Transición energética en la 4ta revolución industrial
Demand Response Program Implementation Methodology: A Colombian Study Case

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Colombia Inteligente
Contents

I. Introduction

II. Reference framework

III. Proposed methodology

IV. Study case

V. Recommendations

VI. Questions
I. Introduction

Comprehensive Climate Change Plan for the energy mining sector – PIGCCme- formulated by the Ministry of Mines and Energy.

2 MtCO2e (18%)

Source: MINENERGÍA
II. Reference framework

1. Demand respond program
   - Availability for disconnection
   - Hourly period
   - 2 MW
   - 20 MW
   - 76 MW
   - 1.3% of the hourly demand
   - 1% of the daily national demand

2. Turn-off Pay program
   - This program has only worked once
   - Monthly period
   - Savings by GWh-2016
   - +530 GWh

3. Voluntary Disconnectable Demand
   - VDD not committed in bilateral contracts
   - Availability
   - GWh-Day 2020
   - [5.9 – 11.5]
   - [246 – 480] MW

DR programs are only used when a critical condition is present in the power system

Source: XM
II. Reference framework

Demand respond → Active users!
Reduction or displacement of electrical energy consumption generated by incentives or others

1. ToU Program
2. Direct load control program
3. Demand bid program

Resource integration schemes: Microgrids / VPP / Energy Communities
II. Reference framework

Stages and components of a DR program

- Formulation
  - Type of program
  - Attributes and requirements
  - Architecture

- Characterization and monitoring
  - Consumption Patterns
  - Consumption Baseline
  - Data reporting

- Evaluation
  - Methodology and indicators
  - Performance indicators
  - Risk analysis

Aspects for empowering the active user of DR programs

- Communication strategies
  - Messages, channels
- User information
  - Socialize benefits
- Development strategies
  - User segmentation
- User Preferences
  - Apply tools
III. Proposed methodology

Regulatory feasibility
Actors and roles
Implementation potential
Development phases

DR program design
- Characterization of consumption
- Roles and responsibilities
- Attributes of the RD program
- DR promotion strategy

DR pilot operation
- Better practices
- Activities diagram
- Activities list

DR pilot assessment
- Indicators of performance
- Activity tracking

Installation & Execution
- Skills and capabilities
- Infrastructure and equipment
- Valuation of benefits
- Cost valuation

Evaluation

Planning
- Coverage of public services
- User characteristics
- Experiences social programs
- Technological programs experiences
- Potential sustainability
- Potential energy culture

Location analysis
- Methodology
- Selection criteria

Gathering information
IV. Study case

Experiences:
1. Increased demand
2. Reliability risk in power supply
3. AMI pilot

Experiences:
1. Load management services
2. AMI implementation
3. User knowledge projects

Analysis of the pilot location of the DR program

- DR pilot analysis at the NIS
  - Utility infrastructure (energy, water, sewerage)
  - Strata ≤ 3 and AMI subscribers
- Previous technology projects?
  - Previous social projects?
    - Yes, Load curve potential
      - Yes, List of potential DR pilots
      - No, Discarded as a possible pilot
    - Yes, Sustainability potential > X
      - No, Load curve potential
      - No, Discarded as a possible pilot
    - No, Discarded as a possible pilot
IV. Study case

Main consumption profiles in Colombia

Relationships between consumption, tariff, and Delta DR
# IV. Study case

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<th>Type</th>
<th>Benefit [unit] &amp; Economic valuation</th>
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<td>Decrease in the number of interruptions [times/year]</td>
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<td>Decrease in consumption during peak hours [GWh]</td>
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<td>Decrease in fuel consumption [GWh]</td>
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**CAPEX + OPEX**

- Telecommunication equipment and data plan
- Information platform - desktop/mobile -
- DR Program Management - DR Team
- Communication and training plan
- Monitoring plan
- Incentives
- DR program total cost
### IV. Study case

#### Pilot Benefits [Millions COP] Costs [Millions COP]

| Zone 1 | $684 | $553 |
| Zone 2 | $559 | $463 |
| Zone 3 | $306 | $269 |

#### Number of users participation sensitivity

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#### Demand response sensitivity

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V. Recommendations

- Aspects such as willingness to change, price-demand elasticity, and impact of price variations must be evaluated in the execution of the pilot.
- Mechanisms that encourage the active participation of users in DR programs must be deepen considering aspects such as knowledge of preferences related to DR programs, identification, segmentation, and the type and quality of the information transmitted.
- The promotion strategies of DR programs must allow for continuous interaction between the users and the company offering the program.
- The selection of the strategy must be based on the characterization and segmentation of the users.
- The consumption baseline must be constructed considering quality, accuracy, completeness, simplicity, and alignment.
- The stakeholders involved in the development of the pilot must be defined.
- The simulation of the DR pilot evidenced the potential for energy reduction and displacement in different time bands for each zone. This allows determining the assessment of the benefits from a technical, financial, and environmental point of view.
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Q&A