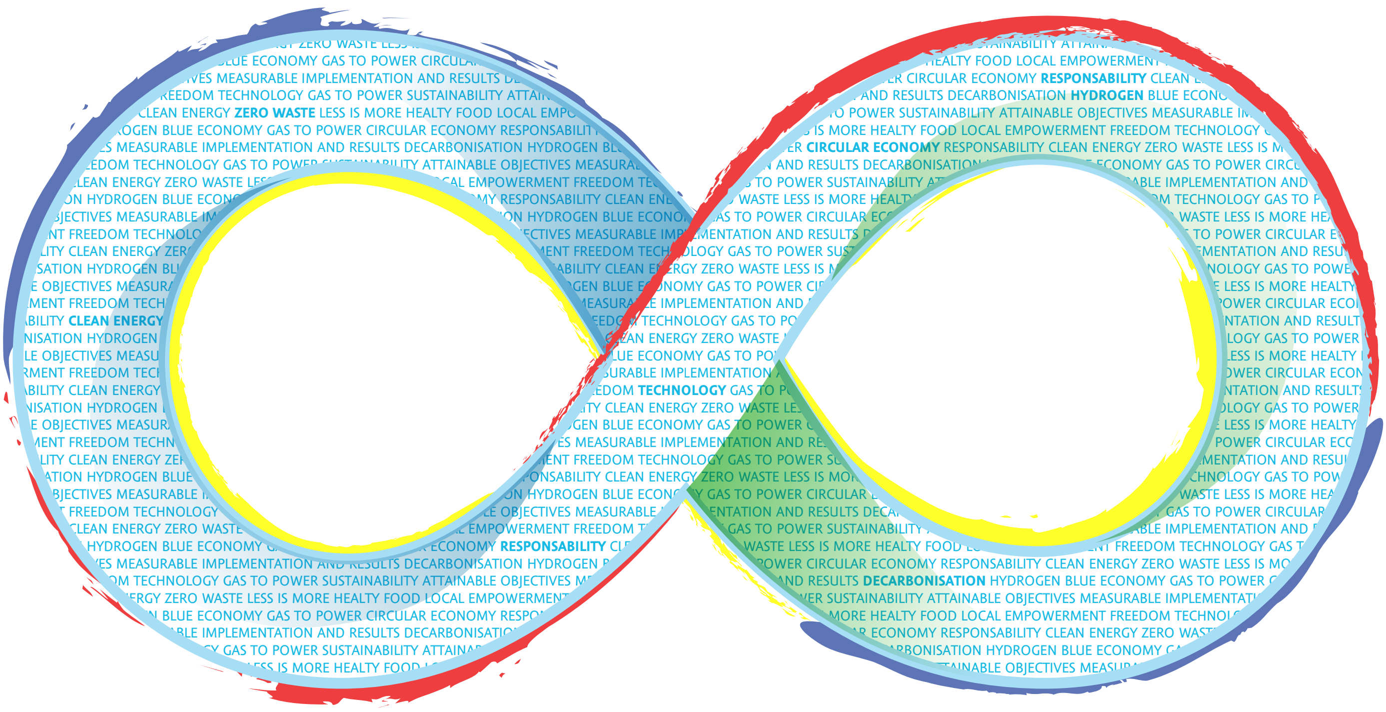
INTEGRATED POWER COMPLEX

MEHEDINTI COUNTY

HALANGA

BUILDING A SUSTAINABLE ENERGY SYSTEM THAT WORKS



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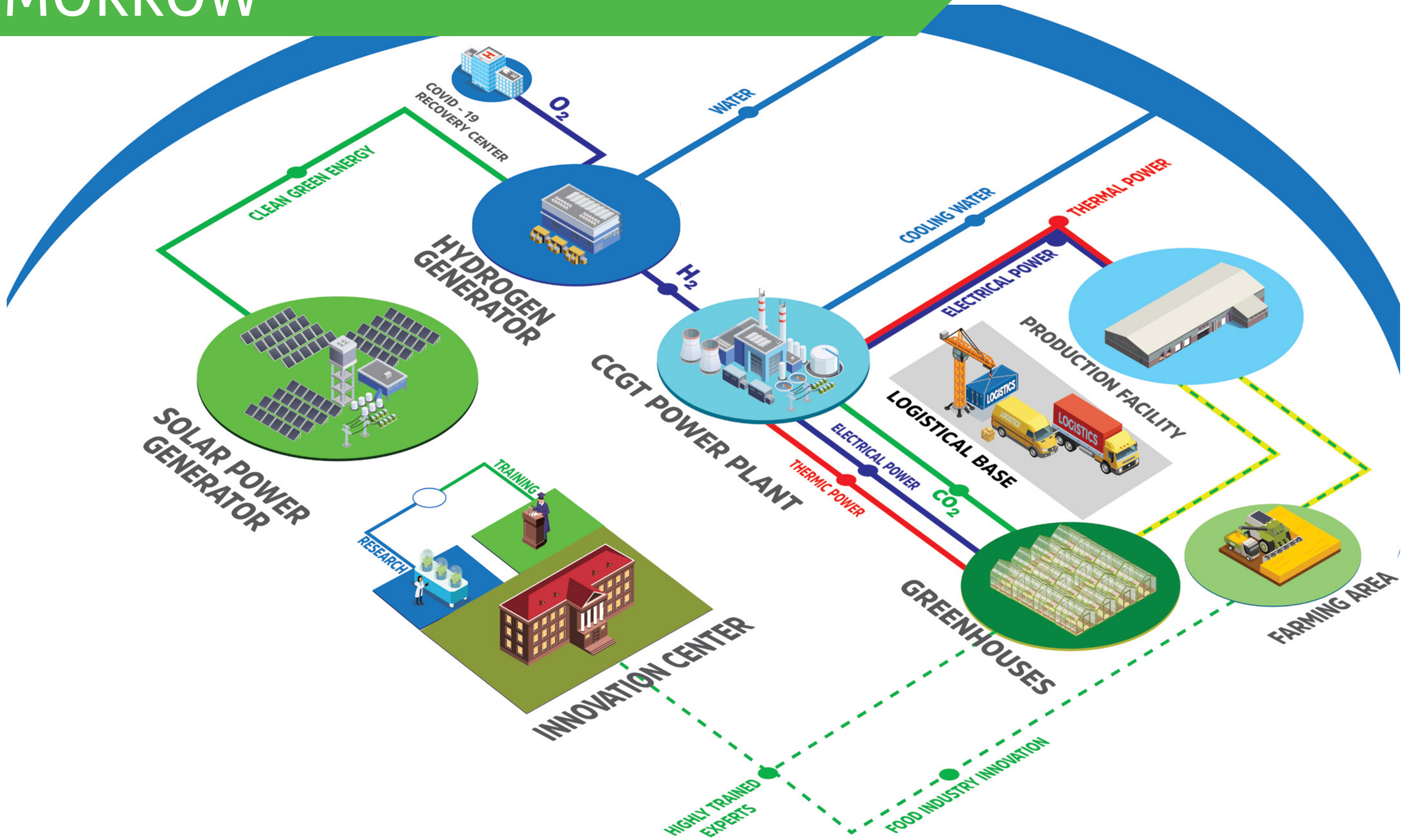
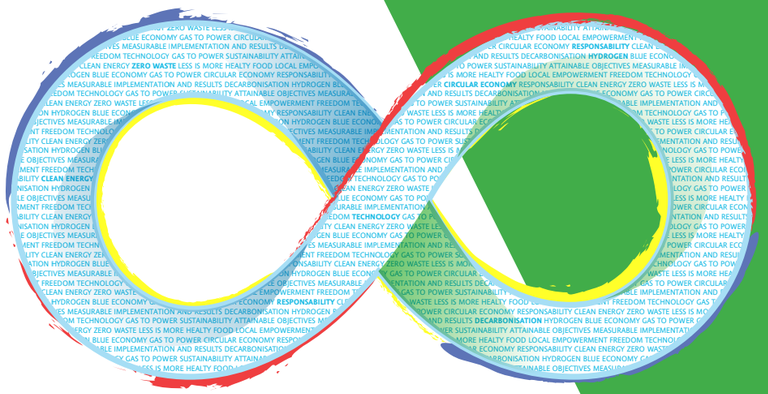
AN INTEGRATED VISION FOR ROMANIA'S GREEN POWER CITIES OF TOMORROW

HALANGA
INTEGRATED POWER COMPLEX



LEADING BY DOING



AN INTEGRATED VISION FOR ROMANIA'S GREEN POWER CITIES OF TOMORROW

Setting the Stage for Deep Decarbonization through Horizontal and Vertical Integration of Multiple Industries

In the coming months, EU MS will be welcoming several legislative initiatives launched by the COM to deliver the ambition targets enshrined in the European Green Deal. The creation of a regulatory framework that is favorable for renewable and low carbon gases will offer the solid premises for a better functioning of the current gas system, provided the changes benefit natural gas as transition fuel towards renewable and low carbon gases by 2030 and beyond. As active players in the energy market, Romanian authorities remain committed to achieve the EU Energy and Climate Targets, and stand ready to continue the path of deeper reforms to reach carbon neutrality by 2050.

This project is a contribution in this regard. It is meant to support the transition towards a sustainable and inclusive economic model, enabled by a broader diffusion and uptake of state-of-the-art technologies, that can make Europe a transformational leader.

Natural gas represents around 95% of today's gaseous fuels consumed in the EU. Next to being an energy carrier, gaseous fuels are one of the sources of flexibility for an energy system increasingly based on variable renewable energy sources generation. Gas ensures stable generation when there is no wind and no sunshine.

As such, we consider gas as part of the solution going forward, not part of the problem, as transition fuel towards green energy in view of reaching the targets set up for 2030 and beyond.

To this end, the RO authorities have committed to take measures to develop and to upgrade the existing infrastructure of natural gas networks, with a positive impact on the capacity to take over the RES energy and on the interconnectedness level.

The gas network becomes part of an ecosystem of deep decarbonization through horizontal and vertical integration of multiple industries (energy, agriculture, mobility, health, research & innovation) that contribute, each and one of them, to a faster and reliable transition towards the green economy.

The use of natural gas in combination with renewables, hydrogen technologies and the use of carbon dioxide to feed into the greenhouse **allows the new plant to reach the 250g CO2/KWh target limit and to go beyond it, towards carbon neutrality.**

Romania has a long tradition as a sustainable and resilient society, being one of the oldest sustainable rural civilizations in Europe, rich in natural resources and human knowledge on how to live in harmony with nature. For Romania, sustainable development is not one of several possible options, but the only rational prospect for the relaunch of the economy and the advancement as a nation.

We acknowledge and have started to work towards reaching the potential of a leap in an adequate ecological-economical interface with our natural capital represented by energy consumption. Once this potential is used with creativity, it is going to drive an unprecedented economic growth and environmental anthropic impact reduction, unleashed by a sustainable technology that would enable us to contribute positively to the regional energy market and bring good practice for a regional green partnership.

The project follows closely the Country Specific Recommendations 2019 and 2020, and respect the provisions included in the European Semester/Country Report 2020. Moreover, the project is in line with the RO objectives to increase the share of energy from renewable energy sources, including hydrogen, correlated with the decommissioning of coal capacities, to invest in durable energy infrastructures, and

to reduce massively the carbon emissions with state-of-the-art technology available on the market.

The project pursues directly two of the flagships described by the EU COM: power-up through renewables, modernised networks and enhanced interconnectivity, and reskill and upskill, enhancing innovation and growth potential, fostering economic and social resilience and ensuring quality employment and social inclusion.

Our commitment and contribution towards reaching seven SDGs is unwavering. Through our project, we target the following SDGs:

- no poverty
- good health and wellbeing
- affordable and clean energy
- decent work and economic growth
- industry, innovation and infrastructure
- reduced inequalities
- sustainable cities and communities

THE PROJECT

Our flagship project offers an integrated industrial cluster, producing and consuming renewable and low-carbon fuels.

We need to kick start **a Romanian hydrogen value chain, based on domestically produced blue hydrogen, on a large scale, and green hydrogen from renewables**, on a scale permitted by costs and the current level of technological achievements. For the reasons explained in the sub-chapter related to the energy security dimension, we need to do that now.

The HALANGA gas-to-power and power-to-X project brings a sound contribution to the stability of the RO NPS and the region, with highly efficient technical solutions, and with state-of -the-art level of RES and hydrogen ready technology available on the market.

The project we put forward offers horizontal and vertical integration of multiple industries – energy, agriculture, health, urban mobility – based on a strong community engagement, including land value capture for the benefit of the community and long-term stewardship of assets, with a preliminary thorough decontamination of the land sites (ash and slag).

We share the view that it is high time to choose wisely for a healthier future and a healthier environment. In an effort to embrace a diverse constituency, we are confident to work within a broad framework of making cities smarter, healthier, grow greener, climate resilient, connected, inclusive and safer.

Our initiative is intended to minimize emissions, respect the taxonomy thresholds and create the necessary infrastructure for future developments of RES capabilities, in line with technological developments available by 2030 that will ease the transition to green.

The earlier we succeed in developing a hydrogen value chain, the less CO2 will be emitted into the atmosphere.

Right now, the **domestic production of blue hydrogen** turns out to be by far the best option for Romania. It is the cheapest option to reduce CO2 emissions that are now the result of the combustion of gas, it is practically possible to produce large quantities in the short term and, given the necessity to balance the national grid, it will not present us with extra vulnerability on the energy front.

In the same vein, the objective is to contribute to the creation of a strong local jobs offer, a well-connected and biodiversity-rich green space and an integrated R&D dimension for all of them, materialized in the form of a Research & Innovation Center with training facilities included. Citizens' ownership of the solutions is very important for us, as we want to host a living platform for innovative technological results. Moreover, we envisage a pioneering approach to climate management: with the active involvement of local authorities, the Center is committed to bring forward systemic change and develop innovative participative democracy approaches to city governance.

Agriculture becomes part of the project ecosystem, as the energy produced will feed an extended area of hydroponic greenhouses developed by our joint venture, covering 120 ha initially, a cultivated surface that allows the new plant to reach the **250g CO2/KWh target limit,** with the objective of expansion towards 530 ha, a cultivated surface that allows the project to reach neutrality/net **ZERO CO2 emissions.**

The use of CO2 in these greenhouses will contribute furthermore, together with the hydrogen blending into the gas up to 30% (with the perspective to increase the percentage, pending technological progress) and the PVs renewable energy to lowering even more the threshold of carbon emissions, in an integrated manner.

Moreover, the oxygen produced in the process shall be used to feed into the health industry devices, such as concentrators, or tanks to be delivered to hospitals, in times of dire need for these outputs.
The consortium envisages also the creation of **a Post-COVID Recovery Center where oxygen is used to provide care for people who have persistent symptoms or related illnesses.**

The contribution of the project to the green component of the NRRP is 100% for the 024a and 033 of the interventions included in Annex II of the EU Regulation 2021/241, and 40% for the digital component of the 011a and 033 included in Annex III to the same Regulation.

Respect for the Do No Significant Harm Principle

Investments in E-RES comply with the Do No Significant Harm (DNSH) principle. Investments in natural gas-based capacities also comply with the DNSH principle, according to the specific conditions for compliance with the climate change mitigation objective of the DNSH under the RRF for measures related to power and/or heat generation, as well as related transmission and distribution infrastructure, using natural gas (Annex III of the Commission Notice 2021/C 58/01).

The project fulfills both the GHG emissions threshold lower than 250gCO2e/kWh over the economic life-time of the facility and the closure of a significantly more carbon-intensive power plant and/or heat generation facility (coal) with at least the same capacity, leading to a significant decrease in GHC emissions.

The greening of the ash and slag deposit, as well as the construction of a photo-voltaic park, respect the principle laid down in EU Regulation 852/2020.

The project in all its components contributes to climate change mitigation, the sustainable use of (waste) water, the circular economy, pollution prevention and control to air, water and land and the protection and restoration of biodiversity and ecosystems.

THE TEAM

To implement this vision, we have gathered the best team, both from public and private realms.

As such, our consortium, with GSP Power and SNGN Romgaz S.A. in the leadership position, as integrators, brings forward all the relevant partners capable to materialize this integrated concept and to respect the 31st of August 2026 deadline:

GSP POWER, a private owned Romanian company, part of a holding with a strong business record and a know-how of more than 40 years in the Black Sea region;

S.N.G.N. ROMGAZ S.A., the national gas company and the largest holder of reserves, gas producer and supplier in Romania;

together with:

SIEMENS ENERGY, a trusted partner in the process of energy transition, with a portfolio of a global leader and an organizational culture based on sustainability, innovation and entrepreneurial spirit;

HALANGA
INTEGRATED POWER COMPLEX

MEHEDINTI MUNICIPALITY/COUNTY COUNCIL;

UNIVERSITY OF AGRONOMIC SCIENCES AND VETERINARY SCIENCES OF BUCHAREST, the oldest and largest institution of higher agronomic education in Romania, founded in 1852, blending in harmony tradition and modernity;

NATIONAL RESEARCH AND DEVELOPMENT INSTITUTE FOR CRYOGENIC AND ISOTOPIC TECHNOLOGIES OF RÂMNICU VÂLCEA, a significant contributor in the Romanian research field by means of important achievements for more than 50 years;

HAVECON, a professional team of experts on greenhouse projects, based in the Netherlands.

The way the consortium has decided to respond to the current crisis is to bring the energy sufficiency and climate topics back on top of the political and economic agenda with **a bold vision that encompasses several industries in an integrated ecosystem.**

The Energy Security Dimension – Energy Intensive Coal Fired Units Phasing-Out Must Be Replaced with Dispatchable Units

Traditional narratives lead us to see old mining city as shrinking cities, almost like "ghost towns". A shrinking city is a place that has experienced consistent population loss due to structural changes (for example job loss or resource depletion). As a result, its infrastructure has become rather useless and too expensive to maintain. Previous social and financial structures don't function anymore. We are not denying the considerable challenges the closing of a coal-mine can bring, but not all mining cities are destined to become ghost towns. The way they react and adapt to the new situation is what makes the difference.

This is a recurrent story in Eastern and Central European EU MS that are coal-reliant countries

and see a compelling case for using gas as a way to improve air quality and cut emissions. **Romania plans to replace coal-fired power stations with gas hydrogen ready and renewables (PVs) in a transition step before moving towards deeper decarbonization by 2030.**

In relation to the energy security dimension and taking into account the national particularities, RO has committed through its integrated National Energy and Climate Plan (NECP) to stricter objectives for energy dependency in 2030 (68%) and for the diversification of sources. The programmatic document includes Romania's commitment to achieve the European targets for 2030, in the field of greenhouse gas emissions reduction and to develop the use of renewable energy resources and use 'energy efficiency first' as a principle for all the economic policies. According to the Regulation (EU) 2018/1999 of the European Parliament and of the Council of 11 December 2018 on the Governance of the Energy Union and Climate Action, Romania must submit to the European Commission the updated version of the National Energy and Climate Plan by 30 of June 2023.

A basic principle in the energy field states that in order to maintain security of supply, system adequacy and to cover properly the demand, it is necessary for the energy system to maintain a certain amount of available and dispatchable power reserve, significantly higher than the power consumed at the peak of consumption, because, for various reasons, the groups are periodically withdrawn from operation for repair and maintenance, or affected by unplanned unavailability or partial, temporary or definitive reductions in availability. In the same vein, an operational reserve must be kept at the disposition of the TSO. Moreover, with the expected growth in the renewables sector, naturally characterized by unpredictability, the rapid tertiary reserve has to be supplemented in order to compensate the inevitable imprecision of the production prognosis of these units.

TYNDP 2020-2030 developed following ENTSO-E regulations describes a major generation deficit in Romania (up to 30% of the pick load) and a regional security of supply dilemma if coal fired units will not be replaced with maximum priority.

According to the Romanian TSO's "Ten-Year Network Development Plan for the period 2020-2030", elaborated in accordance with art. 30 of the CE Regulation 943/2019, one of the scenarios considered a coal phase-out in a capacity of 3,579 MW. The results of the simulation show a pick load deficit of 3,018 MW in 2024 and 3,162 GW in 2029, exceeding the interconnection capacity of Romania at that time.

From the energy import standpoint, this figure exceeds **more than double the country's network capacity of import and runs supplementary risks in relation to a potential lack of regional resources,** taking into account the net annual balance of the countries in the area that are net importers (except for Bulgaria and the Czech Republic).

As a consequence, decommissioning the coal power plants, combined with the lack of resources to build new capacities in line with the new EU targets has a severely negative impact on the system adequacy and energy security both at national and regional level. This damaging effect is multiplied in case of severe meteorological conditions, characterized by a growth of the internal net consumption and the lack of available primary resources. As a consequence, the lack of capacity at the peak of consumption exceeds the import capacity of the TSO and the national power grid does not have the necessary resources to cover consumption, in conditions of maximum utilization of the trans-border import capacity.

With a view to the transition towards a decarbonized economy, we envisage a solution in which **gas and hydrogen become a key lever that can facilitate the large-scale integration of the renewables, enabling grid balancing, ancillary services and seasonal storage, as well as decarbonization of natural gas through innovative technologies.**

The project is in line with the objective of the RO authorities to accelerate the alternative fuels contribution, such as hydrogen, by encouraging research and carrying out pilot project for sustainable development of the hydrogen production from renewable sources, through the provisions of the National Strategy for H2 to be presented in the near future.

SHAPING THE WORKFORCE OF THE FUTURE. THE SOCIAL AND ECONOMIC IMPACT

Future generations will be living in a world that is very different from that to which we are accustomed. It is essential that we prepare ourselves and our children for that reality. We are committed to nurturing a workforce that creates a sustainable knowledge-based economy and supports the nation's socio-economic development plans.

Together we bring energy to life. Our work continues to enable our country and our people to realize their potential, while acting as a catalyst for the growth and diversification of the Romanian economy. We want to inspire energy for creativity, innovation and ingenuity for generations to come. We are ready to do that where it is most needed. Mehedinti is one of the most socially vulnerable counties in Romania.

The integrated project will enable and unleash this tremendous potential of the chain value in terms of employment in multiple industries (energy, agriculture, mobility), on one hand, and research and development, on the other hand.

Our transformation requires leading talents who think strategically and execute unconventionally, ensuring that Romania remains a thriving economic force in the market. To this end, we put forward project that is the result of a solid cooperation between the national and local authorities, strong national and foreign private sector, and a network of research institutes and prestigious academies in Romania.

CONCLUSIVE REMARKS

We submit our project to your distinguished evaluation having in mind that our key pitch is to accept clear-cut support mechanisms through NPRR for integrated projects that combine gas-to-power, green hydrogen and renewable sources, integrating multiple industries and replacing phasing-out carbon intensive coal fired units with dispatchable sources that will allow:

Security of supply after decommissioning of the coal fired power plants, contributing to the Power Systems adequacy in line with ENTSO-E regulations;
Supply of regional ancillary services, thus increasing the integration capacity for new renewable energy sources;
Decarbonization of the generation sector;
Increase the use of hydrogen and further develop hydrogen-based technologies and use-cases;
Direct applicability into other industries (i.e. district heating, agriculture, hydroponic greenhouses, urban mobility, healthcare).

Solidarity and targeted solutions are needed more than ever, as the principle of just transition towards green energy is essential. Moreover, this pilot project will create the sound basis for continued decarbonization of the economy beyond 2030, once the hydrogen technology evolves.

As stated before, many aspects of the transition will require significant coordination, since markets and incentives alone may not be sufficient to deliver effective outcomes. In the medium to long run, EU MS need a well-articulated legislative framework at the EU level that rewards carbon abatement in a market-based, technology neutral way. Ideally this framework could eventually work across gas, electricity and other energy carriers, such as liquid fuels, so that a consistent framework is applied across multiple fuels.

HALANGA INTEGRATED POWER COMPLEX

1 PV PLANT

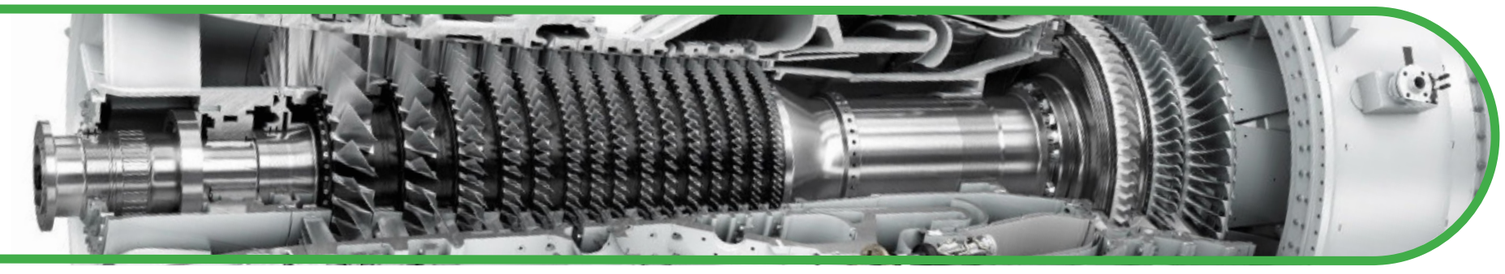
INSTALLED POWER	100 Mwe
ANNUAL PRODUCTION	145,592,828 kWh/year
CO2 EMISSIONS AVOIDED	87,344,760 kg/year

2 HYDROGEN PLANT

INSTALLED POWER	40 MW
EFFICIENCY	75.50%
HYDROGEN PRODUCTION	778,8 Kg H2/h
HYDROGEN CALORIFIC VALUE	120,21 MJ/kg

3 CCGT PLANT

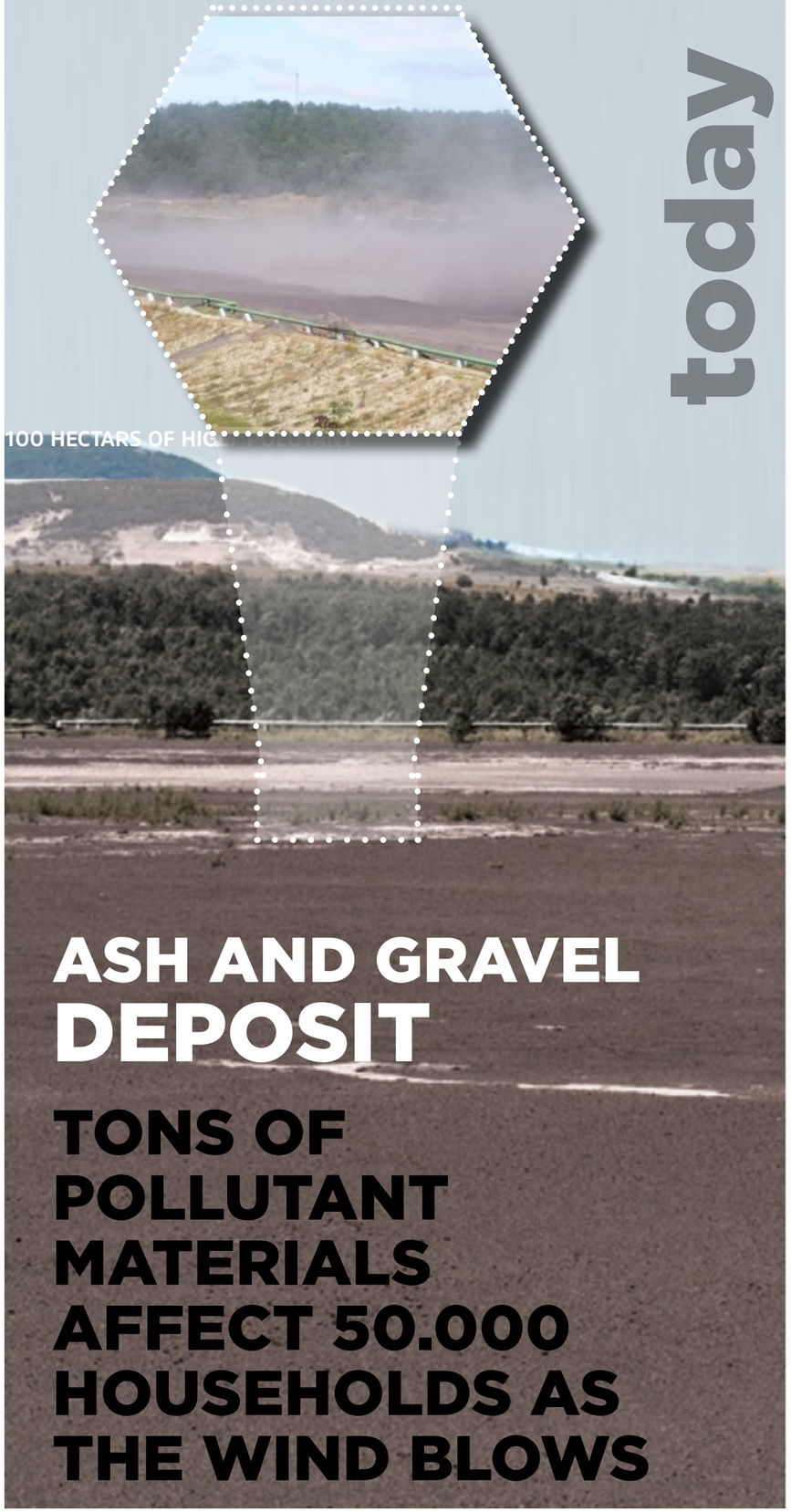
INSTALLED POWER	159 MW
NET EFFICIENCY	56.88%
YEARLY PRODUCTION	1,240,000 MWh/year
GAS CONSUMPTION	0.186 Nm^3/1kWhe
HOURLY GAS CONSUMPTION	29267 Nm^3/h



4 GREEN HOUSES

VALUED LAND	530 ha
CO_2 CONSUMPTION/530 HA/Y	369,520,000 Kg CO_2
YEARLY PRODUCTION	371,000 t

today



ASH AND GRAVEL DEPOSIT

TONS OF POLLUTANT MATERIALS AFFECT 50.000 HOUSEHOLDS AS THE WIND BLOWS

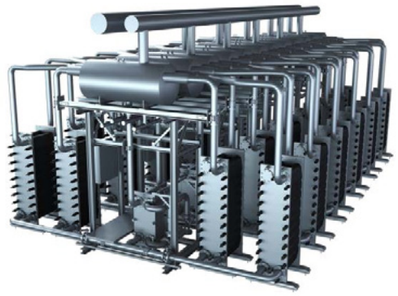
Tomorrow

HALANGA
INTEGRATED POWER COMPLEX

1 PHOTO VOLTAIC POWER PLANT

140 HECTARES OF LAND CLEANED
100 MW OF GREEN POWER GENERATED
87,344,760 KG CO_2 EMISSION AVOIDED

2 HYDROGEN PLANT



THE CORE

Hydrogen production
100 - 2,000kg/h
Minimal load 20 % single module
Plant availability ~ 95 %

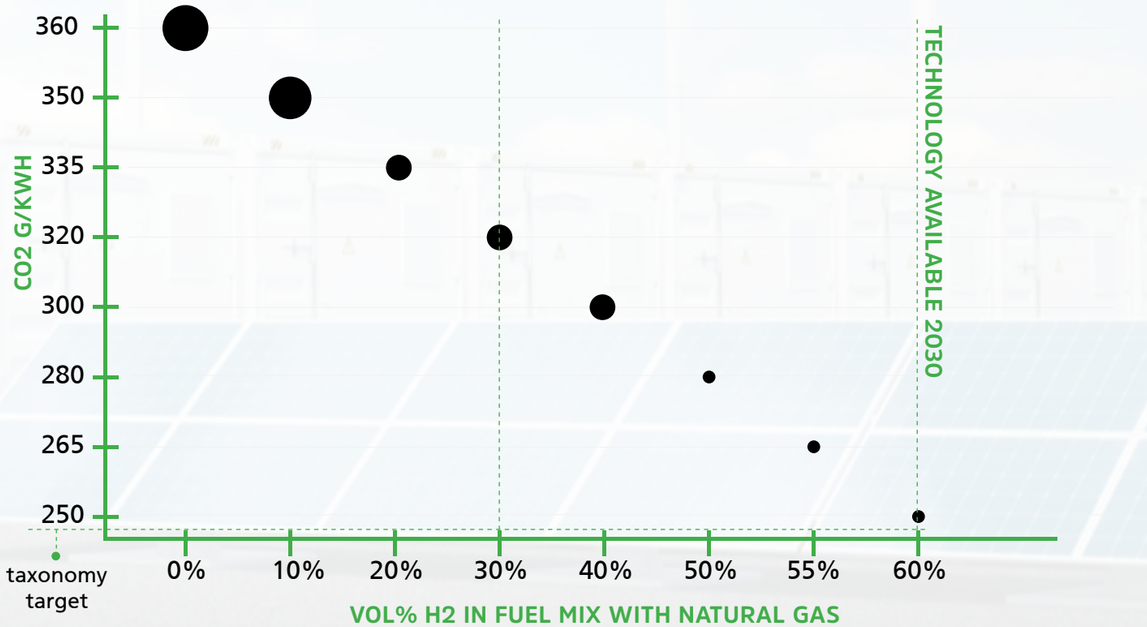
MODULAR
HIGHLY SCALABLE MODEL

Scale up to the necessary demand

CAPEX
decline

Projected CAPEX decline by 2030 – to about USD 200-250/kW at the system-level

H_2 MIX IN NG VS. CO_2 EMISSIONS



3 CCGT PLANT

Thermodynamic data	Unit	Value
Total electric power output, net	MW	156
Plant efficiency, net	%	**55,43**
Gas turbine load	%	100
Number of gas turbines in operation		2

Total electric power output, gross: 159 MW
Total electric power output, net: 155MW

- 2 X 57 MW, SGT-800 – gas turbines
- 2 X HRSG Heat recovery steam generator
- 2 X 24 MW –steam turbines

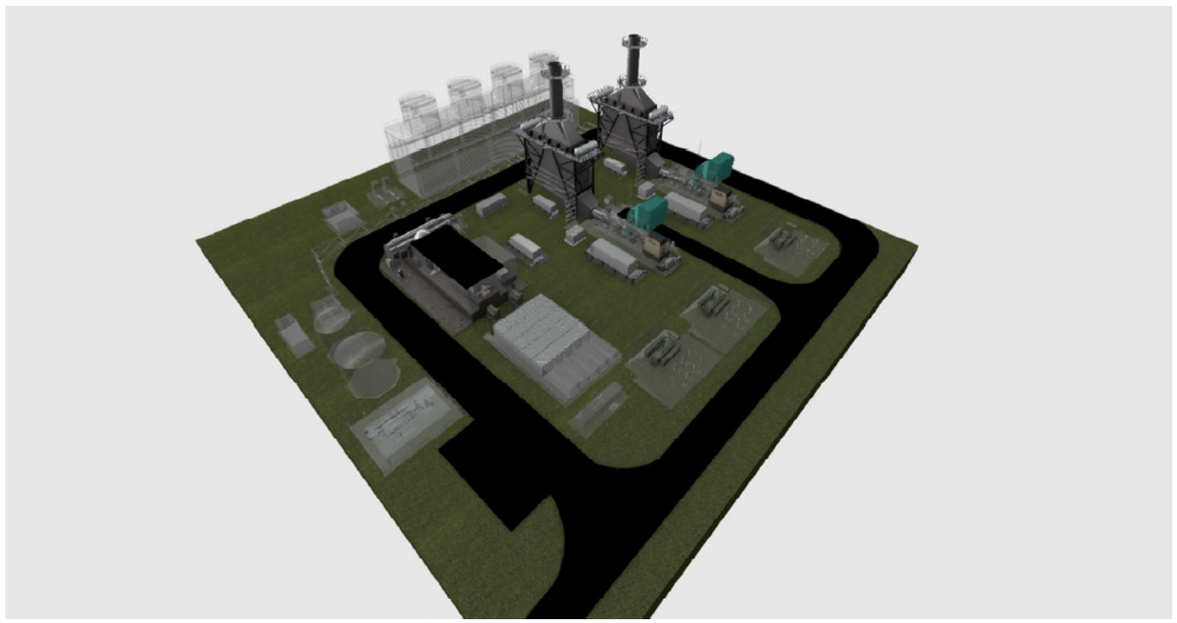
Minimum gross efficiency: 56.88%
Minimum net efficiency: 55.43%

Combined cycled gas turbine (CCGT) efficiency:

- Global gross efficiency 56,88%;
- Net gross efficiency 55,43%;
- NOx 50mg/Nm3 @ 15%O2 emissions, according to current regulations in force;
- Specific fuel consumption 6495kJ/kWh;
- Efficient commercial use in baseload & ancillary services.

Operation in Brayton cycle:

- Global gross efficiency: 40,1%;
- NOx 50mg/Nm3 @ 15%O2 emissions, according to current regulations in force;
- Efficient commercial use in baseload;



4 GREEN HOUSES

Our greenhouse field will amass 530 hectares of unused land, and turn it into a CO2 powered food production facility, filling an indispensable cog in the circular economy mechanism.

The greenhouse complex will:

- reduce the CO2 emissions of the power complex by **369,520,000 Kg CO_2/year.**
- bring 5000+ jobs to the local economy.
- provide a steady, year round production of **371 thousand tons of fresh food produce.**
- provide a steady supply for the nearby **food processing facility.**
- keep the R&D departments busy with **constant study for innovation and improvement.**

KEEPING CO_2 EMISSIONS WITHIN TARGET PARAMETERS

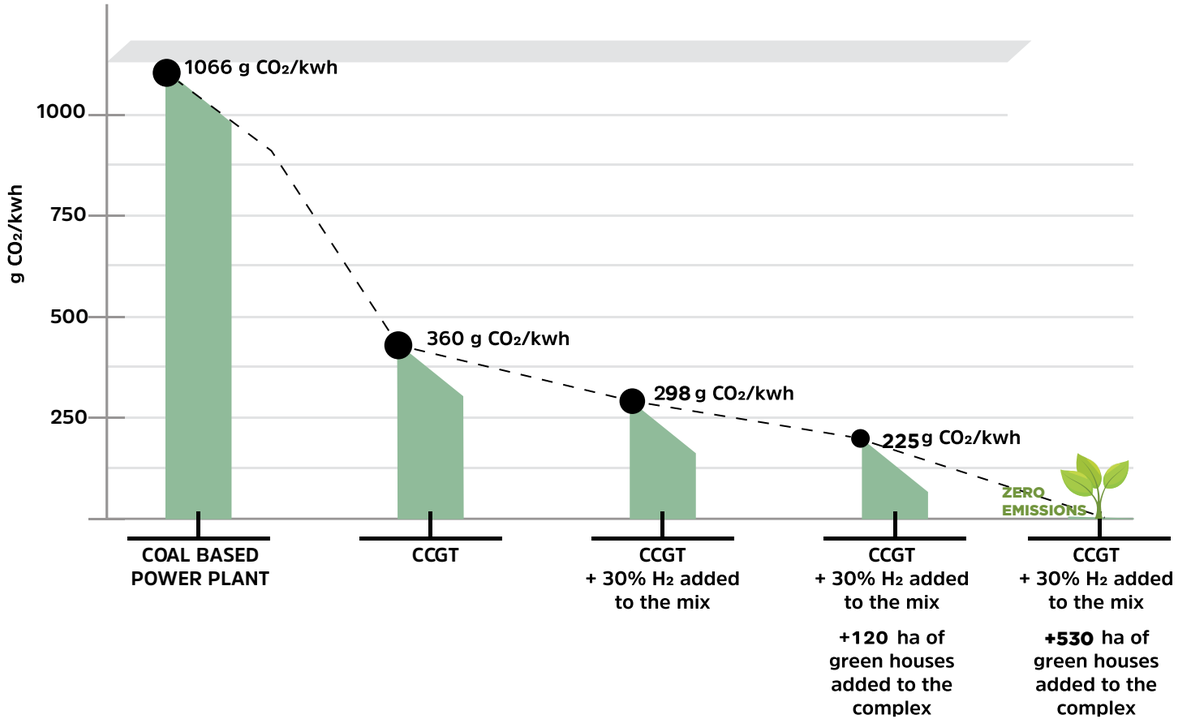
The central focus point of our integrated power complex is to provide a circular model that not only helps put waste to good use, but also keeps CO_2 emissions to a minimum, by employing the latest H_2 technology but also by directing residual heat and CO_2 towards good use, in a complex network of 530 hectares of greenhouses.

HOW IT WORKS

CCGT TOTAL YEARLY POWER PRODUCTION: 1.240.000 MW

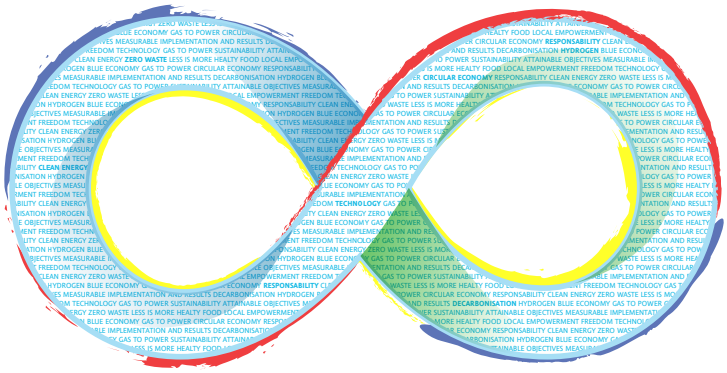
	Tons CO_2/Year	Grams CO_2/Kwh
TOTAL YEARLY CO_2 EMISSIONS:	446.400	360
30% H_2 ADDED TO THE MIX:	- 76.880	- 62
530 HA OF GREENHOUSES:	- 369.520	-298
NEW TOTAL	0	0

JUST HOW MUCH CO_2 DO WE REDUCE



Calculations and projections take into account a base functioning system, providing highly efficient power to the system.

THE ROAD TO ZERO EMISSIONS



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