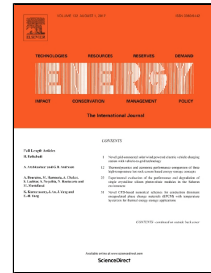


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1 Optimization of hydropower system operation by 2 uniform dynamic programming

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8 **Abstract:** As a popular optimization tool for multi-stage sequential decision problems, dynamic
9 programming (DP) has been widely used to handle with hydropower system operation problems.
10 However, the DP computational burden shows an exponential growth with the increasing number
11 of hydroplants, which results in “the curse of dimensionality” and limits its application to resolve
12 large and complex hydropower operation problem. Thus, this paper presents a novel modified DP
13 algorithm called uniform dynamic programming (UDP) to alleviate the dimensionality problem of
14 dynamic programming. In UDP, the uniform design is first used to construct the state variables set
15 of each period by selecting some small but representative discrete state combinations, and then the
16 DP recursive equation is used to find an improved solution for the next computation cycle. The
17 UDP method is tested in the Wu River cascaded hydropower system of southwest China. The
18 results indicate that the proposed UDP algorithm has competitive performance in computational
19 efficiency and convergence speed, which is an effective tool for hydropower operation problem.

20 **Author keywords:** Multireservoir system operation; Dynamic programming; Uniform design;
21 Dimensionality reduction; Curse of dimensionality

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