

Distributed energy systems people s republic of china

The analysis of strengths-weaknesses-opportunities threats (SWOT) was adapted for the analysis of improvement strategies. The directions for how to improve the application of these strategies were selected by the prioritization method of analytic hierarchy processes (AHP) and evaluated by the best-worst method (BWM). The suggestions were provided according to the ranks figured out by AHP and BWM. Five enablers were selected from the respective economic, environmental, technological and social aspects for participating in this analysis.

There are high potentials for China to further develop and apply DES approaches. The direction of current development might be set to solve three problematic aspects, which are capital investment, technology development and regulation completeness.

According to the various distributed generation DESs used, the DESs could be classified as reciprocating engine-based DESs, gas turbine-based DESs or DESs based on electrochemical devices and renewable devices, respectively, as presented in Fig. 1. DES energy storage technologies are divided into battery energy storage systems, flywheels, superconducting magnetic energy storage, compressed air energy storage and pumped storage systems.

It is evident from Fig. 1 that resource types of DESs vary from fossil resources to renewable resources. Feature of each DES type shows their particularities as well. In other words, DES is a general approach to apply different types of power generation on a small scale. If CHP and CCHP systems are excluded, the environmental protection value of DESs depends on the energy resource of the system. Generally speaking, the DESs which are recommended by scientists and governments are CHP and CCHP systems, since their multiple energy phase outputs steadily increase the energy usage rate.

An analytic hierarchy process (AHP) method is used to analyse the dealing urgency level of each existing problem by an estimated linguistic pairwise comparison invented by Saaty [44]. By applying an AHP method, the related importance is delivered from upper layer to lower layer through the hierarchy structure of the enablers. Therefore, the weights of enablers can be obtained through the hierarchical analysis.

Assuming that the weight of importance with respect to the n th enabler is indicated as w_n , the relative importance between the i th enabler and the j th enabler should be given by $a_{ij} = w_i/w_j$ as shown in Table 1. The pairwise comparison matrix should be expressed as Eq. (1).

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