The main idea behind the balancing algorithm is that users place their expected consumption and production for the coming timeslot on the blockchain. But while posting the expectation may give an insight on the coming time slot, it does not solve any imbalances. To enable balancing the users also have to inform on how flexible they can be with his production and consumption. This is done by posting the flexibility for both the production and consumption, stating how much energy he is willing to buy or sell and for what price. Selling energy can be by both increasing the production or decreasing the consumption and buying by doing the inverse. (E.g. postponing the charging of the client’s e-vehicle or even discharging it for a financial compensation)

It may be the case that the consumption and production cannot be perfectly matched. As the project description states that the solution should be compatible with the current grid, it would be impractical and unreasonable to deny the user the requested energy. To overcome this issue the notion of a back-up supplier is introduced.

This back-up supplier reaches an agreement with the user on a price at which it will fill in any remaining energy gap. This agreement must is made before the client will participate the system.

By doing so the system can be a drop in replacement in the current electrical grid, if a user does not wish to partake in the balancing he can just post his consumption and production and keep is flexibility fixed at zero, and the back-up supplier will act as a normal utility company.

/\* INSERT CLIENT REPORT LAY-OUT HERE\*/

## Guaranteed consumption and production

The amount of energy stated as ‘predicted consumption’’ is guaranteed to be delivered. This can be seen as the minimum amount of energy that the user requires. If this demand cannot be filled in by offers from other clients, the back-up supplier will sell the remaining energy for a pre-determined price to the client.

The amount of energy stated as ‘Predicted Production’ is guaranteed to be accepted on the net. If it can’t be fully matched, the back-up supplier will buy the remaining energy for a pre-determined price.

In the current situation the utility companies do not have separate prices or placed any limits on the client’s production. In the future however, it seems possible that clients will reach an agreement on forehand on how much they are allowed to produce and at what price.

## Consumption and production flexibility

‘Consumption flexibility’ and ‘production flexibility’ is the amount of flexibility the user is willing to deploy send in the form a list.

When ‘Consumption flexibility’ is positive or ‘production flexibility’ is negative, it means the user is willing to increase its consumption or decrease the production by at most the given amount of energy. Both can be seen as an ‘Ask’ for energy from the grid (as it is irrelevant and technically impossible for the grid to distinguish an increase in consumption or decrease in production).

When ‘Consumption flexibility’ is negative or ‘production flexibility’ is positive, the user is willing to decrease its predicted consumption or increase the predicted production by at most the given amount of energy. Both can be seen as ‘Bid’ of energy to the grid

The prices given in the flexibility are not fixed prices but limits similar to exchange markets; for ‘Ask’ it’s a maximum price the client is willing to pay for that energy, where the ‘Bid’ price is the minimum the client wants to receive for that amount of energy. This increases the chance on matching as it is quite unlikely two parties offer for the exact same price, furthermore it benefits both parties as it is very likely they receive a higher price then they want or pay less then they we’re willing.

## Matching ‘Asks’ and ‘Bids’

To perform the balancing the system tries to match as much

(however the sum of all the negative consumption can never be greater then ‘PredictedCons)’

Presentation structure