Structural Engineering Materials Challenges

- Complex infrastructure of “aged” networks
  - Inter-related and co-dependent with common/disparate problems
  - Managed by multiple stake-holders with different drivers
  - Maintenance is a significant activity (multiple impacts)

- Improved living environment
  - Low carbon & reduced impact
  - Sustainable materials & security of supply

- Legacy and New (Novel) materials
  - Lessons from past behaviour to avoid future problems
  - Integrating old and new materials to deliver extended life
  - New uses and integrated solutions – Sustainable Future Infrastructure

Structural Engineering Materials Challenges

- Intelligence – self-diagnosis & reporting
  - Materials
  - Users (distributed data acquisition)
  - Operators (regulated data acquisition)

- Structures that “self-regulate” at multiple levels
  - Material
  - Component
  - Structure
  - Network
  - User
  - Operator

FIF2 - Vision Statement

- Reduced maintenance
  - Tailored design/materials selection
- Reduced maintenance impacts
  - Remote monitoring/actuation
  - 24/7 serviceability for users
- Improved living environment
  - Low CO_2 and other impacts
- Self-regulating structures
  - Structures that require minimal intervention

Infrastructure Challenges

- Deterioration and ageing
  - Corrosion, cracking, chloride
- Environment
  - low carbon and embodied energy
  - Cl^-
- Extreme Events
- Resilience
- Adaptability

Topic Areas Considered

- Legacy materials
- New materials
- Self-healing/cleaning
- Intelligent
- Active surfaces
- Sensing/ actuation
- Nano-materials
- Composite materials
- Sustainable supply
- Low mass structures
- Manufacturing methods
- Thermal mass
- Rehabilitation Materials
- Asset / servicability criteria
- Real asset behaviour – experience base
- Water retainment
- Nuclear materials
- Design specific properties
- Condition assessment – NDT
- Predictability
- Time dependence
- Oil vs Gas materials
- Future certainty (predictions)

Some Questions

- New Materials for Structures
  - how do they deteriorate?
- Can we better understand why/ how existing assets deteriorate?
  - in a way that impacts on performance
- What materials available best address deterioration issues?
- Lessons from legacy materials/structures?

Some Questions

- What are the technical options to make infrastructure more intelligent?
- What are the best materials for high consequence infrastructure?
  - e.g. nuclear, water
- How do we make structural behaviour predictable?
- How do we assess materials condition (legacy/new) in hidden parts?

Some Questions

- How tolerant are new materials to long term/extreme events?
- What are the minimum thresholds for maintenance?
- Can we afford adaptable materials?
- Can we eliminate the concept of design life?
- What are the materials options that provide intelligent self-regulation?

Changes at the EPSRC
Shaping Capability

- Increase funding in 17 areas:

- Reduce funding in 14 areas:

- Maintain funding in 82 areas:

  "The bottom line is that to 'maintain' is to 'reduce' – our budget is going down 15-18% over the review period"

  David Delpy (CEO EPSRC)