

OPTIMAL SELECTION OF ON-SITE GENERATION WITH COMBINED HEAT AND POWER APPLICATIONS

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Keywords: distributed generation; combined heat and power; decentralised optimisation; microgrid; power quality

ABSTRACT

While demand for electricity continues to grow, expansion of the traditional electricity supply system, or *macrogrid*, is constrained and is unlikely to keep pace with the growing thirst western economies have for electricity. Furthermore, no compelling case has been made that perpetual improvement in the overall power quality and reliability (PQR) delivered is technically possible or economically desirable. An alternative path to providing high PQR for sensitive loads would generate close to them in *microgrids*, such as the Consortium for Electricity Reliability Technology Solutions (CERTS) Microgrid. Distributed generation would alleviate the pressure for endless improvement in macrogrid PQR and might allow the establishment of a sounder economically based level of universal grid service. Energy conversion from available fuels to electricity close to loads can also provide combined heat and power (CHP) opportunities that can significantly improve the economics of small-scale on-site power generation, especially in hot climates when the waste heat serves absorption cycle cooling equipment that displaces expensive on-peak electricity. An optimisation model, the Distributed Energy Resources Customer Adoption Model (DER-CAM), developed at Berkeley Lab identifies the energy bill minimising combination of on-site generation and heat recovery

equipment for sites, given their electricity and heat requirements, the tariffs they face, and a menu of available equipment. DER-CAM is used to conduct a systemic energy analysis of a southern California naval base building and demonstrates a typical current economic on-site power opportunity. Results achieve cost reductions of about 15% with DER depending on the tariff. Furthermore, almost all of the energy is provided on-site, indicating that modest cost savings can be achieved when the microgrid is free to select distributed generation and heat recovery equipment in order to minimise its overall costs.