

$$\begin{aligned}
 \text{minimize } obj = & \alpha \left[\gamma \frac{\text{discounted_utility}_{ref} * n_{years}}{\sum_y \text{discounted_utility}[y]} + (1 - \gamma) \frac{\text{min_utility}_{ref} * n_{years}}{\sum_y \text{min_utility}_{ref}[y]} \right] \\
 & + (1 - \alpha) * \left[\frac{\sum_y CO2[y]}{CO2_{ref} * n_{years}} \right] \\
 & + \frac{\text{syngas_prod}}{\text{syngas_prod}_{ref}} \\
 \text{w.r.t } & \text{invest}_{mix} \in [0, 100] \\
 \text{s.t. } & \text{Total_energy_prod} \geq \text{min_energy} \\
 & \text{energy_net_prod} \geq \text{energy_demand} \ (\forall \text{ energies}) \\
 & \text{liquid_fuel_prod} + \text{H2_prod} + \text{H2_liquid_prod} \geq \%total_prod \\
 & \text{solid_carbon_consumption} \geq \text{solid_carbon_stored} \\
 & \text{hydropower}_{2020} \geq \text{hydropower_prod} \\
 & \text{solid_fuel_prod} + \text{elec_prod} + \text{biomass_prod} \geq \%total_prod \\
 & \text{H2_liquid_prod} \geq \%H2_total_prod \\
 & \text{land_use} \geq \text{land_demand} \ (\text{for forest and agriculture})
 \end{aligned} \tag{1}$$