

PECC Seminar on Energy Transition

Victoria, BC, Canada | November 7-8, 2013

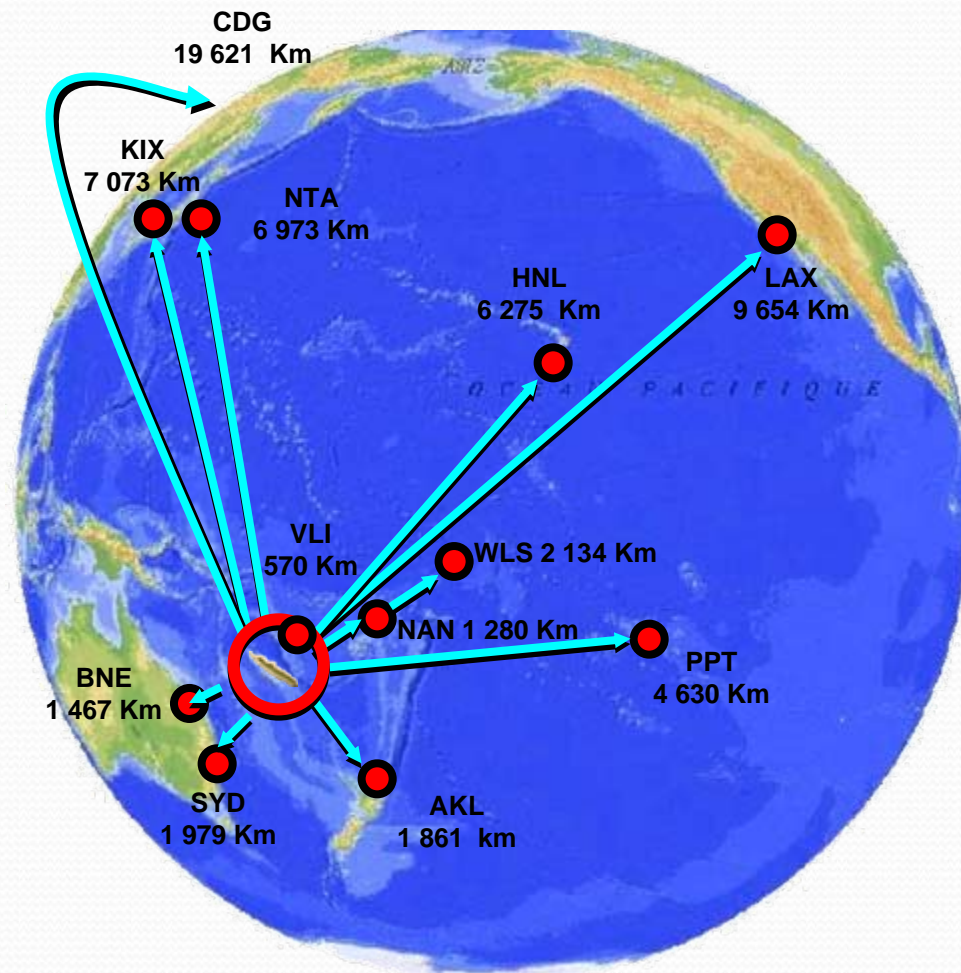
Energy transition in industrialized islands
New Caledonia: a case study



Energy transition in industrialized islands

New Caledonia : a case study

New Caledonia,
Somewhere in the
Pacific,
But where?



- Population : 250,000 (25% under 15)
- Geographical location: 1800km north-north-west of Auckland and 1500km north east of Sydney
- Surface area : 18,576 km²
- Exclusive Economic Zone: 1 386, 588 km²
- Status: Sui generis collectivity attached to France
- Local currency FCFP pegged to EURO (€)



Main economic indicators

:

- 2010 GDP : 812 billion F CFP
- 2010 GDP per capita : 3.2 million F CFP
- Average growth rate of 3.5% over the ten last years
- New-Caledonia in terms of GDP/capita is between Australia and New-Zealand



ECONOMY

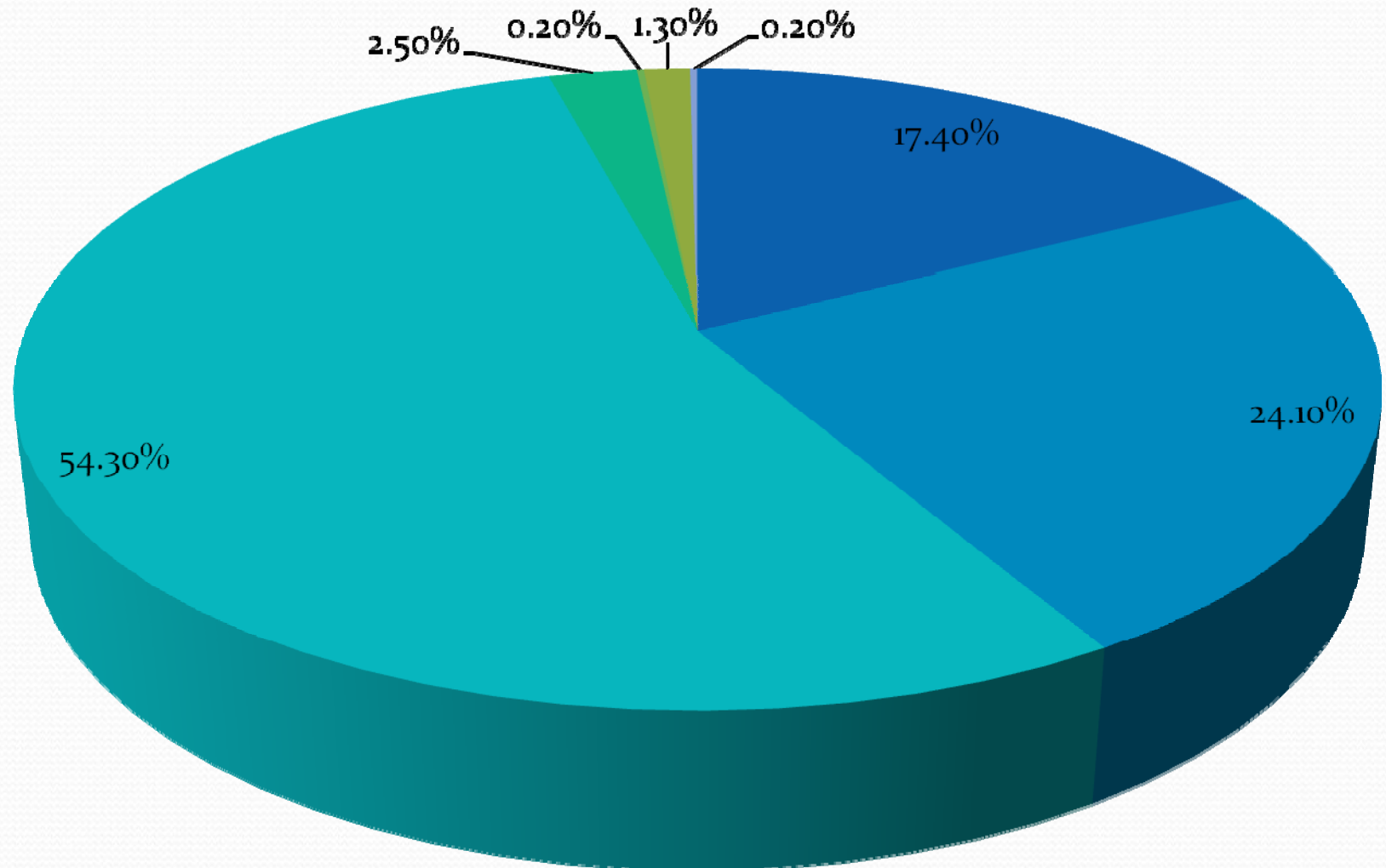
Currency



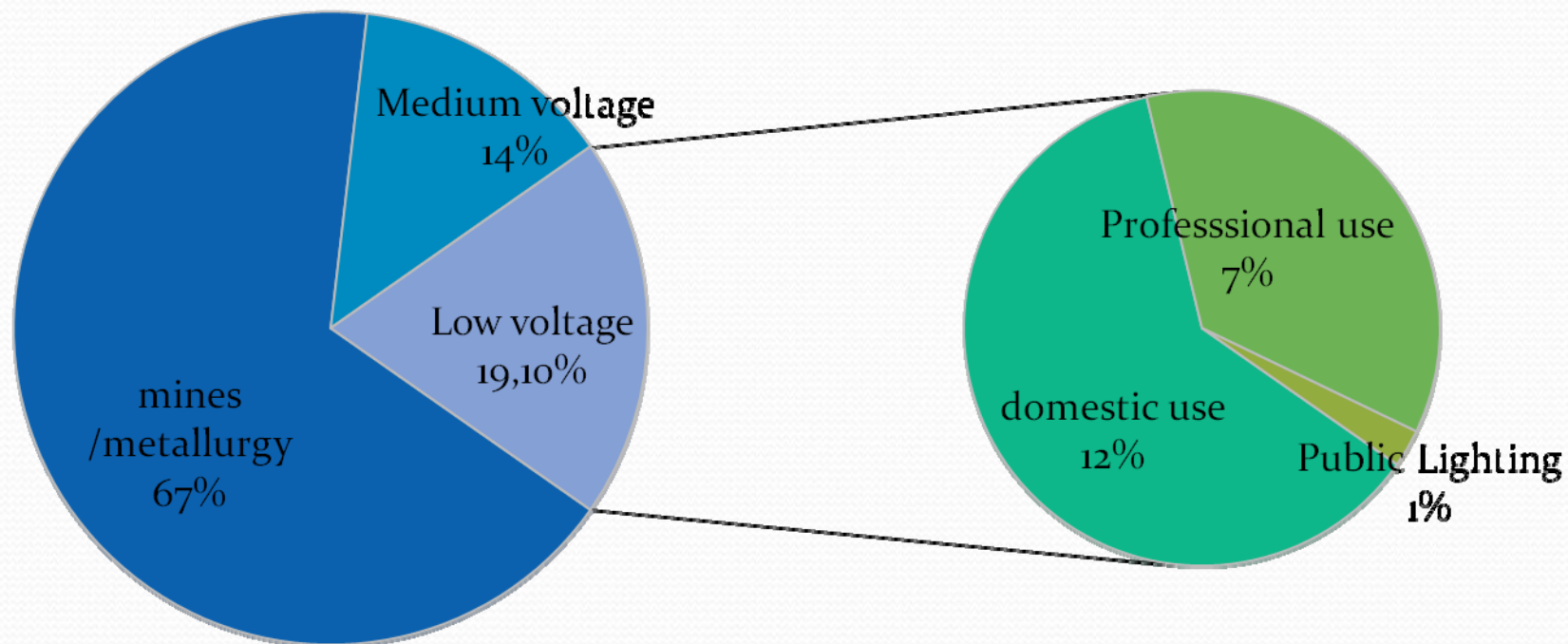
GDP (2010)	GDP per Capita
812 billion XFP	3.25 million XFP
6.8 billion €	27,240 €
9.8 billion AU\$	39,384 AU\$
12.5 billion NZ\$	50,146 NZ\$
793 billion Yen	3.175 million Yen
9.03 billion US\$	36,175 US\$

Energy mix in New-Caledonia 2012

■ Hydro ■ Coal ■ heavy fuel ■ wind ■ kerozene ■ diesel ■ solar



Energy consumption breakdown New-Caledonia 2012



Huge energy needs in New Caledonia to sustain 3 nickel plants besides conventional needs

- 2 (50MW) coal-fired units have been commissioned in 2010/2011 in the south of NC, one for a hydro-metallurgical nickel plant and the second for public use
- 2 (135MW) coal fired units in operation by end of 2013 for a nickel pyrometallurgical plant in the north of NC
- SLN the historical nickel producer plans to replace its 40-year old fuel oil-fired power plant (4X39MW) with a new coal-fired power plant (2X90MW) due to be commissioned in 2019

- 2008: NC government mission college of experts from France to help set up strategy to face these new challenges
- 2010: experts' recommendations used to set up a plan for energy transition
- With the exception of its nickel activity, New Caledonia shares a lot of similarities with many other islands in the world as illustrated in the following slides which show extracts from Eurelectric report:
“EU Islands Towards a Sustainable Energy Future” (2010)

Most Islands share similar challenges

- **Market failure:** Due to their small size, islands lack economies of scale in financing and power production.
- **Inconsistent regulation:** The regulatory treatment of islands is not straightforward. Islands suffer from ‘copy-paste’ solutions from mainland despite their particularities
- **Security of supply:** Due to their isolation, islands have to take extra measures to ensure system stability and security of supply.
- **Emissions:** Islands’ dependency on diesel engine generation will make it difficult and costly to comply with the forthcoming emission requirements of EU regulation

- Despite abundant natural resources, islands are highly dependent on oil, both for transport and power generation.
- The reliance on oil imports for power generation makes islands very vulnerable to oil price volatility and availability.
- Bulk gas shipping or gas/power interconnection with mainlands too expensive & power system too small to justify investments at market conditions.

Particularly true for New Caledonia till the 40-year old fuel oil power plant is replaced

➤ **Missing interconnections**

While islands close to the European mainland (e.g. British Channel Islands) are mostly interconnected, remote places cannot afford it. New Caledonia's closest "mainland" (Australia) is about 2,000kms away.

➤ **Islands: opportunity for demonstrating energy solutions**

Thanks to their isolated and small integrated power systems, islands have the potential to become excellent sites of demonstration, as test-bed for energy solutions. A few small islands in the NC archipelago could become one of these sites

Energy challenges for islands

Emissions

Emissions are a challenge for islands due to fuel oil generation reliance;

Islands largely exempted from the Large Combustion Plant Directive (LCPD);

Strong need for support schemes and incentives to comply with the Industrial Emissions Directive (IED).

- With a population of 250,000 & 3 large fossil fuel-fired power plants, NC will produce a very high emission of CO₂ per capita
- New Caledonia challenge: find solutions to keep nickel industry competitive & implementing energy mix plan complying with environmental regulations

Variability related to some RES means more significant challenges to an isolated island system than to a larger grid:

- Relative plant capacity: commercial scale RES installations will represent a considerably larger proportion of total installed capacity on an island system.
- Diversity considerations: weather diversity over a large area can help to balance variability, if interconnection capacity is sufficient. On islands this is not possible.

- System capacity margins:
 - an island power system will need sufficient back-up plant to cover variations in output from any of the variable renewable sources.

- Conventional and back-up plants:
 - Back-up plant will need to be sufficiently responsive to meet variable demand cycles
 - Their operation at a relatively low load factor with more RES in the mix mean more operation and maintenance challenges

➤ Storage:

Next to sufficient back-up capacity, centralized and decentralized storage solutions and potential interconnections are key enabling technologies for island systems aiming for high RES targets.

➤ Frequency and voltage regulation:

- ❖ variable RES sources may be easily absorbed into large-scale power systems, especially at modest penetration rates.
- ❖ However, integration issues will be more predominant in a small-scale system; therefore frequency will be of greater concern.”

Key principles & trends in the Energy transition on islands:

- Installation of more renewable energy source over the last years, wind, hydro , geothermal or solar energy.
- Larger islands have set the scene for offshore wind farms. +16% in 5 years.
- Smart Grids
- Demand Side Management (balance demand and production)
- Energy Efficiency
- Storage
- Flexible Generation



Several options can be used to improve energy efficiency and assist in system demand:

- Electrical appliances
- Heat pumps
- Building regulations
- Solar thermal panels



What plan for New Caledonia?

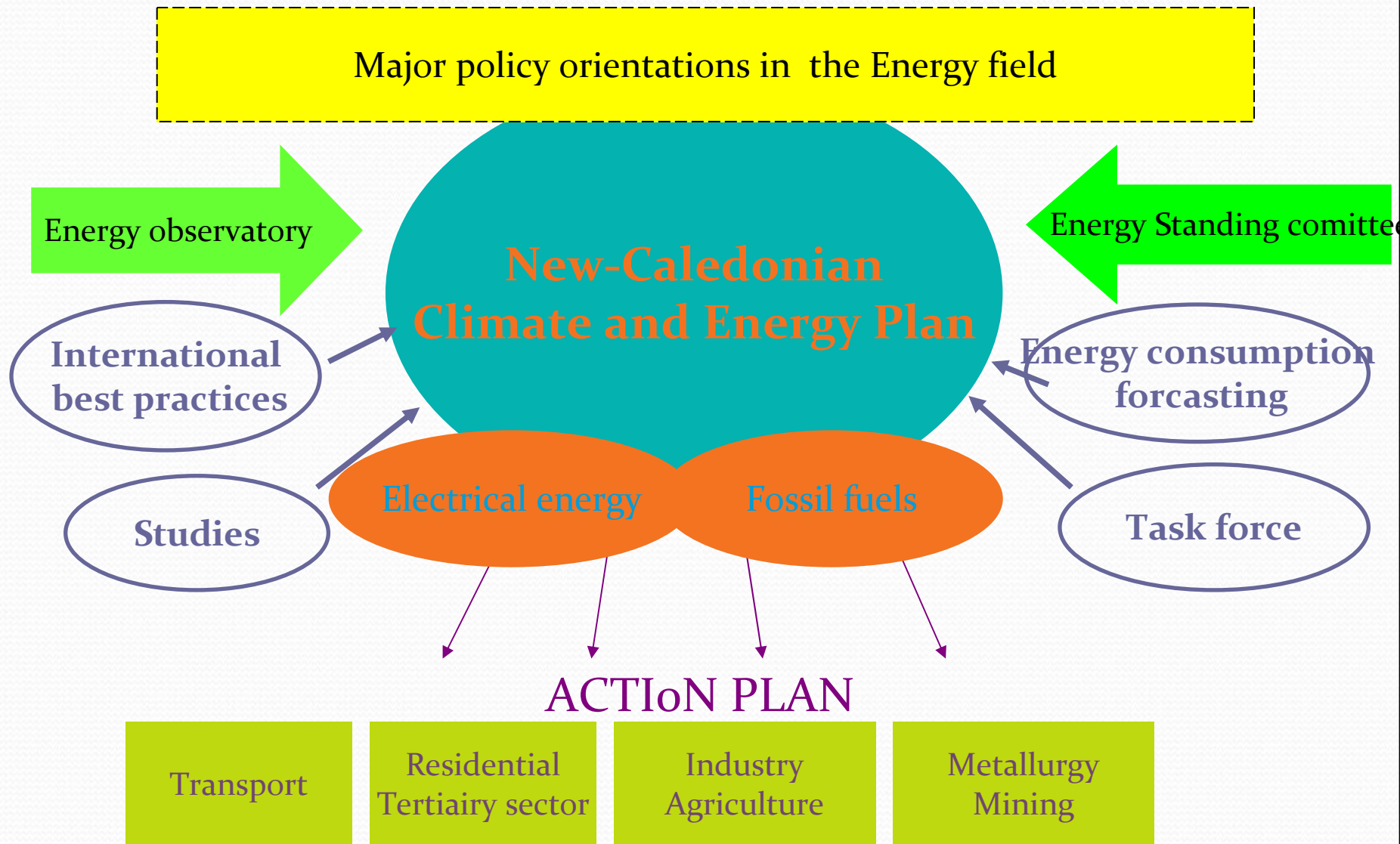
Considering actual and futur development of its population and economic sectors and also its remote island environment, New Caledonia is initiating an ambitious plan to face the energetic challenge.

This plan is designed to achieve 4 main objectives:

- Secure access to sources of traditionnal energy outside New Caledonia
- Reduce energetic dependancy from these sources
- Achieve the most competitive energy cost
- Limit overall impact on the environment

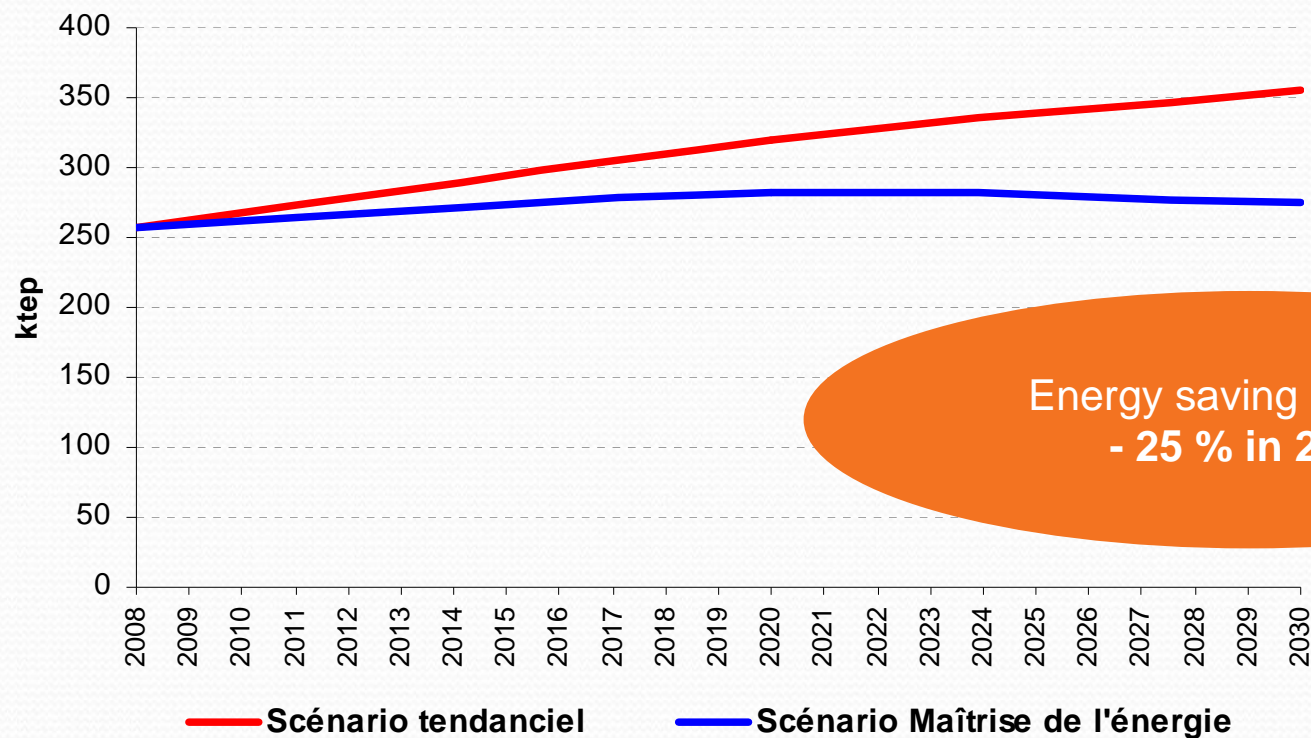
By 2030 the plan aims at reducing overall consumption by 25%.

Method



Energy transition target

(Excluding mining and metallurgy)



NEW CALEDONIA ENERGY TRANSITION PLAN

The plan will impact most areas of the economy :

- Transport
- Housing
- Tertiary sector
- Small industry
- Agriculture
- Fishing
- Mining
- Metallurgy



NEW CALEDONIA ENERGY TRANSITION PLAN

- It will reinforce and promote the use of renewable energy sources with the many challenges identified earlier
- It will include communication packages to sensitize and prepare New Caledonia population to live in a new era of high-cost energy
- It will require mobilization of dedicated human and financial resources



NEW CALEDONIA ENERGY TRANSITION PLAN

KEY ACTIONS

Reduce energy consumption :

➤ In transport:

- ❖ Through energy consumption and environmental criterias in the selection of new equipments,
- ❖ By way of formal regulations and standards,
- ❖ Through technical controls of vehicles.



➤ In the industrial sector:

- ❖ By helping and fostering energy audits initiatives in small and medium transformation industries

NEW CALEDONIA ENERGY TRANSITION PLAN

- Increase production capacities of renewable energy sources by developing wind, solar and hydraulic sectors and by actions in favor of biomass and marine energy



- In the islands, aim to achieve energetic autonomy and secure sourcing of traditional fossil energy
- Integrate New Caledonia in the objectives of stabilization of world climate by the way of inventing emissions of CO₂ and elaborate compensatory mechanisms

NEW CALEDONIA ENERGY TRANSITION PLAN

- Reinforce economic activities by intensifying professional education and training efforts and economic assistance to private companies engaged in energy saving and climate stakes
- Installation of sufficient structures to :
 - ❖ insure appropriate governance,
 - ❖ set up an energy agency ,
 - ❖ and multiply information relays on energy aimed at consumers



NEW CALEDONIA ENERGY TRANSITION PLAN

- Prepare and encourage the population to energy saving habits,
- Bring up energy and climate matters in education and public forums,
- Sensibilize all the economic sectors to build up energy saving consciousness,
- Adapt communication medias to different publics (youth, managers etc...)



NEW CALEDONIA ENERGY TRANSITION PLAN

Current projects initiated or supported by New Caledonian government incentives include:

- 40MW hydraulic dam in the south of the island in the Ouiné area,
- 20MW wind farm also in the south of the island at Yaté township,
- Better selling energy price to promote new solar capacities by private investors



NEW CALEDONIA ENERGY TRANSITION PLAN

Thank you for your attention

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