GFA ENERGY SECTOR: STRATEGIC ALIGNMENT IN TIMES OF CRISIS

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IN BRIEF

COVID-19's sudden arrival has impacted societies all over the world and continues to threaten the stability of health care systems as well as the economic and financial sectors that include education, public services and infrastructure. The pandemic has demonstrated how vulnerable human society is to external shocks. All countries and economies are affected; however the developing countries have far fewer resources and less structure in place to effectively manage the collective impact. COVID-19 is a case that demands a need to ensure resilience of the health care systems along with prioritising all other societal subsystems of the political and economic agendas of governments. Alternative external shocks such as new pandemics along with the inevitable consequences of climate change including large-scale droughts, floods, hurricanes and so forth are likely to manifest.

The energy sector is a crucial component of the response to COVID-19, as it provides the essential infrastructure required for the stable functionality of all health, education, governance, household and industrial systems. A reliable energy supply system; and especially a stable supply of electricity, is a key component hereto. Developing countries face additional challenges within the context of a crisis, as there is often inadequate energy-supply due to limits in the generating capacities, unreliable distribution systems and transport, along with the compounding effect of extremely inefficient energy usage patterns from the demand side.

This paper outlines the perspectives held by the GFA energy team about how the energy sector can contribute to establish resilient societies in future by providing sustainable, flexible and resilient energy solutions that are both technically robust and economically feasible. We reference current dialogue within the international development community, including, amongst others, the development specialists, energy experts, development banks and policy makers.

We briefly describe the challenges arising from COVID-19 and potentials for certain further external shocks and for all these we propose solutions. Finally, we emphasise our experience in those previously mentioned solutions that we have already successfully implemented in co-operation with our clients, beneficiaries and partners.

GFA Consulting Group and its subsidiaries; HEAT International, GFA ENTEC, GFA South East Europe and GFA Climate and Infrastructure have been delivering solutions and implementing projects across 130 countries to date. We offer technical assistance in order to strengthen resilience in various sectors that include rural development, health, governance, private sector development and energy. The energy solutions we implement reflect our technological expertise as well as the significant expression of a cross-sector approach by which the energy system successfully responds to actual demands and needs from other sectors.

ENERGY IN THE HEALTH SECTOR

Critical health infrastructure, including hospitals and health centres, need to be provided with a reliable and uninterrupted energy supply in order to operate life-saving equipment along with adequate lighting, cooling and heating of premises. The electricity is similarly needed for many other applications including the reliable cooling of vaccines and medicines throughout the transport chain and for both the mobile and fixed testing facilities. Within Sub-Sahara Africa; as little as a ¼ of the health care centres own access to a reliable supply of electricity. During a health crisis like COVID-19, the negative impact of an electricity blackout compounds problems for patients due to neither access to functioning equipment nor lighting. A much higher electricity demand for health centres also places additional strains upon already stressed budgeting demands.

Hospital in Amman, Jordan

SOLUTIONS include a rapid upscale in order to establish reliable energy grids that will ensure basic electricity access; the installation of autonomous decentralised RE systems for health facilities; installing efficient lighting, cooling and heating systems. Further, the introduction of energy service models shall provide effective energy management for health facilities and the operational maintenance of health applications. Micro and Pico PV systems can be utilised to feed mobile vaccine-cooling chains.

GFA EXPERIENCE: We presently retrofit hospitals and health centres with efficient lighting and air conditioning in Jordan and advise hospitals in Western Africa on the installation of PV systems. Mini-grid programmes are developed in Togo and Benin – which can be further extended to serve health facilities in rural areas. Energy management schemes for hospitals are developed. We promote technology transfer in many countries; and in particular on efficient cooling technologies that are then applied to the health sector.

ENERGY IN EDUCATION

Access to reliable and sustainable energy supply for educational facilities has a significant impact on a community's economic, political and social sectors; especially with regard to assisting with equal opportunities for girls, women and vulnerable population groups. The COVID-19 crisis led to the complete closure of schools and universities in many countries. The availability of digital infrastructure enabling electricity along with remote access to information therefore became more critical. Being able to attend online lessons and lectures or to receive radio lessons and information transmitted via television will allowall students to continue their education. As the current crisis continues; perhaps for months or even years, the access to electricity for effective educational communication has become a priority. Even after the crisis, educational facilities will continue with online education programs. Therefore, schools and universities will need an adequate and stable access to electricity in order to run their classes.

SOLUTIONS: Schools, regardless whether they are located in the cities or villages, need sufficient and stable access to sustainable energy. Electricity grids and autonomous PV systems will have to provide sufficient output capacity in order to meet the electricity needs. The energy management of all schools will become more important. Energy education that introduces the conceptual behavioural changes at an early age will help to raise the necessary awareness for energy efficiency over the long run. Private households will need more powerful connectivity and access to the supply grid or ownership of their own energy production systems in order to meet the needs for online education.

GFA EXPERIENCE: We provide services in order to improve the energy efficiency of schools and sustainable electricity supply through autonomous rooftop PV. GFA delivers training and respective learning material that enables energy education of pupils, teachers and a broad range of households in order to improve the collective energy savings. Local mini-grids, solar home systems and energy storage enable reliable electricity supply and therefore the pivotal usage of digital educational technologies.

ENERGY IN RURAL COMMUNITIES

Worldwide, more than 800 million people live without access to electricity or with inadequate energy supply. This includes many rural and isolated communities in Sub-Saharan Africa, Asia and other regions, who are therefore often the most vulnerable to external shocks. In areas without safe and stable access to basic energy services such as lighting, cooling, heating, energy inputs for revenue generation and access to information; the individual households resort to traditional solutions such as firewood, petroleum lamps, manual work and mouth to mouth information sharing. Entire communities can be placed at risk during external shocks to their established energy supply and

demand chains as a result of events such as floods and hurricanes or when a sudden need for quick and reliable information such as was the case with COVID-19.

SOLUTIONS including solar-home-systems, solar water pumps, solar refrigeration units, mini-grids and electric grid extensions, allow access to basic and complete energy. New digital innovations including swarm electrification, pay-to-go, machine-to-machine communication and automated control systems can allow for a more efficient energy usage within remote areas without any access to technological expertise or a functional banking system.

Hospital in Zimbabwe

Concepts like swarm electrification, (bottom-up micro-grids), create resilient and flexible energy supply; even in small remote villages, where domestic or private solar systems can redirect the transfer of power from one household to another in exchange for mobile credit.

GFA EXPERIENCE shows that reliable access to energy, especially electric energy, creates favourable conditions for rural development. We presently support the installation of PV systems for households and production in rural areas of Bangladesh, Indonesia, Morocco and within the Caribbean.

ENERGY IN INDUSTRIES

Many large and small companies, as well as commercial businesses such as bakeries and large supermarkets with significant cooling needs, are often heavily reliant on stable energy supply as an input for their production processes. In addition to an intrinsic high vulnerability to energy prices, these industries and business frequently rely on old and inefficient technologies that cause unnecessarily high operational energy costs. During a pandemic such as that caused by COVID-19, the supply chains may be interrupted, leading to a significant loss in revenues; while at the same time, some locations may have to be shut down if their employees are infected or if they are unable to get to work due to lockdown restrictions. Thus, high fixed energy costs during an absence of sufficient revenue flow may dangerously constrain liquidity of companies as an immediate impact of the pandemic. At the same time, their economic survival is also essential to maintain stable employment for the population and revenues from taxes and social contributions to the governments.

SOLUTIONS: The implementation of energy efficient strategies with energy management systems and an energy optimisation for the overall production processes in order to reduce the sensitivity of the production process to shocks in energy prices. Partial energetic autarchy can be implemented by building up self-generated energy supply, (ideally based on renewable energy sources), as well as energy storage capacity. Furthermore, the implementation of E-billing and mobile payment systems enables remote transactions without any physical interaction and is therefore a reliable source of revenue during times of social/physical distancing, while at the same time ensuring the financial stability of industries and businesses.

GFA EXPERIENCE: We promote energy efficiency solutions for many industries through technology transfer from German industries to many threshold and developing countries. We support the energy efficiency ecosystem to provide services to companies such as energy audits, capacity building, fund raising for investments into energy efficient equipment and processes, (in Ghana, Nigeria, Tanzania, Jordan, and Argentina).

With its own **Digital Innovation Unit**, GFA offers technical assistance in Energy Information Systems, digital stakeholder engagement and online platforms, (One-Stop-Shops); providing convenient access to all pertinent information for potential investors within the renewable energy and energy efficiency sector.

WATER-ENERGY-FOOD NEXUS

Stable and resilient societies, across urban metro poles to rural communities, all rely heavily upon an intact water infrastructure. However, energy is needed in order to make water resources available, i.e. for pumping and groundwater extraction, transportation and distribution, wastewater management and treatment. On the other hand, most energy sources require water for their transformation and utilisation, for example for cooling of power plants; as a transport dispersal medium of heat; for purifying exhaust flue gases; for maintenance cleaning or for the cultivation of crops used for bio-fuel. Furthermore, both water and energy are necessary ingredients for establishing a resilient food sector that enables the ever increasing global population.

The current pandemic demonstrates the vulnerability and high relevance of the water-energy-food interface: stricter hygiene requirements on one side

and increased local demand in agricultural production, (due to interrupted global supply chains), on the other have combined to create an increased water demand, building more pressure on already strained water supply systems caused by the adverse effects of climate change.
The increased water demand for pumping, treatment and distribution of water, (as well as wastewater treatment), requires a suitable response in terms of energy efficiency and low-cost self-generated energy supply, (especially in the more remote areas).

Fishfarm in Vietnam

In the food sector, susceptibility of supply chains to disruption is becoming more apparent due to various factors, e.g. workers in lock down; interrupted transport routes; food as a means of political pressure. The possibilities for food processing and storage, (by means of cooling solutions), allow for enhanced food conservation, while once again increasing the energy demands of the food-water system.

SOLUTIONS for this challenge are aimed at strengthening the entire water-energy-food nexus by simultaneously increasing reliability and sustainability. This includes raising access-to and the capacities-of sustainable energy for use in the water and food sectors; such as through the interlinking of off-grid RE systems with water pumping/irrigation systems. Water resource management based on digital solutions, realises higher efficacies of technical facilities like water pumps, cleaning equipment etc. Food processing becomes more effective through using energy efficient equipment and using waste for electricity production etc.

GFA EXPERIENCE: We implement energy efficiency solutions in energy-intensive water processes, e.g. wastewater treatment plants. Furthermore, GFA provides clean energy solutions in rural communities, including micro-hydro projects, capacity building of farmers to create awareness and linkage between energy water and food. We support municipalities with the implementation of energy management systems in water and food related areas. We have successfully implemented several studies and projects on solar water pumping and irrigation, PV based drying and building up cooling/refrigeration solutions for supermarkets, warehouses and production facilities.

MUNICIPAL ENERGY MANAGEMENT AND ENERGY BUDGET

With external shocks like COVID-19, localised municipalities face a steep decline in income from the services they provide and a reduction in tax revenues while the costs of municipal energy demand remains either unchanged or increases. Public energy expenditure for buildings, street lighting, transport and public service provisions are the main challenges for local governments. Moreover, municipal infrastructure is outdated or too small for a growing population in many countries..

SOLUTIONS: Municipal energy management can provide benefits to municipalities facing a stressed budget. Energy efficiency improvements are cost-effective net investments and should be prioritised within municipal powering. Sound measures such as changing street lighting bulbs or retrofitting public buildings, are crucial for the reduction of energy consumption at the municipal level. Assessing municipal energy consumption is the first step to ensure energy resilience and consequently identifying the potential cost savings. The implementation of energy efficiency measures helps municipalities to improve the optimisation of their energy budget while ensuring energy savings. This fund is especially important revenue in period of crises. The net gains from successful implementation could be reinvested into new EE measures or reallocated to other public sectors.

Study tour from Serbia and Bosnia-Herzegowina at a Bavarian biogas plant

GFA EXPERIENCE: We provide consultancy services for municipalities to help develop Municipal Energy Management Systems, (MEMS), Municipal Energy Efficiency Action Plans, and (MEEAPs); within South Africa, Mexico, Bosnia Herzegovina, Albania, Serbia, and Morocco. GFA implements retrofits in the public buildings of Jordan, Ukraine, and Morocco. We promote EE measures and capacity building in the public sector, to support EE planning and monitoring and to assess energy data.

Water treatment plant in Vietnam

RESILIENT UTILITIES AND GRID STABILITY

Energy utilities play a crucial role in the generation and supply of energy in cities and communities. Besides utilities, grid operators such as Transmission System Operators, (TSOs), and Distribution System Operators, (DSOs), are responsible for the reliable operation of stable energy grids that form the backbone of the energy system.

In times of pandemics, both the utilities and the grid operators face significant challenges: abrupt drops in demand due to the shutdown of industrial plants or shifting energy consumption patterns, (e.g. from increased home office working), may pose the threat of a blackout. Additionally, these disruptions on the demand side can be dangerously amplified in the presence of grid instability due to enhanced dispatching of intermittent power sources. Even the routine operation and maintenance of the technical infrastructure can be endangered by the absence of employees due to illness or quarantine. On the financial side, energy suppliers may face lack of liquidity if their customers are unable to pay their bills, as well as an increased risk for energy theft.

SOLUTIONS: Advanced Metering Infrastructure, (e.g. smart meters), allows remote meter reading, remote monitoring and control as well as better load/demand response for increased energy efficiency, improved reliability of the distribution system and faster automated response to interruptions and incidents. Advanced metering infrastructure is the prerequisite for the optimisation of the meter-to-cash-process, which ensures a significant reduction of non-technical losses and the prevention of energy theft.

Optimised and digitalised asset management systems, (including predictive maintenance), for power generation and transport / distribution assets, can improve the reliability of maintenance processes to enable the ability to cope with the sudden lack of manpower; besides which, they can contribute to financial resilience of utilities and grid operators via the reduction to standby times of the assets and thereby increasing the overall efficiency and stability of the maintenance process. Digitalisation of the power grid enables the smart, interconnected and secure energy grids that integrate an increased proportion of renewable energy. In addition they react flexibly to drops in demand and compensate for load variations through the use of sector-coupling, storage and power-to-X technologies.

GFA EXPERIENCE: We work on the analysis of specific grid stability issues and propose appropriate measures to deal with all the issues identified. Our know-how on grid stability includes inertial response; primary and secondary frequency control; voltage support load levelling; cycling and ramping of thermal units and black-start capability, etc. (Jordan). Additionally, we provide consultancy services for reliable energy access through solar home systems, mini-grids, electric grid extension and energy storage (Southern Africa, Bangladesh, Caribbean).

In various projects, we promote smart metering and monitoring of electricity; district heating and cooling; water in buildings; net-metering as well as web-based platforms of RE monitoring. We work on demand-side management measures such as power factor correction and distribution loss reductions, (Southern Africa Power Pool), and we develop strategies for utilities to minimise the impact of the reduced demand from energy-intensive industrial customers, (Ghana).

We are currently engaging in sector coupling and storage measures like green hydrogen and power-to-X, that promote stability of intermittent energy systems. With the support of its specialized C³ Unit for better learning, GFA energy projects are able to provide remote online training/capacity building and webinars for employees of utilities and grid operators in order to better cope with challenges and disruption. **www.c3-training.de**

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