Weather Intelligence for Wind Energy - WILL4WIND -
Inovativna meteorološka podrška upravljanju energijom vjetra

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What are the key interactions of meteorology and wind energy?

1. Wind resources (meas, model, IAV, projections)
   - Estimations inaccurate, typically overestimated

2. Prediction technologies on a range of scales
   - Wind variability complicates grid integration
   - Occasional large errors scale the system

3. Design, loads and wind turbine control
   - Wind turbines are failing faster than predicted
   - They are not designed for extreme weather conditions
What means to manage energy?

Wind energy management is
- Knowing what to do with produced energy
- How frequent is balance of production and consumption?

This is far from a simple problem:
- Includes knowing and predicting production, consumption
- Issues of transmission, energy markets, reserves, even politics
- Variability and predictability are key words

Predictions:
- Required for efficient (wind) energy management
- Required forecast horizons from seconds to decades in complex terrain
- Required realistic treatment of wind prediction uncertainty in complex terrain
- Q: Which forecast range is currently the greatest challenge to wind energy development in Croatia?
WILL4WIND „factsheet”:
- Starting date: 10.4.2013.
- Duration: 24 months
- Cost: 535.863,41 EUR
  - 438.336,27 EUR from EU
  - 97.527,14 nacional co-financing
- Grant scheme: IPAIIIc, Science and innovation investment fund (www.siif-croatia.com)
- 22 persons in the project team, from 5 institutions
- 4 young researchers employed (2 DHMZ, 2 FER)
- From this grant scheme, 4 young researchers in 2013 employed for 2 years at DHMZ (DHMZ- Iris Odak, Josipa Kuzmić, Mario Hrastinski, Igor Horvat)
Project consortium: "handling all aspects"

1. DHMZ
2. FER
3. HOPS
4. EIHP
5. RP GLOBAL
   Projekt
(6. Končar Institut)

Energy systems are local-oriented – need for local interactions

Croatian consortium = Solutions for specifics of Croatian wind climate

Science and innovation investment fund, contract no. IPA2007 HR/16IPO/001-040507

Meteorološki izazovi 3 Ekstremne vremenske prilike i utjecaj na društvo
ALADIN model chain

- A set of dynamical refinements

GLOBAL MODEL ARPEGE/IFS
Grid spacing ~ 12 km

REGIONAL REFINEMENT 1
Grid spacing ~ 8 km
Mesoscale data assimilation

SUBREGIONAL REFINEMENT 2
Grid spacing ~ 2 km
**Specific goal 1**

**Goal 1:** Enhance weather prediction system (DHMZ, FER)

- Enhance ALADIN weather prediction model
- Develop ultra-short range wind forecast (0-3 h)

**STATE-OF-THE-ART REGIONAL MODEL**
- Advance mesoscale data assimilation (currently ~100,000 observations)
- **LOCAL REFINEMENT**
  - Grid spacing ~ 1 km

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**Meteorološki izazovi 3 Ekstremne vremenske prilike**

Specific goal 2

Goal 2:
Estimate errors and uncertainty intervals of wind predictions

Develop probabilistic wind prediction model

Enhance monitoring system
Specific goals 3 & 4

Goal 3:
Integrate developed technologies into forecasting and energy management processes

Goal 4:
Raise awareness of applied meteorological research

Workshops, panels, newsletters, conference etc.

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Meteorološki izazovi 3 Ekstremne vremenske prilike i utjecaj na društvo
1. WILL4WIND workshop (67 participants, 25 institutions)

Topics of interest

- Wind energy predictions
- Weather predictions
- Microscale wind resources
- Wind energy integration
- Climate change of resources
- Uncertainties of predictions
- Uncertainties of integration
- Measurements
- Wind atlases
- Markets
- Storage
Conclusions

- Meteorological aspects of wind energy are important, but are only one piece of a puzzle

- There is a substantial gap between meteorology and wind energy sectors, but there is an increasing interest for interaction

- Meteorologists need to showcase their methods and technologies are useful, and better understand the real needs of the wind energy sector

- WILL4WIND is a unique opportunity to strengthen collaboration between meteorology, ICT and energy sectors
Thanks for your attention!
Hvala na pažnji!