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Sent: 2016-07-26 4:42:25 PM
To: Upadhyay Sanjoy; Morin Dominique; Gagnon Marc
Cc: Hamel Mario; Bourbeau Luc; Sabetta Luisa; Wade Mike
Subject: Protection Methods for Large Components

Attachments: [CH0030 Protection Methods for Large Components Stored Outdoors - Execution Summer 2016 Rev04.pptx](#)

Latest file for submittal to LCP

Merci / Thank you

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Email Header:

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CC: Hamel Mario; Bourbeau Luc; Sabetta Luisa; Wade Mike
Thread-Topic: Protection Methods for Large Components
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TO: Upadhyay Sanjoy; Morin Dominique; Gagnon Marc
From: "Makrogianoudis Konstantin" <Konstantin>
CKX-Bounce-Address: Konstantin
Subject: Protection Methods for Large Components



CH0030 – Protection Methods for Large Components Stored Outdoors

Andritz Hydro

27-July-2016

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1. Background and Context

Highlights of April 25th 2016 Presentation

- As part of CHR-123, AH has proposed a plan to monitor the deterioration of protection (packaging) system for parts stored outdoors.
- AH recommends to follow a reasonable inspection plan that will
 - Validate the effectiveness of the packaging
 - Monitor its possible deterioration over time
 - Reduce risk
 - Minimize cost
- The intent of this inspection plan is to only monitor the packaging with the goal of reducing risk to the equipment form, fit and function. Early intervention would allow identification of parts that need further attention.
- The assumption AH has made in making the plan is that a mechanically intact protection system implies a well preserved part underneath.
- The CHR-123 Part 1.4 also includes a partial open-package inspection of intact areas of three components (Protection Verification), to be done during Summer of 2016.

2. Protection Verification (CHR-123 Part 1.4)

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2. Protection Verification (CHR-123 Part 1.4)

Overview

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- The goal of this inspection is to validate effectiveness of ES 200QE00088 (Engineering Specification for Long Term Storage Protection) with respect to the concerns raised by LCP during the Storage & Preservation Audit (ARS-CH0030001-0005 dated 15-April-2016).
- Andritz Hydro will perform a partial open-package Inspection of intact areas of 3 Components (including re-application of protection)
 - Draft Tube Liner
 - Stay Ring
 - Intermediate Head Cover
- Prerequisites for Protection Verification:
 - Only intact packaging should be considered (assumption is that a mechanically intact protection system implies a well preserved part underneath)
 - Surface rust with no risk to the equipment fit, form & function can be expected
 - In order to be considered well preserved & suitable for installation, components should only require surface rust removal

3. Re-Protection Initiative

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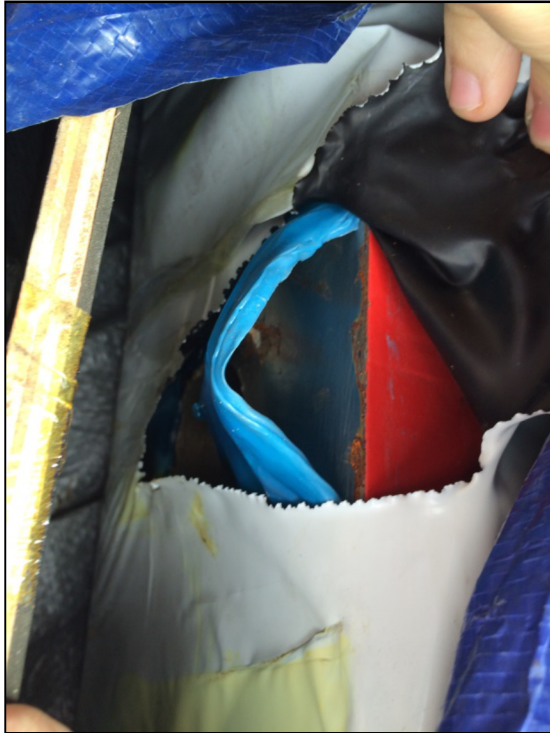
3. Re-Protection Initiative (CHR-123 Part 2.1)

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Impact of Protection Deterioration

- As seen below on the Intermediate Head Cover (June 2016), a compromised packaging leads to more rust, hence needs to be repaired, which is why the monitoring of the deterioration of packaging is covered under CHR-123 Part 2.1



Storage with Intact Packaging



Storage with Deteriorated Packaging

3. Re-Protection Initiative (CHR-123 Part 2.1)

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Components with Deteriorated Protection

- As mentioned in the April 25th 2016 presentation, progressive deterioration has been noted on the protection of certain components (listed in the following slides)
- These parts, delivered as part of shipments 1,2 & 3 would already have been installed or would be nearing installation date as per baseline. Based on mobilization date of May 1st 2015, AH would have started installing components during the Fall of 2015. For example, the Stay Ring delivery & installation dates are as follows:

Component	Delivery Date	Installation Date
Stay Ring U1	06-11-2014	22-07-2015
Stay Ring U2	13-08-2015	30-09-2015
Stay Ring U3	13-08-2015	14-11-2015
Stay Ring U4	13-08-2015	12-12-2015

- As shown in the example above, the Stay Ring would not have to be re-protected based on the original baseline date.
- Activities related to extended storage duration after baseline installation dates are covered in CHR-123

3. Re-Protection Initiative (CHR-123 Part 2.1)

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Overview

- Any protection that is damaged or deteriorated risks losing its protective properties. As these components will not be installed following the baselines schedule, allowing the protection to remain in this condition during the extended storage period would consist of a risk for the equipment fit, form & function.
- In order to mitigate this risk, Andritz Hydro proposes an initiative that, while not renewing the protection, will help maintain it, on a cost plus (T&M) basis, as described in CHR-123:
“Due to LCP’s schedule delay, LCP is responsible for the normal and expected deterioration of the packaging beyond the AH baseline storage period (as this was not planned). AH will repair and touch-up packaging as deviations are noted (...) in an effort to maintain the protection. This includes:
 - Tarps
 - Wood
 - Corrosion inhibitor
 - Coating
 - Infrastructure, materials, equipment labor, supervision, office support, transportation, handling costs, etc. in relation to the repairs and touch-ups of the packaging
 - Etc.
- AH will repair and touch-up packaging as the work occurs and will back-charge LCP the associated costs incurred on a cost plus (T&M) basis.”

3. Re-Protection Initiative (CHR-123 Part 2.1)

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Methodology

Andritz Hydro has assessed the condition of the packaging in the Laydown area for various components and has established 2 levels of intervention.



- **Re-protection:**
 - Cleaning of affected area
 - Complete application of MP5000 on affected area
 - Wrapping in Intercept Paper
 - Wood installation
 - Tarp Replacement in required areas
- **The components targeted are:**
 - 16 x Stay Ring Segments
 - 24 x Draft Tube Liner Segments
- **Protection touch-ups:**
 - Touch-up of MP5000 & Intercept on non-critical areas
 - Closing of Tarp openings
- **The components targeted are:**
 - 2 x Lower Bracket Oil Pot
 - 8 x Stator Frame Segments
 - 4 x Intermediate Head Cover Segments
 - 4 x Thrust Bearing Support Segments

4. Preliminary Protection Gap Analysis

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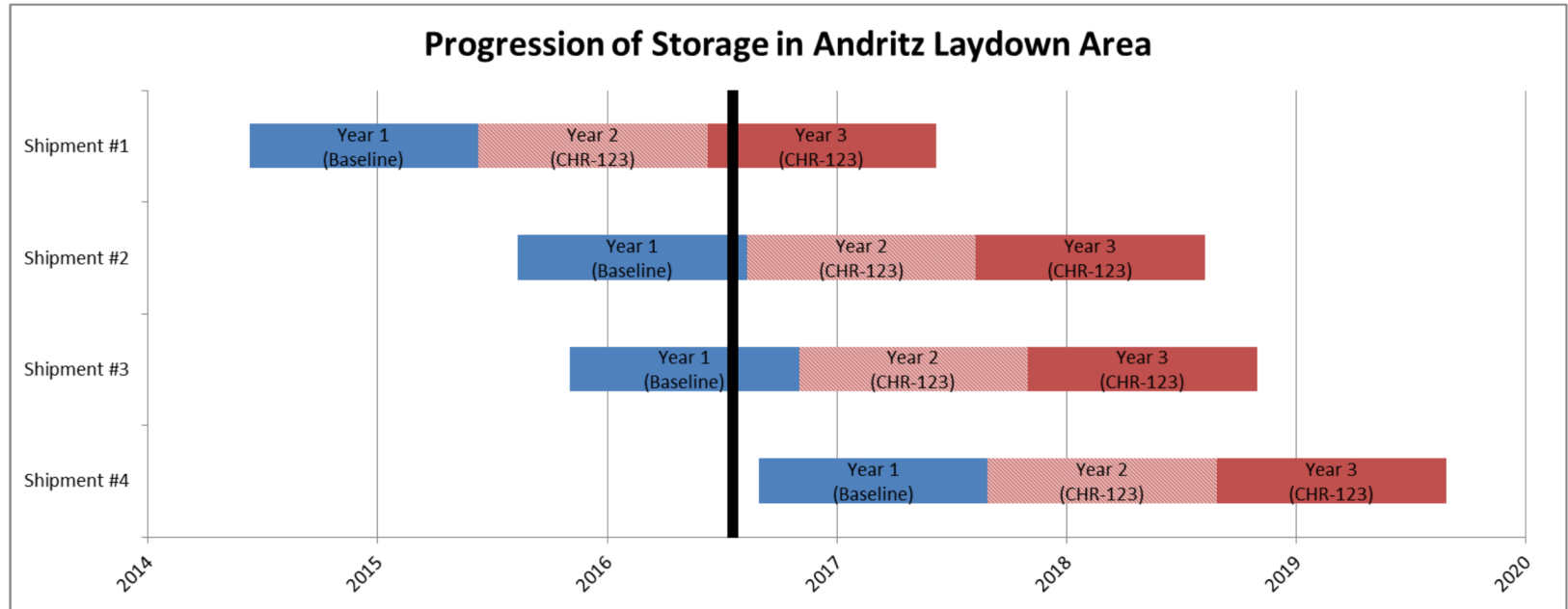
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4. Preliminary Protection Gap Analysis

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Timeframe of CHR-123

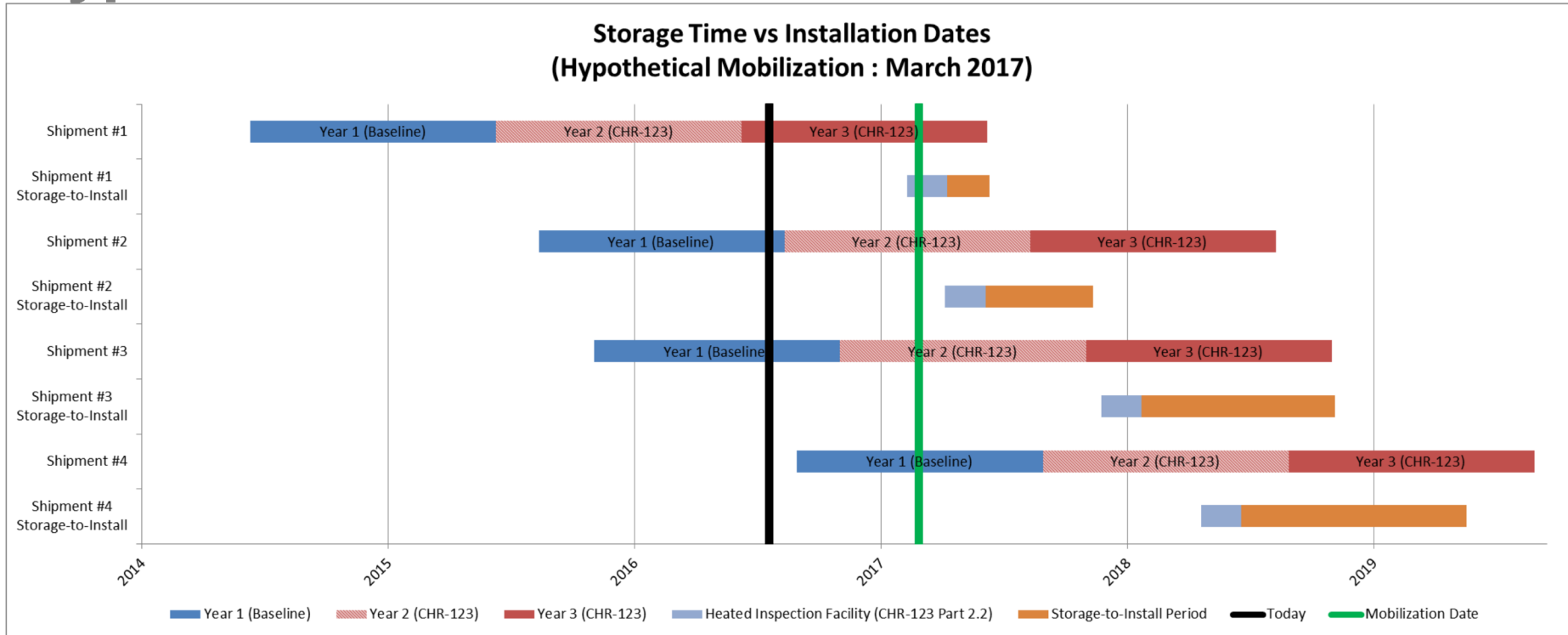


- AH protection system was chosen to ensure long term storage period of up to 12 months as per Baseline Schedule and the Agreement (in blue in the graphic above). Storage beyond this timeframe was not in the baseline plan.
- As per LCP's request, Andritz Hydro provided a proposal (CHR-123) for the provision of long term storage for the Turbines and Generators components that are designated to be stored outdoors. The proposal was based on a minimum of a 12 month adjustment (Year 2) in the original Contract milestones with an option for extending up to an additional 12 months (Year 3 in red in the graphic above).
- The mobilization date will have a direct impact on the timeframe of CHR-123 as it will determine the total storage duration.

4. Preliminary Protection Gap Analysis

CIMFP Exhibit P-02942

Hypothetical Mobilization: March 2017

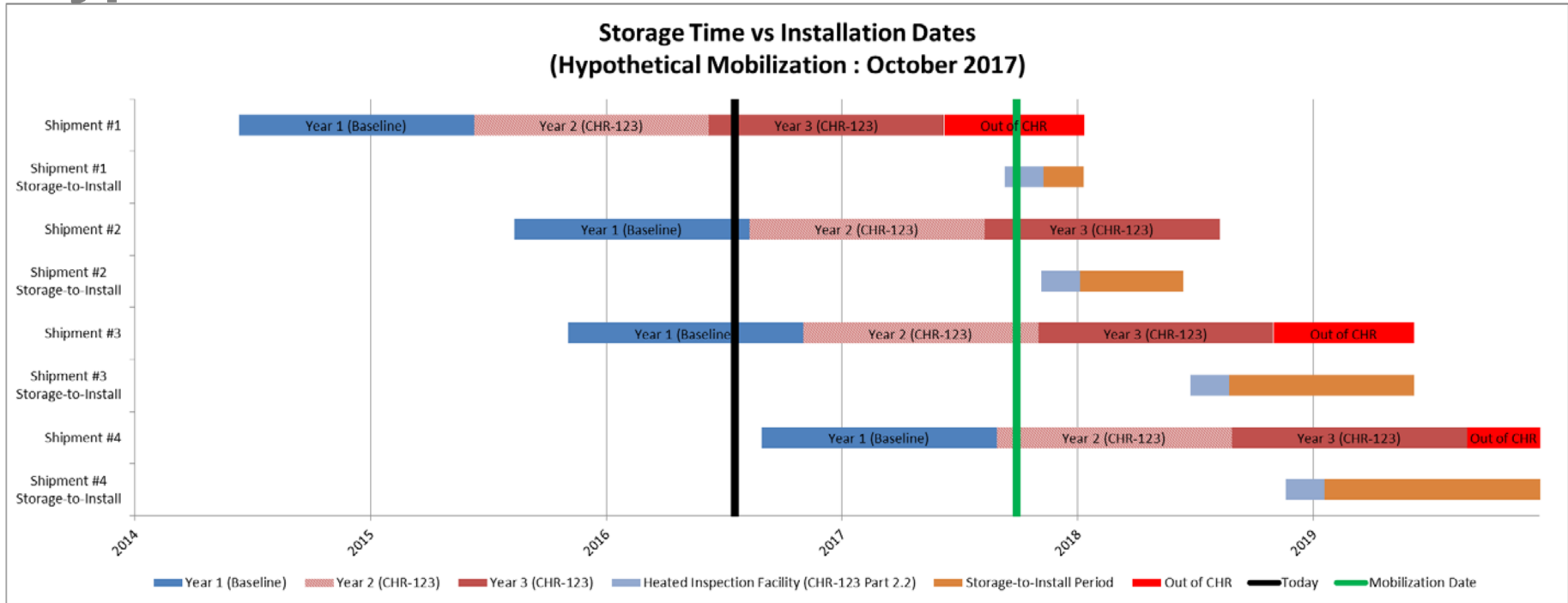


- March 2017 is the last mobilization date where the CHR-123 is valid.
- CHR-123 requires an in-depth inspection and a potential rust-removal period of a minimum of 2 months in an indoor heated facility (with an overhead crane) prior to their respective installation dates as mentioned in part 2.2 of CHR-123.

4. Preliminary Protection Gap Analysis

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Hypothetical Mobilization: October 2017



- If storage of components beyond the two (2) year extended timeframe is required, the measures detailed in CHR-123 would not be sufficient to mitigate the increased risk. It should be noted that, after initiation, the rate of progression of rust will increase exponentially over time.
- Andritz Hydro highlights again that there isn't any protection system, other than indoor heated storage, that can be specified to ensure rust free components

5. Conclusion

- Joint inspection for validation of protection system with LCP as per CHR-123 Part 1.4 (August 2016).
 - During inspection, surface rust (with no risk to the equipment fit, form & function) can be expected.
- Deteriorated protection of identified parts will be repaired (Re-protection Initiative) as per CHR-123 Part 2.1 (Summer 2016)
- A facility will be required as per CHR-123 Part 2.2 (minimum of 2 months prior to installation).
- Delay beyond March 2017 mobilization, extends storage beyond the CHR-123 timeframe, increasing risks for the components' form, fit & function.
- All work being done by Andritz Hydro on the protection system of outdoor components is being performed under CHR-123 only.
- CHR-123 has not been approved yet.