

1 Q. Further to PUB-NLH-605, did AMEC make any significant recommendations
 2 concerning the boilers at Holyrood in the 2011 report or any subsequent report? If
 3 yes, what were the recommendations?

4
 5

6 A. The significant recommendations concerning boilers made by AMEC in the 2011
 7 level 1 condition assessment report, and in the level 2 condition assessment work
 8 from 2012 to 2016 are included in the tables below. The status of the work for each
 9 year is also included except for 2016, which is in progress.

10

Table 1

Boiler Recommendations and Status from 2010 Level 1 Condition Assessment	
Recommendation	Status
Carry out Level 2 inspections and testing in 2012, 2013, and 2014 for Units 1, 2, and 3 respectively on boiler components as identified through level 1 condition assessment.	Completed
Refurbish Unit 1 stack breeching per current plans.	Complete
Addition of reheat boiler tubes in Unit 1 to improve reheat steam conditions and cycle efficiency.	Not completed - discussed with service providers but felt not feasible given limited remaining life
Refurbish Unit 2 stack breeching per current plans.	Complete
Addition of reheat boiler tubes in Unit 2 to improve reheat steam conditions and cycle efficiency.	Not completed - discussed with service providers but felt not feasible given limited remaining life
Refurbish stack breeching per current plans.	Not completed - annual internal and external inspections have not confirmed the need to replace

Table 2

Boiler Recommendations and Status from 2012 Level 2 Condition Assessment	
Recommendation	Status
Inspect Unit 1 steam drum at the downcomer nozzles	Completed
Inspect Unit 1 Superheat Header 6 (SH6) header at the east and west outlet nozzles	Completed
Inspect stub tube to header welds on the Unit 1 SH6 header	Completed
Inspect Unit 2 SH6 header east and west outlet nozzles to confirm no recurring damage accumulation	Completed
A critical crack size assessment be conducted for the Units 1 and 2 economiser inlet headers (one assessment covering both units) as a basis for continued operation without repair, and to define end of life.	Completed
A review of unit start operating practices be conducted to ensure measures to limit thermal cycles impacts are being effectively implemented.	Completed
A review of unit lay-up practices be conducted to ensure measures to limit corrosion and pitting of boiler and piping components are being effectively implemented.	Completed
Results of the Level II assessment and life management strategies be integrated with the annual boiler and high-energy piping maintenance program	Completed/ On going
Recommendation from Alstom/B&W: Replace Unit 2 lower reheater	Planned 2016

Table 3

Boiler Recommendations and Status from 2013 Level 2 Condition Assessment	
Recommendation	Status
Inspect Unit 1 and 2 economizer inlet headers. n. An engineering analysis to define critical crack size and growth rate is recommended for the Units 1 and 2 economiser inlet headers (one assessment covering both units) as a basis for continued operation without repair, and to define end of life. The need for similar analysis for Unit 3 will depend on the inspection results.	Complete
Inspect Unit 1 or 2 boiler superheat crossover piping	Complete
Inspect Unit 1 or 2 SH4 girth weld and internal visual inspection	Complete
Sample reheat tubing Dissimilar Metal Weld (DMW)	Not required (agreed by AMEC and NLH)
Inspection of the Unit 3 economiser link piping supports	Complete
Unit 3 Steam drum inspection	Complete
Circumferential etch of the SH6, RH2 headers and the superheat link piping for evidence of a seam weld microstructure, on either Unit 1 or Unit 2	Complete
Unit 2 SH6 header east and west outlet nozzles are to be inspected for surface defects in 2013 to confirm no recurring damage accumulation.	Complete
Routine inspection of the SH6 nozzle welds for creep damage is to be conducted on each of Unit 1 and Unit 2 every 6 years on both units alternating between units starting on Unit 2 in 2015. The next inspection would be conducted in Unit 1 in 2018, or 2017 given the possible operating hours in present operating plan. The inspections are expected to include wall thickness measurements to detect any impacts of corrosion.	On going
A sample of riser tubes is to be inspected on either Unit 1 or 2 to assess severity of pitting and potential axial cracking before 2015.	Complete
Periodic inspection of a downcomer nozzle inside the steam drum needs to be implemented. One end (one downcomer) every 3 years, alternating ends is recommended for both Units 1 and 2, starting with Unit 2 in 2015.	On going
A review of unit start operating practices is recommended to ensure measures to limit thermal cycles are being effectively implemented.	Complete
A review of unit lay-up practices is recommended to ensure measures to limit corrosion and pitting of boiler and piping components are being effectively implemented.	Complete
Results of the Level II assessment and life management strategies be integrated with the annual boiler and high-energy piping maintenance program	Completed/ On going
Periodic (3 year) removal of waterwall tube samples from high heat flux elevations needs to be part of the on-going boiler management program.	On going
Recommendation from Alstom/B&W: Replace Unit 1 lower reheater	Planned 2016

Table 4

Recommended Inspection Location (scope by Amec)	Status	Follow Up Req'd?
Unit 1 Boiler Internal/External Inspections and Testing:		
Unit 1 economizer inlet header	Complete	Yes, reinspect in 3 years
Unit 2 Boiler Internal/External Inspections and Testing:		
Superheater 3 to superheater 4 link piping	Complete	No
Unit 2 economizer inlet header	Complete	Yes, replace inlet tee in 2015 - Complete
Riser tubes (10 locations)	Complete	No
High pressure heater #5 outlet full flow tee	Complete	No
Unit 3 Economizer inlet header and economizer link piping supports		
Header Internal	Complete	Yes, follow up in 2015 - Complete
Header Supports	Complete	No
Header Nipples	Complete	No
Economizer Recirculation Line (connection to east downcomer)	Complete	No
Header Inlet Elbow	Complete	Yes, reinspect in 3 years
High Temperature Superheater Front Horizontal Spaced Inlet Header (Cold Reheat)		
Header Internal	Complete	No
Header Perforated areas	Complete	No
Header Supports	Complete	No
Header Nipples	Complete	No
Vents and Drains	Complete	No
High Temperature Superheater Front Horizontal Spaced Outlet Header (Main Steam)		
Header Internal	Complete	No
Header Wall	Complete	No
Header Supports	Complete	No
Header Circumferential Seams	Complete	No
Header Nipples	Complete	No
Header Outlet Nozzles	Complete	No
Header End Caps	Complete	No
Vents and Drains	Complete	No

HT Reheater Outlet Header (Hot Reheat)		
Header Wall	Complete	No
Header Supports	Complete	No
Header Circumferential Seams	Complete	No
Header Nipples	Complete	No
Header End Caps	Complete	No
Safety Valve Nozzle	Complete	No
Header Outlet Tees	Complete	No
Header Outlet Tee Welds	Complete	No
Vents and Drains	Complete	No
Superheat Attenuator/Reheat Vertical Header Feeder Piping	Complete	No
Primary SH outlet welds to vertical attenuator header	Complete	No
SH Attenuator Feeder welds to Secondary Superheater Inlet Header	Complete	No
Penthouse Riser Tubes		
Riser straight runs	Complete	No
Feeder Tubes from Downcomers to Waterwall Lower Headers	Complete	No
Steam Drum		
Drum Internals	Complete	No
Drum Seams	Complete	No
Feedwater Nozzles	Complete	No
Drum Head Penetrations	Complete	No
Steam Cooled Roof hanger lug attachments (sample)	Complete	No
Lower waterwall header (front wall and side wall)	Complete	No
Lower downcomer header	Complete	No

Table 5

Boiler Condition Assessment Activities in 2015		
Recommendation	Status	Follow Up Req'd?
<i>Unit 1</i>		
Inspection of SH6 outlet nozzles (east and west)	Complete	Yes, in 3 years
<i>Unit 2</i>		
Lower vestibule tubes	Complete	No
Inspection of reheat outlet header (RH-2)	Complete	No, unless damage is found in seam weld of SH-6 header in 2016
Inspection of SH-6 east and west outlet nozzles and seam weld	Complete	Yes, in 2016
Inspection of steam drum east most downcomer	Complete	Yes, in 3 years
<i>Unit 3</i>		
Inspection of economizer inlet header (boroscope)	Complete	Yes, in 3 years
Inspection of main steam boiler link	Complete	Yes, in 2016
Inspection of lower vestibule waterwall feeder tubes	Complete	No

Table 6

Boiler Condition Assessment Activities for 2016
Amec Recommendation
<i>Unit 1</i>
Steam Drum Downcomer inspection – Periodic Inspection (3 yrs Alternating) 2016 and again in 2019 (Unit #2 done in 2015)
SH6 Header East and West Outlet Nozzle – Inspect for Surface defects to confirm no recurring damage – Replication Every 6 yrs (Unit #2 Done in 2015)
ITP Boiler Inspection Program
<i>Unit 2</i>
ITP Boiler Inspection Program
SH-6 - Perform PAUT on the seam weld to inspect for sub-surface creep damage
<i>Unit 3</i>
Internal lower Waterwall Header/Feeder Tube Inspection to determine if pitting in feeder tube is active (check for orange corrosion products)
Thoroughly inspect lower waterwall tube bends as low readings found and Pad Welds performed in 2015 – Establish wastage rate and order tube material for emergency repairs
Thoroughly inspect bent tubes around burner openings, low readings found in 2015 – establish wastage rate and order tube material for emergency repairs if necessary
ITP Boiler Inspection Program
Secondary Superheater Outlet Tube Bank UT Inspection