# Weather & Climate Services for Energy



## **Steve Dorling**

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Director, WEMC



GFCS Climate and Energy Summer School, 4<sup>th</sup>-7<sup>th</sup> July 2016







Weatherquest provide the weather datafeeds for the OWMS https://www.youtube.com/watch?v=nCp2ialyns4

# **Galloper Wind Farm**



HOME	NEWS	PROJECT OVERVIEW	PROCUREMENT & JOBS	DOCUMENTS	CONTACT	LINKS	CONSTRUCTION
Partners	VE	Galloper Offshor Greater Gabbard consultation, in-o Planning Inspect 2013 by the Sec	e Wind Farm is an extension I Wind Farm off the coast of S lepth site investigations and a corate, Galloper was awarded retary of State.	of the existing and Suffolk. Following c a thorough examina Development Con	l fully operation community ation by the nsent in May	al	
The energ	y to lead	The wind farm, w investment poter annual generation domestic needs	which has grid connection sec ntial of around £1.5 billion. It is on expected at the site will be of around 336,000 average U	ured, represents a s estimated that the equivalent to the a K households <sup>1</sup> .	n expected e average approximate	N.	

RWE are the first client of the OWMS system http://www.galloperwindfarm.com/project-overview

# **Presentation Content**

- About Weatherquest (10 minutes)
- Weather Services (25 minutes)
- Climate Services (10 minutes)
- Discussion (10 minutes)



## www.weatherquest.co.uk



**Weatherquest** is a privately owned weather forecasting and analysis company, headquartered in the School of Environmental Sciences at the University of East Anglia (UEA). Our team is involved in

- 1. Commercial forecasting services for the media, food & agriculture, renewables and port industry sectors
- 2. Applied meteorological research
- 3. Meteorological education & outreach
- 4. Employability training for students studying at UEA
- 5. Co-ordinating *WeatherTalk*, the Royal Meteorological Society's East Anglian Centre





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Need more info?

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wea	therquest	market sectors
Operational << Weather Forecasting >> Weather Data	Agriculture	Water
	Energy	Transport
	Press	TV & Radio
	Insurance	Construction
	Environment	Training
	<< Rese	earch >>

Meteorology & Climate



## A Model-Derived Climatology of Sea Breeze Circulations in the Southern North Sea



Chris Steele <u>Stephen Dorling</u> Roland von Glasow Jim Bacon

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North Norfolk Coast: Composite 10m Windfield at 09:00, 51 Backdoor Sea Breeze events, 2002-12



North Norfolk Coast Sea Breeze Climatology Red=Pure; Blue=Backdoor; Green=Corkscrew Black=Total

# Weatherquest are based in the UK's Greenest Building: The UEA Enterprise Centre youtube.com/watch?v=yNEsfbzUSoM







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## James Fisher and Sons plc

Marine Services Worldwide







THE SUNDAY TIMES













Port of Felixstowe





#### CSC are ISO 9001 : ISO/IEC 27001 accredited

We are particularly proud to be the first IT provider in the area to achieve ISO27001 certification – the recognised international standard for best practice in data security. Computer Service Centre has always placed the highest importance on the availability, integrity and security of our customers' data. The certification process and ongoing assessments test, validate and refine our Information Security Management System. Our ongoing compliance shows that we take your information security seriously, and that effective measures are in place to maintain data security.

# Client Needs and Benefits: Weather Services

- Improved Safety & Risk Assessment
- Enhanced Productivity
- Coordinated decision-making
- Better Financial Planning





### **Days of Thunder – Southern Britain – June 2016**

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#### Plasma Screen / Warnings Example







GO

NR4 7TJ

Max T	Min T	Wind Speed	Wind Dir	Rainfall	Potential Evap
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10 DAY TOTAL RAINFALL (mm) PROBABILITY %														
	Tue-22	Wed-23	Thu-24	Fri-25	Sat-26	Sun-27	Mon-28	Tue-29	Wed-30	Thu-31				
>80mm	0%	0%		0%		0%		0%						
60-80mm	0%													
50-60mm	0%													
40-50mm	0%													
30-40mm	0%													
20-30mm	0.%					2%								
15-20mm	0%									2%				
10-15mm	0%				2%	8%			4%	6%				
5-10mm	0%			2%	32%	52%	2%	6%	4%	6%				
2-5mm	12%	0%		10%	32%	26%	14%	22%	32%	26%				
0.1-2mm	88%	94%	90%	58%	32%	12%	38%	50%	48%	42%				
		6%	10%	30%	2%	0%	46%	22%	12%	18%				

#### 10 DAY TOTAL RAINFALL (mm) CONFIDENCE FORECAST SPREAD



#### Probability Forecasts (%)

Temperature C																																
Date	Thu-16				Fri-17					Sat-18				Sur	1-19		Mon-20					Tue	<del>:</del> -21			We	d-22	!	Thu-23			
Time	00	06	12	18	00	06	12	18	00	06	12	18	00	06	12	18	00	06	12	18	00	06	12	18	00	06	12	18	00	06	12	18
> 35C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30C to 35C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25C to 30C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	6
20C to 25C	0	0	0	0	0	0	0	0	0	0	0	2	0	0	8	32	4	0	28	56	32	0	48	64	34	0	50	64	42	0	56	66
-5C to 0C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-10C to -5C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-15C to -10C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-15C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rainfall mm																																
> 20mm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0
15mm to 20mm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10mm to 15mm	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	0	0	0	0	0
5mm to 10mm	6	0	0	22	0	2	0	16	0	0	0	0	0	0	0	0	0	0	4	2	0	0	0	2	2	6	2	0	0	0	0	10
0.5mm to 5mm	42	10	72	44	26	36	50	50	24	22	30	16	0	2	8	4	2	6	10	20	14	14	20	26	12	18	24	30	10	8	12	14
Omm	52	90	28	32	72	62	50	34	76	78	70	84	100	98	92	96	98	94	86	78	86	86	80	72	84	76	72	70	88	92	88	76
Maximum Gust Sp	eed	l mj	ph																													
> 80mph	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
60mph to 80mph	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50mph to 60mph	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
45mph to 50mph	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40mph to 45mph	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35mph to 40mph	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	4	0	0	0	0	0	0	0	0	0	0	0	2

Energy – Water – Food: Indistinct Boundaries

- Bioenergy (Food v Fuel)
- Wind+Solar Renewable Energy assets in agriculture and water sectors
- Hydroelectric Power
- Commodity Trading



## **Food Price Shocks**



The Food Price Index reflects changes in the (1) sugar, (2) dairy, (3) cereals, (4) Meat and (5) oil and fat markets.



#### Surface Solar Radiation (MJ/m<sup>2</sup>) during the Grain Fill period (10<sup>th</sup> June – 21<sup>st</sup> July)

 $Total \ Surface \ Incoming \ Shortwave \ Radiation \ (SIS) \ for \ the \ period \ June \ 10th \ - \ July \ 21st \ 2003 \ (MJ/m^2)$ 

Total Surface Incoming Shortwave Radiation (SIS) for the period June 10th - July 21st 2007 (MJ/m<sup>2</sup>)



Total Surface Incoming Shortwave Radiation (SIS) for the period June 10th - July 21st 2011 (MJ/m<sup>2</sup>)



Total Surface Incoming Shortwave Radiation (SIS) for the period June 10th - July 21st 2012 (MJ/m<sup>2</sup>)



Total Surface Incoming Shortwave Radiation (SIS) for the period June 10th - July 21st 2006 (MJ/m<sup>2</sup>)



## 2012: Lowest UK wheat yields for 25 years

- Low Solar Radiation
- □ Waterlogging
- Disease
- Forward contracts
- Drought in other key global growing regions







Maize is increasingly being grown as an energy crop, used in anaerobic digestors for the production of Biogas. Maize yields are affected by growing season (April-October) conditions, in particular by air temperature variations.



# Weather Services – a natural precursor for climate services?

- Trust
- Co-design
- Always easier to deepen an existing relationship
- Big Data



# Client Needs and Benefits: Climate Services??

- Investment Decisions
- Adaptation. Building Resilience.
- Supply chain risks
- Scientific Underpinning





Conferences

Events Projects

Resources

s About

Join WEMC

## Turn energy issues into opportunities



1230





## Copernicus Climate Change Service (C3S)

- Seven services: 2x Energy, 2x Water, 1x Agriculture,1x Cities, 1x Insurance
- Aim: to achieve operational climate services codesigned and co-developed with final users





## European Climatic Energy Mixes (ECEM)

Climate Change Service

climate.copernicus.eu



- Budget: €1.6 m
- Length: 27 mth (from Nov 2015)
- Six partners: UEA (lead), EDF, U Reading, Met Office, ARMINES and ENEA



WP 5 – Management & Coordination

Target: proof-of-concept or demonstrator

Stakeholder engagement central to ECEM

- Five stakeholder workshops, one every 6 months
- Tailored engagement plan







## From Climate variables to Energy systems





## The ECEM Demonstrator



The purpose of the ECEM demonstrator is to enable the energy industry and policymakers to assess how well different energy supply mixes in Europe will meet demand, over different time horizons (from seasonal to long-term decadal planning), focusing on the role climate has on the mixes.



University of East Anglia











