Abstract The presence of uncertain parameters will have significant impact on operation of smart distribution grid (SDG). The risk due to uncertain parameters can be mitigated to an extent utilizing new operational strategies such as demand response (DR). This paper address optimal operation of SDG in presence of DR and uncertainties. Information gap decision theory (IGDT) is adopted to model the uncertainties of renewables and grid electricity prices. The proposed IGDT based operation problem is formulated as a multi-objective optimization to jointly maximize uncertainty horizons of both renewables and grid electricity prices. The multi-objective problem is solved using ϵ-constraint approach. The effect of DR programs in making operation of SDG resistant against uncertain parameters is also investigated. The proposed model is implemented on IEEE-33 bus system and various cases are presented to highlight the efficacy of proposed work.