Brute force practice problem

(Credit to Igor Naverniouk)

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Eskom has adopted a new strategy where they provide electricity to customers via a series of stations. All power flows from Eskom to station S_0 which then delivers to S_1, S_1, etc. Within such a framework they implement load-shedding by asking each station manager to toggle each station's state ON/OFF.

When a station is in the ON state and is receiving power from its input plug, then the station connected to its output socket is receiving power as well. When a load-shedding state change is announced – via some protocol – any station receiving power at the time of the snap toggles between the ON and OFF states.

At the moment, there are N stations that are 'chained' together such that the first one is plugged into the main power socket, the second one into the first station, and so on. We are interested in understanding whether your house, that is plugged into the Nth station, has power at a specific moment.

Initially, all the stations are in the OFF state, so only the first one is receiving power from the socket, and your house does not have power. If load-shedding is announced once, that toggles the first station into the ON state and gives power to the second one. If load-shedding is announced again, which toggles both stations and that then promptly cuts power off from the second one, leaving it in the ON state, but with no power. Load-shedding is announced a third time, which toggles the first station again and gives power to the second one. Now both stations are in the ON state, and if your house is plugged into the second station then it will have power.

Load-shedding will be announced multiple times. Will your house have electricity after load-shedding is announced K times? Your house will have electricity if and only if it's receiving power from the station that it's plugged into.