Mario Orestes Aguirre González et al., J Fundam Renewable Energy Appl 2018, Volume 8
DOI: 10.4172/2090-4541-C3-056

Performance measurement system in wind farms

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This paper aims to identify the factors affecting the use of Performance Measurement Systems in wind farms O&M to increase reliability and productivity. A case study was conducted with 7 Brazilian companies which together own 41 wind farms in the state of Rio Grande do Norte, which has the largest installed capacity in the country (32%). As a result of this research, have been identified: (1) The need of making efforts to define what indicators are important to measure. The performance indicators available in the literature are very specific, so it is necessary to analyse the main constraints that affect subsystems and equipment to define what should be measured. (2) Performance measurement based only on indicators defined in contracts. Due the terms of the Operation and Maintenance contracts the managers prioritize a specific indicator (Time Based Availability), at the expense of those who actually illustrate the farm's productivity. (3) Difficulties in monitoring the activities of contracted companies, and also obtaining and validating the results presented by them. The data provided by the contracted companies are not always sufficient and reliable, since they are linked to the possibility of incidence of contractual penalty. (4) Use of non-specific software. Software adapted from other types of industry and not suitable to the reality of wind farms encode the measurement process, rather than facilitating it, and this discourages its use by those involved. (5) Non-use of the indicators results for the decision-making processes and uncertainties about the strategies of action to be adopted when the indicators reach critical limits, generating a lack of commitment to future measurements. (6) Non-use of tools for wind turbine performance analysis. Generation losses in wind farms are generally associated with unavailability of wind turbines. However even in operation, wind turbines may be producing less energy than they should due to problems that cause power limitation. Although few companies use specific tools to make this kind of analysis feasible. In addition, performance analyses require access to raw turbine data, which are often not available from manufacturers. (7) Need to extract data from different systems and transform it into indicators. Most wind farms hire one company to operate the turbines and another to operate the electrical system. These companies use different systems that do not allow the direct exchange of data between them, leaving the responsibility for the managers to extract data from the systems and turn them into useful indicators. This makes it difficult to analyse data, especially in wind farms with a great number of wind turbines. The factors that affect the use of performance measurement systems in the operation and maintenance of wind farms are mostly managerial factors. Therefore, the development of a management culture focused on performance improvement and the training of managers in this theme can enable the successful implementation of this type of tool. The implementation of performance measurement in wind farms can enable the achievement of improvements in processes and increase operational efficiency, resulting in generation gains. With this, it is possible to increase the competitiveness of the wind power source compared to other non-renewable energy sources, contributing to the diversification of the national electricity grid.

Biography

Mario González - Graduated in Industrial Engineering from the National University of Engineering in Peru, specialist in Management of Technological Innovation, Open Innovation approach, master and PhD in Production Engineering from the Federal University of São Carlos. Research topics: Product and process innovation in wind and solar power chains. He has published articles with the themes: Open innovation applied in the wind energy supply chain; Impacts for the implementation of wind farms; Technological prospecting for wind power generation; Management of projects in the construction of wind farms and Technological prospecting for photovoltaic cells. Prof. Dr. González is the current editor of Product Magazine of the Brazilian Institute for Innovation and Product Development Management and leader of the Cri-Ação (Creation) research group at UFRN. Marllen Santos - Graduated in Production Engineering from the Federal University of Rio Grande do Norte and Master in Production Engineering at the same institution. She currently develops research focused on the development of the supply chain of the offshore wind energy industry in Brazil. She has published articles with the themes: Performance measurement in the prospecting stage of wind farms; Key Performance Indicators for wind farm's operation and maintenance; Environmental impacts in the installation of wind farms; Wind farm's operation and maintenance: challenges for increasing competitiveness; and Condition monitoring systems in wind farms. She has experience in Integrated Management Systems, Project Management and Performance Management of Wind Farms. MsC. Santos is technical coordinator of the Cri-Ação Research Group.

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