Contribution ID: **206** Type: **not specified**

Symbiotic Design of Fusion Power Plants

Thursday 30 November 2023 14:40 (25 minutes)

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Current state-of-practice in the design, build and operation of complex engineered systems involves contractual arrangements between many sub-contractors working across an often very complex supply chain. Each company will be responsible for a particular component or subsystem and have its own competences, infrastructure and data management policies. As the need for customisation increases, i.e., the low volume, high value manufacturing required in a first of a kind power plant, there will be a corresponding need to engage with highly skilled specialists. These may be individuals from niche micro-firms or experts embedded in large organisations, who, from the point of view of the wider supply chain, will typically be working in silos. These unconnected islands of knowledge act as firewalls that make it difficult to leverage artificial intelligence in the design process. To address this, there needs to be a paradigm shift in how engineering is organised, moving away from a digitally enabled craft industry towards one that embraces a philosophy of automation. The invention of the world wide web enabled the automation of processes, contracts and data management at a massive scale across a geographically distributed ecosystem; in commerce, banking, media and leisure. The industrial metaverse, the internet in three dimensions, promises to disrupt engineering in the same way. In this presentation, we will show how the metaverse is being used to develop a cyber physical system for power plant design in which design teams connect, collaborate and make increasing use of automation –in near "real-time". Once the cyber physical system is in operation, it will generate, collect, store, process and consume data; encapsulating knowledge related to fusion power plant design. Our vision is for artificial intelligence to use this knowledgebase to learn how to design complex systems, enabling computers to work as partners with humans in a new era of symbiotic design.

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