

Wintegrate Results and objectives

Tim De Troyer
11 May 2015



Vrije Universiteit Brussel



BruWind
Brussels Wind Energy Research Institute

The goal of Wintegrate yr 3

**To submit three requests for building permits
for wind turbines in the Brussels Capital Region**



Main insights from Wintegrate yr 1 + 2

Brussels has a good number of valid sites

See wind maps and CFD micro-siting

Vibration and acoustics are under control

Through a good mounting setup

Brussels wind shows strong economic impact
and valorisation potential

3

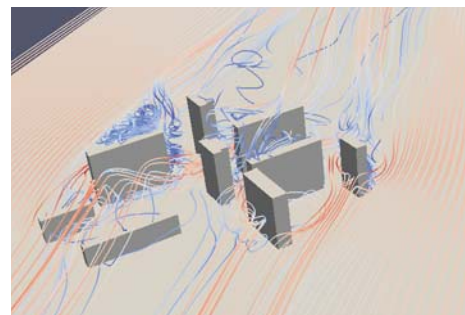
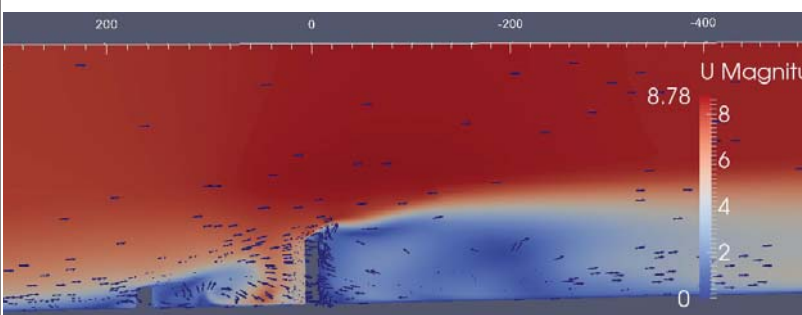
We used CFD to optimise location and height

Turbines on rooftop require careful placement

We formulated practical guidelines for Brussels

Standard rules of thumb too simple

Overly conservative for tall buildings



4

We measured vibrations on two of our test turbines

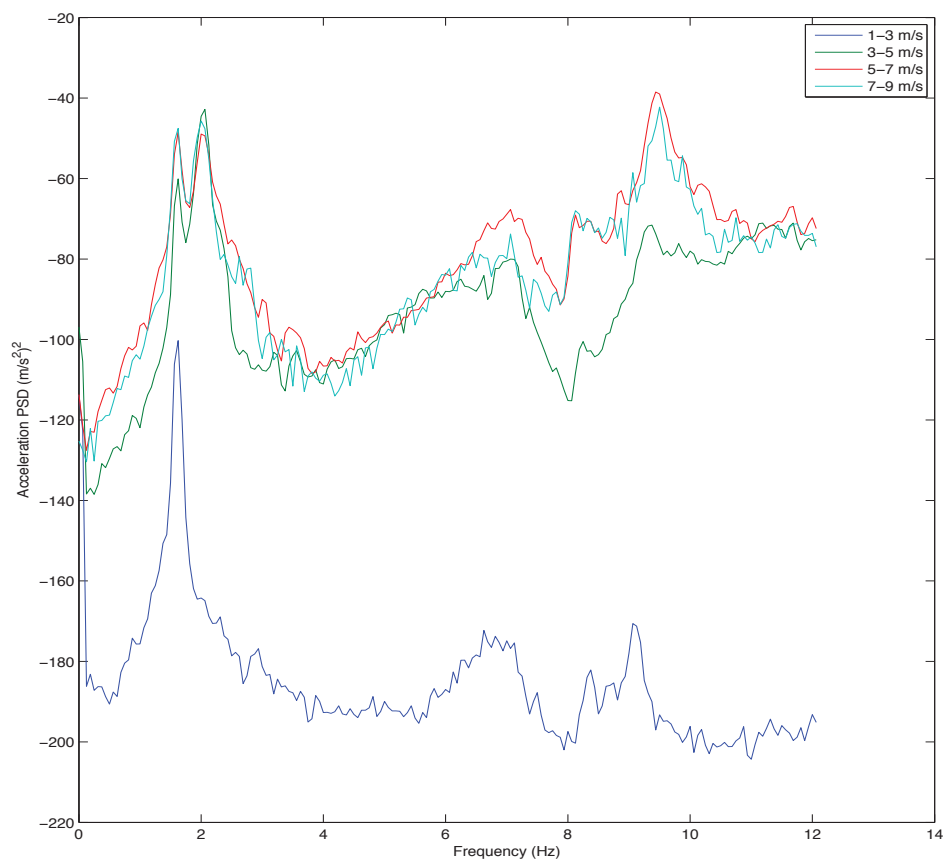
Vibration analysis is required for urban application

Our data was applied on building models (by bureau Greisch)



5

Vibration spectrum is only weakly dependent on wind speed



6

What about different turbines?

Dominant modes are from the mast, which has roughly standard dimensions and usually similar stiffness (steel) so dominant frequencies vary little over different types of HAWT

So vibrations are quite generic



7

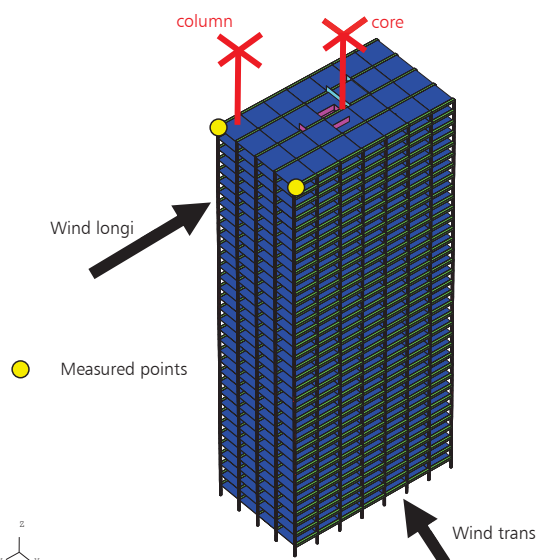
Structural impact of vibrations can be easily mitigated

Small turbines have no impact when mounted on the supporting structure of the building

Otherwise, local reinforcements may be necessary

Added damping
not appropriate

Use counterweights
for fixation on roof



8

Noise from small turbines is dwarfed in background noise

Background noise in BCR:
 $L_{den} > 45 \text{ dB(A)}$

Noise immission from turbine
at 60 m is below 40 dB(A)

Rooftops are noisy



9

The public is sceptic, but also curious

A CEESE (ULB) study of public acceptance points to

- Lack of knowledge

- Need for best practices

Local energy production induces awareness

- Use interactive display to engage the public

10

Wintegrate yr 3 demonstrates the feasibility in Brussels

We consider small turbines for rooftop installation about 5.2 kEUR / kW

Annual production
8000 - 14 000 kWh

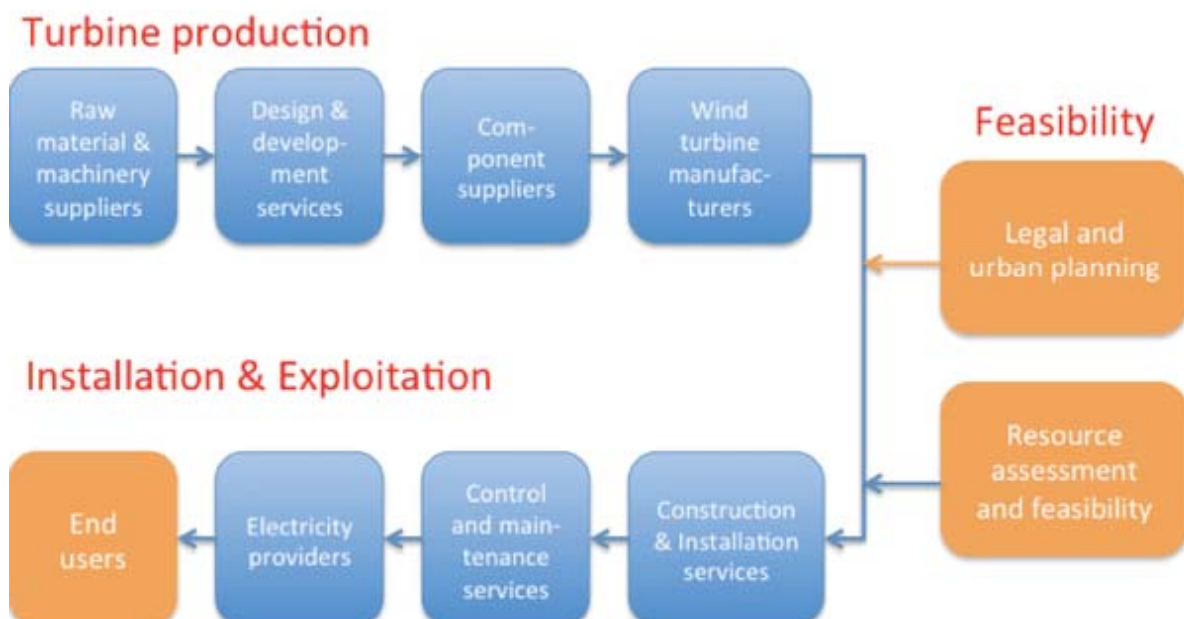
Payback time of
7-8 yr for SME



(Conrad-Hilton, Fort Lauderdale, Florida, 2014)

The medium term shows strong economic impact

Stimulate activity over entire value chain



What is the economic impact on the long term?

We estimate that Brussels has potential for roughly 50 sites, 3 turbines per site

Annual yield of around 1.5 GWh

But rooftop crowding should be managed



What we are doing in yr 3

is a demonstrator project

Prepare building permits for the installation of rooftop-mounted wind turbines

We draw up a detailed feasibility report, the owner submits the request for a permit

We assist with the development of a legal framework

Our valorisation assets

Our knowledge of the market
of small wind turbines

Our expertise with

- feasibility studies

- measurements of wind

- resource assessment

- CFD and micro-siting

- installing, operating, optimising,
maintaining wind turbines

Our network, BruWind



Now is the time to install wind turbines in the BCR

Pilot projects have gained momentum

- Technical and economic feasibility is confirmed

- There is willingness to invest

The technical expertise and valorisation potential
in Brussels warrant long-term benefits

Wintegrate Results and objectives

Tim De Troyer
11 May 2015



Vrije Universiteit Brussel



BruWind
Brussels Wind Energy Research Institute