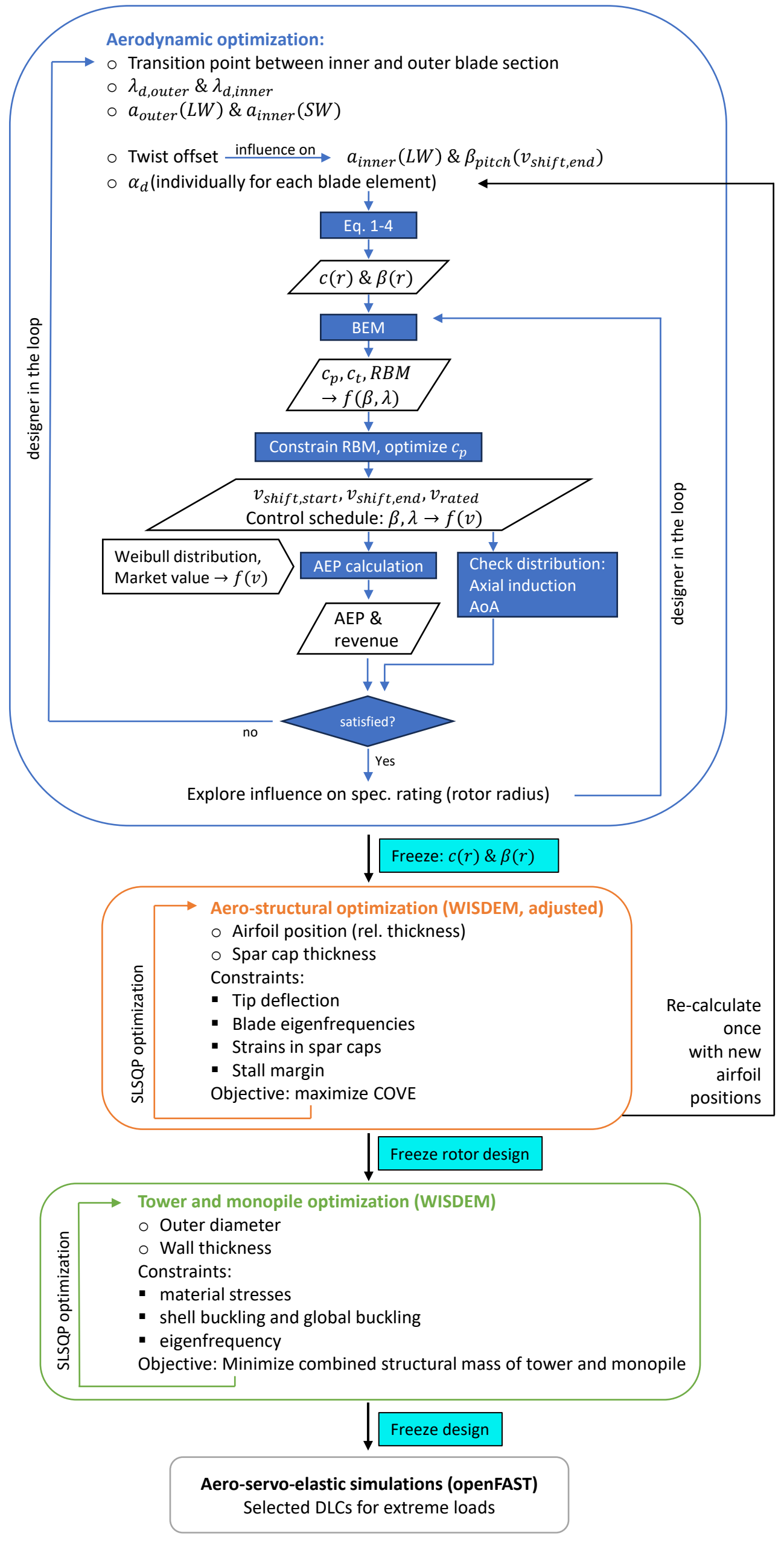
Aerodynamic optimization:
Transition point between inner and outer blade section
$\lambda_{d,outer}$ & $\lambda_{d,inner}$
$a_{outer}(LW)$ & $a_{inner}(SW)$
Twist offset
influence on
$a_{inner}(LW)$ & $\beta_{pitch}(v_{shift,end})$
α_d (individually for each blade element)
Eq. 1-4
$c(r)$ & $\beta(r)$
BEM
$c_p, c_t, RBM \rightarrow f(\beta, \lambda)$
Constrain RBM, optimize c_p
$v_{shift,start}, v_{shift,end}, v_{rated}$
Control schedule: $\beta, \lambda \rightarrow f(v)$
Weibull distribution, Market value $\rightarrow f(v)$
AEP calculation
Check distribution: Axial induction AoA
AEP & revenue
satisfied?
no
Yes
Explore influence on spec. rating (rotor radius)
designer in the loop
designer in the loop
Freeze: $c(r)$ & $\beta(r)$
Aero-structural optimization (WISDEM, adjusted)
Airfoil position (rel. thickness)
Spar cap thickness
Constraints:
Tip deflection
Blade eigenfrequencies
Strains in spar caps
Stall margin
Objective: maximize COVE
SLSQP optimization
Re-calculate once with new airfoil positions
Freeze rotor design
Tower and monopile optimization (WISDEM)
Outer diameter
Wall thickness
Constraints:
material stresses
shell buckling and global buckling
eigenfrequency
Objective: Minimize combined structural mass of tower and monopile
SLSQP optimization
Freeze design
Aero-servo-elastic simulations (openFAST)
Selected DLCs for extreme loads