

Advice Pertaining to ERC Resolution No.16 and the Role of Hybrid Generation

Advice with respect to specific questions from PIPPA

George Horvath

george.horvath@aecom.com

Part A Introduction

From Power Grid #1, to Power Grid #2

George Horvath - AECOM





THE CHEESE



I used to get my electricity from something like this.



Mobile Phone Market





I still get my electricity from something like this.



Why is this so?

Healthy markets are about room for diversity and choice

- “Plenty of room in the market.”



- Diversity brings innovation and wealth.



- Wealth is freedom to chose what is best for each participant.



Electricity Markets around the world are not real markets.

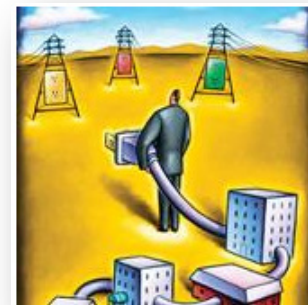
- There is very limited freedom of choice for market participants



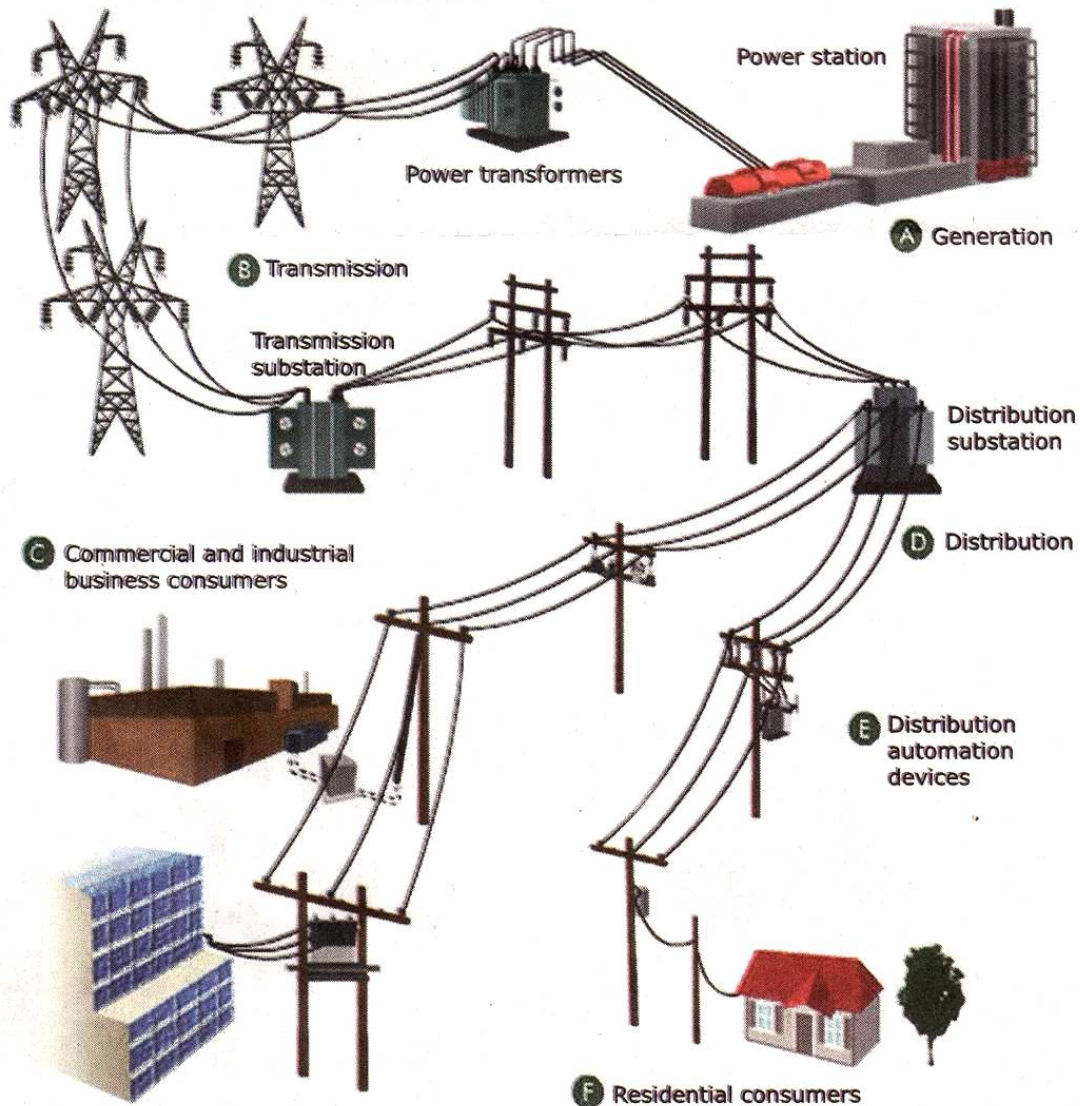
- The Rules are made by small select groups – mostly with technical rather than marketing backgrounds.



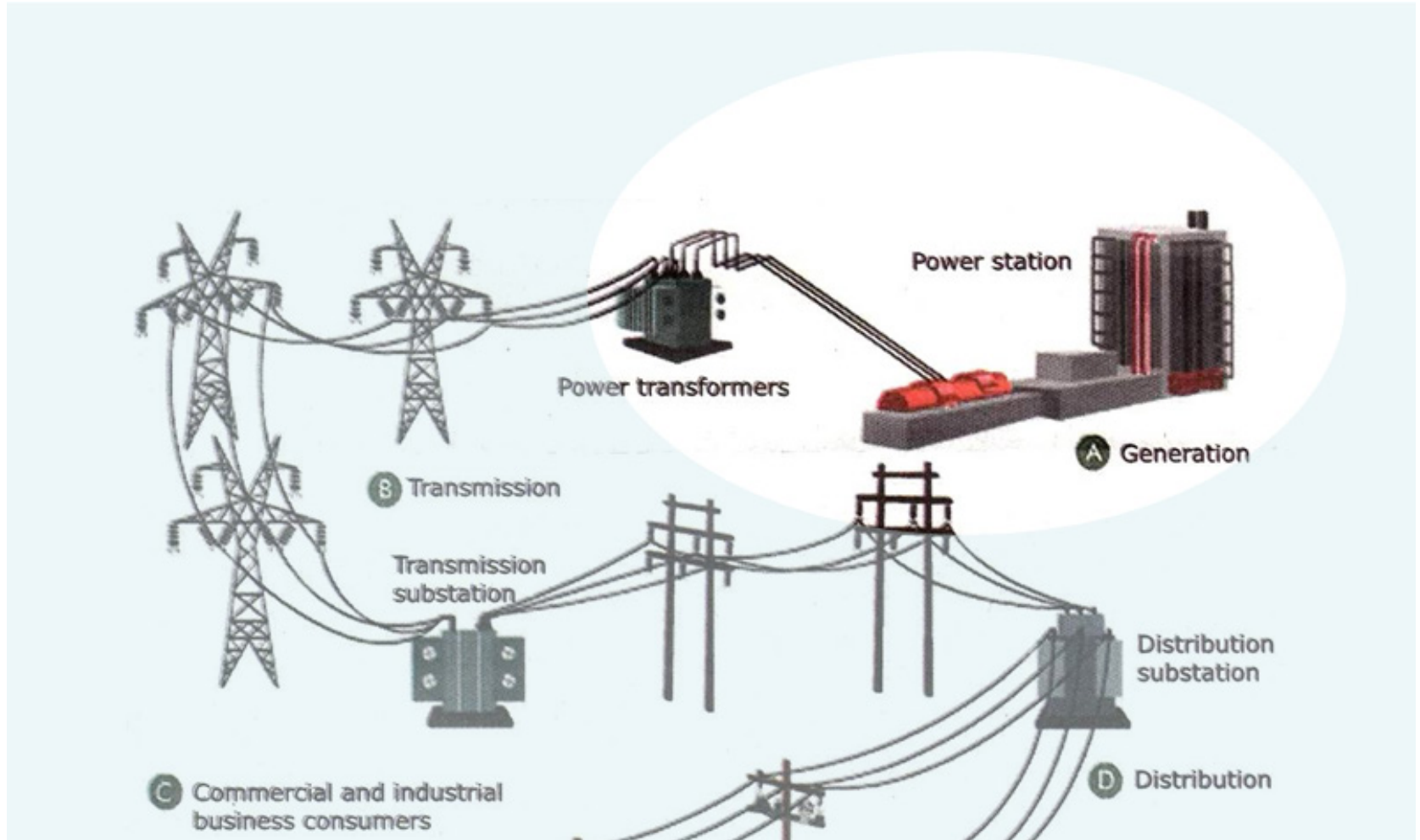
- Technical barriers to market entry are too high for many new players to enter



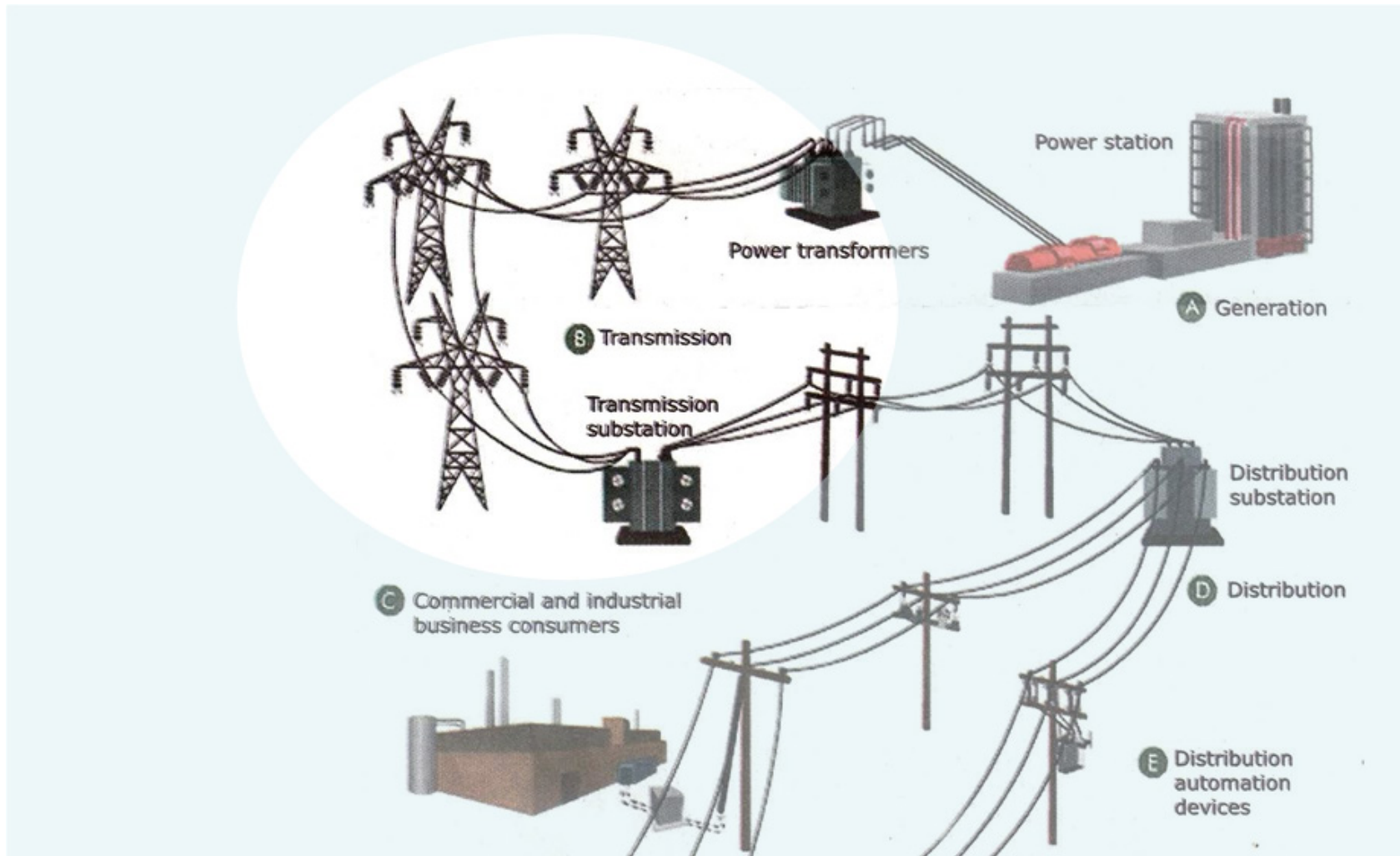
Power Grid #1 – “The Stone Age of Power”



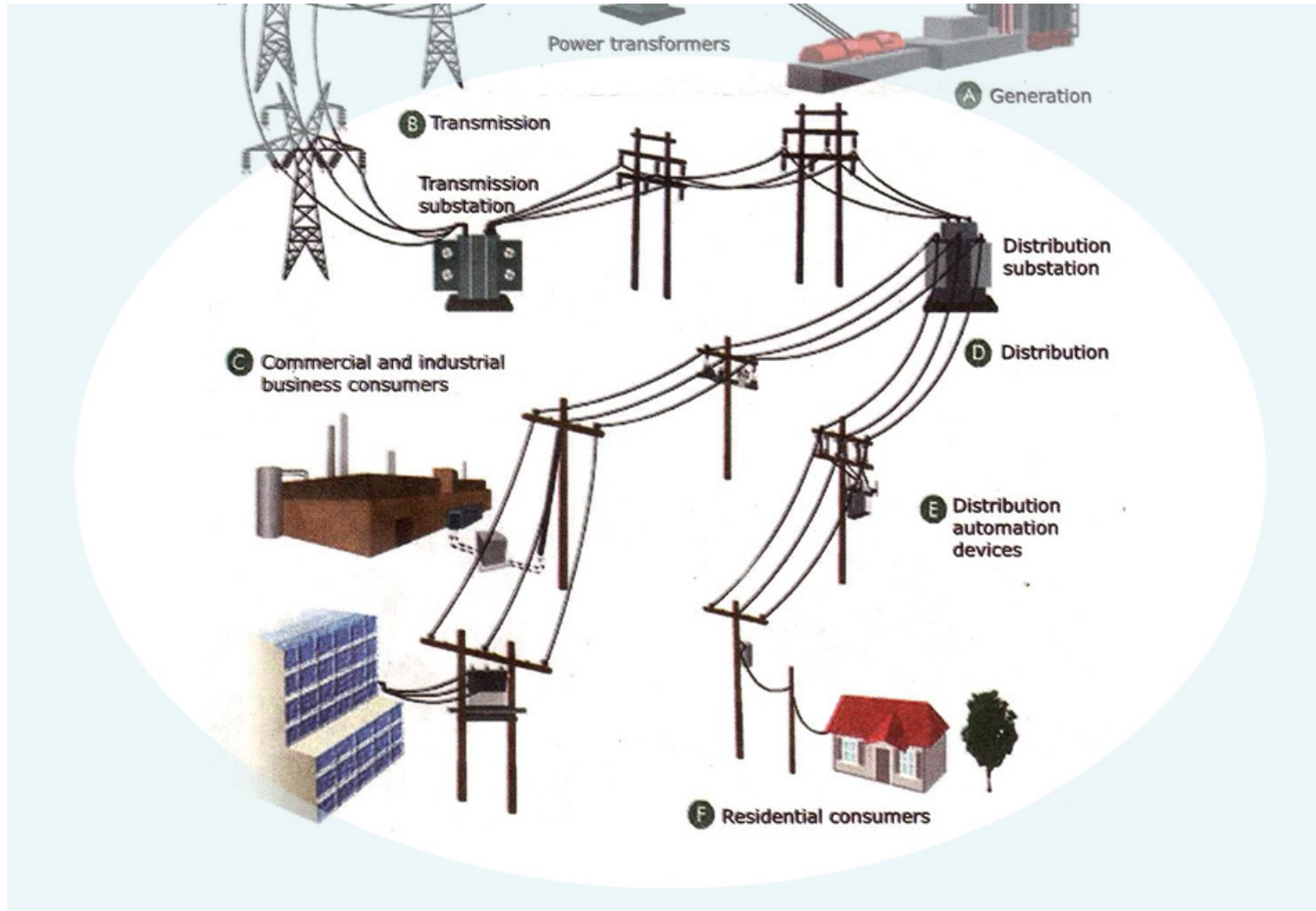
Generation – We need much more – We need to Control Greenhouse Gasses



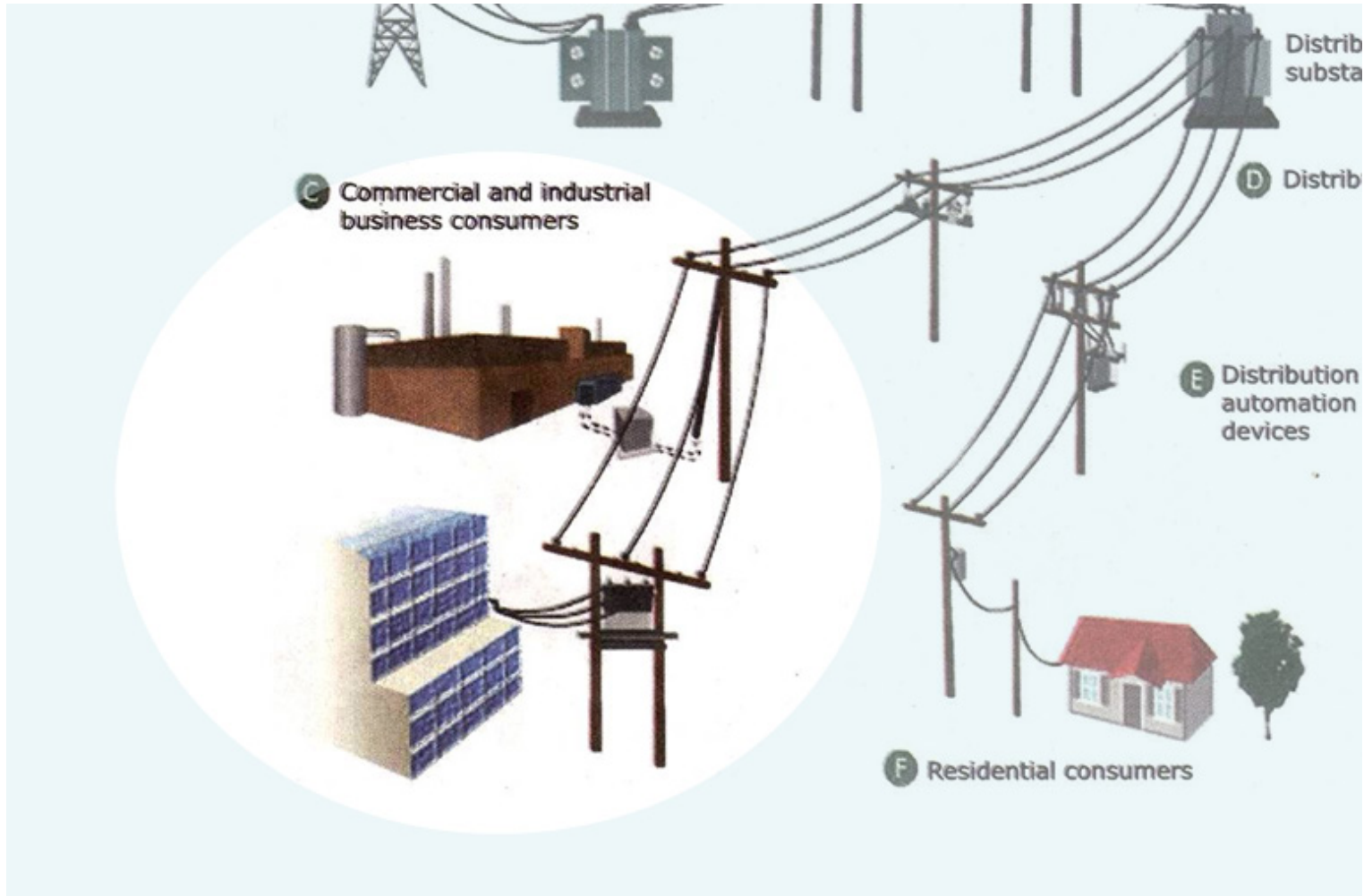
Not Enough Transmission – We need to Extend – We need new Capabilities



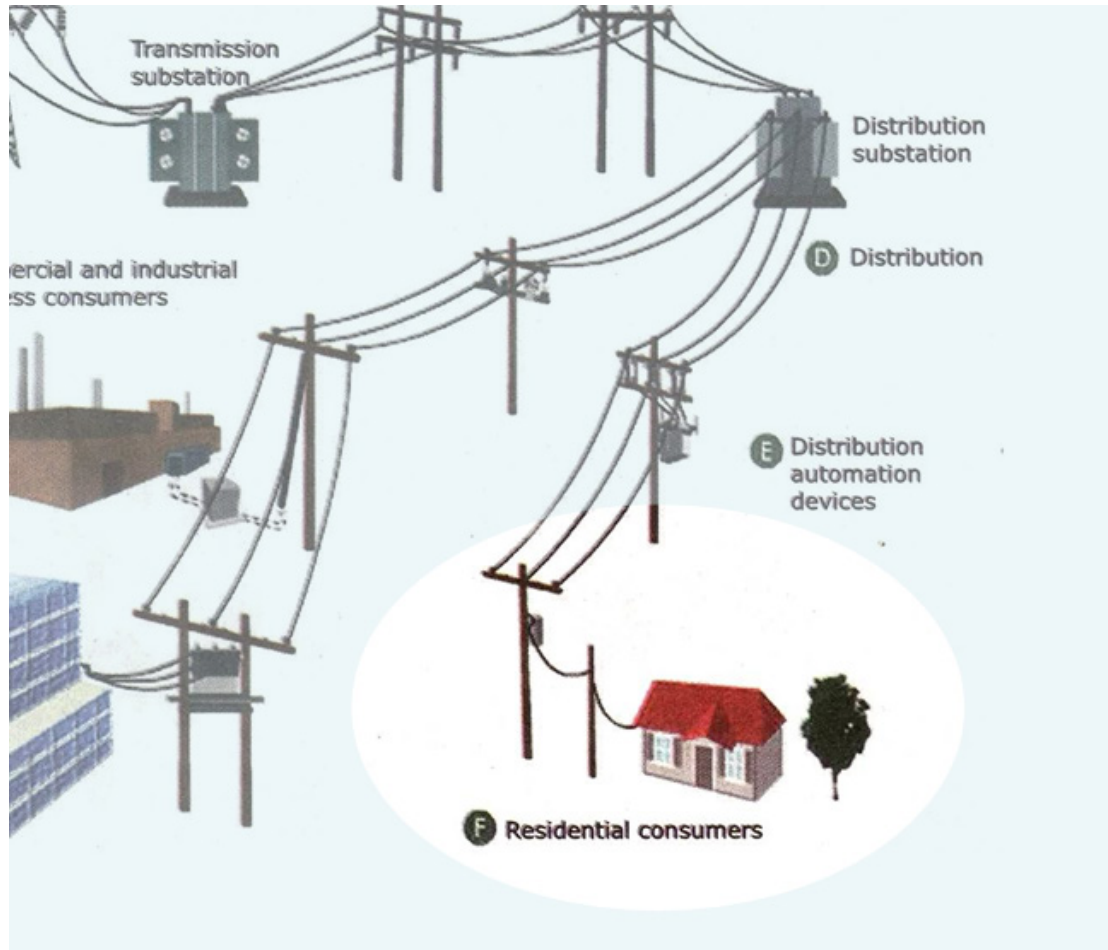
Municipal Grid – Growing Too Fast – Growing Too Old Need to Extend and Replace while Improving Services



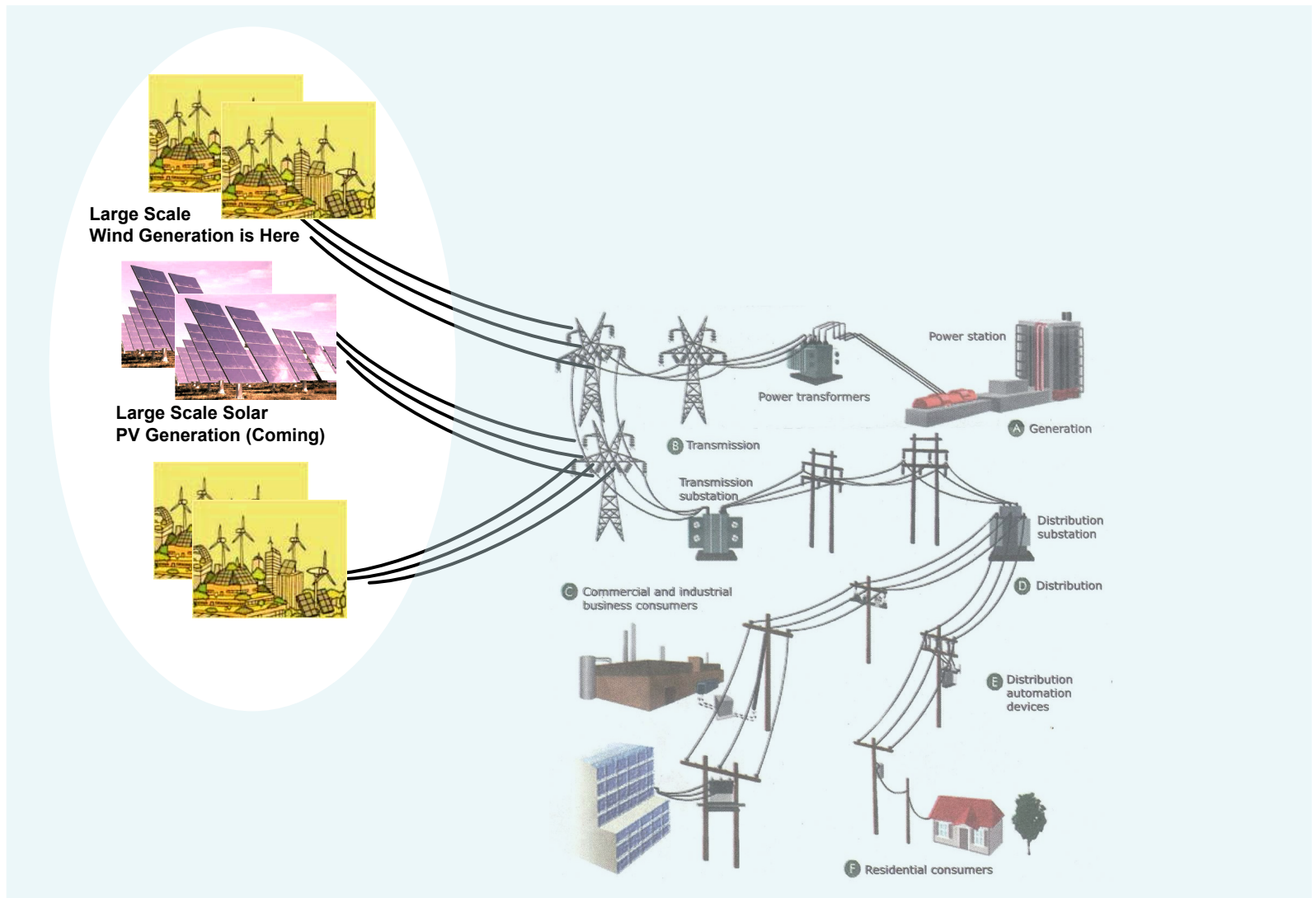
Business Customers – Need More Reliability



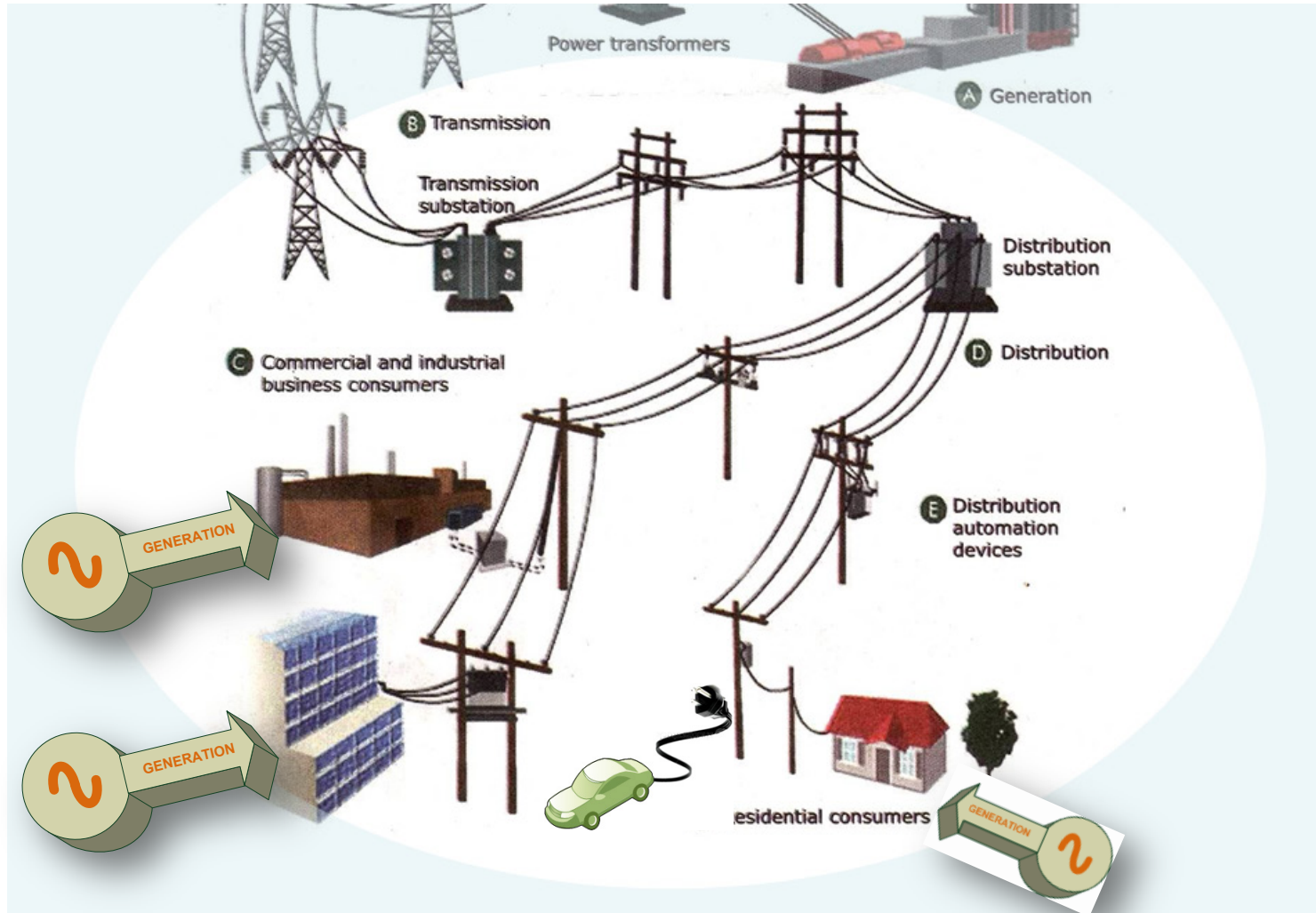
Residents – Need to control cost of energy – Need Real Choice – Regarding Supplier



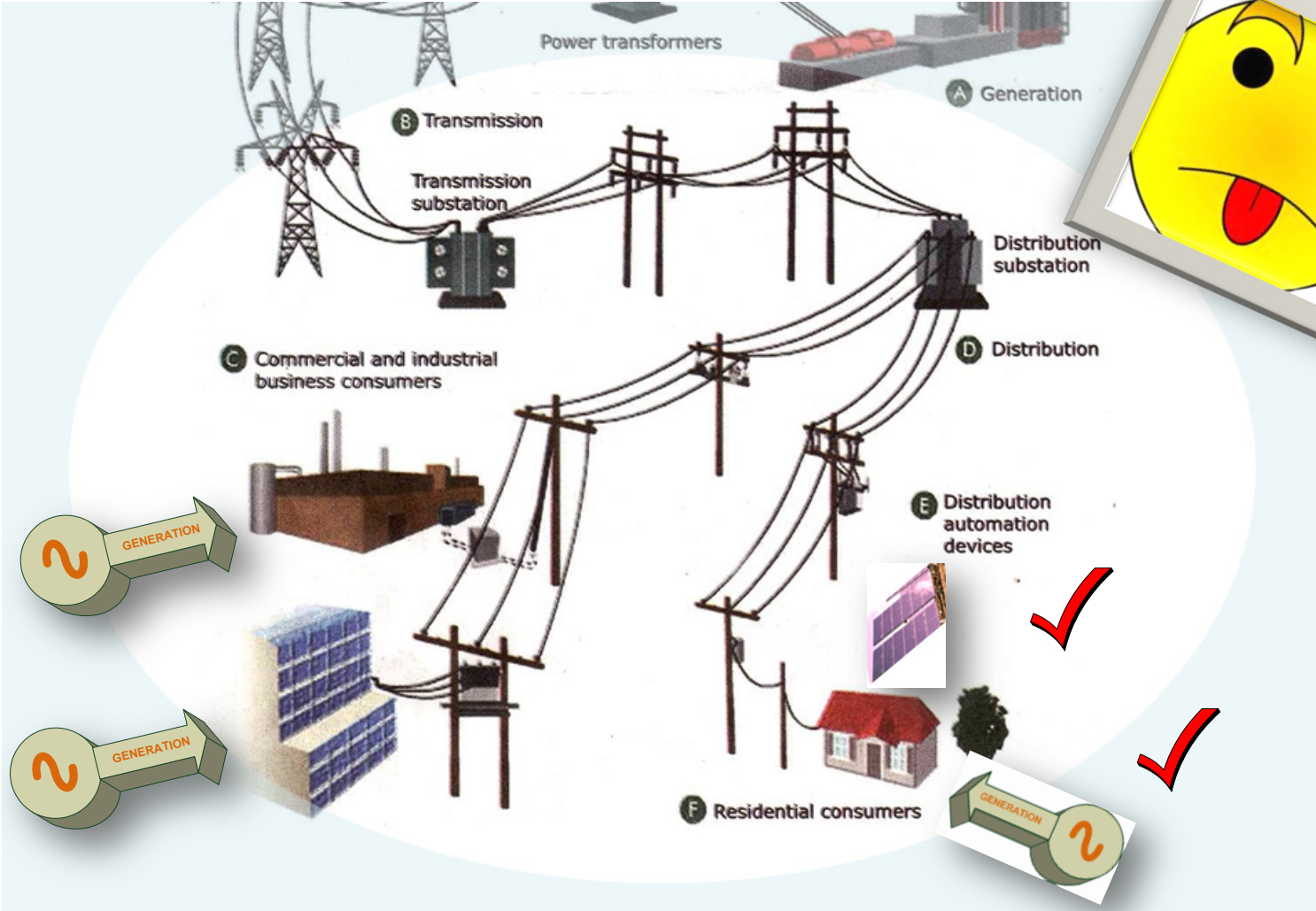
New Forms of Generation – Need New Grid Services



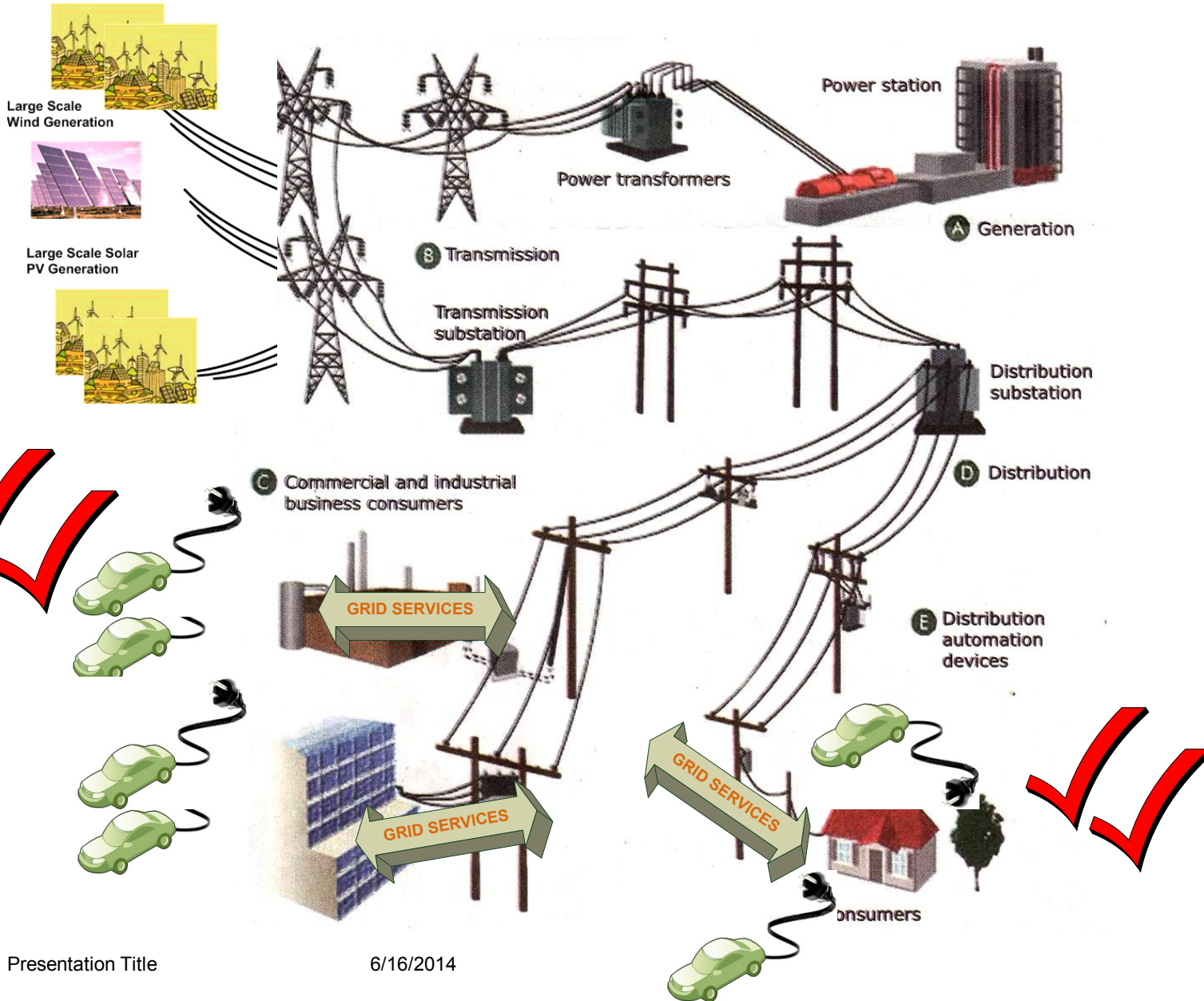
Distribution System – Will become a “Smart Grid” system Hosting Hybrid & Embedded Generation



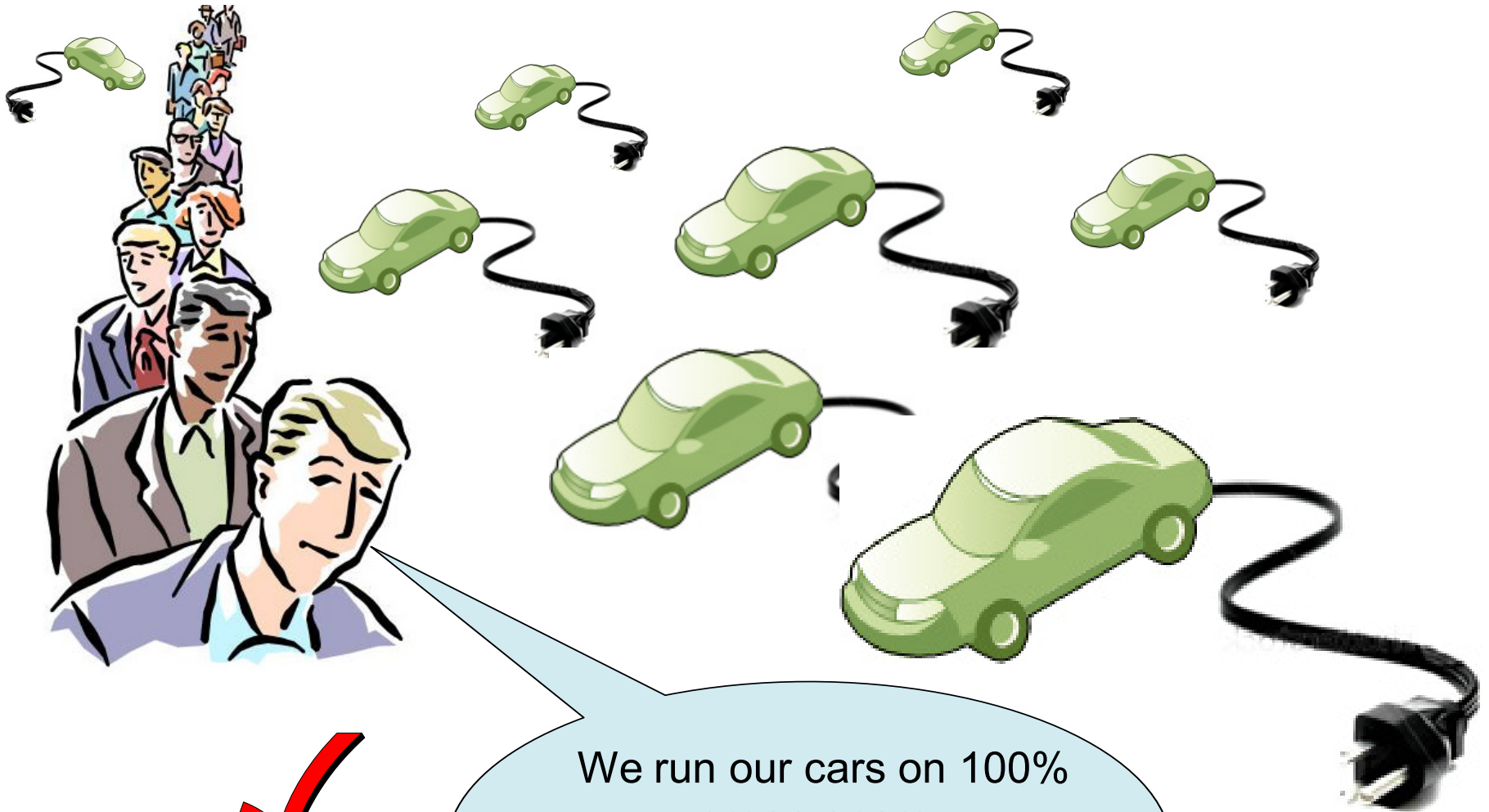
Will all “Distribution” Then be a “Transmission System”?



The Big Opportunity is – EV Power Storage



Power Grid #2 - when we can say:-



We run our cars on 100%
green energy.
What is more: - We get it for free!

A healthy Energy market room for diversity and choice

•“Plenty of room in the Energy Market.”



•Diversity in the Energy Market brings innovation and wealth and reduction in cost for consumers.



•Wealth is customer participation through freedom of choice.



Energy Market Governance Must Adapt to Enable a Diverse and Vibrant Energy Market



Part B

Summary of PIPPA's Questions
together with
Summary of AECOM's Advice

PIPPA Topic 1

Given that Section 4.2, Annex A of Energy Regulatory Commission (“ERC”) Resolution 16, series of 2011 is inconsistent with diagram 4 of the same ERC Resolution;

PIPPA would like advice on the following:-

PIPPA Topic 1

Question 1(a) from PIPPA:

Is the definition of “Connection Assets” in Section 2.0, Annex A of Reso. 16 consistent with the definition of connection assets in other jurisdictions?

AECOM Answer - Advice to PIPPA:

The definition of “Connection Assets” is consistent with the definition of connection assets in some other jurisdictions

In practice, there is a broad diversity in connection assets, which depends on the intended operational and business purposes they will serve.

PIPPA Topic 1

Question 1(b) from PIPPA:

What specific types of assets or equipment are considered “Connection Assets” in other jurisdictions?

AECOM Answer - Advice to PIPPA:

Connection assets are links in the electricity network that are constructed to connect one grid customer at a location in the network.

There is a broad diversity in types of assets which serve as connection assets, ranging from entire switchyards and transmission lines, to as simple as the conductors that link a generator to a transmission switchyard. The form depends on the purpose they will fulfil.

PIPPA Topic 1

Question 1(c) from PIPPA:

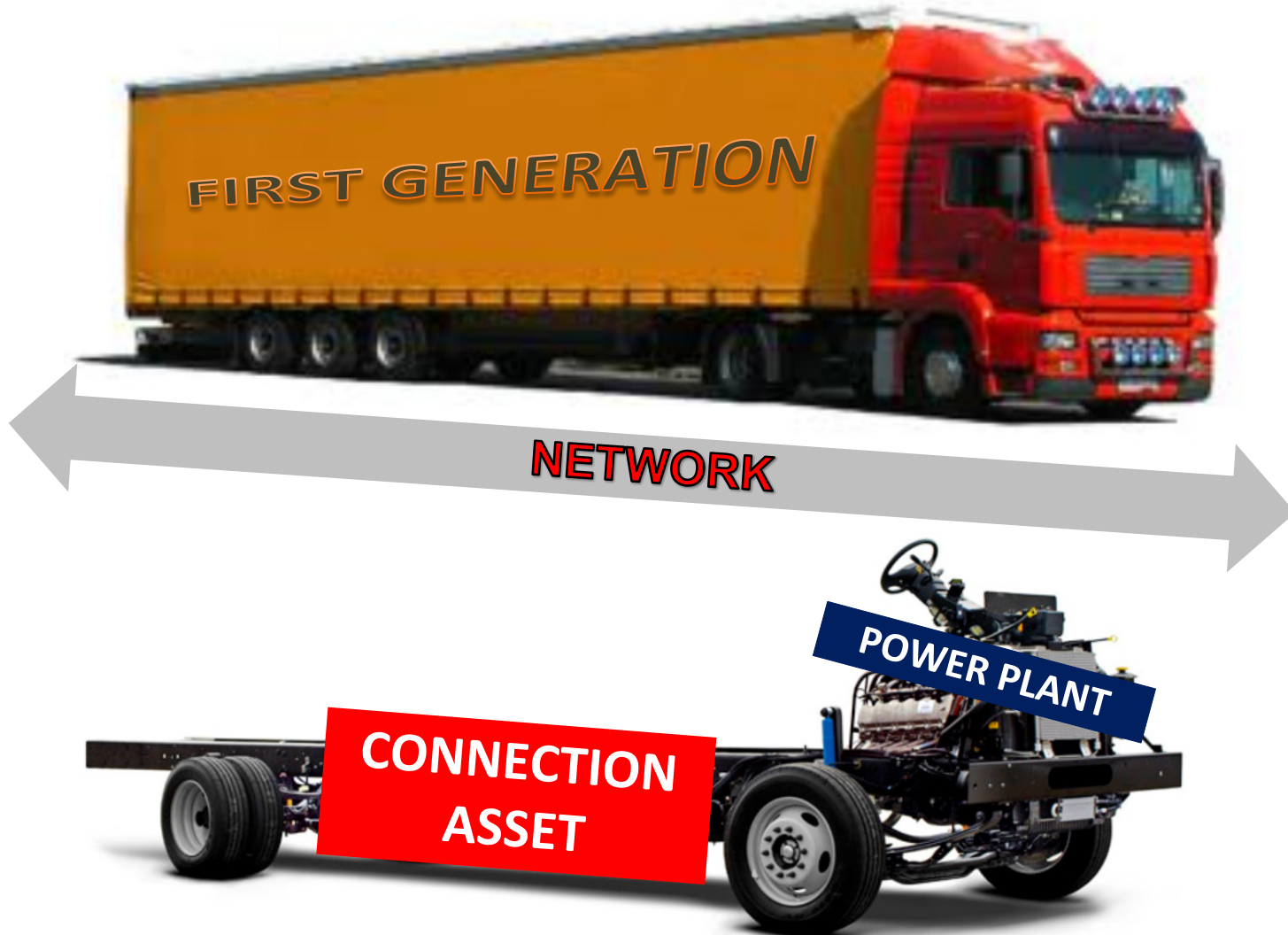
Is the definition of “Connection Assets for Generation Customers of Transmission Provider” in Section 4.2, Annex A of Reso. 16 consistent with the definition of connection assets in other jurisdictions?

AECOM Answer - Advice to PIPPA:

There is a wide diversity in the forms and the extent of connection assets of power plants in other jurisdictions.

There is also wide diversity in the forms and extent of connection assets of distribution customers, which may in turn, connect generation with the grid.

Connection Assets



Example - The 500 kV Connection Assets of Nam Theun 2 Corporation - Laos

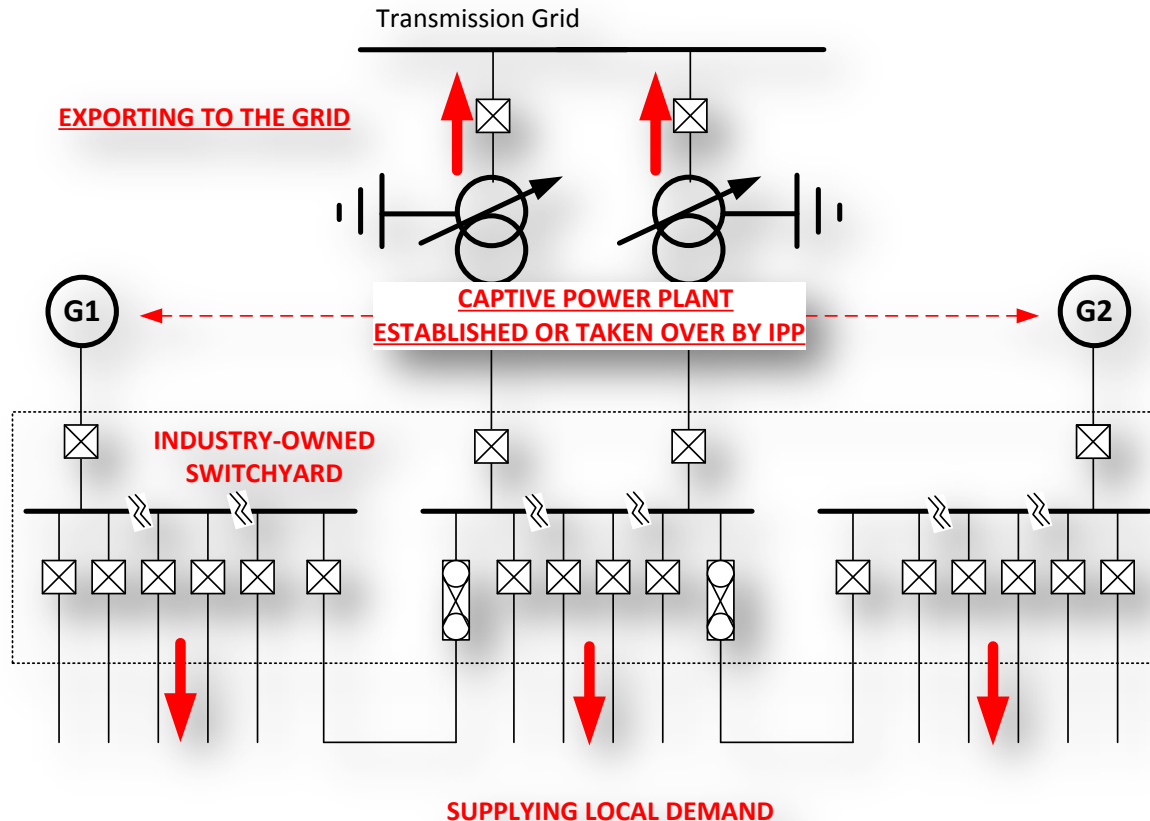


Also: ~ 320 km of 500 kV Transmission Line Connecting NT2 to EGAT RE2 Substation.



Captive Power Plant Built or Taken Over, By a Generation Company - Examples

At; Industry Parks - Steel Mills – Oil & Gas Facilities – Pulp & Paper Mills – Sugar Refineries – Mines – Port Facilities – Municipal Substations - - - -



PIPPA Topic 2

With regard to a switchyard being an integral part of a power plant;

PIPPA would like advice on the following:-

PIPPA Topic 2

Question 2(a) from PIPPA:

Do you agree with the proposition that a switchyard is an integral part of a power plant? Why, or why not?

AECOM Answer - Advice to PIPPA:

Yes, a switchyard is part of a power plant, if it has been built primarily for the purpose of conducting the business of power generation.

A switchyard is *not* part of a power plant if it has been built primarily for the purposes of the shared grid, even if power plant connects to it.

PIPPA Topic 2

Question 2(b) from PIPPA:

Are you aware of any power plant without its own switchyard? If yes, please explain the circumstances in which that plant is being operated.

AECOM Answer - Advice to PIPPA:

Yes, when assets of a state-owned combined generation and transmission corporation was split into two state-owned entities → a Generation Corporation, and Transmission company – Before generation is sold off.

New power plant is developed near its fuel source. It will have a switchyard – for its own operational & business purposes – reliability, maintenance, expansion, etc.

PIPPA Topic 3

With regard to the statement:

“The acquisition of a power plant’s switchyard does not affect Grid Security.”

PIPPA would like advice on the following:-

PIPPA Topic 3

Question 3(a) from PIPPA:

NGCP has asserted that it needs to acquire the switchyard of certain power plants (particularly those that also directly connect the plant to a distribution utility) for grid security. What are your comments on this?.

AECOM Answer - Advice to PIPPA:

There are no means by which the acquisition of a grid-user customer's assets could be justified under a regulated, grid investment process.

If there is a need for any asset, then the Grid Investment Process ensures that grid company can fund its own asset. I know of no mandate by which it could disrupt its customers' businesses by breaking them up.

I know of no cases wherein Power Plant switchyards have been compulsorily acquired from Power Plant Owners by the Grid Company.

I have been Expert Witness in the break up of a Power Generation Business wherein the High Court decided that:-

“Any assets **created as part of Power Plant** are parts of the Power Plant and **must remain with the Power Plant** in the division of assets to be sold separately.”

PIPPA Topic 3

Question 3(b) from PIPPA:

Assuming that the acquisition of a power plant's switchyard may enhance grid security, are there other more effective ways to achieve such purpose? If yes, what are they? Why are they more effective?

AECOM Answer - Advice to PIPPA:

It is my opinion that transferring ownership of power plant switchyards would DECREASE RELIABILITY and INCREASE THE COST of the grid for users and the public.

There are many ways of improving grid reliability other than increasing the number of assets, and these alternatives would involve lesser cost and have produced verifiably positive results.

PIPPA Topic 3 – Ways of Improving Grid Reliability

Better designs - better materials – more standardisation – Reliability Centred Maintenance – (FEMCA) – clear and exacting systems performance requirements – better condition monitoring and testing – better in-service training of engineers – stricter compliance and reporting – proactive investigations of non-compliances – well developed codes and standards of performance –

and also: “N-1 and “N-2”

PIPPA Topic 3 – Ways of Improving Grid Reliability

AECOM Answer - Advice to PIPPA:

For the Transmission Industry; the formal consideration of reliability centres on “N-1” and “N-2”, which is not efficient.

Other reliability techniques are not formally implemented within utilities. Grid reliability would benefit from any and all of the initiatives listed on the previous slide.

Current initiatives being undertaken by utilities include:

Changing the utility’s culture from being “CAPEX-led” to being “Services-led” with “Asset Management” as the focus.

Improving the quality of organisational function e.g., training and adopting PAS55, is the current target for leading utilities.

PIPPA Topic 3

Question 3(c) from PIPPA:

What is the impact, if any, upon grid security if a power plant's switchyard connects the plant to the grid and at the same time directly connects the plant to a distribution utility?

AECOM Answer - Advice to PIPPA:

There is no effect, provided that the arrangement is correctly engineered and adequate planning and operational processes are followed.

There is a recognised commercial problem - the reduction in Grid Company Revenues resulting from such connections.

The commercial concerns of the grid company can be addressed, but not by restricting connections.

PIPPA Topic 4

Allowing a power plant to directly connect to a distribution utility enhances a power plant's operational efficiency.

PIPPA would like advice on the following:-

PIPPA Topic 4

Question 4(a) from PIPPA:

Do you agree with this proposition that the power plant efficiency is improved by this? Why or why not?

AECOM Answer - Advice to PIPPA:

I agree firmly with this proposition. Serving local load reduces transmission losses and therefore increases power plant efficiency.

In fact, many/ most System Operators formally practice “Locational Marginal Pricing” (LMP) to weight the bid-prices in favour of power plants that are closest to the load prior to determining the order of dispatch. The method of determining LMPs is to consider the system losses.

PIPPA Topic 4

Question 4(b) from PIPPA:

What are the technical advantages and disadvantages of connecting a distribution utility directly to the switchyard of a power plant? If there are disadvantages, what are the mitigating measures that can be implemented?

AECOM Answer - Advice to PIPPA:

The main advantage is an improvement the efficiency of the utilisation of the transmission grid assets.

Improvement in the reliability of supply for the local distribution customers. Also, lower cost power to local communities.

There are no disadvantages.

PIPPA Topic 5

Hybrid embedded generation (where a power plant is connected to a grid and at the same time directly connected to a distribution utility or other end user) is allowed in other jurisdictions.

PIPPA would like advice on the following:-

PIPPA Topic 5

Question 5(a) from PIPPA:

Do you agree with this proposition? Why or why not?

AECOM Answer - Advice to PIPPA:

I firmly agree that Hybrid and Embedded generation is allowed in other jurisdictions.

In fact, it is very actively encouraged by governments, through their departments of energy and other governmental and quasi-governmental organisations.

Hybrid and Embedded generation is actively facilitated by Electricity Regulators through preparation of suitable codes and standards for planning, connections and operations.

PIPPA Topic 5

Question 5(b) from PIPPA:

What are the issues (technical or otherwise) that were considered in determining whether or not hybrid embedded generation should be allowed?

AECOM Answer - Advice to PIPPA:

Precedent – they existed in isolation before the grid, and continue operation after grid connection.

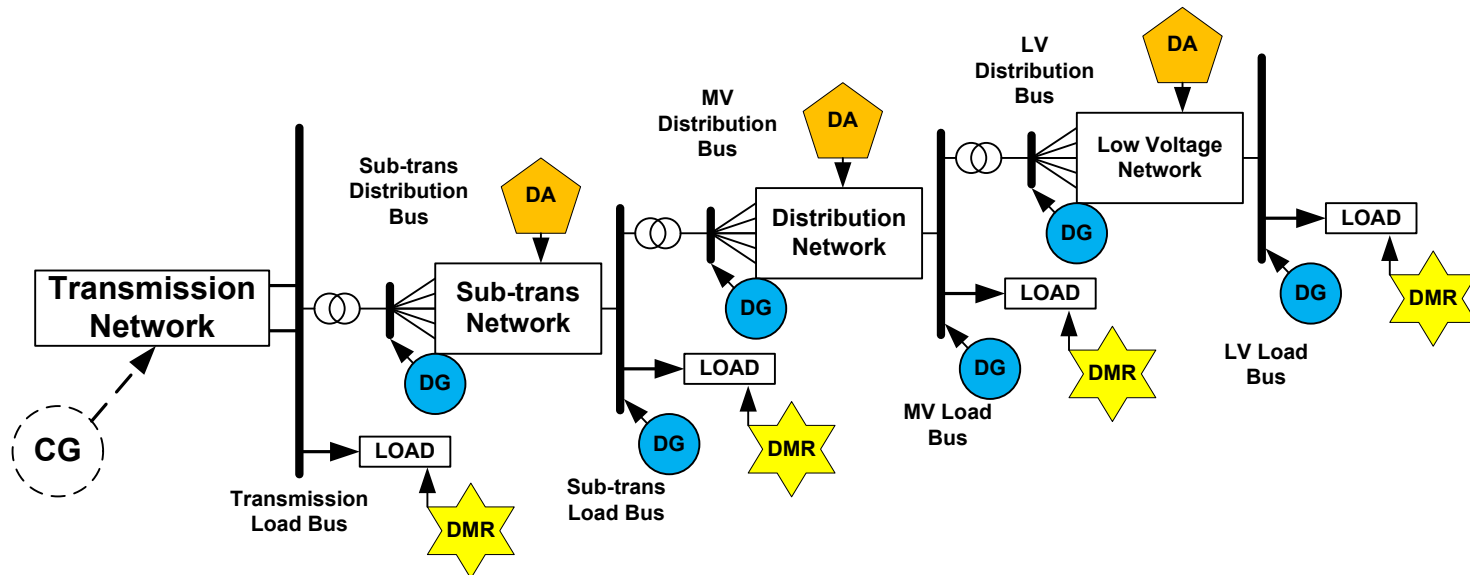
Requirement for green energy, and energy efficiency.

Advances in technology have created many new forms.

Effective international standards have been prepared allowing ease of connection and operation.

Hybrid & Embedded Generation is Encouraged in -

All States of the European Union - The United States –
Australia - New Zealand - The Pacific Islands - Parts of Asia
– e.g. Singapore, Laos. It is the Future



PIPPA Topic 5

Question 5(b) from PIPPA:

What are the issues (technical or otherwise) that were considered in determining why they are not allowed?

AECOM Answer - Advice to PIPPA (Continued):

Opposition from Grid Companies about loss of revenue and increasing operational complexity of the grid.

Lack of grid planning processes that incorporate consideration of the effects and the needs of HG/EG.

Poor technical administration of connection processes

Misplaced concerns about the security impacts on the grid

PIPPA Topic 5

Question 5(c) from PIPPA:

In other jurisdictions where hybrid embedded generation was allowed, what were the considerations for allowing this?

AECOM Answer - Advice to PIPPA (Continued):

Effective technical arrangements – and Least Cost!

Negotiations between PP Owner and the Connecting Party.
Less costly for the community than grid supply. Improves community support for the PP Development.

Sometimes, there is a government agency requirement to offer supply to local communities.

PIPPA Topic 5

Question 5(d) from PIPPA:

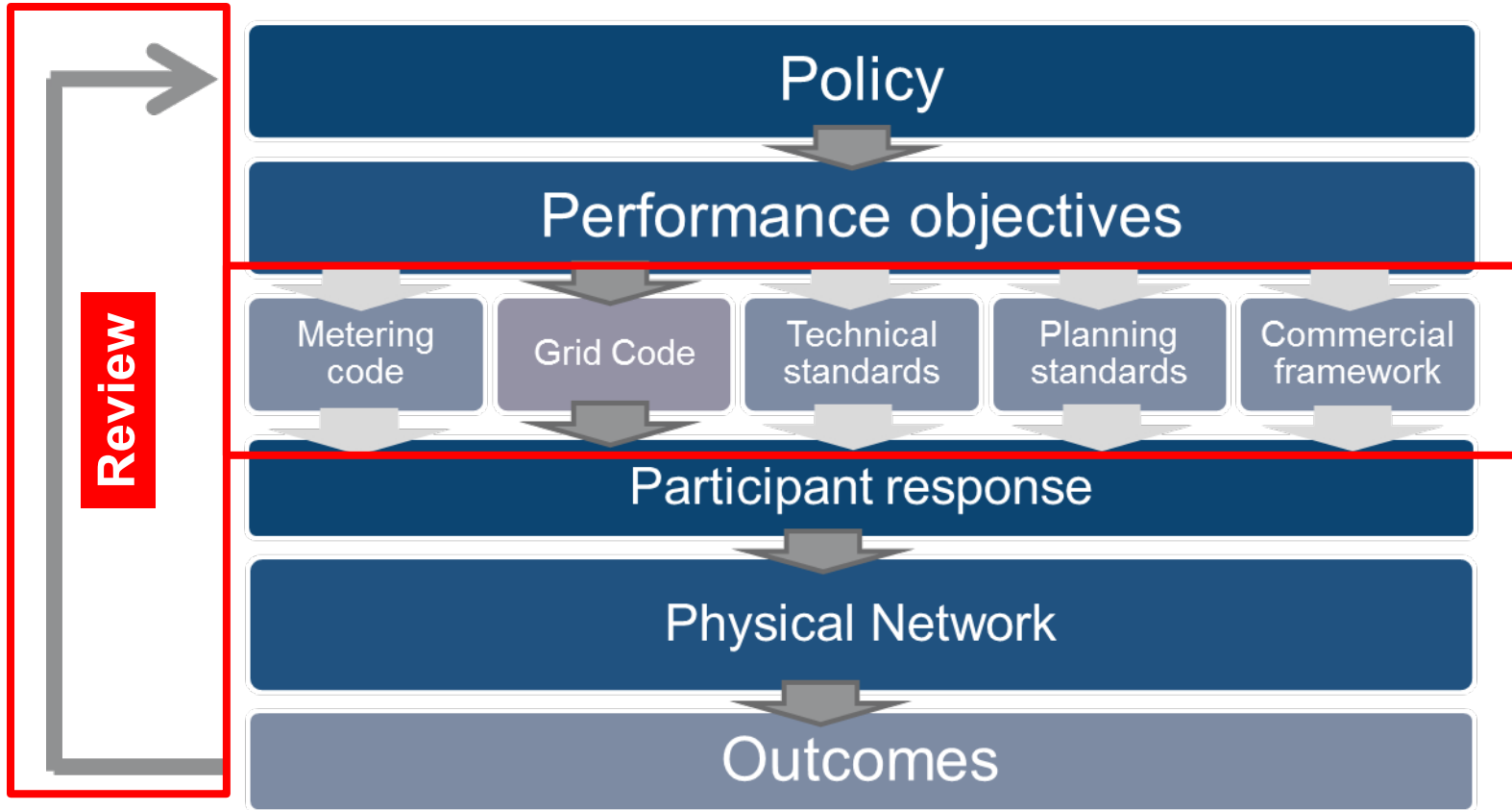
In other jurisdictions where hybrid embedded generation was allowed, how were these implemented (e.g., how was the plant connected the grid and to a distribution utility or other end user)?

AECOM Answer - Advice to PIPPA (Continued):

Preparation of Appropriate Codes of Practice for technical and commercial administration of the connections

Current Best practice in my opinion is according to *IEEE Standard 1547 – 2003 Standard for Interconnecting Distributed Resources with Electric Power Systems.*

Regulatory Roadmap for Development of Grid Services



Thank You

Any questions?

email address (george.horvath@aecom.com)