Surplus Calculation:

For each demand node (GXP) with demand > 0:

$$LoadCustomerSurplus = (VOLL - Price) \times ClearedDemand$$

For each demand node (GXP) with demand < 0:

$$GenerationSurplus = -Price \times ClearedDemand$$

For each offered generation node (GIP):

$$GeneratorSurplus = GenerationRevenue - GenerationCost$$

Where:

$$GenerationRevenue = Price \times \sum_{i=1}^{5} ClearedGeneration_i \qquad i\text{: offer band}$$

$$GenerationCost = \sum_{i=1}^{5} ClearedGeneration_i \times OfferPrice_i \qquad i\text{: offer band}$$

Benefit Calculation: (Comparing Upgrade Case and Base Case)

For each GXP with demand > 0:

$$Benefit = Max[0, LoadCustomerSurplus_{UpgradeCase} - LoadCustomerSurplus_{BaseCase}$$

For each GIP and GXP with demand < 0:

$$Benefit = Max[0, GenerationSurplus_{UpgradeCase} - GenerationSurplus_{BaseCase}$$

SPD Charge Calculation:

(Applied to every trading period)

$$SPDChargeRatio = Min[1, \frac{TransmissionRevenueRequirement(\$)}{\sum_g Benefit_g} \qquad g \; \forall \; GXP \; and \; GIP$$

$$SPDCharge_g = SDPChargeRatio \times Benefit_g \qquad g \; \forall \; GXP \; and \; GIP$$