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| **Juxtaposing bulk transfer of water and renewable energy storage** |
| **Project Outlin** |
| Bulk transfer of water should be a key factor in the provision of resilience in water supply, helping to address population and climate change driven water scarcity in the South East by taking advantage of existing water resources in the North and North West of the country, with these likely to become more viable under wetter climate change scenarios.  This research will take the novel approach of evaluating and modelling the potential to achieve both bulk transfer and storage of renewable energies to help meet the impending supply demand crisis in the energy sector. This will be done by considering options such as multistage pump storage across different routes with short duration operation driven by energy supply and demand needs, but providing long term bulk movement of water. The inefficiencies of pump storage and costs of bulk transfer can be offset by the value associated with peak energy demands. Thus the concept offers the potential to transform previous assessment of bulk transfer schemes that have frequently found energy costs to be prohibitive. Further the project will seek to explore transfer of treated or semi treated water directly to impounding reservoirs such that the environmental concerns of inter catchment transfer (such as from the Severn to the Thames) are mitigated. A final novel aspect to be considered will be the utilisation of ‘dark infrastructure’, that which already exists but could be exploited or connected to transform its use, for example Severn Trent and Yorkshire Water have strategic transfer grids within their monopoly regions.  The project will focus on technical feasibility, taking systems mapping and technology performance modelling approaches to unlock new transformative potential for both water and energy systems. |
| **Primary supervisor** |
| Joby Boxall, Civil Eng, Theme 2 and Hub. Expertise in hydraulics and potable water supply  j.b.boxall@sheffield.ac.uk |
| **Other members of the supervisory team** |
| Vanessa Speight, Civil Eng, Hub and Theme 7. Expertise in water supply including energy metrics and performance.  Richard Collins, Civil Eng, Theme 3. Expertise in programming and systems analysis. |
| **how the proposed project adds value to TWENTY65** |
| Theme 2 looks at systems mapping for local water storage and recovery options. This project conversely looks at the national scale and seeks to help solve long term water security issues as well as renewable energy storage.  Water UK ‘Water resources long term planning framework’ (2016) identifies bulk transfer as an essential component for long term water security. But is constrained by monopoly boundaries, raw water transfer and bulk energy costs; as historic EA reports on bulk transfer. This work will transform the feasibility of bulk transfer by considering dark infrastructure and renewable energy storage. |
| **Suggest titles and journals for two 4\* papers that you expect to arise from the project** |
| ‘Exploiting dark infrastructure to meet the pressure of population growth and climate change.’  ‘Cross utility service provision providing both renewable energy supply demand balance and bulk water transfer.’ |