

Operating turbine



Measurements y

- Generator torque Q_g
- Rotor speed Ω
- Pitch θ_p
- Tower-top acceleration

 Ω, θ_p

Wind speed and thrust estimation

- Tabulated data:
- $C_P(\lambda, \theta_p)$
 - $C_T(\lambda, \theta_p)$

 Q_a

Turbine model



Kalman filter

- Previous states x_{k-1}
- Current inputs $u = [T_a, Q_g, \theta_p]$
- Current measurements y
- Noise levels Q, R

- State-space model $\mathbf{X}_x, \mathbf{X}_u, \mathbf{Y}_x, \mathbf{Y}_u$

Estimated states x_k

- Structural DOF q, \dot{q}
- Aerodynamic torque Q_a

 q

Tower loads and fatigue