2021 Canadian Consulting Engineering Awards

SENEGAL ENERGY PROJECTS – FEASIBILITY STUDIES

International

wsp

ASSOCIATION OF CONSULTING ENGINEERING COMPANIES | CANADA

SOCIAL AND ECONOMIC BENEFITS

More than 1.3 billion people around the world lack access to electricity. This stifles investment, increases costs of goods and services, and often forces families to seek electricity sources that are expensive and environmentally unfriendly. Unreliable sources of electricity have significant social impacts as they can hamper the delivery of critical services like health care and reduce job opportunities.

With a population of 14 million people, Senegal is one of Africa's fastest-growing economies. Yet, economic growth and progress are constrained by the high cost of electricity to grid-connected firms and the limited access to electricity in the peri-urban and rural areas. Senegal's average labour productivity, per person employed, is low, and women are strongly disadvantaged. Ensuring consistent and affordable access to energy in Senegal will allow businesses to grow, catalyze private sector investment, increase productivity and employment, and ultimately support the diversification and growth of Senegal's economy—across genders and age groups. A 2014 African Development Bank (AfDB) report estimated that in the short run, a 1% increase in access to electricity increases Senegal's total factor productivity by 12%, and by up to 21% to 29% in the long run.

WSP was selected by Millennium Challenge Corporation (MCC) to provide infrastructure consulting services to assess the feasibility of energy projects across Senegal, which would provide the basis for a five-year, $600 million program. This investment is designed to strengthen the power sector, by increasing reliability and access to electricity and providing an efficient foundation upon which the nation's power system can grow. Rural populations will benefit as remote economic regions will be opened up with transmission connections. Reinforcements and modernization to the grid in urban areas will increase reliability and affordability to nearly 60% of the Senegalese population in the next decade.

The project included technical assessments (requirements, risks, resiliency, costing, optimization to maximize benefits), environmental, social and gender assessments, and economic and financial analyses. MCC, from its inception, has upheld a rigorous approach to environmental and social standards, so the final reports not only created the basis for detailed project design but also provided for the resulting Environmental and Social Impact Assessments (ESIAs), Environmental and Social Management Plans (ESMPs), Social and Gender Integration Strategy (SGIP) and Resettlement Action Plans (RAPs).

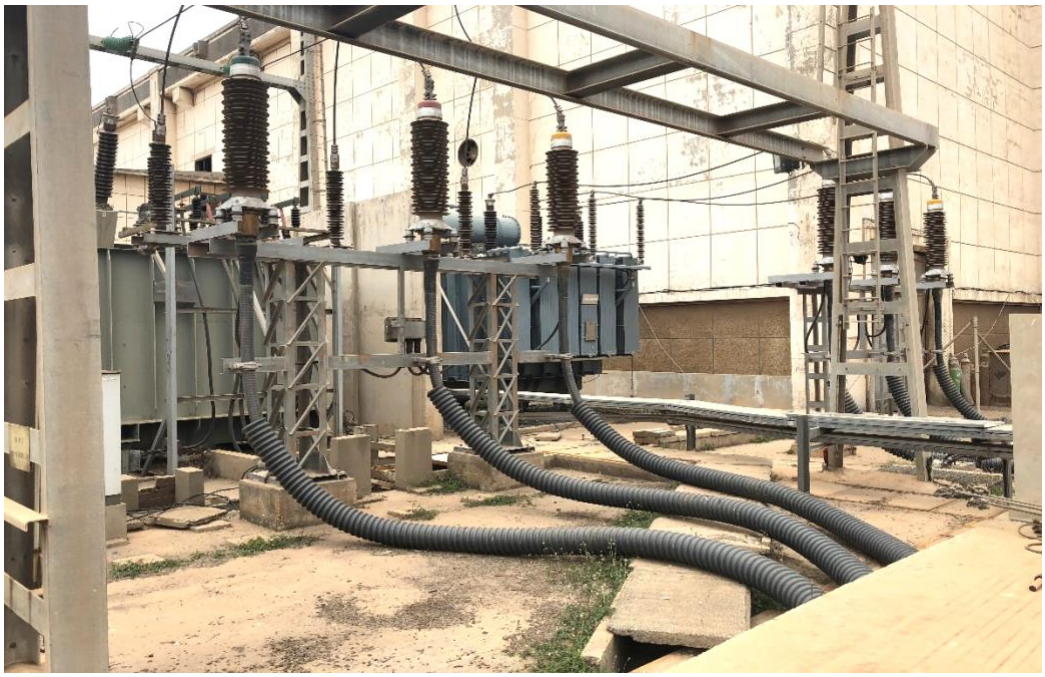
TECHNOLOGY TRANSFER

WSP provided deep expertise on emerging technologies in the design of power generation, transmission, and distribution networks. Some of the technologies proposed include the technical capabilities to assess, design, build, operate and maintain the following:

- Refurbishment and conversion program for existing diesel and coal power plants, thereby, utilizing gas-to-power generation as a strategy to deploy inexpensive, scalable and relatively clean energy;
- Utility-scale battery storage solutions, totalling 315 kV (80 MWh), which would be one of the first projects of its kind in Africa;
- Planning capacity reinforcement and modernized dispatching capability to further reduce and eliminate blackouts and ensure real-time dispatching capability that would allow the grid to utilize Variable Renewable Energy (VRE) resources;
- Three 225 kV double circuit underground and submarine high-voltage transmission links, which would be a first for Senegal. The results would boost reliability to the Dakar region with less disruption and displacement of a dense urban population than overhead lines.

Capability-building through the transfer of knowledge is a powerful tool. By recommending the use of Information Education Campaigns (IEC) to teach the public and large government institutions about energy efficiency and demand-side energy management activities, we encourage the utilization of more efficient technologies, reduce electricity use, and all the while maintaining the same level of service.

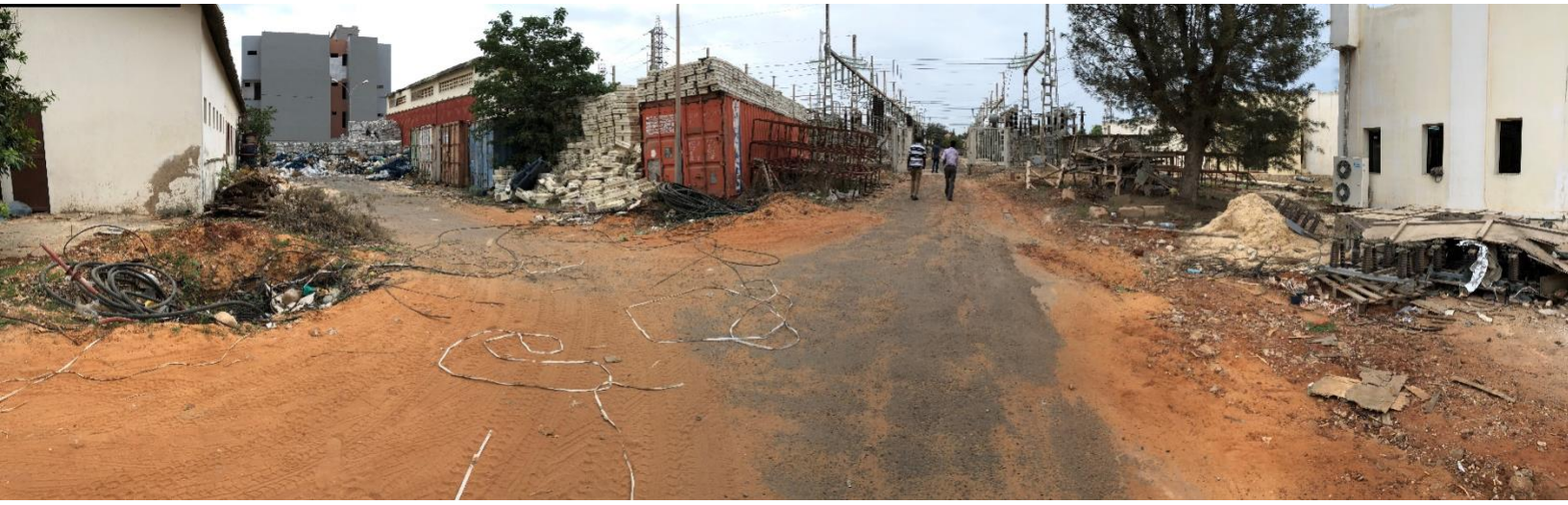
Communication to transfer know-how and facilitate teamwork was essential to the success of this project. The ability to work in French and English allowed us to effectively communicate with stakeholders across the US and Senegal.



ENVIRONMENTAL BENEFITS

MCC sets high standards for the environment, adopting the International Finance Corporation's (IFC) Performance Standards on Environmental and Social Sustainability. In providing analysis on the projects and ensuring that they met this high level of criteria, WSP confirmed that all environmental and social mitigation measures required were feasible from a technical and cost perspective. With these definitions, the following recommendations highlight the environmental benefits of a sustainable solution:

- The construction of high-voltage substations, as well as the installation of underground and submarine electrical cables. This minimized resettlement impacts in a dense urban setting;
- Ensuring the health and safety of workers and local community members, minimal impacts to the physical environment and habitat, including disturbance of biodiversity and coastal ecosystems in the Bay of Dakar (e.g., sediment disturbance on marine life), and impacts on artisanal fishing and other local economic activities. This includes assessment of the existence of prior seabed contamination related to marine transport spills, unexploded ordnance, and artificial reefs, as well as shipwrecks;
- Refurbishment and conversion program for existing diesel and coal power plants to natural gas. Natural gas emits 50 to 60 percent less carbon dioxide (CO2) when combusted in a new, efficient natural gas power plant compared with emissions from a typical new coal plant;
- Information Education Campaigns (IEC) to communicate and train new practices across operating and maintaining the systems.



COMPLEXITY

The project was complex across stakeholder management, especially with a compressed eight-month schedule. In this context, WSP involved power sector experts from other offices and partners across Canada, the UK, the US, Serbia and France with clear activities and goals to discuss technical assessments; environmental and social analyses; social and gender assessments; economic and financial analyses; and monitoring and evaluation. This assisted to deliver findings across policy reform, regulatory and institutional strengthening.

The reporting evaluation was also quite complex, as it needed to meet with MCC's investment objectives including:

- Economic Rate of Return of at least 10% for each discrete project;
- Clear program logic, showing a clear link to the constraints identified in the constraints analysis and demonstrating how program activities will lead to a measurable impact and performance of the utilities;
- Can be completed within 5 years;
- Pro-poor, socially inclusive and with MCC Gender Policy and Gender Integration Guidelines;
- Incorporate sector policy reform into compact project design where appropriate;
- Attract capital from private sector/other donors and implement new financing structures and innovative delivery models;
- Can be maintained (operationally, financially, institutionally) and are therefore sustainable;
- Adhere to the MCC Environmental Guidelines, including the environmental and social performance standards; and
- Scalable.

By ensuring good communication and transparency with the client, also by respecting the delivery schedule and reaching a consensus when changes occurred, all these challenges were successfully mitigated.

MEETING THE NEEDS OF MILLENNIUM CHALLENGE CORPORATION

The objective of the study was to identify and prepare infrastructure project concepts for a Compact program to support the Senegal power sector. Crucial to this objective was not only to conduct the technical work requested but also to ensure the link between the infrastructure identified and a reduction in the cost of electricity. Feasibility analyses included technical assessments (requirements, costing, optimization to maximize benefits), environmental, social and gender assessments, and economic and financial analyses.

WSP delivered on all of these objectives on schedule and within budget, and the conclusions provided in 2018 still hold true during the ongoing implementation phase. This is a testament to the rigour of the analyses and to meeting the high standards and expectations for quality as set forth by MCC.

SUCCESS

The lack of access to reliable and affordable electricity negatively affects a developing country's ability to grow to economic prosperity and deliver of critical services – disproportionately affecting disadvantaged groups like women even more. WSP successfully delivered feasibility studies across generation, transmission and distribution systems in Senegal that seek to address these complex social, environmental, and regulatory issues. The resulting report provides a strategic framework for the newly signed Compact program and $600 million investment by Governments of the US and Senegal – a brighter future for all Senegalese.

BENEFITS

Provide developing countries with a strategy across projects and regulations to reduce poverty and encourage economic growth with accessibility to reliable and affordable electricity.

Diversify Senegal's power generation with greener and more sustainable energy.

Educate the public and government organizations on the utilization of more efficient technologies, and reduction of electricity use.

WSP is one of the world's leading professional services consulting firms. We are dedicated to our local communities and propelled by international brainpower. We are technical experts and strategic advisors including engineers, technicians, scientists, architects, planners, surveyors and environmental specialists, as well as other design, program and construction management professionals. We design lasting solutions in the Transportation & Infrastructure, Property & Buildings, Environment, Power & Energy, Resources and Industry sectors, as well as offering strategic advisory services. With approximately 49,500 talented people globally, including more than 7,200 in Canada, we engineer projects that will help societies grow for lifetimes to come.