Optimum Energy Utilization Technology
− Contributing to More Comfortable and Enriched Life −

Brief Overview

We developed energy utilizing technology supporting rich life and industry, and satisfying comfort and environmental requirement. We also conducted performance evaluation for changes in ambient temperature, room temperature, and water temperature using the environmental test facility for Heat Pump Water Heater introduced in FY2006 for spreading of new Eco-cute system for cold area application.

We also conducted research for rationalized system operation and control when a large number of distributed power generations such as photovoltaic power generation are penetrated into the utility distribution lines in the future. We improved the detection system for islanding of distributed power generation to verify its effectiveness from both viewpoints of simulation analysis and experiments and finally clarified, by simulation, rationalized voltage control method effectively responding to individual conditions at penetrated area of distributed power generation and its penetrated volume.

Achievements by Research Theme

End use technology

○Customer energy utilization support

・For practical realization of residential indoor thermal environment design tool, we improved the tool to evaluate detailed heating conditions using various types of floor heating and air conditioning as well as energy consumption.

○Evaluation of system operational performance of new Eco-cute model

・We evaluated operating performance of various new Eco-cute systems to difference in ambient temperature, room temperature, and water temperature using the environmental test facility for evaluate of Heat Pump Water Heater introduced in FY2006. (Fig.1)

○Inverter with SiC device

・Targeting an inverter for distributed power source interconnection, we developed a prototype device (3.3 kW) applying SiC diode to achieve maximum efficiency of 96.4%, and obtained possibility to reduce the device volume by 15% compared to conventional device. (Fig.2)

○SiC power semiconductor

・To realize a large capacity and low-loss SiC semiconductor devices, we developed crystal growth technology of high purity and thick SiC film having purity and thickness that correspond to 20-30 kV class withstanding voltages. (Fig.3)

○Compact secondary battery utilization

・We measured energy consumption at complete electrical housing combining Eco-cute, IH cooking heater, and others for actual condition survey considering family structure.

Next generation grid technology

●Technology for autonomous demand area power system

・We improved the detection system for islanding of distributed power generation to verify its effectiveness from both sides of simulation analysis and experiment.

・We clarified, by simulation, combination of proper voltage control systems corresponding to penetration area and penetration rate of distributed power generation. (Fig.4)

End use technology

Fig.1 Performance evaluation of new Eco-cutes

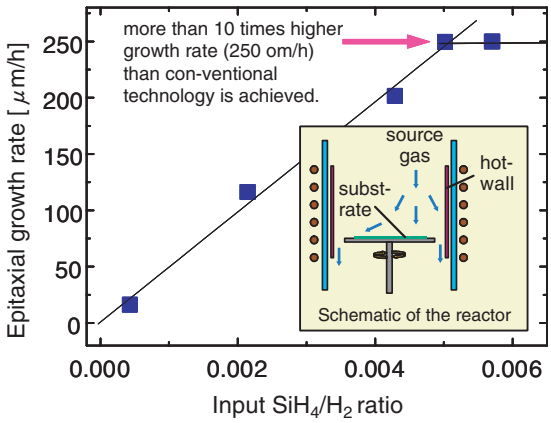
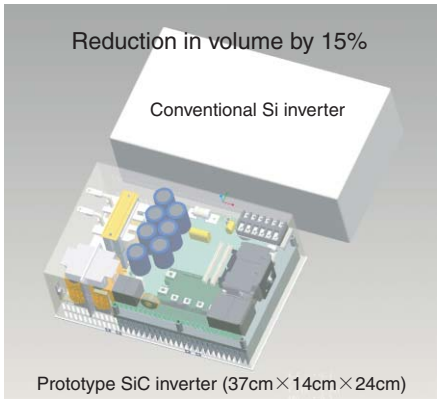


Fig.3 Growth technique of highly-pure and thick single crystal SiC film



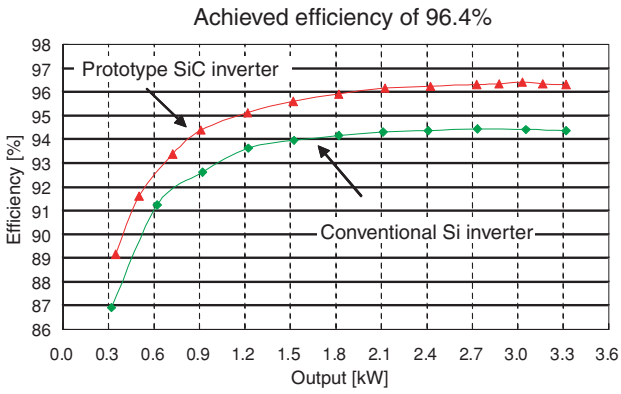


Fig.2 Prototype inverter using SiC diodes (3.3kW)

Next generation grid technology

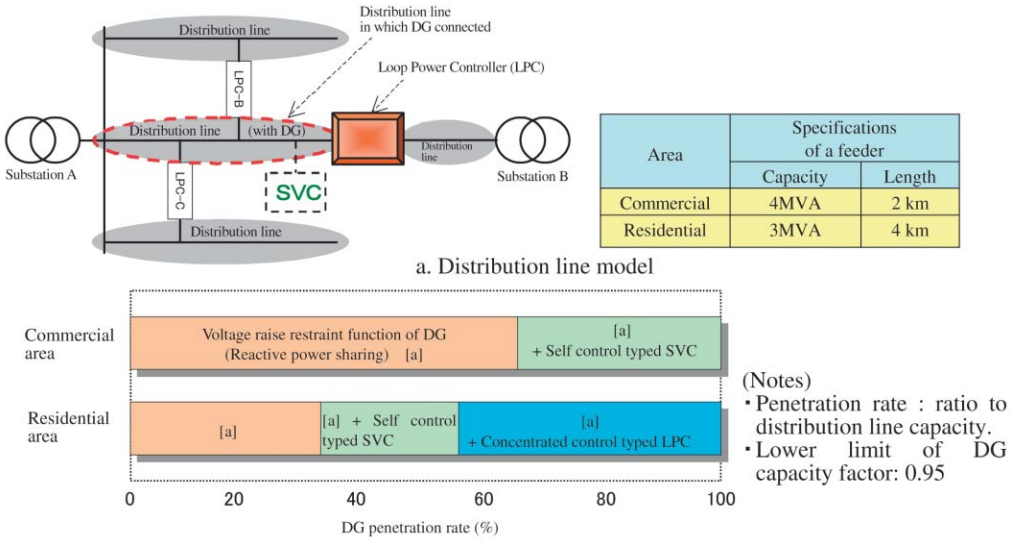


Fig.4 Classification of proper distribution line voltage control method according to DG penetration rate and area.