PHOTOVOLTAIC TECHNOLOGY DIRECTION – JAPANESE "PV2030"

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Acknowledgements to Dr. Fukuo Aratani, NEDO

PHOTOVOLTAIC TECHNOLOGY DIRECTION – JAPANESE "PV2030"

Intrinsic Value: Sustainability by Renewables.

Possible Scale of Future PV Deployment.

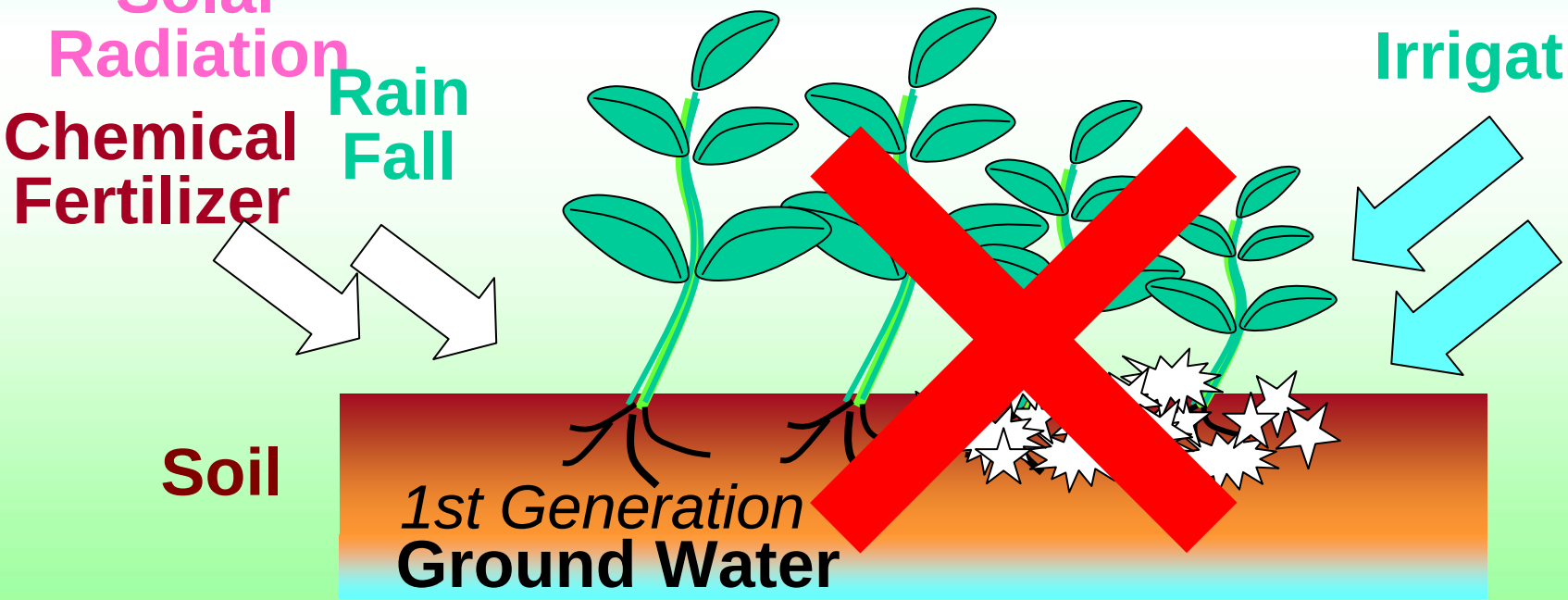
Japanese PV2030 Overview.

Preliminary Projects toward PV2030.

Sustainability in Complex Systems like Cultivation

Repeated Cropping → Acidification Soil Degradation → Soil Flying Desertification

Careless Irrigation → Salt Accumulation → Abandoned Land at last



MGLCA: Multi Generation LCA necessary!

What's Sustainablility?

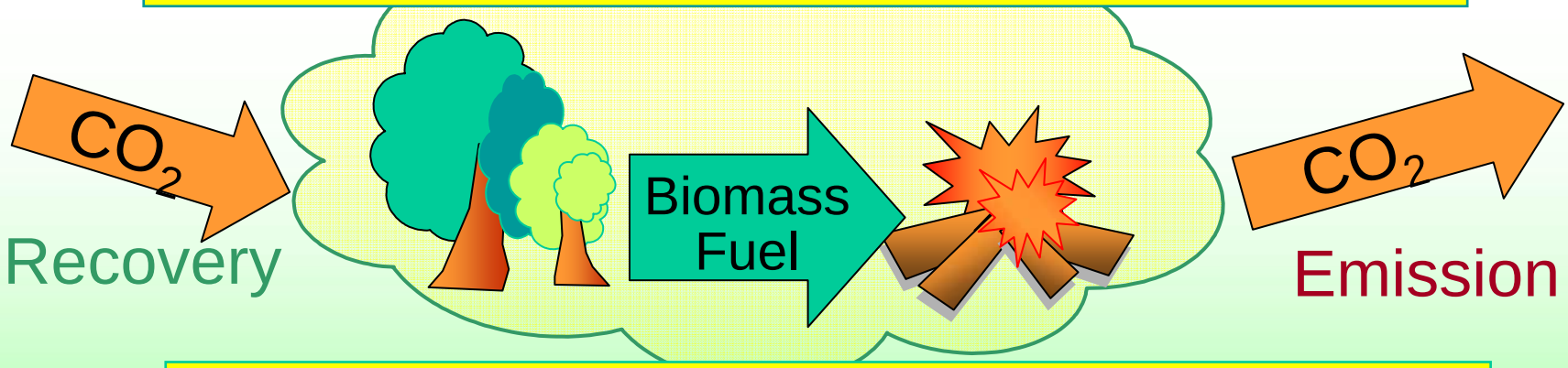
- **The First Category … *Ideal***

  No Emission at all.

  Complete Closed System.

- **The Second Category … *Realistic***

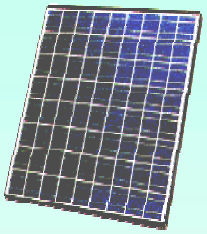
  Limited Emission slower than Environmental Recovery Speed.



- **The Third Category … *Survivability***

  Multi-Generation Survival Sustainability without any excess or deficiency in a system.

GREEN VALUE OF PV !



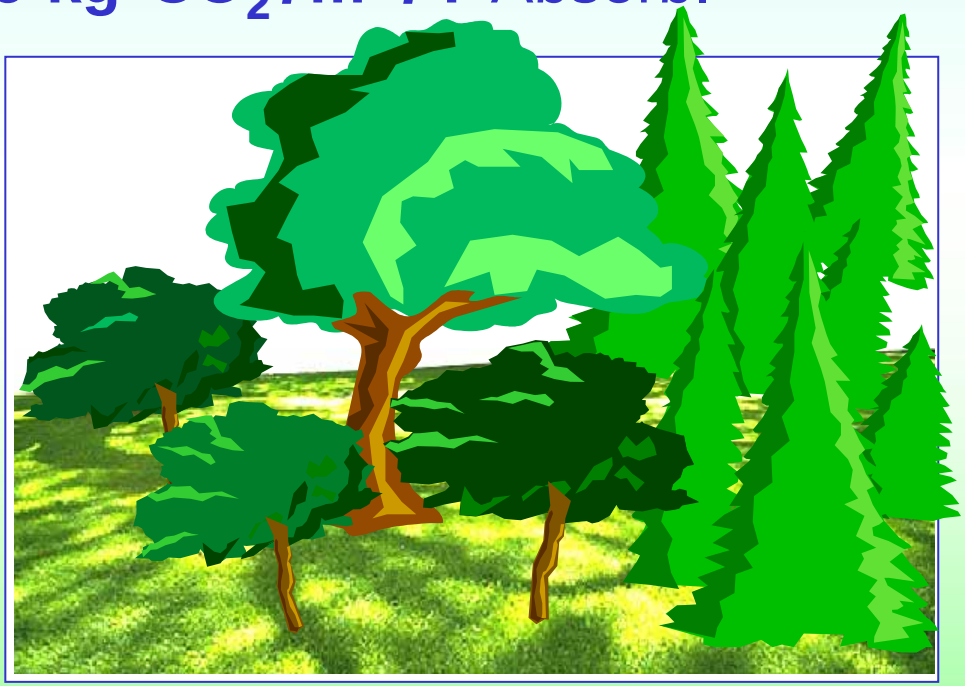
1m² PV = 66 kg-CO_2/m²/Y Emission Red.

660 g-CO_2/kWh-PV ecld. 70g/kWh for manufac.

1kW≈1000kWh/Y≈10m²

× 100

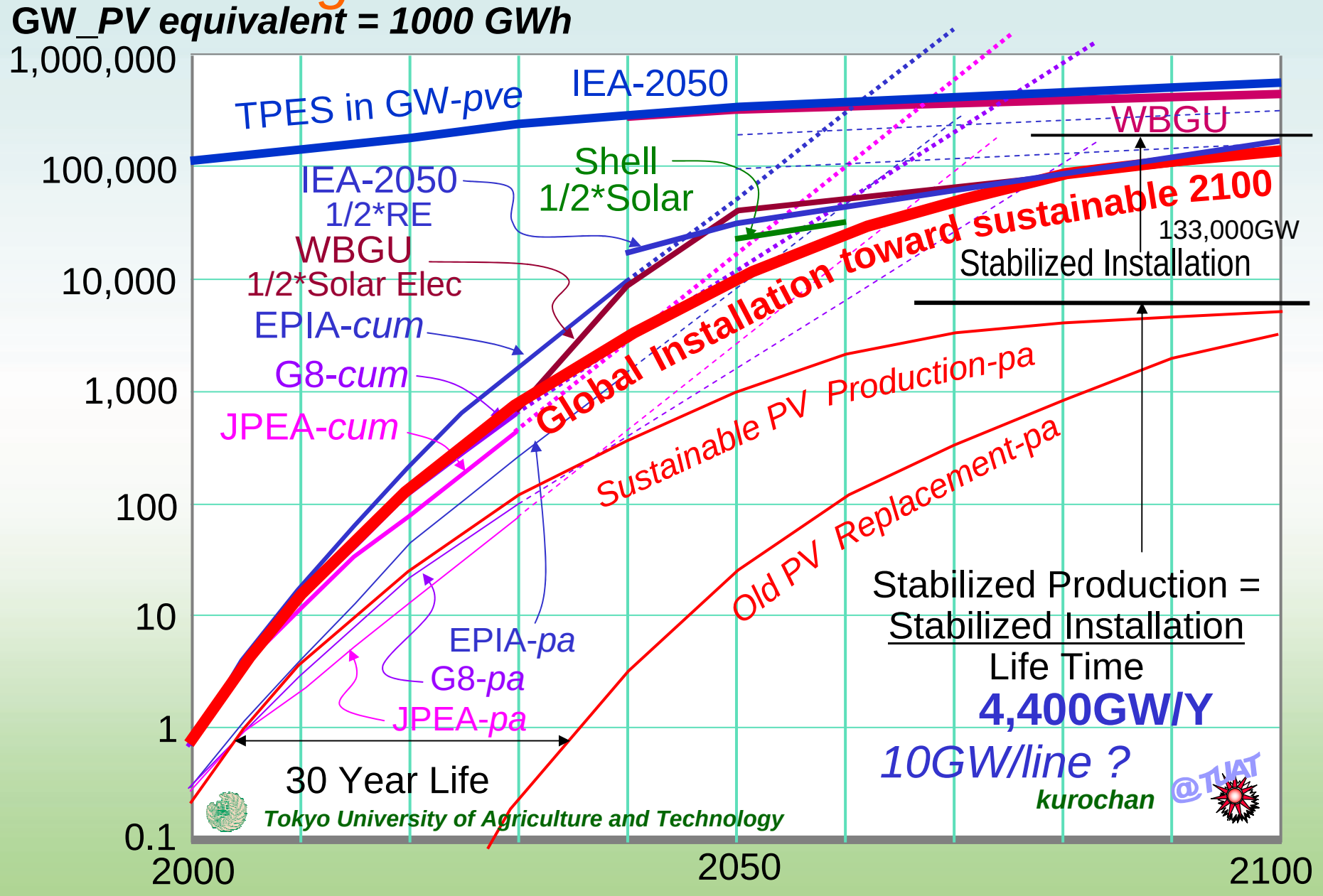
1m² Artificial Forest = 0.649 kg-CO_2 / m² / Y Absorb.



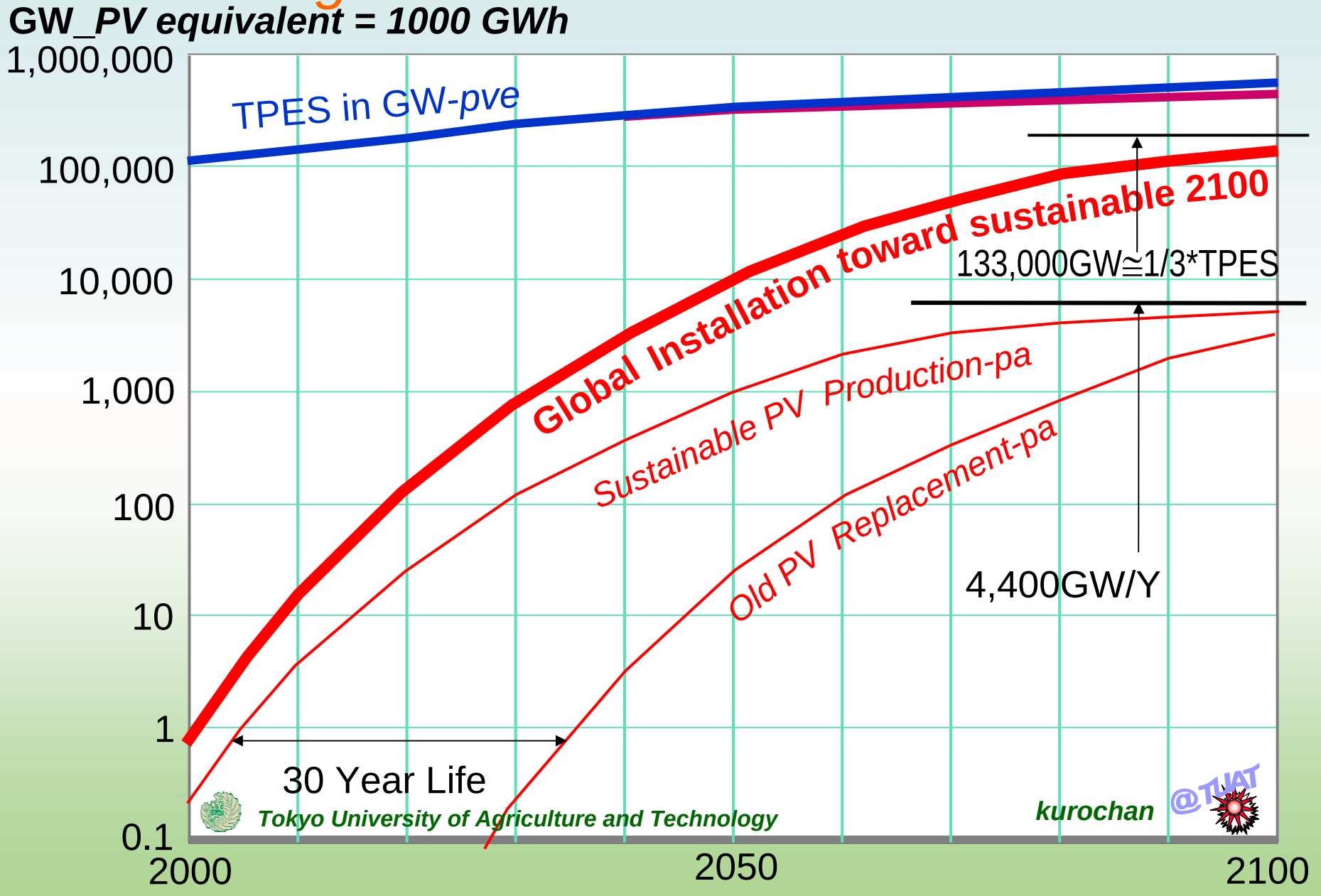
Tiny PV Roof
Recovers much CO_2 !

3 kW-PV on 130 m² Land = *3000 m² Forrest (equiv. to 6 Tennis Courts)*

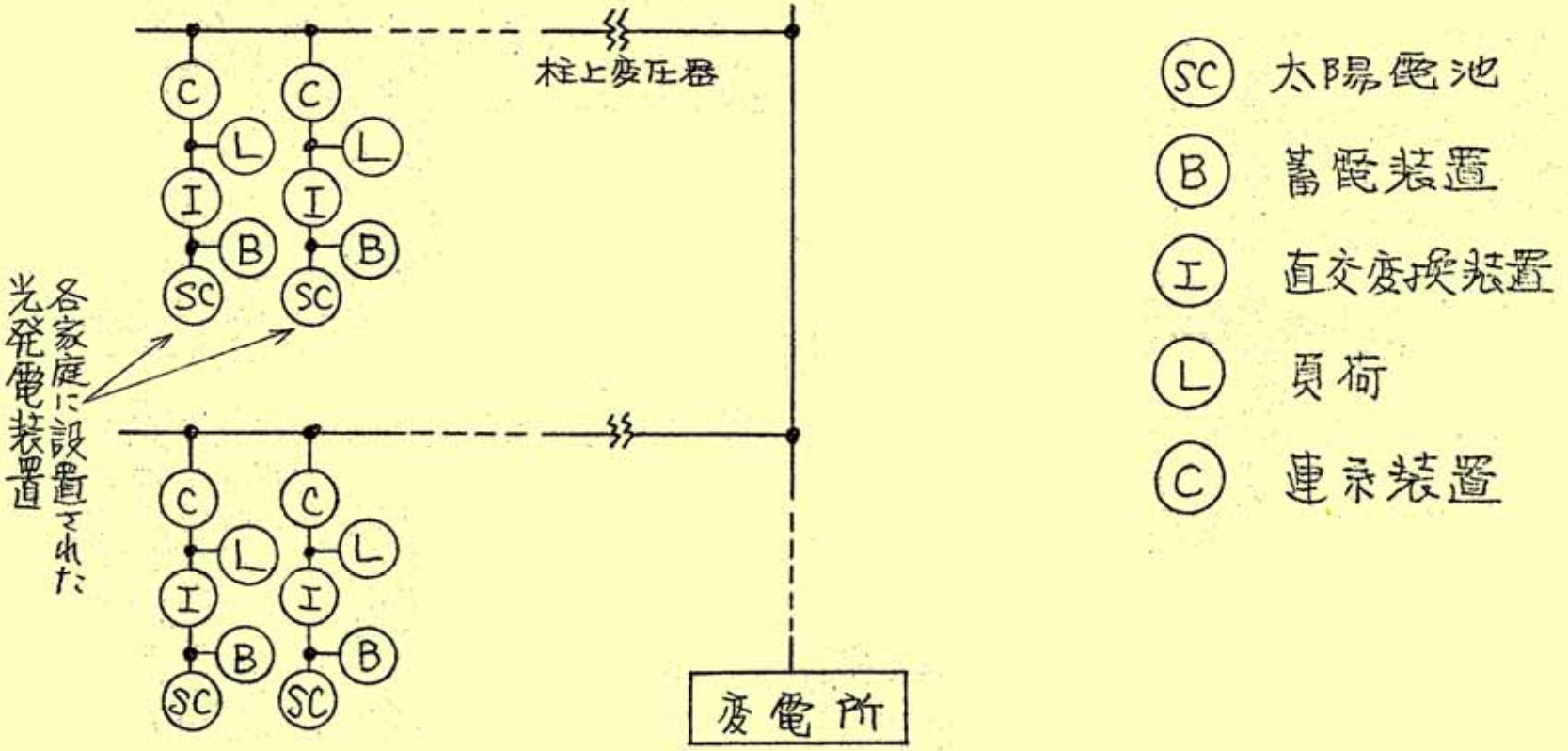
Long Term Sustainable Scenario



Long Term Sustainable Scenario



It happened to start in 1978!



In 1977, Kurokawa made a proposal that a number of individual PV houses can be operated as aggregated power station. It was explained by himself to MOF and new project stated in 1978 by CRIEPI.


Now in Japan,
50 000 PV houses installed last year;
@TUAT

Now in Japan,
50 000 PV houses installed last year;

230 000 PV houses or more already;
corresponding to 900 MW:

Now exceeding 1 GW in Total !!

2010 in Japan, ...
4.82 GW will be installed !

More than 1 million roofs reduce 3,180 thousand ton of CO_2 .

And Then ??

One Community will be fully powered by PV roofs: the era of new life style is waiting. ….

PV2030 Roadmap finalized

By NEDO Study Committee

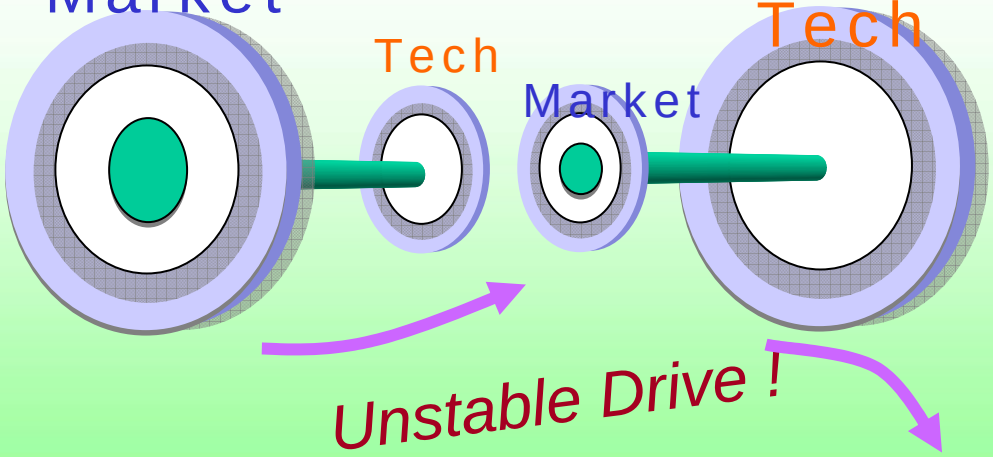
Under the Supervision of ANRE, METI

Philosophy for PV Deployment

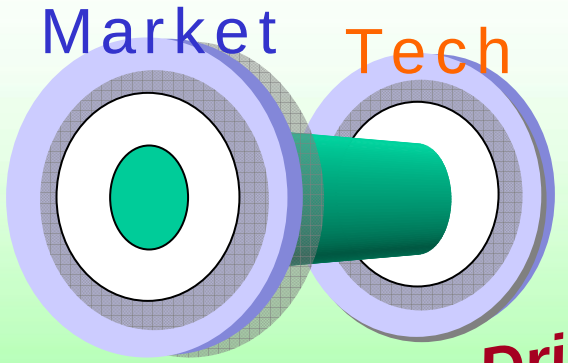
PV2030

Tech Gap for Future Young Generation Budget

'market-pull' *'technology-push'*

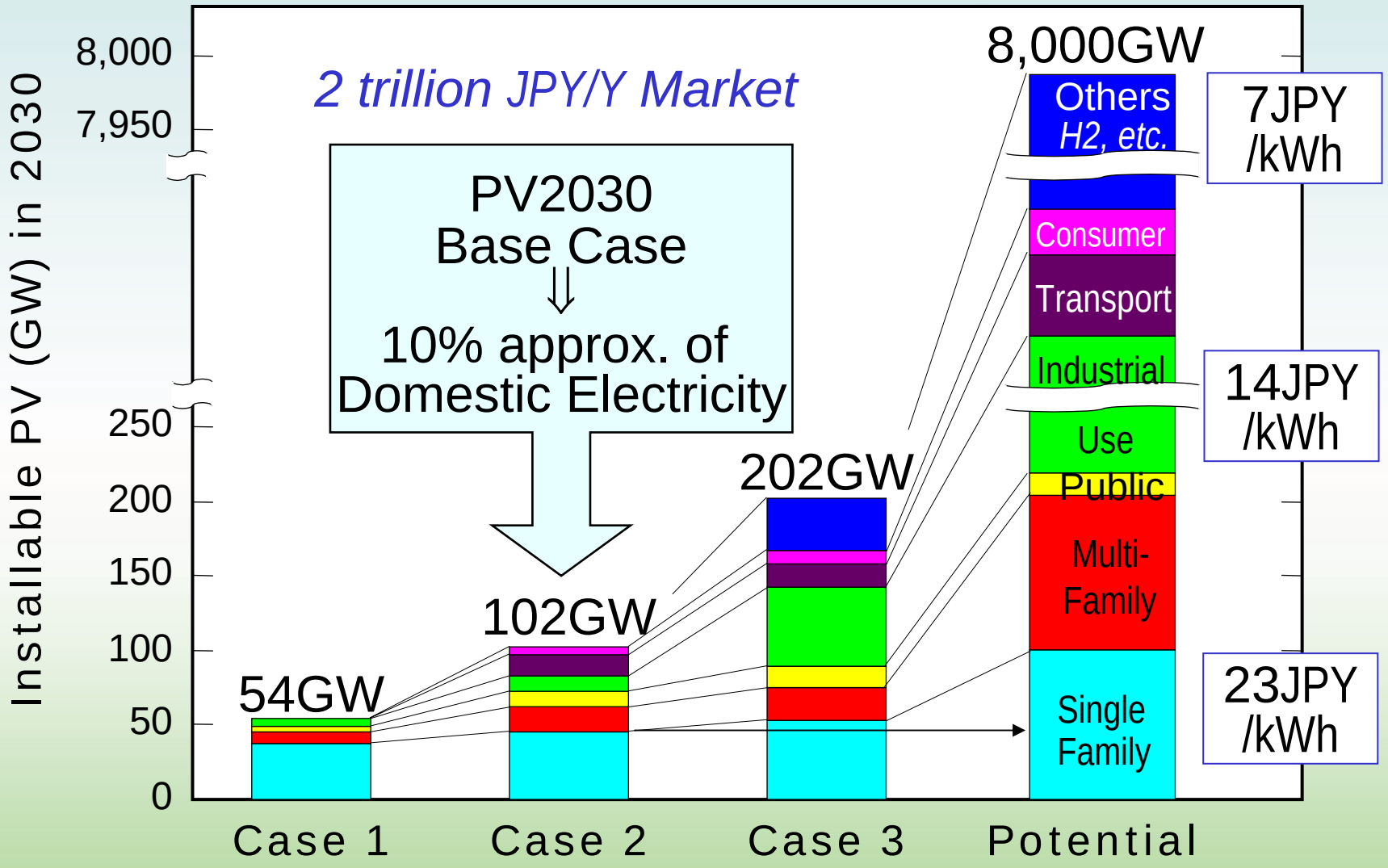


"push-pull"



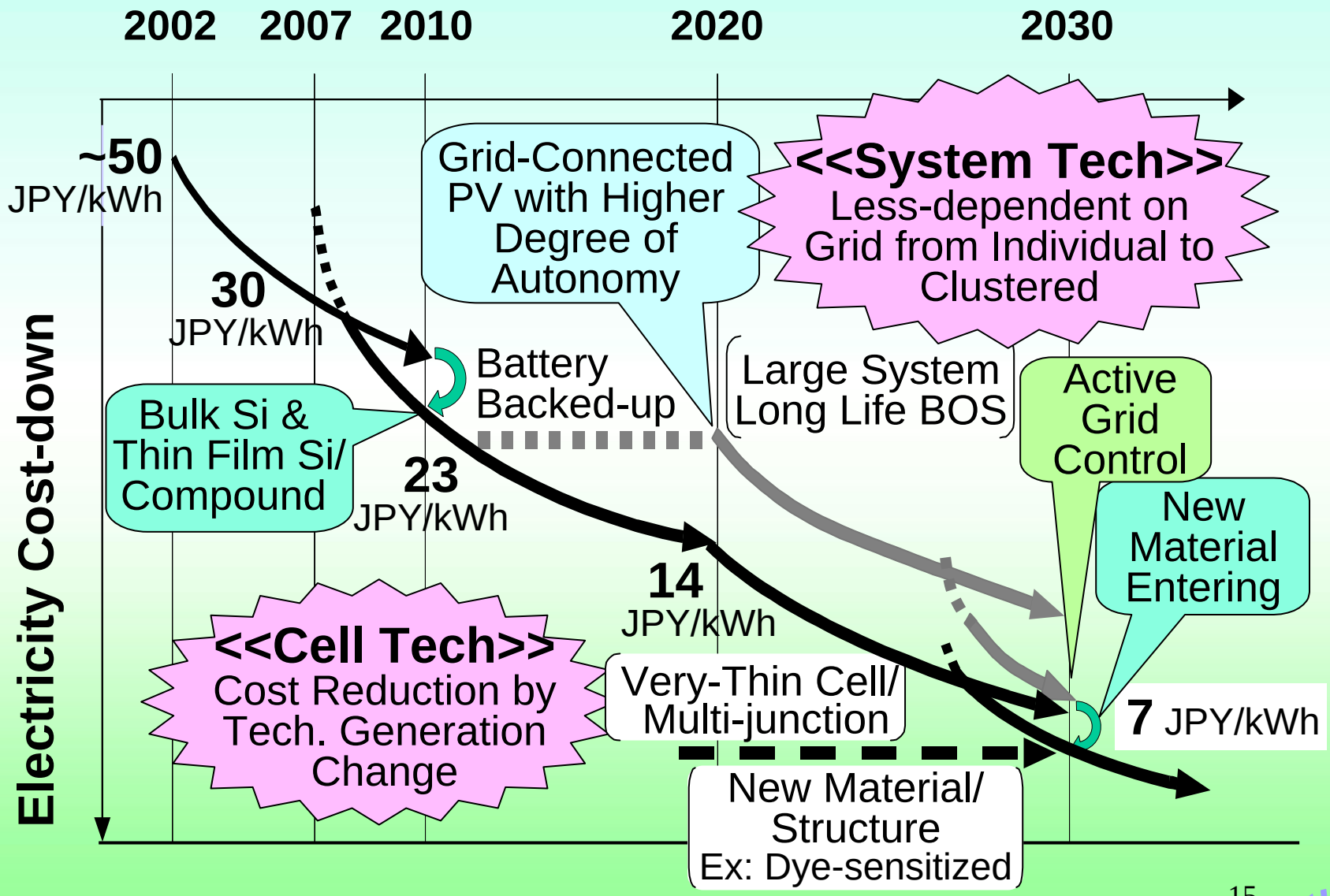
Tough Long-Term Drive !

Installable PV (GW) assuming Technological Progresses up to 2030



Case 1: Business as usual
Case 2: R&D and Market Penetration according PV2030 Base Case
Case 3: Accelerated R&D and Market Penetration with large–scale industrial use
Potential: Physical Limit by residential, public, industrial, unused land, etc.

PV2030 Scenario



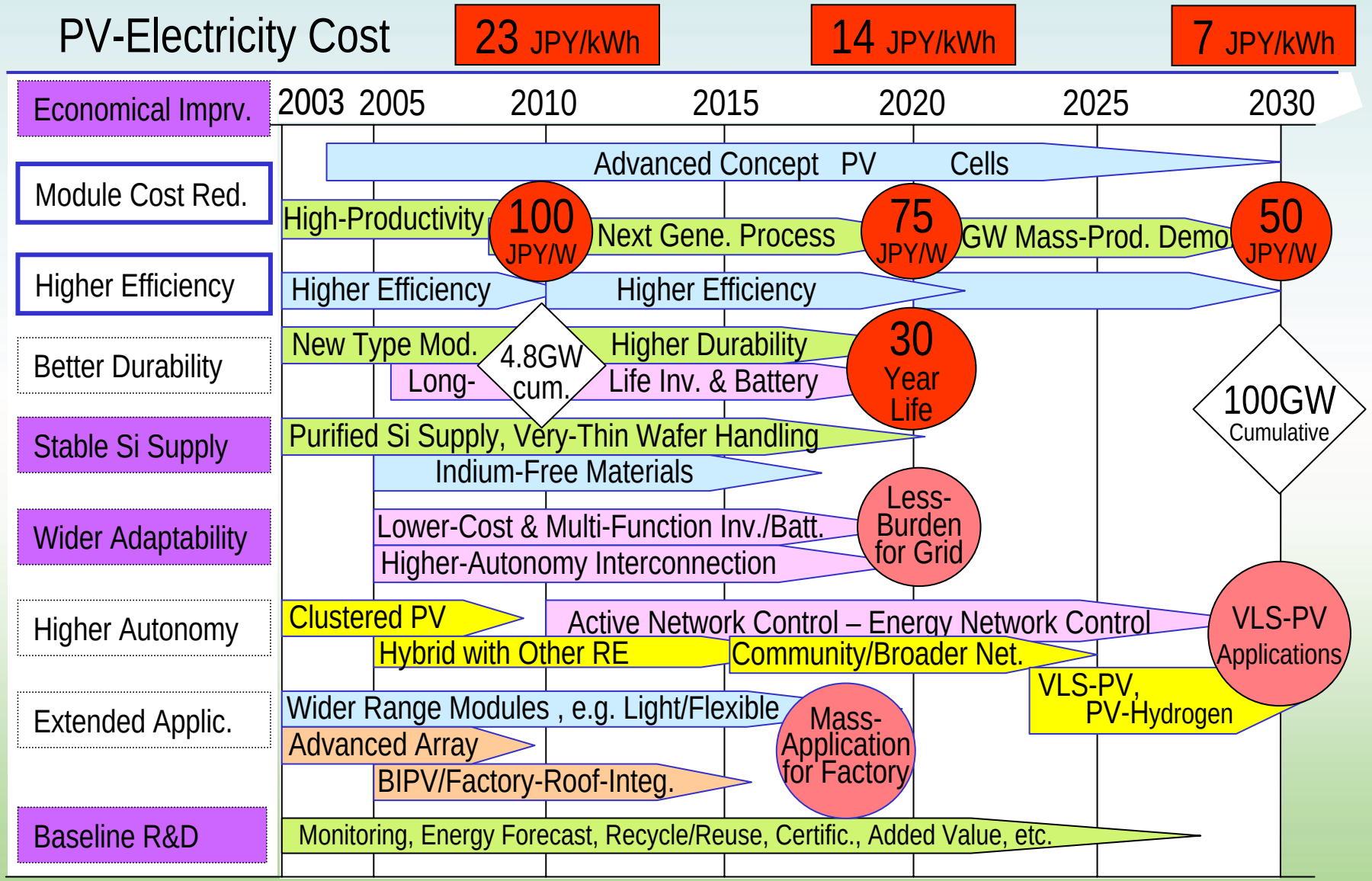
Individual Technology Target toward 2030

ITEM	Target (Target Year)
PV Module Cost Reduction	100 JPY/W (2010) 75 JPY/W (2020) **<50 JPY/W ; 22% ex. (2030)**
Higher Module Efficiency	
Module Durability	30 Year Life (2020)
Stable Material Supply	Specific Si Consumption **≈ 1 g/W (2030)**
Inverter Cost	15,000 JPY/kW (2020)
Storage Battery	10 JPY/Wh (2020)

Module Efficiency Target (%) (Cell η)

CELL TYPE	2010	2020	**2030**	
Thin-Bulk Multi-c-Si	16(20)	19(25)	**22(25)**	50JPY/W
Thin-Film Si	12(15)	14(18)	**18(20)**	45JPY/W
CIS Type	13(19)	18(25)	**22(25)**	50JPY/W
Super-High η	28(40)	35(45)	**40(50)**	
Dye-sensitized	6(10)	10(15)	**15(18)**	

Overview of Proposed R&D Items



PRELIMINARY PROJECTS FY2004-2005 TOWARD PV2030

Crystalline Silicon PV Cells

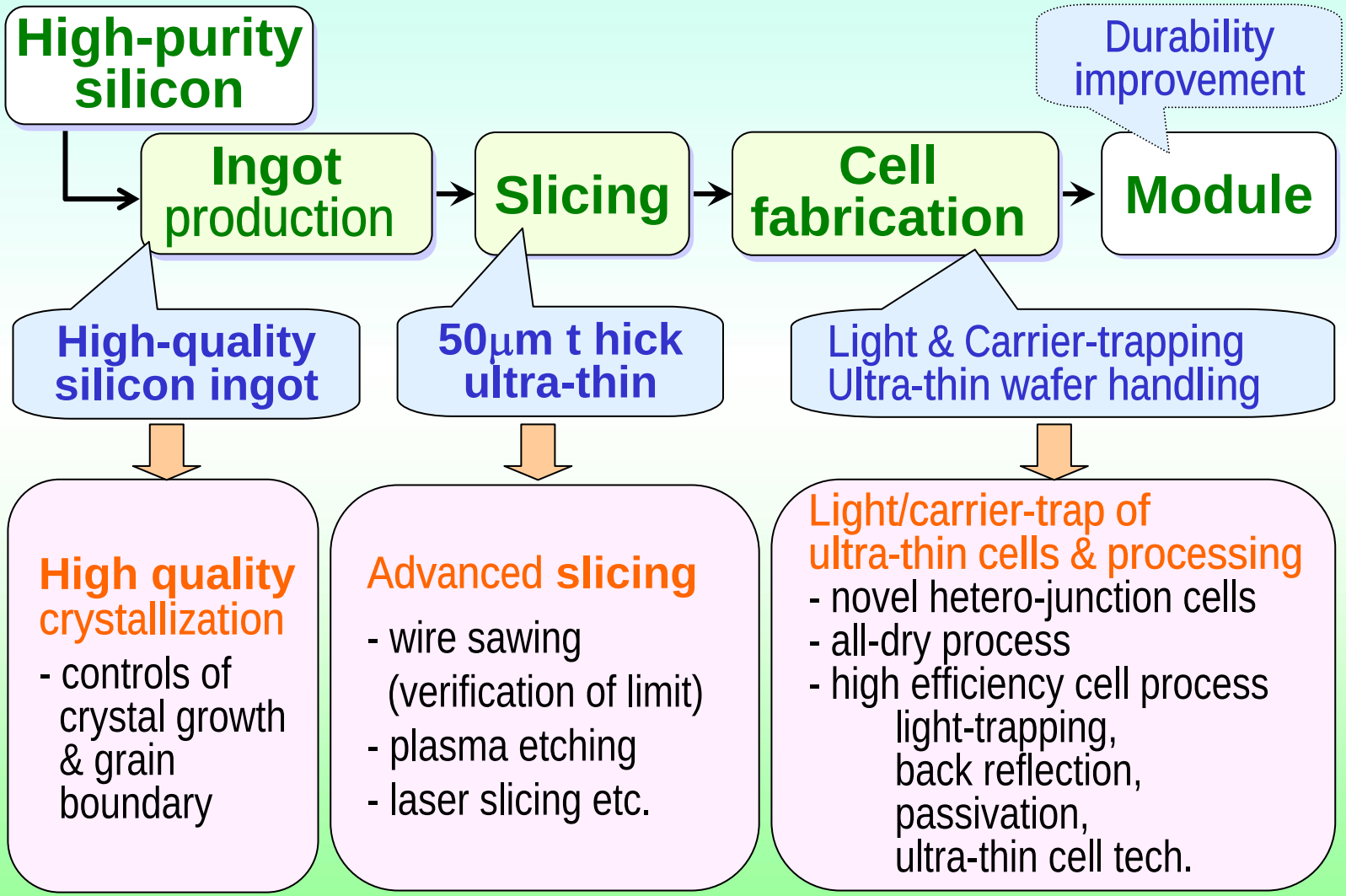
Thin-Film Silicon PV Cells

CIS PV Cells

Dye-Sensitized PV Cells

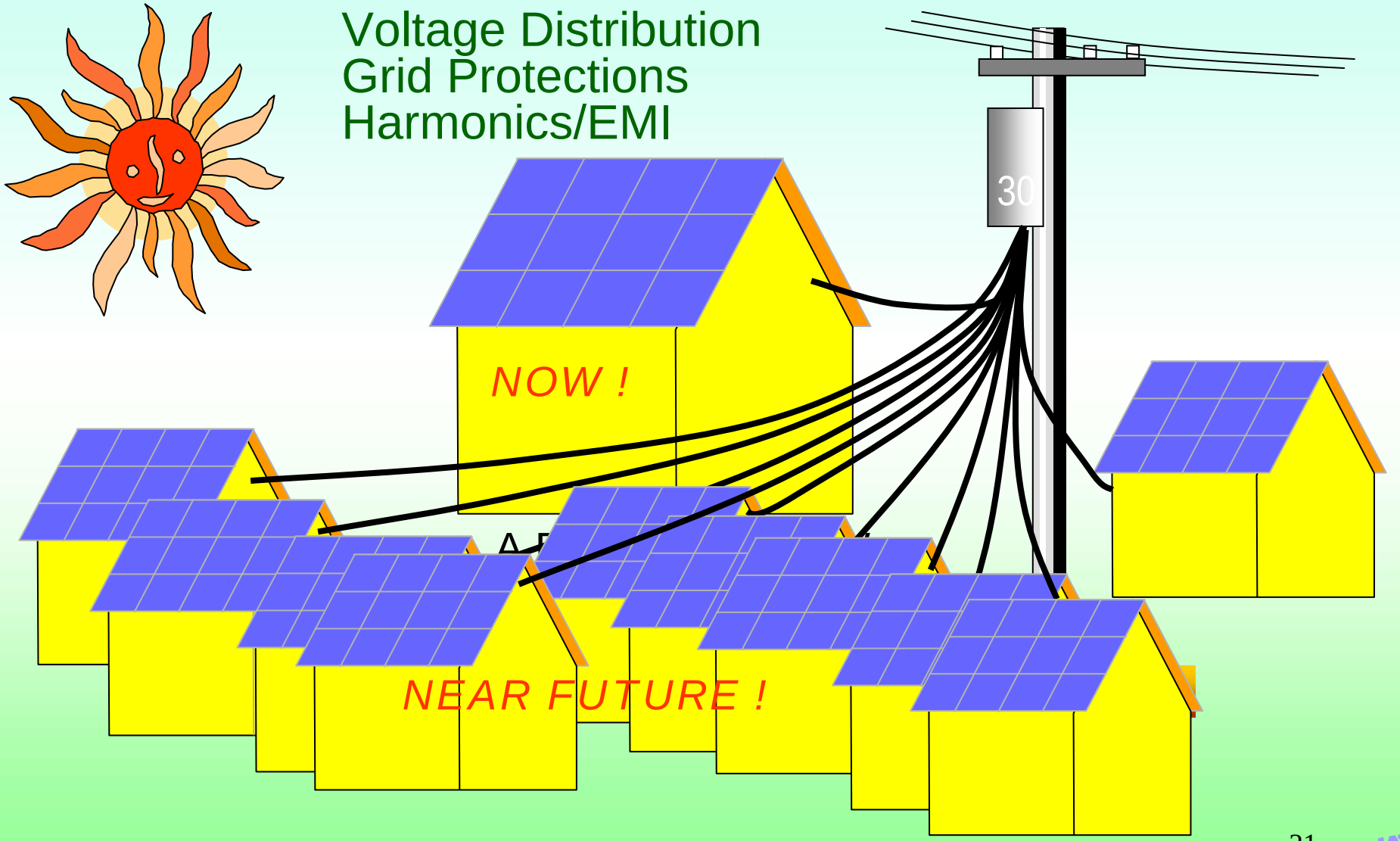
PV System Technology

Preliminary research on Crystalline Silicon Cells

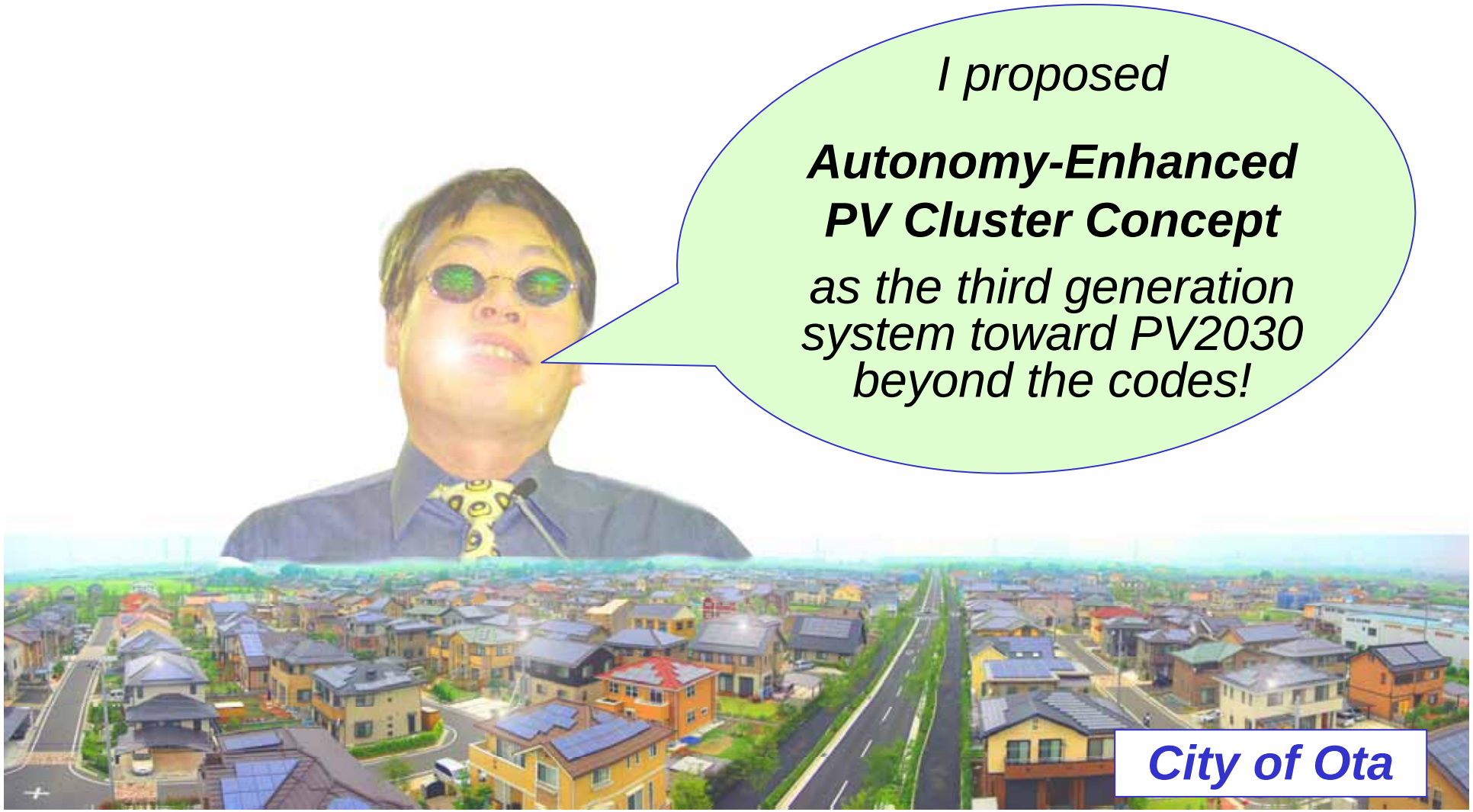


High-Density PV Cluster

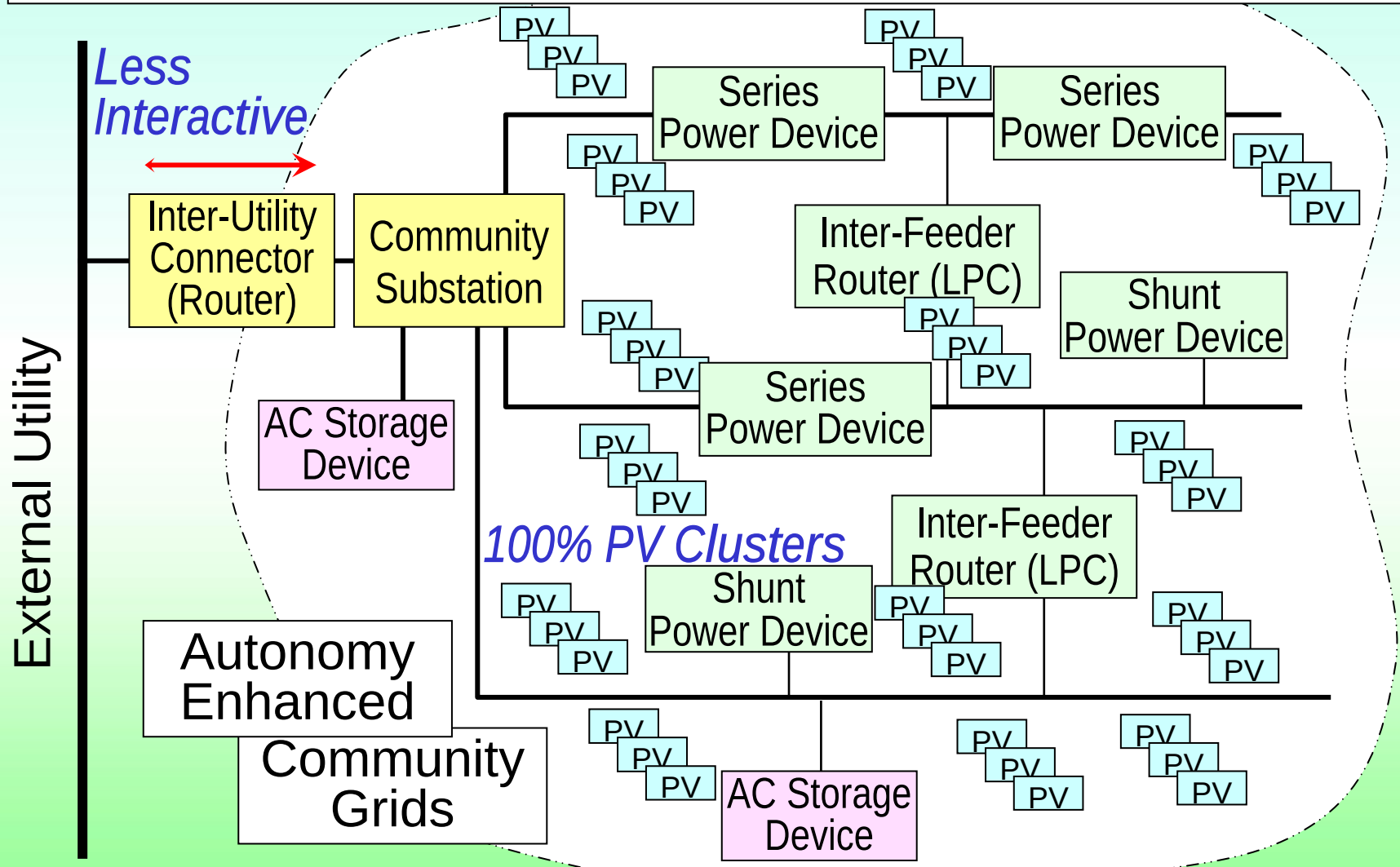
Voltage Distribution
Grid Protections
Harmonics/EMI



NEDO's CLUSTERED INTERCONNECTION RD&D PROJECT


I proposed
Autonomy-Enhanced PV Cluster Concept
as the third generation system toward PV2030 beyond the codes!
City of Ota

Autonomy-Enhanced, Community-base PV Cluster Concept by introducing Active Power Network Control



Present project status and possible future plan

June 2004	Oct 2004 March 2006	FY2006 2010	toward 2030
PV2030 discuss.	**AE-PVC Concepts**	Active Networks & Components	100% PV Community
PV2030	AE-PVC Feasibility	a series of AE-PVC R&D	AE-PVC Demo. & Deployment

AE-PVC: Autonomy-Enhanced PV Clusters

AE-PVC Project Team

Project Leader: Kurokawa

21st Century Major Energy

Total System Study by Research Group (PVTEC)

- Seeds 1: Power Elec. (TUAT)
- Seeds 2: SiC Devices (AIST)
- Seeds 3: Batt. Stn (GS Yuasa)
- Seeds 4: EDLC (Nippon Oil)
- Simul.(AIST, Waseda-u, Fukui-u)

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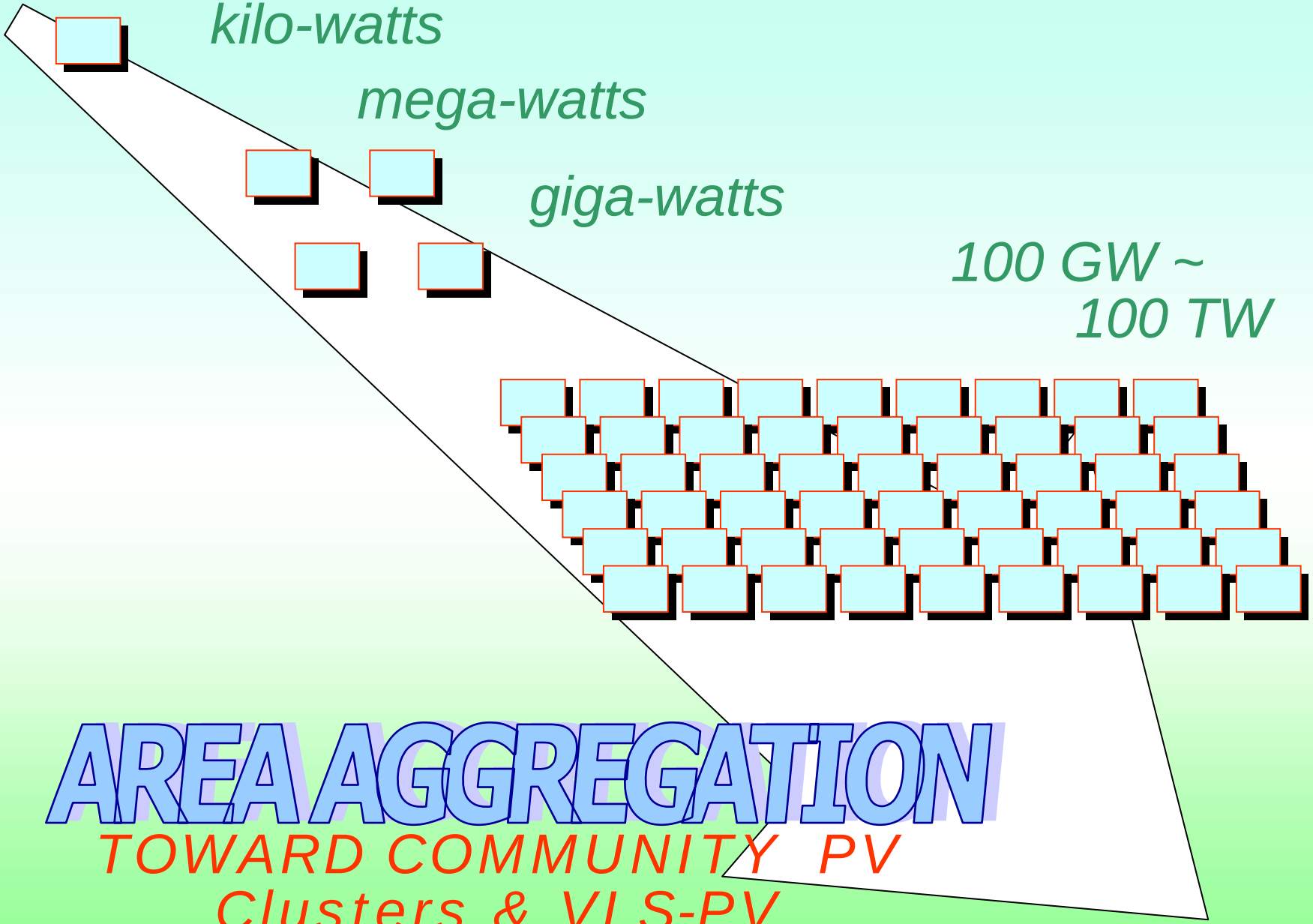

AREA AGGREGATION

TOWARD COMMUNITY PV

Clusters & VLS-PV