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Subject: Input to Use Case and Architecture discussion for the 7th Framework project EcoGrid EU Task 1.7 as discussed in teleconference on 18.11.2011 13:00-1400
Use Case - Retail Real-Time Market with automatic price reaction
Use Case - Retail Real-Time Market with residential manual-reaction
Sequence Diagram - RTM with automatic price reaction
Sequence Diagram - RTM with residential manual price reaction
Physical View - RTM with automatic price reaction
Physical View - RTM with residential manual price reaction

1. Introduction

This document gives discussion input on the use cases *retail RTM with auto-price-reaction* and *retail RTM with manual-reaction (residential CP)* as discussed in the face-to-face meeting on the 2nd November 2011 in Amsterdam. It is targeted for Task 1.7 of WP1 of the 7th Framework Program EU project EcoGrid EU.

Roles, use case format, quality and security requirements are based on the draft of the deliverable D1.7.

2. **Use Cases**

2.1. **Retail Real-Time Market with automatic price reaction**

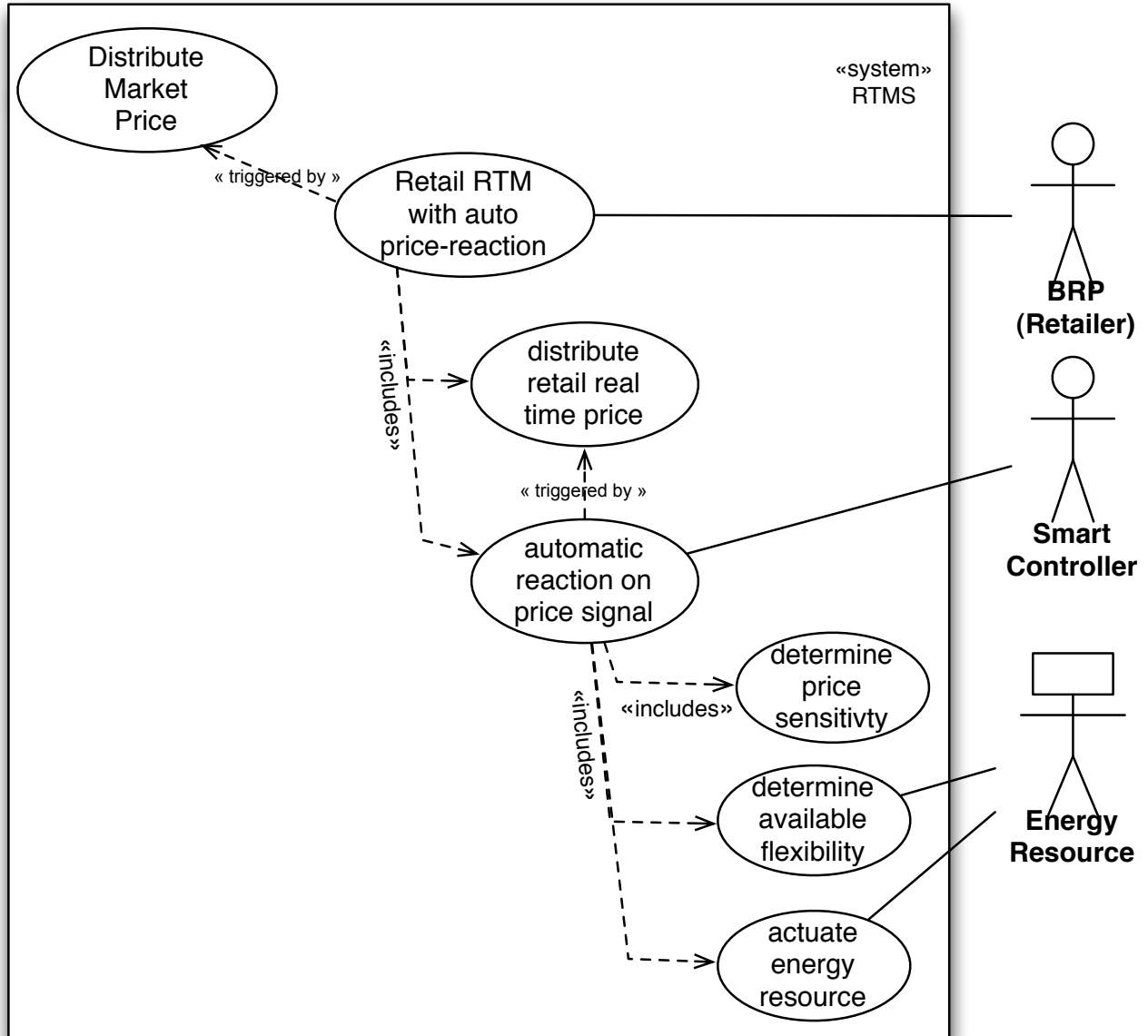## 2.1.1. **Graphical Overview**

2.1.1.1. **Domain Model**

The figure below shows the Domain Model from 3.2.2 of the EcoGrid Real-Time Market applied to a Real-Time Market from the TSO down to a single household with one or more controllable energy resources. It uses the EcoGrid Real-Time Market model in a recursive way to allow the BRP in form of a Retailer to attach the necessary price components on the whole sale level Real-Time Market price to form a complete end customer price. The two Domain Models show the two available options, automatic response by a smart controller and manual response by a CP Owner.
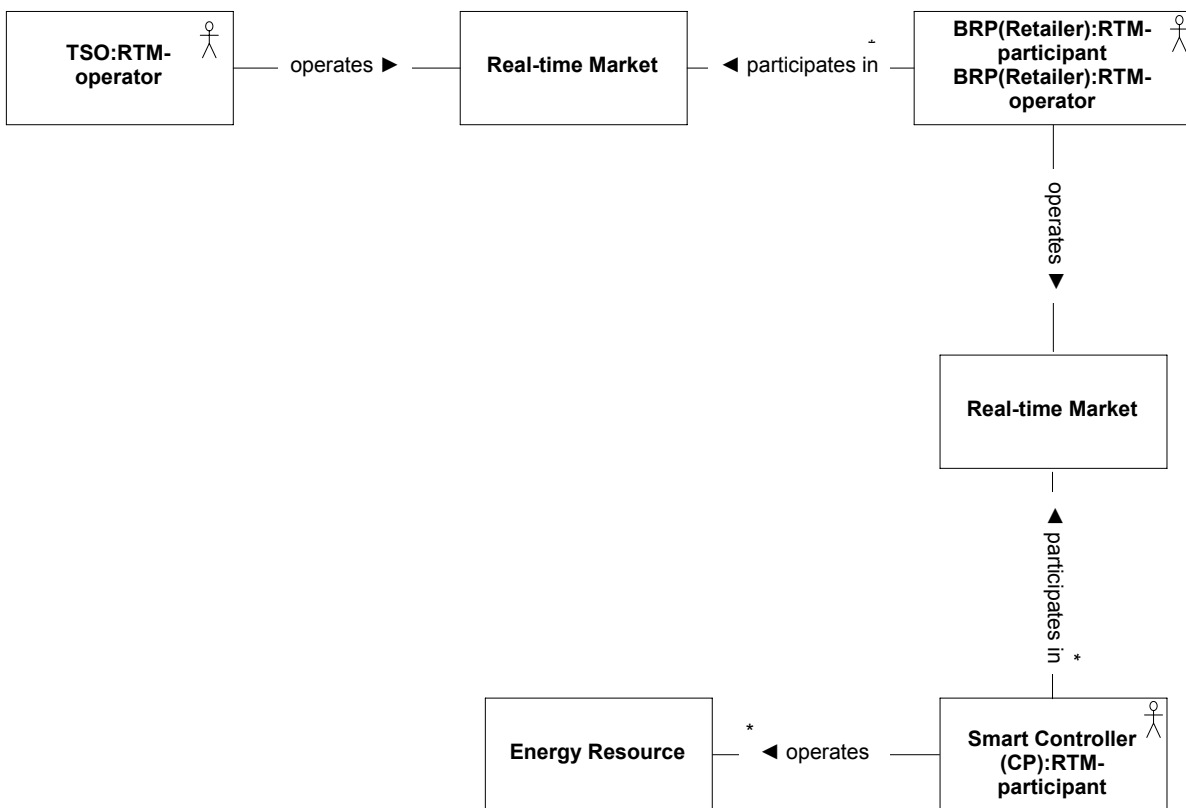
| Smart Controller | A Smart Controller controls the available energy resource depending on the input price given of the real time market |
| Energy Resource | A by the Smart Controller controllable energy resource (load/generation) |

2.1.1.2. **Use Case**

2.1.2. **Textual description**

Retail Real-Time Market with automatic price reaction	
Involved Actors	BRP as RTMP and RTMO (e.g.Retailer), Smart Controller as RTMP
Preconditions	The BRP (Retailer) received a whole sale real time price for the next time period from the TSO
Trigger	distribute market price (as in 3.4.2.5 Operate)
Success Condition	An adjusted consumption profile implemented by the Energy Resources within the available flexibility and in correlation to the given price sensitivity to fulfill the Transmission System Operators needs
Quality Requirements	Efficiency / Time Behavior Reliability / Fault Tolerance
Scenario	1. The BRP (Retailer) receives a new whole sale price signal ahead of the actual slot starting time 2. The BRP (Retailer) adds all necessary components to the wholesale price (e.g. taxes) *3. distribute retail real time price* *4. automatic reaction on price signal*

sub use case - distribute retail real time price	
Involved Actors	BRP as RTMO(Retailer) Smart Controller as RTMP
Preconditions	retail real time price price-calculation finished
Trigger	retail real time price price-calculation finished
Success Condition	price signal sent to the Smart Controller
Quality Requirements	Efficiency / Time Behavior Security / Integrity Security / Authenticity - the price must be from the correct entity Security / Non-Repudiation - the publisher must not be able to challenge its statement
Scenario	1. Retailer digitally signs the price telegram 2. the Smart Controller receives the price telegram 3. the Smart Controller proves the authenticity and integrity of the price telegram 4. the Smart Controller latches the price telegram for until *automatic reaction on price signal*

sub use case - automatic reaction on price signal	
Involved Actors	BRP as RTMO (Retailer), Smart Controller as RTMP
Preconditions	retail real time market price received
Trigger	sub use case - distribute retail real time price
Success Condition	An adjusted consumption profile implemented by the Energy Resources within the available flexibility to fulfill the BRP needs
Quality Requirements	Efficiency / Time Behavior Reliability / Fault Tolerance
Scenario	1. read delivered price for this 5 minute slot from Retailer 2. *determine the available flexibility* 3. *determine price sensitivity* 4. down select the Energy Resources to control 5. *actuate energy resources*

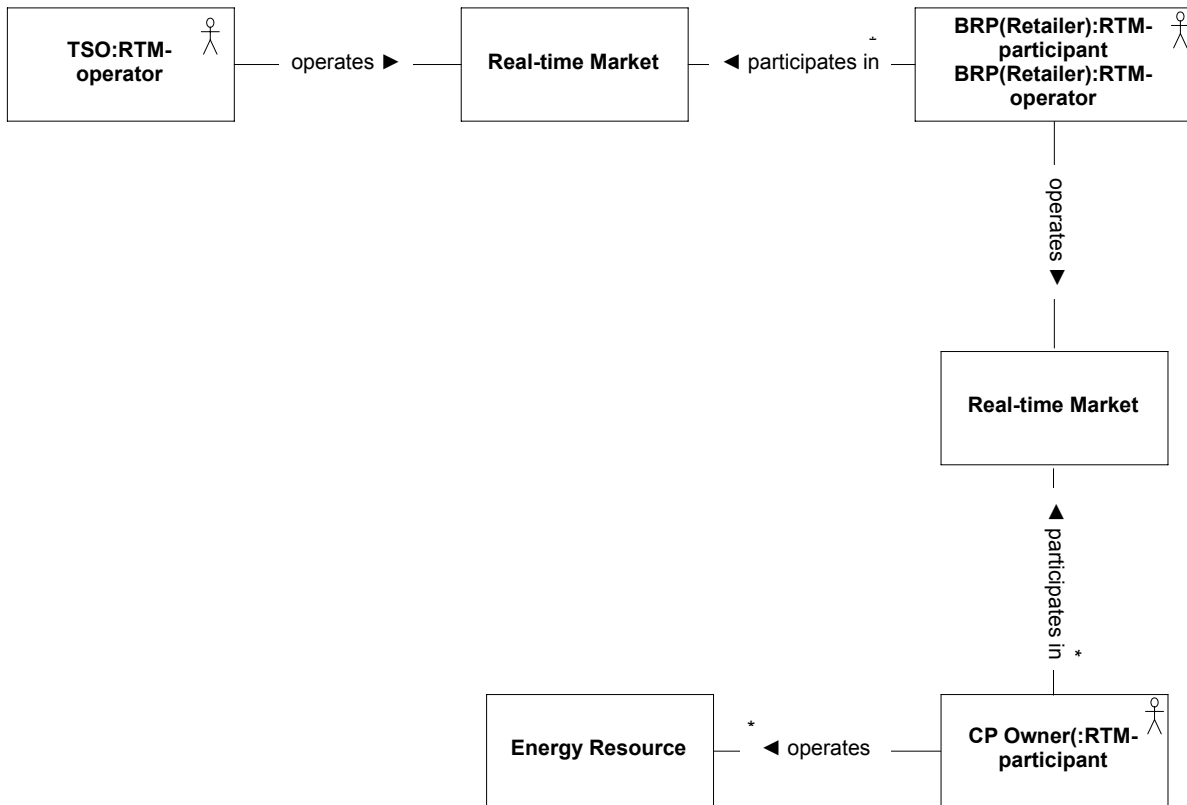| sub use case - determine available flexibility	
Involved Actors	Energy Resource
Preconditions	target set point set in energy resource
Trigger	automatic reaction on price signal
Success Condition	An flexibility plan for the next 5 minute periods
Quality Requirements	Efficiency / Time Behavior Reliability / Fault Tolerance
Scenario	1. read the current state of the energy resource 2. predict the state in the future 3. create a flexibility plan 4. deliver flexibility plan

sub use case - determine price sensitivity	
Involved Actors	Energy Resource
Preconditions	determination of available flexibility completed, price sensitivity set for Energy Resource
Trigger	automatic reaction on price signal
Success Condition	a plan of price sensitivity for this Energy Resource
Quality Requirements	Efficiency / Time Behavior Reliability / Fault Tolerance
Scenario	1. read the available flexibility plan 2. read the price thresholds for the Energy Resource 3. create create price flexibility plan 4. deliver the price flexibility plan

sub use case - actuate energy resources	
Involved Actors	Energy Resource
Preconditions	down selected the Energy Resources to Control
Trigger	automatic reaction on price signal
Success Condition	Acknowledgment of the Energy Resource to control
Quality Requirements	Efficiency / Time Behavior Reliability / Fault Tolerance
Scenario	1. send the control signal 2. wait for acknowledgement 3. finish control transaction

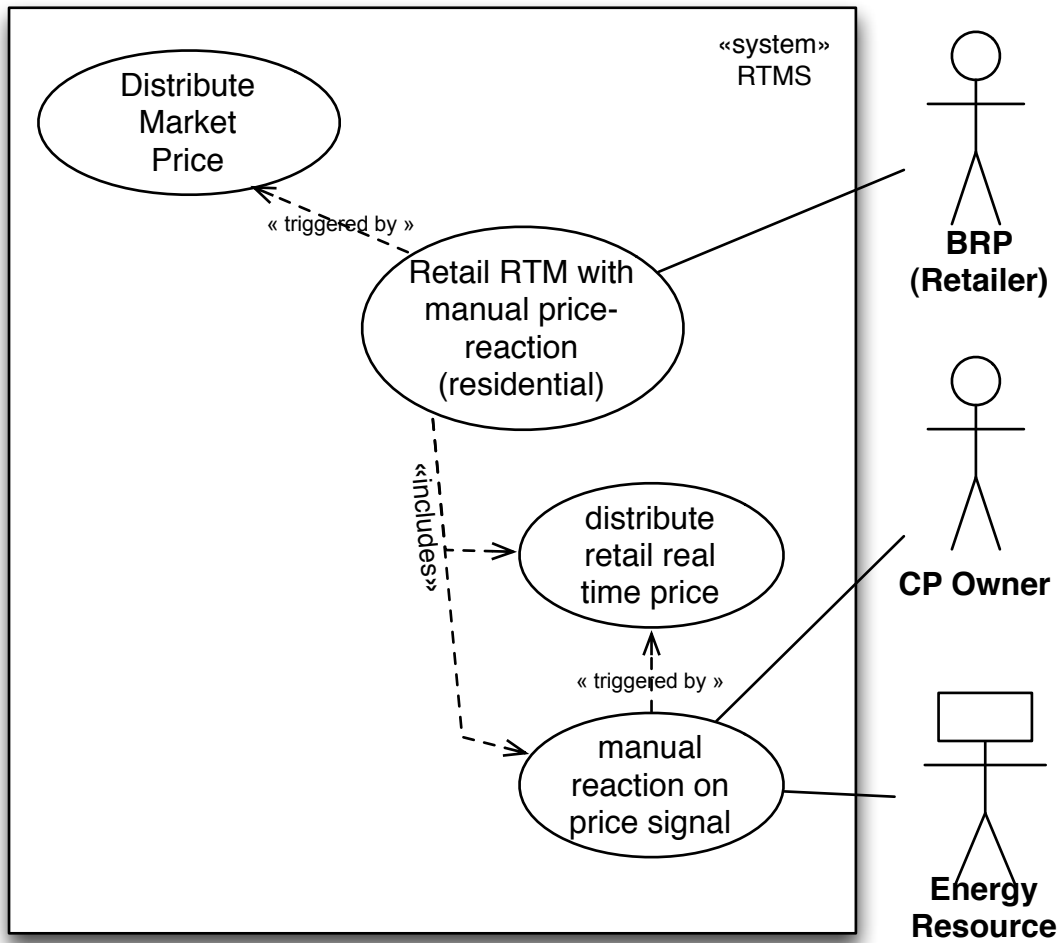## 2.2. Retail RTM with manual-reaction (Residential CP)

2.2.1. Graphical Overview

2.2.1.1. Domain Model

| TSO:RTM-operator | —operates ▶— | Real-time Market | —◀ participates in— | BRP(Retailer):RTM-participant BRP(Retailer):RTM-operator |

operates ▼

Real-time Market

▲ participates in *

| Energy Resource | * ◀ operates | CP Owner(:RTM-participant |

CP Owner	A human in charge of controlling the energy resources to its needs depending on the given Real Time Market input price.

2.2.1.2. Use Case

2.2.2. Textual Description

| Retail Level – Real-time Market with residential manual price reaction	
Involved Actors	BRP as RTMP and RTMO (Retailer) CP Owner as RTMP
Preconditions	The BRP (Retailer) received a whole sale real time price for the next time period from the TSO
Trigger	distribute market price (as in 3.4.2.5 Operate)
Success Condition	price signal received by the RTM participant
Quality Requirements	Efficiency / Time Behavior
Scenario	1. The BRP (Retailer) receives a new whole sale price signal ahead of the actual slot starting time 2. The BRP (Retailer) adds all necessary components to the wholesale price (e.g. taxes) 3. *distribute retail real time price* 4. *manual reaction on price signal*

| sub use case - distribute retail real time price	
Involved Actors	BRP as RTMO (Retailer) CP Owner as RTMP
Preconditions	retail real time price price-calculation finished
Trigger	retail real time price price-calculation finished
Success Condition	price signal sent to the CP Owner
Quality Requirements	Efficiency / Time Behavior Security / Integrity Security / Authenticity - the price must be from the correct entity Security / Non-Repudiation - the publisher must not be able to challenge its statement
Scenario	1. BRP(Retailer) digitally signs the price telegram 2. the CP Owner receives the price telegram 3. the CP Owner proves the authenticity and integrity of the price telegram 4. the CP Owner latches the price telegram for until *manual reaction on price signal*
sub use case - manual reaction on price signal	

Involved Actors	CP Owner
Preconditions	retail real time market price received
Trigger	retail real time market price received
Success Condition	price signal sent to the CP Owner
Quality Requirements	Efficiency / Time Behavior
Scenario	1. The CP Owner reads the price signal 2. The CP Owner decides on reaction to the price signal

3.Sequence Diagram updates

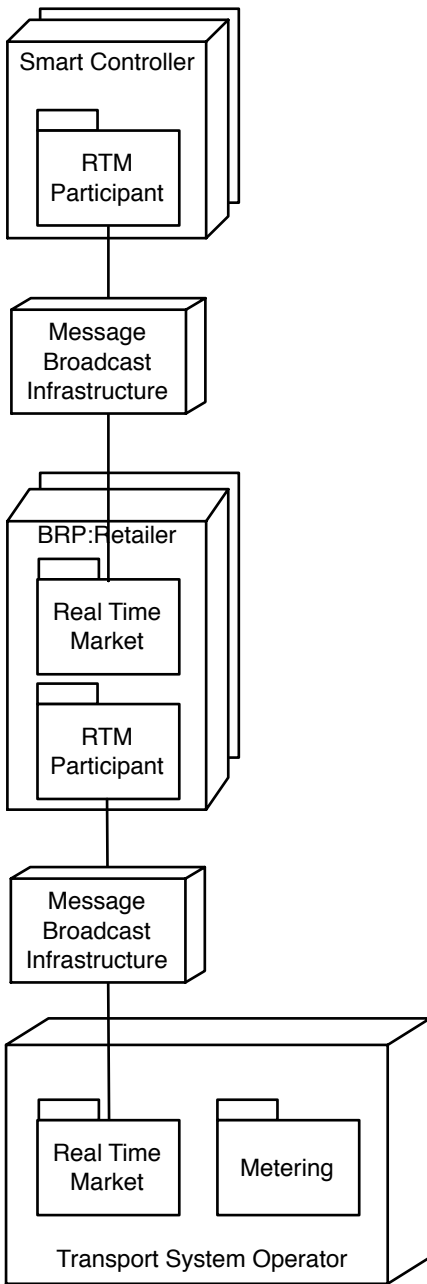## 3.1. RTM with automatic price reaction
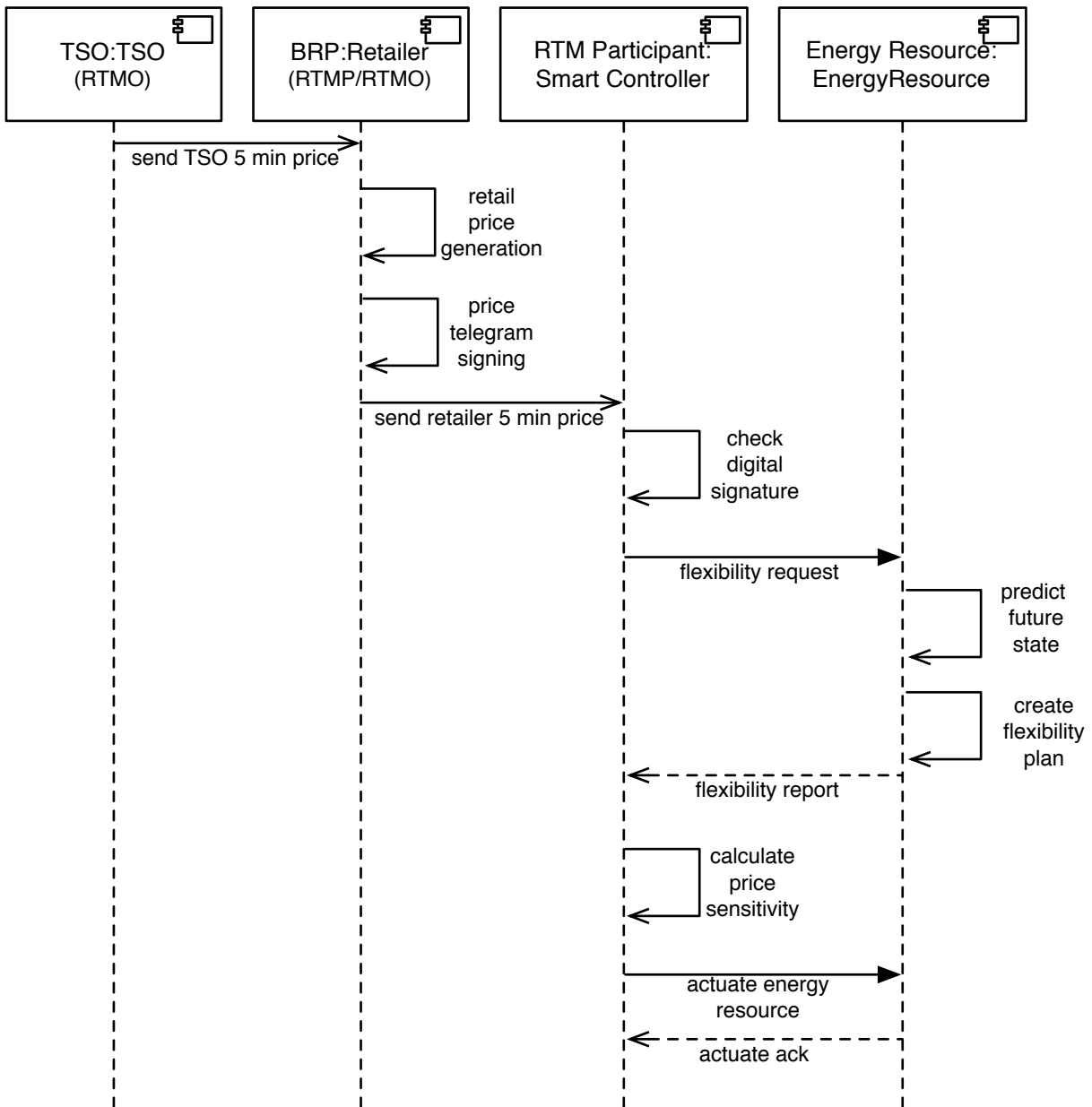
3.2. RTM with residential manual price reaction
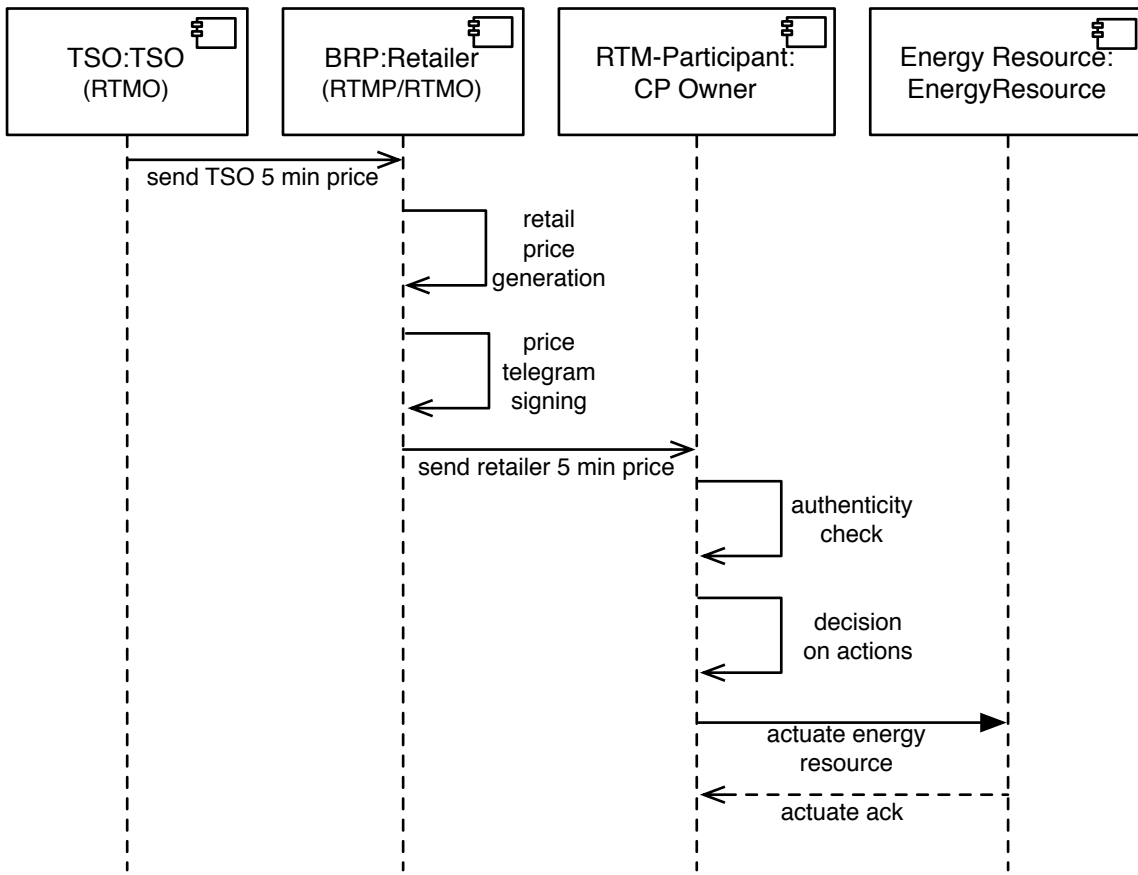
4. Physical View

4.1. RTM with residential automatic price reaction

4.2. RTM with residential automatic price reaction

CP Owner

RTM
Participant

Message
Broadcast
Infrastructure

BRP:Retailer

Real Time
Market

RTM
Participant

Message
Broadcast
Infrastructure

Real Time
Market

Metering

Transport System Operator