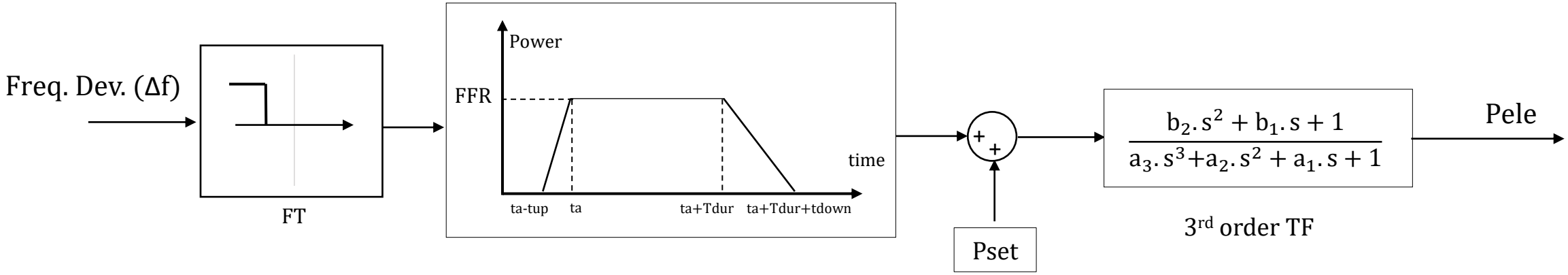
Vogelgrün – Variable speed model for FFR without SPPS

Block Diagram for FFR provision



Run-of-river hydropower plant (no pump mode available)

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Model's input signals, output signals and parameters

Input signals:

- Δf – grid frequency deviation from setpoint, given by fgrid - fset (p.u.)
- Pset – active power setpoint (p.u.)

Output signals:

- Pele – electrical active power (p.u.)

Parameters:

- FT – frequency deviation threshold (p.u.)
- FFR – FFR capacity (p.u.)
- ta – full activation time (s)
- Tdur – support duration time (s)
- a1, a2, a3, b1, b2 – 3rd order transfer function parameters
- tup – Ramp up time (s)
- tdown – Ramp down time (s)

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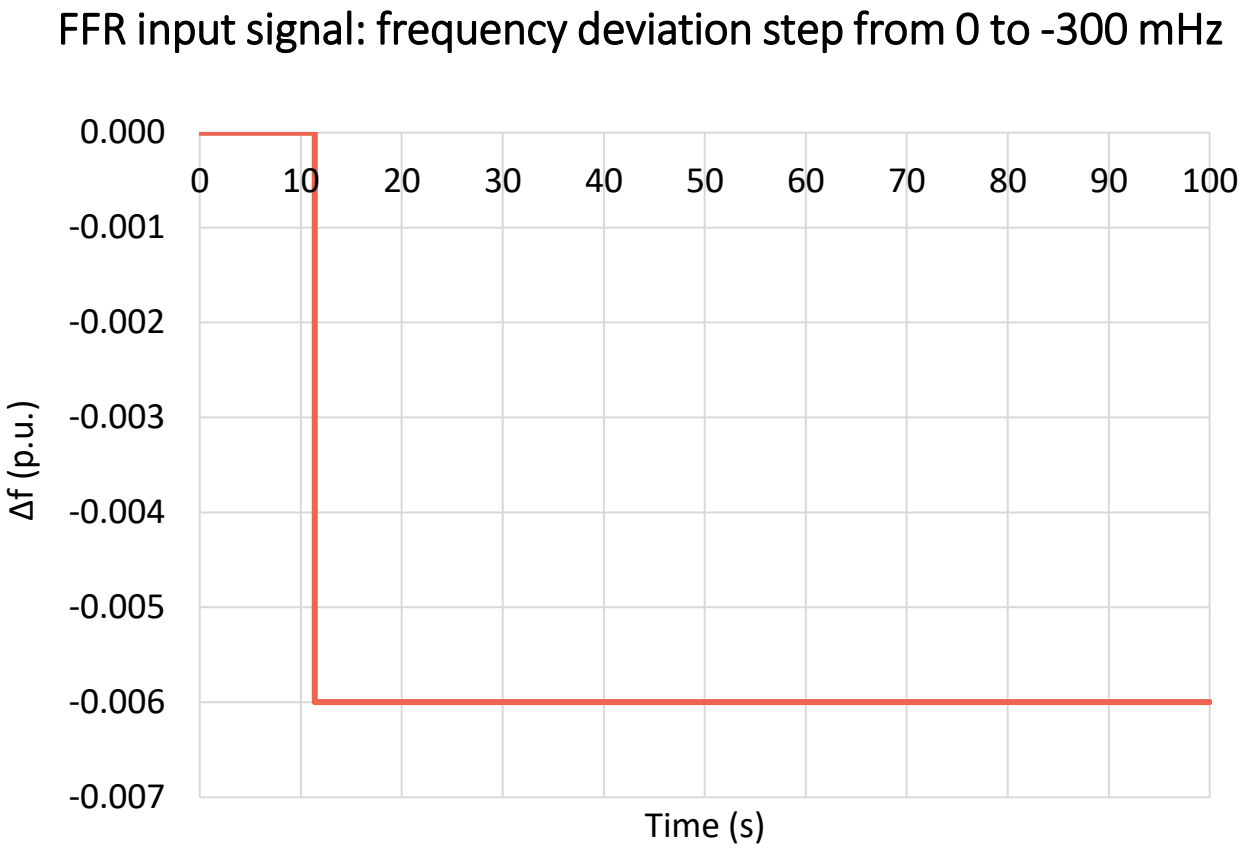
FFR input signal



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FFR service provision