

Integrated, Automated Distributed Generation Technologies

Roger Weir
Plant Engineer/Energy Manager
ATK Space Systems

San Diego 2009 Symposium on Microgrids
17 & 18 September, 2009



Who Is ATK?

- A premier aerospace and defense company with more than 18,000 employees and operations in 23 states and Puerto Rico



Project Partners:

- **ATK Space Systems – Project Management/Host**
- **P&E Automation (San Diego, CA) – Technology/Experience**
- **Rocky Mountain Power – RMP - (Division of PacifiCorp) – Gateway/Incentives**

Overall Project Purpose and Objectives:

- **Develop and demonstrate a diverse system of renewable distributed generation technologies that are integrated into an intelligent automation system with two-way communications to the utility and that will produce an on-demand reduction of 15% of substation load.**

Project Uses a Mix of Renewable Resources

- **Heat Recovery Systems (Organic Rankin Cycle – ORC) 1400 kW**
- **Concentrating Solar Thermal (ORC)**
- **Wind Turbines (water pumping/compressed air storage) 144 kW**
- **Hydro-Turbines (pumped storage) 1040 kW**
- **Compressed Air (storage & generation, waste compressed air) 80 kW**

What makes our Project Unique?

- **Peak Demand Control with Renewable/Distributed Generation (DG)**
 - Limit 17 mW Plant peak demand to 14.5 mW
- **Limitations due to Plant Micro-Climates and Siting Restrictions**
 - All 2.5 mW of renewable generation must be sited within plant 20,000 acres and outside of the existing manufacturing areas
- **Dispatching renewable resources to address:**
 - Plant Peak Demand, **and**
 - Utility/Grid System Peak Demand, **and**
 - Grid Reliability
- **Integration with Plant Control/SCADA Systems – load shedding**
- **Project is Customer Driven**

Demonstrate that distributed/renewable resources can provide meaningful benefits to customers/users and utility/interconnected grid.

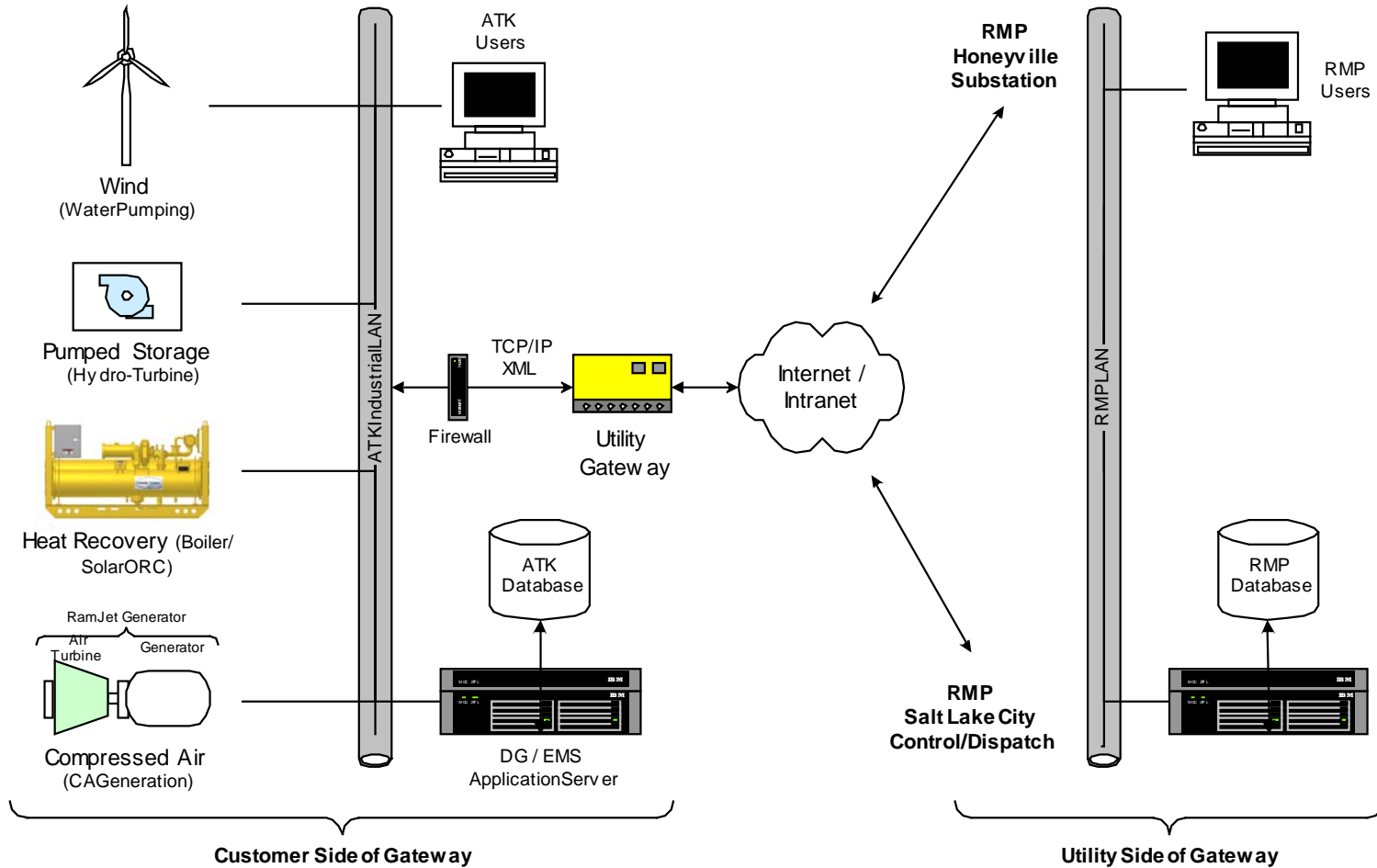
How does our Project Advance the Microgrid Concept?

- **Full Two-way communication between customer and utility**
 - Utilizes standard IT/Web protocols
 - Compatible with EPRI IntelliGrid Architecture
- **Customer and Grid demand management/grid reliability**
- **Can be expanded to integrate other assets into demand control**
 - Heating and air conditioning systems
 - Pumping systems
 - Lighting systems
 - Compressed air and vacuum systems
- **We are now productively working the microgrid elements with the local electric utility; initially they resisted participation.**
- **Microgrid elements - Load Aggregation & Monitoring, Fault Detection & Diagnostics, Net-Metering, Alarm & Event Notification, Black Start, Remote Monitoring & Control, Historical Trending and Reports**

Project Communications Overview



A premier aerospace and defense company



- Standard IT interface between ATK and Rocky Mountain Power
- Based on EPRI Intelligridsm platform

What is the most challenging technical problem?

Using a mix of renewable generation for demand reduction

- **No single renewable is available 24/7**
 - Wind doesn't blow and sun doesn't shine all the time
- **No single renewable is the 'perfect' solution at every micro-climate across a large facility**

How will this problem be addressed?

- Project will develop an operational model to take advantage of periodic availability
- Utilize water and compressed air systems for storage
 - **Pump water when renewable resources are available ... or at night**
 - **Compress air when renewable resources are available ... or at night, or when "excess/waste" compressed air is available**
 - **Can supplement renewable thermal resources with plant steam**

What are the project benefits?

- Advance use of renewable/distributed generation for peak load control
- Advance use of energy storage
- Advance Microgrid automation concepts for
 - **Two way communication between Utility/Grid and Customer/Generation**
 - **Dispatch for both Site and Grid Peak Load management**
 - **Dispatch for System Reliability/Stability**
 - **Automatic response to renewable resource availability and peak shaving requirements**
- Close gap between utilities and customers for development of similar projects
- Robust measurement and verification
- Savings from both kWhrs generated and peak kW reductions.

What have been the major success stories?

- We have learned much about our internal systems
- Significant progress in closing the gap between ATK and RMP
- Enthusiastic support from internal organizations for being involved in a “Green” project

What is the Current Status?

- Nearing completion of Phase I – Development Phase
 - **Design of 2.5 mW of renewable distributed generation and controls**
 - **Design of microgrid (automatic controls, two-way utility/customer gateway)**
 - **Installation of 34 kW of DG for testing generation, controls and microgrid concepts**

Phase II Demonstration (Years 2-3 Installation, Years 4-5 M&V)

- **DG Implementation:**
 - **4 – Heat Recovery Systems (Ormat – 350 kW each)**
 - **2 – Concentrating Solar Thermal Arrays (summer steam boost)**
 - **4 – Wind Turbines (2 – 50 kW, 2 – 20kW each)**
 - **5 – Hydro-Turbines (200 kW each)**
 - **4 – Micro-Hydro Turbines (10 kW each)**
 - **4 – Compressed Air Generation/Storage Devices (20 kW each)**
- **Microgrid Implementation:**
 - **Utility gateway 2-way communications**
 - **Automated Optimization of DG resource usage (15% demand reduction)**
 - **and RMP system peak reduction**
 - **Automated Measurement & Verification (M&V)**
- **Validate Savings:**
- **Commercialize to other RMP customers and/or RMP sites:**

Unique Monitoring/Control application optimizes mixed DG

- **Real-time optimal usage of Distributed Generation Resources based on:**

- Resource availability (sun/wind)
- Peak load
- Available stored energy

Generate savings by reducing energy requirements and Peak Demand kW

- **Can be staged to reduce customer demand or to offset utility system demand**

Generate revenue stream for user and lower peak resource costs for utility

DG demonstration will provide reliable data on efficacy of mixed DG

- **Automatic Dispatch**
- **Robust data collection/reporting**
- **Applicable to any widespread facility or campus**

Roger Weir

Plant Engineer/Energy Manager

ATK Space Systems

PO Box 98, M/S G2UT

Magna, UT 84044-0098

801-251-2063

roger.weir@atk.com

San Diego 2009 Symposium on Microgrids

17 & 18 September, 2009