

Responding to the Question PS1 Q1.2.3, we would like to introduce an going energy-supply project in an island called "Hahajima-island project" as a contribution.

"Hahajima-island project" is a project to switch the energy sources in the island to renewable energy sources (REs). Photovoltaic power generations (PV) and batteries are planned to be installed to establish all RE supply more than half the time throughout a year, combining battery discharge and charge. The state of charge (SoC) of the batteries at 0:00 AM tries to keep the level 24 hours ago. If the SoC is lower, backup diesel generators start up. Fig.1 shows the combination of power generation sources including PV and batteries in the island.

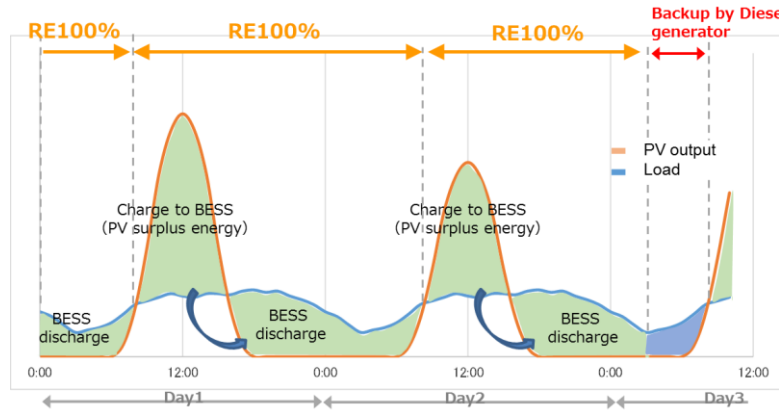


Fig.1 Combination of power generation sources

To establish all REs supply, we have to overcome technical issues. The biggest problem is that REs don't have the inertia that conventional synchronous generations have. So frequency fluctuation must be carefully taken into consideration when it comes to introducing REs to the grid. To overcome frequency fluctuation, a PCS (VSG) system cooperating with storage batteries have been developed in a real-time simulator. The word VSG means Virtual Synchronous Generator. It has been confirmed in the PCS (VSG) system that the frequency shortly after a sudden change of load can be maintained at the same level as the synchronous generator. In other words, it has been proved that the PCS (VSG) has the equivalent inertia.

To ensure grid stability and economic efficiency, it is necessary to coordinate the operation of batteries, PV and diesel generators. The project is going to introduce EMS along with PV and batteries. EMS plays important roles in whole control, such as demand and supply planning /control ,SoC management and so on.

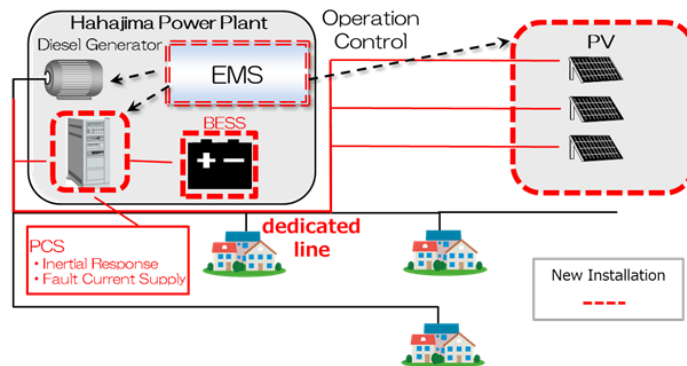


Fig. 3 New Installation in the project

Whole system tests in a 1/100-scaled real-model are now performing aiming at the installation in Hahajima-island in the future. The whole system test includes the effectiveness of PCS (VSG) system.