



International cooperation started at EWEC in Madrid 1990

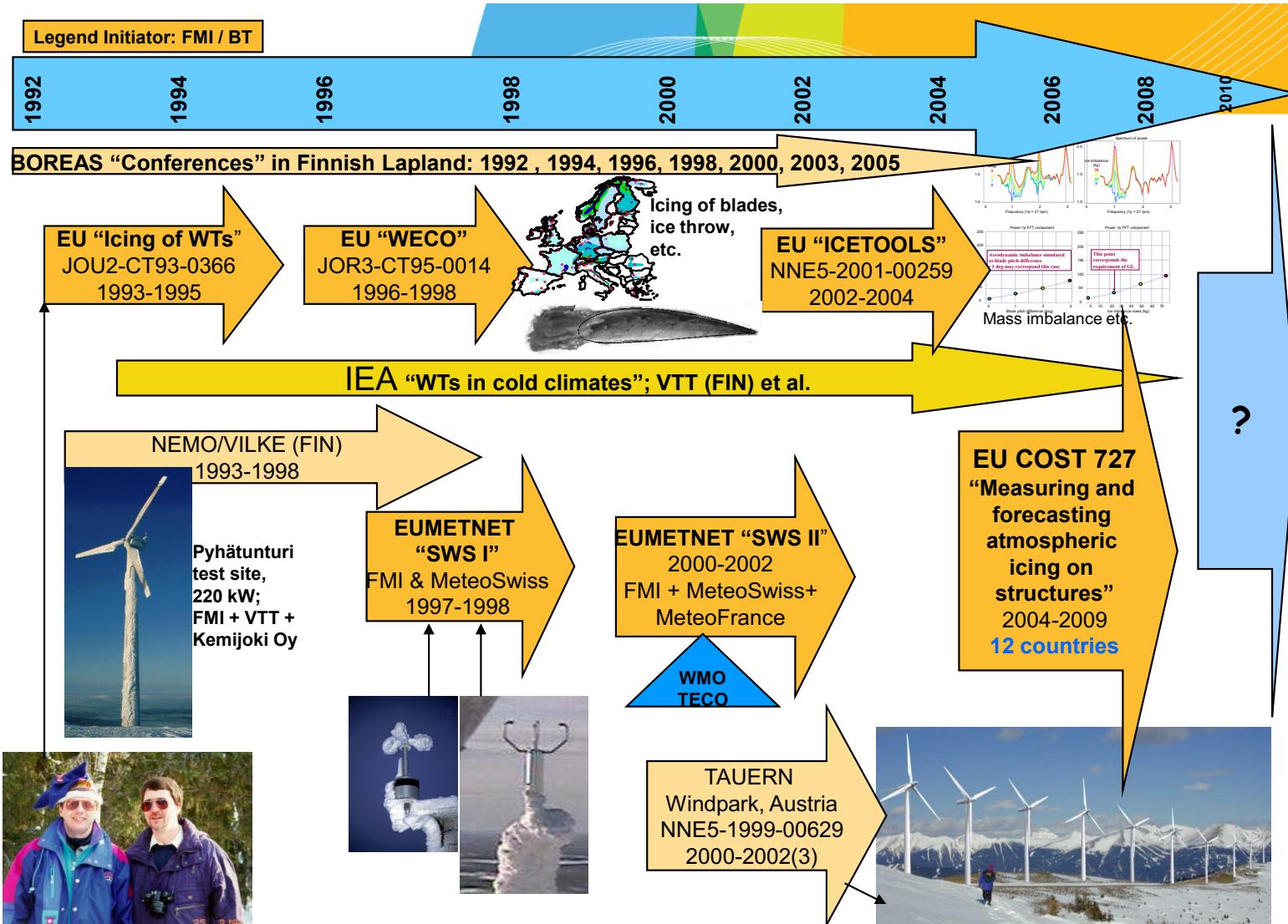
(based on some earlier contacts during EWEC in Glasgow 1989)



Brain storming in Madrid; from left:

Markku Autti (Kemijoki Oy, FIN), *Esa Peltola* (VTT, FIN), *Paul Kenyon* (NRG Systems Inc., USA), *Henry Seifert* (DEWI, GER), *Georg Böhmeke* (Aerodyn GmbH, GER),
Bengt Tammelin (FMI, FIN) and the taker of the photo *Shigeo Kimura* (KAIT, JPN).

Reasearch in
Wind Energy in
Cold Climates
started >30 years
ago



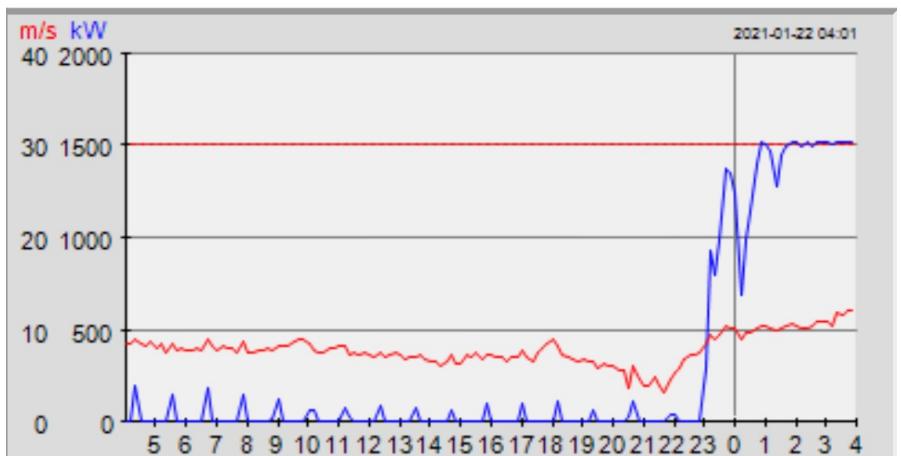
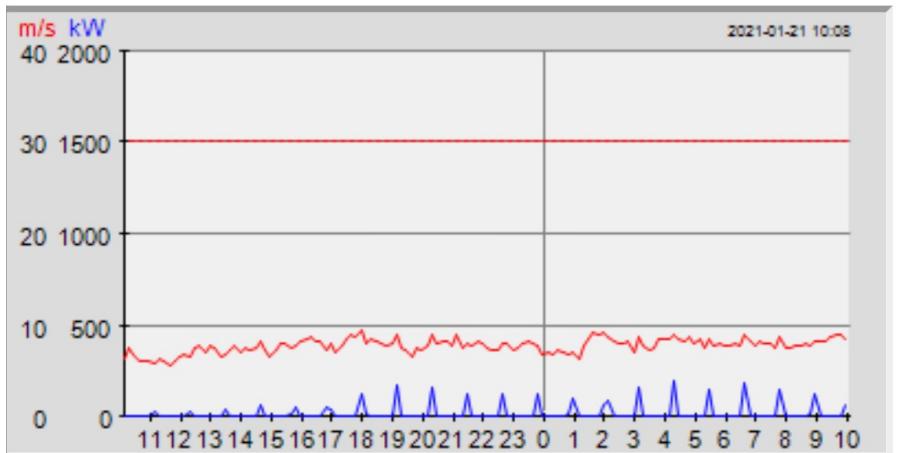
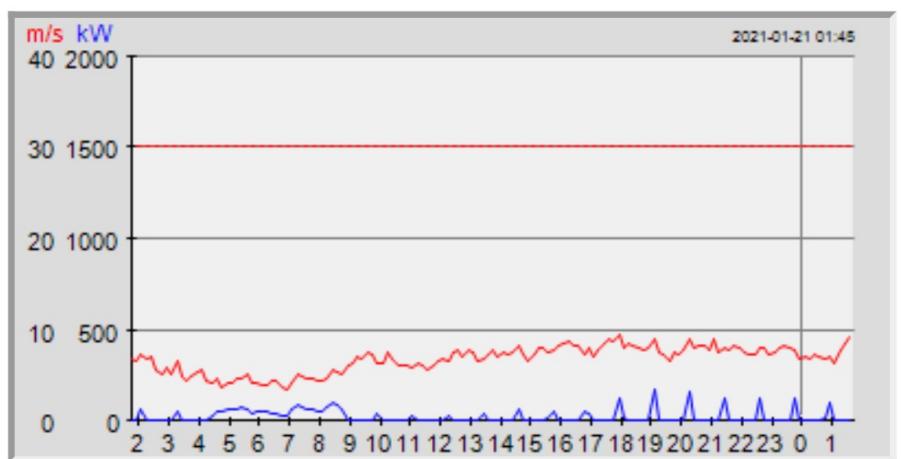
A summary by FMI of the first 10 years

The smallest EU research project ever. FMI + DEWI

For project details see: http://www.ilmatieteenlaitos.fi/research_meteorology/meteorology_7.html



We've still got
problems in cold
climates





January 2021 [MWh]

T1: -4,7 T3: -7,4

T2: -6,4 T4: -7,7

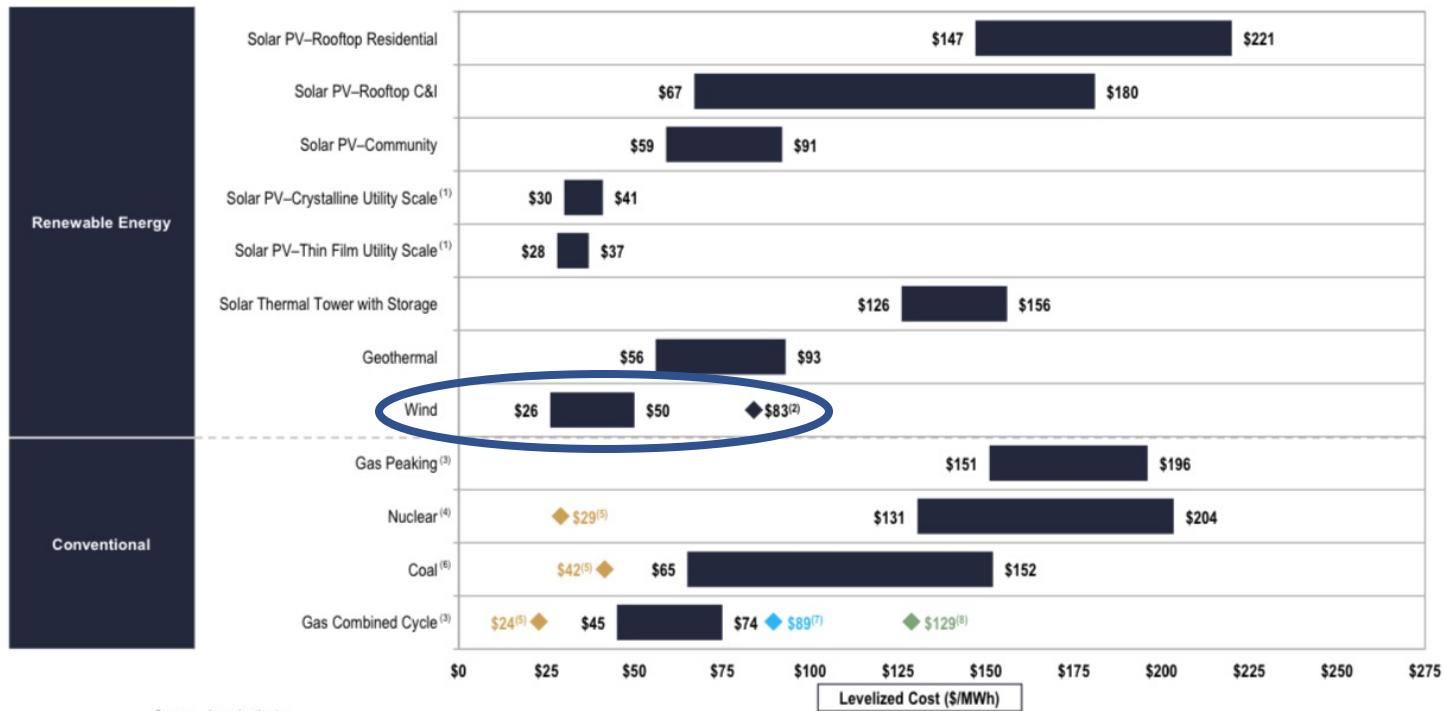
We ought to have had
300 - 400 MWh from
each WT.

They were all iced up.

For weeks and
months.

Levelized Cost of Energy Comparison—Unsubsidized Analysis

Selected renewable energy generation technologies are cost-competitive with conventional generation technologies under certain circumstances



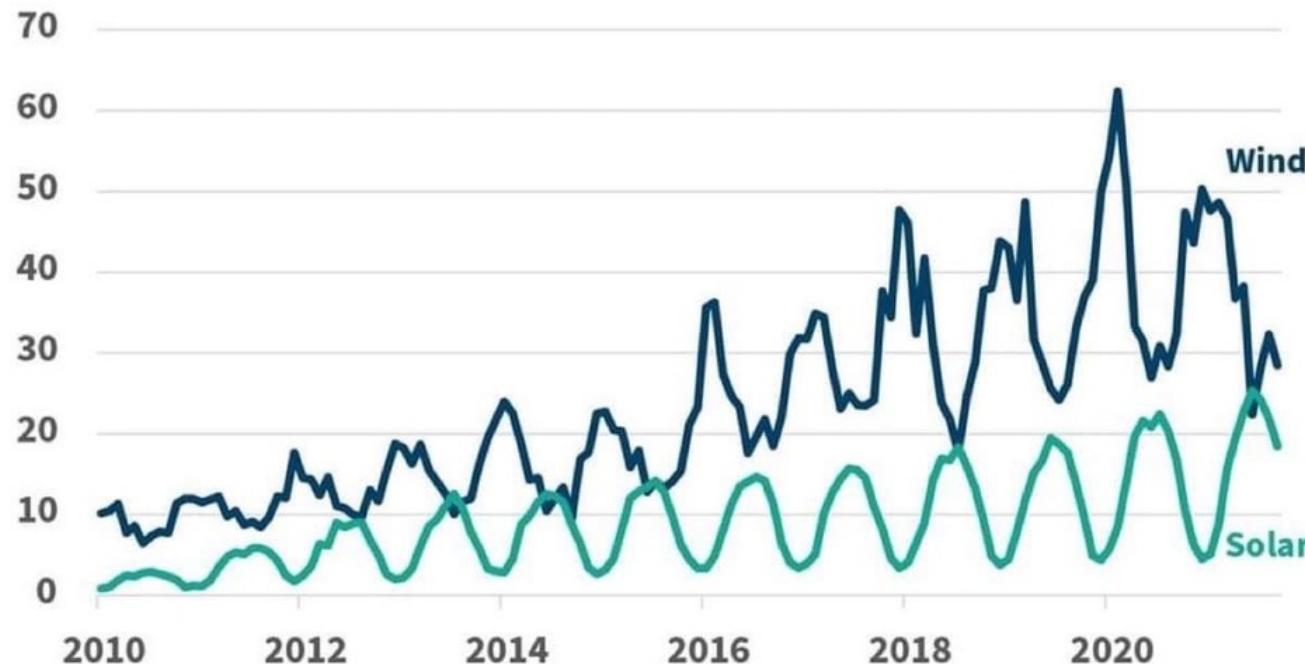
Is it still cheap
if we're
standing still?



We need to
find new ways

Wind and Solar Generation in Europe

terawatt hours (monthly)



Source: International Energy Agency, Monthly Electricity Statistics, December 2021. Data for OECD Europe, updated to September 2021.

PV and Wind are complementary



There's a huge demand for storage and grid system services