

# Powerful and Quiet Garden Machinery

## Development and Market Needs

The STIHL logo is displayed in a large, bold, orange font across the center of the image. The background is a photograph of a forest with tall, thin trees and a sun flare on the left side. A person is visible in the distance on a path.

**STIHL**®

Dipl.-Ing.

**Fabian Pöhler**

Function development noise, vibration and harshness

ANDREAS STIHL AG & Co. KG, Waiblingen, Germany

# Agenda

- Product range / fields of application
- Conflict of R&D targets
- Sources of noise
- Comparison of 2 blowers
- Battery development
- Noise emission and performance
- Conclusion

# Product range...

## Forestry



## Garden



## Construction



## Lawn



# ... and fields of application

Application of lawn & garden, forestry products can be classified in three groups



**Consumer**



**Semi-professional**

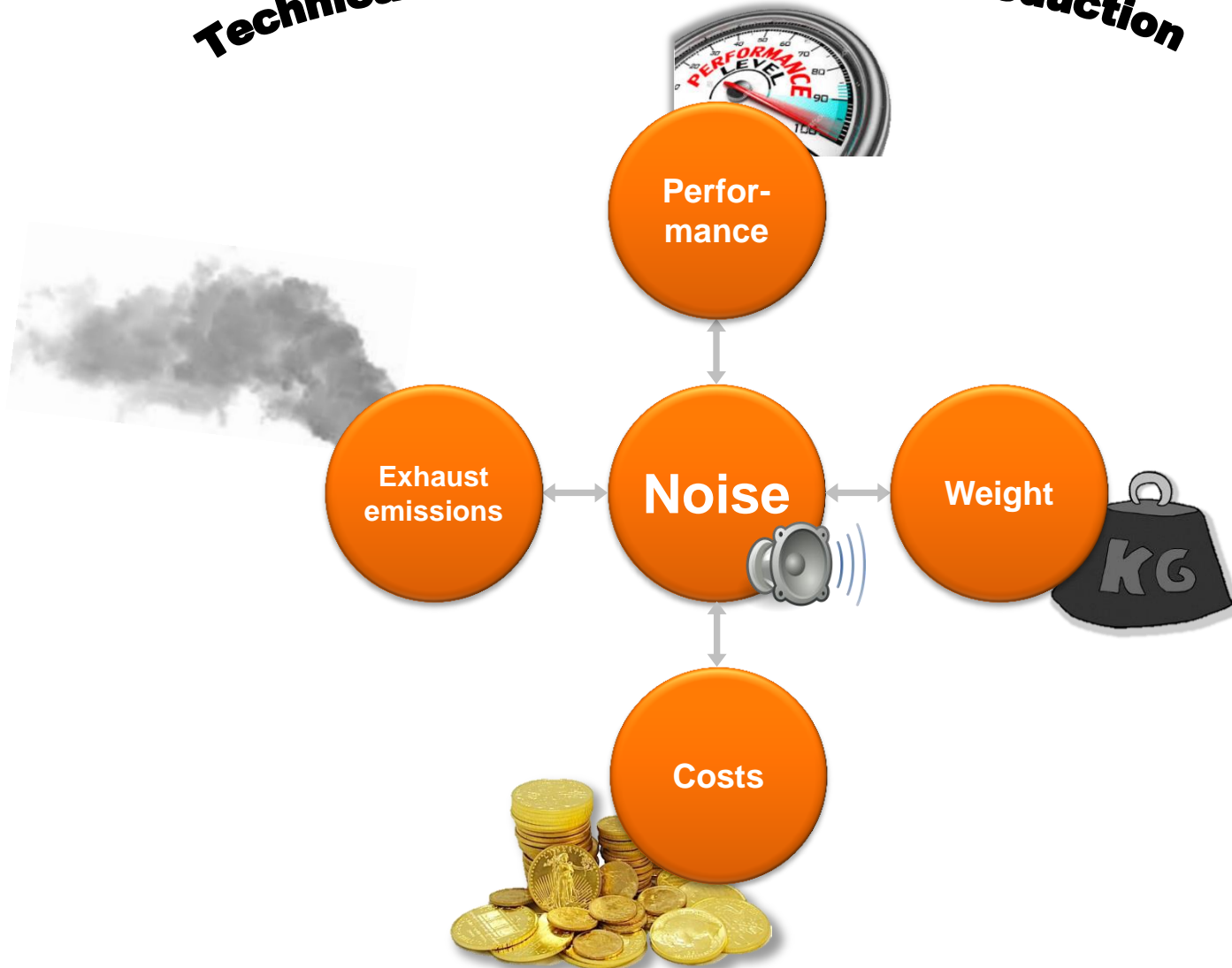


**Professional**

Power, Performance and Price

# Conflicting R&D Targets

## Technical barriers opposing noise reduction



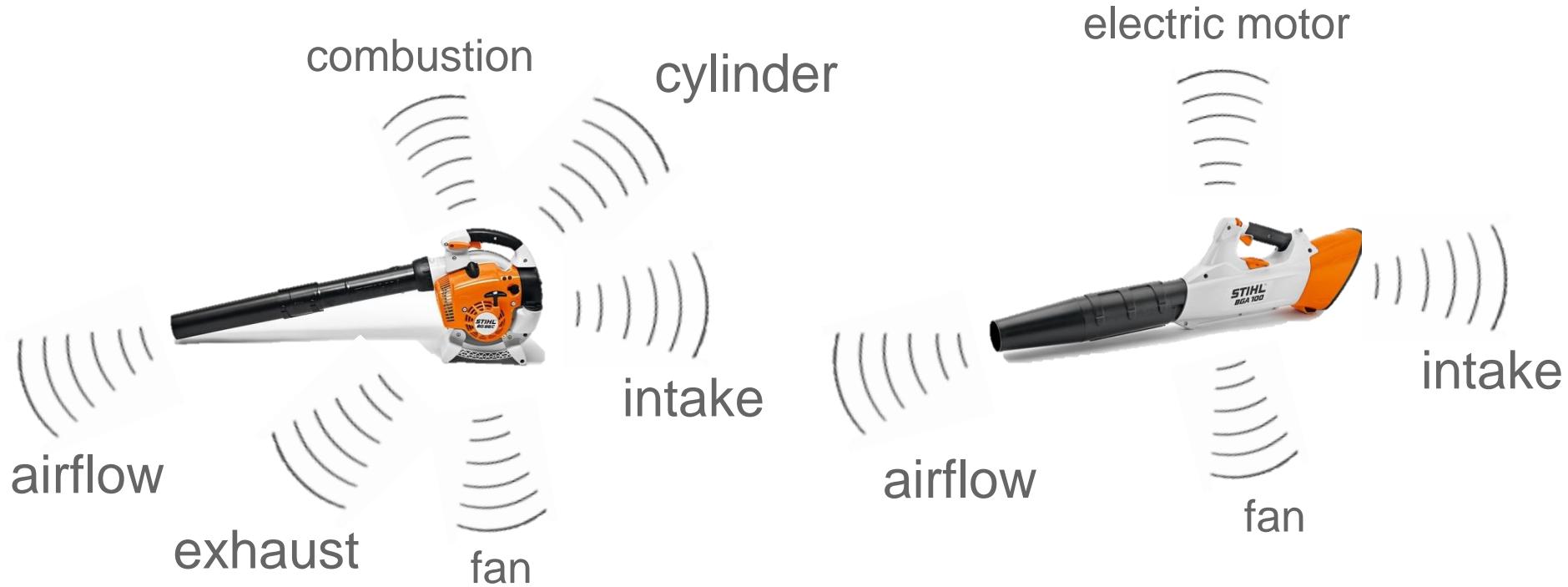
# Sources of Noise – Gas vs. Electric



**BG 86**



**BGA 100**



**Reduction from 6 to 4 sources**

# Comparison between gas and electric driven blowers



**BG 86**



- Blow force: 15 N
- Sound power: 104 dB(A)



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**BGA 100**

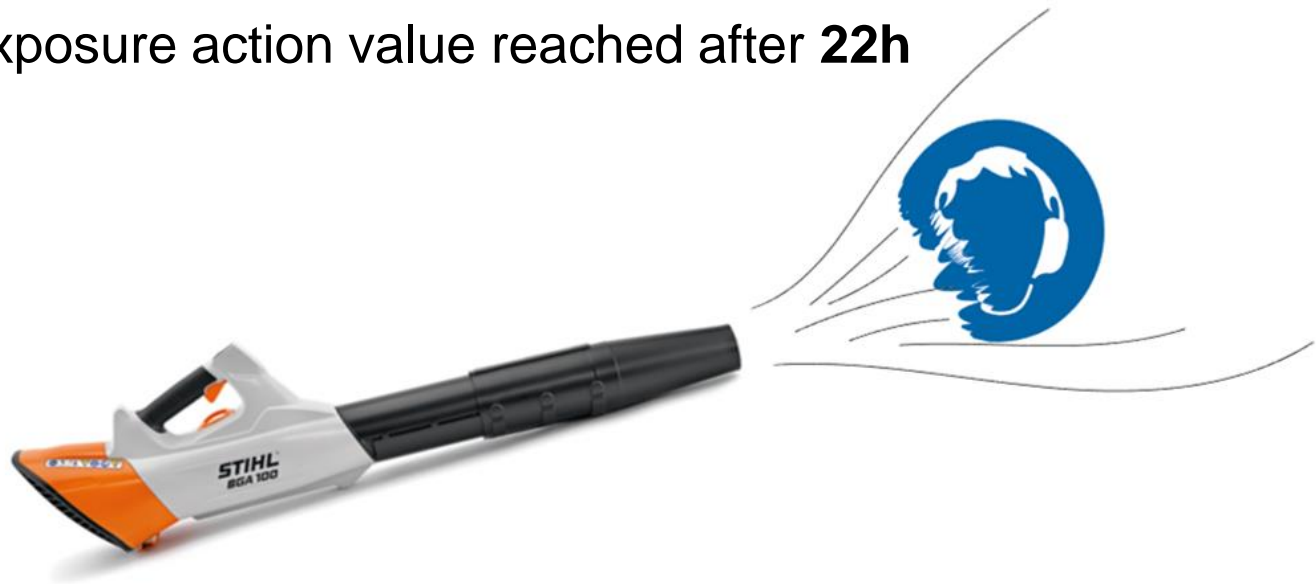


- Blow force: 17 N
- Sound power: 90 dB(A)



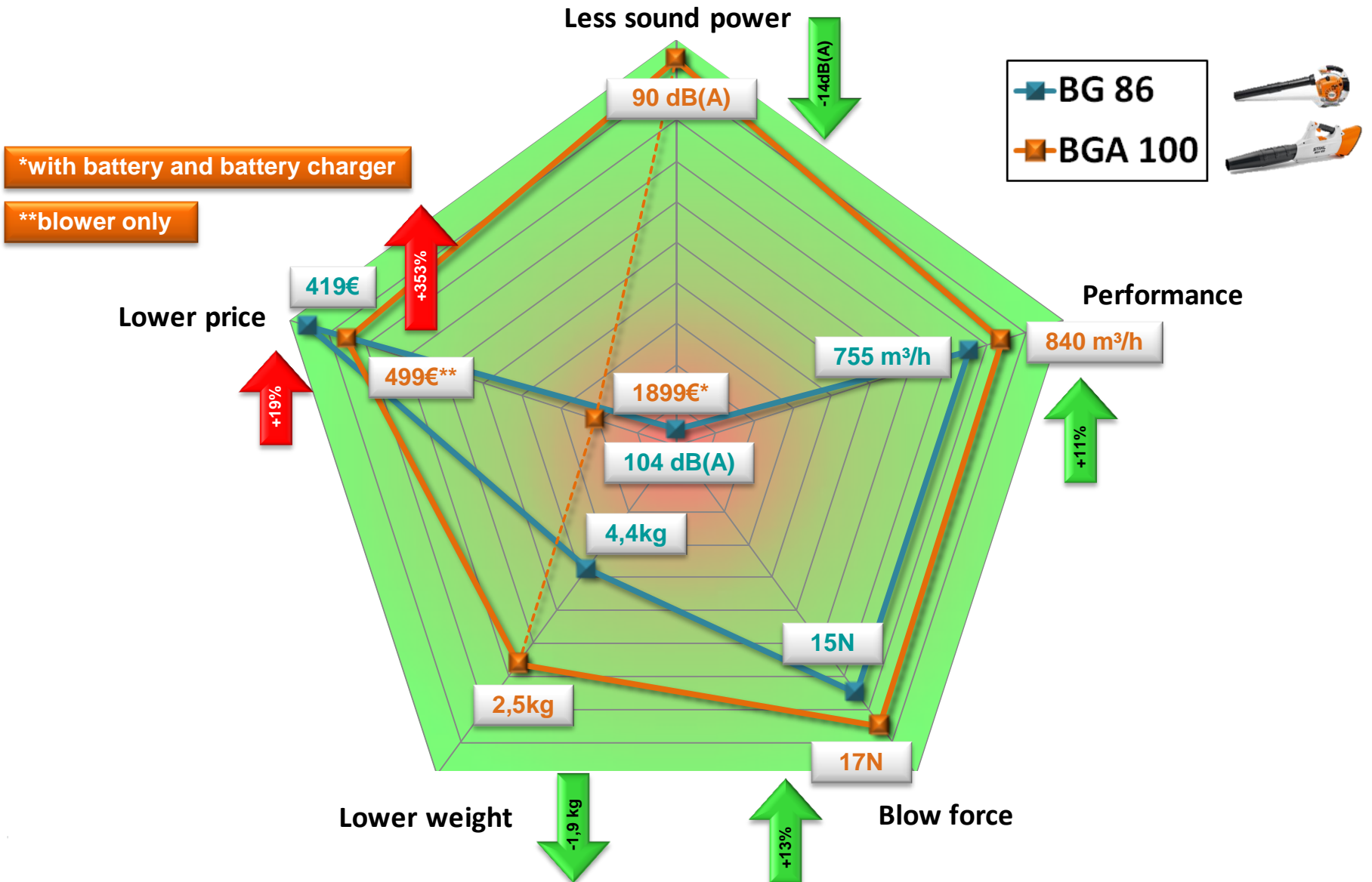
# Advantages of BGA 100

- High blow force
- Low noise emission
  - Use 25 x BGA 100 instead of 1 x BG 86
- No ear protection needed
  - Daily noise exposure level = **68dB(A)**
  - Daily noise exposure level Limit = **85dB(A)**
  - Upper exposure action value reached after **22h**





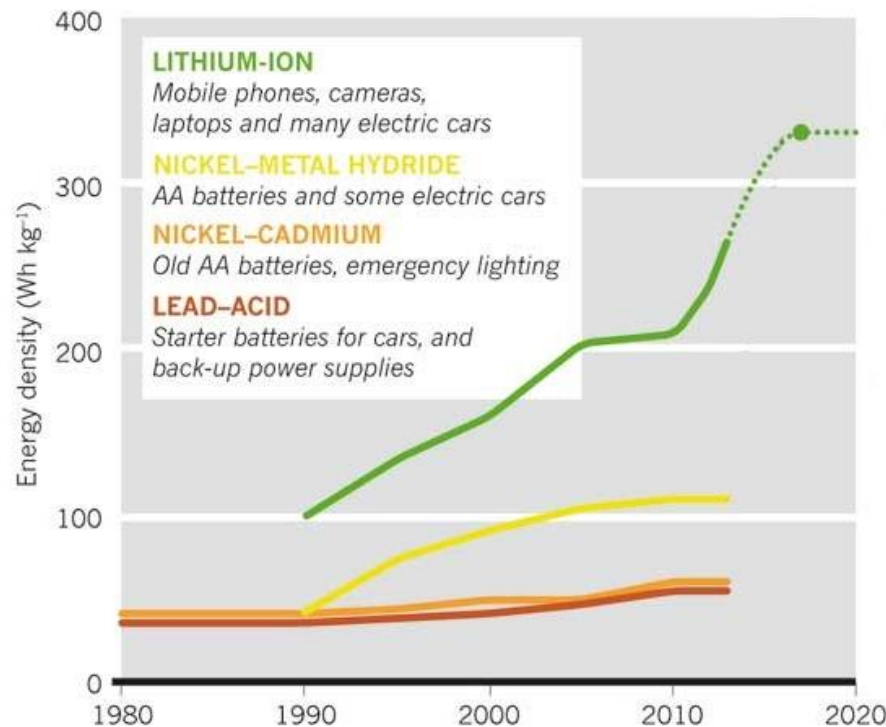
# Facts and Figures



# Battery development during the last 40 years

## POWERING UP

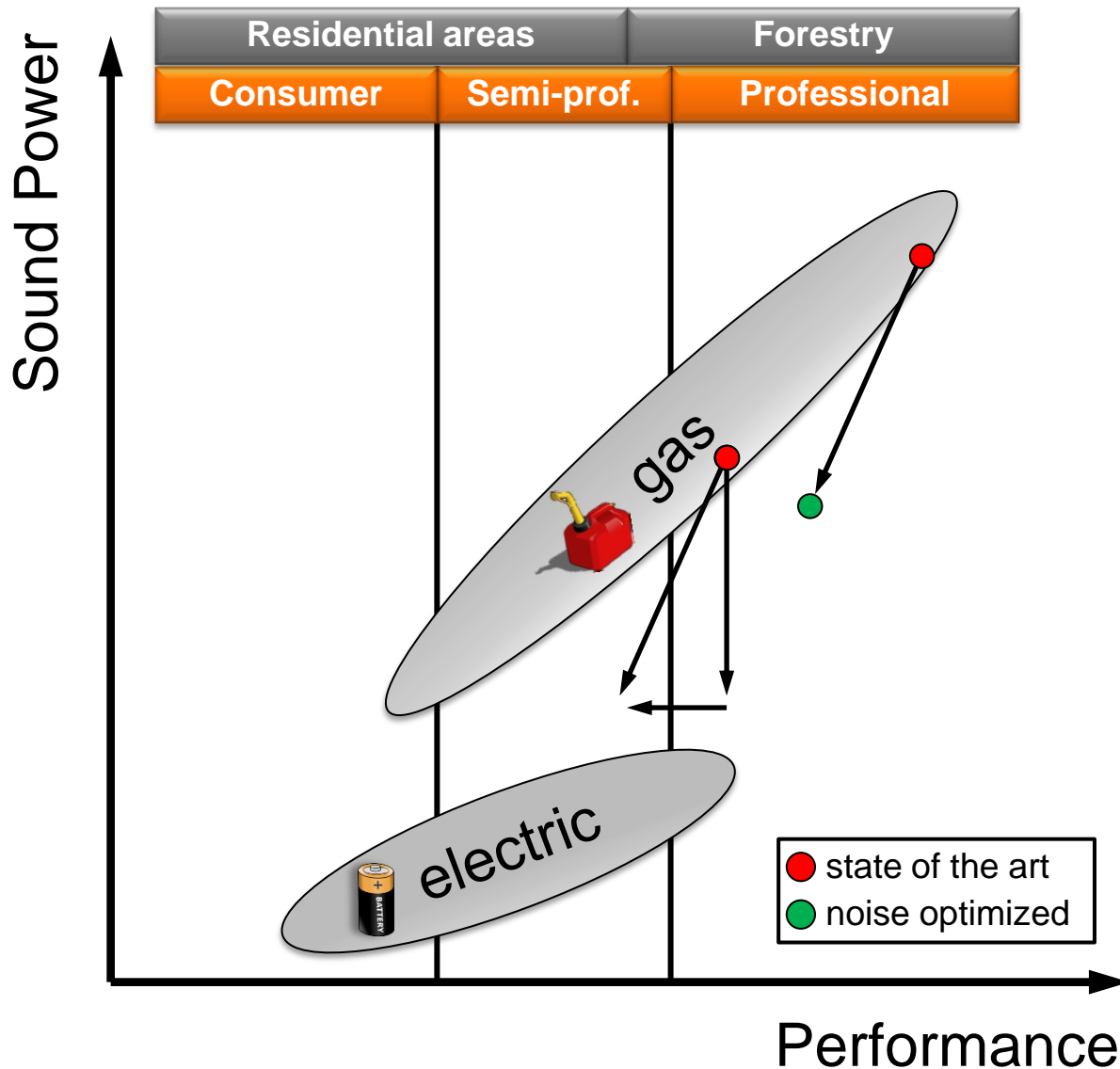
Portable rechargeable batteries tend to hit an energy-storage-per-weight limit. Lithium-ion technology has gone through several phases and types, but is also expected to reach a ceiling soon.



Source: C.-X. Zu & H. Li Energy Environ. Sci. 4, 2614–2624 (2011)

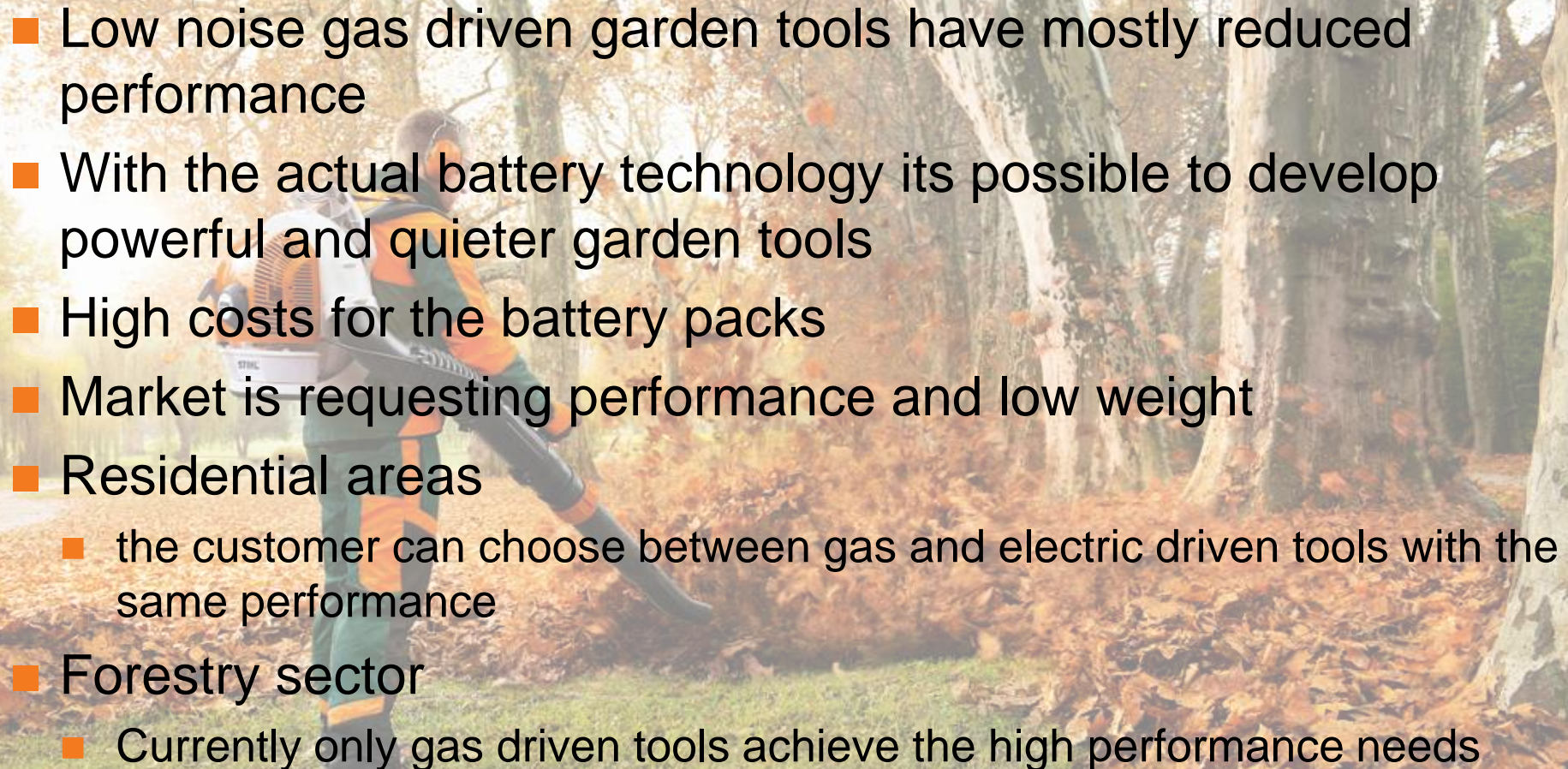
**Energy density of Gas is 50x higher than the density of a battery**

# Noise emission and Performance



- e.g. noise reduction for a brush cutter
  - additional parts for:
    - Muffler
    - Engine cover
    - Filter cover
  - more weight / higher price
  - reduced speed
  - reduced line diameter
  - less performance

# Conclusion

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- A person wearing a green and orange STIHL safety vest and a backpack blower is shown in a forest setting. The ground is covered with fallen autumn leaves, and the trees have sparse foliage. The person is holding the blower's nozzle, which is directed towards the ground. The background is slightly blurred, emphasizing the person and the blower.
- Low noise gas driven garden tools have mostly reduced performance
  - With the actual battery technology its possible to develop powerful and quieter garden tools
  - High costs for the battery packs
  - Market is requesting performance and low weight
  - Residential areas
    - the customer can choose between gas and electric driven tools with the same performance
  - Forestry sector
    - Currently only gas driven tools achieve the high performance needs

→ Performance outweighs low noise machines