



*Innovation for Our Energy Future*

# System Engineering Workshop Welcome and Introduction



**Fort Felker,  
Director**

**National Wind  
Technology Center**

**December 14, 2010**

# Welcome to NWTC Visitors!

## Agenda

### Welcome

- 8:30 Fort Felker, Director, National Wind Technology Center

### Department of Energy Perspective

- 8:40 Chris Hart, Manager - Offshore Wind, DoE Wind and Hydro Power Program

### Academic Overview

- 9:00 Juan Alonso, Stanford University
- 9:30 Katherine Dykes, MIT
- 9:55 Deniz Ozkan, George Washington University

10:20 BREAK

### NREL Overview

- 10:35 Scott Schreck, WindPACT studies
- 11:00 Maureen Hand, Cost Modeling

### Industry Perspective - Manufacturers

- 11:25 Patrick Riley, General Electric
- 11:25 Andy Paliszewski, Siemens
  
- 12:10 Lunch

### Industry Perspective - Developers

- 1:00 Brad Horn, NextEra
- 1:25 Andy Oliver, RES Americas
- 1:50 Scott Haynes, Iberdrola

### Industry Perspective - Consultants

- 2:15 David Malcom, GEC-DNV

2:40 BREAK

### Computer Science Perspective

- 2:55 Mike Eldred, Sandia National Laboratories

### International Laboratories

- 3:20 Bernard Bulder, ECN
- 3:45 Flemming Rasmussen, Risø-DTU

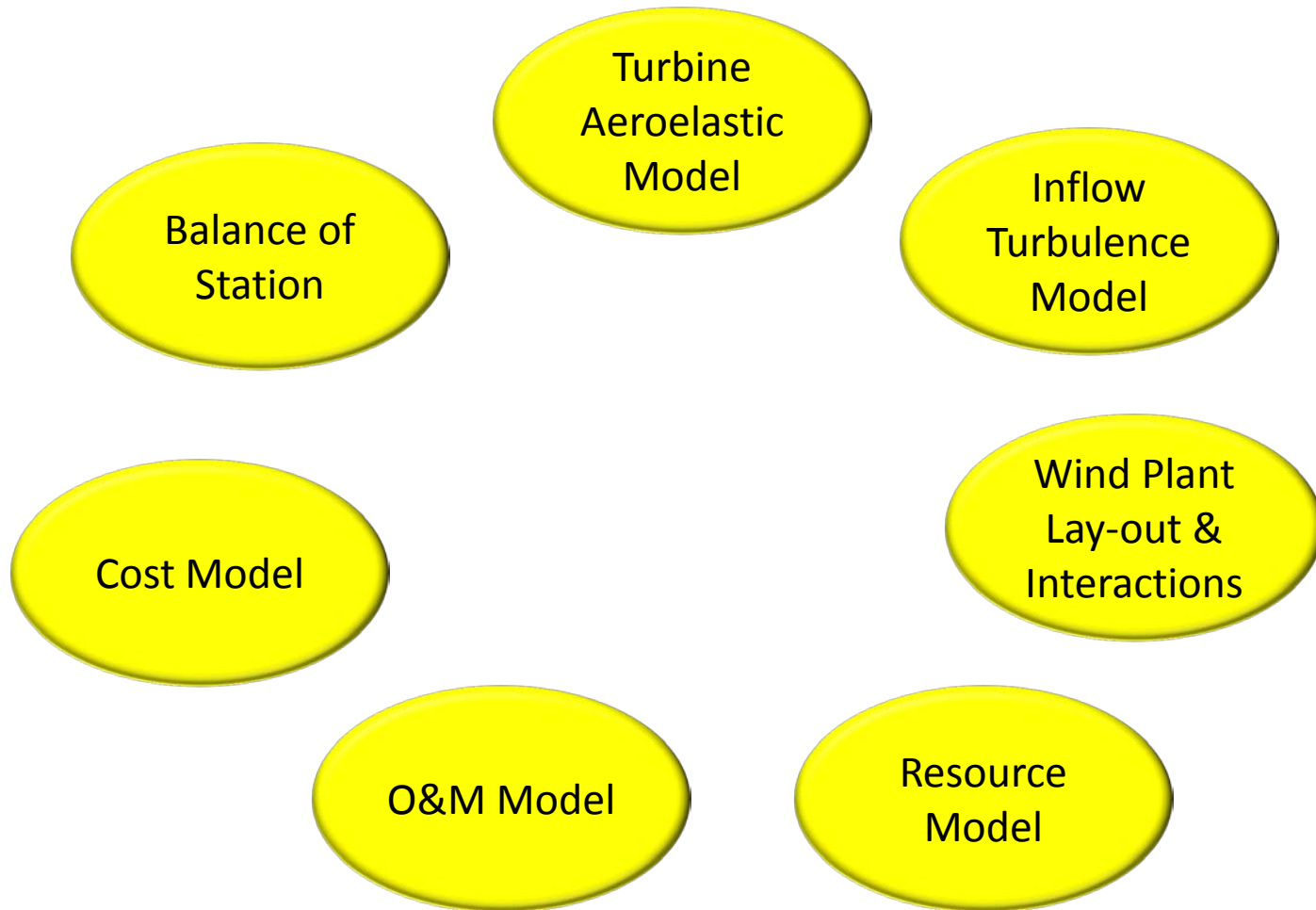
### Discussion

- 4:10 Paul Veers, Chief Engineer, National Wind Technology Center

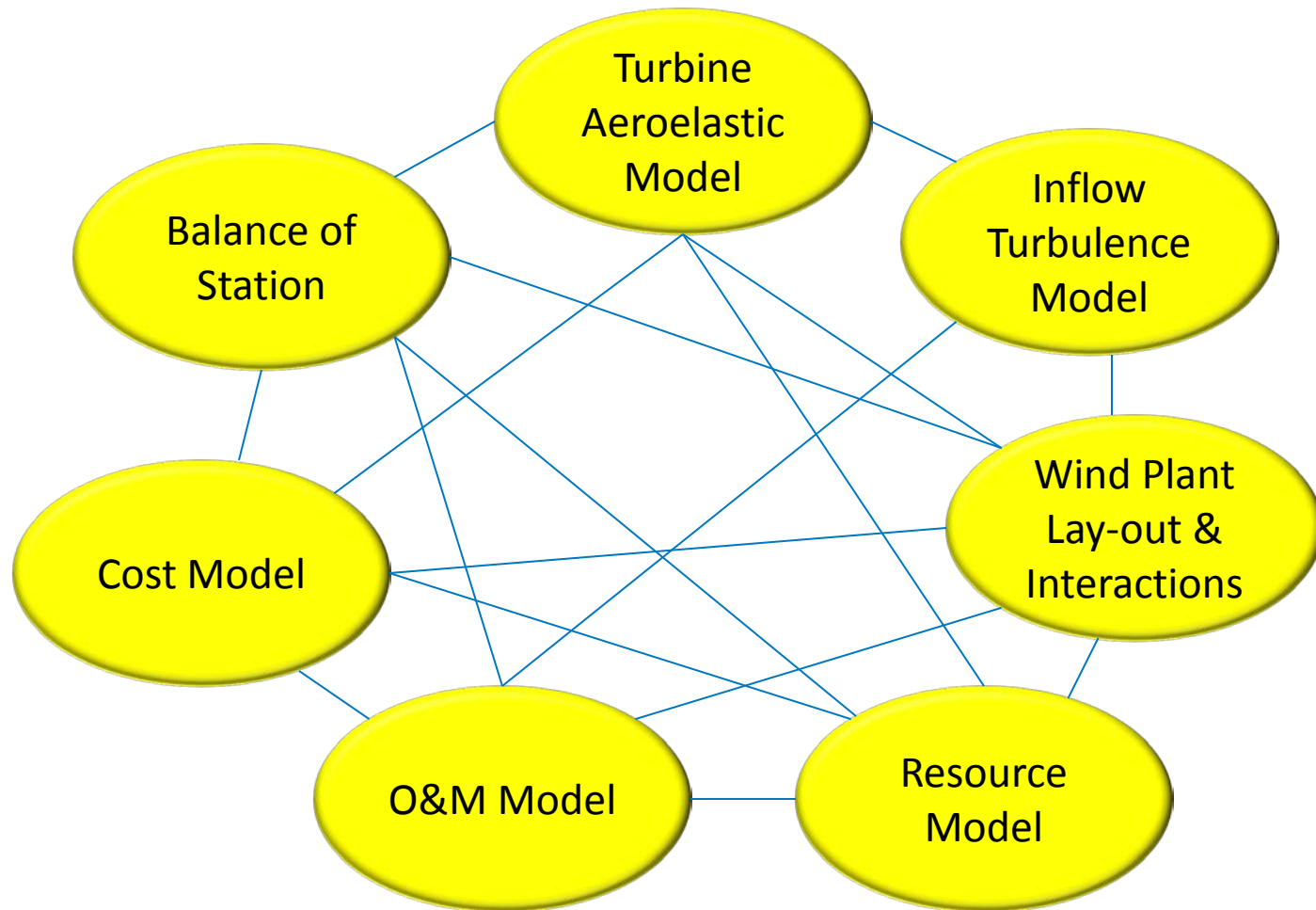
### Conclusion

- 5:30 Conclusion & wrap-up
  
- 6:30 Non-hosted group dinner in Boulder at The Mediterranean

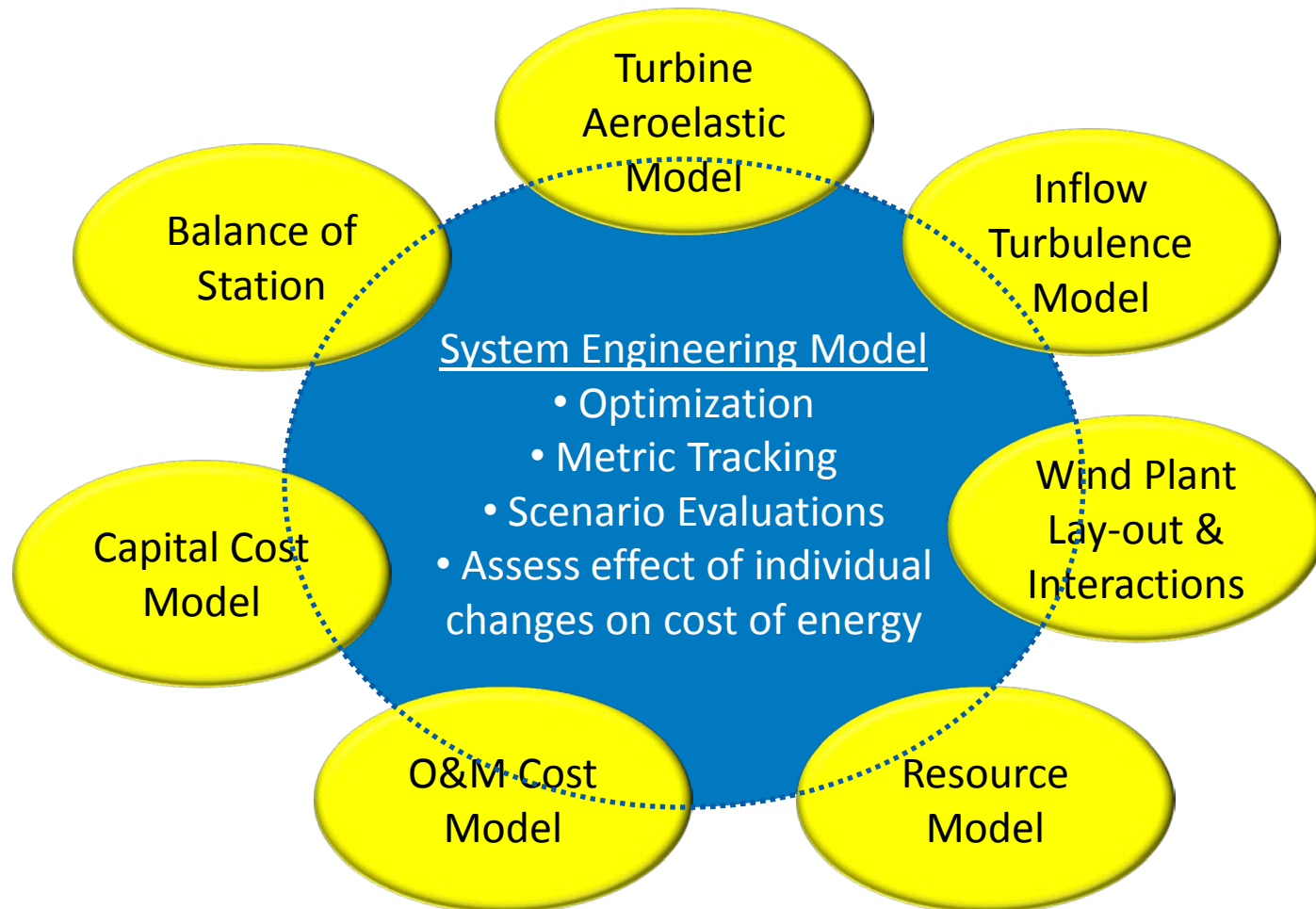
# Wind Plant Design Relies on Many Models



# There are linkages between many models:



# System Engineering – Bringing them together



# Windplant Systems Engineering Vision

- Comprehensive scope
  - Address all significant components
  - Blades, yaw drives, trenches, roads, contactors, transformers, etc.
  - Establish cost vs. performance relationship for all components
  - System ends at interconnect
- Include engineering analyses in model
  - Aerodynamic performance
  - IEC loads cases
  - Finite element analyses
- Implement optimization capability around systems engineering model

# Windplant Systems Engineering Approach

- Wide participation in development of analysis
  - National labs
  - Industry
  - Academia
  - International collaboration
- Open source
  - Modular software
  - Easy for specific users to implement custom subsystem models
- Range of fidelity (selectable)

**Result: Lower costs for wind energy worldwide**



# Questions