

Beyond Oil

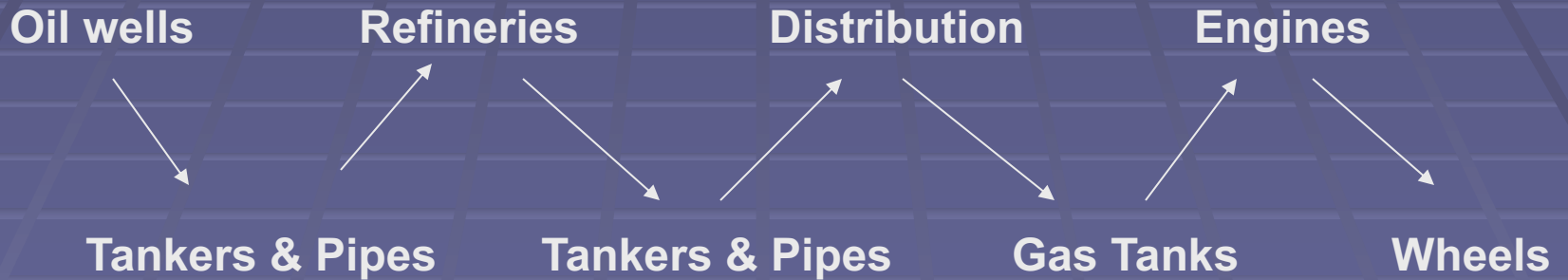
Transforming Transportation

The Challenges of On-board Energy Storage

4th September 2008

Julian Taylor
Pacific Green Energy Analysts

The Entrenched System

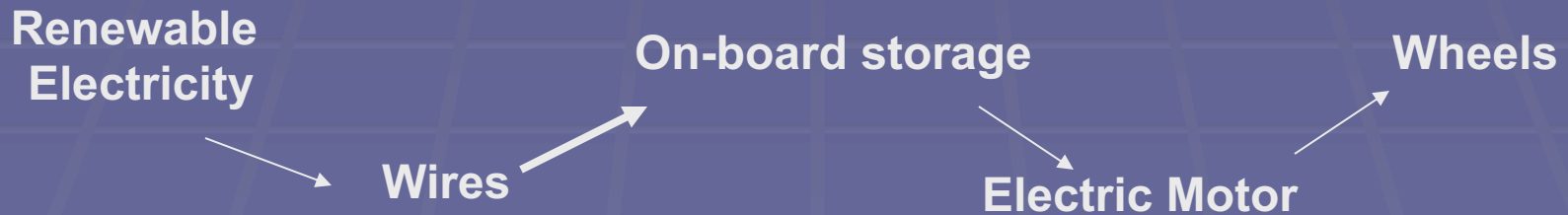


Fossil fuelled internal combustion

The Entrenched System



The EV System



The Entrenched System



The EV System




Batteries

... take your pick!

Each with different characteristics:

- SLA
- Alkaline
- NiMH
- NiCad
- Li-Ion
- Li-Polymer



- Total storage capacity
- Energy density
- Rate of power delivery over time
- Recyclability
- Service life
- Maintenance requirements
- Cost
- Demand tracking ability
- Charging requirements
- Temperature tolerance
- etc.

Must be smart, safe & resistant to customer abuse

Ultracapacitors

- Lower energy densities than batteries, but
- Much higher power density ... i.e. ability to deliver power rapidly
- Fast charge capability
- Great for soaking up braking power (regeneration)

Considerable development potential

... could replace batteries

... possibility of battery/ultracap hybrids

Chargers

- **Must sense battery type and conditions**
- **Vary rate of charge according to specific battery requirements**
- **Avoid conditions that lead to premature battery failure**
- **Monitor energy delivered**
- **Ensure right person gets billed for the power consumed**

Stepping Forward

- **Technology is necessary but alone not sufficient to enable the change. Political will and financial risk takers are every bit as important to make this happen.**
- **Build consortia of technology providers, host organizations, governments, funding bodies**
- **Combine our strengths to identify and collaborate on high profile projects that test and demonstrate new systems in action.**

Thank You!

Julian Taylor

Pacific Green Energy Analysts

604 916 9087

jtaylor@intustrat.com