

Physiological and Psychological Influence on Office Workers during Demand Response

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Abstract : In recent years, power system has been changed and flexible power pricing system such as demand response has been sought in Japan. The demand response system is simple in the household sector and the owner, decision-maker, can gain the benefits of power saving. On the other hand, the execution of the demand response in the office building is more complex than household because various people such as owners, building administrators and occupants are involved in making decisions. While the owners benefit from the demand saving, the occupants are forced to be exposed to demand-saved environment certain benefits. One of the reasons is that building systems are usually centralized control and each occupant cannot choose either participate demand response event or not, and contribution of each occupant to demand response is unclear to provide incentives. However, the recent development of IT and building systems enables the personalized control of office environment where each occupant can control the lighting level or temperature around him or herself. Therefore, it can be possible to have a system which each occupant can make a decision of demand response participation in office building. This study investigates the personal behavior upon demand response requests, under the condition where each occupant can adjust their brightness individually in their workspace. Once workers participate in the demand response, their task lights are automatically turned off. The participation rates in the demand response events are compared between four groups which are divided by different motivation, the presence or absence of incentives and the way of participation. The result shows that there are the significant differences of participation rates in demand response event between four groups. The way of participation has a large effect on the participation rate. 'Opt-out' group, where the occupants are automatically enrolled in a demand response event if they don't express non-participation, will have the highest participation rate in the four groups. The incentive has also an effect on the participation rate. This study also reports that the impact of low illumination office environment on the occupants, such as stress or fatigue. The electrocardiogram and the questionnaire are used to investigate the autonomic nervous activity and subjective symptoms about the fatigue of the occupants. There is no big difference between dim workspace during demand response event and bright workspace in autonomic nervous activity and fatigue.

Keywords : demand response, illumination, questionnaire, electrocardiogram

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