Three Months from Idea to Implementation: Jumpstarting Agile at a Nuclear Power Company

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Agenda

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2. Experience Summary
3. Experience Details
    1. Phase 1: Awareness/Assessment
    2. Phase 2: Initial Rollout
    3. Phase 3: Ongoing Adoption
4. Lessons Learned
5. Questions/Contact Details

Introductions

Srini Gopalan

- Product Manager
- Project Manager, Plant Control Systems
- Agile Scrum Master and Product Owner

Eric Pitschke

- Engineering Program Manager
- Project Manager
- I & C Technical Lead
- Agile Scrum Master

Sanjiv Augustine

- President, LitheSpeed, LLC
- Agile and Lean management consultant
- Author, “Managing Agile Projects”

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EXPERIENCE SUMMARY

Why Agile at WEC Nuclear Automation?

Project: AP 1000 Nuclear Power Plant Control Systems

- Project moving into **formal production phase in 3 months**; compressed schedule
- Early need for specific control systems/components
- Large scope of work (>80 control systems distributed over 30 processors)

Why Agile at WEC Nuclear Automation?

Major Challenges:

- Input requirements continuing to change due to concurrent design development
- Anticipated continuing changes through the life of the project
- Rapid growth resulted in a shortage of experienced personnel

Why Not Waterfall?

Existing Waterfall production process was full of potholes:

- Subject to resource leveling issues
- Inefficiencies inherent in hand-offs
- Created silos that impacted communications and hampered professional development

Jumpstart Timeline: Agile at WEC Nuclear Automation

Phase 1: Awareness/Assessment

- Introduction to Agile PM with Scrum – May 30, 2009
- Decision to pursue Agile PM – June 15, 2009
- LitheSpeed evaluation and report – July 27-31, 2009

Phase 2: Pilot Rollout

- Scrum team training – August 13-14, 2009
- Scrum Master training – September 10-11 2009
- First project sprints start – September 25, 2009
- End of first three sprints – December 2009

Significant improvement in team productivity recognized by end of 3rd Sprint

Jumpstart Timeline: Agile at WEC Nuclear Automation (Cont'd)

Phase 3: Ongoing Adoption

- Downsized team size - June 2010
- Brought in first trainee from another project – June 2010
- Continue to cycle new engineers through original teams
- Upper management accepts agile project management
- Tools and processes available for new projects

Productive platform for rapid professional development as a result of team work and shared knowledge

Success with Agile – Impact on Teams

Improved Productivity:

- Team **productivity increased more than 40%**

Better Self-Organization:

- Team members benefited from cross training within teams; WEC is benefitting through the cross training
- Team members managed their activities better with less direct supervision
- Team members picked up responsibility for their team's performance

Continuous Learning and Improvement:

- Individual performance issues are quickly identified
- Not all individuals can work or want to work in the Agile environment
- Most team members provided positive feedback on the team working and learning environment

Success with Agile – Customer Engagement

- Plant Designers
  - They obtained better understanding of how their requirements are being implemented by us.
  - Were able to see importance of properly stating requirements.
  - Were able to quickly agree on necessary changes to requirements.
- Training Simulator
  - They gained an understanding of software status.
  - They were able to provide feedback on the value of the deliverable

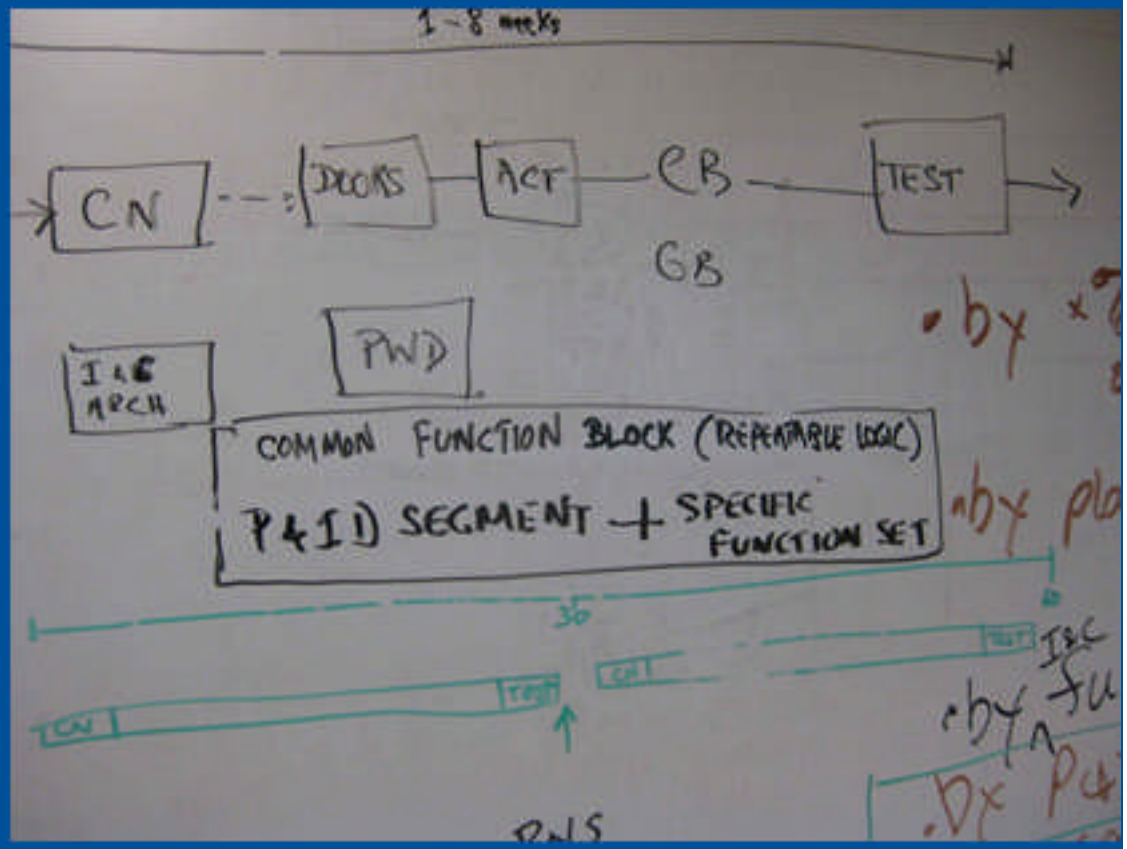
EXPERIENCE DETAILS – PHASE 1: AWARENESS/ASSESSMENT

LitheSpeed Agile Readiness Assessment

- **Reviewed the current environment, processes and practices**
- **Provided recommendations in many areas, including:**
  - Incremental Release Timeline
  - Product development process and tools
  - Management processes and tools
  - Team organization/silos, size, workload and capability
  - Customer interaction

Implementation Issues

- How to reorganize and train personnel in Agile PM with Scrum sprints
- Identify and implement the minimum set of tools needed to execute sprints



Implementation Issues

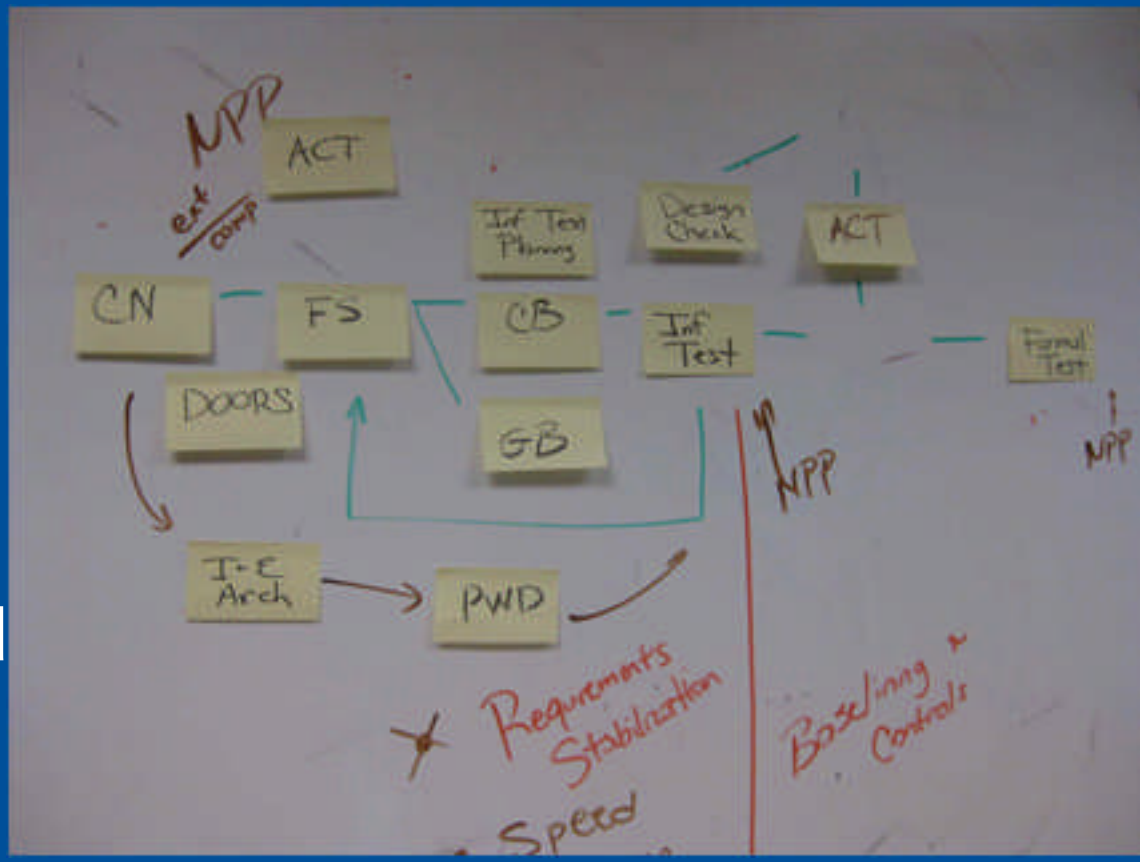
- How to divide control systems into packages for Sprints
  - Most control systems are distributed over more than one controller drop;
  - Design requirements were provided by plant system while each controller must be tested with integrated software
- How to convert the current EV calculation from a waterfall process to using the sprint backlog smoothly

Project Risks

- Need to complete preparations by mid-September to start sprints. What if not ready on time?
- Implementation of a new management strategy for a stream of project critical path activities
- Acceptance of new approach by senior company employees who will be assigned to teams (loss of support from experienced personnel)

Project Risks

- Failure to show productivity improvements sufficient to cover startup costs
- Performance of Scrum Masters and new, inexperienced team members



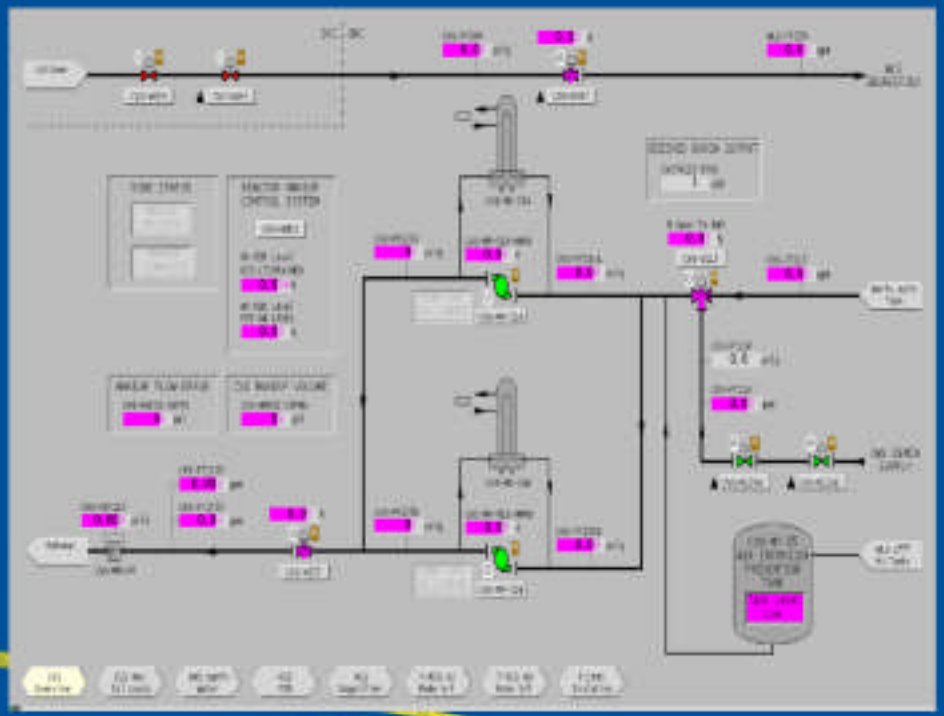
Near Term Action Plan

- Inventory the functional design database status and take the open work to completion
- Complete coding, graphics, testing, and documentation with whatever is there. Work these in parallel.
- Focus Team 4 on tool development required to support other teams
- Focus 2 teams on new systems. Determine functionality to be delivered based upon results of the step-1 inventory
- Focus 1 team on changes in the shutdown cooling water system
- Plant computer software: Reorganize teams – testers, functional designers, etc
- Determine the who/when/where of our customer involvement
- Model system architecture in the tools database and identify the input and output signals for each distributed controller
- Capture timing data and evaluate schedule

EXPERIENCE DETAILS – PHASE 2: INIITAL ROLLOUT

Baseline Training

- Team training for all team members
- Customized training for all Project Leads
- Customized training for ScrumMasters & Project Managers



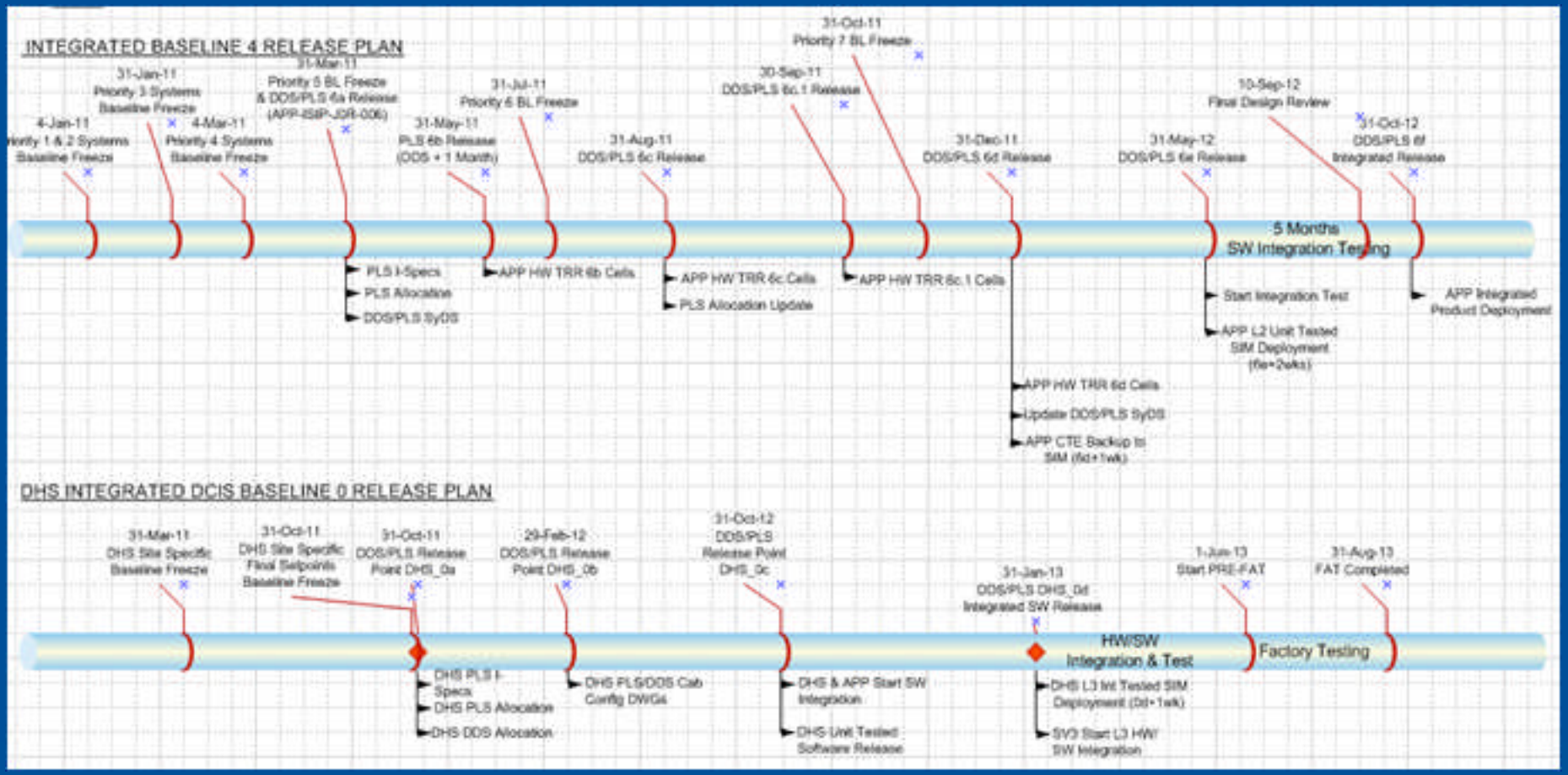
Initial Sample Scrum Team Structure

Primary Speciality	Team 1	Team 2	Team 3	Team 4 - (Additionally - Standard / Design process Support)
Functional Design	R. M. - Functional Design	J. P. - Requirements	G. P.	R. C. - Design Process
Functional Design	S. M.	D. H.	H. G.	N. E.
Control Software	B. A.	A. J.	J. J.	J. M. - Control Software
Display	E. M.	E. B	R. L.	N. D.
Testing	B. A.	K.S.	J. G.	W. M. - Testing
Testing	A. S.	T.M.	C. T.	
System engineering	V. P.	C. T.	R. K.	B. K. - Interfaces / PLS system design
System engineering				G. M. - PWD
System engineering				M. K.

Team Working Arrangements

- No changes in physical arrangements permitted
- Conference rooms reserved for daily stand-ups
- Teams met informally during the day in common areas*
- Eventually, a conference room reserved for use all day to support teams
- There were no remote team members

Release Planning



Product Backlog

PLANT SYSTEM	DESCRIPTION	PLANT PART	V22:RELEASE POINT	TEAM#	INPUT PRIORITY
APP-HW-DDS	DDS Hardware Cell (26 Cabinets & 3 Local Control Station Enclosures)	NI	6b	DDS_SYS	4
APP-HW-DRPI	PLS-DRPI Hardware Cell (4 Cabinets)	NI	6b	DRPI	4
APP-HW-MFP	PLS Main Feedwater Pump & Vibration Monitoring Cell (7 Cabinets)	BOP	6b	PLS_SYS	4
APP-HW-SIF	PLS Safety Interface Hardware Cell (4 Cabinets)	NI	6b	PLS_SYS	4
APP-DDS-DL-AOI	Advant to Ovation Gateway	NI	6c	DDS	3
APP-HW-DRCS	PLS Hardware Cell (10 Cabinets)	NI	6c	DRCS	4
APP-HW-NSSS	PLS Steam Supply Hardware Cell (14 Cabinets)	NI	6c	PLS_SYS	5
APP-PLS-DRPI	Digital Position Indication	NI	6c	DRPI	5
APP-HW-PWRT1	PLS AC Power & Ventilation Train 1 Hardware Cell (14 Cabinets)	NI	6c.1	PLS_SYS	4
APP-HW-PWRT2	PLS AC Power & Ventilation Train 2 Hardware Cell (15 Cabinets)	NI	6c.1	PLS_SYS	4
APP-HW-RWDB	PLS Radwaste & Diesel Building Support Hardware Cell (4	NI	6c.1	PLS_SYS	4
APP-BDS	Steam Generator Blowdown	NI	6d	4	2
APP-CVS	Chemical and Volume Control	NI	6d	3	1
APP-EFS	Communications	NI	6d	4	3
APP-EHS	Special Process Heat Tracing	NI	6d	4	2
APP-HW-PSI	PLS Package System Interface & VFD Interfaces Hardware Cell (6 Cabinets)	NI	6d	PLS_SYS	4

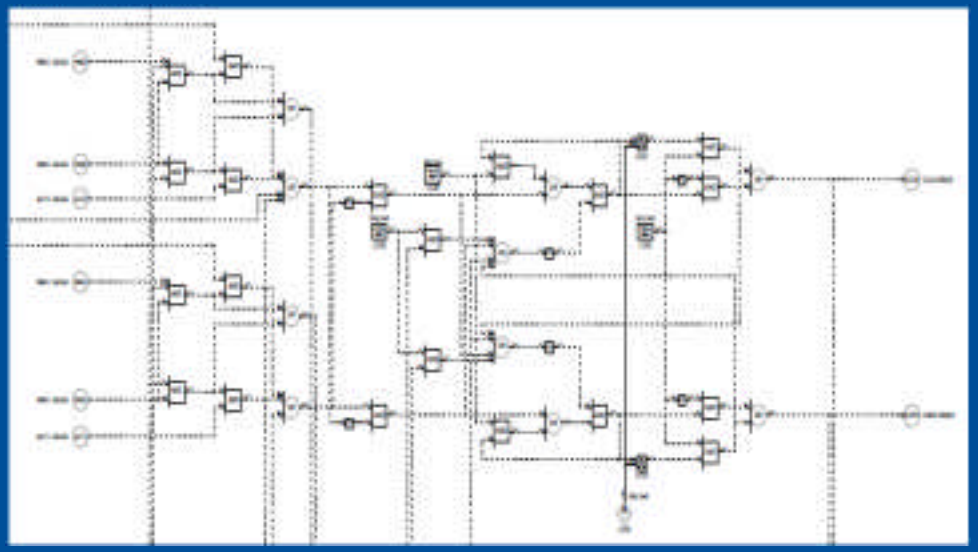
Rules for Agile Project Management with Scrum on AP 1000 Control Systems*

- Contents:
  - Sprint Planning Meeting
  - Daily Scrum Meeting
  - Sprint
  - Sprint Review Meeting
  - Sprint Retrospective Meeting

* Based upon APPENDIX A from *Agile Project Management with Scrum* by Ken Schwaber, but modified for project specific environment

Sprint Backlog and Tracking Spreadsheet Contents

- Burndown Chart
- Sprint Data
- Functional Design
- Software Design
- Testing
- Personnel Availability
- Work Tracking Check-off Sheet
- Open Items
- Lessons Learned



Spreadsheet Pages

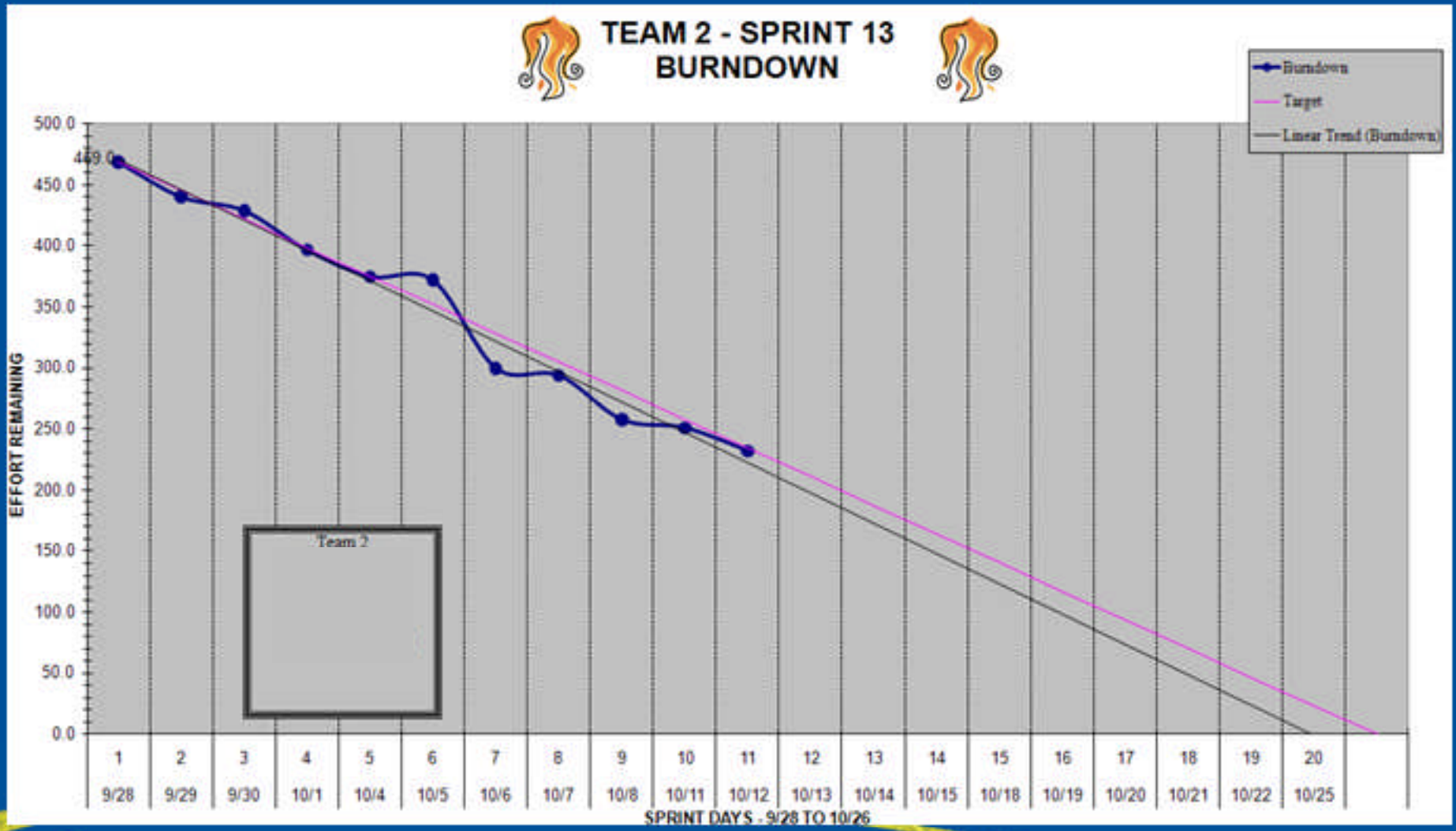
Burndown Chart | Sprint Data | Functional Design | Software Design | Testing | Availability | Work Tracking Checkoff Sheet | **Open Items** | Lessons Learned

Sprint Backlog

Team 2 - Sprint 13 - Backlog & Tracking

Story ID	Notes	Points	Days in Sprint / Effort Remaining														
			9/28	9/29	9/30	10/1	10/4	10/5	10/6	10/7	10/8	10/11	10/12	10/13	10/14	10/15	10/18	10/
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	1(
		469.0	440.3	429.0	396.7	375.0	372.0	299.7	293.9	257.5	250.9	232.0						
VXS-MY-V01		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
VXS-MY-W01A		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
VXS-MY-W01B		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
VXS-MY-W01C		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Documentation		10	3.333	3.333	3.333	3.333	3.333	3.333	0	0	0	0	0	0	0	0	0	0
			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MTS-EM-01		10	10	10	8.333	8	7.333	4.667	4.667	4.667	4.667	4	4	4	4	4	4	4
MTS-V034		10	10	10	8.333	8	7.333	4.667	4.667	4.667	4.667	2.667	2.667	2.667	2.667	2.667	2.667	2.6(
MTS-V704A		1	1	1	0.917	0.917	0.833	0.567	0.567	0.567	0.567	0.567	0.567	0.567	0.567	0.567	0.567	0.5(
MTS-V704B		1	1	1	0.917	0.917	0.833	0.567	0.567	0.567	0.567	0.567	0.567	0.567	0.567	0.567	0.567	0.5(
MTS-V704C		1	1	1	0.917	0.917	0.833	0.567	0.567	0.567	0.567	0.567	0.567	0.567	0.567	0.567	0.567	0.5(
MTS-V704D		1	1	1	0.917	0.917	0.833	0.567	0.567	0.567	0.567	0.567	0.567	0.567	0.567	0.567	0.567	0.5(

Scrum Burndown Chart



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Impact of Agile on Teams

- Team productivity increased more than 40%
- Team members benefited from cross training within teams; WEC is benefitting through the cross training
- Team members managed their activities better with less direct supervision
- Team members picked up responsibility for their team's performance
- Individual performance issues are quickly identified
- Not all individuals can work or want to work in the Agile environment
- Most team members provided positive feedback on the team working and learning environment

EXPERIENCE DETAILS – PHASE 3: ONGOING ADOPTION

Reduced Sample Scrum Team Structure

Plant System Software Teams			
Team 1 **9:30 - 9:45** **S/M - J> K.**	**Team 2** **10:30 - 10:45** **S/M - C. T.**	**Team 3** **10:15 - 10:30** **S/M - C. T.**	**Team 4** **9:00 - 9:15** **S/M - E. F.**
K.V.	J. P. (Requirements)	H.G.	R. C. (Design Process)
S.G.	D.H.	J.J.	C.M.
B.C.	R.G.	E.M.	J. M. (Control Software)
B.A.	T.W.	C.T.	W. M. (Testing)
S.W.			T.W.

Ongoing Adoption

- Existing teams became on-the-job training assignment for new engineers
- New engineers experience rapid professional growth in this environment
- Design updates easily planned and implemented through additional sprints rather than handling each one separately
- Scrum Masters cycled to spread experience in order to form a base for expansion
- Sprints provide planning path for design updates

Ongoing Adoption

- Sprint teams are very good now on estimating sprint backlog
- Daily Scrum meetings, Sprint Planning and Review meetings are more efficient and shorter
- Communication inside and between teams improved - helping in identifying and resolving issues quicker

LESSONS LEARNED

- Agile PM can be implemented from a bottom up approach as long as …..
- Implementation costs can be offset by production savings when the project is large enough
- Agile PM can be successfully implemented in a new organization in less than 3 months with focussed attention and willingness to take risk
- Assistance should be used from a qualified resource to accomplish this startup

LESSONS LEARNED

- Not all engineers will accept the new working order
- Individual performance issues are easily identified
- A proven, successful implementation is a valuable asset in obtaining upper management support
- There is a minimum tool set necessary to start executing scrums. You do not need to invest significant amount of money to create these tools.

Questions?

CONTACT INFORMATION:

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