

અત્તર קק कु બ મેંજે ખેશ ર્અત્ર) HIS MAJESTY'S SECRETARIAT DE-SUUNG SKILLING PROGRAMME SOLAR INITIATIVE (DSP-SI) Motithang, Thimphu: Bhutan



DSP-Solar Initiative Project phase-2 update

Background

Bhutan is largely dependent on hydropower for its electricity source. The reliance on hydropower as the primary source of electricity in Bhutan has been beneficial so far, utilizing the fast-flowing rivers and streams in the country. However, the impact of climate change poses a significant threat to hydrological patterns, leading to seasonal water availability and reduced electricity generation during the lean flow season in winter. This situation creates challenges in meeting the electricity demand, particularly when it is highest.

To address these challenges and ensure a reliable and sustainable electricity supply, it is important for Bhutan to diversify its energy sources. Solar and wind power offer viable alternatives that can supplement and complement hydropower, especially during the lean flow period. Bhutan has abundant potential for solar and wind energy, and tapping into these resources can help reduce the country's dependence on hydropower and enhance energy security.

Implementing small-scale distributed renewable energy generation, such as rooftop and groundmount solar photovoltaic (PV) installations, can be a valuable strategy. This approach not only diversifies the energy portfolio but also increases the national energy capacity. Additionally, it enables the development of technical expertise in the field of solar energy, which is crucial for the country's long-term energy sustainability.

Adopting solar PV technology and encouraging the populace to embrace renewable energy will help raise awareness about climate change mitigation. Bhutan's efforts in promoting renewable energy can serve as an example and contribute to the global transition towards cleaner and more sustainable energy systems.

By embracing a mix of renewable energy sources and investing in solar and wind power, Bhutan can enhance its energy resilience, reduce its carbon footprint, and contribute to a more sustainable future.





Rationale

The Royal Command was received to take up the solar initiative as a means to diversify the sources of energy and to enhance energy security for the country which is primarily dependent on hydropower plants at the moment.

In light of the growing popularity and adoption of solar power globally as a renewable energy resource, this solar initiative is also envisioned to promote and pave way for similar uptake in the country by both public and private sectors tapping into the huge solar potential of 12 GW electricity capacity that exists in the country.

To take the Royal Vision forward, the DSP Solar Initiative (DSP-SI) erstwhile Bhutan Solar Initiative Project (BSIP) was formed with Dasho Bharat Tamang, Member, Privy Council as the Chair of the DSP Solar Initiative and Project Director, RSSTEM, as the Project Lead for Project Implementation Unit (PIU). The Board of Directors functions as an advisory body to the PIU.

The DSP Solar Initiative is being undertaken to pave the way to tap into the larger solar power potential the country has towards strengthening the energy security of the country as well as to demonstrate its leadership in environmental conservation. DSP-SI is expected to provide the necessary support and impetus to this objective by building capacity and catalyzing a conducive regulatory and policy regime, thereby clearing the path for large-scale uptake of solar PV by both Government agencies and private individuals in the country.

The 1st Phase of the project, which consisted of a 250 kW Rooftop Solar Power Plant at the Centenary Farmers Market and a 500kW ground-mounted Solar Power Plant at Dechencholing, was successfully completed and commissioned on 29 May 2023 and 9 June 2023, respectively. These projects, funded by the Bhutan Trust Fund for Environmental Conservation (BTFEC), have set a benchmark for cost-effectiveness in solar installations in our country and the region with a capital cost of Nu 54,000/- per kW capacity solar power generation.

The Projects have been implemented to further the Royal Vision to:

- a. Work towards the country's energy security needs;
- b. Demonstrate Bhutan's continued leadership in environmental conservation;
- c. Establish technical and economic viability of solar PV in the country and pave the way for uptake of solar PV by both private and public entities; and



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d. Build local capacity in this growing and important sector through the De-suup skilling program (DSP).

DSP-SI has received Royal approval to implement solar projects Phase II, which includes building an additional 2.1MW ground-mounted PV system at Dechencholing, a 1.5MW rooftop solar PV system at The Royal Academy, Pangbisa, and 250kW rooftop solar PV system at CFM to cover the entire portion of the roof. The project will be executed by in-house Bhutanese engineers and De-suups and the additional De-suups will be engaged as and when required due to the scale of the project.

The solar projects for phase II is funded by the Royal Government. To this, the DSP-SI had the opportunity to submit the success story of the project to the Hon'ble Prime Minister (Dr. Dasho Lotey Tshering) of Bhutan and also to apprise him on Phase II of the Solar Project including the need for funding for the project. To this, the Hon'ble Prime Minister was pleased at the achievement and underlining the successful execution of the first phase Solar project as an auspicious start towards fulfilling His Majesty's vision, the project's role in helping leverage technology, building local skills, and enhancing energy security, has granted approval to DSP-SI request for funding support for second phase solar project to the tune of Nu.150 million as capital investment from the Royal Government.





ASSESSMENT AND RISK ANALYSIS OF DSP-SI SOLAR PROJECTS

The PESTLE (Political/Policy, Economic, Social, Technology, Legal, and Environmental) model is adopted to conduct the risk analysis of key external factors of the DSP-SI Solar projects in Bhutan.

Political/Policy:

The government has devised a plan and articulated a strategy aimed at generating 500MW of solar electricity during the 13th Five-Year Plan (FYP), intending to broaden the nation's energy mix by incorporating a combination of clean and renewable energy technologies. Additionally, efforts are underway within the government to establish favorable policies and regulations conducive to the advancement of solar projects.

Economic:

Bhutan's growing economy is driving up the demand for electricity, thereby creating a market for solar projects. As the prices of solar technology continue to decrease, the project feasibility and attractiveness increase.

The DSP-SI solar project phase one stands out as one of the pioneers in this field, already generating revenue in a remarkably short period. The income generated from the solar project can be utilized to repay the loan within 10 years, cover operational and maintenance expenses of the solar plant, and further invest in skilling and skill enhancement programs for the Desuups. This aligns with His Majesty's vision of empowering youth by enhancing their capabilities and skills, enabling them to lead meaningful, productive, and prosperous lives.

Securing funding for the next phase of DSP-SI is crucial to keep our skilled Desuups engaged until appropriate policies and regulations are in place. This will facilitate the creation of aspiring solar Desuups who can eventually enter the solar business independently in the future.

Social:

The advancement of solar energy represents a form of energy diversification that enhances the overall energy security of the nation. By investing in solar power, we can mitigate risks associated with reliance solely on electric hydropower, particularly concerning the potential drying of glacial lakes due to long-term global warming effects.



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The rooftop solar initiatives enable us to maximize the efficient utilization of available space for harnessing solar energy effectively. Additionally, agrivoltaic systems, which combine ground-mounted PV systems with agricultural activities, can further optimize land usage for solar energy generation.

Furthermore, solar projects have the potential to generate employment opportunities and stimulate local economic growth.

Technological:

Advancements in solar technology significantly enhance project viability by improving efficiency, reducing costs, and introducing innovative storage solutions. Establishing local expertise in solar technology maintenance is crucial for ensuring long-term sustainability. Furthermore, ongoing research and development efforts can lead to further enhancements in solar technologies and make them more affordable in the future.

Legal:

Adherence to environmental regulations and obtaining necessary land-use permits is paramount. It's worth noting that rooftop solar PV projects typically do not require environmental clearance. Implementing favorable tax policies can serve as incentives for solar project development and encourage investment in the sector. Additionally, having a clear understanding of ownership structures and licensing requirements is essential for successful solar project implementation.

Environmental:

Bhutan's reliance on imported fossil fuels underscores the importance of transitioning to renewable energy sources. Despite challenges, Bhutan's diverse topography presents opportunities for strategically locating solar farms. Embracing solar energy not only reduces carbon emissions but also mitigates the impacts of climate change. Unlike large-scale hydropower projects, solar initiatives entail minimal ecological disruption and help safeguard biodiversity.



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Pictorial Update of Solar Project Phase-2



Figure 1: Installation of Module Mounting Structure(MMS) on the rooftop of the Inverter house at Dechencholing Site.



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Figure 2: Construction of Inverter house for Dechencholing Solar plant completed



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Figure 3: Installation of Ground Mounted Mounting Structure- 25% completed













Figure 4: Installation of Ground Screw (completed)



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Figure 5: Installation of GEE Earthing slab (completed)



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Figure 6: Solar Gojay operating the Crawler pile driver machine through the experience of operating the ROC machine