Correction to: An extension of the general lot-sizing and scheduling problem (GLSP) with time-dependent energy prices

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The author would like to correct the errors in the publication of the original article. The corrected details are given below for your reading.

In the “Introduction” section, the sixth sentence of the third paragraph should read as:

The inventory costs arise from the product-specific inventory cost factor hc_k and the amount of products on stock $I_{k,t}$ in macroperiod t .

In “2.2 Literature overview” section, the seventh sentence of the second paragraph should read as:

Rager et al. (2015) minimize the demand for final energy by leveling applied energy resources such as steam and pressure, for two parallel machines.

In “2.2 Literature overview” section, the fifth sentence of the fifth paragraph should read as:

The second group comprises big time bucket models with so-called macroperiods (capacitated lot-sizing problem (CLSP)) (Maes and Van Wassenhove 1988).

In “2.2 Literature overview” section, the fourth sentence of the sixth paragraph should read as:

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Particularly, the model formulation must have the flexibility to operate with process times, which are both longer or shorter than the length of a period with constant energy prices in order to ensure the models application in markets with both long periods and short periods of constant energy prices.

In “3.1 Assumptions” section, the ninth paragraph should read as:

Eighth, time-dependent energy prices are known for the next 24 hours according to the Day-Ahead market at the energy stock exchange.

In “3.3 Optimization model” section, the third sentence of the first paragraph should read as:

The extended optimization model consists of the adapted objective function (2) as well as non- or slightly modified constraints of the basic model [c.f. Formulas (3)–(5), (9)–(11), (25)–(28)] and new constraints [c.f. Formulas (6)–(8), (12)–(24)].

In “3.3 Optimization model” section, the third sentence of the sixth paragraph should read as:

Constraints (5) ensure that the scheduled time e_s over all microperiods s within a macroperiod t is equal to the capacity C_t .

In “3.3 Optimization model” section, the eighth equation of the sixth paragraph should read as:

$$\sum_{k=0}^K \left(v_{k,s} + \bar{v}_{k,s} + \sum_{k'=0}^K z_{k',k,s} \right) = 1 \quad (8)$$

In “3.3 Optimization model” section, the seventh sentence of the twelfth paragraph should read as:

Regarding the constraints (12) and (13), both assignments are possible, however, only the assignment (a) is correct chronological, as in the assignment (b) even for $r = 1$, 30 min are assigned to the microperiod $s = 4$, although the previous microperiods $s = 1$, $s = 2$, and $s = 3$ have not been finished in $r = 1$.

In “3.3 Optimization model” section, the fifteenth and sixteenth equations should read as:

$$u_{r,s-1} \geq u_{r,s} \quad \forall r \in R^{all}, s > 0 \quad (15)$$

$$l_{r,s} \leq u_{r,s-1} \cdot l \quad \forall r \in R^{all}, s > 0. \quad (16)$$

In “3.3 Optimization model” section, the tenth sentence of the thirteenth paragraph should read as:

These additional constraints are necessary, as in microperiods s with a length e_s of 0, $u_{r,s}$ gets without constraints (15) immediately 1, even if the previous machine states have not finished (c.f. assignment (a) and (b) in Table 1).

In “3.3 Optimization model” section, the tenth sentence of the thirteenth paragraph should read as:

Altogether, these constraints combined exclude invalid assignments of the two types of microperiods (as presented in Table 1).

In “4.2 Generation of test instances” section, the tenth sentence of the fourth paragraph should read as:

The energy consumption in the production state is set as follows: $p_1^q = 81.4 \text{ kW}$; $p_2^q = 162.7 \text{ kW}$; $p_3^q = 244.1 \text{ kW}$. The product-specific inventory cost factors are set as follows: $hc_1 = 0.025 \text{ €}/(\text{units} \cdot t)$; $hc_2 = 0.05 \text{ €}/(\text{units} \cdot t)$; $hc_3 = 0.075 \text{ €}/(\text{units} \cdot t)$.

In the “4.3 Evaluation of the cost saving potential of an energy-oriented planning approach” section, the sixth and seventh sentence of the fifth paragraph should read as:

It appears that the *prospective possible volatility* has the highest influence on the energy cost and total cost saving potential (19.2% energy cost/ 1.8% total cost saving potential). In contrast, the *expected volatility* (6.8% energy cost/ 0.9% total cost saving potential) and *actual volatility* (3.1% energy cost/ 0.4% total cost saving potential) have a weaker influence on the cost saving potential.

In the “5 Managerial implications” section, the sixth and seventh sentence of the third paragraph should read as:

Nevertheless, due to the Day-Ahead Market for energy prices in Germany the number of periods, which have to be considered in planning, is limited to 24 hours. The resulting instances with a planning horizon up to 24 hours can be solved with the presented model formulation to optimality.

In the “6 Summary and outlook” section, the first sentence of the second paragraph should read as:

Future work can be addressed into three directions.

In “Appendix 1” section, the 29th equation should read as:

$$v_{0,s} = 0 \quad \forall s \in S^{all}. \quad (29)$$

In “Appendix 1” section, the first sentence of the first paragraph should read as:

As in the case study both the binary variable for the machine state ‘manufacturing’ product ‘0’ ($v_{0,s}$) and the binary variable for the machine state ‘preserving’ product ‘0’ ($\bar{v}_{0,s}$) can be used to model the machine state ‘idle’, the constraints (29) avoid the existence of the machine state $v_{0,s}$ to reduce emerging symmetry.

In Appendix 1, fifth paragraph should read as:

Constraints (33) ensure that the machine can only be set up from product k' to product k in microperiod s ($z_{k',k,s} = 1$), in case the machine is set up for product k in the microperiod s , when the setting up takes place ($\omega_{k,s} = 1$).

In “Appendix 1” section, sixth paragraph should read as:

Constraints (34) guarantee that the binary variable for the machine state ‘manufacturing’ product k in microperiod s can only be active ($\bar{v}_{k,s} = 1$), in case the machine is set up for product k in the same microperiod s ($\omega_{k,s} = 1$).

In “Appendix 1” section, seventh paragraph should read as:

Constraints (35) guarantee that the binary variable for the machine state ‘preserving’ product k in microperiod s can only be active ($\bar{v}_{k,s} = 1$), in case the machine is set up for product k in the same microperiod s ($\omega_{k,s} = 1$).

The first sentence of the “Appendix 2” should read as:

In this Appendix, detailed results regarding combinations of parameter characteristics are given in Tables 6, 7, 8, 9, 10 and 11.

The original article has been corrected.