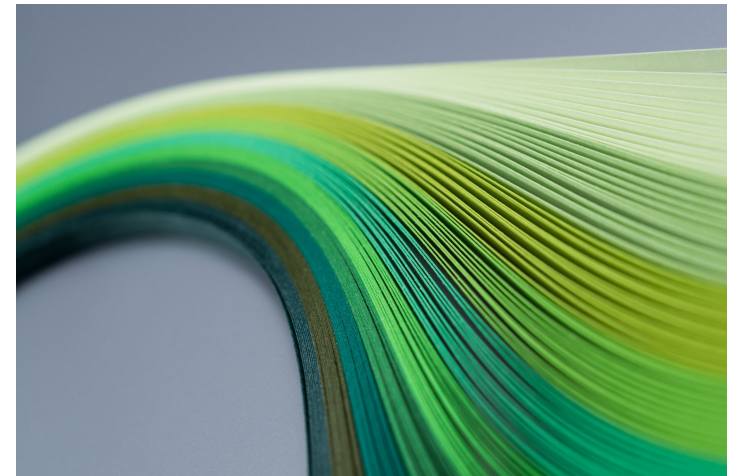# Introducing
WindSim Accelerator

WindSim AS
Tollbodgaten 22
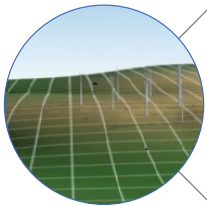3111 Tønsberg
Norway
Tel.: +47 33 38 18 00

WindSim China
No. 101 Shaoyang Beili, Chaoyang District
1000029 Beijing
China
Tel.: +86 186 1029 1570

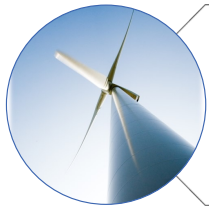# What we will cover in this session

- What it is
- How it works
- Demo key features
- Microsoft Azure and security
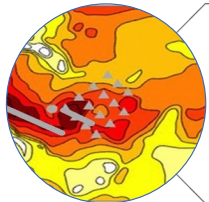- A word from the beta testers
- Software-as-a-Service

WindSim Accelerator | Product Strategy

Enable successful wind farm projects through accurate and fast modeling of wind fields in the cloud

Deliver the platform of choice for wind farm modeling from screening through planning

Lead with technology and expertise in wind flow modeling
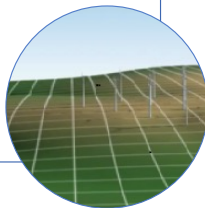
WindSim Accelerator | Roadmap

WindSim Accelerator

User driven requests

Operations & Support

Expand offering to China

Enable successful wind farm projects through accurate and fast modeling of wind fields in the cloud

New markets

End-to-end workflow in cloud
Improve visualization & results

Expand life cycle coverage

Explore adjacent markets

Deliver the platform of choice for wind farm modeling from screening through planning

Innovation Norway

HOHAI UNIVERSITY 河海大学
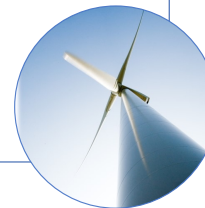
AKER OFFSHORE WIND

Collaborative research for offshore wind

SMART INNOVATION NORWAY

上海电气 SHANGHAI ELECTRIC
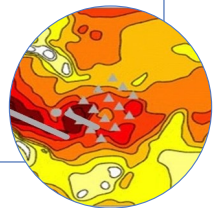
Strategic cooperation

Lead with technology and expertise in wind flow modeling

WindSim Accelerator | Game Changing Migration from Desktop to Cloud

windsim

Desktop software license with annual Support & Maintenance
- Physical local installations
- Only accessible from customer owned PC
- Licenses for current version only
- Upgrades released once a year

WindSim Accelerator | Game Changing Migration from Desktop to Cloud

**WindSim Accelerator –
Cloud-based SaaS with subscription model**
- Easier access
- Simulation time significantly reduced
- Ongoing upgrades
- Tiered subscription-based pricing model
- Released 1Q22, first customers signed on 2Q22

**Desktop software license with annual
Support & Maintenance**
- Physical local installations
- Only accessible from customer owned PC
- Licenses for current version only
- Upgrades released once a year

WindSim Accelerator | Faster Simulations – How Does it Work?

WindSim Accelerator | Simulation Software Modules
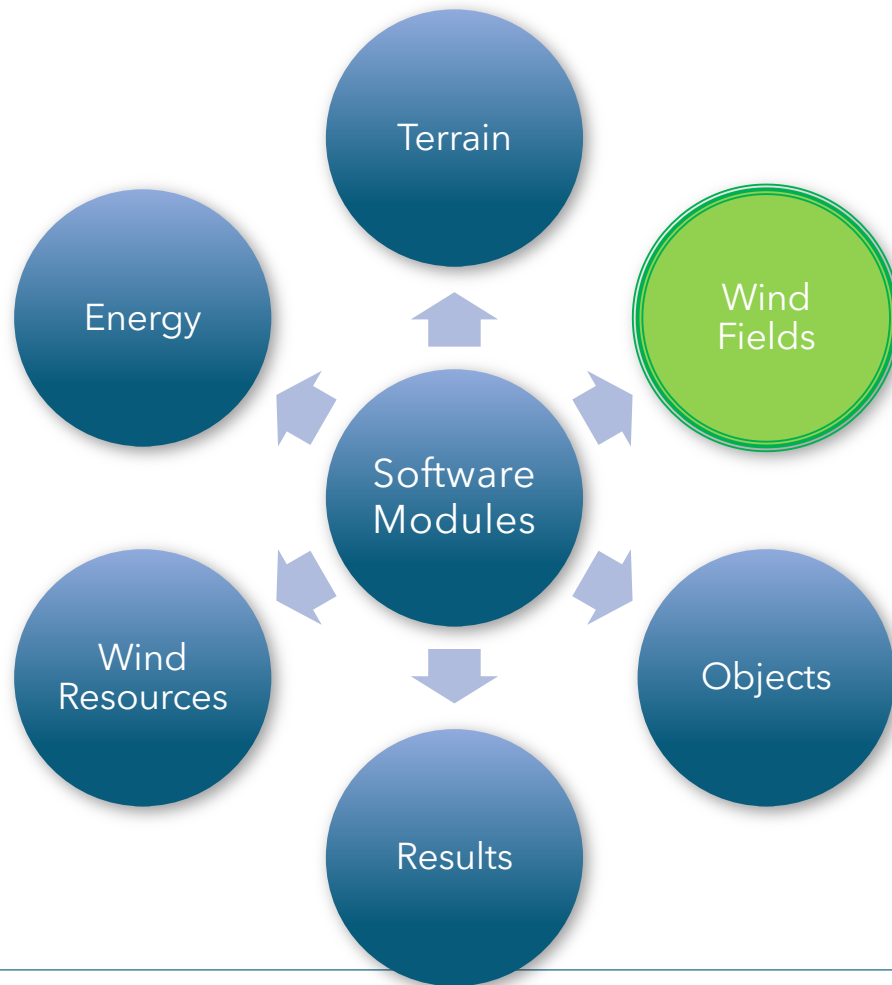
WindSim Accelerator is the platform housing the simulation modules.

Wind Fields simulation module is the first module moving to the cloud, leading to significantly faster simulation times.

Pre- and post-processing will take place in latest WindSim desktop version.

WindSim Accelerator | Wind Fields Simulations in the Cloud
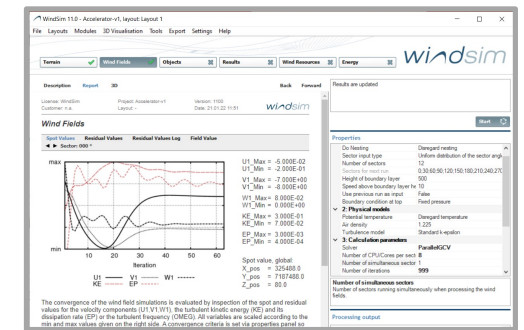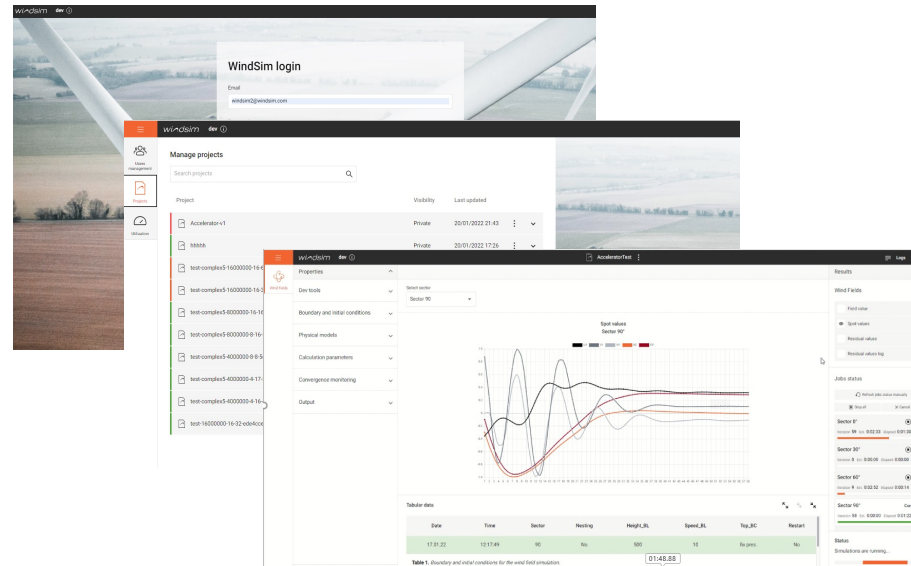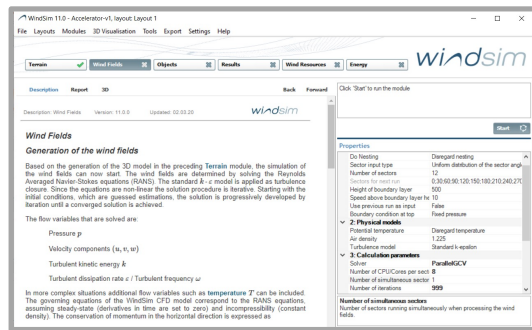
WindSim Desktop
Calculate 3D model of terrain and define Wind Field properties

WindSim Accelerator
Upload project and run Wind Fields, benefit from cloud scalability
Share results file with your team
Download results

WindSim Desktop
Download project including
Wind Fields results
Continue workflow in desktop version

WindSim Accelerator | The Experience

Features	**Benefits**	**Advantages**
CFD (Computational Fluid Dynamics)	✓ Optimal turbine placement ✓ High accuracy and reliable results, trustworthiness ✓ Increased earnings visibility	✓ Bankability ✓ Better investment decisions ✓ Higher, realistic AEP ✓ Lower CAPEX ✓ Lower OPEX
Cloud computation	✓ Reduced project development time ✓ Higher productivity ✓ Flexible subscription packages ✓ Time freed up ✓ Less local hardware investment ✓ Reduced internal IT support ✓ Accessibility ✓ "Limitless" model size ✓ Continuous access to upgrades ✓ Predictable costs	✓ Faster investment decisions ✓ Higher competitiveness ✓ Improved project RoI

WindSim Accelerator | Key Features

- Fast WindFields calculation

- Project storage

- Project and results sharing

- User management

- Utilization information, credit monitoring

WindSim Accelerator | WindFields

- We choose the optimal servers, based on:
  - Solver
  - Model size
  - Number of sectors

- Comparision between WindSim Accelerator and running on a powerful desktop machine (12 CPU, 128 GB RAM) of a 12 sector project

Model size	Iterations	Accelerator (hours)	Local (hours)	% Faster
5 M	400	5	10	200%
6 M	600	8	18	225%
10 M	200	2	10	500%
11 M	600	8	33	413%
24 M	1500	30	360	1200%
55 M	1000	40	3300	8250%

Microsoft Azure | A safe environment

- Microsoft Azure maintains the largest compliance portfolio in the industry including CSA Star, SOC 3, and several ISO standards

- WindSim follows industry standards and best practices to protect the interests and privacy of our client's organization by securely managing customer data
  - Security
  - Availability
  - Processing integrity
  - Confidentiality
  - Data Privacy
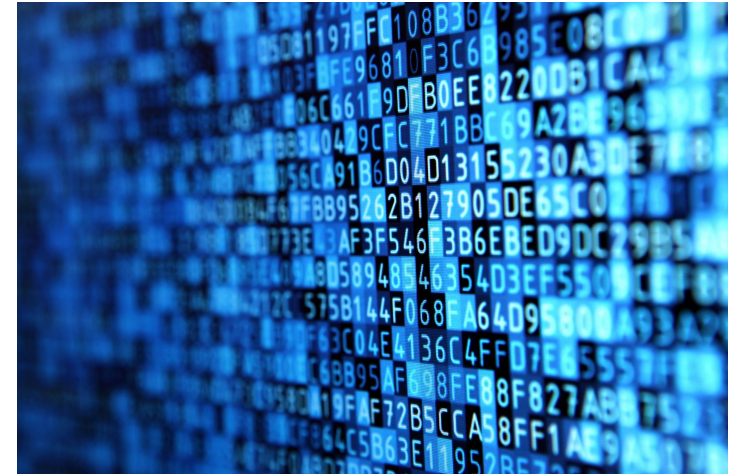
Microsoft Azure | Security

- Refers to protection of the system against unauthorized access. Access controls help prevent potential misuse of the system or data.

- Secure access control
  - Authentication and authorization: username and password
  - Roles and claims and logging, so that the users, application, and data are isolated from each other to ensure security

- SQL Injection

- Cross Site Scripting (XSS)

- URL/HTTP Manipulation Attacks (Parameter Tempering)

- Cross Site Request Forgery (CSRF)

- Brute Force Attacks (DDoS)

- Insufficient Access Control

- Too Much Information in Errors/Public Configuration

Microsoft Azure | Availability

- Refers to the accessibility of the system

- Monitoring through health checks and heartbeat to ensure continuous up-time

- multiple servers in different Microsoft Azure Datacentre regions to secure up-time and scales the system automatically according to the load
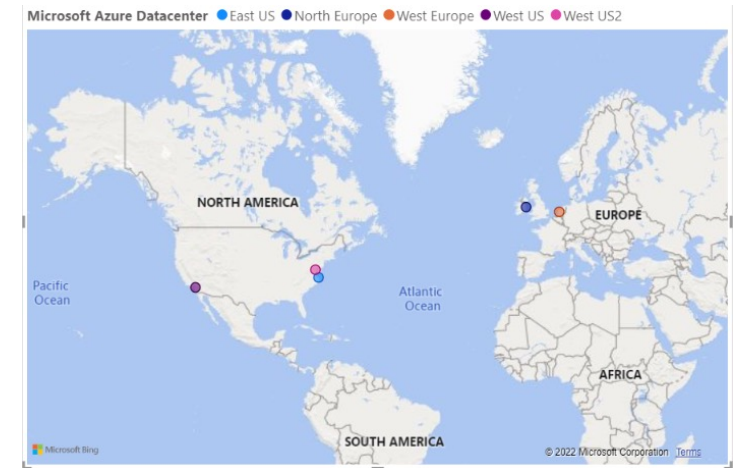
Microsoft Azure | Processing Integrity and Confidentiality

Processing Integrity

- We ensure the quality and integrity of the system by testing it in several ways: Automated tests of the software to ensure that the system is producing the expected output and manual periodic reviews of the system output.

Confidentiality

- The data in our system is only accessible to the intended users of an organization. We encrypt the data for protecting confidentiality

We secure the data at rest and in transit by the following methods:

- Protecting data during transmission through SSL

- Microsoft SQL and Azure SQL provide Transparent Data Encryption (TDE)

- SQL Azure encrypts the database by default

- Azure Blobs, Files, Table, and Queue Storage are encrypted by default

Microsoft Azure | Data Privacy

- GDPR compliance

- We collect the following personal information to use our application:
  - First name, last name, email, phone number and organization name, address, and phone number
  - The personal information is kept to perform necessary operations in the application and according to the contract / agreement.
  - User can delete data (personal, organization, project level)
  - Your data will not be used or shared for any other purpose than stated in the contract
  - Additional use of data is described in detail in the contract

What's coming next | Examples from development pipeline 2022

- Continuous releases based on user input

- First release updates on June 11

    - Change simulations parameters directly in Accelerator
    - Automatic rerun of sectors which did not converge
    - Display real time plots as simulations are performed
    - See detailed information about credit consumption per project
    - User management and access to projects

What's coming next
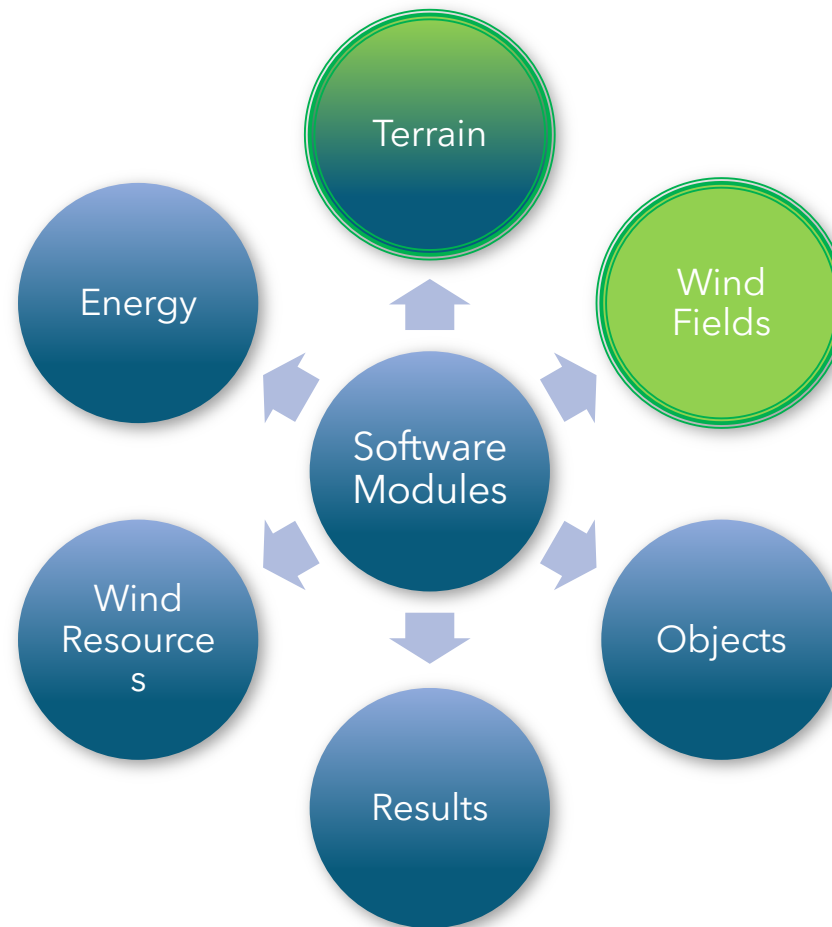
What's coming next
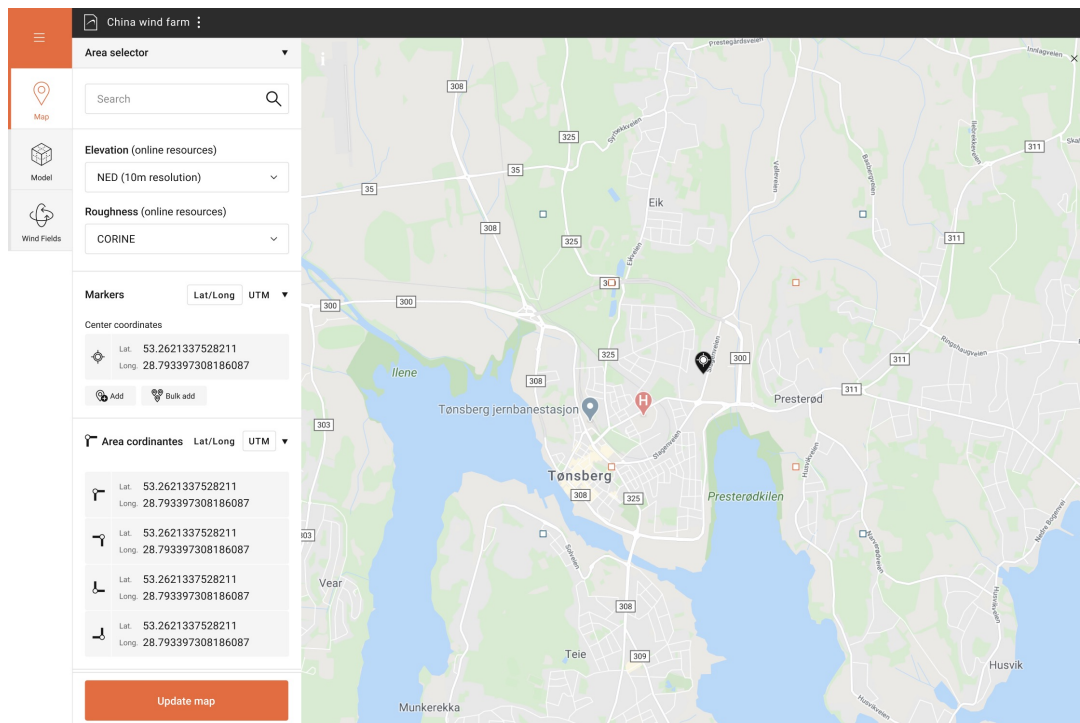
Terrain model moved to cloud, with additional features;

- Dynamic map
- Powerful data sources
- Brand new interface

Experience from beta-testers

- 3 beta-testers running for 1 year, 3 months, 1 month respectively

- Detailed testing protocol for evaluation and benchmarking

- Regular touch points, and final evaluation

- A total of 173 projects

- Max cell count 55M

- 12-36 sectors

- Medium to complex terrain

A word from a beta-tester: Pattern Energy

WindSim Accelerator

Testing Approach

Testing Criteria: The Pattern Wind Resource Team selected sites to analyze based on:

- Project terrain complexity (Simple to Complex)
- Project size (50 MW to 2400 MW)
- Geographical diversity (Japan, North America)
- Varying atmospheric conditions
- Sensitivity to convergence criteria
- *9 test cases were assessed*

Success Criteria: The Pattern Wind Resource Team was looking for the following to be met:

- Reduce overall time needed for running Wind Fields simulations
- High level of confidence that the process would work once started
- Eliminate workload and support from Pattern internal Technology Services Team
- User friendly interface that is easily/globally accessible

Pattern Wind Resource Team

- Andrew Lammers, Meteorologist
- Lesley Dubois, Lead Meteorologist
- Rich Ossiboff, Senior Meteorology Manager

WindSim Accelerator

Overall Experience

Successes of the Interface:

- Easy access/login to WindSim Online interface
- Calculation of Wind Fields on the cloud service reduced the simulation running time (*for some test cases*)
- Multiple users could run multiple projects simultaneously
- Interface includes a 'Project Dashboard' which summarizes all simulations (active and historical) across all team members
- Workflow process was relatively simple, including:
  - Uploading/downloading workbooks,
  - Reviewing project properties once workbook has been uploaded,
  - Ability to track active project run statuses
- Eliminated support from Pattern IT group
- When simulations failed (*completely or individual sectors*) it was straight forward to identify what needed to be restarted
- Smooth transition from downloading results workbooks from interface to uploading into WindSim 11 desktop application completing remaining calculation modules

WindSim Accelerator

Overall Experience

Less Successful Aspects of the Interface:
- After initial workbook is uploaded to interface project properties cannot be modified
- Cannot restart failed sectors without going back to the desktop application, editing initial workbook, reuploading to the interface, and restarting the Wind Fields calculation
- Only Wind Fields module is currently available
- Job status '*Estimated time remaining*' feature was not fully functional making it difficult to confirm/plan for when the job would be completed

Ideas for the Future Enhancement
- Ability to change properties once initial project workbook has been uploaded.
- Ability to restart select/failed sectors within the interface without having to revert back to desktop application first
- Add additional module support and download capabilities

WindSim Accelerator

Final Impressions

Upon completion of the testing protocol, the Pattern Wind Resource Team has decided to proceed with the purchase of the Accelerator interface given its:

- Ease of use and positive outlook for where the interface is planned to go, potentially removing the need for the desktop application completely.

- Ability for multiple analysts to run multiple projects simultaneously.

- Cost effective solution that helps alleviate internal IT support.

A word from a beta-tester: Statkraft

"Our project execution has greatly benefited from WindSim Accelerator. Access to abounded computing resources in the Cloud has reduced the simulation time from days to hours. Easy access for all members of our wind and site team has further reduced the project execution time."

Utku Unal,

Senior Wind & Site Specialist,

Wind & Site Team

Statkraft

WindSim Accelerator | Cloud-based Software-as-a-Service

Why move to a SaaS model?

Objectives: simple and transparent model, flexibility, reflecting typical user needs and patterns

- Highly scalable; multiple users and sites
- Easy to use and configure
- No separate security and maintenance
- Seamless upgrades and customizations
- Multiple data backups
- Significantly lower initial costs
- Simple, predictable budgeting

WindSim Accelerator | Cloud-based Software-as-a-Service

Key characteristics

- Subscription fee covering everything (support & maintenance, depreciation, IT-related costs)
- Monthly or annual subscription plans based on different credit levels
- Flexible credits to be used throughout the subscription period
- Up to 30 days trial period

- Welcome package with onboarding information
- Support
- Ongoing upgrades

- Flexibility in switching plans
- Booster packages

Wrapping it up | WindSim Accelerator Promotion

Would you like to try WindSim Accelerator for 30 days, no strings attached?

If you sign up before 15 July, we will offer you 50% discount on list price for a 30 days trial period.

You decide how many credits to include.

If you want a quote or more information, please contact anyone of us or at sales@windsim.com

Wrapping it up | Thank you!

Thank you & let's stay in touch!

Phone: +47 33 38 18 00

General inquiries: info@windsim.com
Support: support@windsim.com
Commercial: sales@windsim.com

www.windsim.com