



# LiquidPiston Overview

## July, 2018



# Traction

Awards:



Programs:

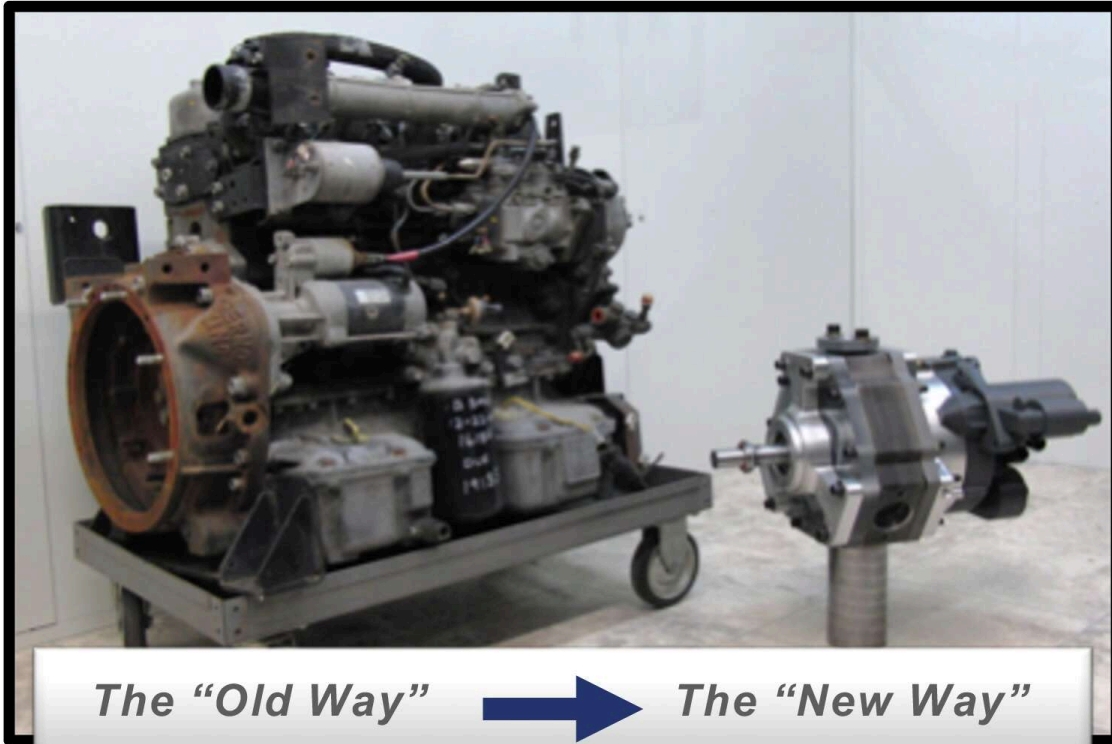


Featured in:

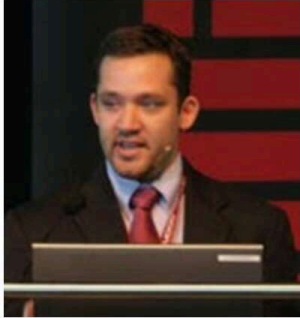


# Company overview

**“Dolby Labs” business model: LPI develops and licenses compact & efficient power solutions, based on a new thermodynamic cycle & rotary engine technology**

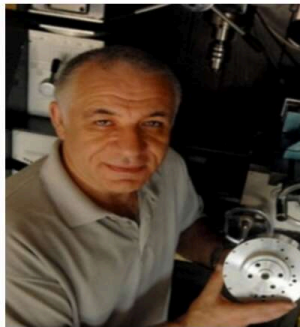






## **Dr. Alexander Shkolnik – Co-Founder & CEO**

- PhD in Computer Science from MIT
- Technical focus on leading teams in modeling dynamic systems, optimization and controls



## **Dr. Nikolay Shkolnik – Co-Founder & CTO**

- PhD in Physics from UConn
- Former Clean Energy Program Director, GEN3
- Motorola award for Creativity
- > 25 patents: engines, fuel cells, super caps, etc.
- TRIZ expert



## **Per Suneby, VP of Corporate Development**

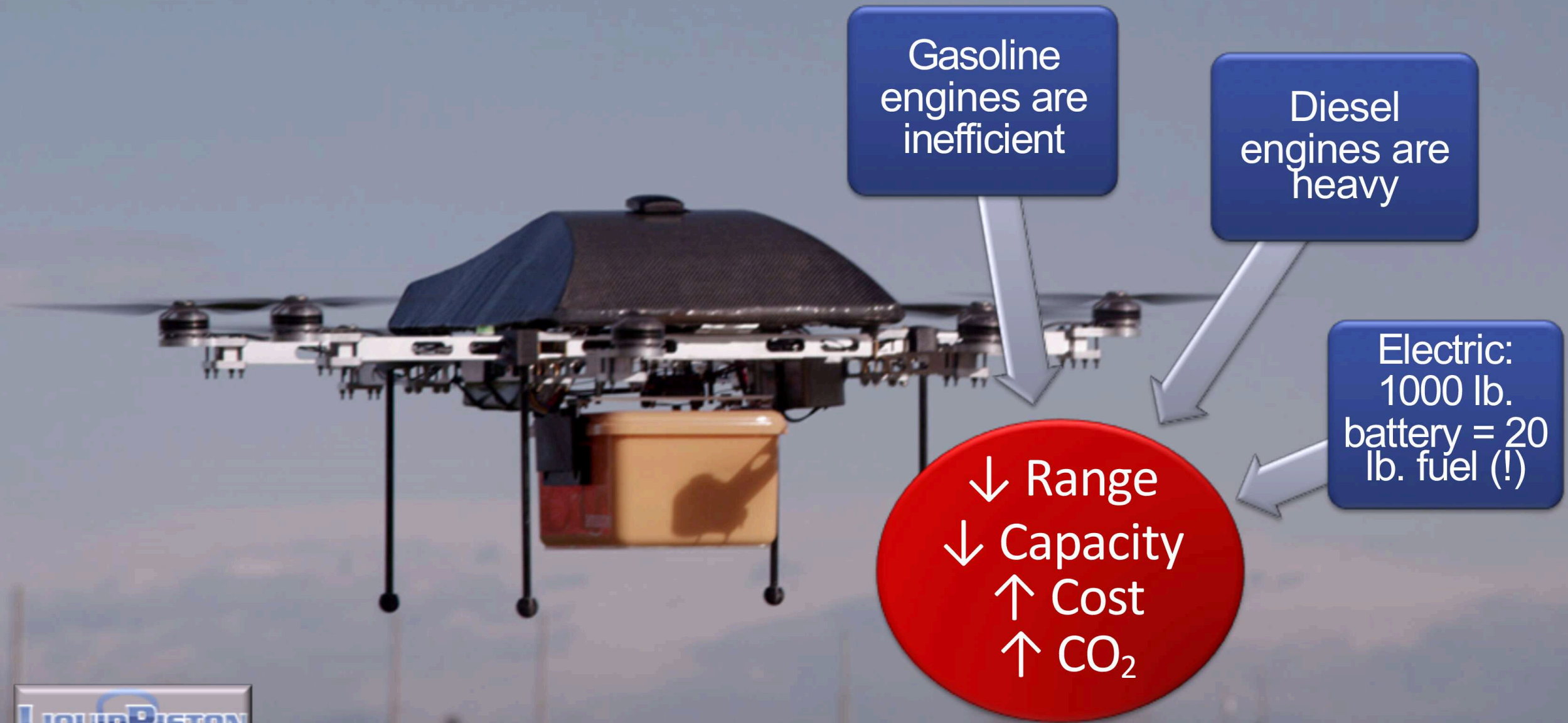
- MBA, Harvard; BASc Electrical Engineering, U. British Columbia
- Seasoned tech & clean tech startup executive
- NE Clean Energy Fellow

## **Independent Board Director**

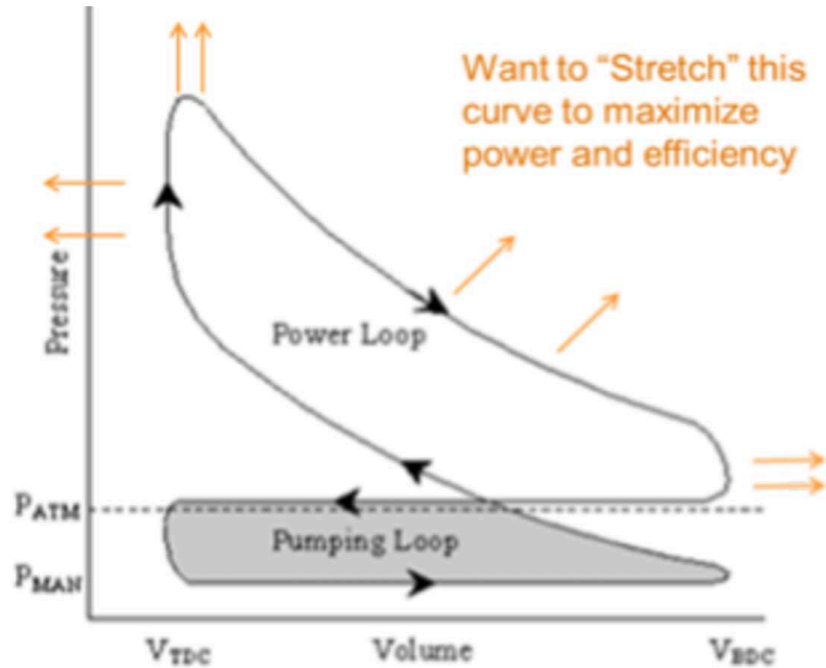
**Dr. Tony Tether**, Retired Director of DARPA; Oversaw \$25B while at DARPA.

**Team of 16 engineers;  
Network of advisors and  
consultants**

# POWER & ENERGY are limiting today's vehicles {ground / sea / air}

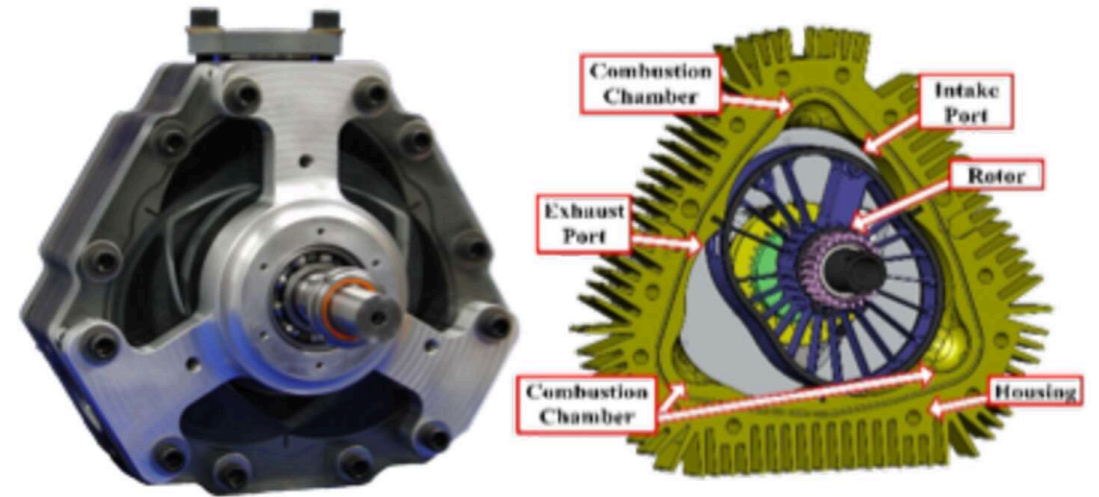


# Power Reimagined: Physics tells us – we can do better!



**Advanced Thermodynamic Cycle**

+



**New Rotary Engine Architecture**

2x more efficient

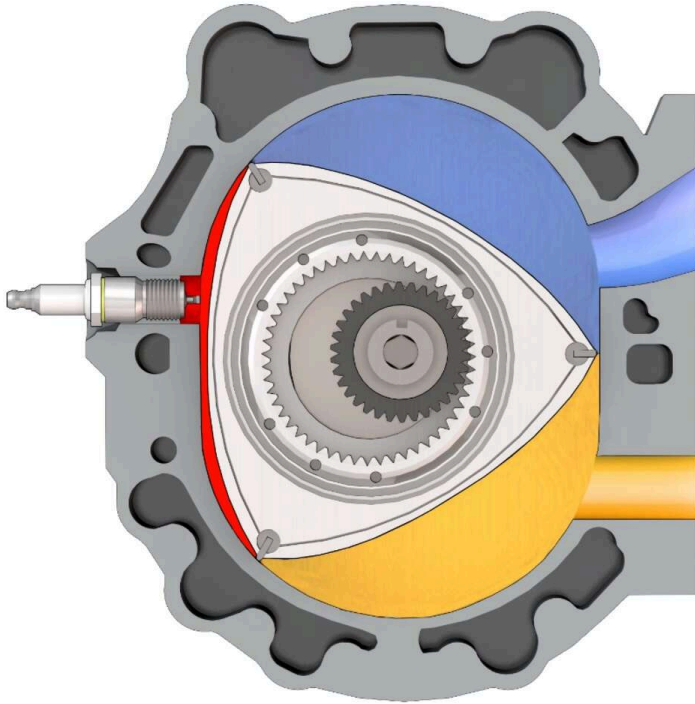
2x quieter

10x smaller &  
lighter

1000x less  
vibration

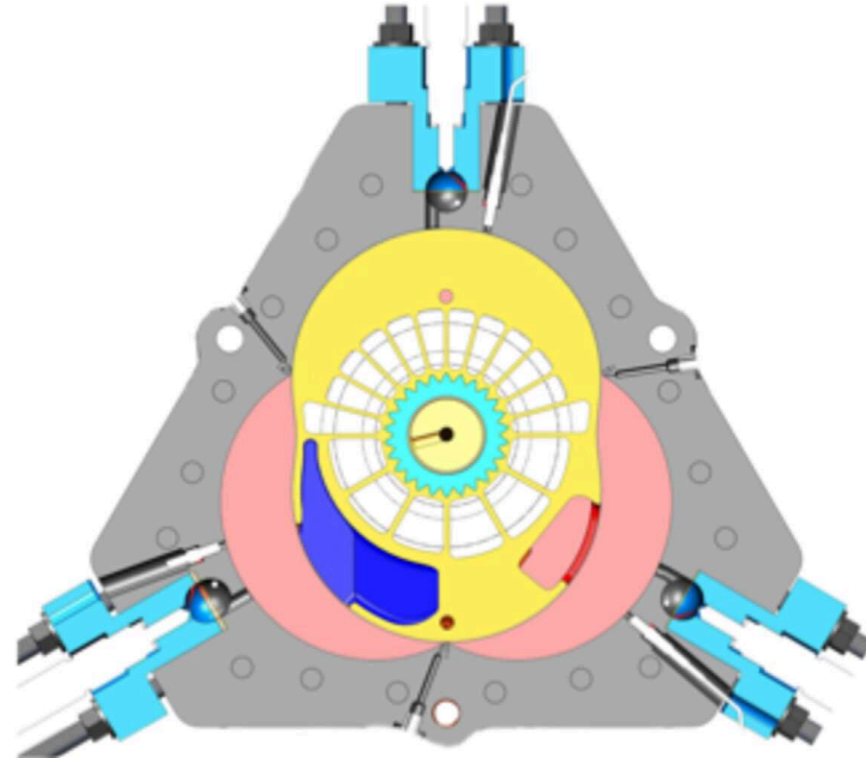


# Technology: it's not a Wankel!



## Wankel Engine

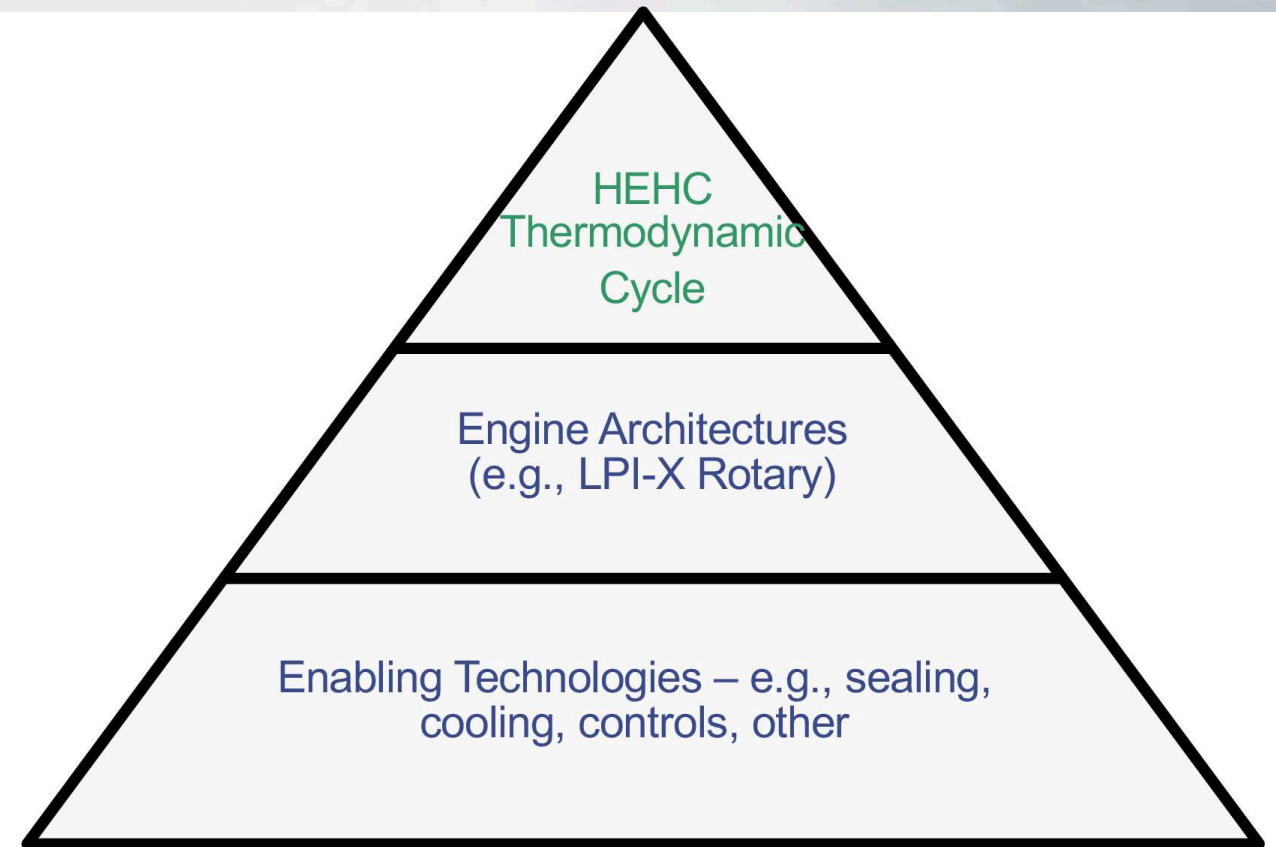
- Poor combustion (long flat chamber)
  - Poor sealing (apex seal corners)
  - Poor lubrication (seals hard to lube)
- Bad efficiency, durability, lubrication, emissions...



## LPI Engine

- High compression ratio
  - Constant-volume combustion
  - Over-expansion
  - Direct lubrication of seals
- efficient, durable, good emissions

# Extensive IP portfolio

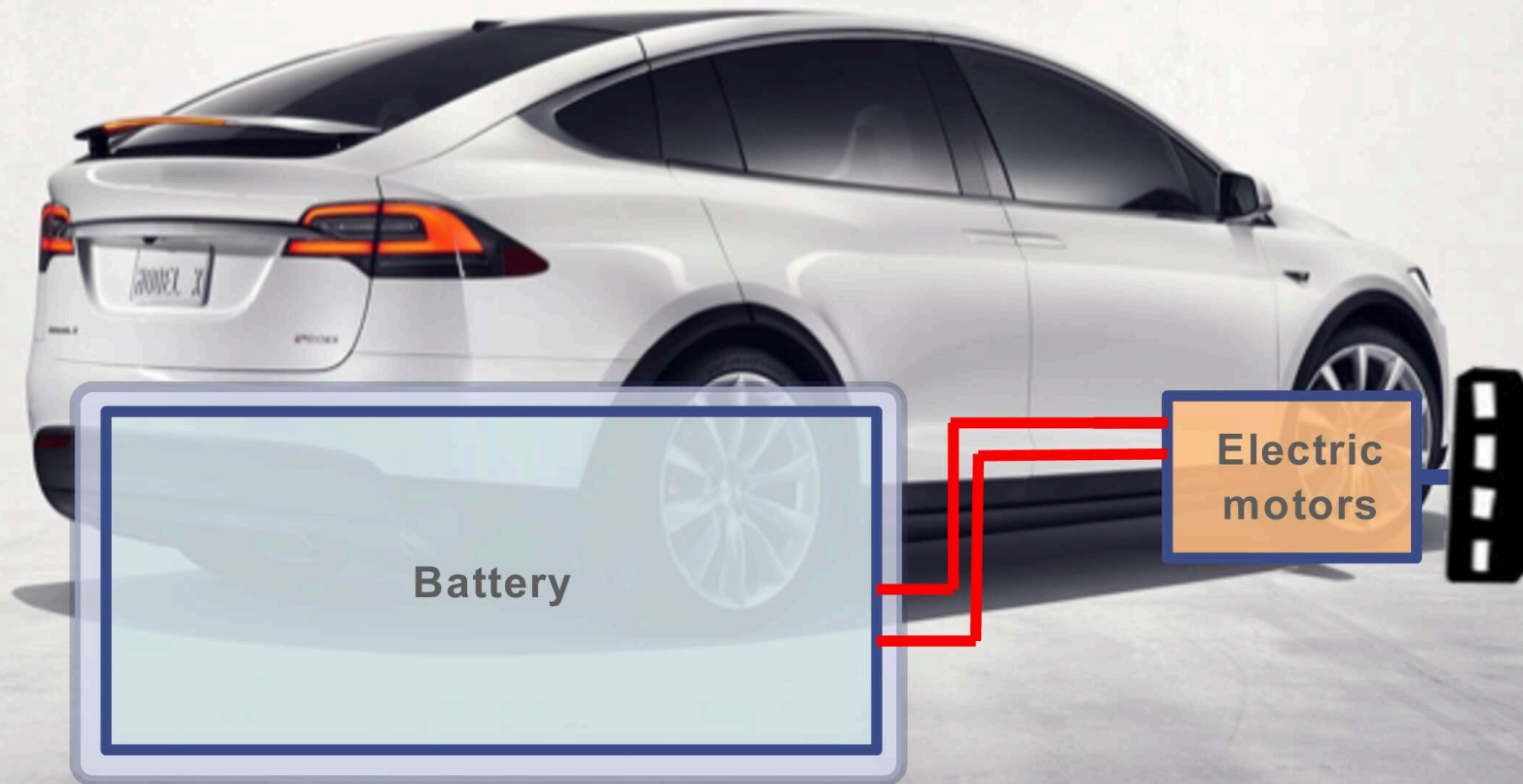


- Comprehensive patent coverage
- 45 patents issued / pending (worldwide/PCT)
- Defensible & extensible
- IP strategy supports licensing model



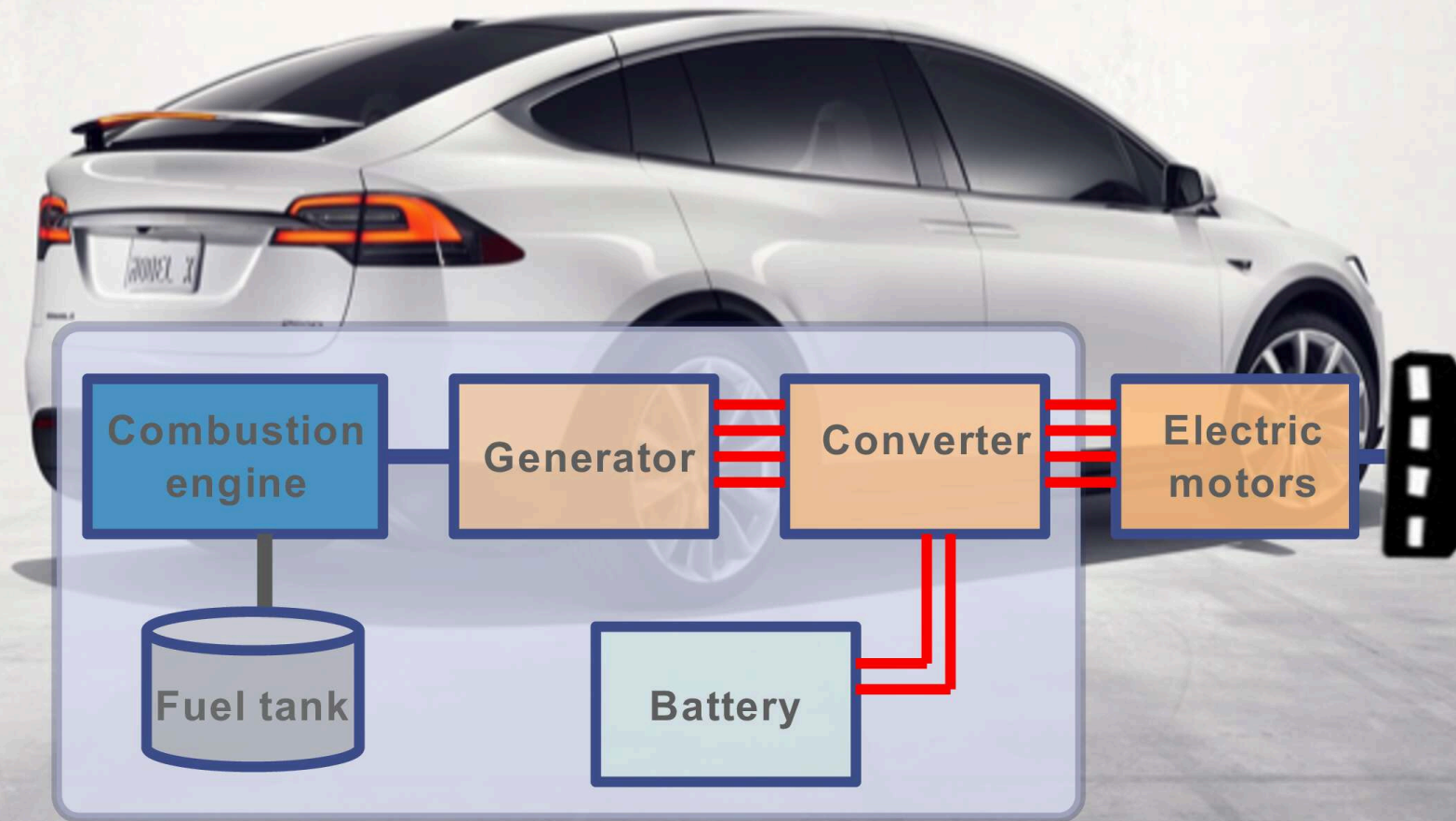
# Key enabling technology for vehicle electrification

**Today's EV: big, heavy, expensive battery**



# Key enabling technology for vehicle electrification

**HEHC ReV: Increased range, small, cheap battery  
Recharge in 2 minutes**





# Traction with beachhead customer: U.S. DoD



**\$9M in government contracts**

**Army:** 2kw hybrid electric power supply for M777 Howitzer.

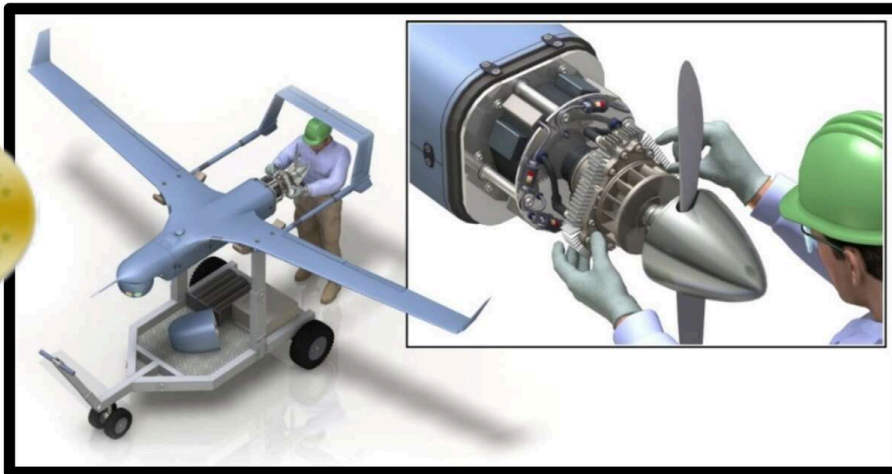
Sub-



Contractors:

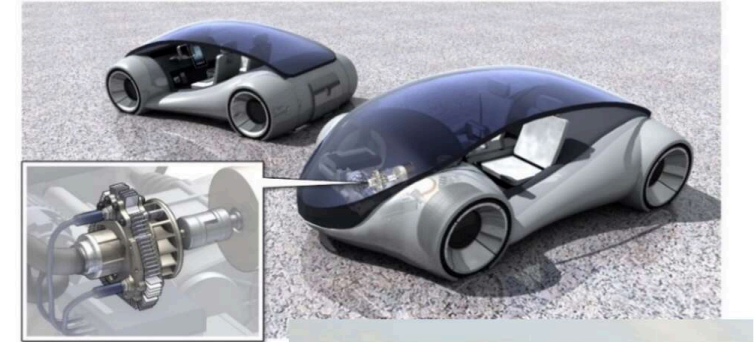
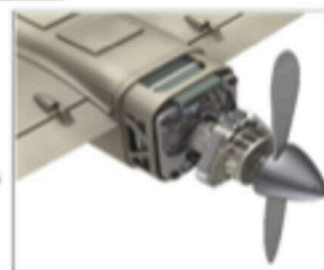
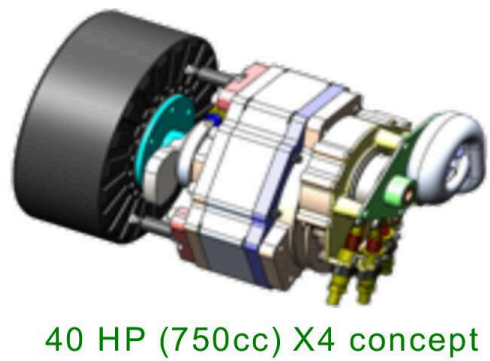
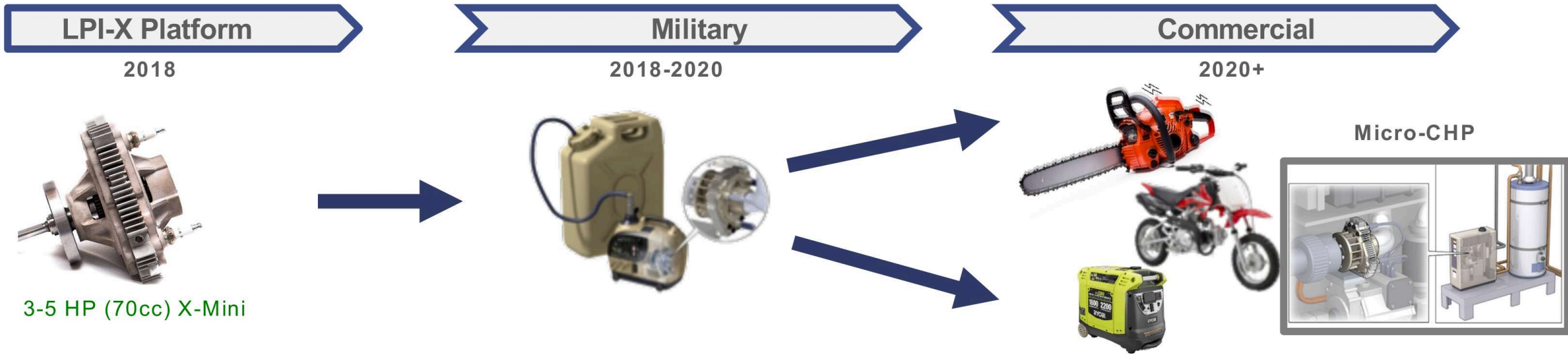


**DARPA:** 40 HP high efficiency compact heavy fuel X-engine development contract. For UAVs and/or generators.





# LPI-X Engines: Two initial application pathways



# “Dolby Labs” Business Model: Engineering and Licensing



## Engineering Services

- Engine design & testing for OEMs and mfg partners
- Productization & industrialization engineering support
- Post-sales technical support



## Government Contracts

- DoD, DoE engine and energy conversion technology development
- System demonstration projects (propulsion, power gen., etc.)



## License/Royalties: Upfront & Recurring

- Technology, engine design, and manufacturing licenses
- LPI is global IP and learning “clearinghouse”



## Engine Product Sales

- Low volume pilot production or niche market supply
- Contract manufacturers managed by LPI

## \$1M Wefunder raise – use of funds

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- Technology and platform development – endurance and other testing; initial next generation platform R&D
- Non-DoD funded expenditures for business development and commercial readiness – primary focus on signing 1-2 strategic partners (OEMs, engine manufacturers)
- Help extend company cash runway for \$10M Series A raise in the next 6 – 9 months



# Summary

## Game Changing

- New thermodynamic cycle, rotary engine
- Up to 2x more efficient, up to 10x smaller
- 45 patents issued / pending

## Customer Traction

- Beachhead customer: U.S. DoD {Army, DARPA}
  - \$9M in R&D contracts, 2016-2019
- Subcontractors: General Atomics, HDT
- Army to field test 2kW generator Q1 2019
- Multiple partnering engagements underway

## Ramp Up

- Leveraging 10 years of prior R&D
- Raising \$10M Series A – next 6 – 9 months
- Business model: licensing, engineering services
- Multiple exits possible in 3-5 years



**Power Reimagined**