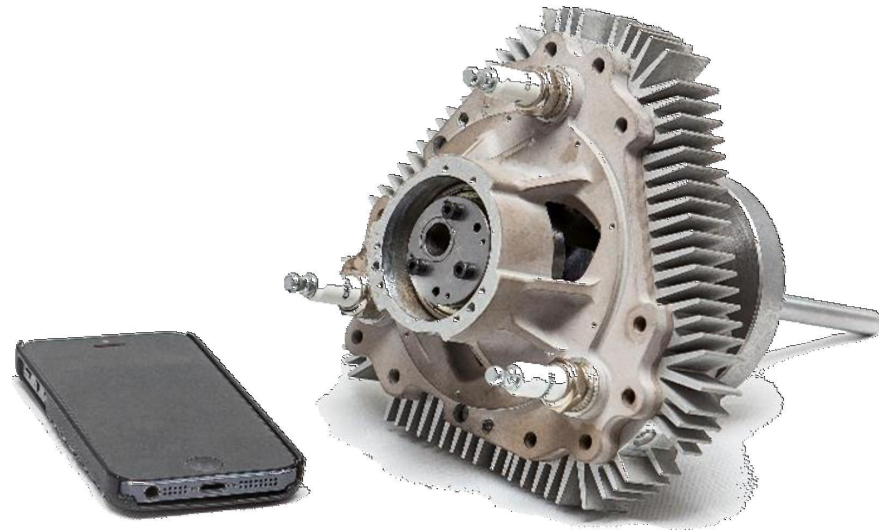




Re-Imagining the Internal Combustion Engine

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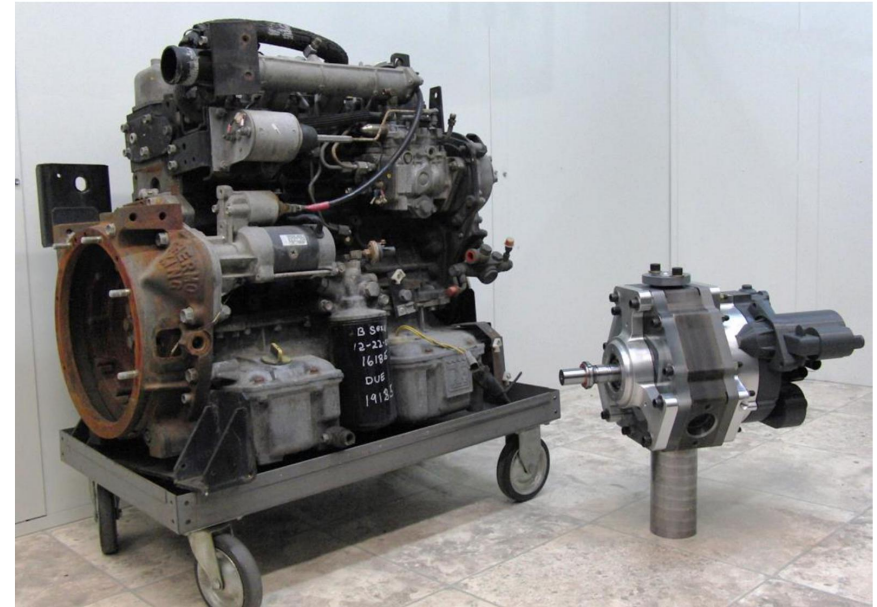
Why a new engine? They've been around for 150 years



Today's engines only ~ 20% efficient



LPI-X engine could achieve 40-50%



Diesels are heavy!



LPI-X engine is up to 10x smaller / lighter

A new engine? Who would care?



LPI Technology & X - Engine



Major Customer Benefits (Eg.)

New thermodynamic cycle
+
Novel rotary engine embodiment
+
scalable from 1hp to > 1000hp



Better fuel economy
& more power
for a variety of applications



Increase UAV mission duration by 2x



Increase fuel efficiency & lower cost of hybrid electric vehicles



Higher efficiency, multi-fuel generator sets



LiquidPiston Overview

Disruptive technology

- New thermodynamic cycle & innovative rotary internal combustion engine
 - Up to 2x more efficient (compared to automotive gasoline engine)
 - Up to 10x smaller and lighter (compared to a diesel engine)

Very strong IP position

- 27 patents: 16 granted/allowed; 11 pending; rich pipeline

Focused go-to-market strategy

- Initial focus on < 100 HP “niche” markets: \$100B+ market
- First customers: US military (generators, APUs, and drones)
- 2nd phase customers (targeted): small-engine manufacturers (handheld power equipment, generators, mopeds)
- Future: Scale to other power products, including powertrains for Range-extending Electric Vehicles (REVs)

Capital-lite business model

- License to customers & partners to manufacture
- Revenue model: Licenses, royalties & engineering services



LiquidPiston Overview – *continued*

Traction

- Two DoD development contracts issued Sept 2016 for \$5.5M, representing non-dilutive development funding
 - In partnership with two major Prime Contractors
 - Objectives include field tested generators in 24 months
- Multiple potential partners in discussion – military & commercial

Superior investment return

- \$100M+ projected revenue run-rate within 5 years
- 50%+ projected EBITDA
- Multiple exit possibilities

Investment required

- Currently seeking capital to augment 2016 seed round
- \$5 - \$10M all in new capital required to reach cash flow breakeven. Company expects to raise Series A financing (\$5-7M) in early 2017.

Team

Dr. Alexander Shkolnik – Co-Founder & CEO

- PhD in Computer Science from MIT;
 - Team lead on MIT DARPA LittleDog program;
- Technical focus on leading teams in modeling dynamic systems, optimization and controls.

Dr. Nikolay Shkolnik – Co-Founder & CTO

- PhD in Physics from UConn
- >25 patents: engines, fuel cells, super caps, energy systems, robotics
- Former Clean Energy Program Director, GEN3;
 - Motorola award for Creativity
- 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

Team of seven w/engine design & testing experience

Directors

Dr. Tony Tether, Retired Director of DARPA; VP SAIC, VP Ford Aerospace, Director of National Intelligence. Invested >\$25 B while at DARPA.

Dr. Alexander Shkolnik,
Dr. Nikolay Shkolnik,
Per Suneby

Advisors

Thomas Howell, Director, New Technology, Jacobs; Chief Engineer, Engines - Ricardo

Dr. S.M. Shahed, Retired Director of Southwest Research Institute (SWRI); V.P of Engineering at Honeywell; President of the Society of Automotive Engineers (SAE)

James Marsh, Retired Director of ATL, Lockheed Martin

Dr. Sam Kogan & Alex Lyubomirsky, GEN3 Partners / TRIZ

Status: LPI-X Mini installed in small vehicle demo (go-kart)



70 cc 3-5 HP X-Mini Prototype Rotary Engine



Engine powering go-kart:

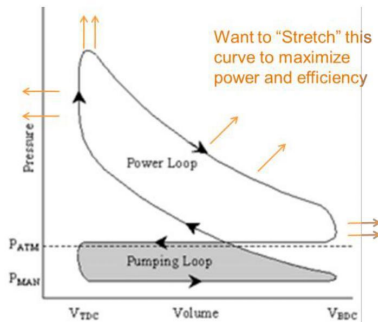
<https://vimeo.com/170502635>

<https://vimeo.com/164412266>

Engine assembly, running in dyno:

<https://vimeo.com/99002635>

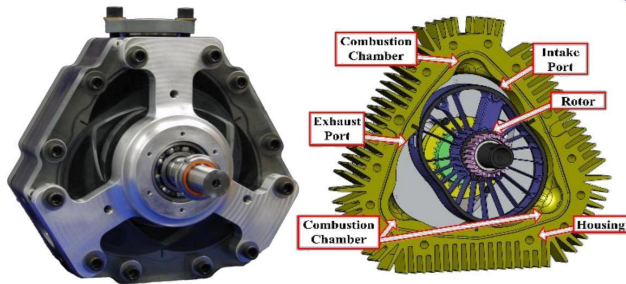
LPI-X Engine technology



Advanced Thermodynamic Cycle

+

=



Rotary Engine Embodiment

Potential Engine Benefits

High-efficiency

- 75% theoretical thermal cycle efficiency of HEHC
- 57% expected realized peak brake efficiency
- 50% expected realized partial load brake efficiency

Compact and lightweight

- > 5x smaller, > 2x lighter than comparably powered engines
- High power density potential of up to 2 HP/Lb (3.3kW/kg)

Multi-fuel capable

- Including diesel, gasoline, natural gas, JP-8

Scalable

- From 1 to over 1000 HP; Prototypes from 3 to 70 HP

Low cost at volume

- Few moving parts and materials

Quiet

- No poppet valves
- Exhaust turbulence minimized by over-expansion

Low-vibration

- Only two primary moving parts, optimally balanced

Low temperature exhaust

- Due to overexpansion

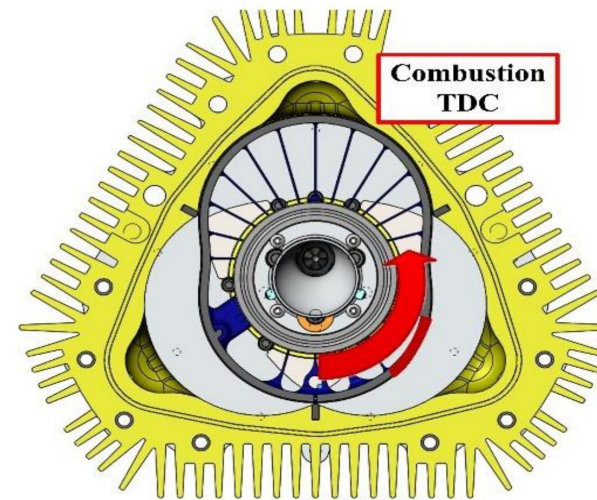
It's not a Wankel ! *(More like a Wankel inverted inside-out....)*

Wankel Rotary Engine (e.g. Mazda RX-8)



- Otto cycle – gasoline only
- Efficiency < 25%
- Sealing/lubrication issues
- + High power density

LPI X - Engine



- + HEHC cycle – diesel / gasoline / multi-fuel
- + Efficiency > 40% (range depends on size)
- + Sealing/lubrication solved
- + High power density

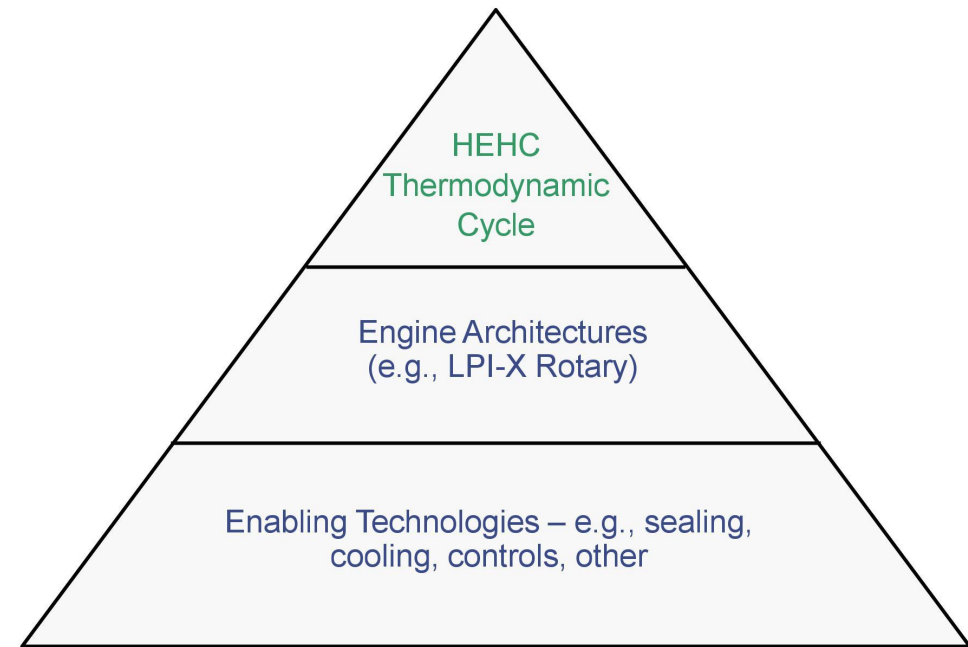
See: <http://liquidpiston.com/technology/how-it-works/>

Competitive Advantages

TECHNOLOGY	Power Density (kW/m ³)	Specific Power (kW/kg)	Energy Capacity (Wh/kg)	Efficiency	Cost of Ownership
Battery - Powered Devices	OK	OK	OK	Great	Bad
OPOC Engines	OK	Great	Great	OK	Great
Micro - Turbines	Great	Great	Great	Bad	Bad
Fuel Cells	OK	OK	Great	Great	Bad
LPI X- Engines	Great	Great	Great	Great	Great



Extensive IP portfolio



- Comprehensive patent coverage
- 16 patents issued/allowed, 11 pending (worldwide/PCT)
- Defensible & extensible
- IP strategy supports licensing model

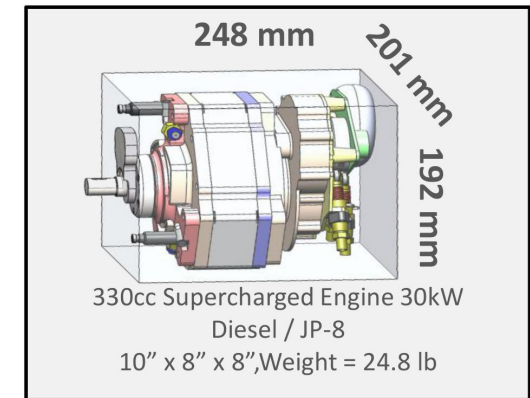
Engine demonstrators: 3 HP through 220 HP; gasoline, kerosene, JP8, diesel



X1 Diesel/JP-8 Engine
(Alpha Prototype, 1.6L)



X Mini v3 Gasoline Engine Prototype
(Beta Prototype, 70cc / 2-3kW)
Image: Jalopnik.com



X4 .33L, 30 kW Concept
(For DARPA / drones / generators / REVs)

- X Engine Technology:

- Scalable
- Multiple fuel options
- Versatile – most piston engine technologies are transferable, e.g., direct injection, supercharging, etc.

- Demonstrated:

- Working running engine prototypes, fully cooled, hours of continuous operation
- 50% fuel efficiency improvement
- 50% power density improvement
- Beta prototype complete

Initial markets > \$100M

Sub -100HP engines in sectors demanding light-weight, compact, quiet, low-vibration, and/or fuel-efficient engines

	<u>Annual \$</u>
▪ Unmanned aerial vehicles	\$4B
▪ Auxiliary power units/gensets	\$8B
▪ Military apps (gensets, ATVs, robots)	NA
▪ Range extenders for EVs	\$40B (est. 2025)
▪ Mopeds, small motorcycles	\$22B
▪ Lawn & garden equipment	\$7B
▪ Small and medium boats	\$9B

Currently in discussions with potential partners for co-development & technology licensing of engine for specific market applications

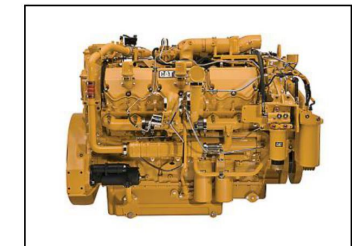


Markets: Long-term > \$400B

In addition to initial markets:

	<u>Annual \$</u>
• Automotive and truck	\$290B
• Off-highway ¹ Diesel	\$46B
• Military aircraft:	\$29B
• Large watercraft and boats	\$19B
• Stationary diesel	\$13B
• Helicopters and jets	\$13B

¹ Diesel includes agriculture, construction, logging, marine, mining, rail



LPI & partners can choose which segments of >\$400B global annual engine markets to address

Why the military as first customer?



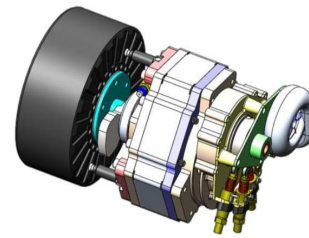
- U.S. Military is the LARGEST consumer of oil in the world. 100 M barrels / year
- 99 gallons to deliver 1 gallon to front line + Cost measured in lives
- JP8 / Diesel engines are HEAVY



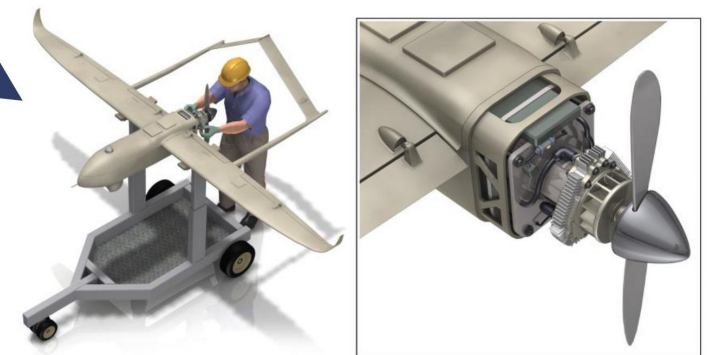
- Strong fit with LPI engine benefits
- Many applications – UAVs, range-extended vehicles, generator sets, etc
- A single generator contract can be up to \$200 - \$300M over 5 years. Different contract for each generator rating – 2kW, 3 kW, etc

DoD contract to develop 40 HP diesel engine

- \$2.5M base contract won Sept 2016, potential for \$7M in follow on contracts
- Example Applications:
 1. Today, 30kW Military generators weigh 2750 lbs → LiquidPiston could reduce this to ~200 lbs.
 2. Drones need efficient, compact power → LiquidPiston engine could double the mission range of a drone with same amount of fuel



40 HP (330cc)
X4 concept



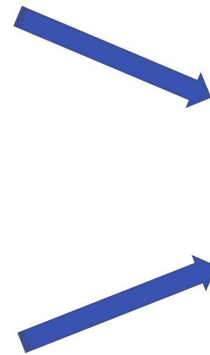
Dr. Tony Tether, retired Director of DARPA, has joined LiquidPiston Board of Directors

DoD contract to develop 3 kW diesel generator

\$3M potential program, in partnership with 2 major prime contractors

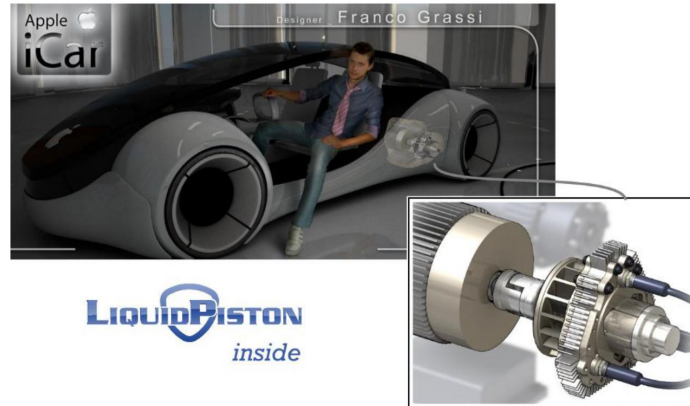


Today: 3 kW, 300 lbs.



With X-Engine: 3 kW, 30 lbs.

Future Applications: Range-extended Electric Vehicles (REVs)

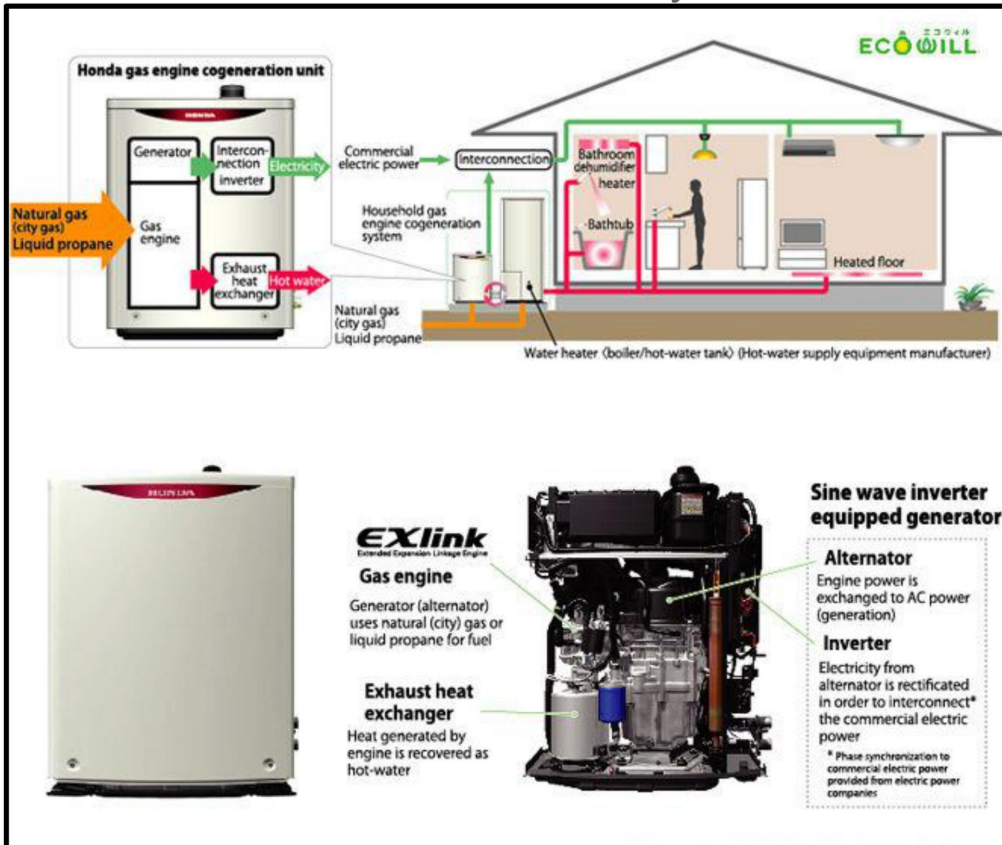


LPI engine platform helps enable cleaner, smarter auto future:

- Likely powertrain solution: range-extended hybrid power train (~30+ mile electric range, battery charged by range extender) -- small engine required (30-60 HP)
- Higher well-to-wheel energy efficiency & lower CO₂ footprint vs. charging EV with U.S. power grid
- Lower cost of ownership to consumers vs. all-electric
- Gasoline, diesel & natural gas usable for hybrid electric transportation with same engine platform

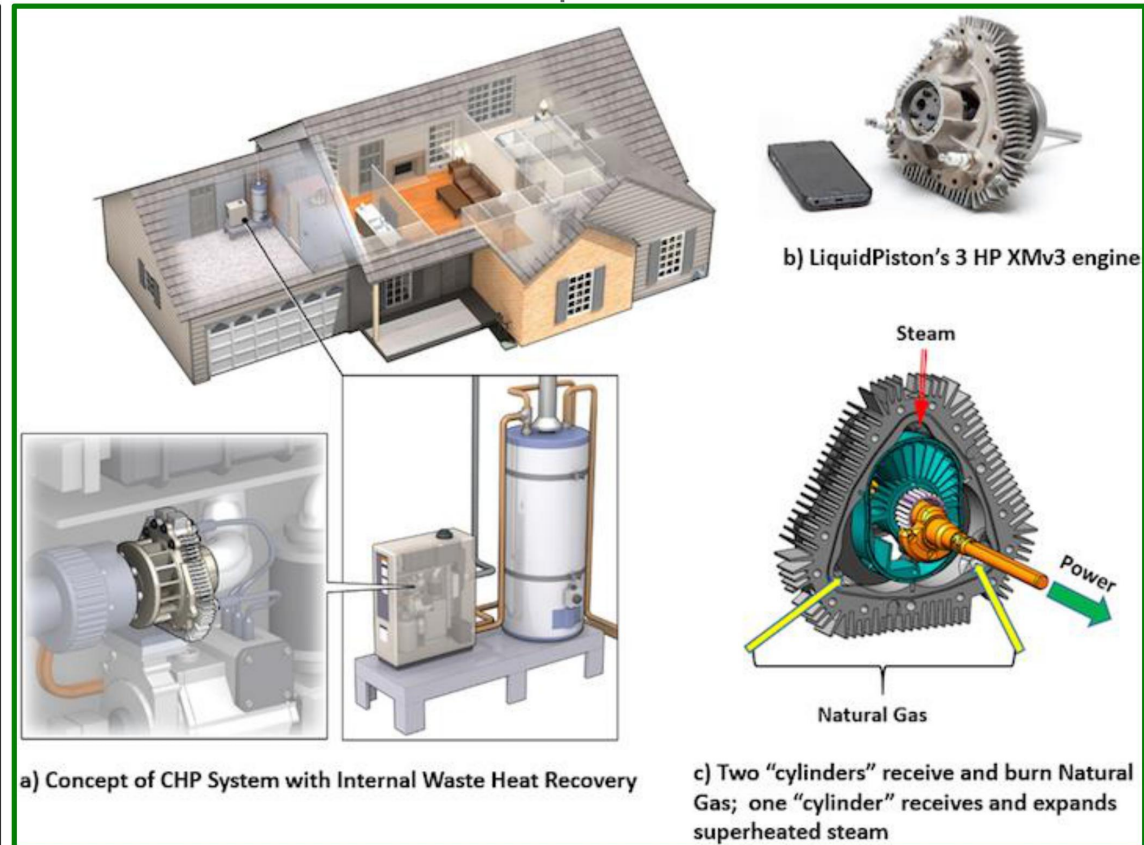
Future applications: Natural gas cogeneration (MicroCHP)

Current System



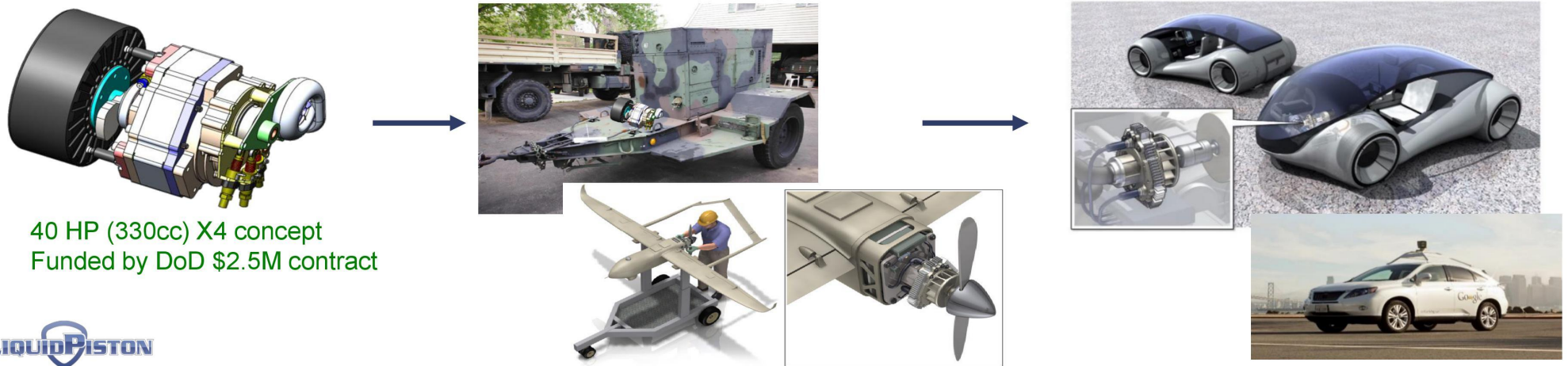
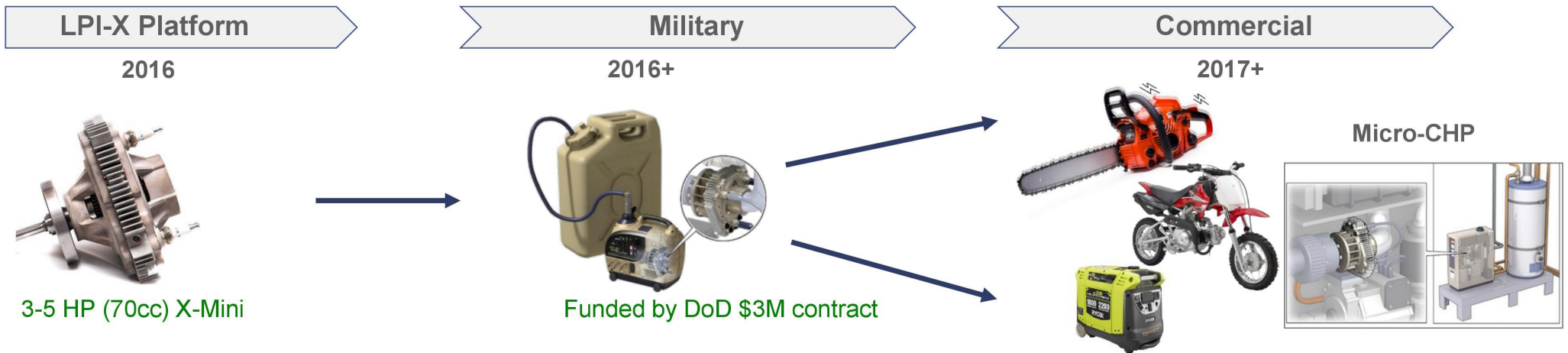
26% electrical efficiency

LiquidPiston



41% electrical efficiency

LPI-X Engines: Two initial product pathways



Objectives: Next 6 months

Baseline durability test on X-Mini + 1 refinement iteration

Baseline emissions test on X-Mini: Hydrocarbons, CO (NO_x tbd)

Develop benchmark testing protocol with partner

DoD:

- 2 development programs underway, meet milestones

Series A financing: \$5 – \$7M targeted for Q1 2017

- Goal: 1+ strategic partner(s) participating in Series A and/or NRE licensing MOU
- Objective of Series A will be to accelerate commercialization (beyond military application), and take company to cash-flow positive

Summary

- Game changing technology
- Very strong IP position: 27 patents issued and pending
- Leverage past investment & existing development / test infrastructure: 8 years, \$19M invested
- Beachhead customer identified: U.S. Military / DoD. 2 contracts won for \$5.5M
- Multiple potential partners – several in discussion
- Capital efficient business model: Licensing, engineering services, avoiding Detroit / primary propulsion initially
- Innovative startup team – proven & experienced, connected advisors and BoD members
- Multiple exit opportunities: 3 - 5 years