

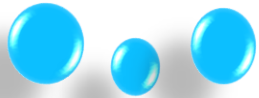
Resource Revolution

Circularity is a Potent Weapon in the Arsenal

Principles of resource revolutions

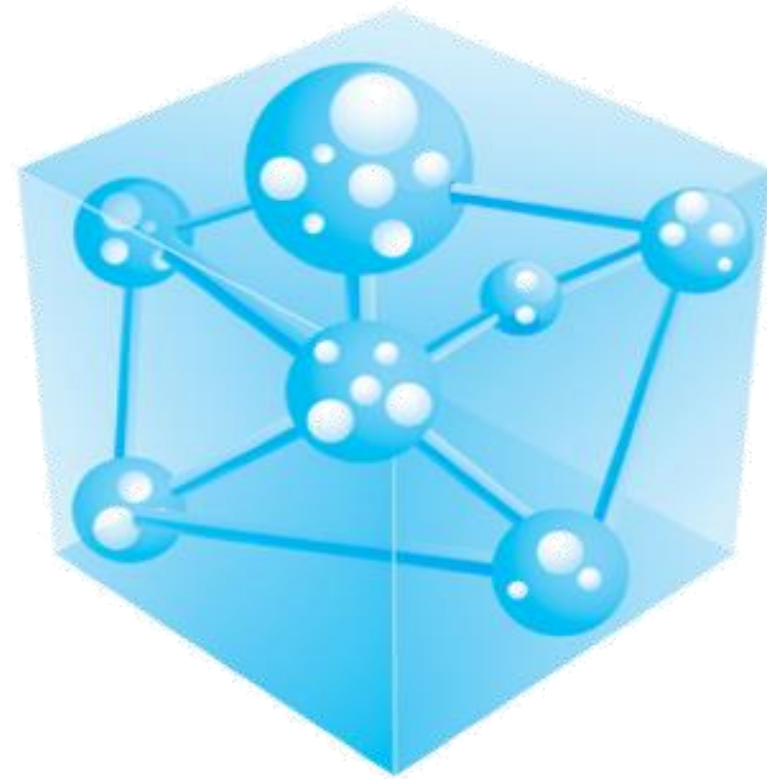
Characteristics of winning solutions

- Superior performance upfront – faster, safer, cleaner, more convenient
- Clear pathway to significantly lower cost
- Ability to deliver at industry scale
- Backwards compatibility
- 50-80% resource productivity improvement; 2-year payback timing
- High productivity business model



Building blocks

- Interchangeable parts
- Systems integration
- Embedded Software; remotely upgradable
- Nanotechnology and biological methods
- Network effects
- Step by step, scale up; customer segment by customer segment
- Computational methods to test/simulate

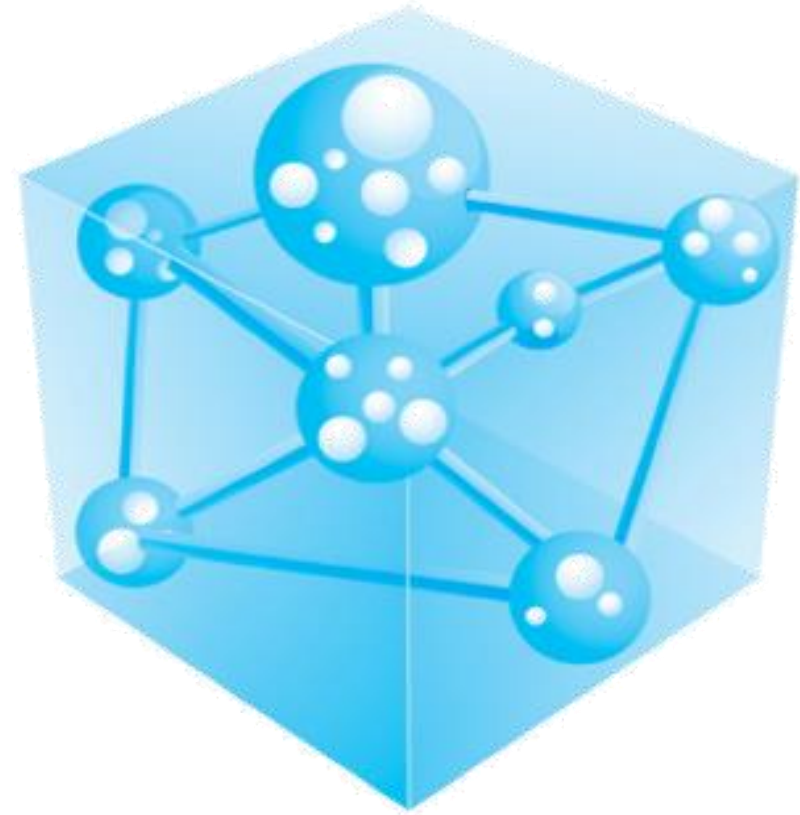


Organizing principles

- **Standard operating system**
- **Network organization**
- **Committed champions**
- **Resource productivity metrics**
- **High productivity sources and types of talent**
- **Freelance innovation; crowd sourcing**

Sources of productivity

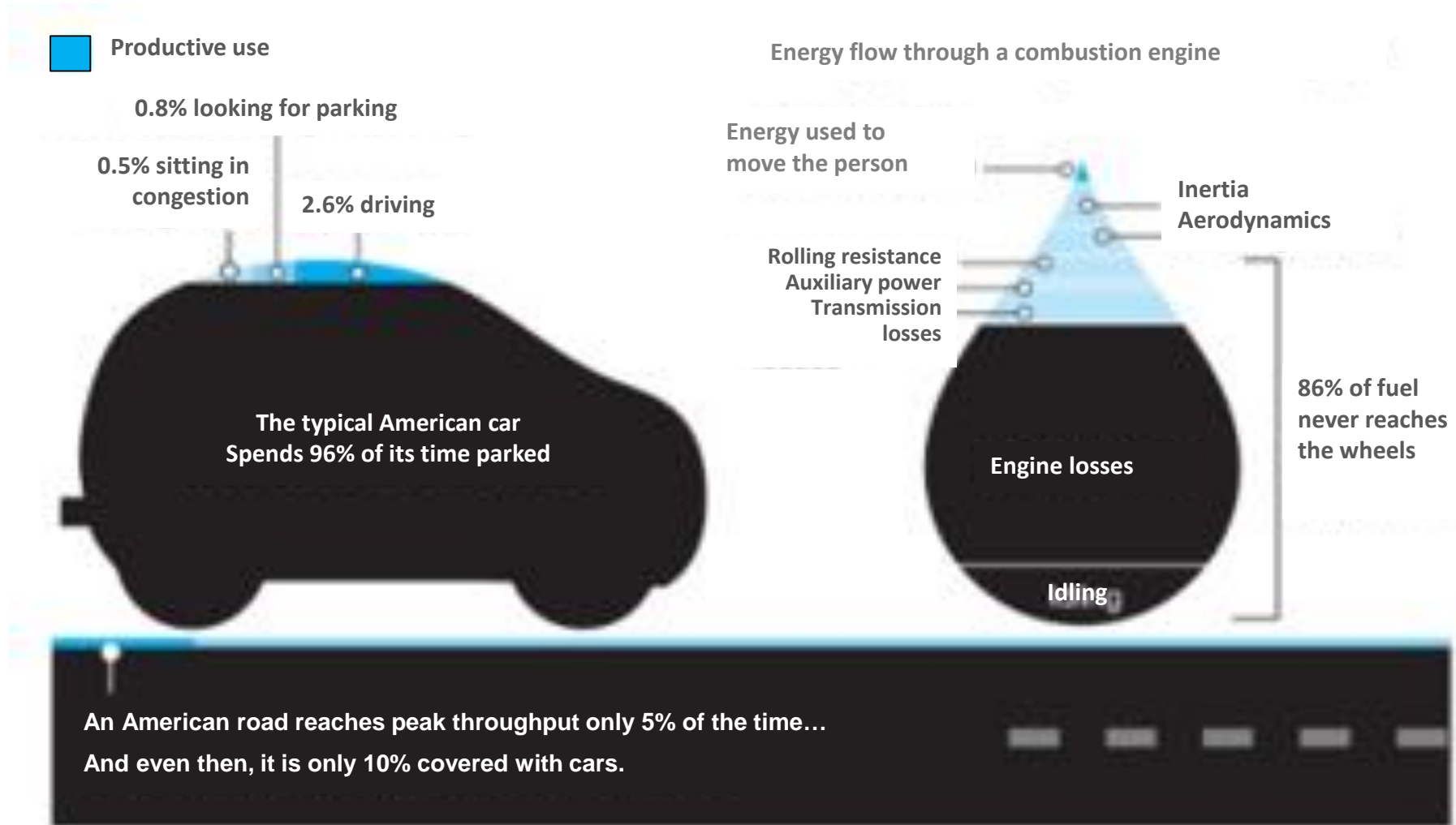
- **Substitution: lighter, stronger, cheaper, lower resource risk materials**
- **Waste reduction: resource productivity is the new lean**
- **Circularity: designed in closed-loop resources**
- **Optimization: predictive or real-time analytics to reduce resource requirements or increase asset utilization**
- **Virtualization: resources as a service**



The goal of a Circular Economy is simple:

***“to halt over-consumption so that we can still
afford to be prosperous in the future.”***

Waste in fuel, cars, and roads caused by automobile transportation



CHALLENGES AND BARRIERS TO CIRCULAR ECONOMY

- Political Will
- Economic Incentives
- Funding
- Standardization of products

- Legislation
- Collaboration
- Pricing
- Education

And More