

## Socioeconomic Impact Highlights

**Increase in Economic Output (GDP):** USD \$9.27 million – \$10.81 million per year (0.12% – 0.14% increase to estimates)

**Direct Increase in Employment:** 50 jobs for long-term maintenance and servicing

**Indirect Increase in Employment:** 4,900 – 5,800 jobs (0.11 – 0.13% increase to employment estimates)

**Households to be provided with electricity:** 15,000 – 18,000 households

**Time saved from biomass fuel collection (firewood and charcoal):** 10.95 million – 13.29 million hours per year

**Additional income per year due to the reallocation of time:** \$834,000 to \$1.79 million per year

**GHG savings vs. other sources of energy:** 7,500 – 8,400 tons of CO<sub>2</sub>e/ year

**Number of children with increased school performance:** 35,550 - 43,100 school students

With less than 15% of Rwanda's population having access to electricity, (including only 1-2% in rural areas where 90% of the population lives), Rwanda is in dire need of additional power generation capacity. Insufficient and unreliable power provisions hinder the country's economic growth potential and depress living conditions. The field adds roughly 6% of new generation capacity, enabling tens of thousands of individuals to receive regular power along with numerous socio-economic benefits for Rwanda and its inhabitants. These benefits will significantly improve social welfare in the country through increasing economic output and employment conditions, improving standard of living conditions for residents, and minimizing the environmental impact from new energy production. GWG has done an in-depth analysis to provide some tangible estimates of these benefits.

### *Impact on Economy*

Rwanda is a rapidly growing yet energy-starved economy, with a population of around 10.9 million that is expected to grow to 16 million by 2020. Rwanda has displayed significant growth since 2000 with average GDP growth of 8.2% and a 9.9% GDP growth in 2012. Rapid growth in electricity generating capacity is required to sustain Rwanda's 8%+ GDP growth.

The 8.5 MW solar power plant will benefit Rwanda's economic growth through the creation of employment at all phases of development and through its lifetime. At the pre-development phase of the project, local Rwandan experts were hired to complete surveying, feasibility studies, site preparation including ground leveling and road building, financing, regulatory licensing and permitting. During the construction period, we employed 200 construction workers part time, most of whom were Rwandan nationals. 30 full time maintenance jobs are required for the upkeep of the solar field. Additionally, certain jobs were subcontracted out to local businesses such as local accounting firms, local legal firms, and local administrative and management companies. We estimate an additional 20 long-term jobs have been created.

The project is a core enabler of considerable further national job creation. The much-needed additive electricity supply supports increased economic activity throughout multiple agricultural, industrial, and service sectors. The electricity generation from the project could stimulate an increase in Rwanda's

annual gross domestic product (GDP) of \$9.27 million - \$10.81 million (0.12% – 0.14% increase to annual GDP estimates) and potentially add 4,900 – 5,800 jobs (0.11 – 0.13% increase to employment estimates). The increases in economic output and employment will come from various sectors in the economy, primarily agricultural production and processing (tea, coffee, tobacco, wheat, meat, fish, and dairy products), consumer product manufacturing (beverages, paper, furniture, chemicals, textile and clothing), mining, and business and consumer services (construction and repair, utilities, communication, finance and business, public administration, transportation, education, and health).

It is widely recognized that for Rwanda to continue to support stable growth in their economy, it will need to transition from an agriculture- and commodity-based economy to a more industrialized nation. Manufacturing, processing, and service activities add more output in the supply chain to the economy and provide an abundance of stable jobs. Improvements in Rwanda's infrastructure are necessary for this transition. Electrification from this project alone is expected to generate an additional 0.16% - 0.18% growth per year for output in the industrial and service sectors in Rwanda's economy.

We calculate these economic measurements through an assessment of the current correlations between electricity supply and demand with Rwanda's various economic output and employment sectors, and subsequently applying a derived multiplier to these industries provided by the increased electricity generation. The methodology and model for our calculations were published and provided by the International Labor Office of the United Nations in their report on *Assessing Green Jobs Potential in Developing Countries*.

### ***Impact on Standard of Living***

The solar power plant will have a strong positive social impact on the Rwandan people. The supply of clean electricity generated is sufficient to power approximately 15,000-18,000 additional households. Further, the number of households provided with electricity could multiply significantly if the country's electrification rate were to increase due to improvements and expansions over time in the transmission and distribution grid.

The project significantly reduces the amount of time and money women and children must spend trying to gather fuels, allowing for more time to be spent on capacity building activities such as education, work or vocational training. We estimate that the total time savings could range from 10.95 million – 13.29 million hours per year, and that there could be between \$834,000 to \$1.79 million of additional income or equivalent economic value per year due to the reallocation of time.

The project also increases economic empowerment of women and other disadvantaged or disenfranchised groups through the participation in and implementation of the project. Local engineers and technicians continue to benefit from training programs being implemented to teach them how to properly manage the solar field. We have offered several local engineers the opportunity to attend a renewable energy training internship at the Arava Institute in Israel to further build the technical capacity.

Children benefit considerably from additional and enhanced reliability of electricity, allowing them to allocate more time to studious activities. It is estimated that there could be increased school performance for 35,550-43,100 school students. Furthermore, the ASYV orphanage benefits from the increased access to renewable energy services, and receives a steady flow of rental income from the land lease that contributes to the long-term sustainability of the orphan village and benefits its health and education programs. Additionally, the 500 students at ASYV have access to education regarding engineering and solar PV technology provided by GWG.

### ***Impact on Environment***

An ESIA study found that the PV solar power plant would have no potentially significant and irreversible environmental impacts. On the contrary, this project will have a number of positive environmental impacts.

Approximately 40% of Rwanda's current energy production is derived from diesel and heavy oil thermal production, despite the very high economic and environmental cost of relying on oil – in addition to higher instance of respiratory illness. The installation of the solar power plant significantly reduces the amount of greenhouse gases (GHGs) per year by displacing some of the need for the use of diesel for providing electricity. We calculate that 7,500 – 8,400 tons of CO<sub>2</sub> are saved a year relative to other sources of energy.

Also, the rate of deforestation is reduced, as biomass use for heat production is displaced as electrification spreads. Currently, 95% of all energy in Rwanda comes from burning wood. We estimate that around 12,500 – 15,000 m<sup>3</sup> of wood will be saved each year by connecting 15,000-18,000 households to GWG's solar project.