Should I heat or should I not

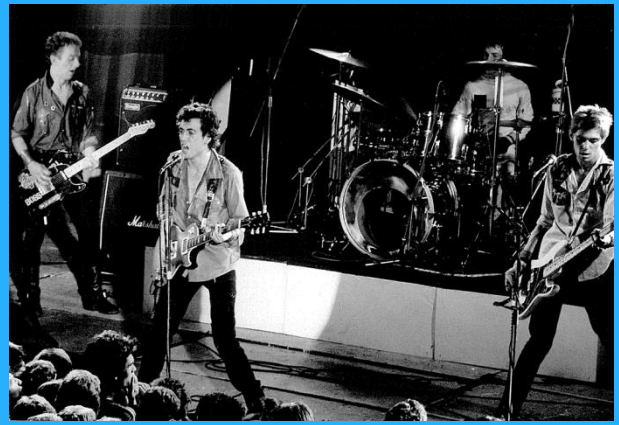
Smart Operation of Wind Turbines in Cold Climate

05.02.2020

René Cattin
Paul Froidevaux, Ulrich Langnickel

Winterwind 2020, Åre, Sweden

To heat or not to heat



Should I heat or should I not

Need to maximise power production

Quelle: watson.ch/!776140378l (19.02.2015)

Our world has become digital

Selected Events: SSI,TT
Activated Events: SSI

Meteotest

need

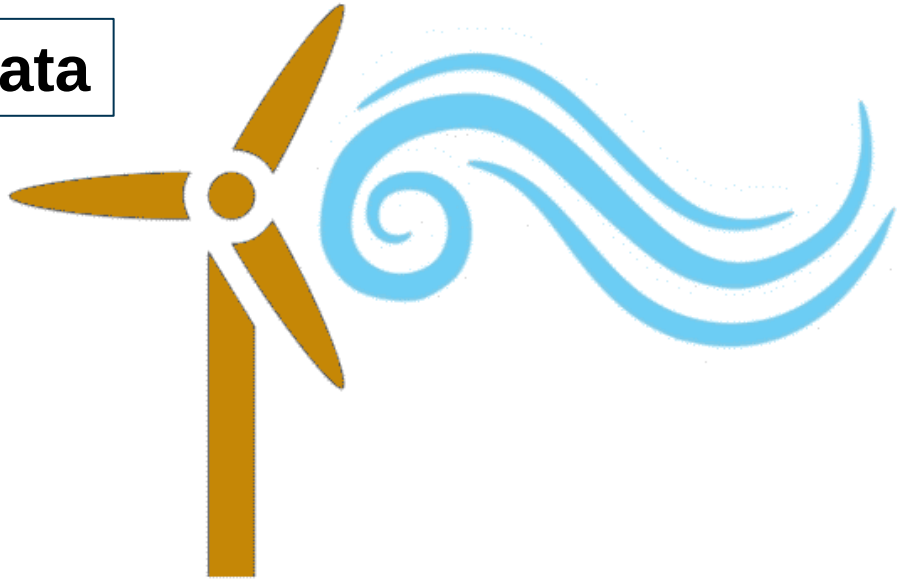
technology

A standard wind turbine
under icing conditions…

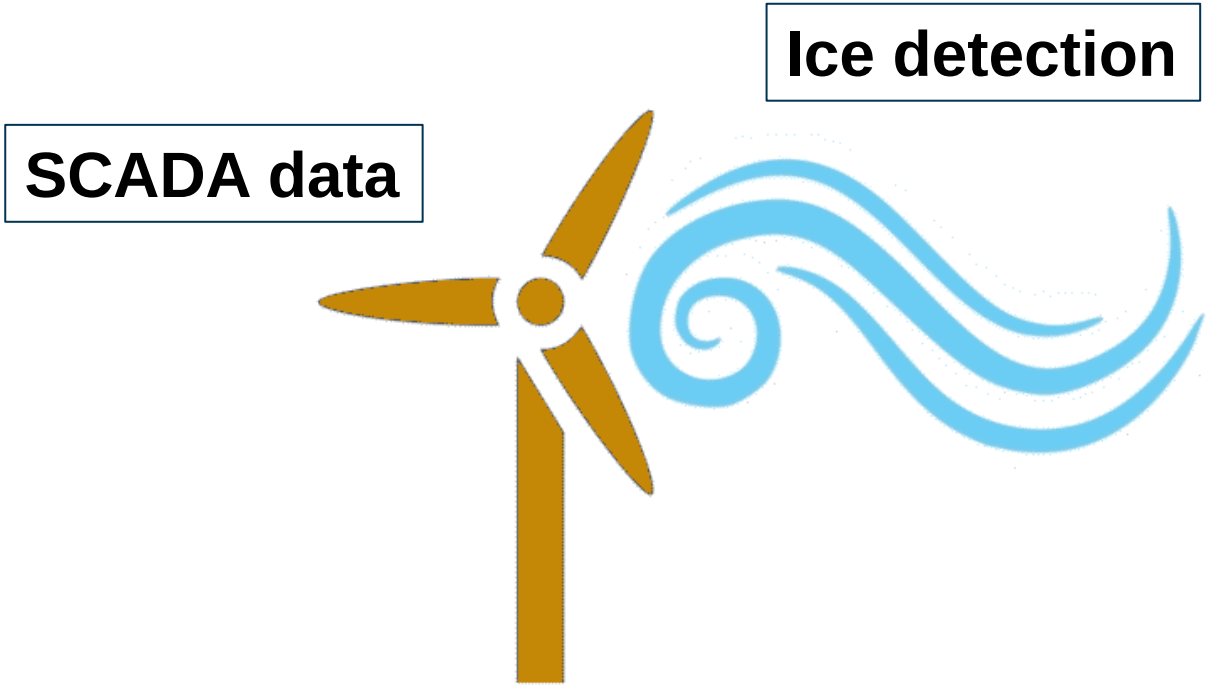
…is stupid, naked, deaf and blind.

Stupid, naked, deaf and blind

SCADA data



Stupid, naked, deaf and blind



Ice detector benchmarks

Senvion MM92 2.05 MW

*Tested rotor icing detectors

Weidmüller fos4X eologix

Not tested Wölfel

NERGICA

Vestas V90,1.8 MW

Stor-Rotliden, Sweden

weidmüller, BLADEcontrol (GER, 2005)

wölfel, IDD.Blade (GER, 2012)

fos4X, fos4Ice (GER, 2013)

eologix (AUT, 2015)

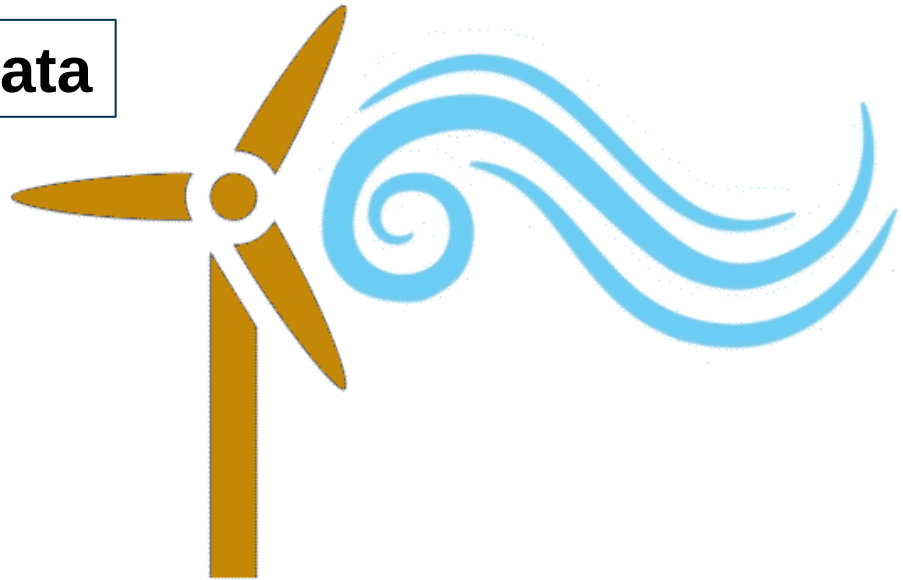
Meteotest

VGB PowerTech

Stupid, naked, ~~deaf~~ and blind

Ice detection

SCADA data



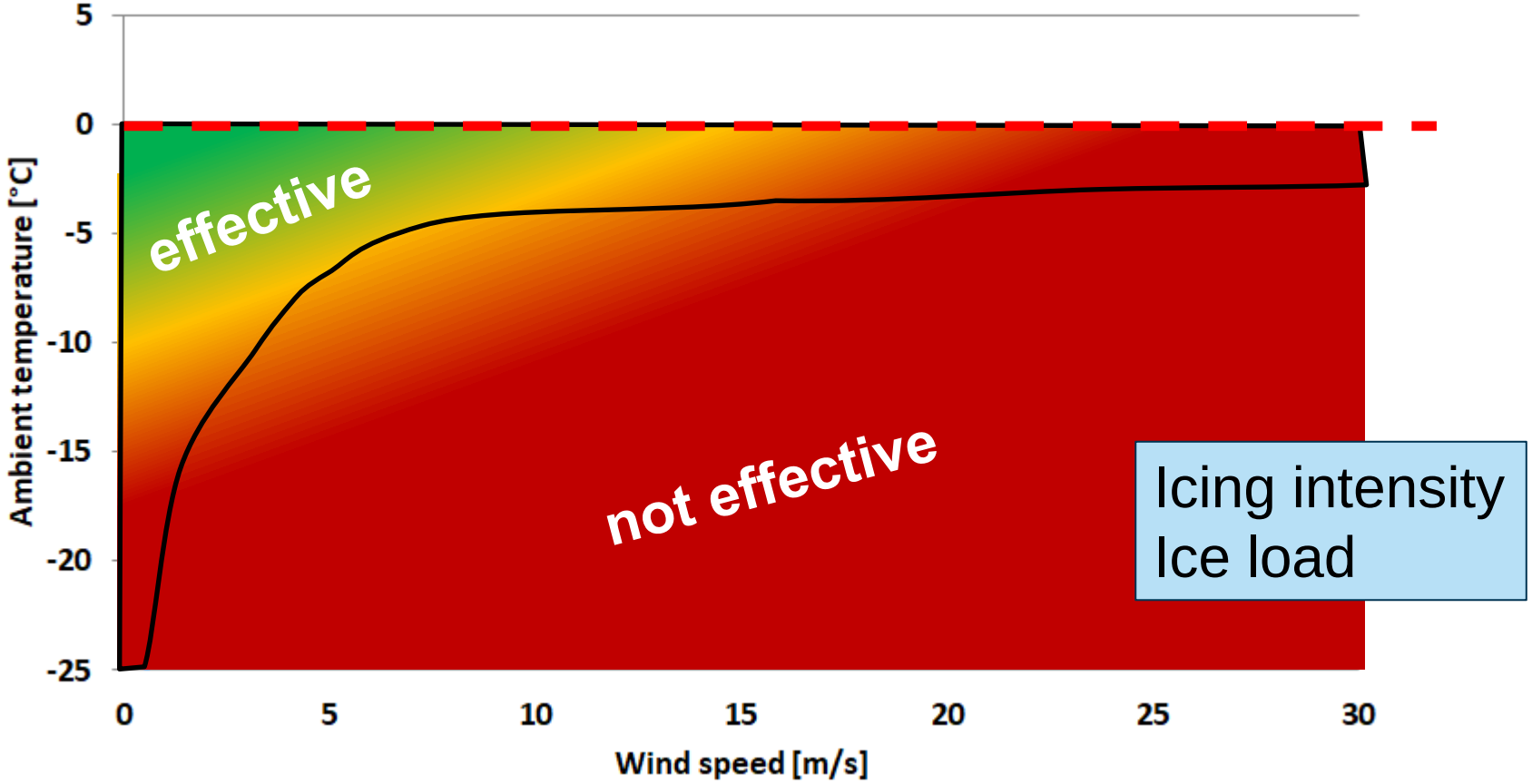
Stupid, naked, ~~deaf~~ and blind

Ice detection

SCADA data

Ice protection system

IPS performance envelope



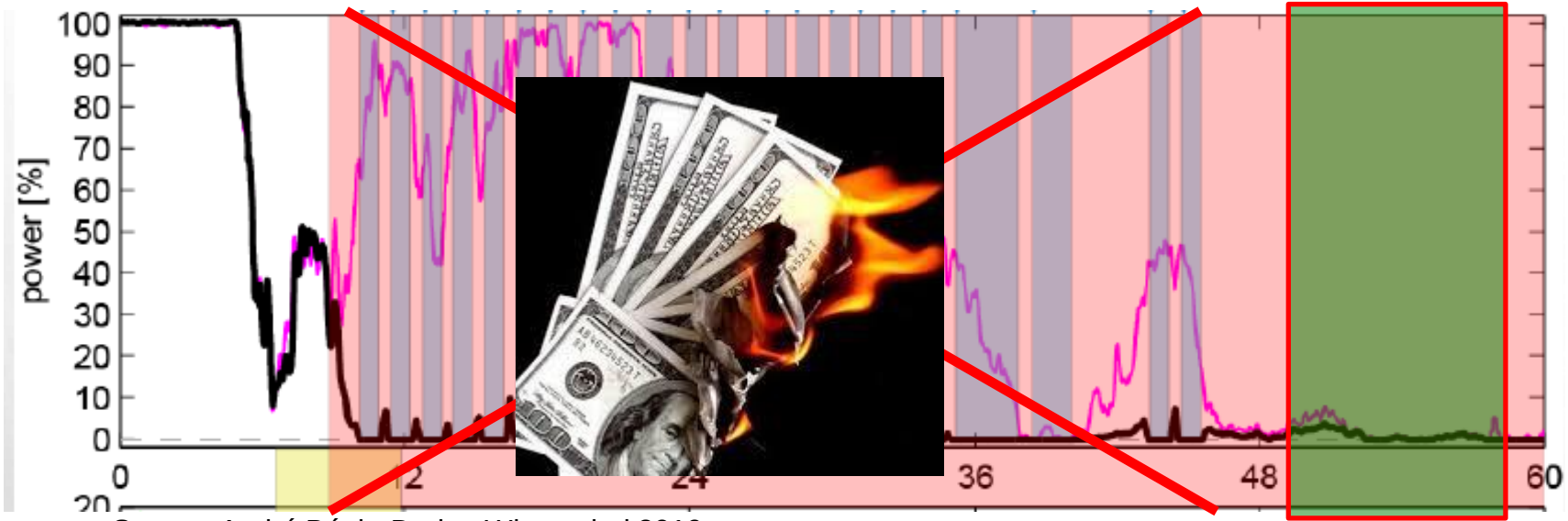
Stupid, ~~naked,~~ ~~deaf~~ and blind

Ice detection

SCADA data

Ice protection system

Stupid, ~~naked,~~ ~~deaf~~ and blind



Source: André Bégin-Drolet, Winterwind 2019

State-of-the-art wind turbines in cold climate are no more naked nor deaf…

…but they are still blind and stupid.

Should I heat or should I not?

Stupid, ~~naked,~~ ~~deaf~~ and blind

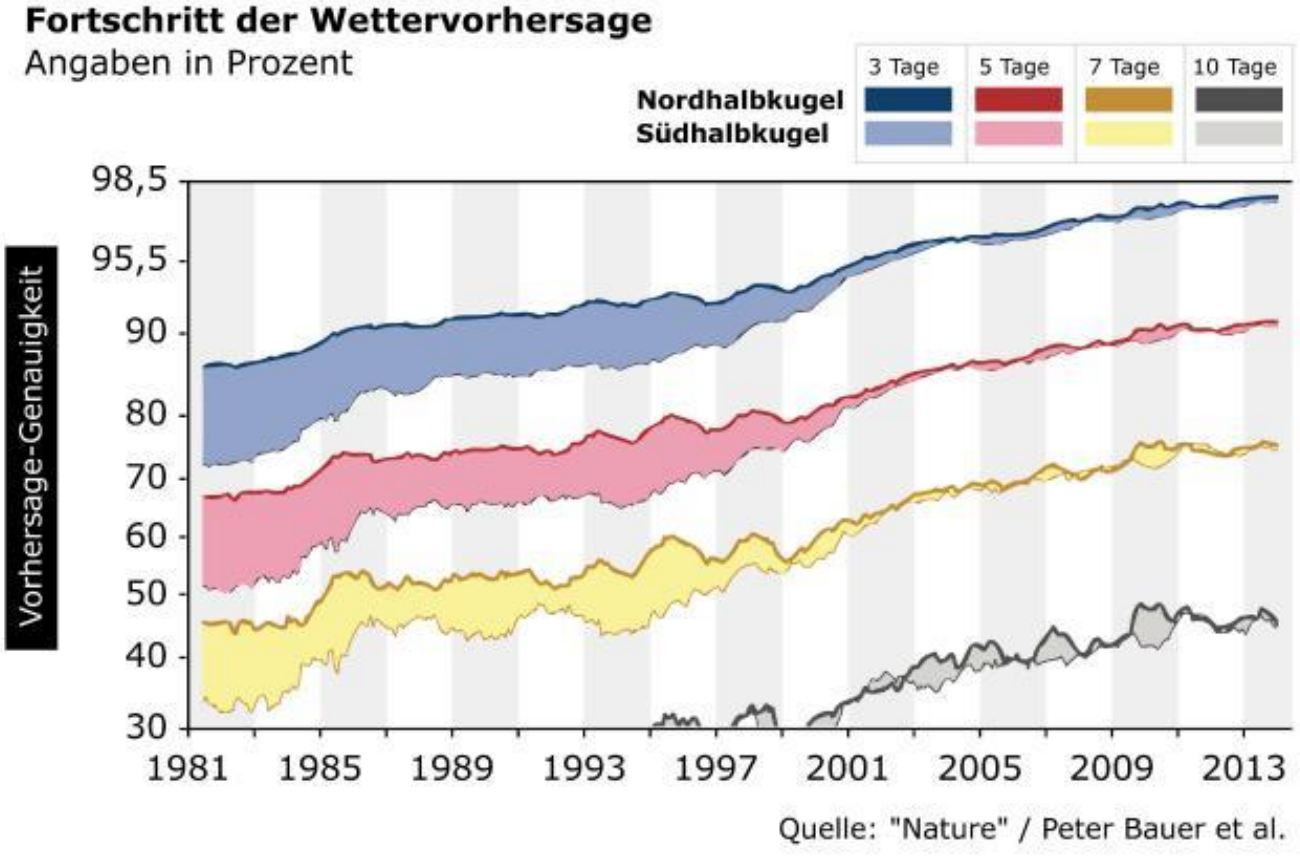
Ice detection

SCADA data

Weather Forecast

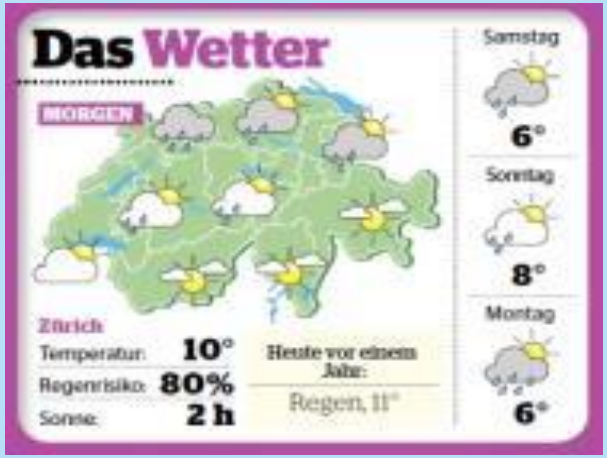
Ice protection system

Accuracy of a weather forecast



Digital weather forecast

Weather yesterday



Weather today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     <code>200</code>
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  −<payload>
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            <dni>882</dni>
            <e>717</e>
            <gh>754</gh>
            <gh_max>798</gh_max>
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          </values>
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            <dh>100</dh>
            <dni>917</dni>
            <e>826</e>
            <gh>871</gh>
            <gh_max>907</gh_max>
            <tt>20.5</tt>
          </values>
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JSON Rohdaten Kopfzeilen

Speichern Kopieren

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    308799:
      2018-07-02 15:00:00:
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        bh:                633
        gh:                709
        tt:                24.1
        gh_max:            737
        e:                 649
        dni:               904
      2018-07-04 18:00:00:
        dh:                99
        bh:                40
        gh:                140
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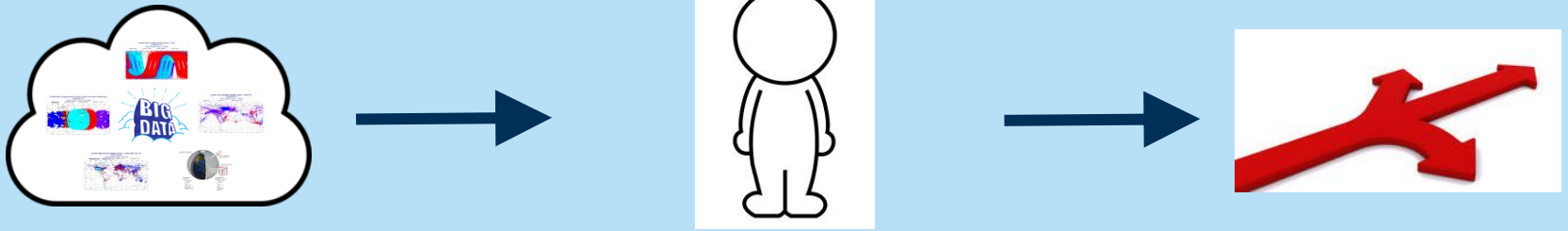
Machine2machine

Yesterday

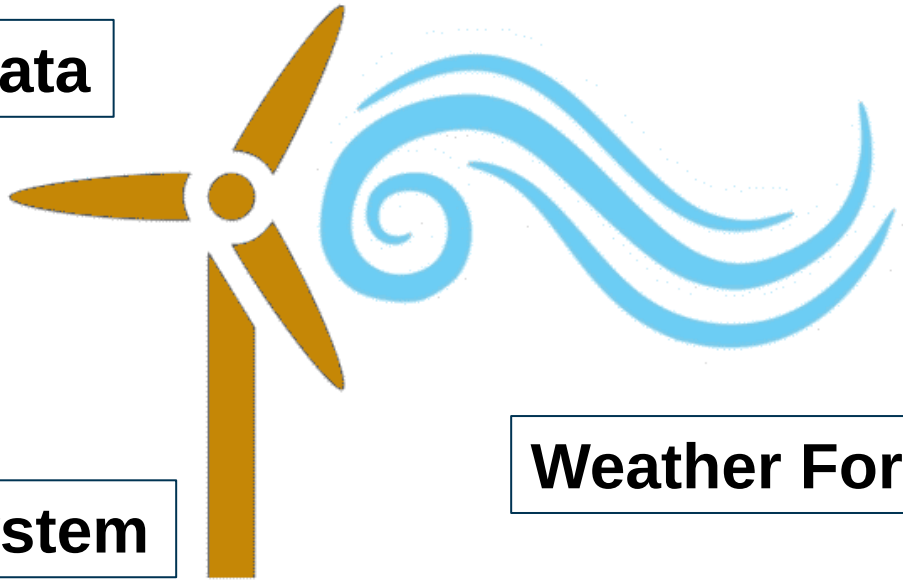


Today

Stupid, ~~naked, deaf and blind~~

Ice detection

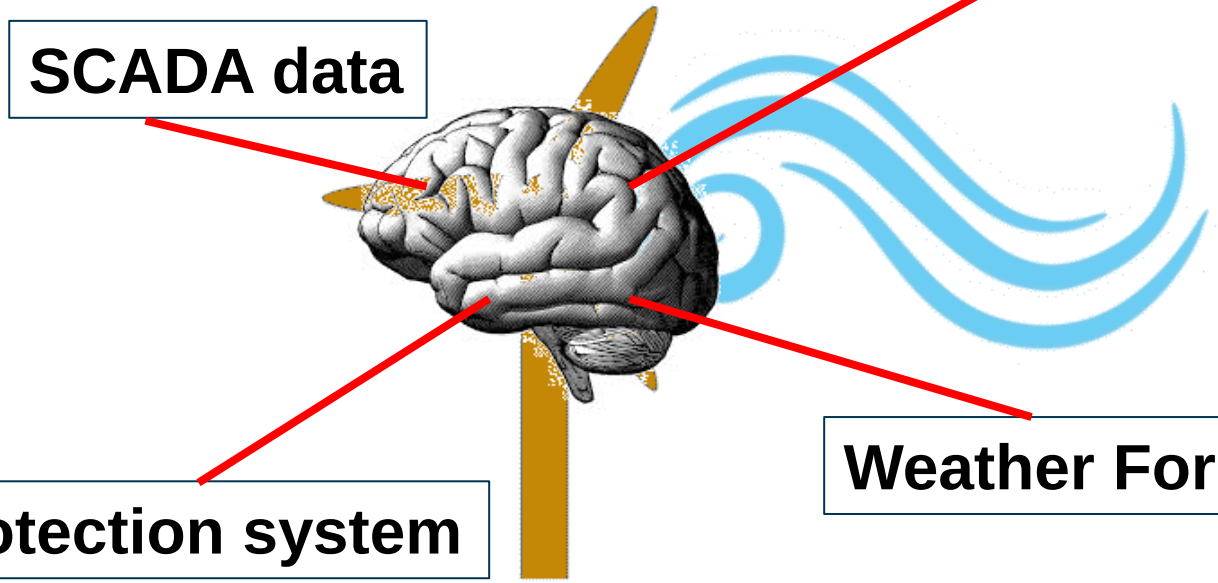
SCADA data



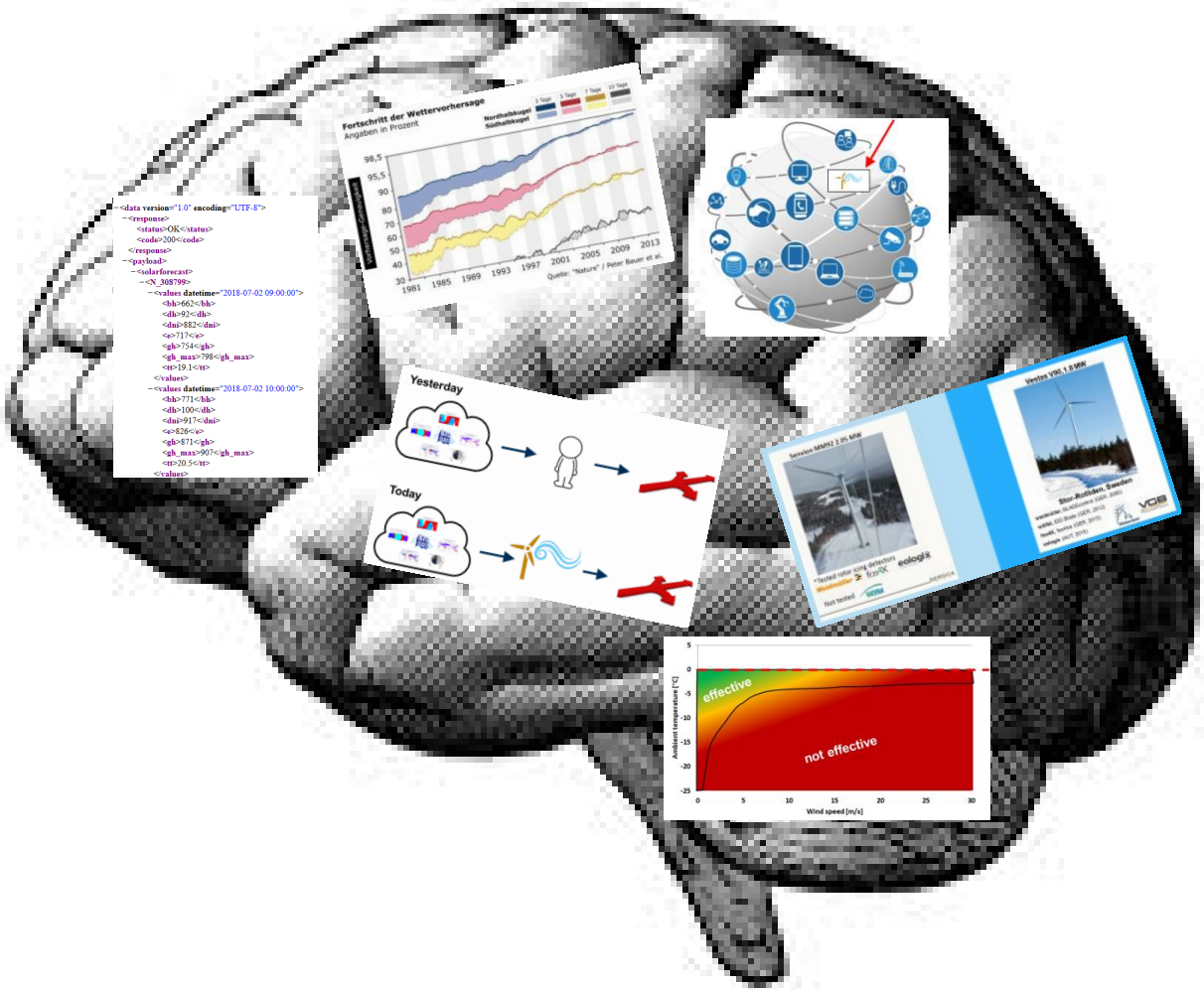
Weather Forecast

Ice protection system

Stupid, ~~naked, deaf and blind~~



What if we Interconnect all components and data streams in **real-time** and combine them with **smart decision making algorithms?**


Fortschritt der Wettervorhersage
Angaben in Prozent
Yesterday
Today
effective
not effective
Ambient temperature [°C]
Wind speed [m/s]

Meteotest
Fortschritt der Wettervorhersage
Angaben in Prozent
Nordhalbkugel
Südhalbkugel
Quelle: "Nature" / Peter Bauer et al.
<data version="1.0" encoding="UTF-8">
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<code>200</code>
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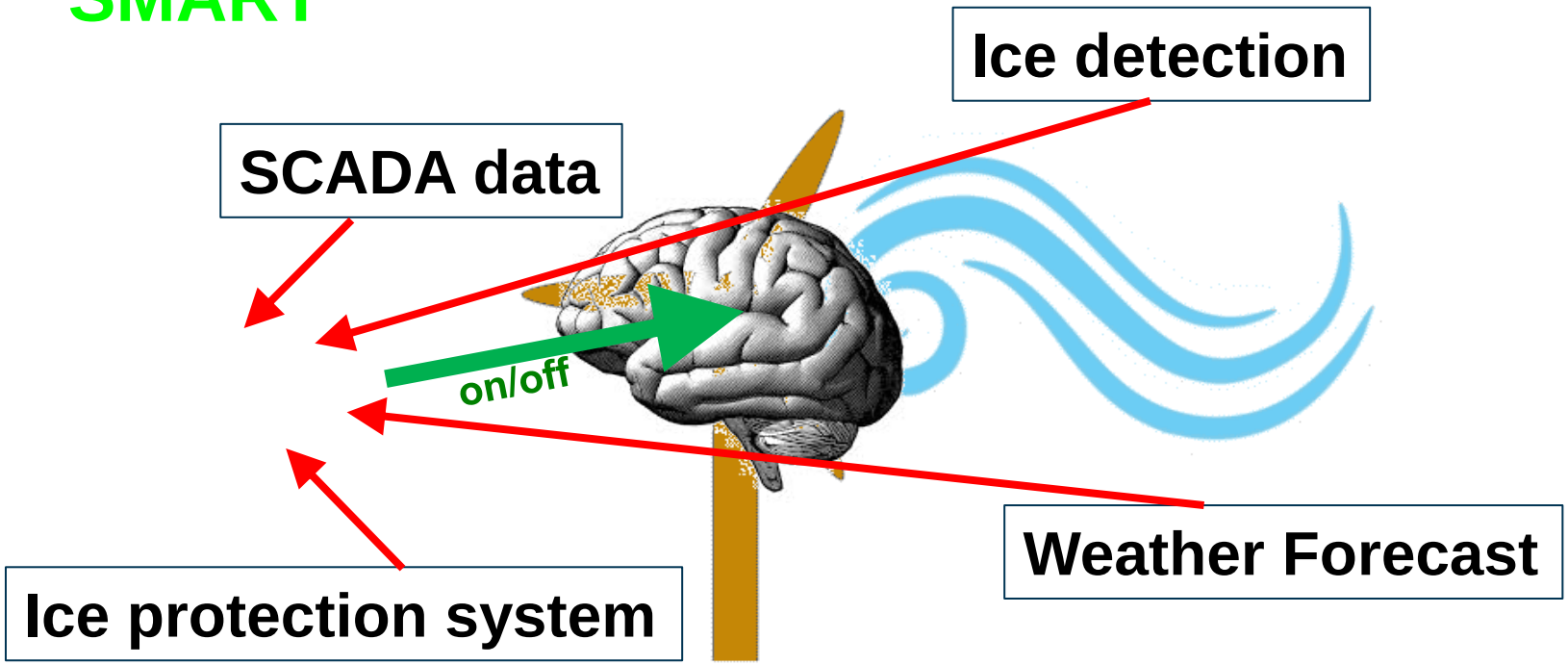
<gh_max>907</gh_max>
<tt>20.5</tt>
Yesterday
Today
effective
not effective
Ambient temperature [°C]
Wind speed [m/s]

~~Stupid~~, ~~naked,~~ ~~deaf~~ ~~and blind~~
SMART



~~Stupid~~, ~~naked,~~ ~~deaf~~ ~~and blind~~
SMART

You may say that I’m a dreamer

But I believe that in the future…

…Winterwind will not only be about “nuts and bolts”

but also about and “bits and bytes”

CLEVER & SMART
Meteotest

Meteotest
René Cattin
rene.cattin@meteotest.ch
+41 31 307 26 25