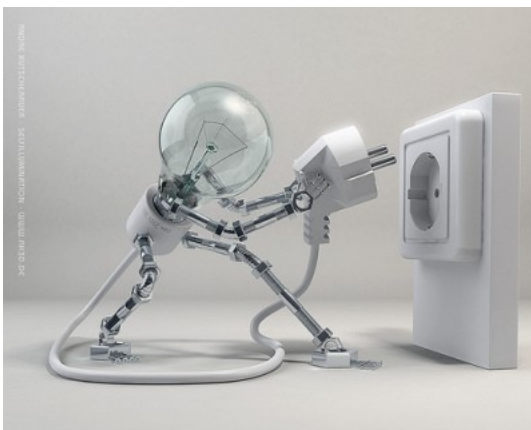




An approach to an electricity tariff for responsive demand in the Uruguay of next years with high penetration of Wind and Solar energy.



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Enzo Coppes, Gonzalo Casaravilla, Senior Member, IEEE
Ruben Chaer, Senior Member, IEEE

Thanks to the support of

- This work was possible thanks to the software tools developed under the project ANII_FSE_1_2011_1_6552: “Modelo de energías autóctonas en SimSEE”.



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It is happening ...

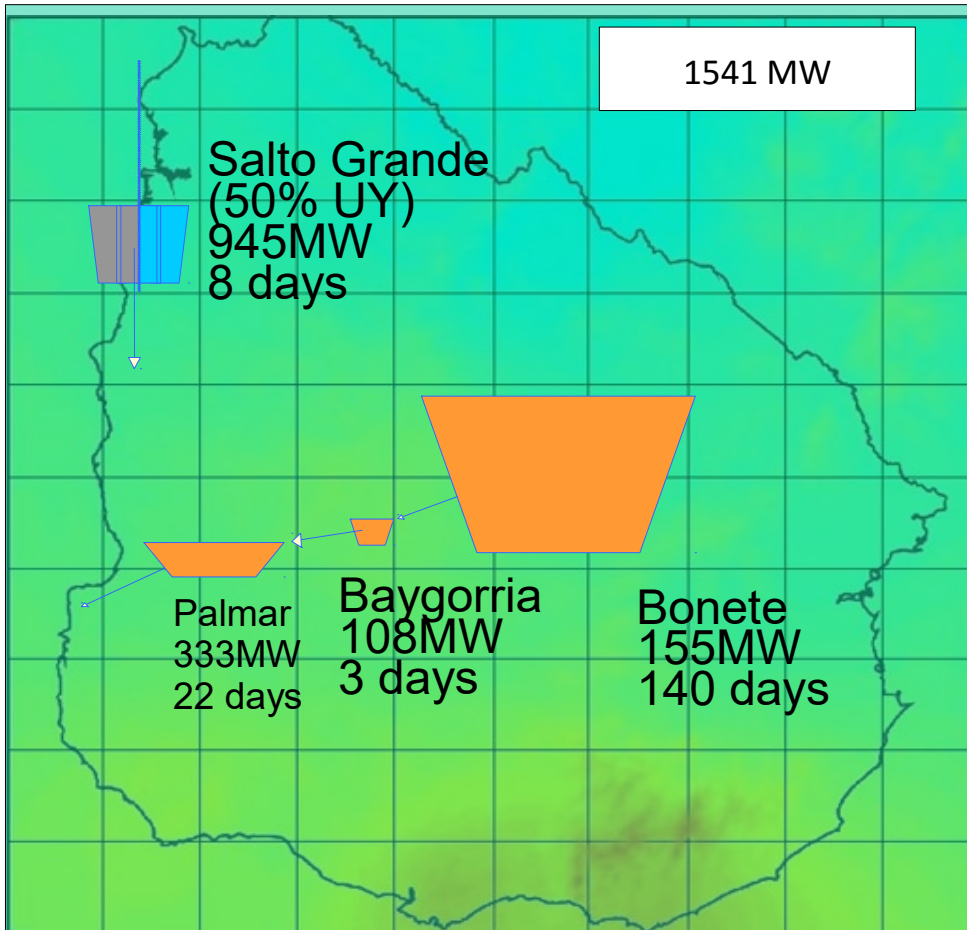


Uruguay is changing its electricity generation matrix integrating a great amount of wind power.

happening as planned...



There will exist an energy surplus that can be exported to other countries or may be used in Uruguay if a new demand appears, capable of absorbing this type of surplus.



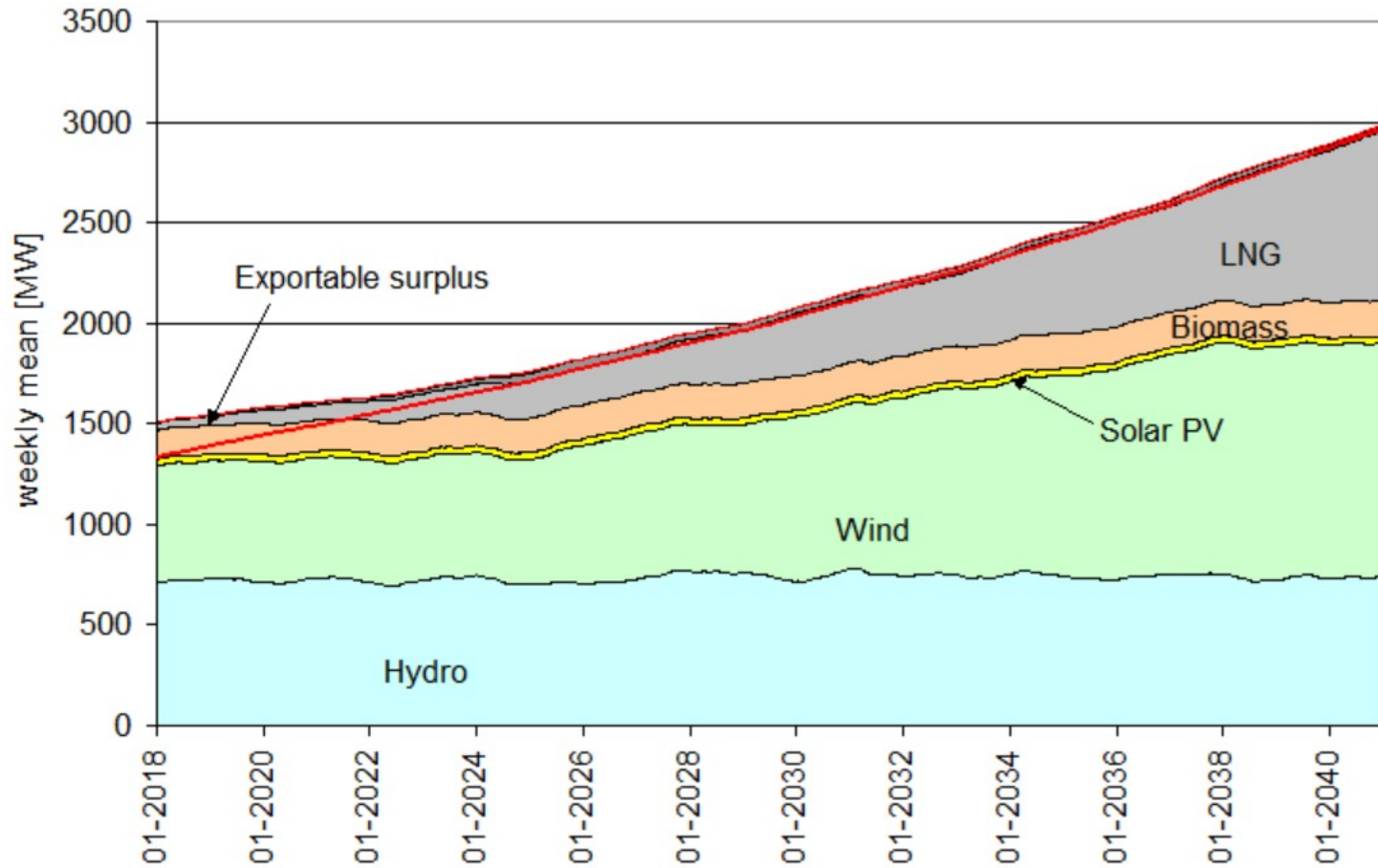
Hydroelectric
Is full developed.

The are no big projects
to develop.

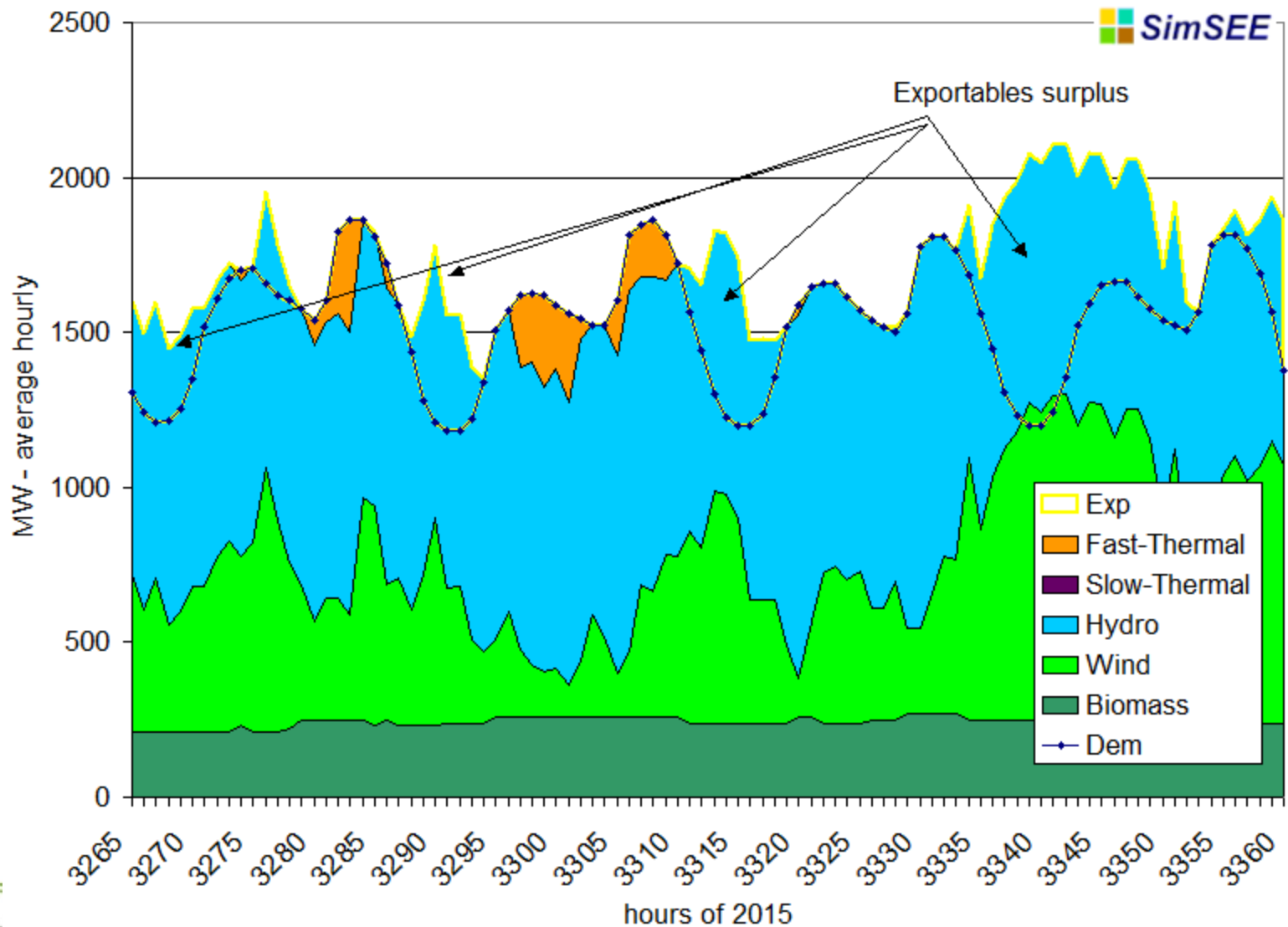
Possibility of distributed in
mini and micro exploitation:
200 MW.

Storage pumping potential:
300 – 500 MW

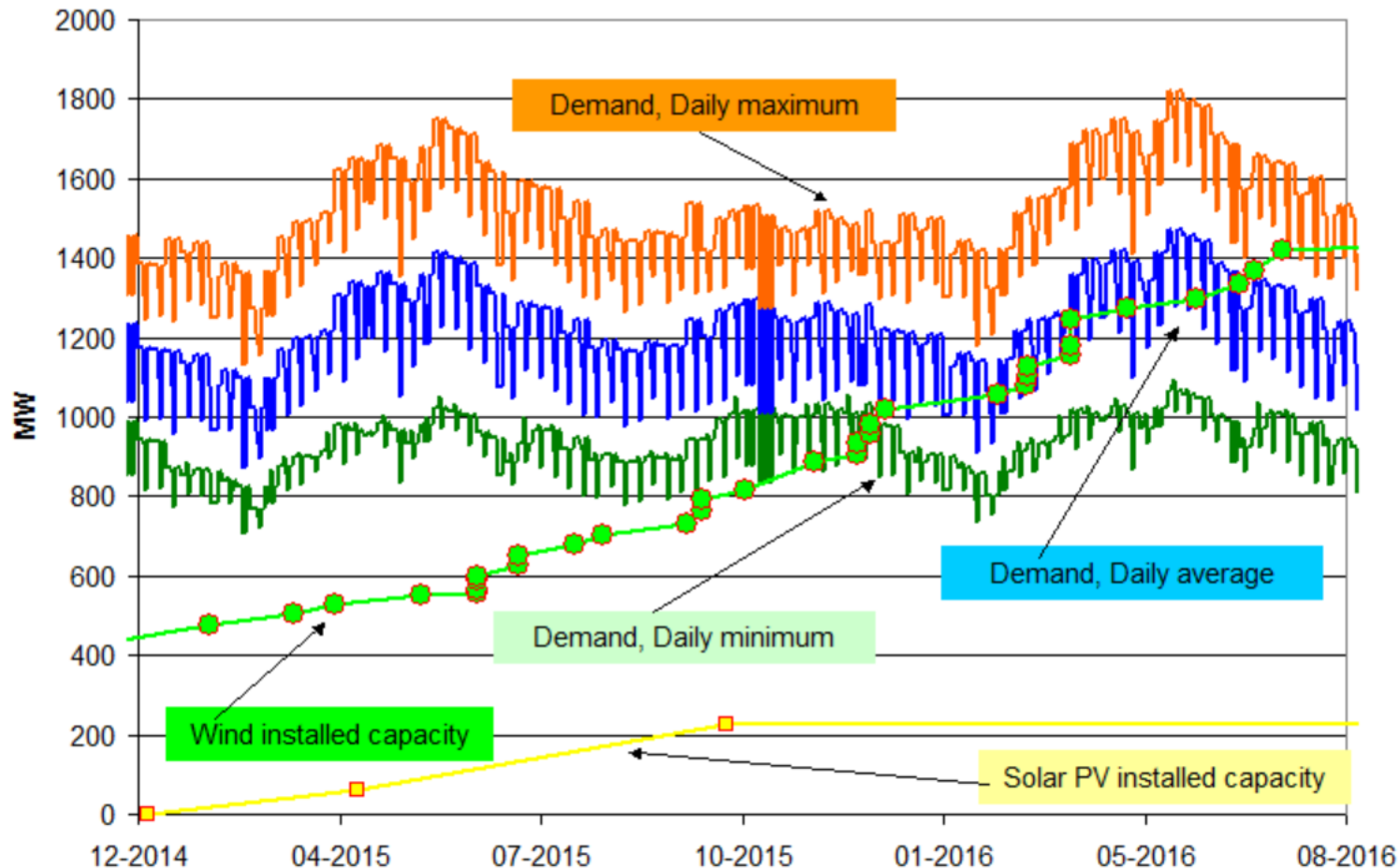
Uruguay - long term power share by source



Generation by source on a specific stochastic realization
 days of springer with high values of inflows to the hydroelectric plants.



Wind capacity vs. System load.



This work



This work shows an approximation to definition of a price signal that can be used by smart controllers distributed over the grid to manage such demands. Simulation of the proposed algorithm are carried out showing that the stability of the system is achievable.

We need new loads capable of defer/advance the consumption...





Electric vehicle for citizen usage.

Storage capacity equivalent to two days of the expected travel.

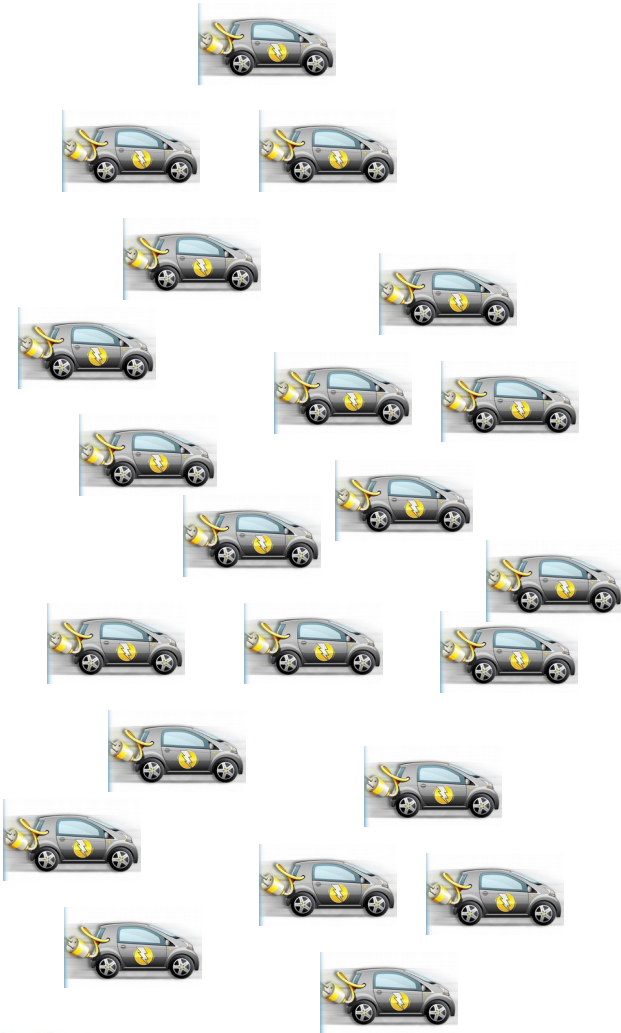


Water heater.

60-90 It storage
capacity.

Daily target temperature
for a prograded hour.

Cloud of loads with statistic behavior



Real time tariff.

- In real time forecast to the next 72 hours
- The Smart Controllers will try to allocate consumption in the cheaper hours.

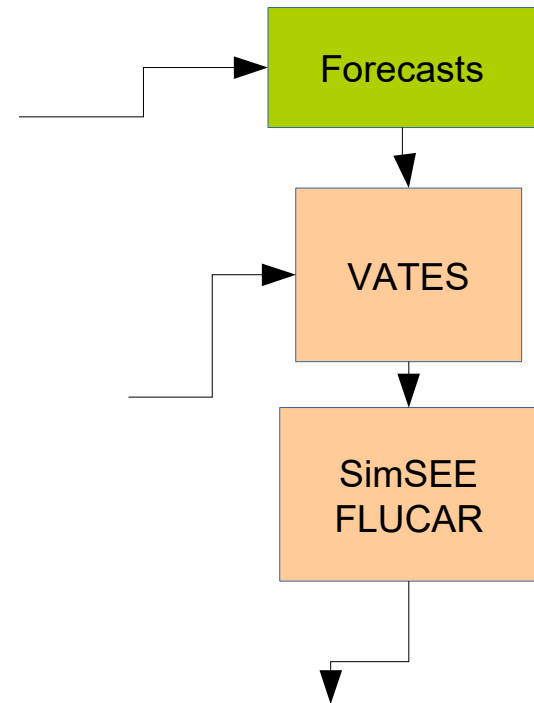


Starting building blocks



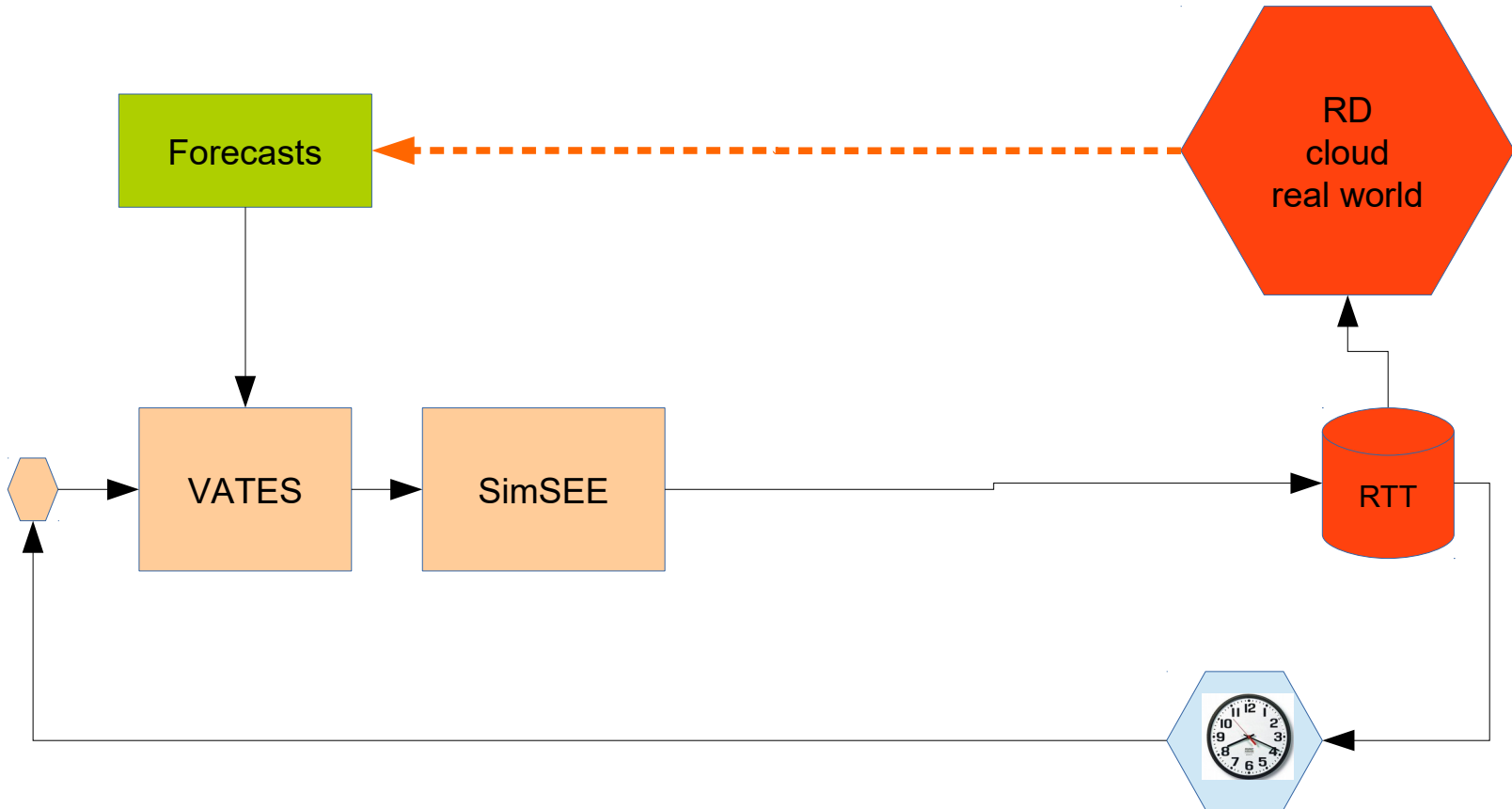
Hydro-Solar
Temperature

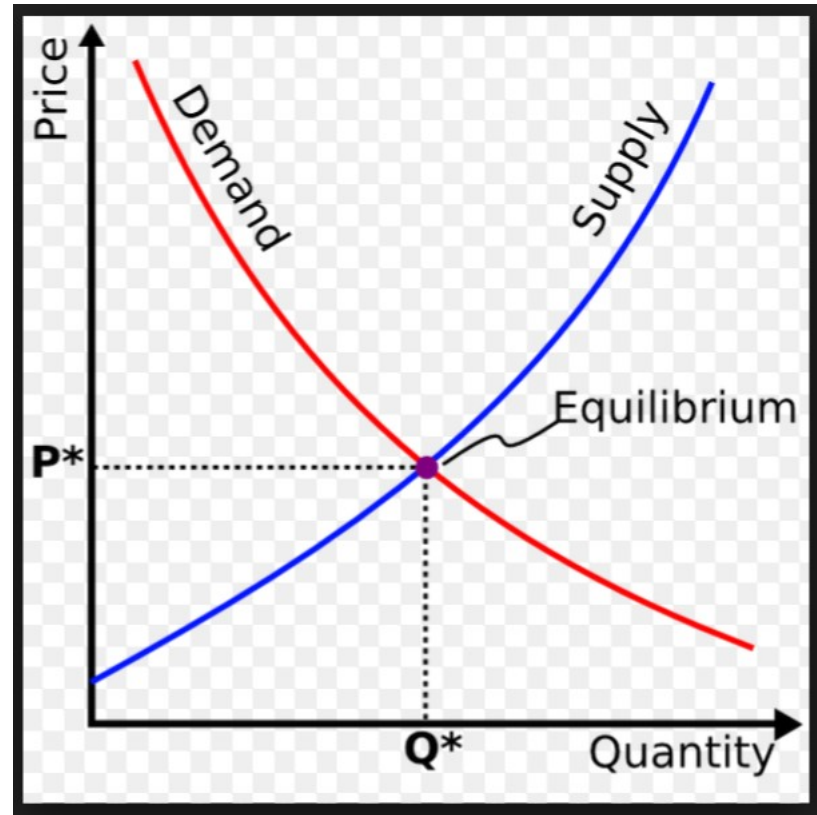
Real time
system
Status info.



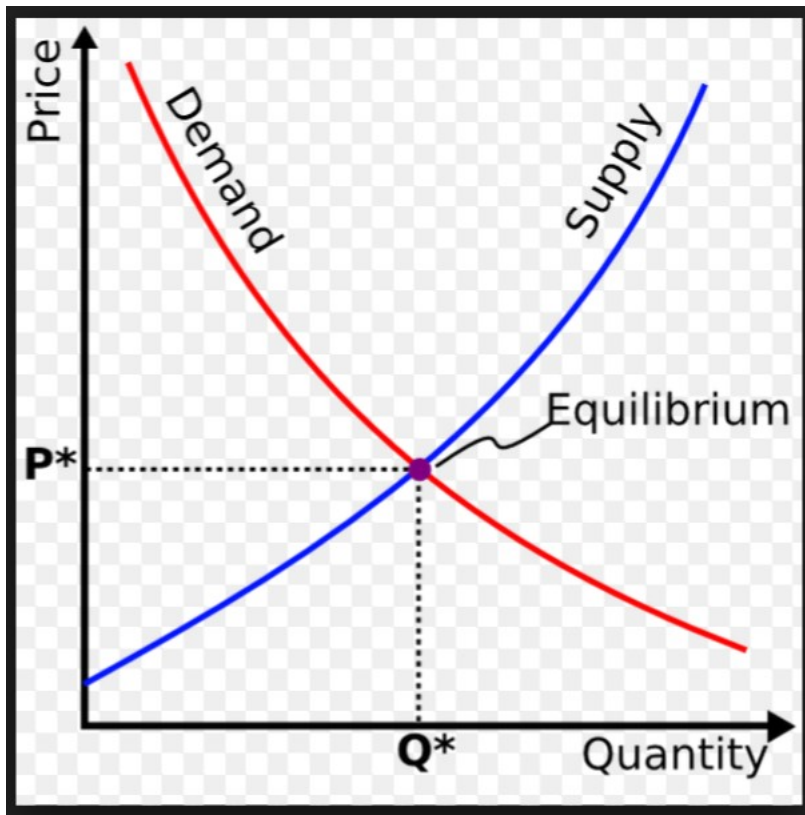
Hourly marginal cost at
each Node of the grid
for the next 72 hours.

Closing the loop.





It is no true.

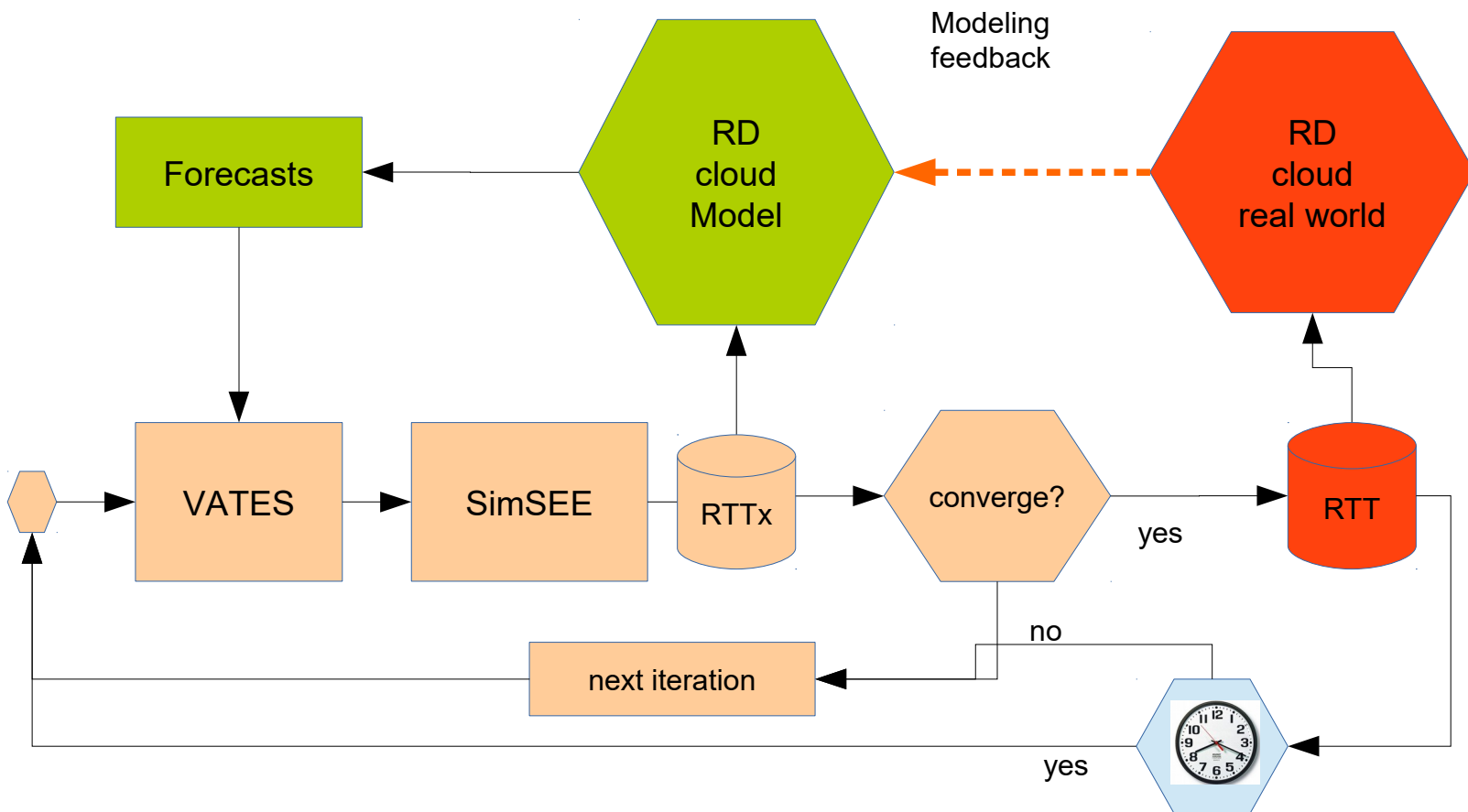


- You need the EV charged every day.
- You need the water heater every day.
- You want to buy at the cheaper hour.
- There are not elasticity.

Real time tariff and demand reaction.

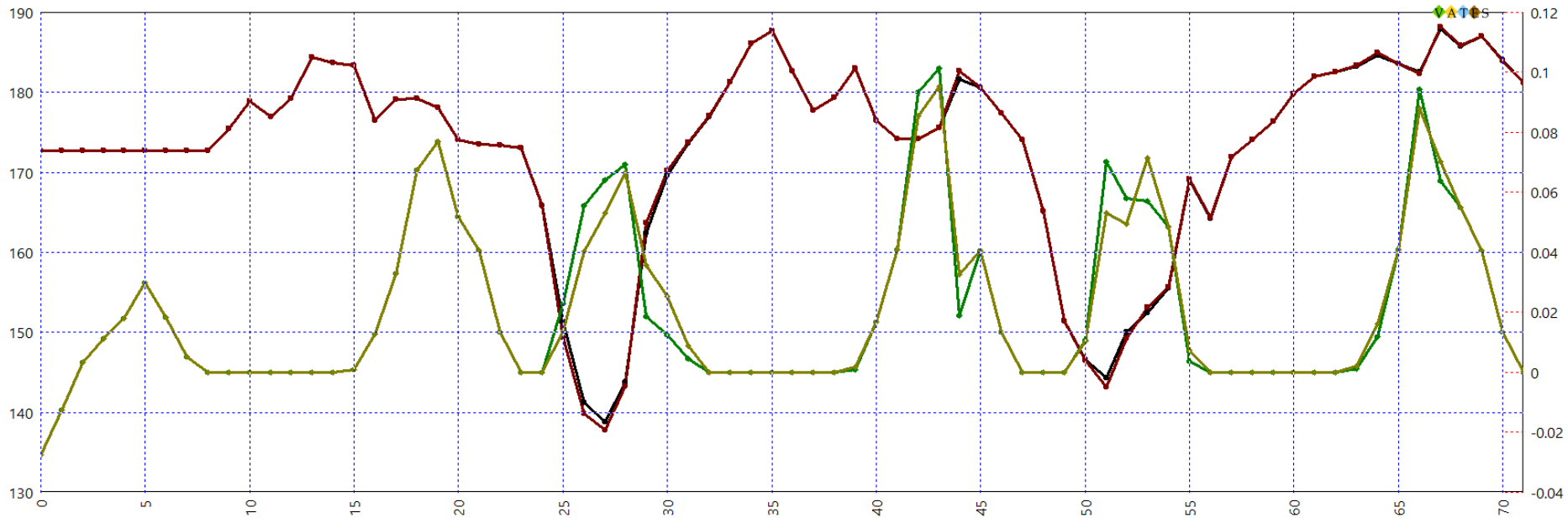


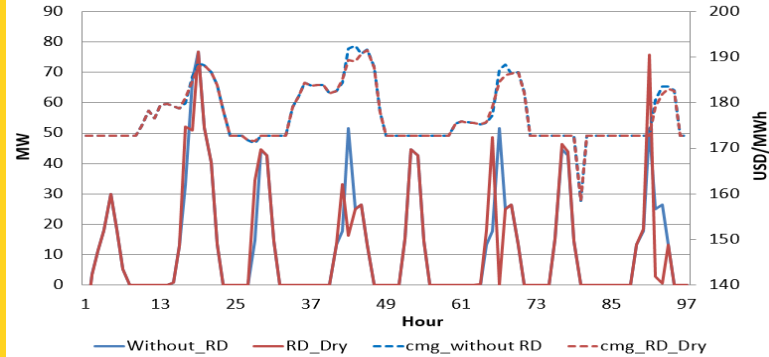
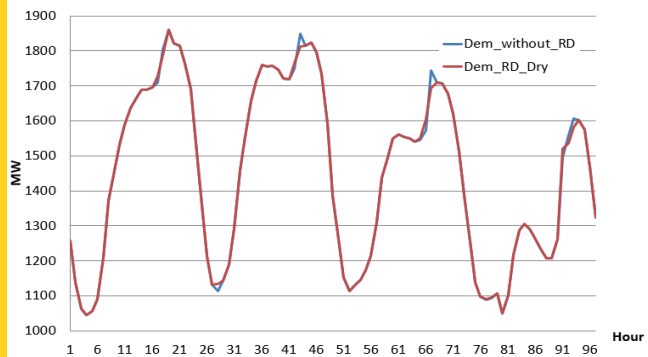
- In real time a forecast to the next 72 hours is published.
- The Smart Controllers will try to allocate consumption in the cheaper hours.
- The marginal cost of the cheaper hour of the forecast will increase do to the increase in the consumption of that hour.



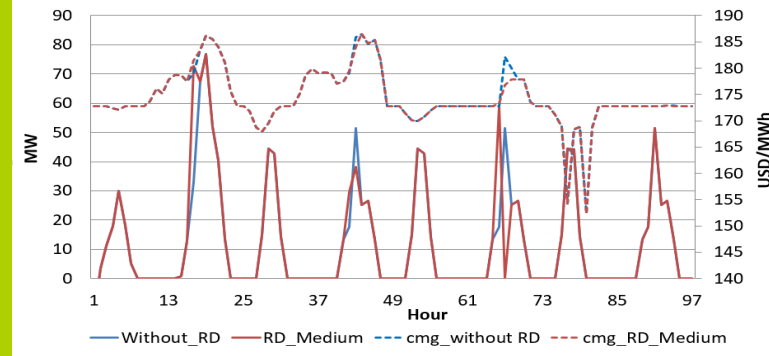
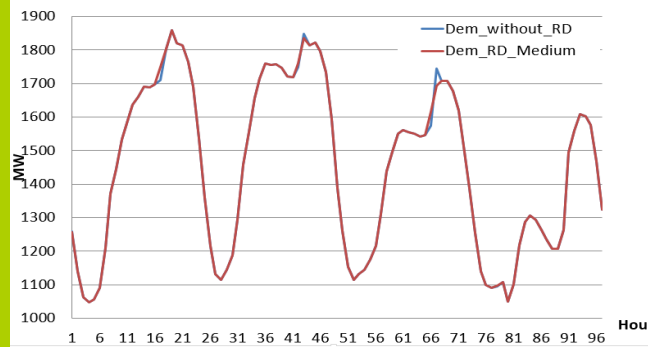
Avoiding oscillations

- Model of the cloud of RD with self-learning mechanism.
- The distributed controllers ask for the tariff forecast no more than one time every hour.
- The best forecast is given any time.

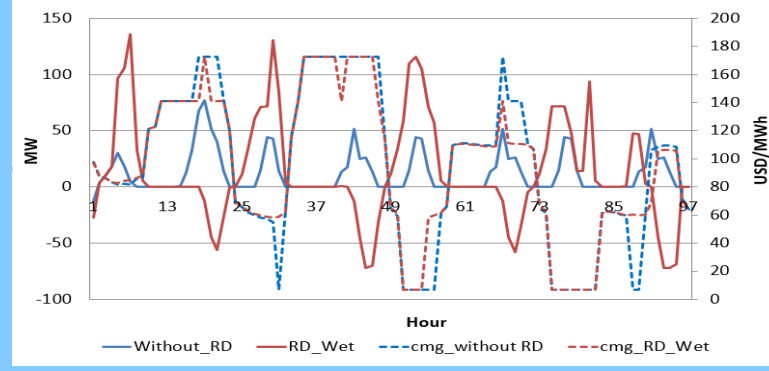
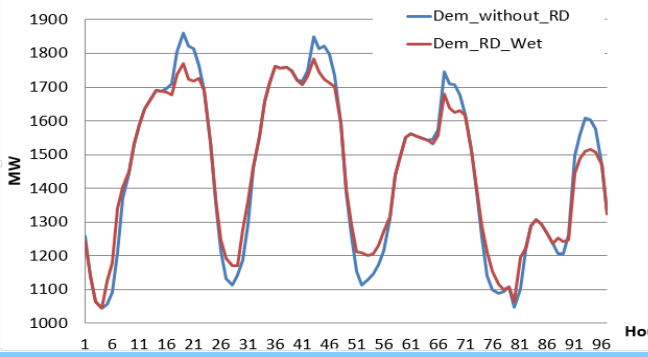




Dray



Medium



Wet

We must be agile to keep the train
... and not get on the wrong.



Thanks a lot for your time!