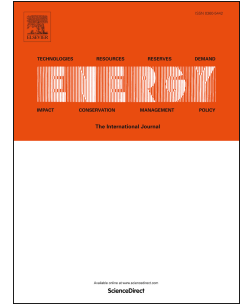


# Accepted Manuscript

The performance investigation of increasing share of photovoltaic generation in the public grid with pump hydro storage dispatch system, a case study in Japan

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11

12 **Abstract**

13 Massive PV integration will profoundly affect the power supply-demand dispatch scenario,  
14 such as the generator flexibility, dispatch of renewable production, and utilization of seasonal  
15 storage. This research presents a technical-economic assessments of a large-scale PV  
16 integration into grid with PHS balancing dispatch are presented, using real data of Kyushu,  
17 Japan. The impacts of PV integration on demand curves and detail storage dispatch scenarios  
18 are described, together with the simulation of economic performances of further PV integration  
19 considering the technical constraints, changes in power supply fraction and residual load  
20 duration curves are exhibited. PHS effectively absorbs the surplus PV production, maintains the  
21 grid flexibility, and further decreases the output from medium base plants. Due to technical  
22 limitations, simulation results indicate that around 50.0% of PV production will be curtailed  
23 when maximum PV generating capacity to peak load ratio reaches 1.02. As integrated PV  
24 capacity increases, effective PV integrations show significant variations across months over a  
25 year, and increases in PV annual penetration degrees become smaller with aid of PHS.  
26 Furthermore, in examining the promotion performances of PV integration with different PHS  
27 capacities reveals that PHS can effectively maintain low LCOE through recovering surplus  
28 production, especially at higher PV penetration levels.

29 **Keywords:** Photovoltaic; pump hydro storage; load duration curve; economic performance

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