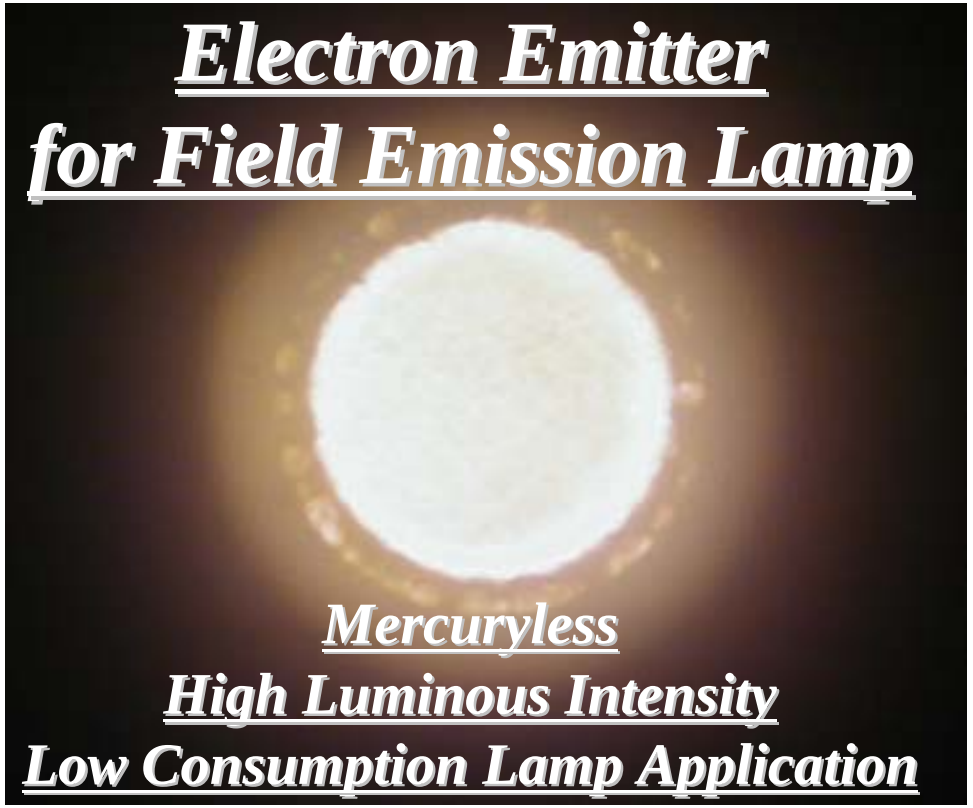
YIELD OF AUTOMATIC CONTROLES

YAC Co., ltd.

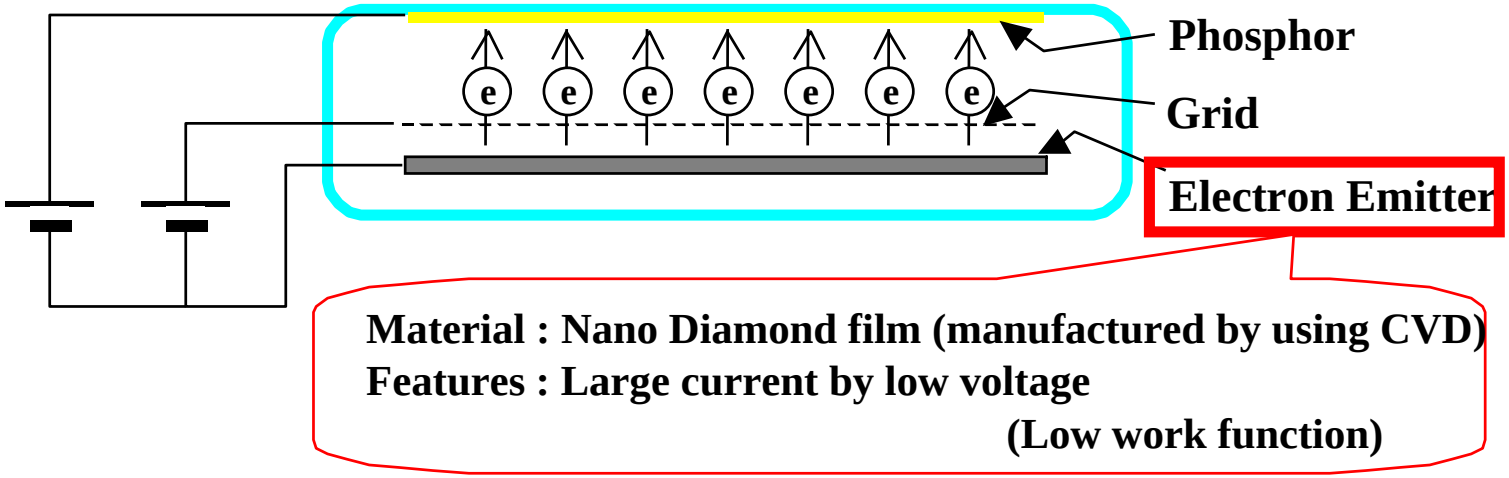
Electron Emitter for Field Emission Lamp



Mercuryless
High Luminous Intensity
Low Consumption Lamp Application

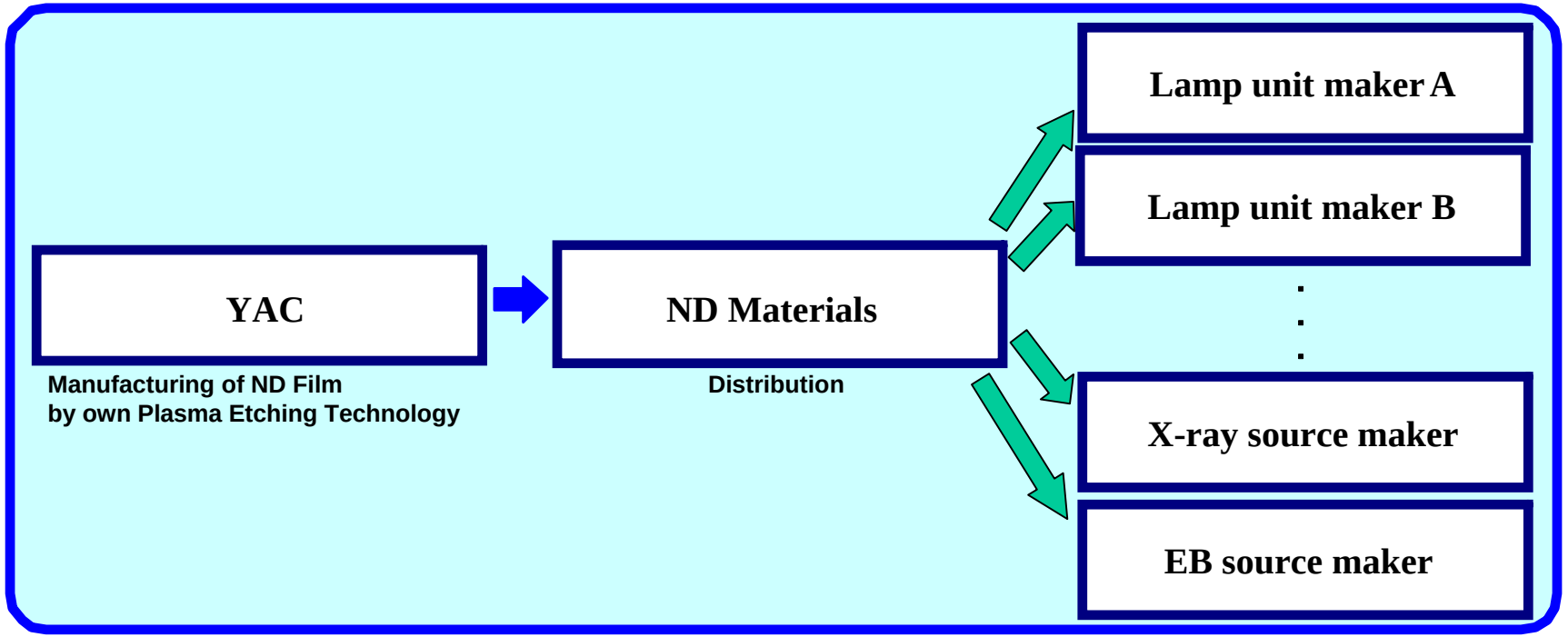
Proposal from YAC

There are two different Emitter types for FEL application.
One is Hot Cathode Type, like a Tungsten wire. It requires power supply for heating, therefore generates much heat. The other one is Cold Cathode Type, like CNT. It doesn't require heating, so that it has lesser heat generation and wider application. However, there is no Emitter what has long lifetime and high efficiency.
YAC proposes ND (Nano Diamond) Emitter as Cold Cathode Type for FEL application.



ND-Emitter Business Model

YAC manufactures ND-Emitter and supplies to lamp unit maker via "ND Materials Ltd". (Joint capital investment by YAC and other two companies.)



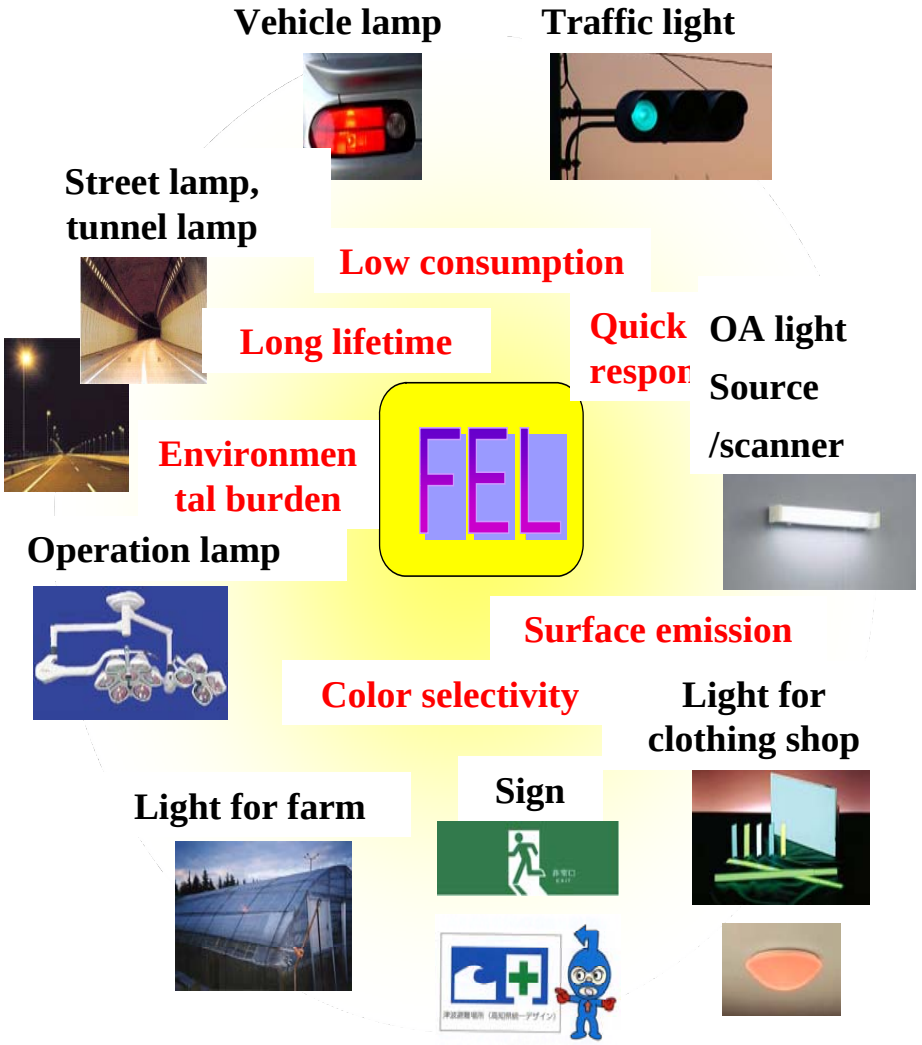
Applications

Application example

·*X-ray source------Charge release, Sensor for metal target*

·*Electron Beam source------Sterilization, Surface Modification*

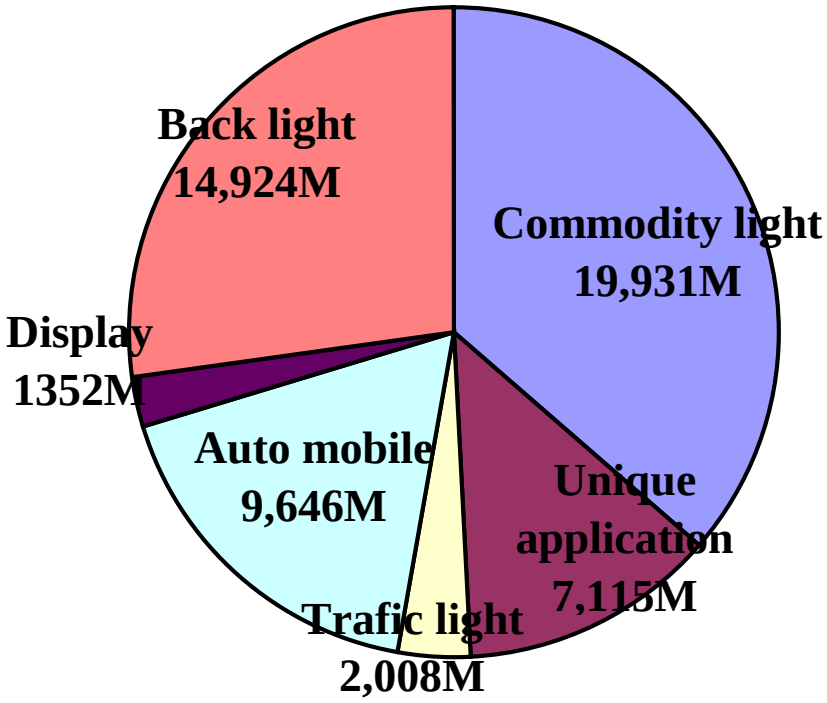
·*Lamp------ Vehicle Agriculture, Fishery, Projector light source, etc. for luminescence target*



Lamp Application Market Size

Estimated Worldwide Sales in 2008: 86Billion US$

(Japanese market 0.5Billion USD = 54,977M JPY)



Japanese Market

Features

Features of FEL with ND Emitter

- ***Mercuryless ---------- Countermeasure for Environmental issue***
- ***Large Emission Size -- 75mm x 75mm size achieved (Si substrate)***
- ***High Efficiency -------- 120 lm/W***
- ***High Luminous Intensity ----- 25,000 cd/m^2***
- ***Long Lifetime ---------- 100,000 hour***
- ***Low Temperature ------ < 50 ºC (Emitter's temperature)***

····· Subject to luminous material's characteristic

YAC supplies Emitter with above features for lamp application via "ND Materials ltd".

YIELD OF AUTOMATIC CONTROLES

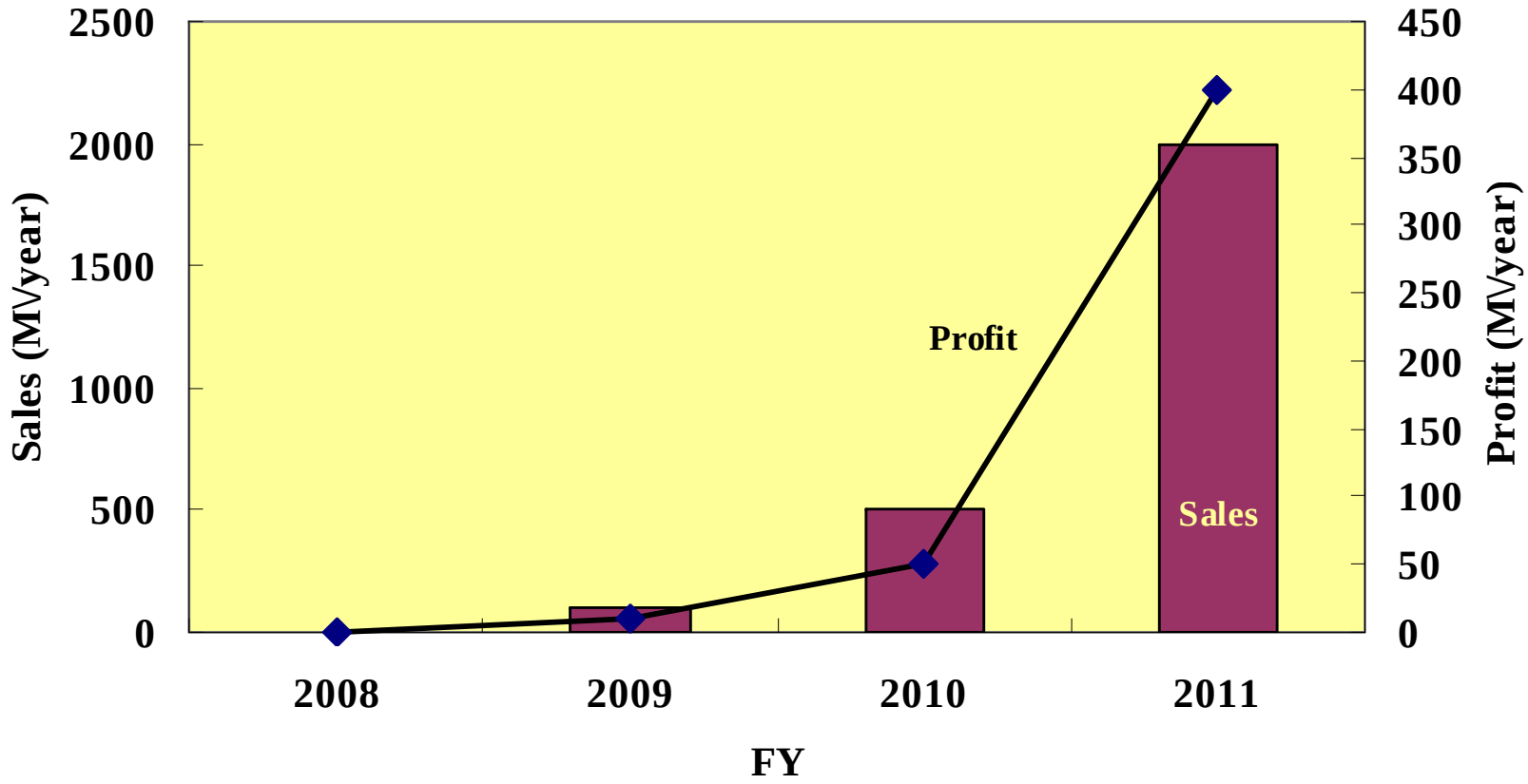
Characteristics Comparison

	FEL	CCFL	OLED	EL	Halogen
Energy Efficiency	**30 %**	**10 %**	**7 %**	**3 %?**	**15 %**
Disadvantage	**Difficulty on cathode development**	**Use of Mercury** (Toxic substance)	**Limitation of color wavelength**	**Weather-proof Required**	**Slow lighting response**
Power Consumption ($5{,}000cd/m^2$)	**0.5-1.0 W**	**30-40W**	**10-20W**	**10-20W**	**100-200W**
Life Time (khr)	**50-100**	**20-30**	**30-50**	**5-10**	**20-30**
Heat Generate	**Very low**	**Yes**	**Yes**	**Yes**	**Yes**
Use of Gas	**No**	**Argon**	**No**	**No**	**Halogen**

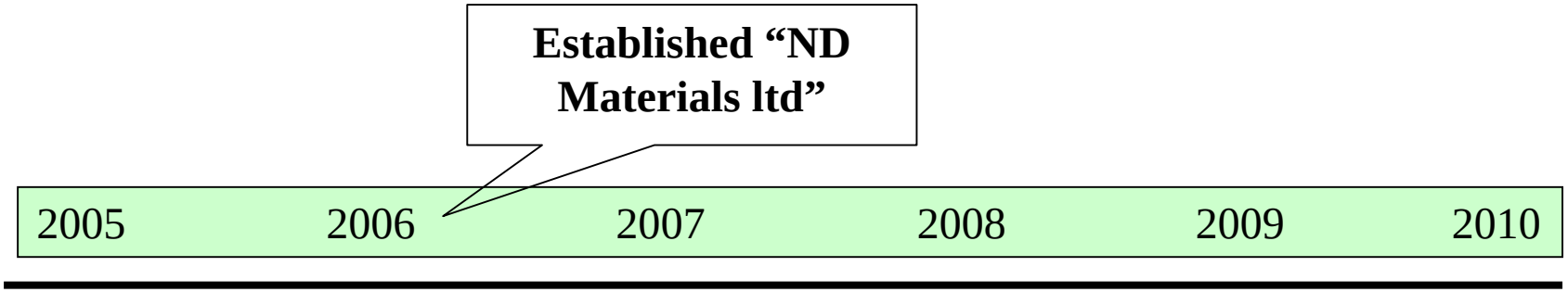
Original Data Source: Valloy. Inc

YIELD OF AUTOMATIC CONTROLES

Business Plan



Roadmap



CVD

Equipment R&D → Equipment Production

ND Emitter

Non-commercial Sample → Commercial Sample

Lamp Trial Manufacturing

Vacuum Tube