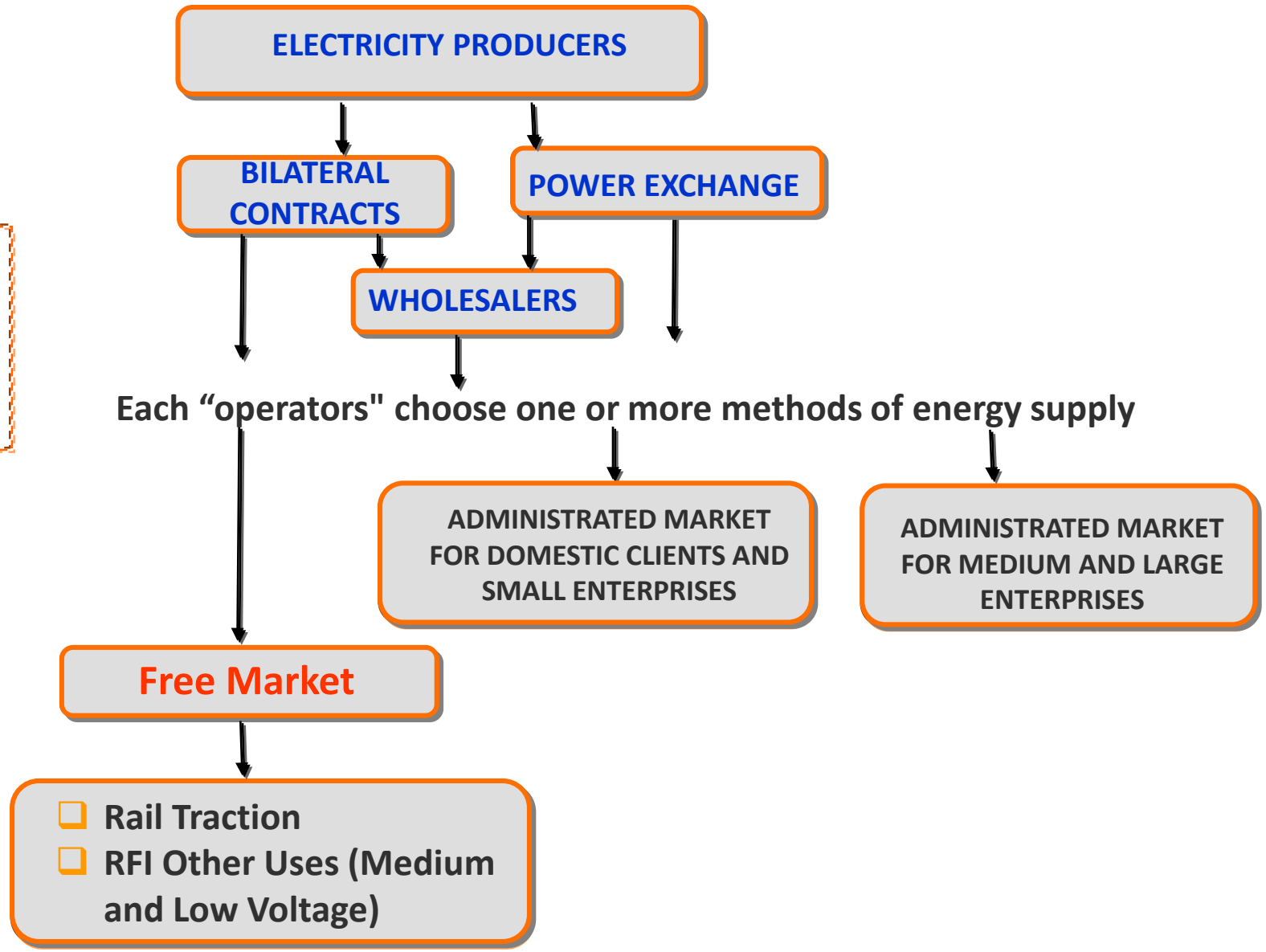
# Purchasing Railway Energy in Italy

**ERESS FORUM 2018**
***Rome***

RFI
RETE FERROVIARIA ITALIANA
GRUPPO FERROVIE DELLO STATO ITALIANE

# RFI in the Italian Power Exchange (GME)

*RFI buys energy for rail traction and otther uses directly on the Italian Power Exchange in the Day Ahead Market.*

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# The Italian Power Exchange (Day-Ahead Market) - GME

- Italy is divided into 6 electrical zones: North, North / Center, South / Center, South, Sardinia and Sicily.
- Every day (within 9 o'clock) for each electric zone and for every hour the producers / buyers enter their offers / requests for the following day.
- For each electricity zone and for each hour of the day the GME sets the price at which demand and supply are equal (auction with award at the marginal price).

Operating in the Day-Ahead Market means that RFI has to set the following forecasts:

***Rail Traction Energy***

- **24h * 5 electrical zones (no Sardinia) for a total of 120 consumption forecasts**

***RFI Uses***

- **24h * 6 Electrical Zones for a total of 144 consumption forecasts**

**a total of 264 daily consumption forecasts**

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# Actual Consumption of Electricity on the Italian Power Exchange

RFI's energy is so available on the Power Exchange at the efficient price determined by the intersection between demand and supply. But this is no free….

The **Unbalance Risk Problem**:

1. The actual hourly consumption obviously differs from the energy purchased on the Power Exchange.
2. The difference between these amount of energy is called **Unbalance**.
3. If the actual consumption is higher than the available energy, the Grid Operator (Terna) has the mandate to find the surplus of t required energy.
4. If the actual consumption is less than the available energy, the Grid Operator (Terna) has the mandate to sell or not produce energy which is no longer required.
5. Such differences are economically set by Terna at prices defined by applying the Energy Authority Resolutions (ARERA).

**Consequences**:

The difference between the price of the unbalanced energy and the Power Exchange price determines an extra price which is negative in most of the cases.

It follows the importance of accurate forecasts so as to reduce what I call the **Unbalance at Risk**.

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# Daily Consumption Forecasting

The current forecasting process is based on **two different forecasts**: **Railway Traction** and **RFI Uses**.

- The **Railway Traction** model is based on an univariate econometric model where the independent variable is represented by electric trains*km: the model produces monthly purchase plans for each electrical zone on the basis of the planned rail circulation. The monthly purchase plan is sent to the Power Exchange (Monthly Purchase Plan).
- In case of a variation of the planned rail circulation, the system updates the energy forecast for that day (Daily Purchase Plan). The new forecast is sent to the Power Exchange within the time limits allowed by the energy market.
- A control procedure is applied to remove the anomalous data from the sample (outliers), i.e. observations that does not fall within the confidence intervals previously defined.

- For **Medium and Low Voltage** (RFI Uses) a simple moving average model is used. The model produces monthly purchase plans for each electrical zone. For that month, the average is calculated on the month of the previous year by type of day (Monday-Friday, Saturday, Sunday and holidays). The monthly purchase plan is sent to the Power Exchange.
- A control procedure is applied to remove the anomalous data from the sample, i.e. observations that does not fall within the confidence intervals previously defined.

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# RFI Energy Program

- The increasing level of technical / regulatory complexity and the amount of data and information to be processed has implied a radical revision of the IT systems supporting the RFI electricity purchasing process on the energy free market.
- The RFI Energy Program represents the set of projects and development plans to support the operations of the Electricity Supply and Utilities Management structure of the Production Department of RFI.
- Each action therefore incorporates the internal development needs (management of the purchasing process) accordingly to the constraints and technical specifications required by a continuously evolving market.

Shortly, the main goals can be summarized as follows:

1. Optimization and continuous improvement of the forecasting / planning process on the electricity market;
2. Implementation of new systems to support the process of attribution and reporting of traction energy consumption to Rail Undertakings;
3. Monitoring of measurement data to reduce metering errors and improve the settlement process of the market;
4. Correct acquisition of invoices in the accounting systems and related cost controlling;
5. Timely provision of information to inner and outer stakeholders involved in the procurement process.

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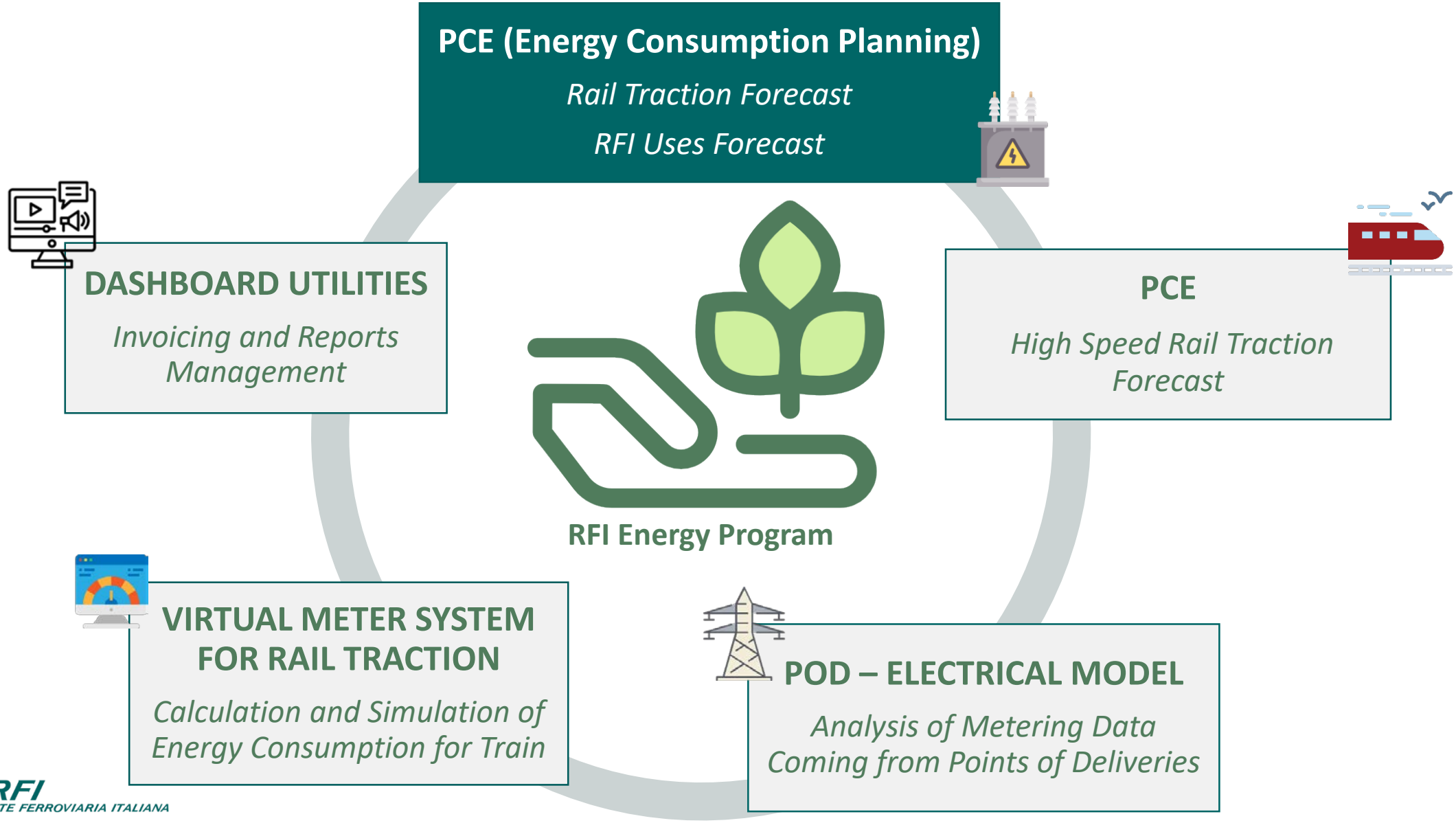
# RFI Energy Program

## Overview of the current initiatives

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# RFI Energy Program: a Process Overview

**PURCHASING ON THE ITALIAN ELECTRICITY MARKET**

**ACTIVE MANAGEMENT**

**FORECSTING AND PLANNING** → **PURCHASING ON THE MARKET** → **MONITORING** → **REPORTING AND BILLING** → **RISK MANAGEMENT** → **PORTFOLIO OPTIMIZATION** → **TRADING**

**PCE (Planning Energy Consumption)**

***Rail Traction Forecast***

***RFI Uses Forecast***

**ELECTRICAL MODEL (POD)**

*Analysis of Metering Data*

**DASHBOARD UTILITIES**

***Invoicing and Reports Management***

**PCE(Planning Energy Consumption)**

***High Speed Rail Traction Forecast***

**VIRTUAL METER SYSTEM FOR RAIL TRACTION**

*Simulation of Energy Consumption for Single Train*

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# THANK YOU
# FOR YOUR ATTENTION

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