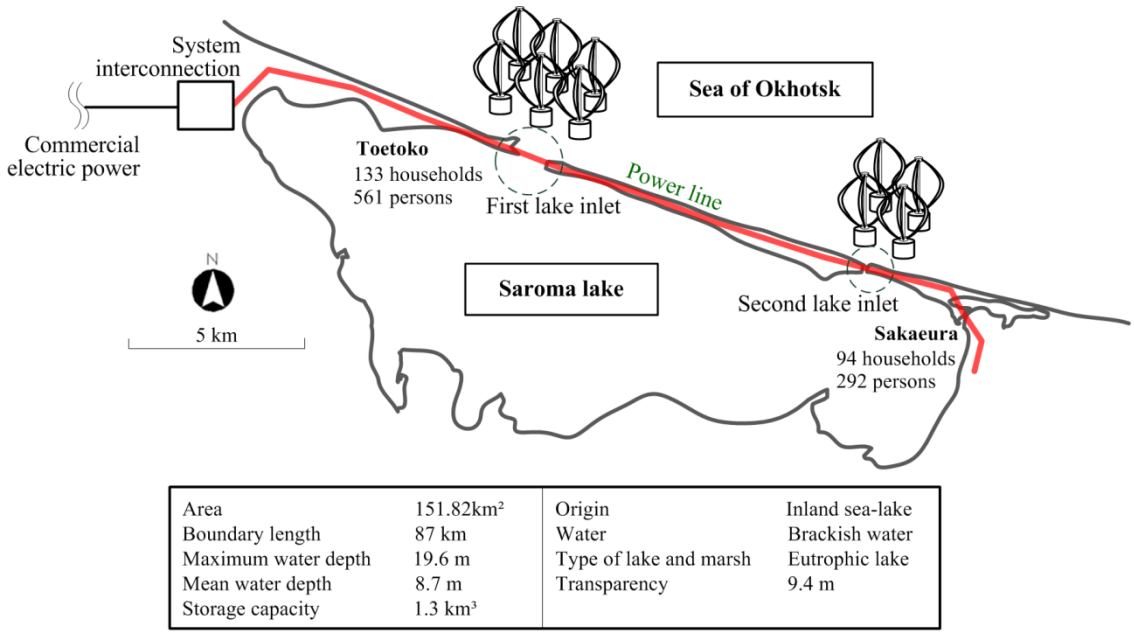
Study of a Tidal Current Microgrid with Electricity Storage and Heat Storage Planning Based on Energy Demand and Tidal Flow Velocity Forecasts



Area	151.82km²	Origin	Inland sea-lake
Boundary length	87 km	Water	Brackish water
Maximum water depth	19.6 m	Type of lake and marsh	Eutrophic lake
Mean water depth	8.7 m	Transparency	9.4 m
Storage capacity	1.3 km³		

Fig. 1 Electric power system of the Saroma Lake microgrid

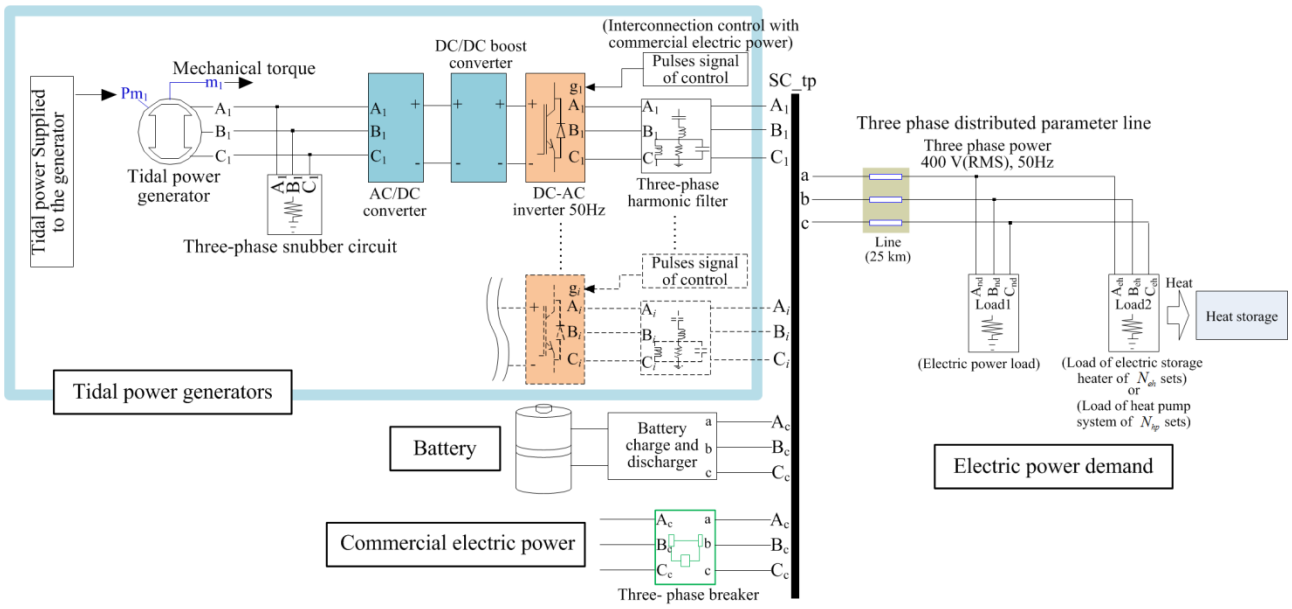


Fig. 2 Proposed system of the Saroma Lake Green-Microgrid

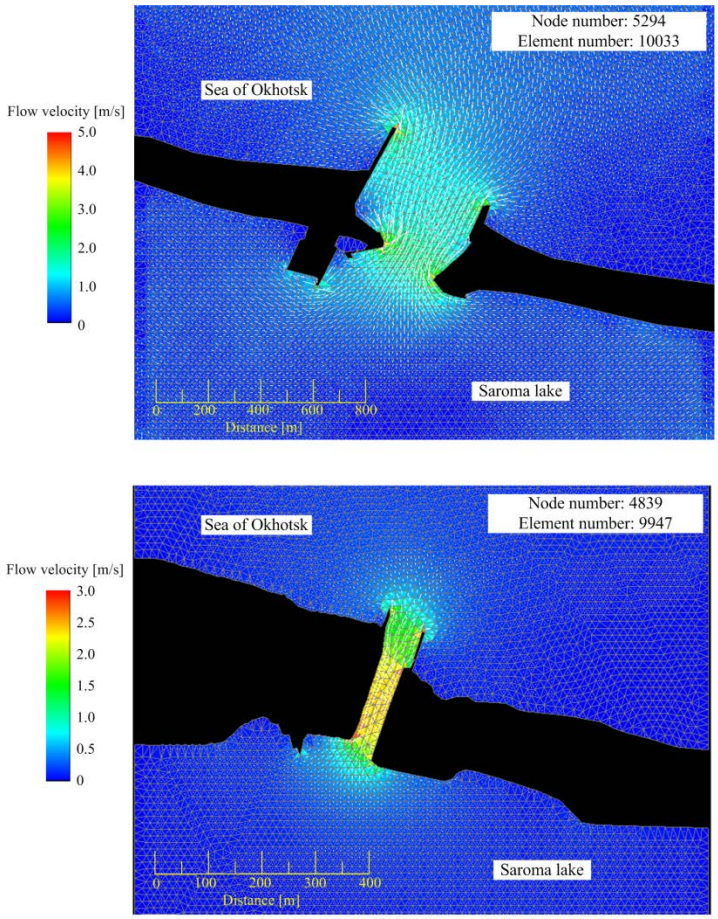


Fig. 3　Tidal flow velocity

The Facility Planning and Electric Power Quality of the Saroma Lake Green Microgrid by the Interconnection of Tidal Power Generation, PV and SOFC

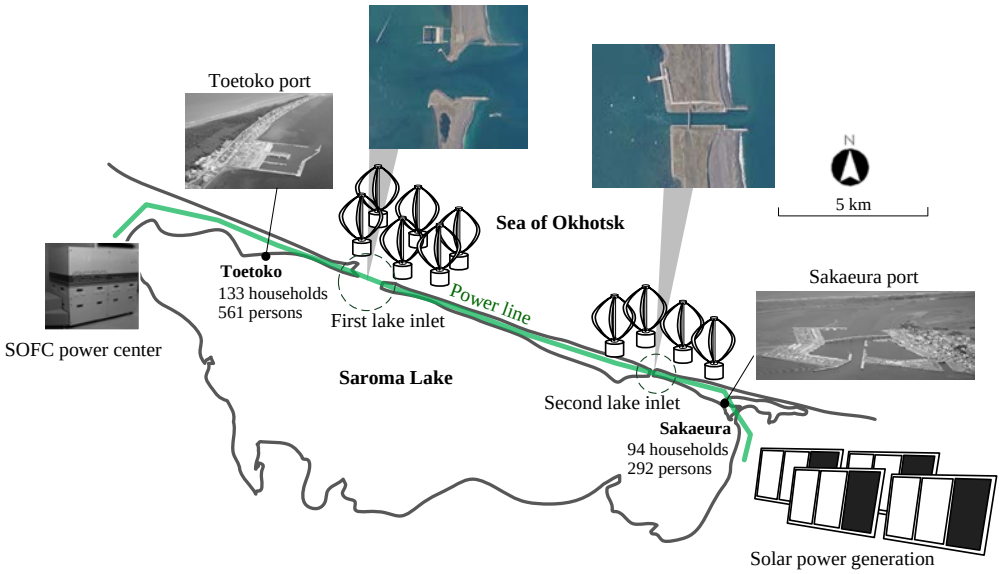


Fig. 1 The power system of the Saroma Lake green microgrid

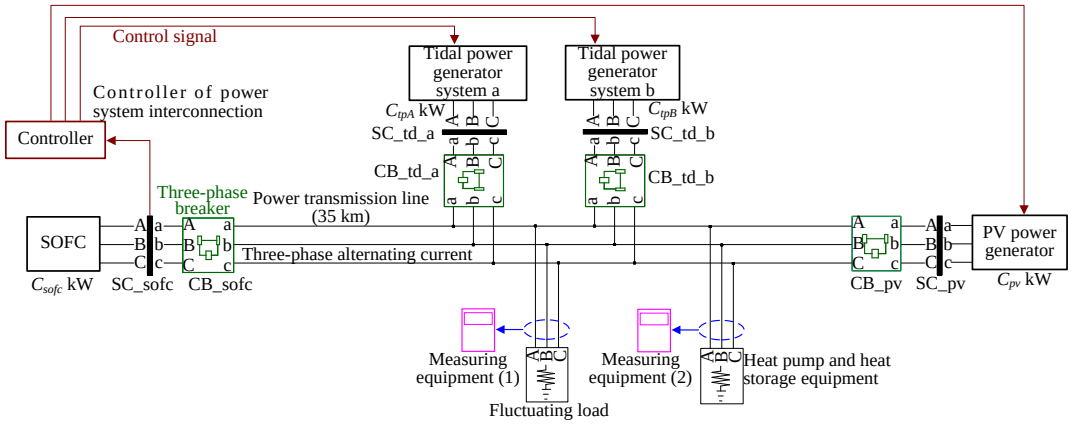
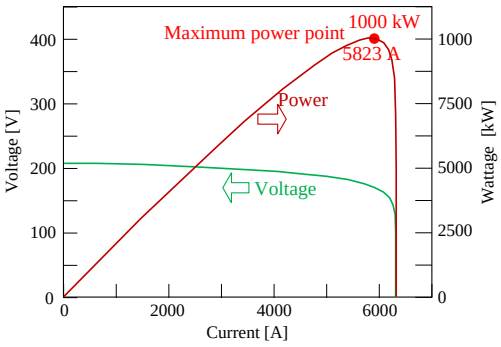
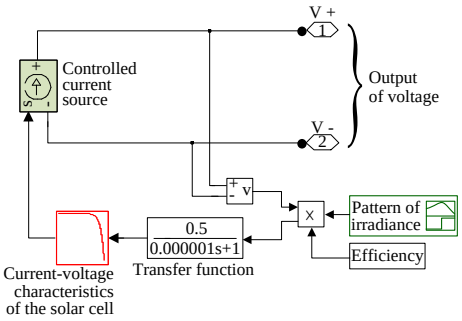


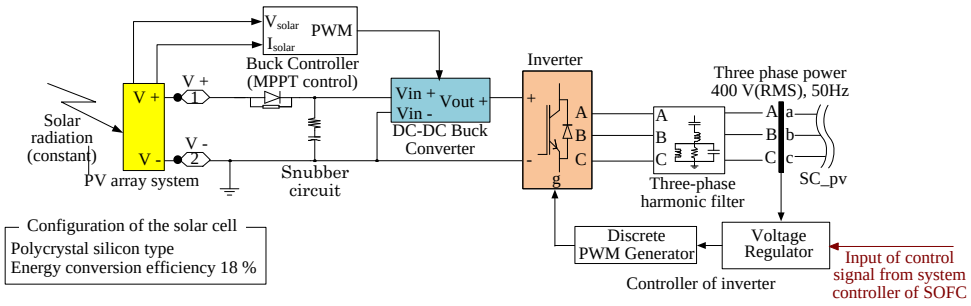
Fig. 2 The electrical power system of the SLMG, as defined by MATMAB/Simulink



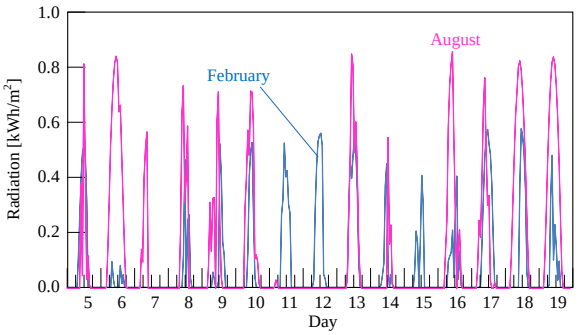
(a) The output characteristics of the PV system



(c) The PV system with the output PV characteristics



(b) A block diagram of the PV power generator

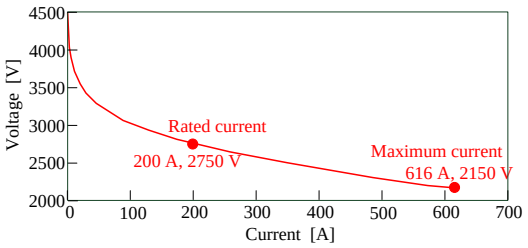


(d) The global solar radiation

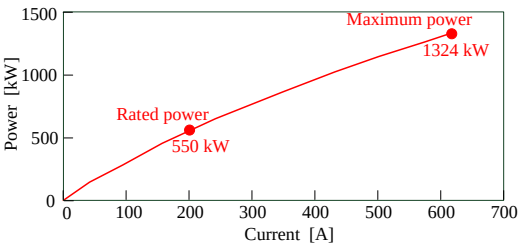
Fig. 3 The PV system

Table 1 The specifications of the SOFCs

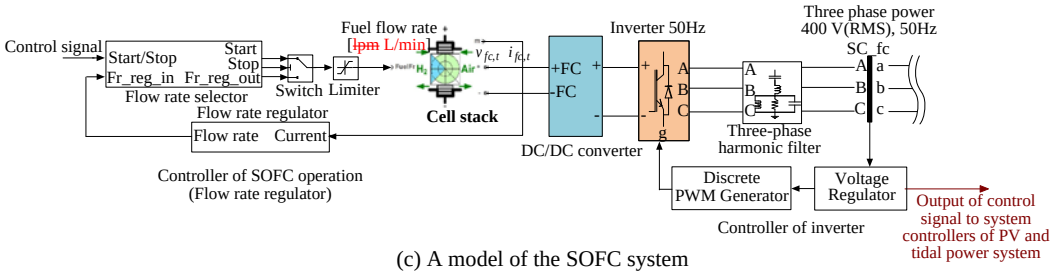
In the case of capacity 550 kW
Number of cells 2700
Nominal operating point 200 A, 2750 V
Maximum operating point 616 A, 2150 V
Nerst voltage of one cell 1.1865 V
Nominal stack efficiency 55 %
Operating temperature 1275 K
Nominal Air flow rate 0.233 m^3/s
Nominal supply pressure, Fuel 0.2 MPa, Air 0.15 MPa
Nominal utilization Hydrogen 67.7%, Oxigen 79.2%



(a) The output characteristics of the SOFC and the stack voltage vs. the current



(b) The output characteristics of the SOFC and the stack power vs. the current



(c) A model of the SOFC system

Fig. 4 The SOFC system

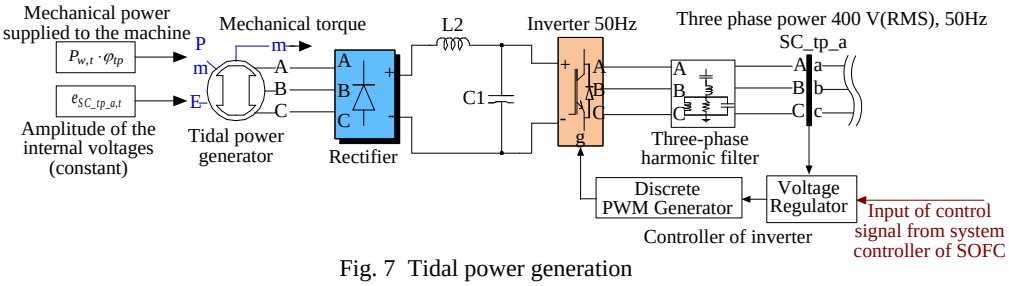


Fig. 7 Tidal power generation