Towards a Steeper Learning Curve with the CrocodileAgent 2012
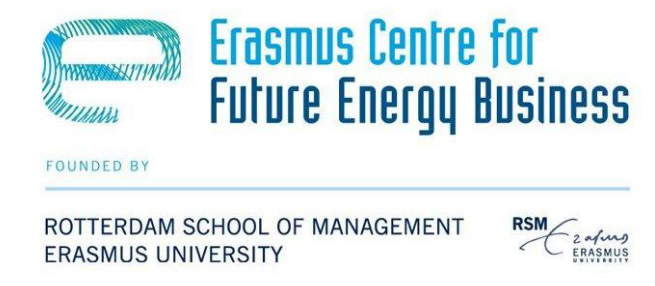
TAC

Trading Agent Competition

The Trading Agent Competition (TAC) is an international forum which promotes high quality research regarding the trading agent problem
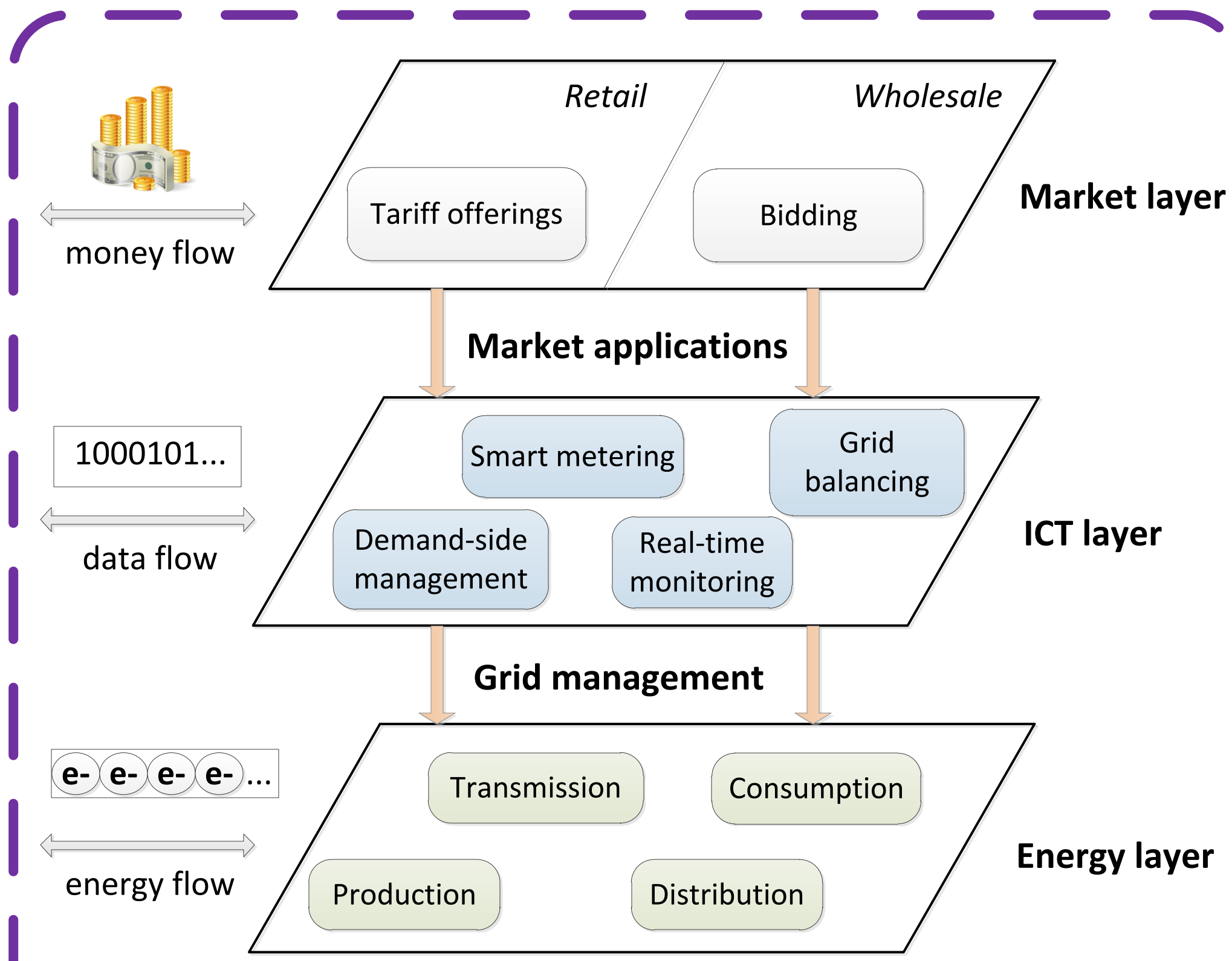
University of Zagreb, Croatia

Faculty of Electrical Engineering and Computing

FER

Erasmus Centre for Future Energy Business

ROTTERDAM SCHOOL OF MANAGEMENT
ERASMUS UNIVERSITY

**Erasmus Energy Forum
Reinventing the energy landscape:
Shaping a future sustainable retail energy business**

**Rotterdam, The Netherlands
15 June 2012**

Jurica Babic, Sinisa Matetic, Marin Matijas, Ivo Buljevic, Ivana Pranjic, Marija Mijic, Mia Augustinovic, Ana Petric, Vedran Podobnik

I

The **CrocodileAgent 2012** is our agent that participates in Power TAC 2012. Its chief advantage is its active tariff offering adjustment. It consists of three main modules:
- Tariff Manager;
- Market Manager; and
- Forecast Manager.

Maximizing profit
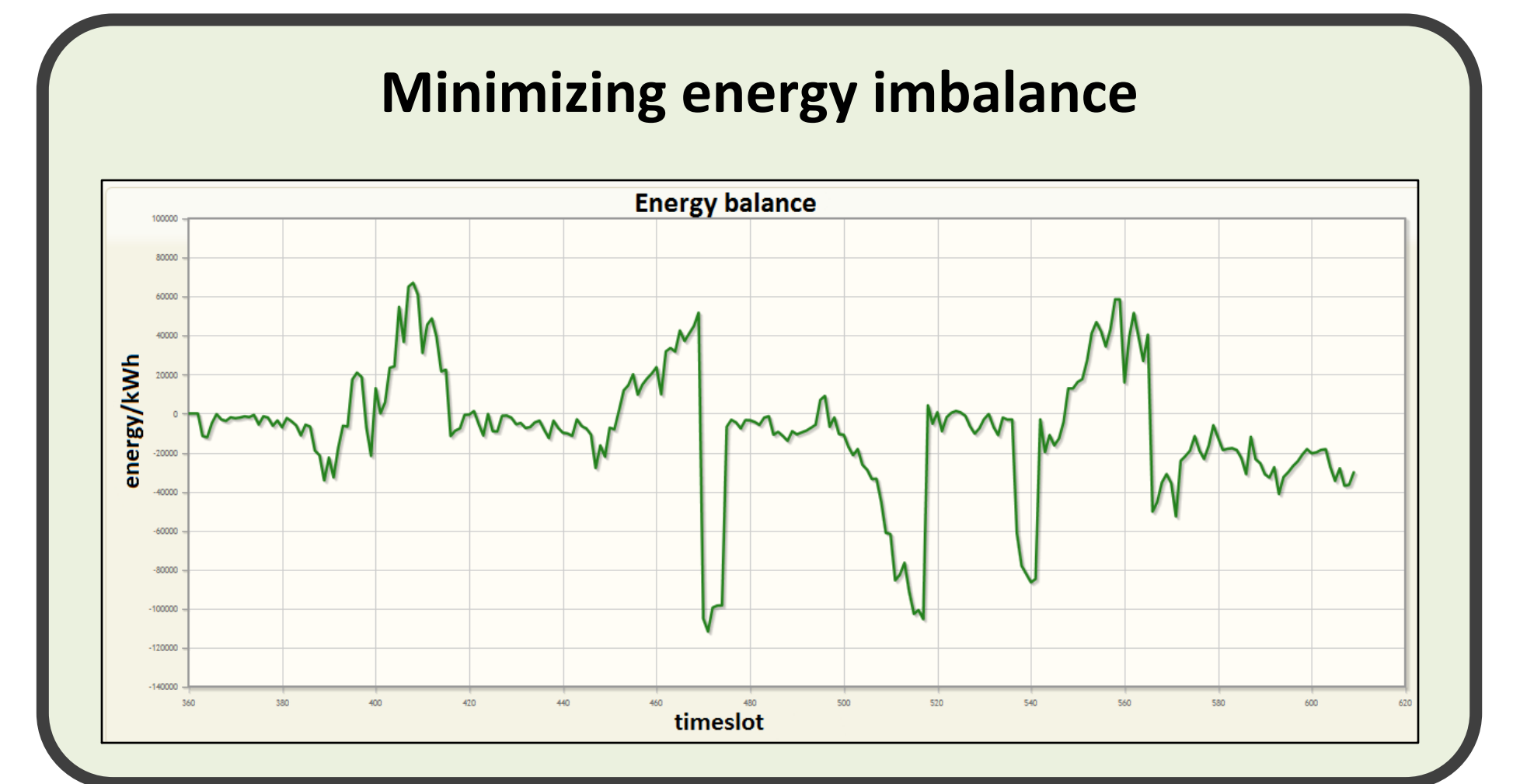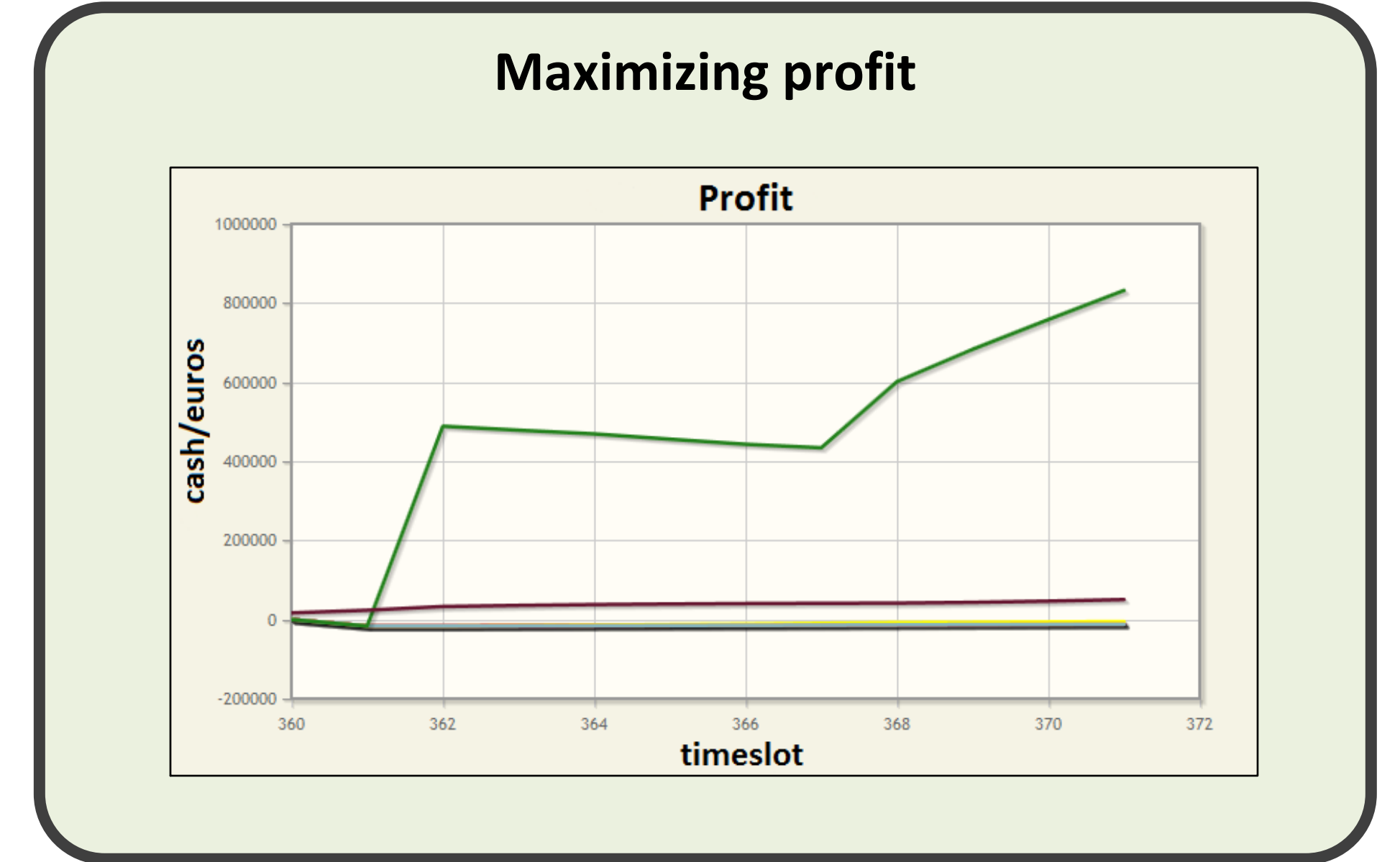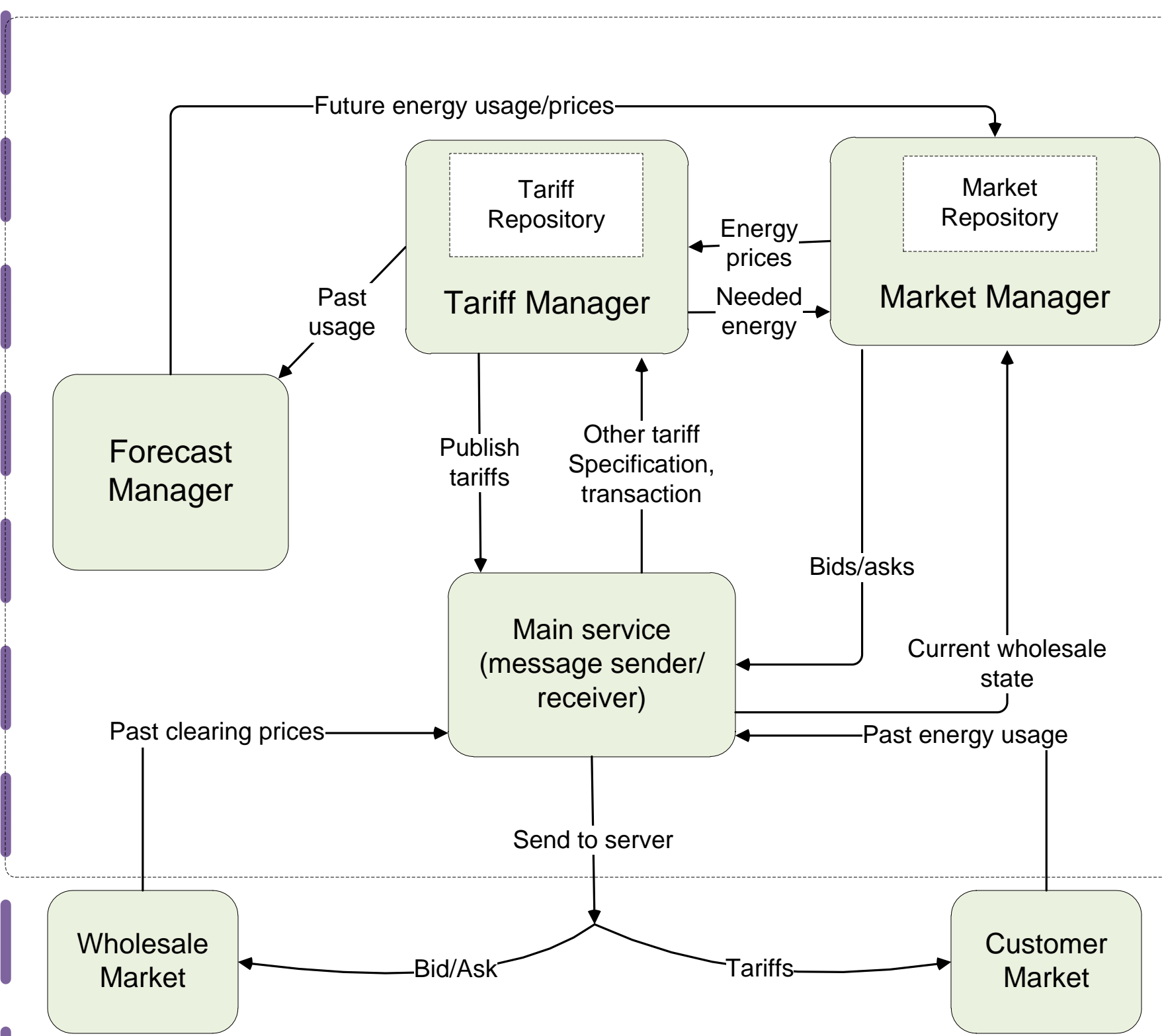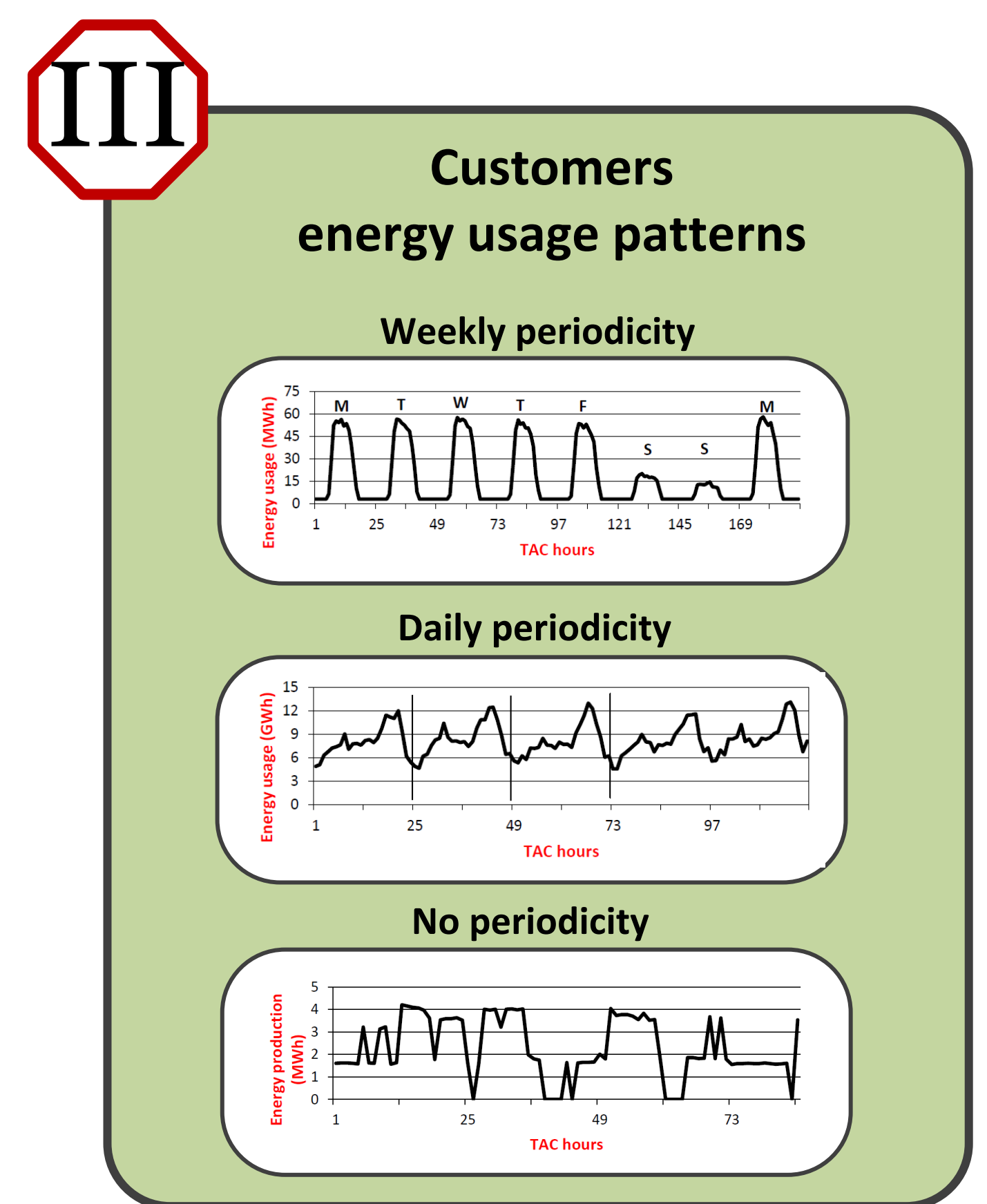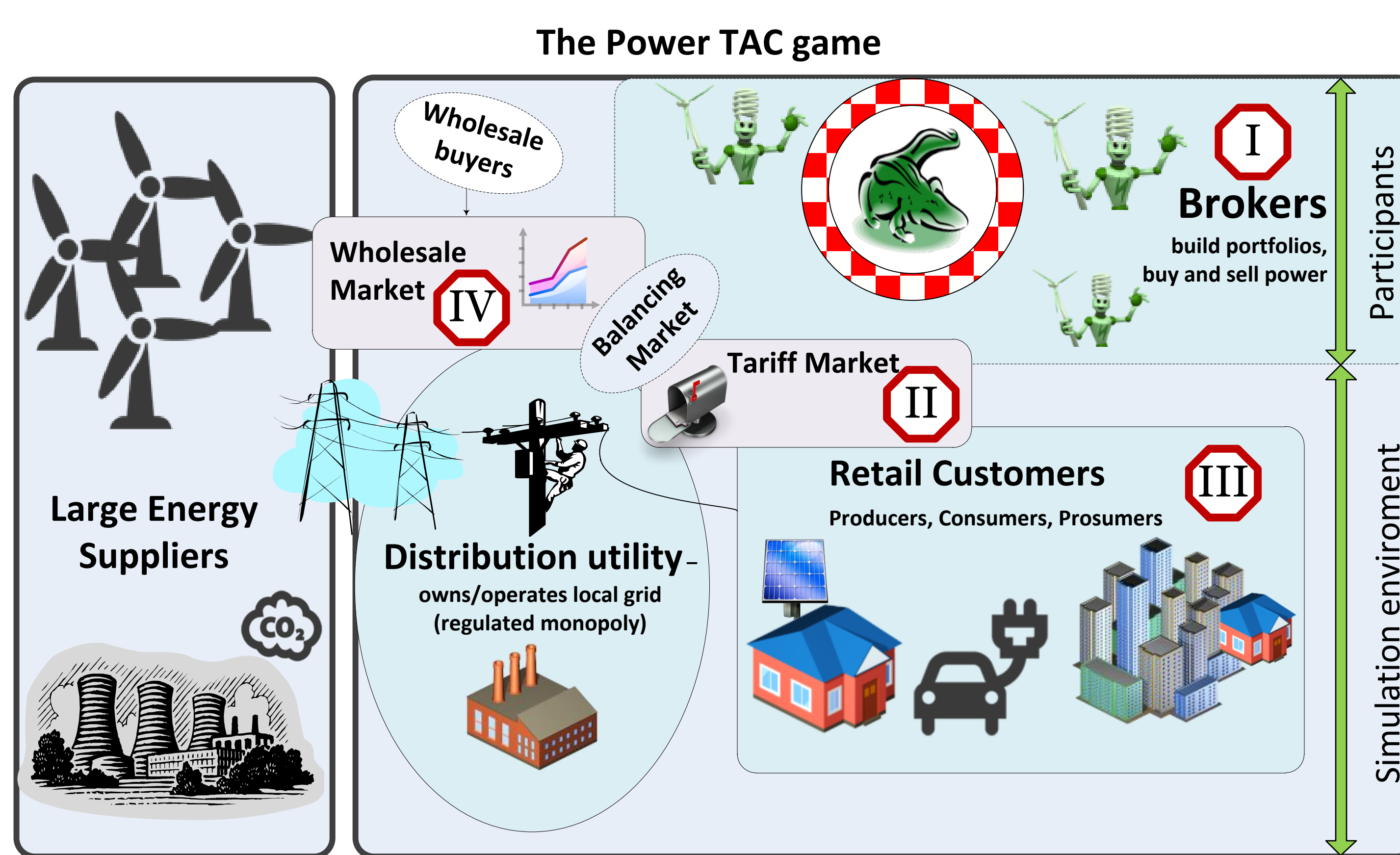
Minimizing energy imbalance

Power Trading Agent Competition (Power TAC) is an open, competitive market simulation platform aiming to provide an insight into the structure and operation of retail power markets. Research results obtained from Power TAC will be used to derive market rules for future retail-level power markets. In this simulation competitors are brokers that provide energy services to retail customers using tariff offerings, while managing their energy loads by trading in a wholesale market

II

An active role on the tariff market

Tariff models

- Fixed price (average price on wholesale)
- Multi-rate tariffs (price depending on day of the week and hour of the day)
- Flat-rate with periodic payment
- Special tariffs (e.g., for interruptible consumption)

Hourly revenue for the flat-rate model

As the sign of gratitude, Croco will give a fixed amount of money to a new customer, (indicated by a negative peek on the graph)

The Power TAC game

Wholesale buyers

Wholesale Market

Balancing Market

Tariff Market

Brokers
build portfolios, buy and sell power

Participants

Large Energy Suppliers

CO_2

Distribution utility – owns/operates local grid (regulated monopoly)

Retail Customers
Producers, Consumers, Prosumers

Simulation enviroment

III

Customers energy usage patterns

Weekly periodicity

Daily periodicity

No periodicity

IV

Wholesale activities: forecasting and order assembling

Energy usage forecasting for Croco's customers (Holt-Winters method)

Wholesale price forecasting (Holt-Winters method)

Bidding strategy

- Current timeslot?
- Timeslots open for trading?
- Energy balance for a timeslot?
- Adapt to game parameters?
- Use price boundaries?
- Which price calculation function to use?

Wholesale order

Competitive environment

Live info:

Icon	Name	Cash bal. [€]	Energy bal. [kWh]	Subs.
	CrocodileAgent	582,177.41	-2,461.66	10,446
	default broker	41,610.55	1,807.21	4,975
	Jurica	-9,859.61	-10,563.01	4,996
	Marin	-10,398.23	-1,918.12	4,996
	Ivana	-10,989.86	-2,430.77	4,990
	Marija	-11,071.26	-1,579.29	4,994
	Mia	-11,229.34	-1,459.36	4,989
	Ivo	-11,410.24	-1,424.99	4,999
	Sinisa	-11,515.25	-1,262.83	4,995

Publication

CrocodileAgent Official Website:
http://agents.usluge.tel.fer.hr/power_tac

Power TAC Official Website:
http://www.powertac.org/

**Can you guess what are the following three:
Fat Boy, Ping Pong and Death Star?**

Towards a steeper learning curve:
The learning curve for the competition design can be improved by segmenting the one-year competition runs into more stages, e.g. three stages separated by three months each. This will in turn give faster feedback on retail power market design helping retailers and increasing welfare to the society at the same time.

Market layer / ICT layer / Energy layer diagram

Retail / Wholesale

money flow

Tariff offerings / Bidding

Market layer

Market applications

data flow — 1000101...

Smart metering / Grid balancing

Demand-side management / Real-time monitoring

ICT layer

Grid management

energy flow — e- e- e- ...

Transmission / Consumption

Production / Distribution

Energy layer

Module diagram

Future energy usage/prices

Tariff Repository — Tariff Manager

Energy prices / Needed energy

Market Repository — Market Manager

Past usage

Forecast Manager

Publish tariffs

Other tariff Specification, transaction

Bids/asks

Main service (message sender/ receiver)

Current wholesale state

Past clearing prices

Past energy usage

Send to server

Wholesale Market — Bid/Ask

Tariffs — Customer Market