



# Emerging Technologies: Sustainable Solutions

Michigan Aggregates Association (MAA) February 3, 2022

## Dr. Ray Gallant - Biography

*Vice-President Product Management and Productivity for Volvo Construction Equipment, part of the Volvo group of companies.*

- Responsibilities include sales and application engineering; product, sales and operator training; Customer Center operations; and Product Strategy and Development for Region Americas.*

### *Education:*

- Bachelor of Science (Chemistry) from Dalhousie University*
- Bachelor of Science in Forest Engineering from UNB*
- Master of Science in Management from Boston University*
- Doctor of Business Administration*





## Megatrends driving change



Urbanization



Sustainability



Political  
Trends



Technology



Social Organization

# 1. Rapid Urbanization

	1950	2018	2050
Population	2.6	7.6	9.8
% Urban	30%	55%	68%
# Megacities	1	33	60+

- Majority of growth and urbanization is in Asia and Africa
- High growth rate in large-cities (5-10M)
- Drives major infrastructure projects for urban and changes in rural jobsites

Source: United Nations. (2018). *World Urbanization Prospects—Population Division—United Nations*. Retrieved from <https://population.un.org/wup/>





## 2. Sustainability



### **Social sustainability**

To care for people's health and wellbeing in all parts of the value chain and to contribute to a sustainable development of the society.



### **Environmental sustainability**

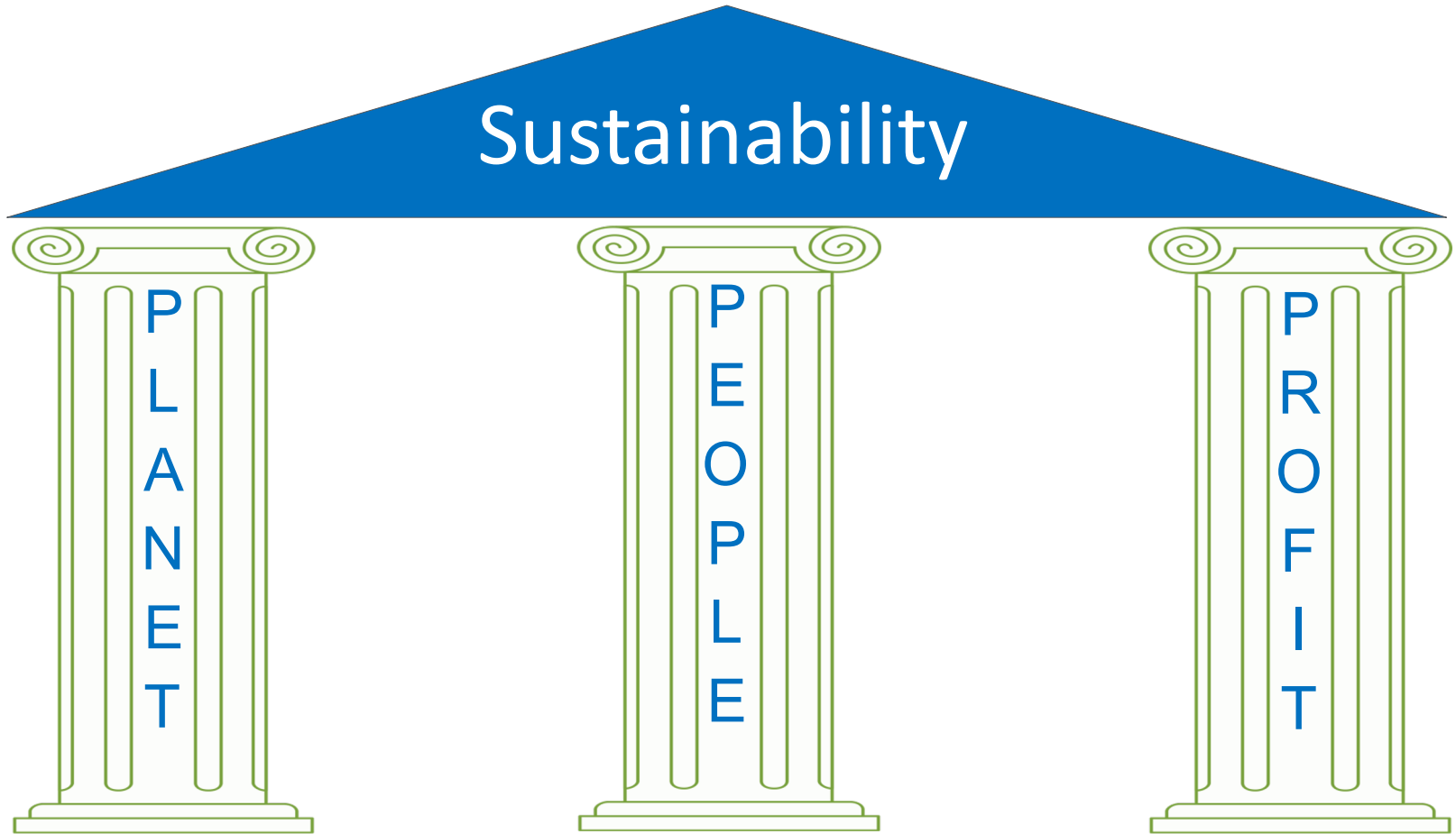
To limit emissions and use of natural resources in all phases of the product lifecycle.



### **Economic sustainability**

To offer competitive and financially healthy products and services, enabling investments for the future.

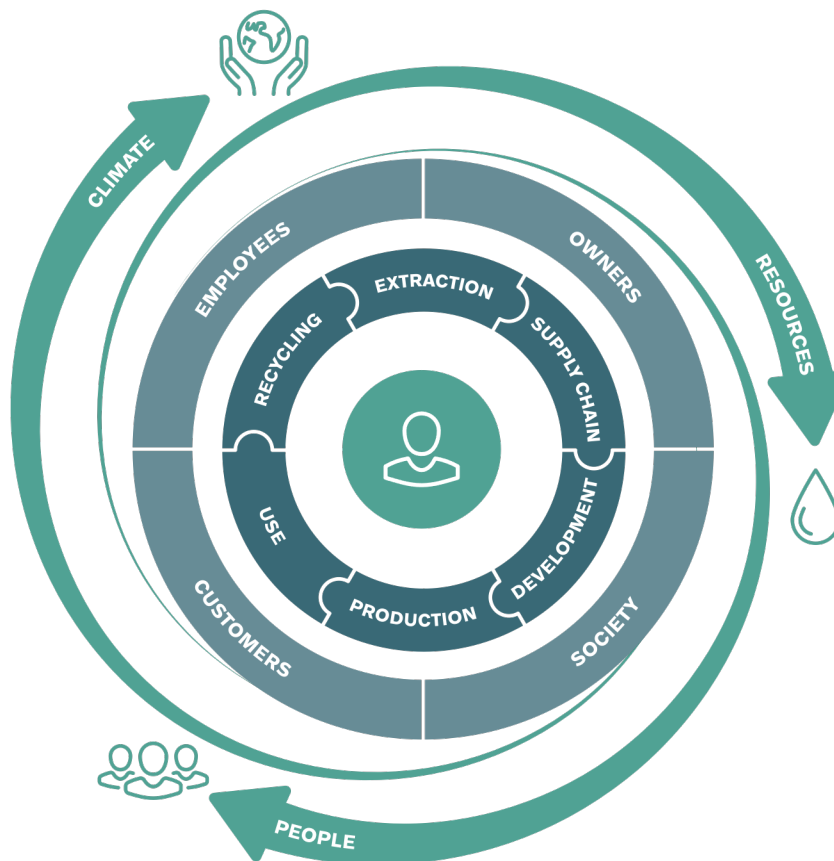






## Sustainability Approach at Volvo CE

- People-centric, with safety, health and wellbeing at our core.
- A holistic life cycle perspective in the entire value chain with circularity approach.
- Close collaboration with stakeholders and partners.
- Focusing our efforts within three key areas: Climate, Resources, and People.







### 3. Political Trends

- Political stalemate
- Political Instability/Civil unrest
- Global trade/nationalism
- Tariffs
- Regulatory environments
- Volatility in capital/stock markets



## 4. Technology

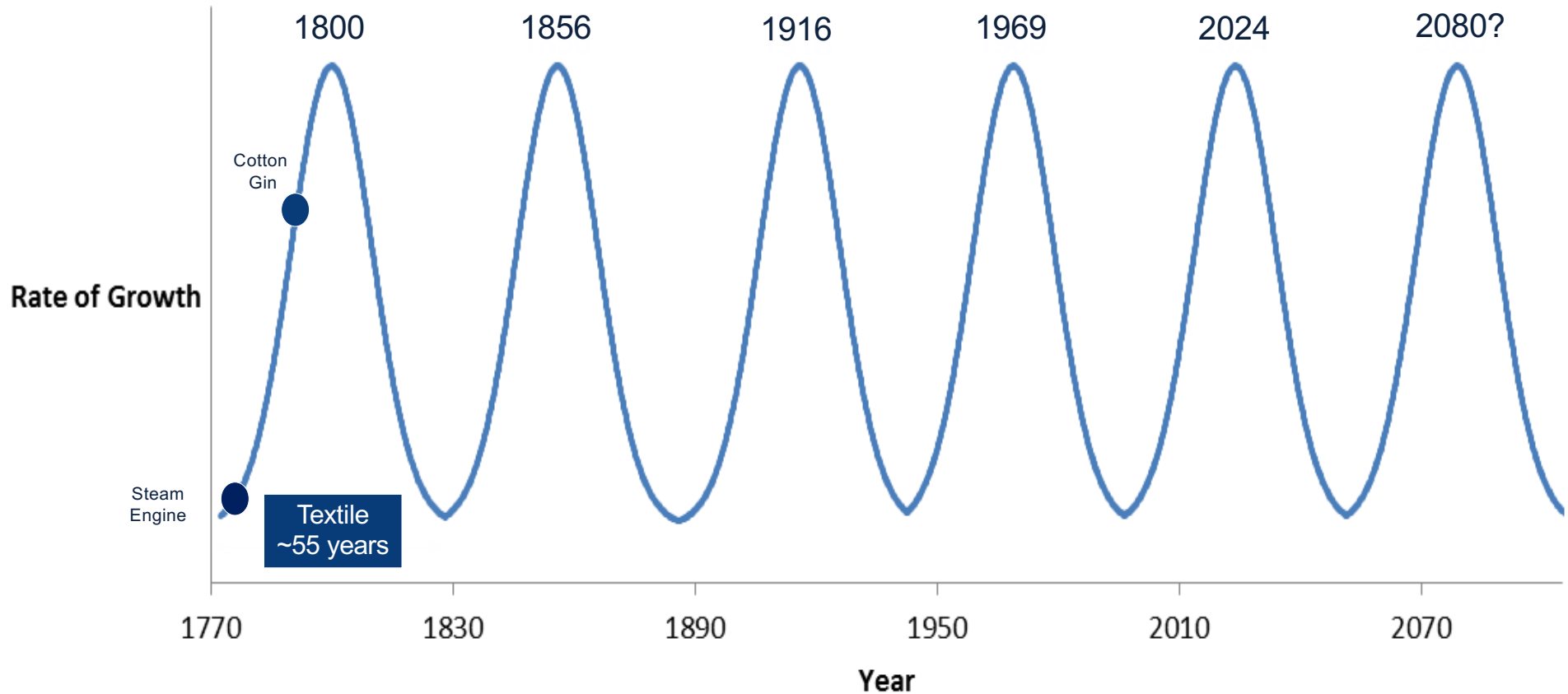
- Pace of technology change continues to accelerate
- Technology sciences converging
  - Partnerships/open networks are vital
- Technology advances in cyclical waves





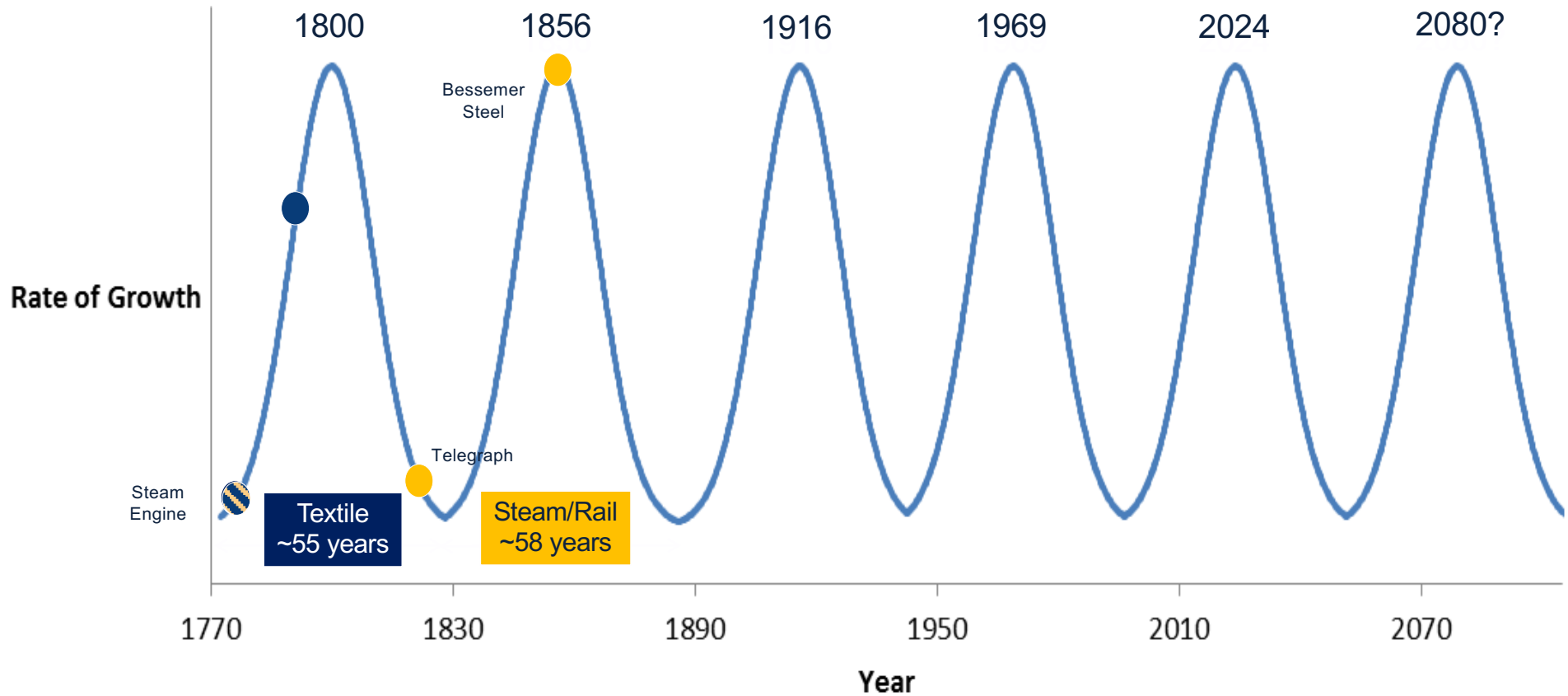
# Kondratiev (K) or Long Waves

Source: Coccia, M. (2017). The source and nature of general purpose technologies for supporting next K-waves. *Technological Forecasting and Social Change*, 116, 331–339. doi: 10.1016/j.techfore.2016.05.019



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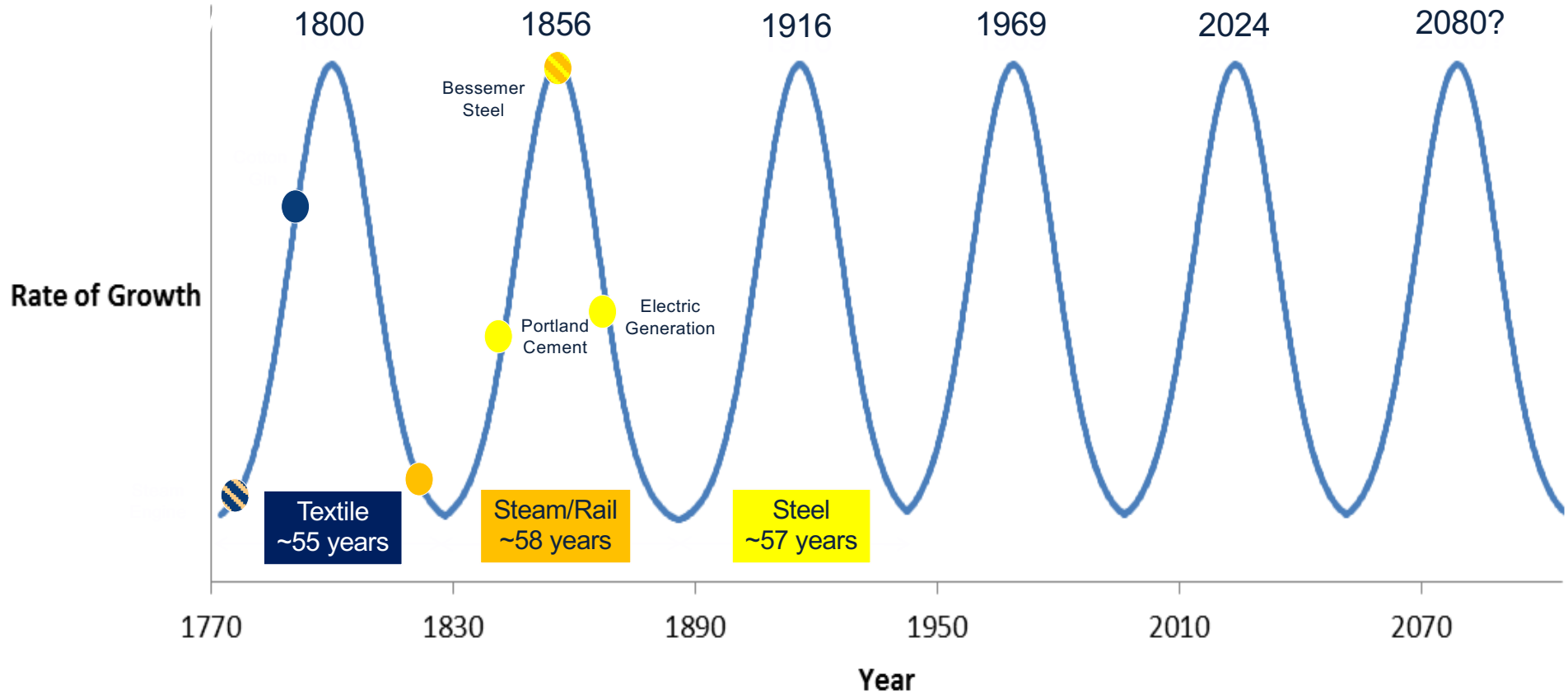
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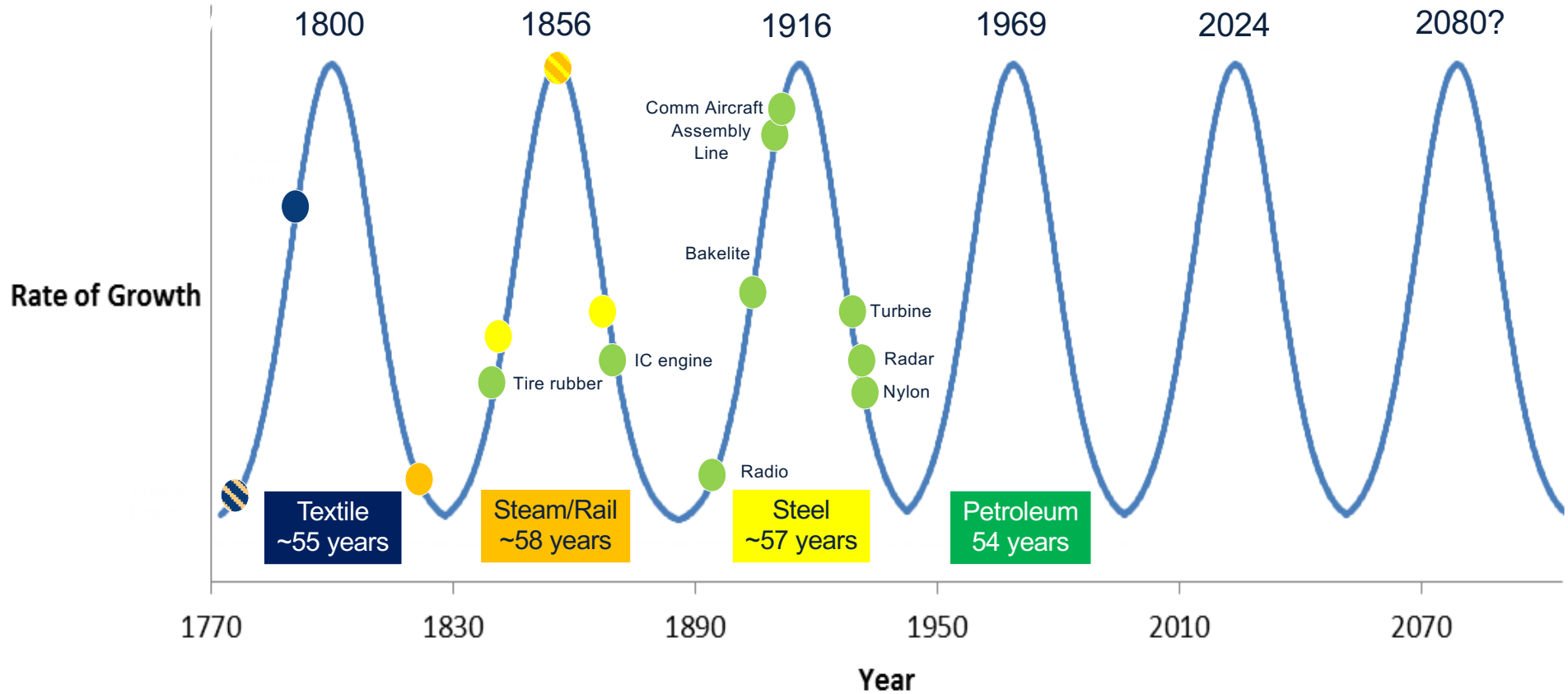
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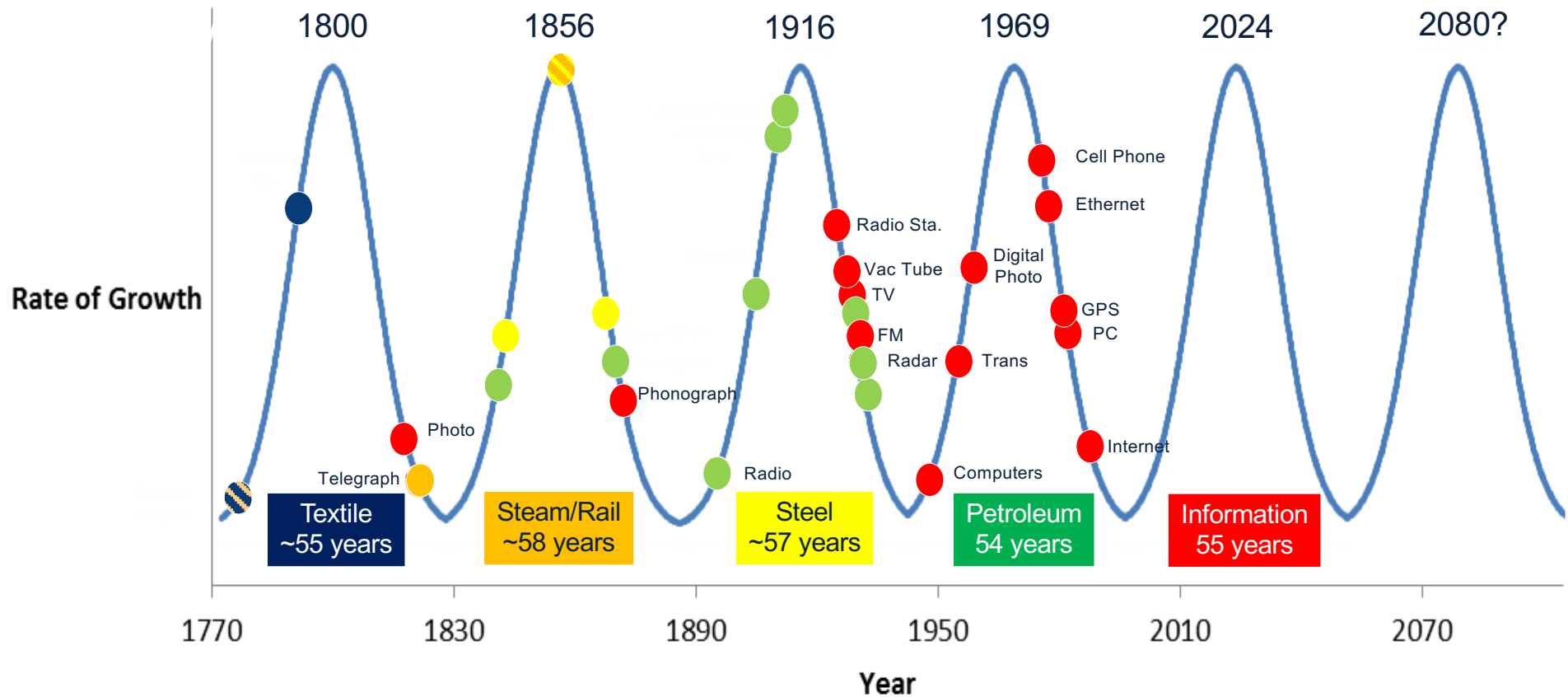
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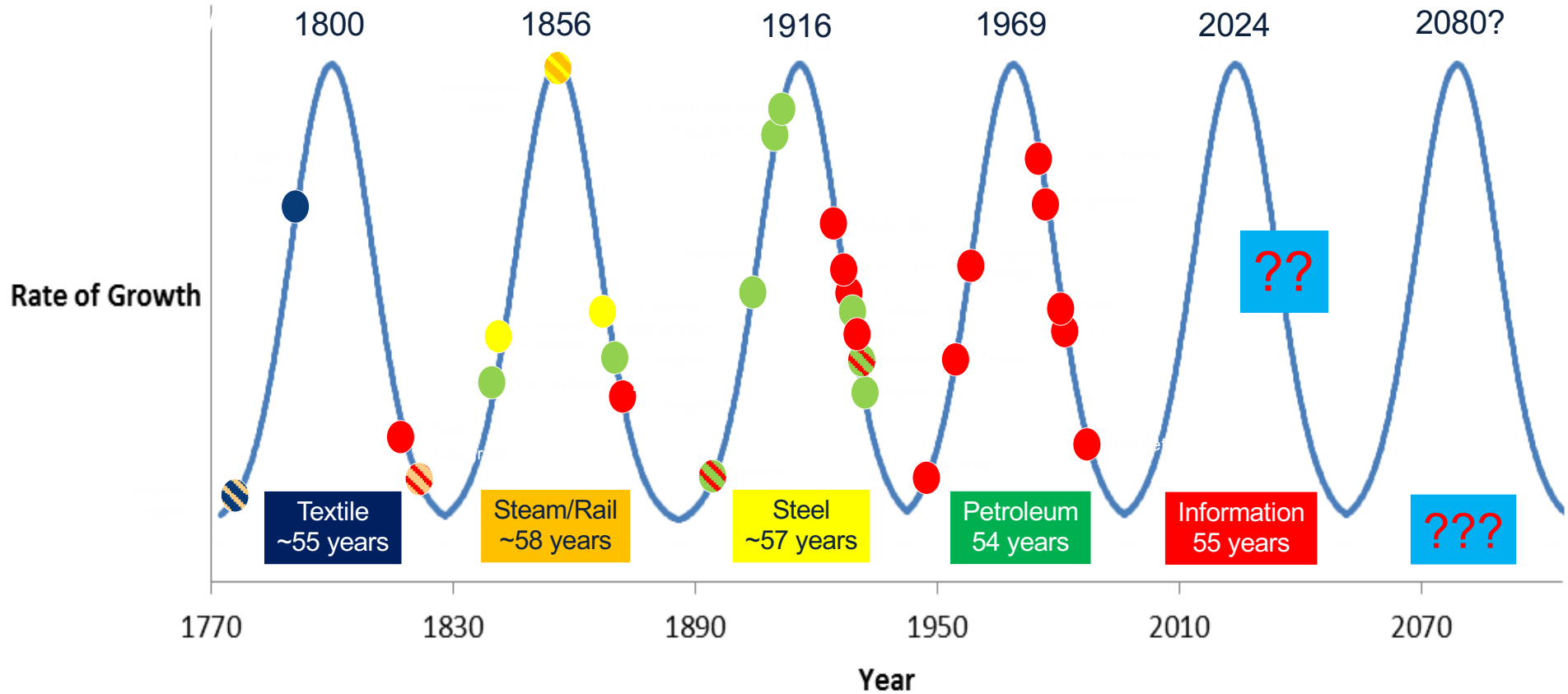
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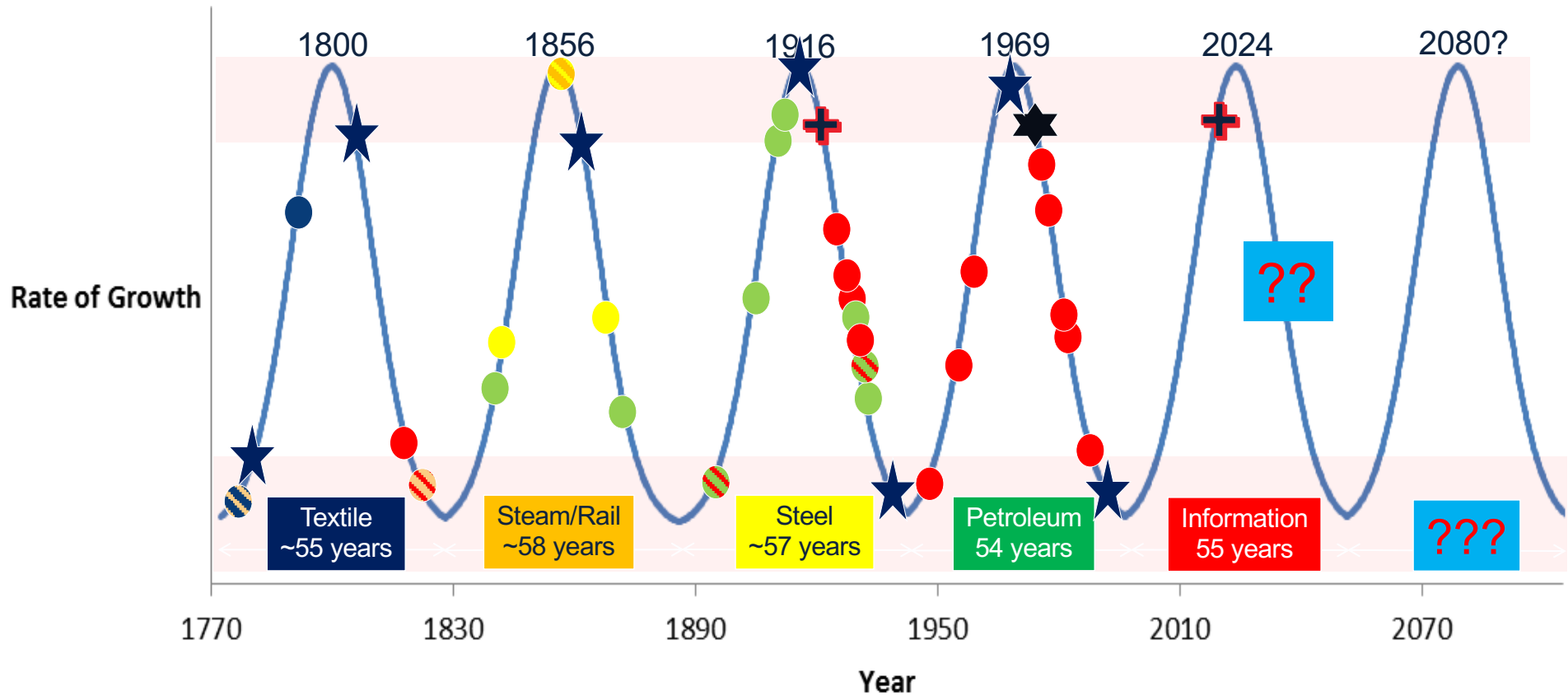
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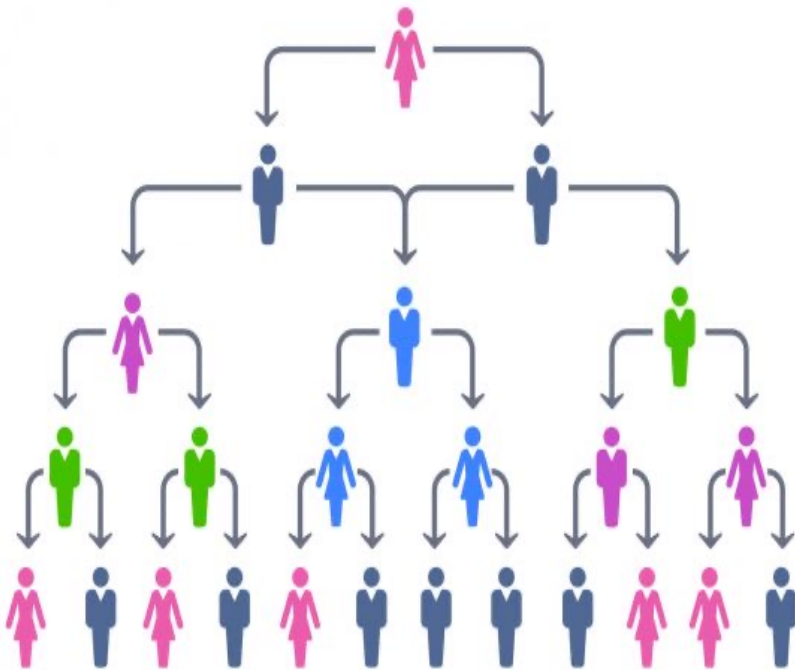
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## 5. Social Organization

### Hierarchical

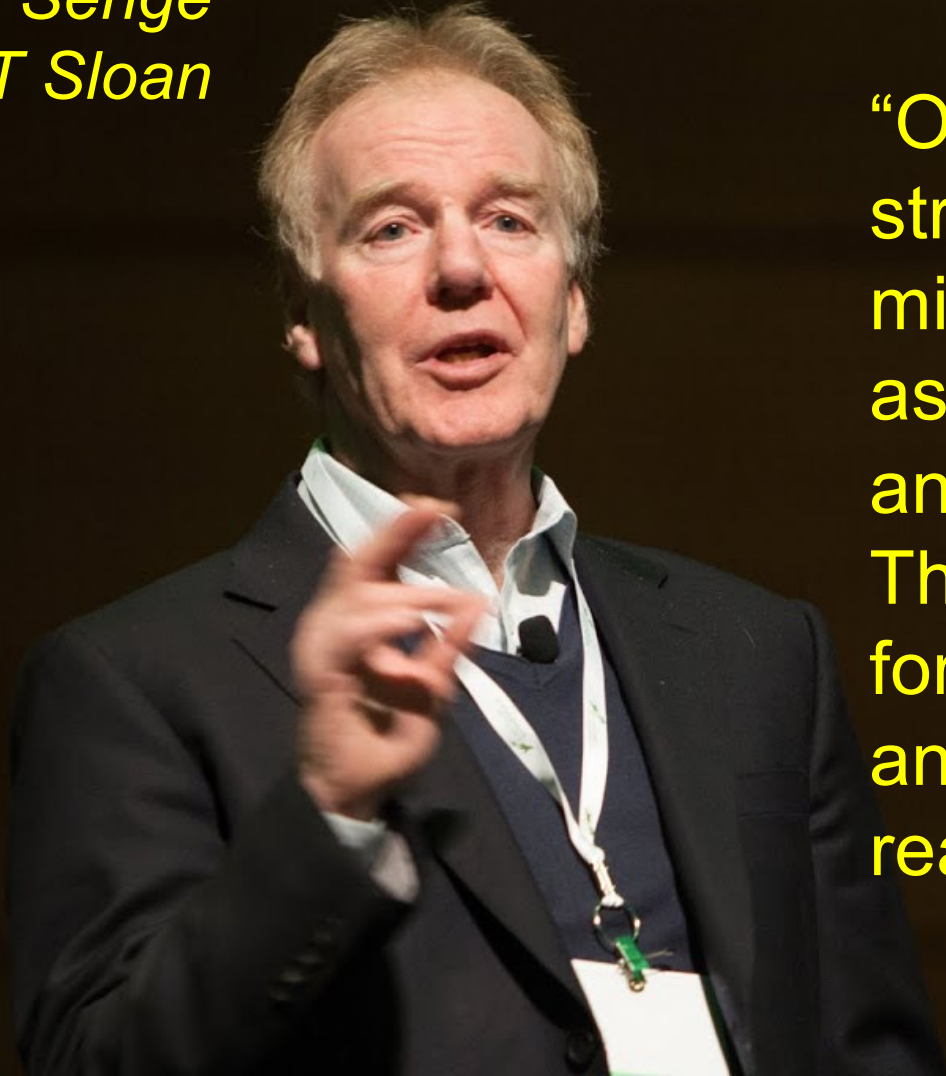


### Network





*Peter M. Senge*  
*MIT Sloan*



“Organizational structures are mirrored in our assessments, thinking and mental models. They form the basis for our understanding and the nature of our reality”.

# THE FUTURE...



**DIGITIZATION**

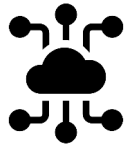
Volvo Construction Equipment





- Productivity Monitoring
- Location tracking/mapping
- Operator Assist

Volvo Construction Equipment









# THE FUTURE...



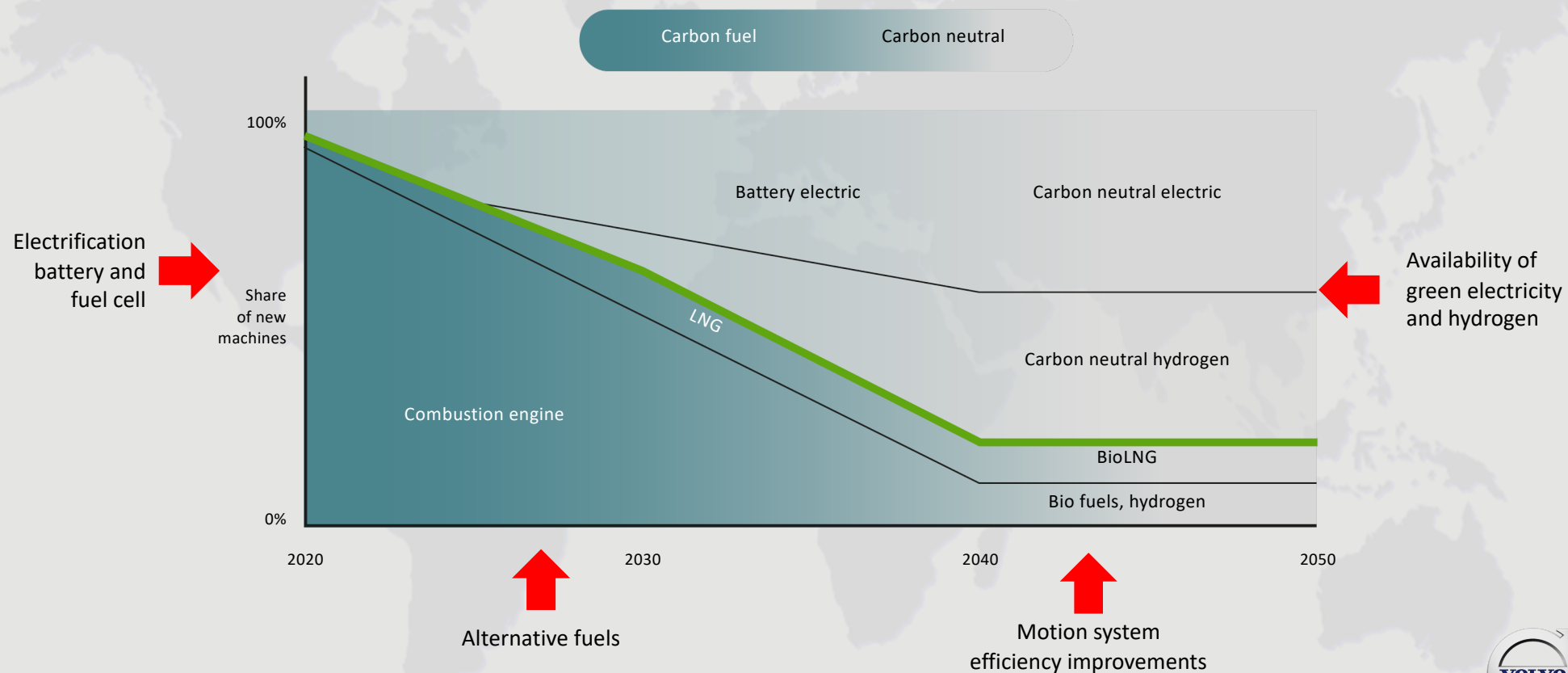
**DIGITIZATION**



**SUSTAINABLE POWER**



# Journey to Carbon Neutrality

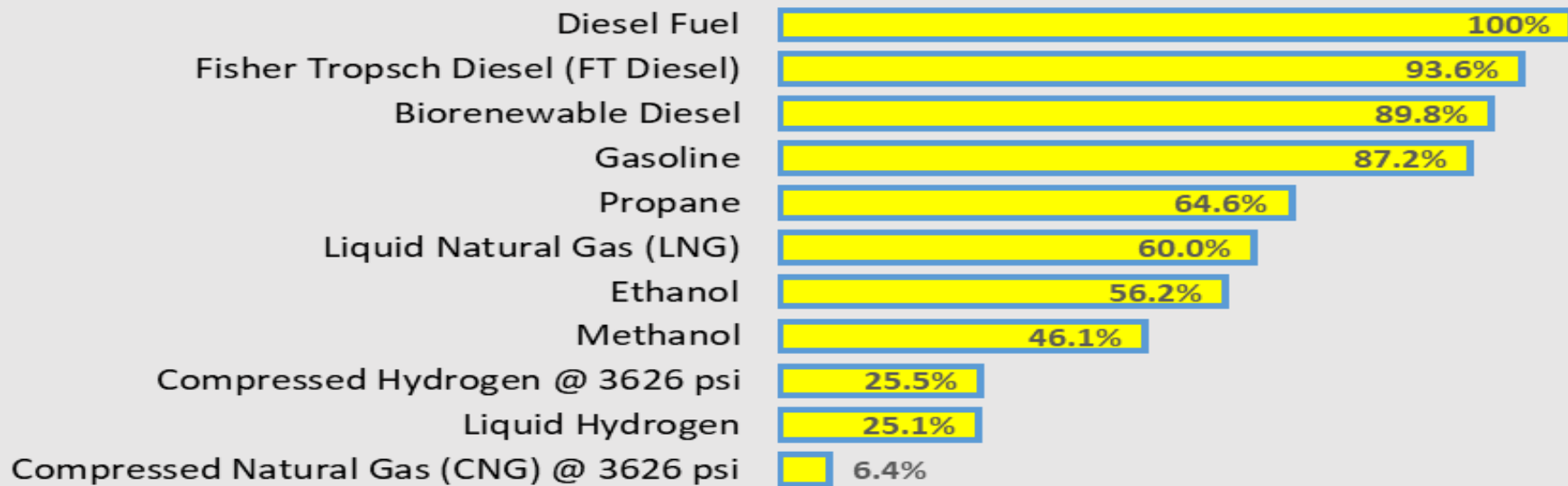




## Challenge of Alternate Fuels



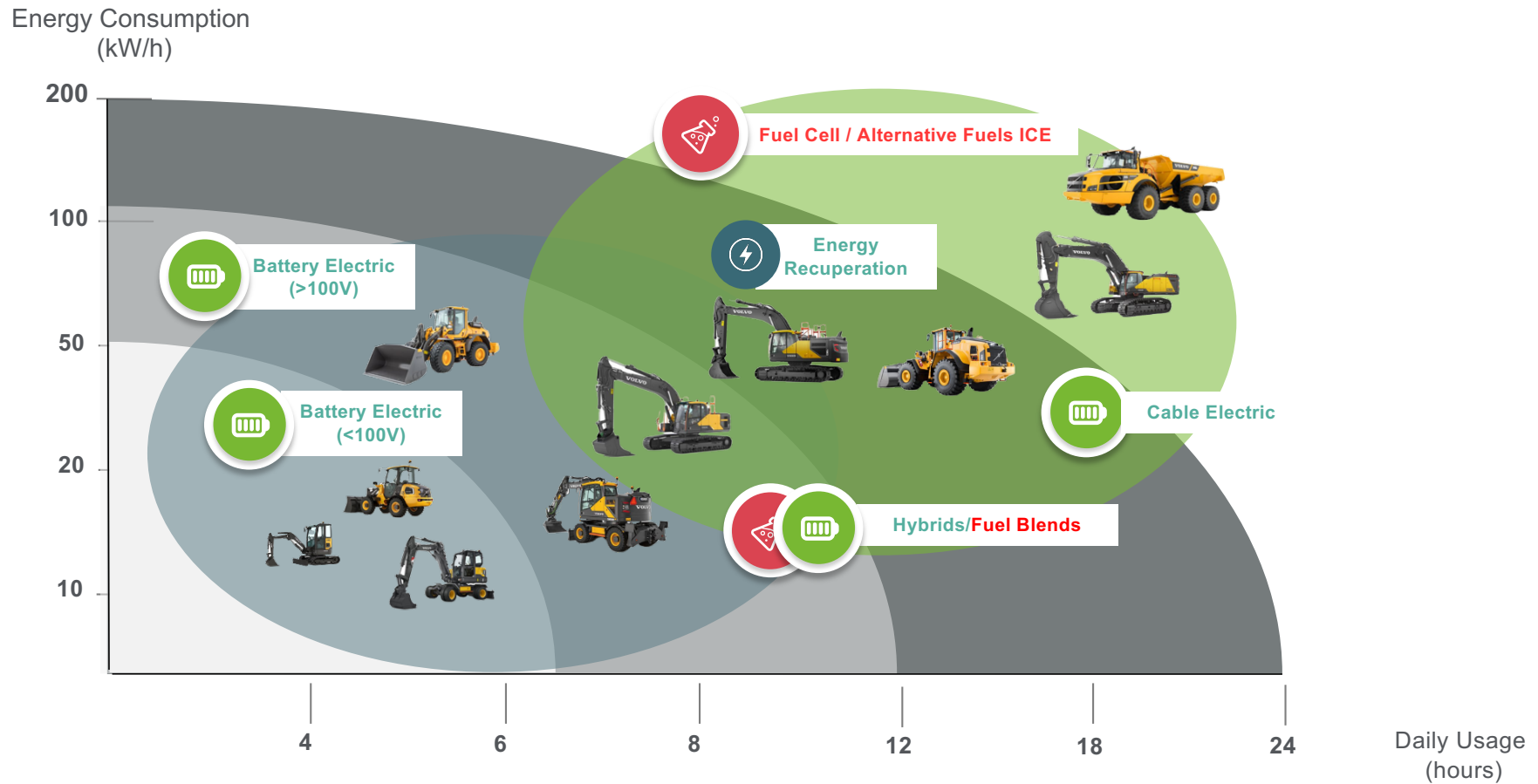
### Fuel Energy Density



Source: What Is Clean Diesel? | Diesel Technology Forum. (n.d.). Retrieved January 22, 2021, from <https://www.dieselforum.org> website: <https://www.dieselforum.org/about-clean-diesel/what-is-clean-diesel>



# Technology Positioning for Construction Equipment



# Electrification in all product areas



Volvo Buses



Trucks



Volvo CE



Volvo Penta



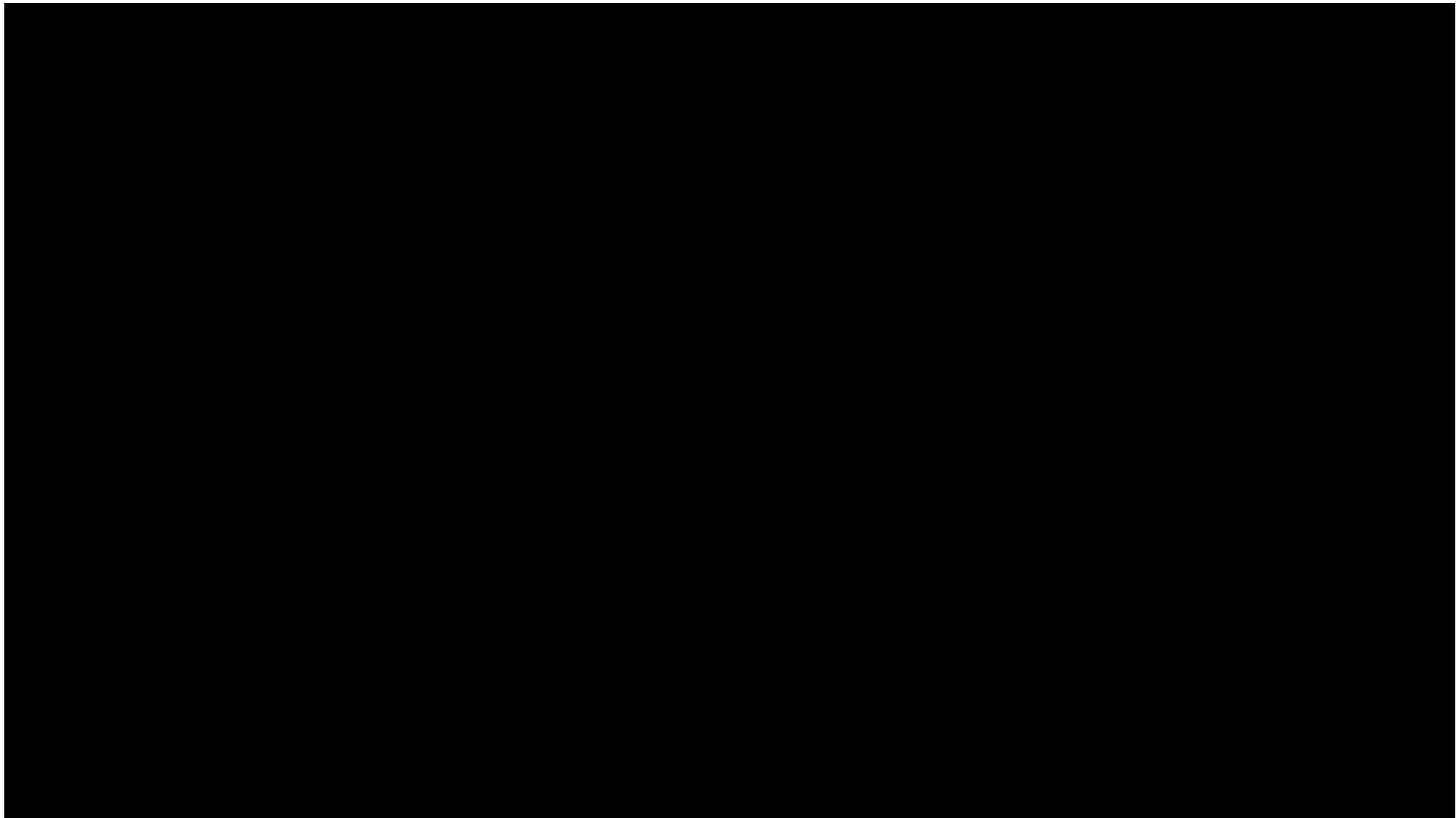
# Structural moves driving speed of transformation

- Partnership with **NVIDIA** to develop advanced AI platform for autonomous trucks
- Strategic alliance established with **Samsung SDI** for electromobility
- Intention to form a strategic alliance with **Isuzu Motors**
- Fuel cell JV with **Daimler Trucks (Cellcentric)**
- Green H<sub>2</sub> production facility in Eskilstuna (**Shell**)
- New business area created for autonomous transport solutions **Volvo Autonomous Solutions**
- New business area **Volvo Energy**

Volvo Construction Equipment







# Electromobility – Battery Electric (Low-Voltage)



48VDC/40kWh for the L25



48VDC 20kWh for the ECR25





- Customer Pilot Trials
- 23 ton crawler excavator
  - 600V/360kWh Li-Ion battery pack
  - ~ 4.5 hour duty cycle, one hour fast charge
  - Same performance as conventional diesel

## EC230 electric



# THE FUTURE...



**DIGITIZATION**



**SUSTAINABLE POWER**

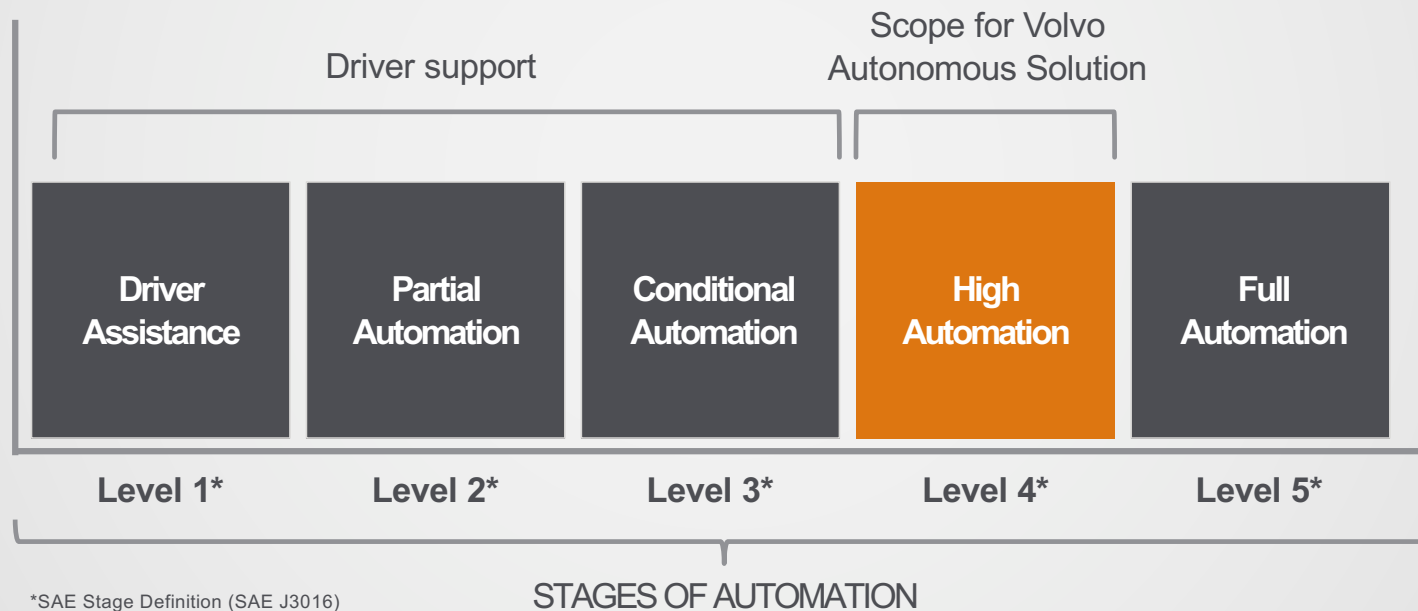



**AUTOMATION / A.I**





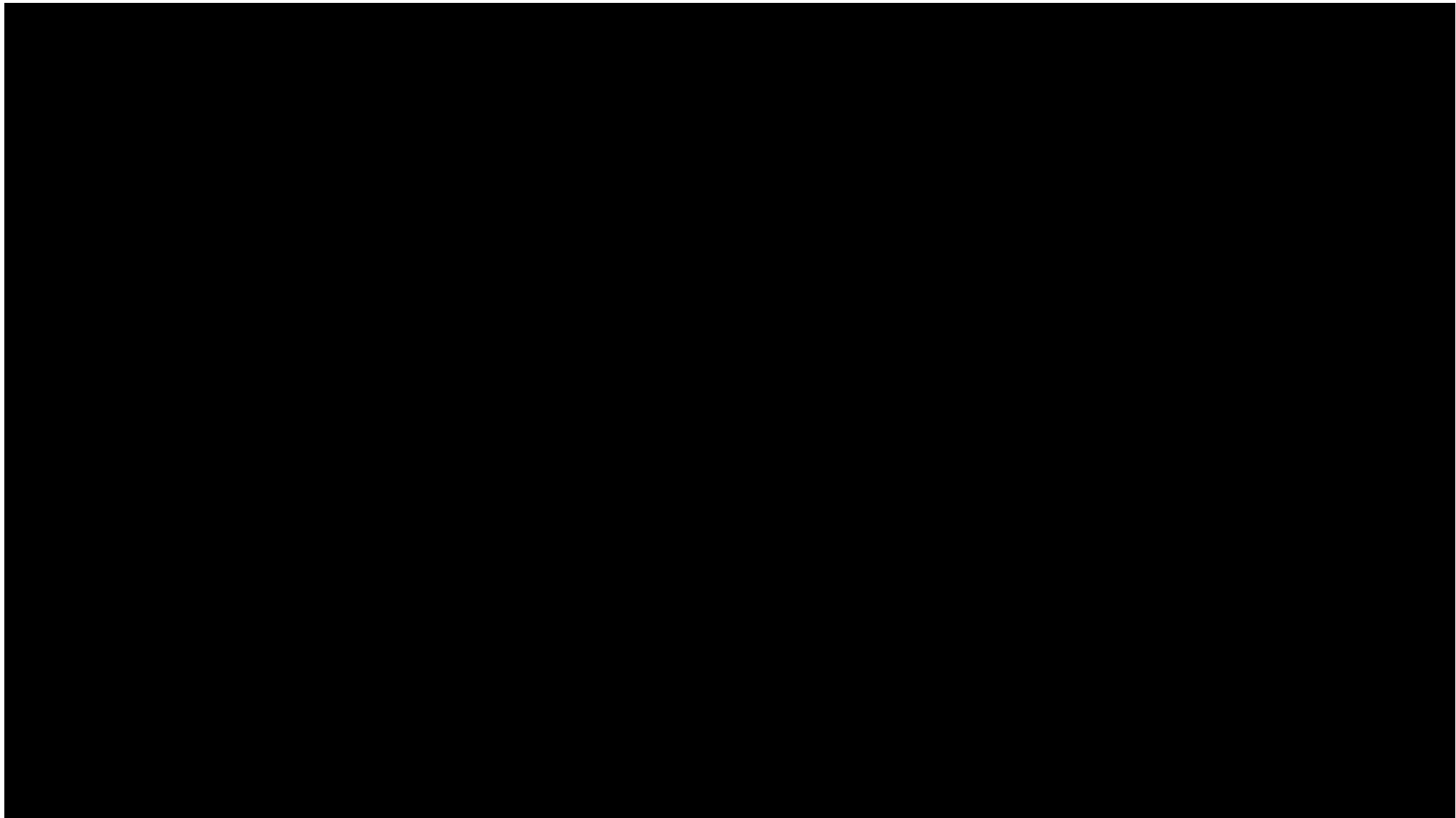
# Level 4 automation is focus for Volvo Autonomous Solutions



**CO<sub>2</sub>**  
**95%** 

**TCO**  
**25%** 





**CO<sub>2</sub>**  
**95%**



**-98% CO<sub>2</sub>**

**TCO**  
**25%**



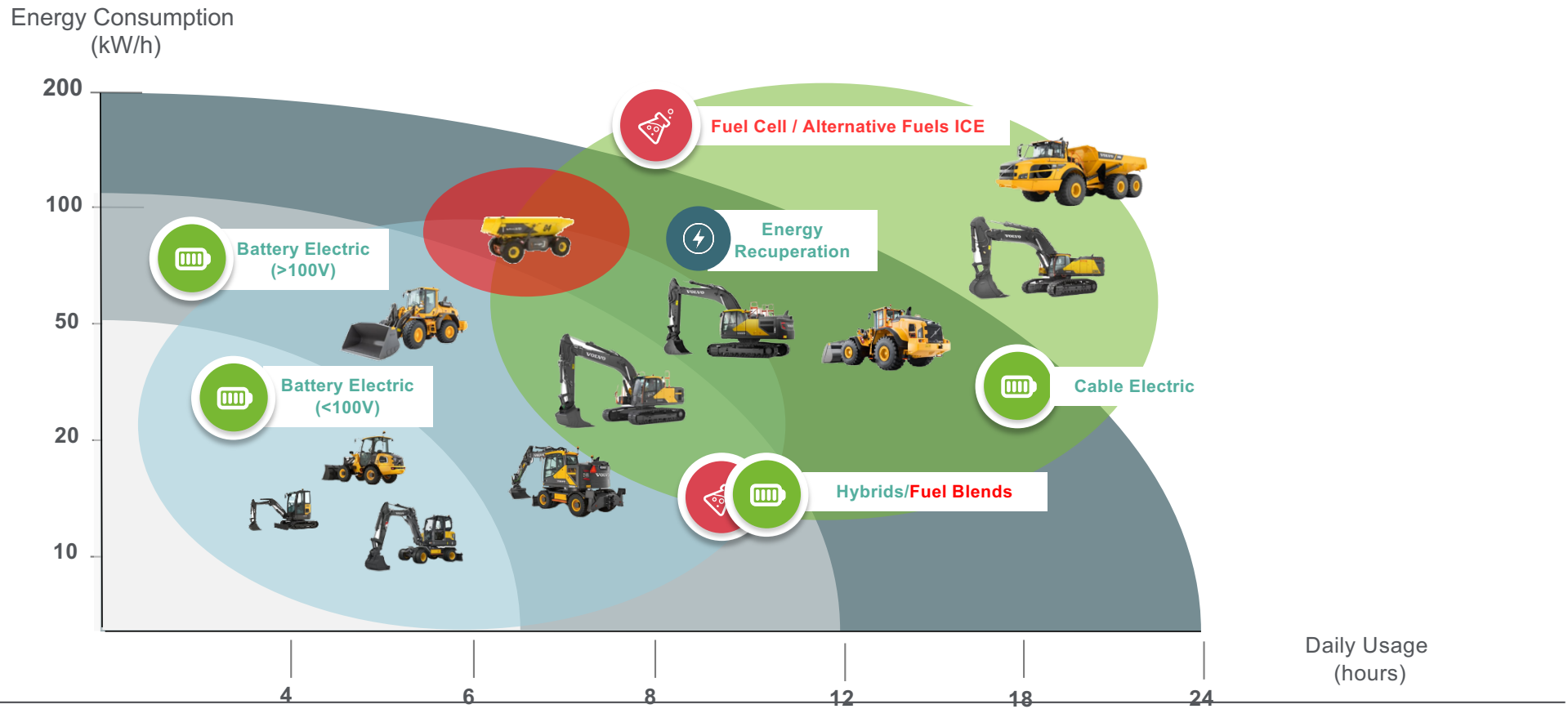
**-70% Energy cost**  
**-40% Operator cost**

**Increased safety**





# Technology Positioning for Construction Equipment



# Summary

- Megatrends/drivers are real and continue to accelerate
- We are in a “networked” world
  - Social organization changing
  - Solutions to tomorrow’s issues will be multi-disciplined and involve many companies/groups
  - Knowledge/learning diffusion is very rapid
  - New level of awareness of the social/business/technological interactions
- Entire value chain must be in focus
- New technologies supplement/enhance existing technologies and enable progress forward
- No single solution or technology is the final answer



**V O L V O**

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