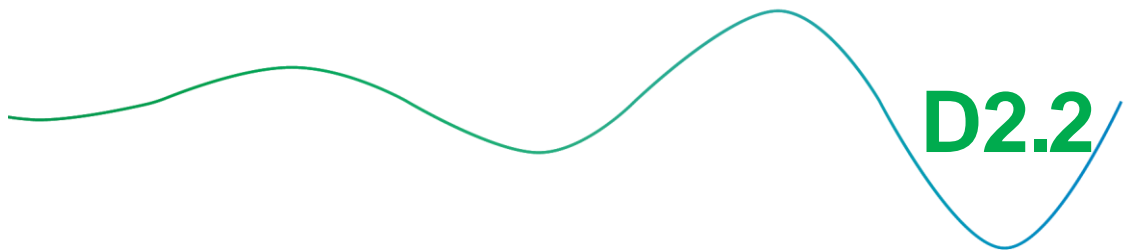


DREAM-GO



Support Document to Deliverable D2.2 - v1

Demand Response Registration Digital (D2RD) framework for DR programs and models, including the short and real-time DR models conceived and developed in the scope of DREAM-GO – Mid-term release



Deliverable



Horizon 2020
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for Research & Innovation



Demand Response Registration Digital

This document has the purpose of supporting the Demand Response Registration Digital (D2RD) framework for DR programs and models, including the short and real-time DR models conceived and developed in the scope of DREAM-GO, which is envisaged in Task 2.3, and the output of D2.2. This demand response registration framework is being developed so that it is able to include the short and real-time demand response programs and models conceived and developed in the scope of the project. It is noteworthy that the final release of this deliverable will be provided in month 44, as result of the extensive length of Task 2.3, which is important to support the project execution and the outcomes of the subsequent work packages with a strong conception and modelling approach provided by this task. It is also important because it allows considering the feedback from the simulation and experimental studies in the models resulting from the project and the incorporation in the D2RD framework of the most updated and adequate models. For this reason, the version of the framework presented in this document is, despite already very complete, still a preliminary version, which will be subjected to several updates and extensions along the project execution.

The developed framework presents an interface between the user and the demand response programs implemented in the scope of DREAM-GO. The different programs that are included result from partners' experience, by the state of the art concerning smart grid and electricity markets, and by their expected and envisaged evolution. The program and model conception is based on the definition of a set of characteristics that are used to characterize the demand response programs. For each identified characteristic, a range or a set of possible assigned values are identified. This supports the subsequent conception and development of the demand response programs and models, which are classified in a number of types according to the set of characteristics they present.

The demand response programs are modelled considering the participating entities (ISOs, curtailment service providers, and aggregators, including VPPs – Virtual Power Players, and consumers of several types); the ways that can be used for their interaction in short and real-time DR events and the required technologic means; and DR contracts and consumer remuneration methodologies.

The framework described in this deliverable is directed to the consumers, enabling them to register their expected consumption, flexibility and envisaged incentive prices for each moment, so that this information can be used by the entities managing the demand response application and consumption flexibility by using the demand response programs conceived and developed in the scope of the project. Figure 1 presents an overview of this interaction.

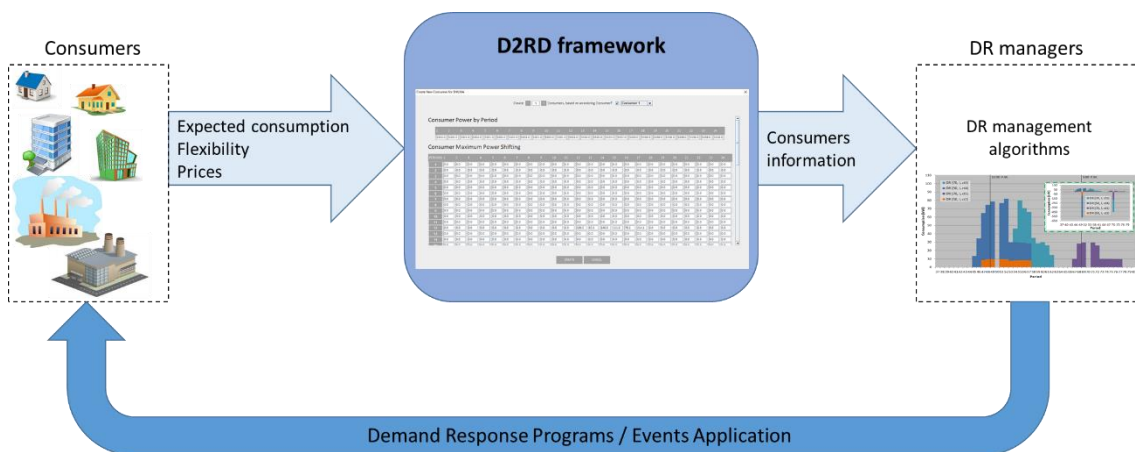


Figure 1. Consumers D2RD framework overview.

From Figure 1 it is visible that, through the D2RD framework, consumers are able to register their information so that the entities responsible for managing the demand response and consumption flexibility can process it and achieve the required decisions. The information that consumers are able to register is based on the consumers' needs and desires, and also depend on the data that is required by the different algorithms themselves.

Figure 2 shows the main registration interface page, which allows creating new registers for consumers and also edit existing ones.

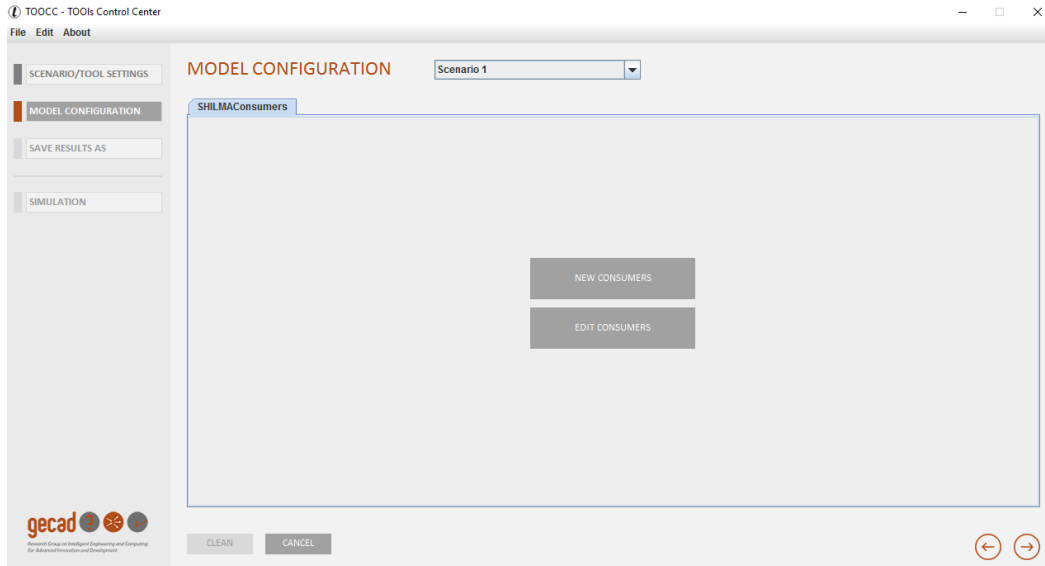


Figure 2. Main registration interface page

The registration of new consumers can be built from scratch, or can be based on existing ones, in order to facilitate the introduction of values, especially in cases when the required information is extensive. It is also possible to edit existing registers in order to update the current values. Figure 3 shows an interface that allows consumers to introduce their expected consumption for the 24 hours of the following day, as well as making available the consumer flexibility. In this case, this flexibility refers to the availability in shifting consumption from and to different periods of the day.

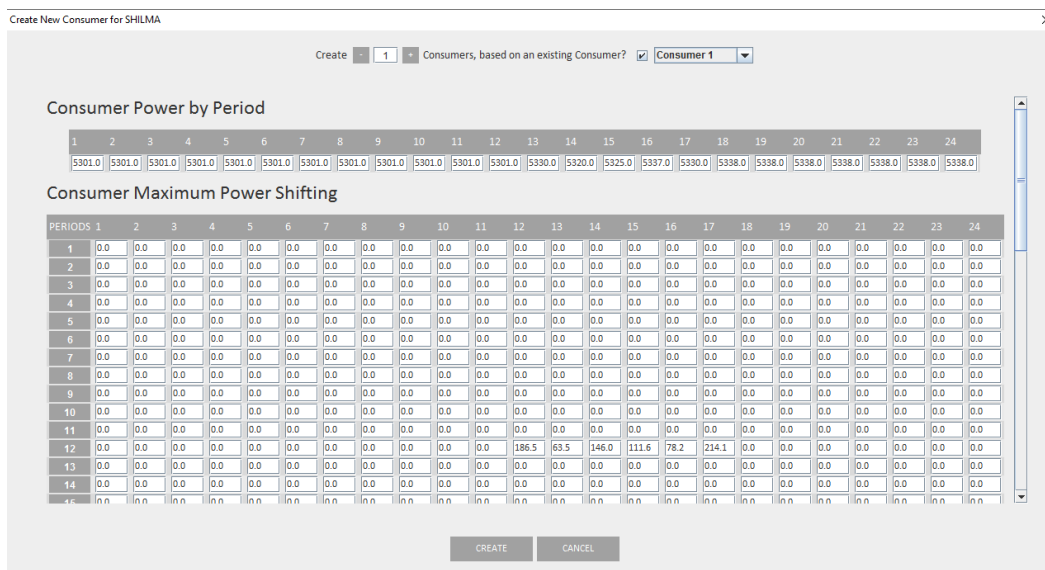


Figure 3. Consumers registration of expected consumption and consumption shifting availability

Figure 3 shows that consumers are able to register their 24 expected hourly consumption values, and also their flexibility for shifting consumption from each hour to any other hour of the following day.

Figure 4 shows another excerpt of this interface, which enables consumers to define their envisaged prices for using such shifting flexibility.

The screenshot shows a software interface titled "Create New Consumer for SHILMA". At the top, there are controls for "Create" (set to 1), a checkbox "Consumers, based on an existing Consumer?" (checked), and a dropdown menu "Consumer 1". Below this is a large grid of 24 rows (hours) and 24 columns (shift periods). Each cell in the grid contains the value "0.0". Below the grid is a section titled "Consumer Power Cost Shifting" with a sub-grid of 9 rows (periods) and 24 columns. Each cell in this sub-grid contains the value "3.0". At the bottom of the interface are "CREATE" and "CANCEL" buttons.

Figure 4. Consumers registration of prices for using the consumption shifting flexibility

From Figure 4 it is visible that consumers can define a different cost for actually shifting their indicated consumption from one period to another. The defined prices can be specified for each possible consumption shift, in a way that these reflect the shifting influence on the consumer’s comfort. The values registered by consumers that are shown in Figure 3 and Figure 4 enable aggregators and/or demand response application managers to execute algorithms that manage consumers shifting possibilities.

Figure 5 shows another registration interface, which is directed to consumers’ registration of their flexibility for energy reduction/increase at each moment. In this case the flexibility does not refer to the availability of changing consumption to other periods of the day, rather the flexibility of actually decreasing or increasing their consumption at each moment.

The screenshot shows a software interface titled "TOOCC - TOOLS Control Center". It has a menu bar (File, Edit, About) and a "MODEL CONFIGURATION" section with a dropdown menu set to "Scenario 1". Below this is a section titled "Create New Consumer for MaxSoRP" with controls for "Create" (set to 1), a checkbox "Consumers, based on an existing Consumer?" (checked), and a dropdown menu "Consumer 1" with a list of options: Consumer 1, Consumer 2, Consumer 3, Consumer 4, Consumer 5, and Consumer 6. Below this is a table titled "Values by Period" with 2 columns (1 and 2) and 6 rows (Consumption, Elasticity, Initial Cost, Max Load Increase, Max Price Increase). The table contains numerical values for each cell. At the bottom are "CREATE" and "CANCEL" buttons, and a footer with the "gecad" logo and navigation arrows.

Feature	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Consumption	434.6644	421.4081	419.9404	413.2416	408.1611	396.6265	396.0715	384.5839	378.2239	373.8772	374.8086	373.6702	365.4662	368.1758	363.6974	361.9663	356.9987	360.6209	358.4005	358.4005
Elasticity	0.530000	0.530000	0.530000	0.530000	0.530000	0.530000	0.530000	0.530000	0.530000	0.530000	0.530000	0.530000	0.530000	0.530000	0.530000	0.530000	0.530000	0.530000	0.530000	0.530000
Initial Cost	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0
Max Load Increase	23.25757	36.22727	38.44929	46.40666	52.04857	63.36458	63.12028	74.49772	80.39141	85.31785	86.52226	88.31985	95.65978	92.46422	96.30439	98.95348	104.8131	101.8433	105.1186	105.1186
Max Price Increase	6.057391	9.732135	10.36516	12.71310	14.43618	18.08590	18.04142	21.92942	24.06224	25.83367	26.13326	26.75747	29.63176	28.43111	29.97652	30.94840	33.23721	31.97107	33.20371	33.20371

Figure 5. Consumers registration of flexibility for consumption reduction and increase

Figure 5 shows that consumers can define their consumption elasticity for each hour of the considered day, which is a value that represents the expected variation of the consumption according to the energy price. This means that when the price increases the consumption is expected to decrease, and when the price decreases, the consumption is expected to increase. The maximum consumption increase and decrease can be specified by the consumer, as well as the corresponding prices. This type of information can be used by aggregators and demand response managers to execute algorithms that manage the demand response at each specific moment, considering variations in the energy price.

The D2RD framework thus enables consumers to register their flexibility, their expected consumption, and their envisaged costs for using such flexibility. This is important information that can be managed by different entities, in specific for each consumer or as a set by aggregating the information from different consumers. Until the final release of this deliverable in month 44, and using the work still to be done in Task 2.3, the D2RD framework will be constantly updated and extended in order to enable the collection of the data that is relevant from both the perspective of the consumer and of the aggregator and demand response manager entities.