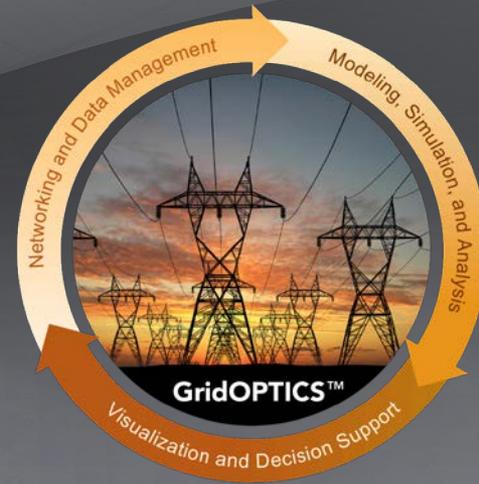




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# Welcome to 3rd Workshop on Next- Generation Analytics for the Future Power Grid

HENRY HUANG, DAVID CALLAHAN

Pacific Northwest National Laboratory  
Richland, WA

# Power Evolution Demands Holistic Approaches for Grid Analytics

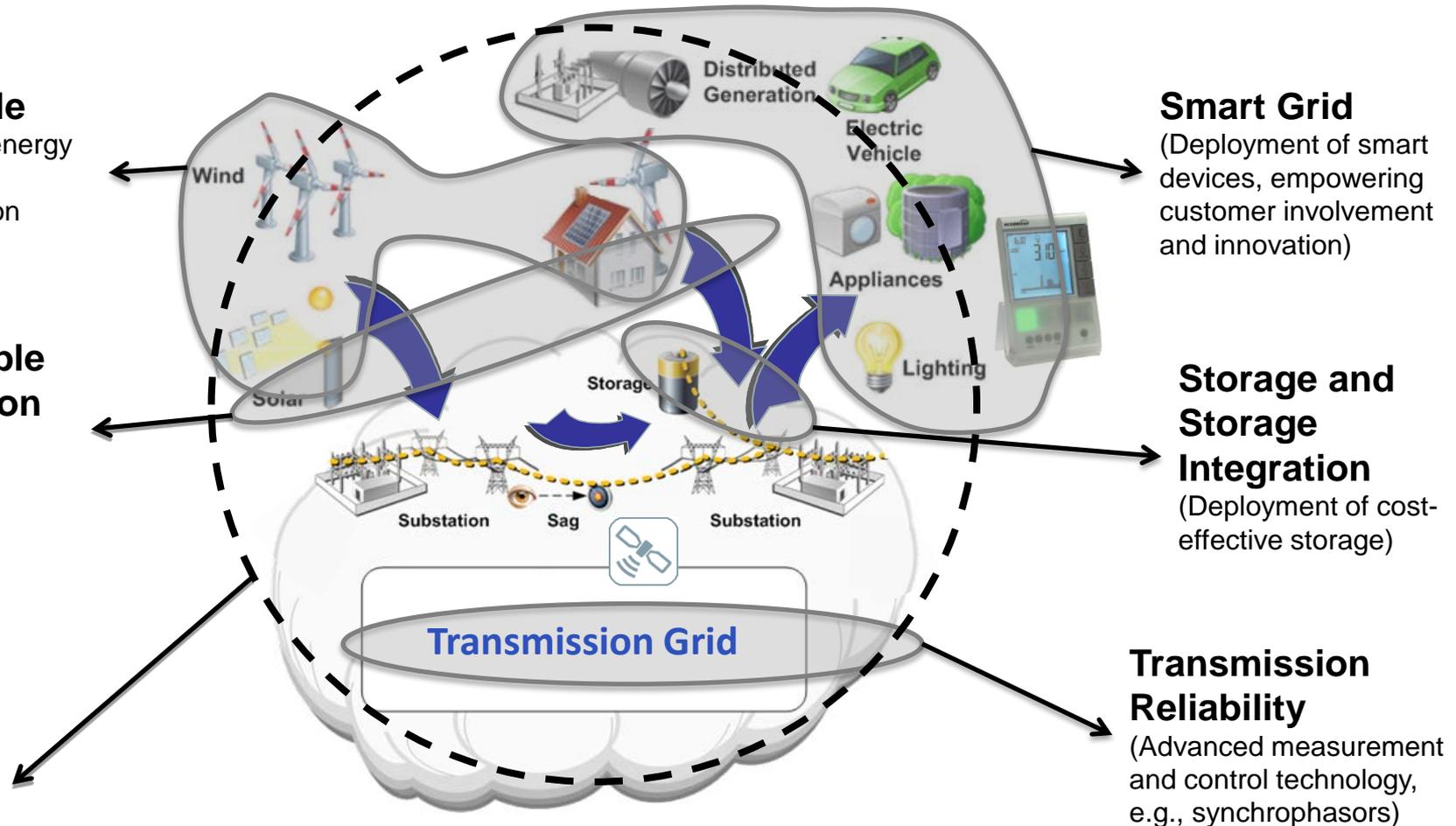
**Renewable**  
(Renewable energy technology, interconnection standards)

**Renewable Integration**  
(Renewable Integration Modeling)

## Gaps

With end-to-end grid in mind, address questions:

- What can we use the data for (what data network is required)?
- How will we address the complexity in order to understand the grid?
- How will we run such a complex grid?



# Power Grid Fusions Require New Computing Capabilities

## Drivers

### Fusion #1:

#### **power grid + data network**

Bring big data to applications  
Enable “all-hazard” analysis

### Fusion #2:

#### **operation + planning + market**

Minimize overhead in communication  
Improve responses w/RE & smart loads

### Fusion #3:

#### **transmission + distribution**

Model end-to-end grid  
Understand emerging behaviors

## Requirements

Bigger Data

Bigger System

Bigger Model

## Needs

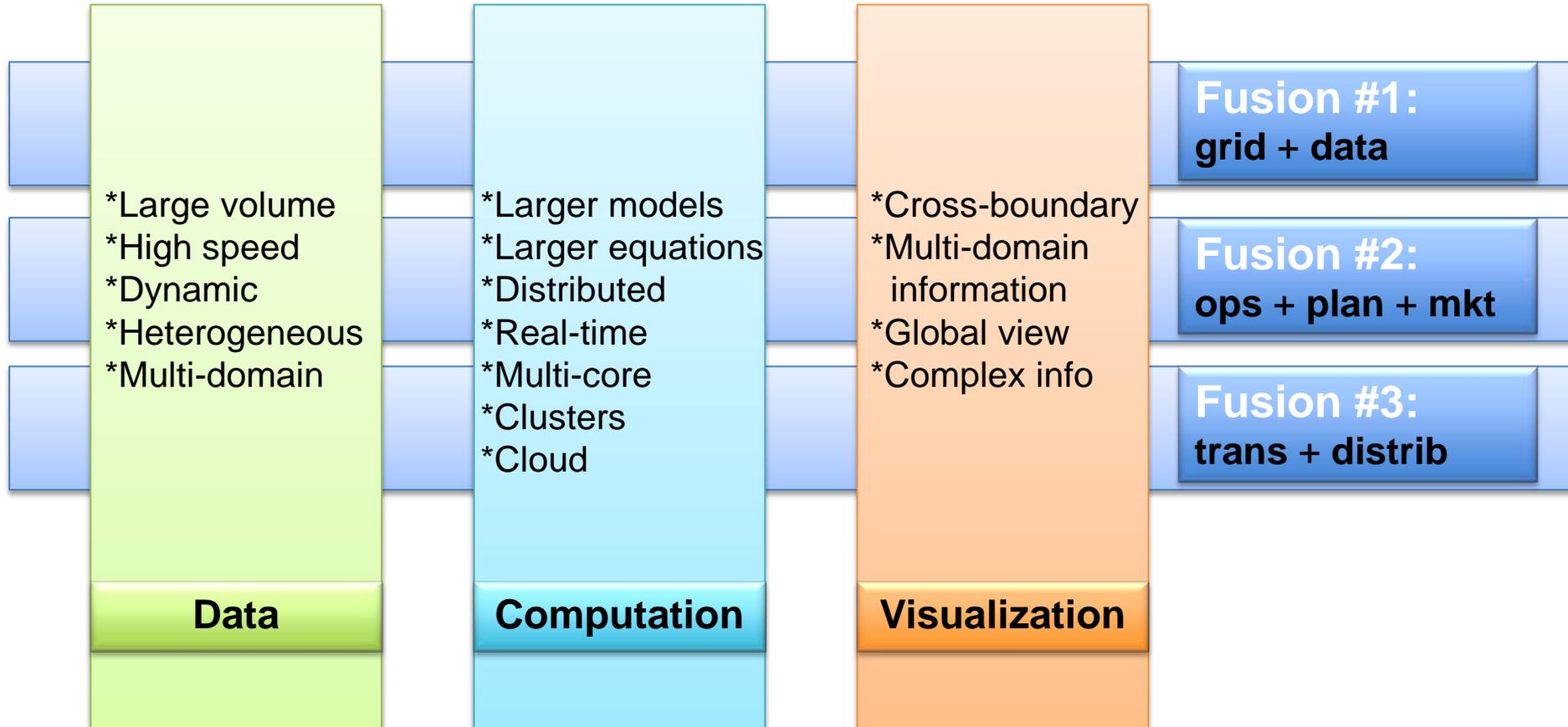
Data

Computation

Visualization

# Adoption of Advanced Computing Needs Three Areas to Work Together

Slide from August 2012  
2<sup>nd</sup> Annual Review

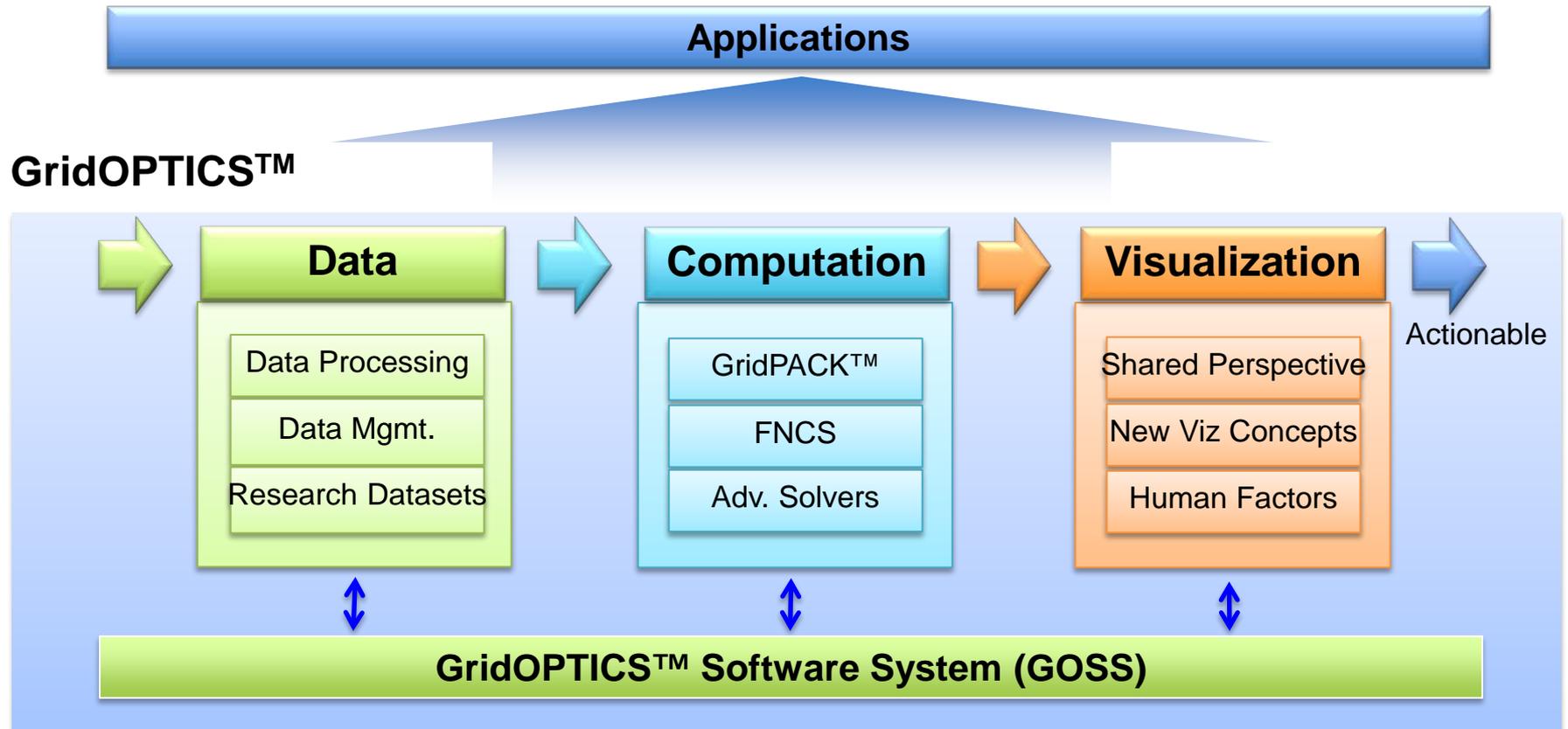


**Parallel computing is essential for developing future tools**

# GridOPTICS™ Architecture: Links Data to Computation to Visualization

Slide from August 2012  
2<sup>nd</sup> Annual Review

- ▶ GridOPTICS™: Open Source, Open Format, Open Forum
  - Enhance interoperability of software tools
  - Overcome barriers for accelerated development of advanced technologies and tools for the future power grid



# Community-Building for Broader Engagement and Impact

- ▶ GridOPTICS™ is a significant endeavor that calls for community-driven development
- ▶ Prior workshops of this series
  - 1<sup>st</sup> workshop: Nov 29-30, 2012; Seattle, WA; 29 participants
  - 2<sup>nd</sup> workshop: September 19-20, 2013; Seattle, WA; 45 participants
  - Participants included national labs, universities, power companies, and software vendors
- ▶ Major workshop findings:
  - Need for a power-grid-specific computing **architecture** is recognized, which includes data, computation, and visualization components.
  - Building such an open software architecture requires a **community** with a well-defined business model – a DOE leadership opportunity
  - Realistic control-center-like **testing facility** is needed

# This Workshop Continues the Momentum...

- ▶ Richland, WA; July 17-18, 2014
- ▶ 77 registered: national labs, universities, power companies, and software vendors
- ▶ Objectives
  - Share information of sharable software codes across organizations
  - Identify key challenge applications
  - Understand data challenges
  - Define a path forward for shared-source software development for power grid applications

# Agenda: Plenary Speakers

(this morning)

- ▶ **Gil Bindewald**, Program Manager, Advanced Grid Modeling Research Program, DOE Office of Electricity Delivery & Energy Reliability
- ▶ **Russell Robertson**, Grid Protection Alliance
- ▶ **Jason Fuller**, PNNL
- ▶ **Larry Bekkedahl**, Senior Vice President, Transmission Services, Bonneville Power Administration

(tomorrow morning)

- ▶ **Jess Berst**, Founding Editor and Chief Analyst for Smart Grid News; Chairman, Smart Cities Council
- ▶ **Larry Buttress**, Vice President and Chief Information Officer, BPA
- ▶ **Terry Oliver**, Chief Technology Innovation Officer, BPA

# Agenda: Activities

- ▶ Research Software (this morning)
  - Mark Rice**, PNNL, GridOPTICS™ Software System
  - Shri Abhyankar**, ANL, Mathematical Libraries Developed at Argonne National Lab (include PETSc, TAO, Minotaur, etc.)
  - Jeff Daily**, PNNL, FNCS
  - Carol Woodward**, LLNL, The SUNDIALS Suite of Nonlinear and Differential/Algebraic Equation Solvers
  - Bruce Palmer**, PNNL, GridPACK™
  - Daniel Kirschen**, UW, Stochastic Unit Commitment Variants
  - Jereme Haack**, PNNL, VOLTTRON™
- ▶ Challenge Problem Definition (this afternoon)
  - Anjan Bose**, Washington State University, **David Sun**, Alstom Grid, **Henry Huang**, PNNL
- ▶ Data Panel (tomorrow morning)
  - Jeff Dagle**, PNNL, **Dave Bakken**, WSU, **Russell Robertson** GPA, **Larry Buttress**, BPA, **Terry Oliver**, BPA
- ▶ Community Next Steps (tomorrow morning & lunch)

# Steering Committee, Thank you!

- ▶ Bora Akyol – Pacific Northwest National Laboratory
- ▶ Anjan Bose – Washington State University
- ▶ Russell Robertson – Grid Protection Alliance
- ▶ Scott Backhaus – Lawrence Livermore National Laboratory

# Questions?



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Monthly Newsletter

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