```
IMPLICIT                        NONE

   ! Passed Variables:

INTEGER(4), INTENT(IN )      :: NumBl       ! Number of blades, (-).
REAL(ReKi), INTENT(IN )      :: DelGenTrq   ! Pertubation in generator torque used
during FAST linearization (zero otherwise), N-m.
REAL(ReKi), INTENT(IN )      :: DT          ! Integration time step, sec.
REAL(ReKi), INTENT(OUT)      :: ElecPwr     ! Electrical power (account for losses),
watts.
REAL(ReKi), INTENT(IN )      :: GBRatio     ! Gearbox ratio, (-).
REAL(ReKi), INTENT(IN )      :: GenEff      ! Generator efficiency, (-).
REAL(ReKi), INTENT(OUT)      :: GenTrq      ! Electrical generator torque, N-m.
REAL(ReKi), INTENT(IN )      :: HSS_Spd     ! HSS speed, rad/s.
REAL(ReKi), INTENT(IN )      :: ZTime       ! Current simulation time, sec.
CHARACTER(1024), INTENT(IN ) :: DirRoot     ! The name of the root file including the
full path to the current working directory.  This may be useful if you want this
routine to write a permanent record of what it does to be stored with the simulation
results: the results should be stored in a file whose name (including path) is
generated by appending any suitable extension to DirRoot.

! Local Variables:
REAL(ReKi)                   :: ElapTime      ! Elapsed time since the last call to
the controller, sec.
REAL(ReKi), SAVE             :: LastGenTrq    ! Commanded electrical generator
torque the last time the controller was called, N-m.
REAL(ReKi), SAVE             :: LastTimeVS    ! Last time the torque controller was
called, sec.
REAL(ReKi), PARAMETER        :: OnePlusEps = 1.0 + EPSILON(OnePlusEps)  ! The
number slighty greater than unity in single precision.
REAL(ReKi)                   :: TrqRate       ! Torque rate based on the current
and last torque commands, N-m/s.
REAL(ReKi), PARAMETER        :: VS_Rgn3MP =  0.01745329 ! Minimum pitch angle at
which the torque is computed as if we are in region 3 regardless of the generator
speed, rad. -- chosen to be 1.0 degree above PC_MinPit
REAL(ReKi), PARAMETER        :: VS_CtInSp =  70.16224   ! Transitional generator
speed (HSS side) between regions 1 and 1 1/2, rad/s.
REAL(ReKi), PARAMETER        :: VS_DT  = 0.00125  ! Communication interval for
torque controller, sec.
REAL(ReKi), PARAMETER        :: VS_MaxRat     =   15000.0   ! Maximum torque rate
(in absolute value) in torque controller, N-m/s.
REAL(ReKi), PARAMETER        :: VS_MaxTq      =   47402.91  ! Maximum generator
torque in Region 3 (HSS side), N-m. -- chosen to be 10% above VS_RtTq = 43.09355kNm
REAL(ReKi), PARAMETER        :: VS_Rgn2Sp     =   91.21091  ! Transitional
generator speed (HSS side) between regions 1 1/2 and 2, rad/s.



REAL(ReKi)                   :: VS_RtGnSp     ! Rated generator speed (HSS side),
rad/s. -- cequal to 99% of PC_RefSpd
REAL(ReKi)                   :: VS_Slope15    ! Torque/speed slope of region 1 1/2
cut-in torque ramp , N-m/(rad/s).
REAL(ReKi)                   :: VS_Slope25    ! Torque/speed slope of region 2 1/2
induction generator, N-m/(rad/s).
REAL(ReKi), PARAMETER        :: VS_SlPc = 10.0  ! Rated generator slip percentage
in Region 2 1/2, %.
REAL(ReKi)                   :: VS_SySp       ! Synchronous speed of region 2 1/2
induction generator, rad/s.
REAL(ReKi)                   :: VS_TrGnSp     ! Transitional generator speed (HSS
side) between regions 2 and 2 1/2, rad/s.
REAL(ReKi)                   :: BlPitchCom    ! Commanded blade pitch angle for
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