



Pacific Northwest Natural Gas System



“Plugging Into Natural Gas”

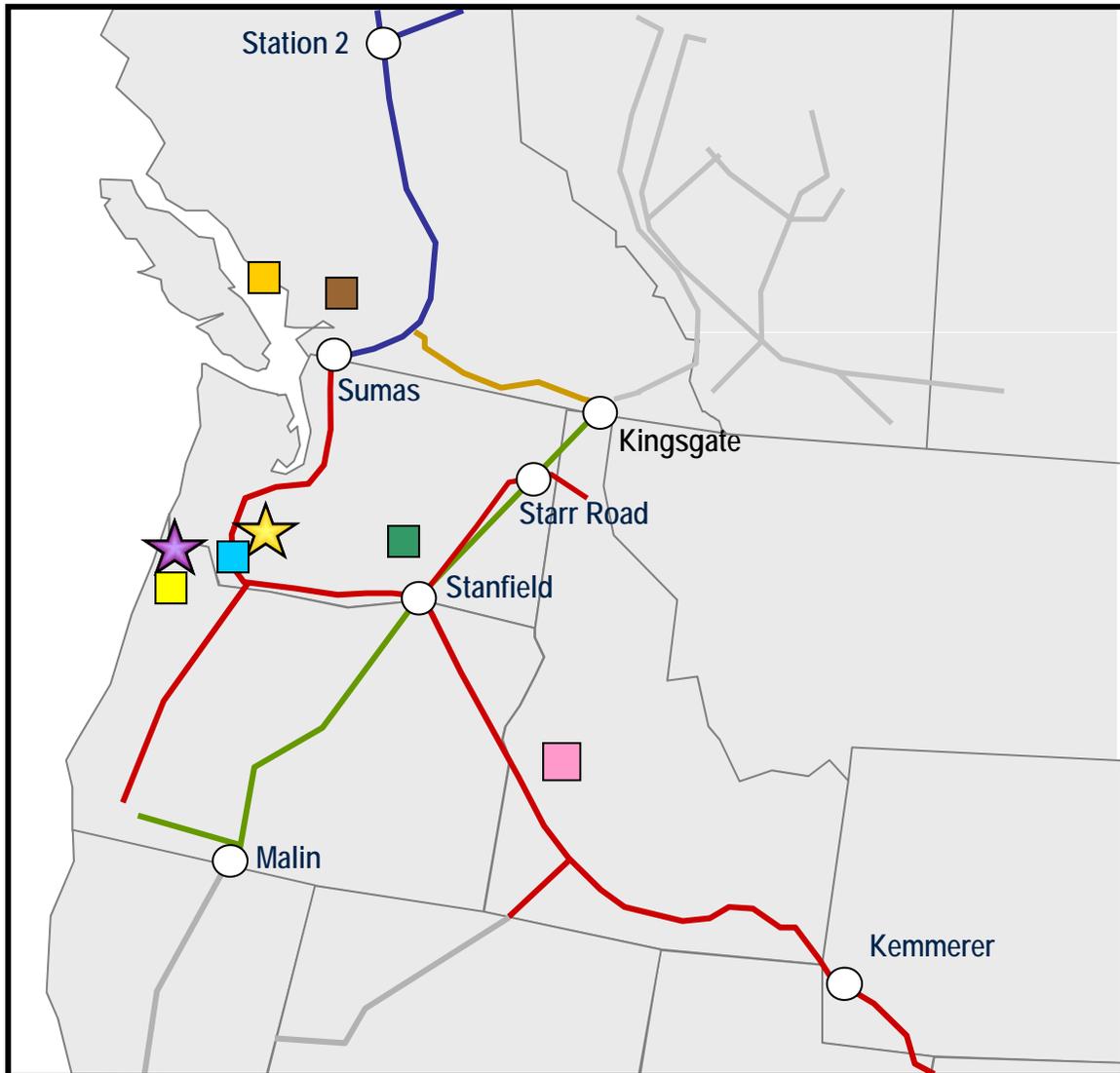
Clay Riding

Director, Natural Gas Resources

January 25, 2012

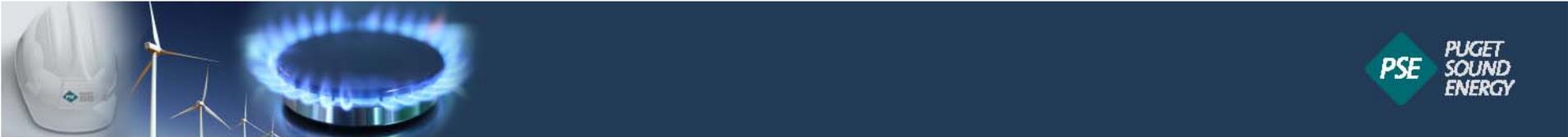


Pacific Northwest Regional Infrastructure

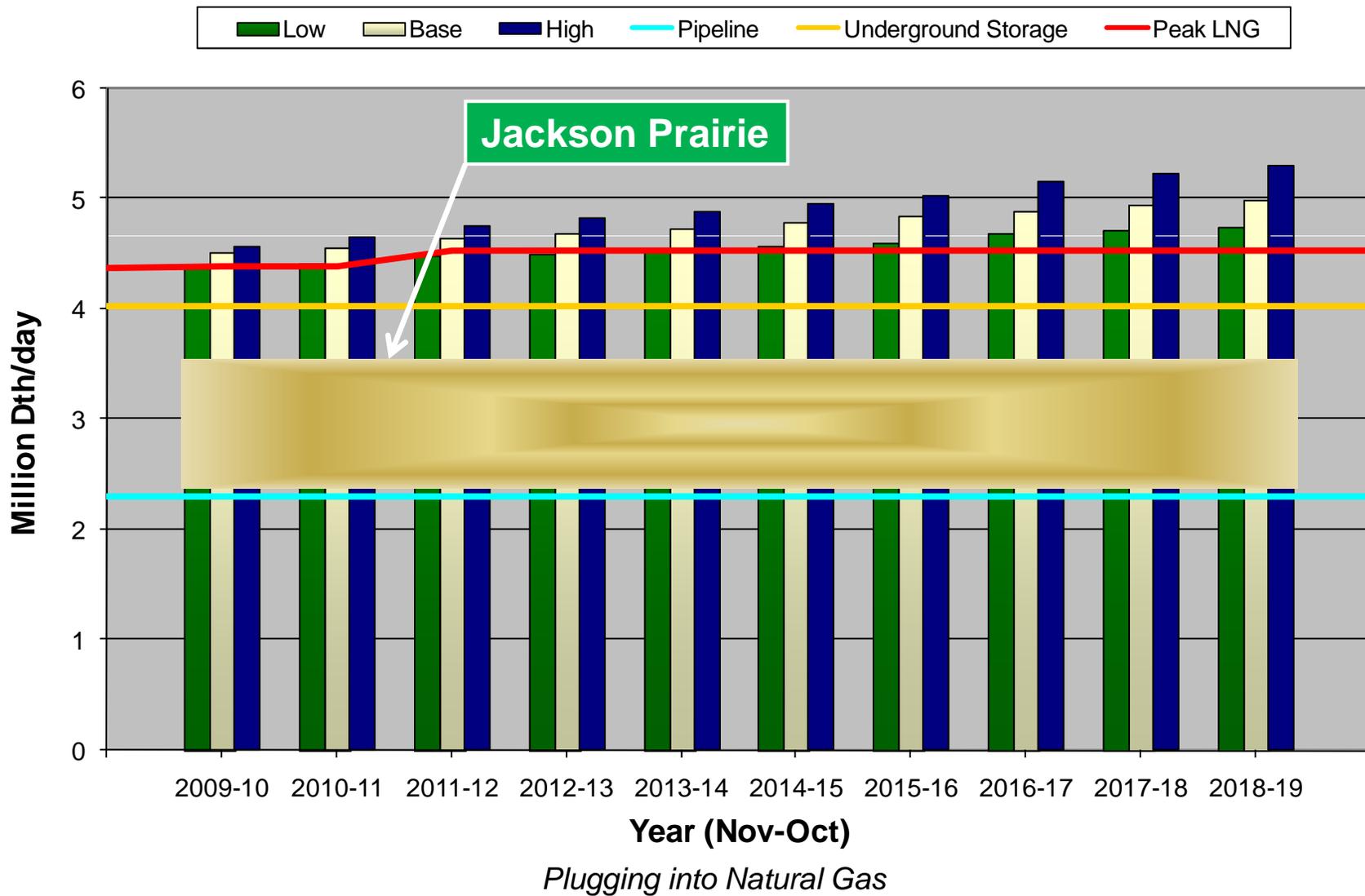


- Pipelines**
- Spectra Westcoast
 - Williams NWP
 - TransCanada GTN
 - Terasen S. Crossing
- Storage Facilities**
- ★ Jackson Prairie
 - ★ Mist
- LNG Storage Facilities**
- Plymouth (NWP)
 - Newport (NWN)
 - Portland (NWN)
 - Tilbury (Terasen)
 - Nampa (Intermountain)
 - Mt. Hayes (Terasen)

Plugging into Natural Gas



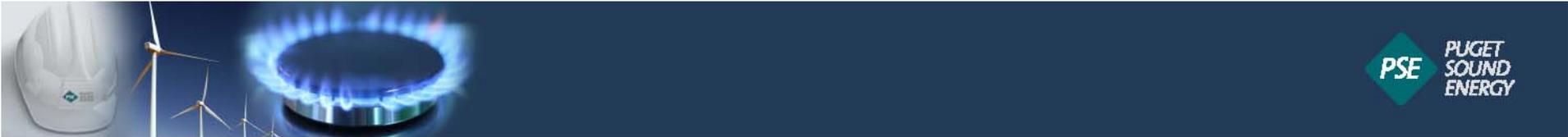
I-5 Total Firm Peak Day Supply/Demand Balance (2009 Outlook)





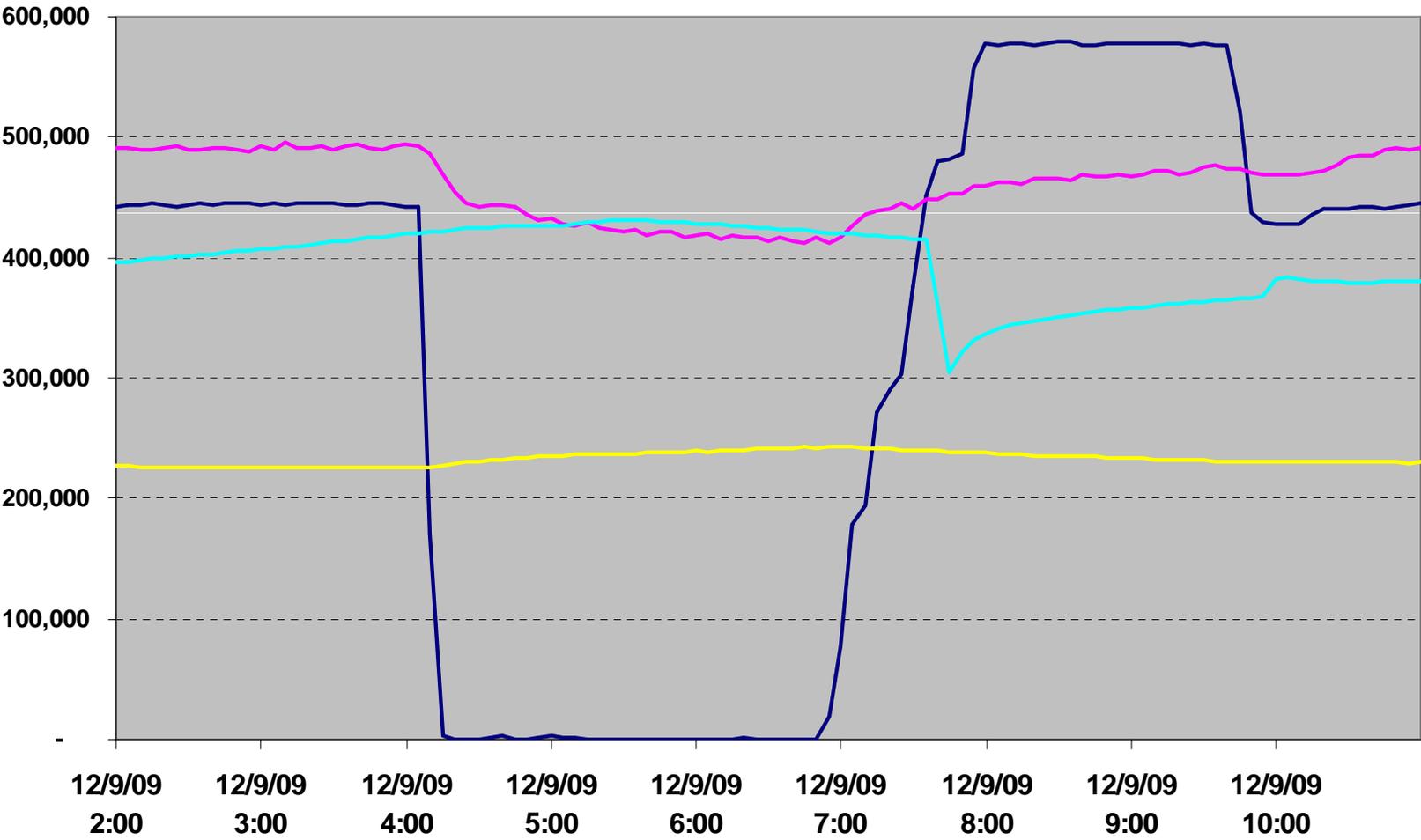
What Can (Did) Go Wrong – December 9, 2009

- NWP-GTN Stanfield interconnect closed due to lack of sufficient pressure differential between the pipelines
 - Lost approximately 3 hours (4 a.m. – 7 a.m. MST) of gas supply receipts, which was flowing at a rate of 500,000 Dth/day
 - Would have been insignificant as a stand-alone incident, but got the morning off to a less than stellar start



Stanfield– Morning of December 9, 2009

— Stanfield Receipt Flow — Plymouth flow to Gorge — Plymouth LNG Sendout — Willard Calculated Flow



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What Can (Did) Go Wrong – December 9, 2009

- Single digit temperatures at Jackson Prairie
- Ice formed in individual well water separators (only a minor impact)
- Measurement facilities failed due to high volumes and debris in lines:
 - First meter failed sometime during gas day December 8
 - Second and third meters failed during the afternoon of gas day December 9
 - The first failed meter went unnoticed until the later failures
 - Didn't necessarily impact gas supply on the system, but did affect perception of problem (i.e., it did not appear that the storage facility was delivering as much as it actually was delivering)



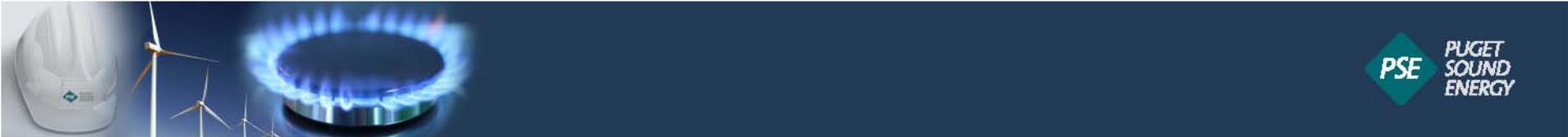
What Can (Did) Go Wrong – December 9, 2009

A.M. Event

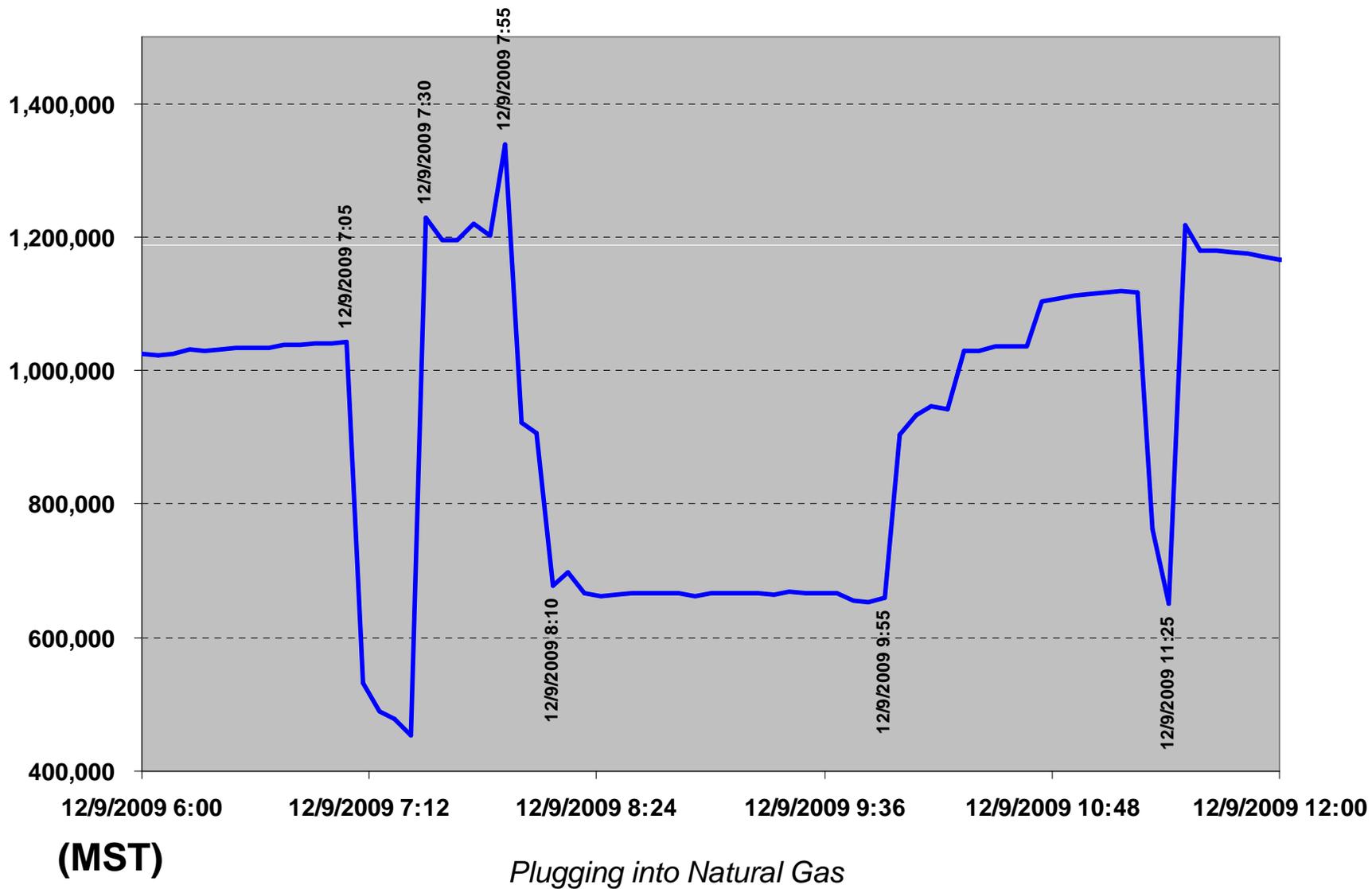
- Ice formed in a compressor station vortex water separator:
 - Disassemble, clean-out and reassemble (~2 hours); reduced production by 30% - 40%
- Multiple compressor starts and stops create restart risk:
 - Largest and newest turbine binds due to extreme changes in temperature (2-3 hours to resolve)

P.M. Event

- Cold weather wreaked havoc on sensors:
 - Pressure sensors apparently failed, causing an emergency shut-down valve to close; reduced production to zero off and on for approximately 4 hours (5:00 p.m. – 9 p.m. MST)
 - Control logic had to be diagnosed and modified to facilitate a return to normal operations



Jackson Prairie – Morning of December 9, 2009





Actions Taken (A.M. Event)

- **NWP began notifying customers gas control contacts as soon as it was apparent mainline pressures were dropping:**
 - **Such notifications could have been more timely, but...**
 - **The problems were not catastrophic; JP and NWP believed facilities would be back on-line “shortly”**
- **NWP notified all customers through an all shippers notice within 2-3 hours of learning about the problem**
- **LDC’s immediately started notifying interruptible customers to switch to alternate fuels or otherwise curtail gas usage**
- **PSE switched all switchable gas-fired generation to fuel oil**
- **Regional resource coordination was discussed, but primarily on an individual basis (i.e., NWP talking to customers and utilities talking to utilities)**

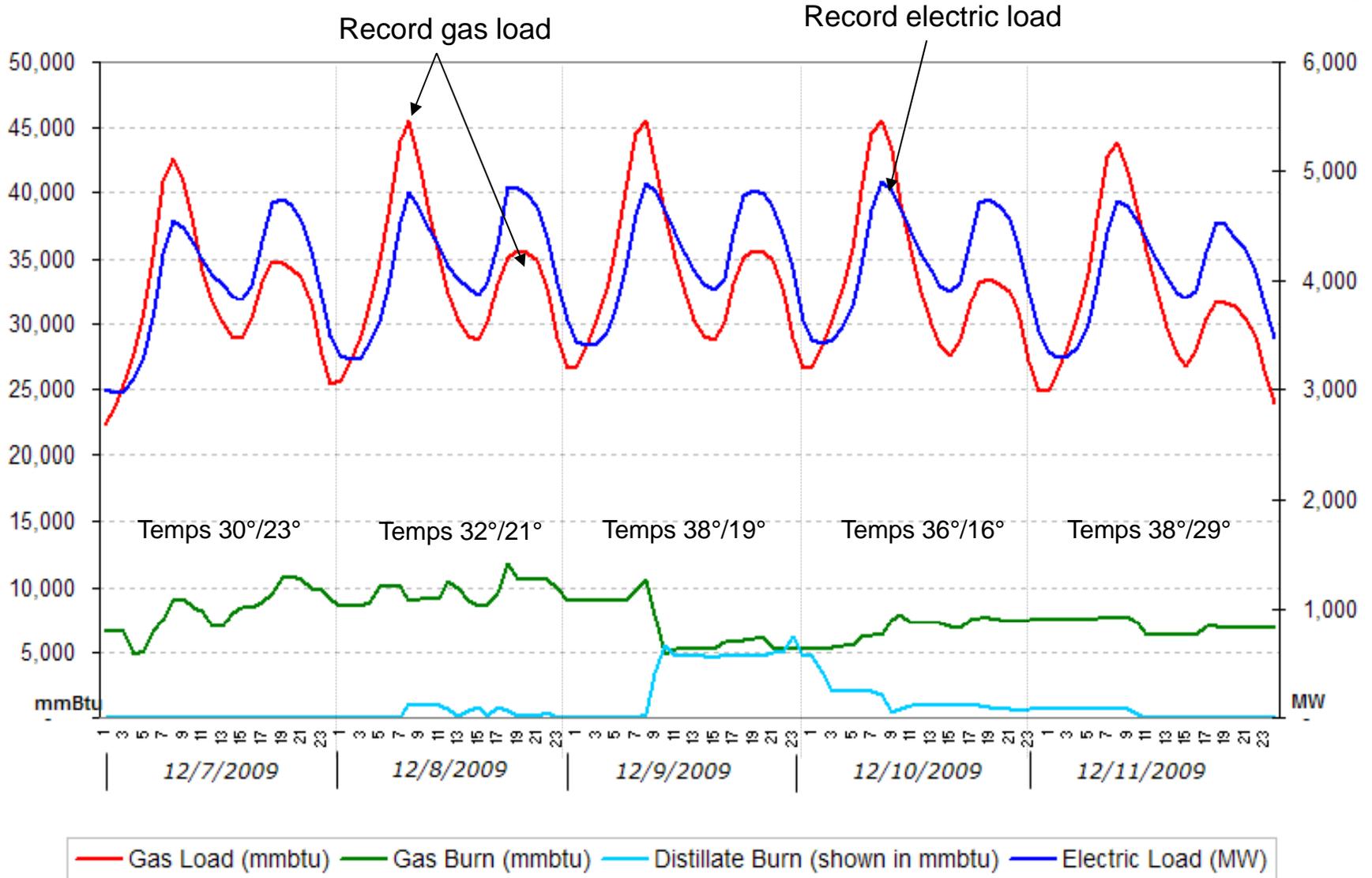


Actions Taken (P.M. Event)

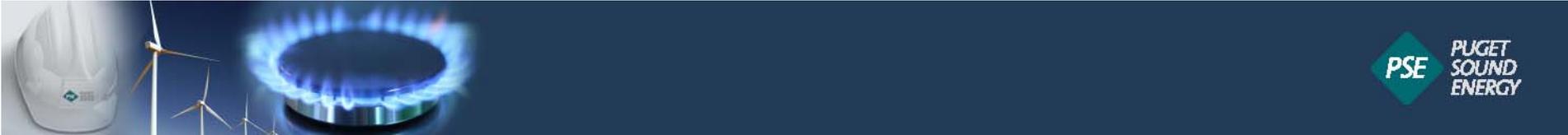
- **Discussions were primarily held between NWP and PSE – since the magnitude of the event was apparent after the final scheduling deadline (ID-2), it was determined that an all shippers notice would have little affect.**
- **Fortunately, PSE had not switched power generation facilities back to gas, but IT customers had been allowed to return to gas service in most areas.**



New PSE Peak Demand Records Reached During Dec 2009 Cold Snap



Plugging into Natural Gas



End Results

- **Pressures on NWP's system got precariously low, especially late in the evening event, but firm customers were served:**
 - **NW Natural did lose service to several hundred customers in Vancouver, WA in the early morning of December 9th –**
 - **300-400 lost service completely, requiring relights**
 - **several hundred others didn't require relights, but didn't have enough pressure to effectively run equipment**
 - **However, pressures on the NWP system remained high enough to keep LDC's systems viable and gas-fired generating facilities on-line, including on the lateral that served NW Natural's system in Vancouver, WA**



Observations

- **Communications could have been improved:**
 - **From JP operator (PSE) and NWP –**
 - **In retrospect, sooner and more would've been better, but...**
 - **The extent of the outage was not readily apparent**
 - **Outages occur that are resolved before supply is affected, and no one likes to “cry wolf” for every blip in operations**
 - **A coordinated, regional dialogue would have helped**
 - **Interruptions of interruptible customers and power plant fuel switching worked very well in most cases**
 - **The regional system, albeit limited in nature, is pretty resilient; an outage that affected up to 25% of the I-5 corridor peak-day supply for several hours, didn't cripple the regional system**



Subsequent Actions Taken

- **At Jackson Prairie:**
 - **Improved weatherization**
 - **Enhanced understanding of newer equipment and related operating procedures**
 - **Replaced control system, developed in-house expertise and retained external expertise**
- **Regional communication and preparedness:**
 - **Revamped and expanded a Northwest Mutual Assistance effort –**
 - **The Northwest Mutual Assistance “Agreement” (NWMAA) contains no commercial terms or obligations**
 - **The only commitments are to provide committee members and emergency contact information, and participate in planning meetings, emergency exercises and discussions during actual emergencies**



Northwest Mutual Assistance Participants

- Avista Corp.
- Bonneville Power Authority
- Cascade Natural Gas
- FortisBC
- Idaho Power
- Intermountain Gas
- Northwest Natural
- Northwest Pipeline GP
- TransCanada (GTN)
- PacifiCorp
- Pacific Northern Gas Ltd.
- Portland General Electric
- Puget Sound Energy
- Ruby Pipeline
- Seattle City Light
- Spectra

Chair: Clay Riding, Puget Sound Energy

Vice Chair: Jan Caldwell, Northwest Pipeline

Other involved entities:

- Northwest Industrial Gas Users
- NWGA
- PNUCC
- Western Energy Institute

(Expansion of this list is expected in 2012)



Northwest Mutual Assistance Objectives

- **Communication! Communication! Communication!**
- **Emergency Planning Committee:**
 - **Meet at least twice a year –**
 - **Fall – Discuss upcoming winter outlook and issues**
 - **Spring – Review previous winter and effectiveness of NWMAA**
 - **Maintain key contact list for all participants**
 - **Coordinate periodic tabletop emergency exercises**
 - **Manage NWMAA**
- **Develop and maintain protocol for region-wide communication during emergency events—convened by affected pipelines or other system operators**



Northwest Mutual Assistance Concerns

- **Communication! Communication! Communication!**
- **Keeping emergency contact lists fresh and maintaining a ready capability to instantly reach out (email, text, phone messages, etc.)**
- **Relevant participant representatives must be able to communicate in an emergency to fully implement optimal solutions:**
 - **Standards of conduct issues if transmission personnel are on a call with marketing personnel?**
 - **Commercial operations folks must be involved as should those that understand critical electric transmission issues, due to the convergence of power and gas in the region**



Longer-term Reliability Initiative

- **Joint initiative –**
 - **Northwest Gas Association (NWGA)**
 - **Pacific Northwest Utilities Conference Committee (PNUCC)**
- **Improve NWGA products, such as the annual Outlook by including a broader planning perspective**
- **Discuss regional system and operational issues**
- **Look at regional gas system impact of new gas-fired generation additions**