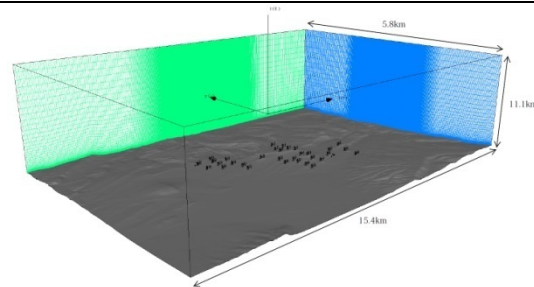## Application of LES CFD for turbine sitting for a complex terrain wind farm site
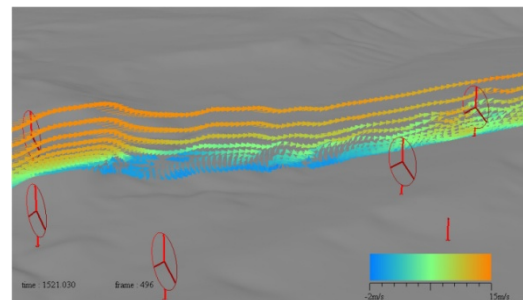
*Tsubasa Windfarm Design has carried out LES CFD calculation for a complex terrain site for EverPower Wind Holdings. The unsteady LES CFD code from the software RIAM-COMPACT®, developed by Dr. Uchida of Kyushu University, Japan was employed for flow simulation.*

Detailed topography data provided from EverPower was combined with SRTM1 data for constructing the CFD model.
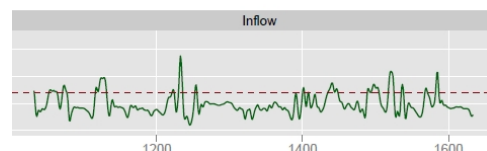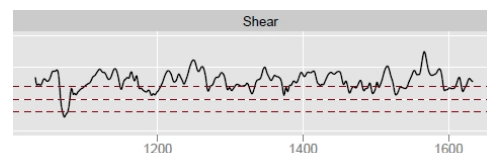
Calculation domain and grid mesh spacing was carefully considered. In order to increase accuracy, calculation mesh was concentrated to a minimum of 6m in the vicinity of turbines. A total of 26 million grid points was calculated for a real time output of 10 minutes.

The LES CFD simulation predicted flow separation and onset of turbulence at a hill and the turbulence is travelling through to one of the turbines downstream. As a result, wind speed fluctuates vertically and horizontally across the wind turbine rotor face.

The time series of vertical shear exponent and inflow angle were analyzed. The wind speed time series across the turbine rotor face was compared with IEC Extreme Wind Shear (EWS) model. Based on the analysis results, it was recommended to relocate the turbine in order to minimize operational risk.



CFD Domain & Calculation Mesh



Flow Separation and Onset of Turbulence

(click here to see animation)



Shear Exponent and Inflow Angle Time Series

*"Very helpful tool for turbine sitting. The dynamic LES simulation provides accurate and important information on turbulence distribution across the site. I see a lot of value in running this simulation on not just new sites but also for existing operational sites."*

Jim Sardonia, Director of Wind Resource of EverPower