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### **Abstract**

The paper looks at a selective smelting regime where higher activity components are smelted with lower activity components with the aim to reduce the amount of ILW waste for disposal. This has been applied to the European DEMO Fusion Plant HCPB 2015 baseline design waste assessment. The paper assesses the structural steels in the breeder blanket and the vacuum vessel. Other benefits of a smelting regime are considered, including decarburisation and detritiation. Key radioisotopes are identified for disposal in different countries – UK, CSA (France) and Italy – with comparisons drawn between them. For the UK disposal option large savings in the amount of EUROFER ILW can be achieved with decarburisation but minimal savings are achieved for SS316 ILW due to high levels of Ni63. For the CSA the reverse is true with Nb94 the key nuclide for both steels with no savings made in the amount of EUROFER ILW and significant savings made to SS316 ILW when Nb is reduced. For disposal in Italy no savings are seen in EUROFER ILW waste and moderate savings for SS316 ILW with Nb94 and C14 the key nuclides respectively. The paper illustrates the potential benefits of international arrangements for waste disposal: individually the highest potential reduction in overall in vessel ILW was 40% in the UK, while, with a suitable arrangement between the UK and France, a potential reduction of 84% could be achieved. The selective smelting regime may be applicable within the wider nuclear waste industry.