Abstract-- **The carbon obligation in power systems can be directly allocated in demand side to avoid the non-transparent processes involving obligation transfer. Due to the interactions and common carbon obligations among the loads, the problem of demand side carbon obligation allocation can be considered from a perspective of cooperative game theory. The Shapley value and the prenucleolus as two classic single-valued solution concepts are utilized as two feasible methods of the problem. Another two feasible methods based on the existing nodal carbon intensity assessment are revisited. Some relevant axioms and requirements are analyzed and discussed, which are used as fundamental criteria to evaluate these feasible methods. Comparatively, the Shapley value based method have some desirable properties that others do not have. With these properties, the interactions of loads and the topology of power network are comprehensively and properly measured, and hence the actual contribution of each load to the carbon emission of the whole system is accurately reflected. Accordingly, the proposed method has a better performance in terms of fairness, reasonability and compatibility, which is tested in two case studies.**