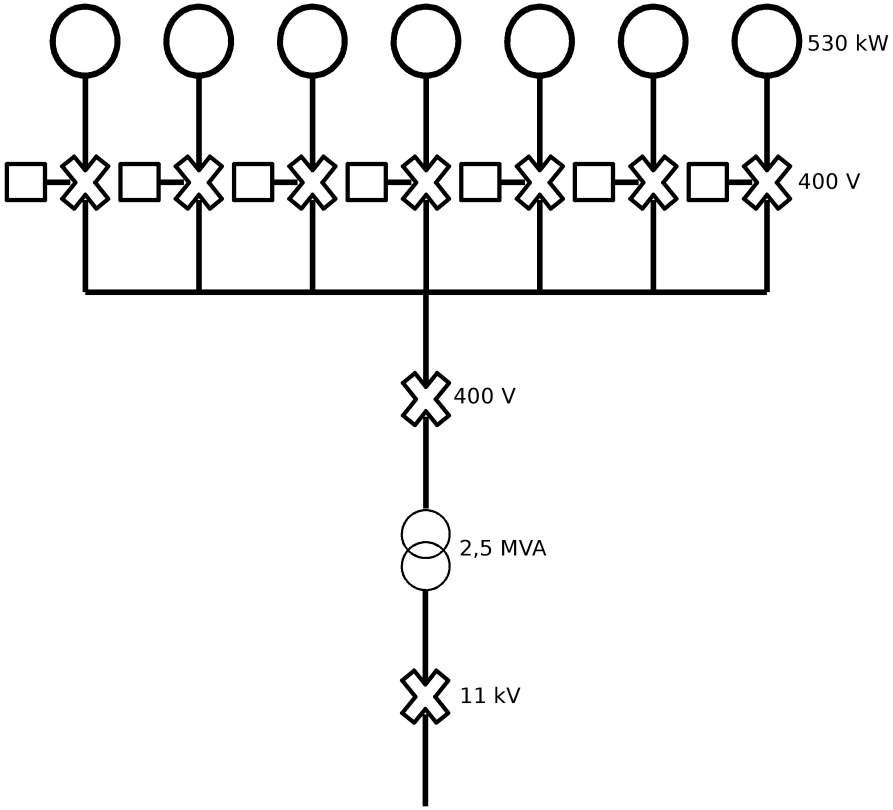
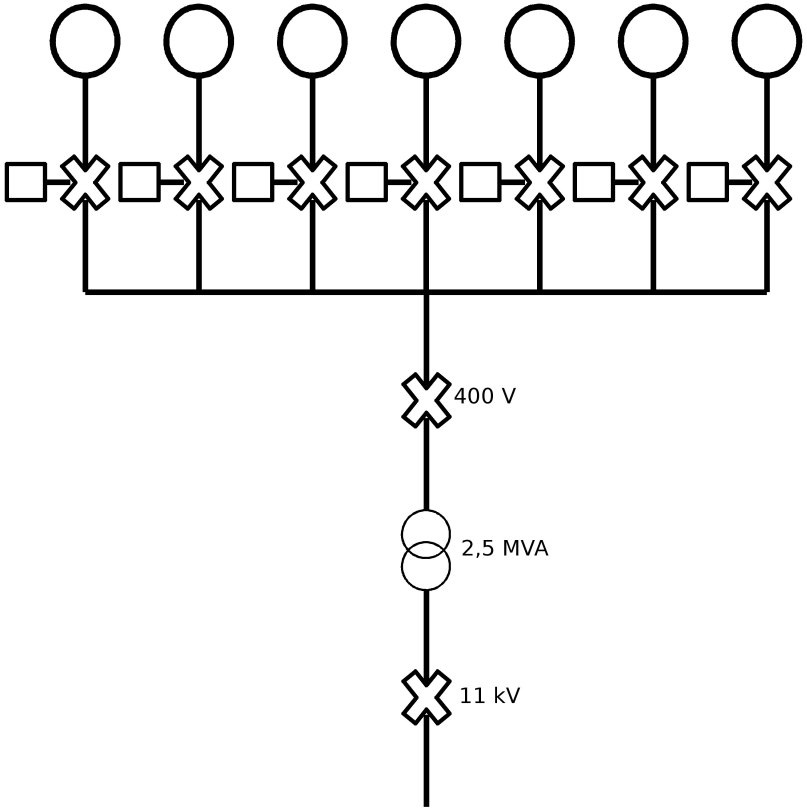
Technical specifications (3)

	KPP – 5 MW 1 Module	KPP – 40 MW 8 Modules	KPP – 100 MW 20 Modules
Total Performance	5 MW	40 MW	100 MW
Type	Thrust Kinetic Power Plant	Thrust Kinetic Power Plant	Thrust Kinetic Power Plant
Nominal Power	5 MW	40 MW	100 MW
Power by Stroke	530 kW	530 kW	530 kW
Number of Strokes	10 + 4	80 +32	200 + 80
Number of Generators	14	112	280
Average Production	43 200 MWh	345 600 MWh	864 000 MWh

Technical specifications (4)

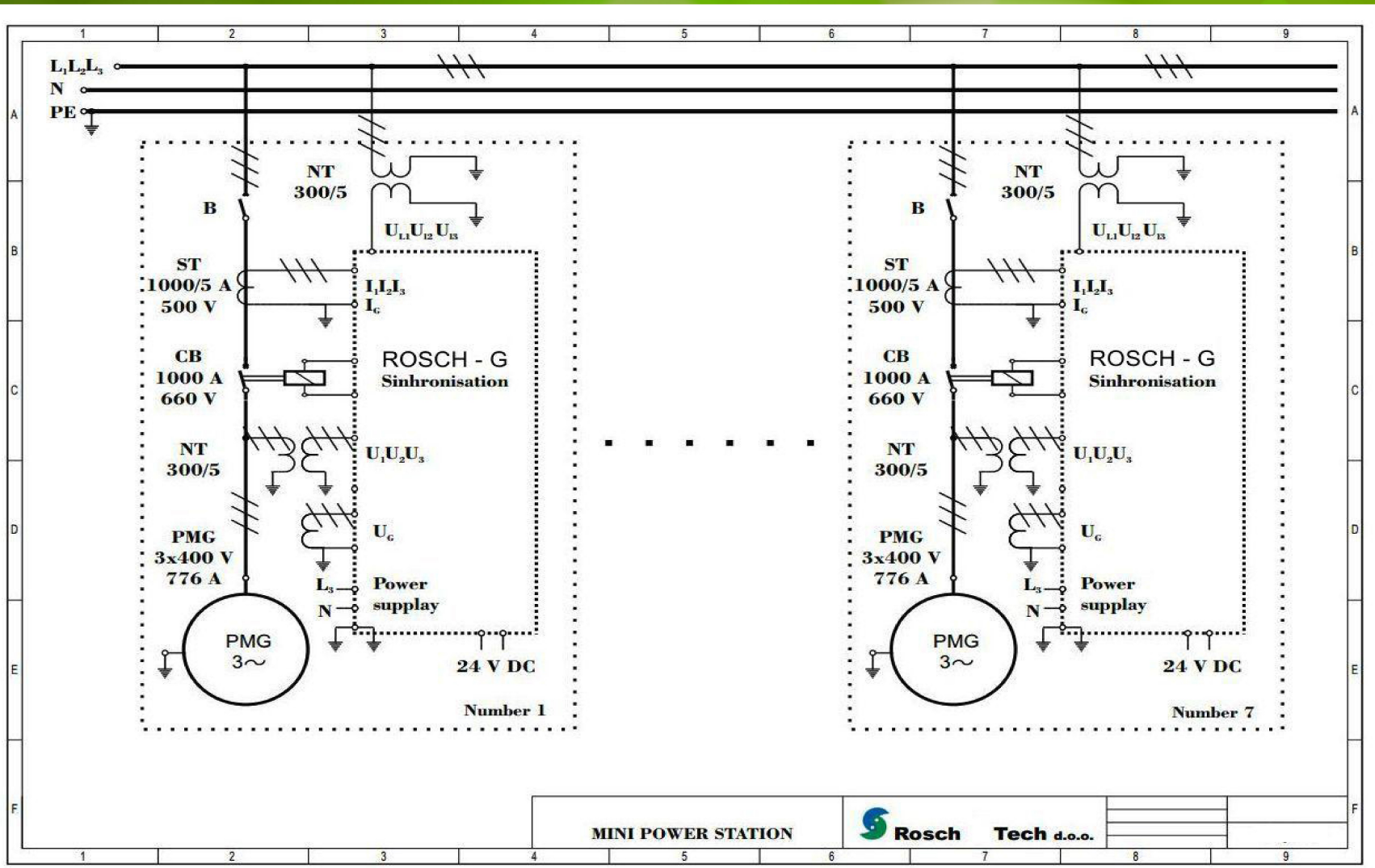
Typical 5 MW Installation – Electrical Single Line Diagram





Technical specifications (5)

Control Schematics – Synchronising Units



benefits

- ✓ Can be located close to the off-taker / buyer
  - Short-distance transmission and distribution networks
- ✓ Renewable energy source
- ✓ Clean technology
  - No air emissions
  - Minimal water consumption
  - Minimal eefluents
  - No waste products
- ✓ Uninterrupted power generation capability
  - Firm supply installations
  - No exogenous energy sources i.e. wind, solar, water
  - Baseload capable
- ✓ Modular and easy expandable
- ✓ Small footprint

applications

- Centralised power generation
  - Baseload capability
- Decentralised power generation
  - Micro and mini grids
  - Remote destinations
- Small, medium and large-scale applications
- Off-grid areas
  - Small businesses, mines, plants, factories
  - Remote communities
- Special Economic Industrial Zones (SEZ’s)
- Independent Power Producers
  - Competitive operational costs
  - Baseload capability
  - Short distribution networks
  - Land use
- Developed Areas
  - Small footprint