Biogas renewable energy

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The proposed general form of self-adjusting biogas flow is shown in Fig.1a. The optimization was categorized into four analytical steps: a data-driven identification of the biogas demand rate; quantifying operational parameters of biogas production; temporal biogas storage capacity designs to avoid discontinuous supply and biogas loses; and operational strategy determination for coordinating biogas flows both on the plant side and user side (Fig.1b).

a Schematic diagram of the biogas flow. Biogas losses occur when the temporal redundant biogas exceeds the storage capacity. b Framework to establish an upgraded CBPD for a demand-driven biogas supply. Data on the rural community"s energy consumption is collected to estimate biogas consumption. The dynamically measured biogas supply rate is designed to equal the timely consumption/utilization rate in the community. Parts (I), (II) and (III) are sources of greenhouse gas emission or mitigation. Dotted arrows indicate information flow, and solid arrows indicate biogas flow.

In the third step, biogas storage capacity was determined to efficiently store excess output of biogas for dynamically meeting biogas production shortages, which was based on precise estimates of biogas consumption rate, accurate feeding process controls, and efficient margin designs. Among these, margin design is safeguards to achieve the target that CPR is equal to 1 on site, mainly determined by the operation levels of feeding, deviations in fermentation temperatures, irregular temporal and quantitative changes of biogas usage, and so on.

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Web: https://sumthingtasty.co.za/contact-us/
Email: energystorage2000@gmail.com
WhatsApp: 8613816583346