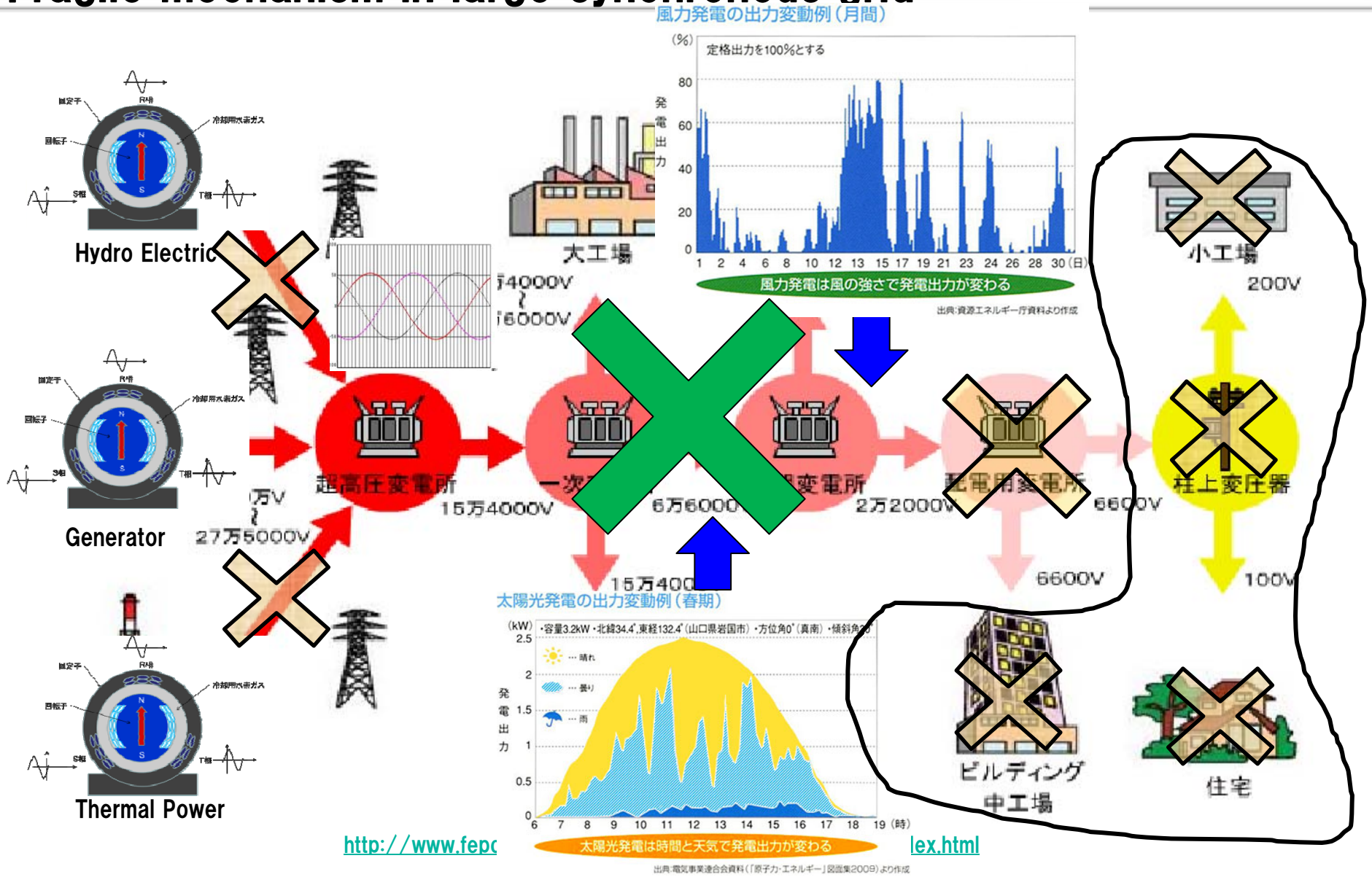
Fragile mechanism in large synchronous grid

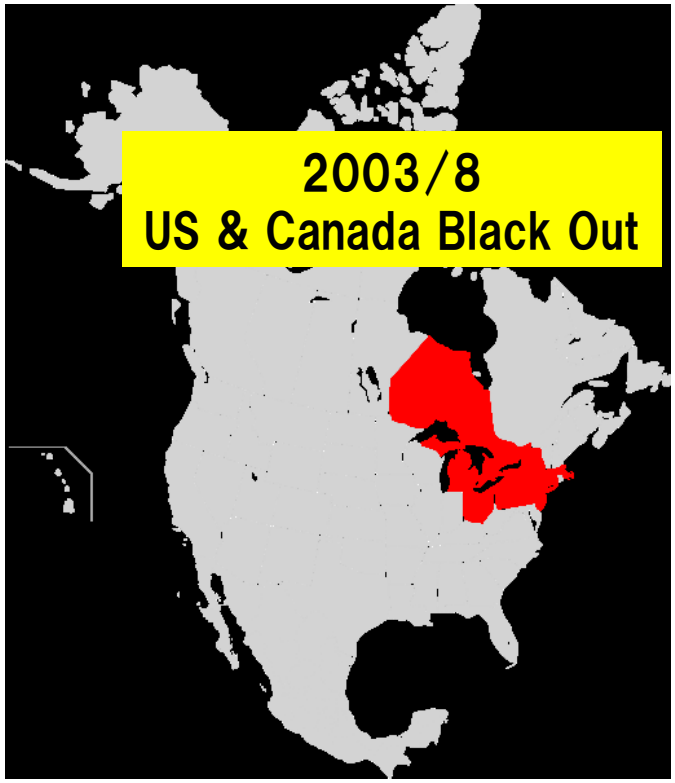


Increasing large scale black out

digital grid

A small accident or mistake causes small failure, cascading larger scale failure, resulting in huge scale black out

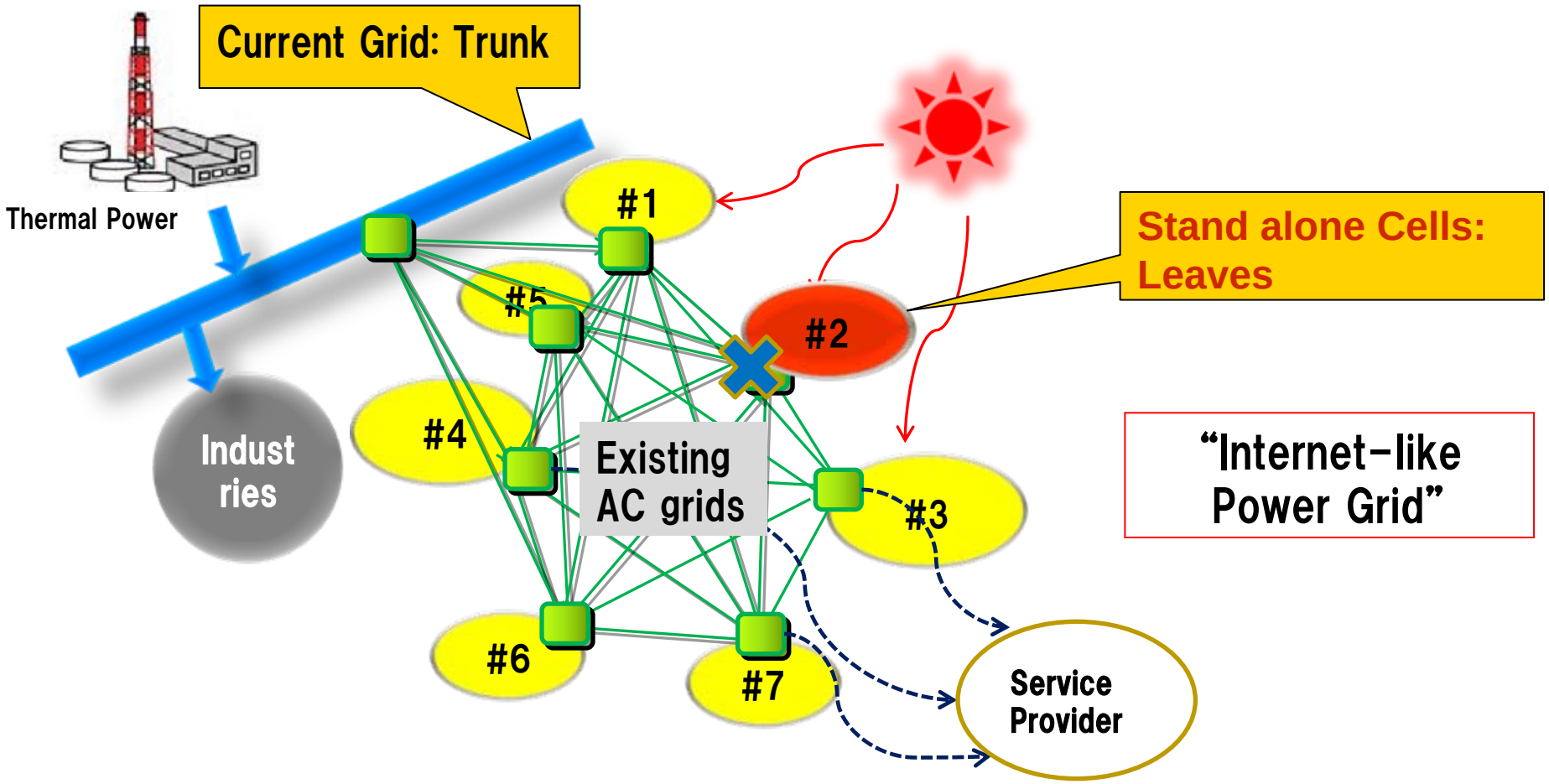
Large scale black out	Suffered number (million people)	Place	Date
Southwest US	6	San Diego, Mexico	6 days ago
Brazil	87	Brazil and paraguai	2009/11/10
Indonesia	100	Java, Bali	2005/8/18
Italy	55	Italy	2003/9/28
North East US	55	US & Canada	2003/8/14
South Brazil	97	South East Brazil	1999/3/11



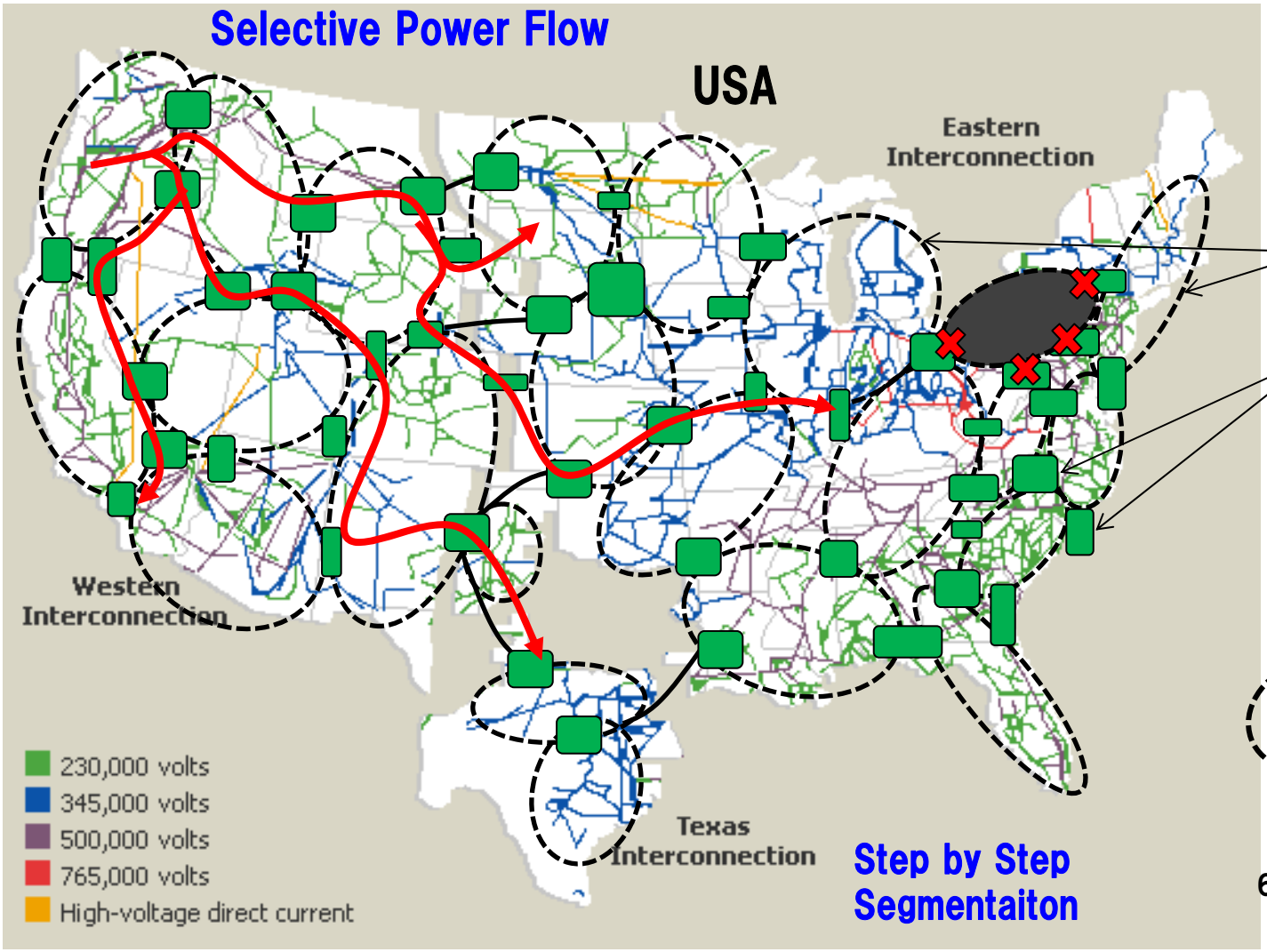
Trunk and leaves with sun-shine

digital grid

Time to change from huge unity system
to subdivided system with controlled connection



Subdivide the Grids into Digital Grid

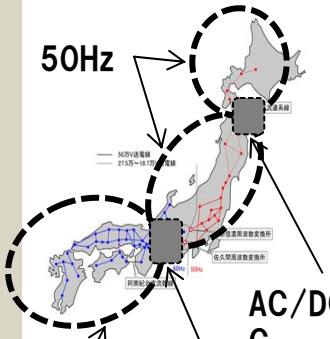


Maps are to the same scale

Cells

Digital Grid Routers

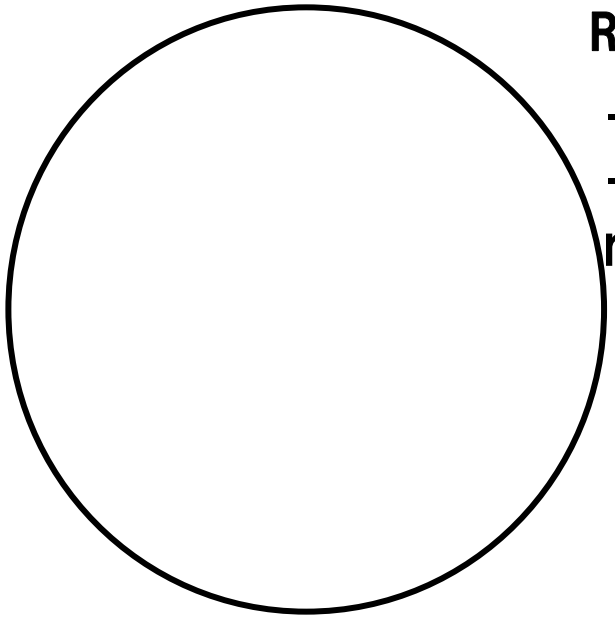
Japan



Concept of Digital Grid

digital grid

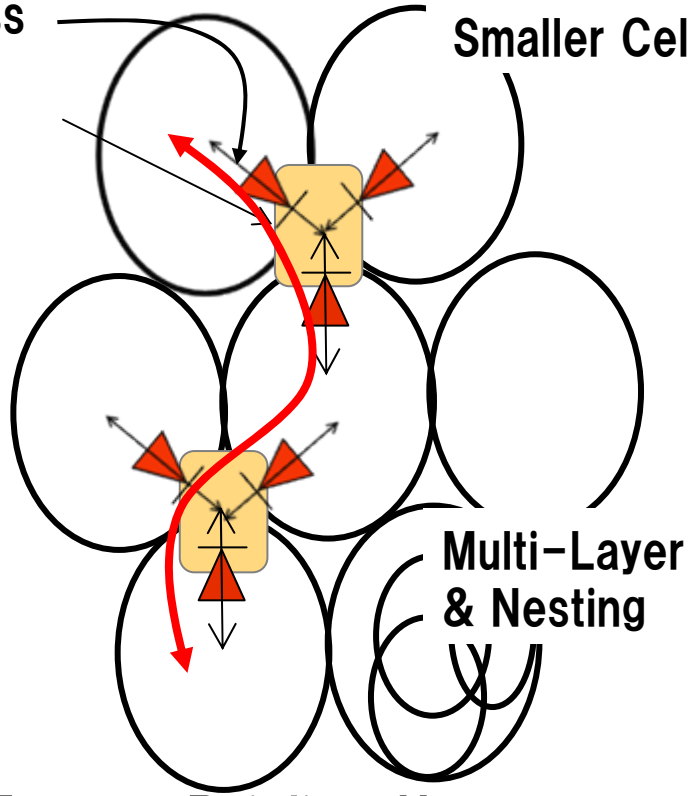
Large synchronous grid
(all the generators and motors are synchronized to the grid frequency)



Digital Grid Router™

-VSC inverter
-Multi-leg router

Smaller standalone Cell Grids
(with asynchrous connection)



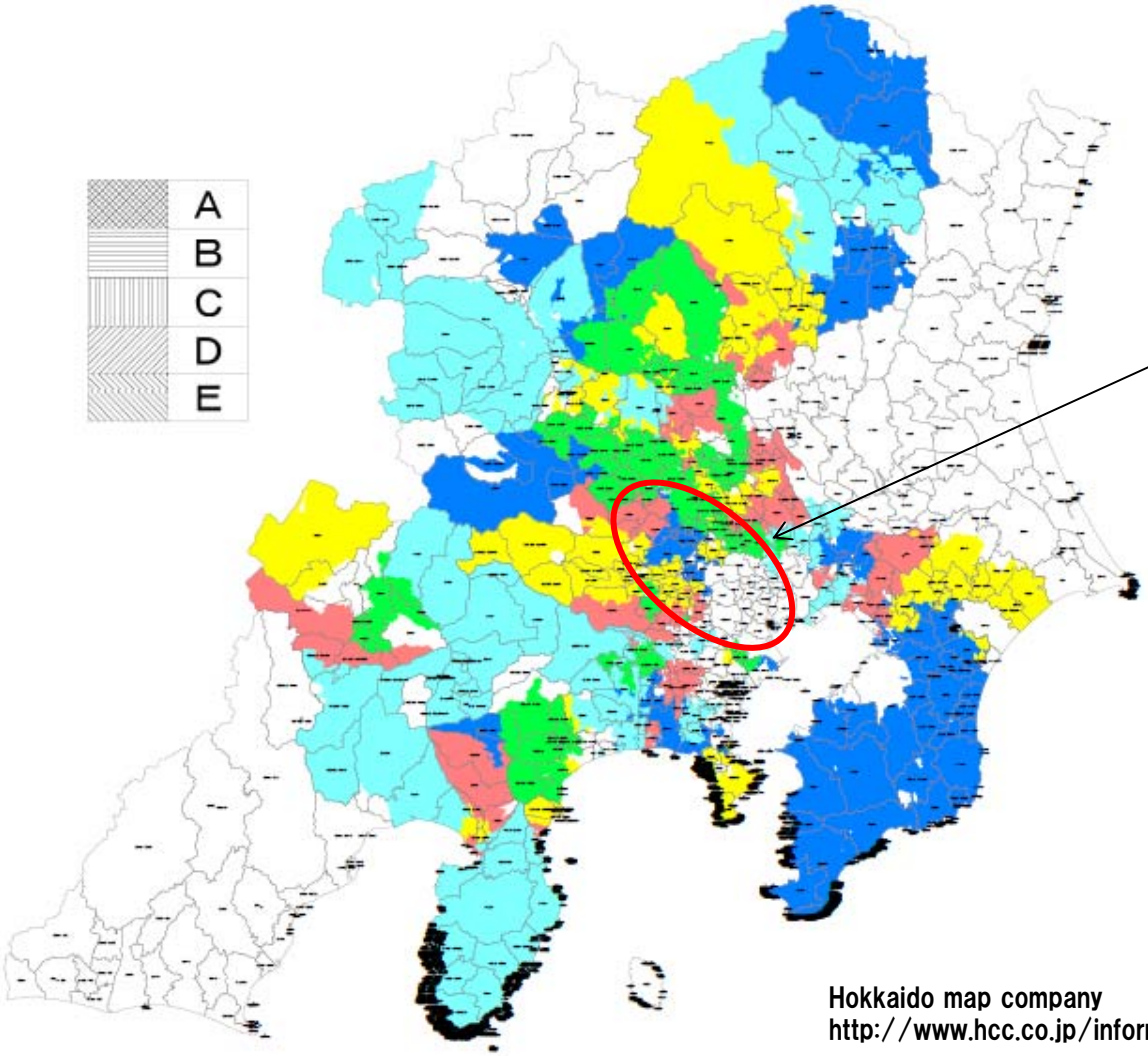
Cell Size: State, City, Town, Village, Factory, Building, House, etc.

Digital Grid actively controls T&D

	Current Grid	Smart Grid	Digital Grid
Generation	Controllable	Not Controllable	Not Controllable
Transmission & Distribution	Passive	Passive	Active Control
Demand	Not Controllable	Not Controllable	Not Controllable

Demand Response

First experience of scheduled 3hour load shedding



Hokkaido map company
http://www.hcc.co.jp/information/report/report-elecplan.html

Digital Grid Market