**Notes for simulations of use-cases in PLATONE platform**

Use-case of zero power exchange with external grid

* Cost factors of power from external grid should be set very large, much larger than the cost factors of generators
* Min limit of power from external grid should be set to zero
* Max limit of power from external grid can be anything positive, according to the line/transformer capacity

Use-case of desired power injection to the external grid

* Positive values of power from external grid express injection to the external grid (in this use-case only)
* Cost factors of power from external grid should be set too large, much larger than cost factors of generators
* Max limit of power from external grid should be set equal to the desired injection to the external grid
* Min limit of power from the external grid can be any value

General comment

* The cost factors of the power of the external grid can act as priority or penalty, to force for zero power exchange or desired injection. When the loading condition of the system requires other power exchange with the external grid, violating the desired one, then the OPF solution will give how much is this power and the corresponding cost of violation of desired operation can be computed at the end, with the monetary costs. The monetary costs are different from the cost factors that appear in the objective function of the optimization problem.

Parameters to facilitate convergence and increase convergence speed

* max\_iter\_t: This is the max number of iterations. Set it to a very large number, like 10000-20000.
* v\_conv: This is the threshold for the voltage convergence. Realistic low value: 0.001.
* t\_conv: This is the threshold for the convergence of the Taylor approximation. It can be relaxed, maybe by one order. If it becomes too large (very relaxed criterion), it might have the opposite effect, esp. if the other thresholds are kept small (very tight criteria). Not very accurate Taylor approximation will require more iterations of the OPF algorithm to achieve the final convergence.
* max\_iter\_x: This is the maximum number of the internal iterations for the Taylor approximations. It might change, but its effect is difficult to predict (strong trade-off). More Taylor iterations need more time, but lead to more accurate solution, so the needed iterations of the OPF algorithm decrease and this can be beneficial for the overall convergence. Very few Taylor iterations mean less time for the Taylor approximation, but they lead to not accurate approximation (considering also the used threshold), and this causes more iterations until convergence of the OPF algorithm.
* power\_balance: This is the parameter of the accepted power losses in the convergence criterion of power balance. Set a large value, like 5-10 to allow for large amount of losses in the congested scenarios and thus facilitate the convergence.
* default\_max\_p: This is the max limit of power flow in lines. Set this large, like 10-20pu, to allow very high power flow in the congested scenarios, and thus facilitate convergence. This parameter by default is set to large values for unlimited power flow.
* default\_max\_i: This is the max limit of current flow in lines. The same comment as for the max limit of power flow is valid here too.
* rho\_v: This is the penalty parameter of the adaptive ADMM technique that is used to split the OPF problem (distributed OPF algorithm). This affects convergence speed and optimality of OPF solution in opposite ways. Change the value by 2-3 orders, larger or smaller, to see which facilitates the convergence.
* Warm start: This is the starting point for the solver of the OPF algorithm. This can be 1pu for all voltages and zero for all power generation and max power for all flexible loads (cold start). As warm start another solution of the OPF problem can be used, which should be computed for similar system conditions. If the conditions for the generation of the starting point are not similar with the simulated scenario, then the use of the warm start might have a negative effect on the convergence speed. The solution of the OPF algorithm for one congested scenario can be used as starting point for the rest scenarios of the same system. The solution of the power flow algorithm for the congested scenario, together with the power inputs of the power flow problem, can be used as starting point to the OPF algorithm for this congested scenario. So, each congested scenario can have its own starting point, which is the solution of the prior power flow algorithm.