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| **Table S2.** Representative reactions in the model |
| **Phosphorylation reactions** |  |  |  |
| $$ADP +P\_{i}\rightarrow ATP +H\_{2}O$$ | $$∆G\_{ATP}^{0}= +50 kJ/mole$$ |  | (R1) |
| $$PleC\_{kin} +P\_{i}\rightarrow PleC\_{kin}\~P +H\_{2}O$$ | $$∆G\_{PleC\~P}^{0}= +50 kJ/mole$$ |  | (R2) |
| $$DivK +P\_{i}\rightarrow DivK\~P +H\_{2}O$$ | $$∆G\_{DivK\~P}^{0}= +30 kJ/mole$$ |  | (R3) |
| **R0 🡪 T0 reaction** |  |  |  |
| $$PleC\_{pho} \rightarrow PleC\_{kin}$$ | $$∆G\_{RT}^{0}= +8.55 kJ/mole$$ | $$K\_{eq}=0.0316$$ |  (R4) |
| **Typical ligand binding reactions** |  |  |  |
| $$PleC\_{pho}+DivK\~P \rightarrow PleC\_{pho}: DivK\~P$$ | $$∆G\_{HS}^{0}+∆G\_{HL}^{0}= 0 kJ/mole$$ | $$K\_{eq}=1$$ | (R5) |
| $$PleC\_{pho} +DivK \rightarrow PleC\_{pho}: DivK$$ | $$∆G\_{HP}^{0}+∆G\_{HL}^{0}= +11.4 kJ/mole$$ | $$K\_{eq}=0.01$$ | (R6) |
| $$PleC\_{kin} +DivK\~P \rightarrow PleC\_{kin}: DivK\~P$$ | $$∆G\_{KP}^{0}+∆G\_{KL}^{0}= -8.55 kJ/mole$$ | $$K\_{eq}=31.6$$ | (R7) |
| $$PleC\_{kin} +DivK \rightarrow PleC\_{kin}: DivK$$ | $$∆G\_{KS}^{0}+∆G\_{KL}^{0}= -19.95 kJ/mole$$ | $$K\_{eq}=3160$$ | (R8) |
| **Phosphatase reaction** |  |  |  |
| $$PleC\_{pho}:DivK\~P +H\_{2}O\rightarrow PleC\_{pho}:DivK+P\_{i}$$ | $$∆G\_{ph}^{0}= -18.6 kJ/mole$$ | $$K\_{eq}=1830$$ | (R9) |
| **Phosphotransfer reaction** |  |  |  |
| $$PleC\_{kin}\~P:DivK \rightarrow PleC\_{kin}:DivK\~P$$ | $$∆G\_{pt}^{0}= -8.6 kJ/mole$$ | $$K\_{eq}=32$$ | (R10) |
| **Auto-dephosphorylation reaction** |  |  |  |
| $$PleC\_{pho}\~P +H\_{2}O \rightarrow PleC\_{pho}+P\_{i}$$ | $$∆G\_{ad}^{0}= -50 kJ/mole$$ | irreversible | (R11) |