Biofuel Experiences in China

Governance and Market Development Updates

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INNOVATION CENTER FOR ENERGY AND TRANSPORTATION
iCET
能源与交通创新中心

Outline

1. ***i*CET** introduction
2. **Backgound and drivers** for China's biofuels
3. **Current state of biofuel governance**: policies and instruments
4. **China's unique market** development, challenges and opportunities
5. China and global bio-fuel **exchanges and collaboration**
6. Suggested **areas for action**

About iCET

- The Innovation Center for Energy and Transportation (*i*CET) is an independent non-profit, professional organization registered in Beijing, China and Los Angeles, United States.
- *i*CET strives to inform China's policy-makers and stakeholders of international expertise and innovative solutions that would help **reduce oil dependency**, **mitigate GHG emissions** and **improve air quality** through three work areas.

Clean Transportation

Carbon Management

Clean Tech Collaboration

- *i*CET has been promoting biofuels in China since 2007, mainly through advanced international experience introduction, sustainability standards and policy initiatives development.
- *iCET* is the only non-government standing member in related national standards committees.
- *i*CET is the only China-based member of the Roundtable on Sustainable Biomaterials (RSB).

More information about *i*CET, please refer to www.icet.org.cn

ÆCET's expertise in Biofuels:
Leading role in China's Biofuel Development

- *i*CET is a **Technical Committee Member** of China's two bio-fuel related National Energy Industry Standardization Committees (NEA/TC24 and NEA/TC22) since 2011.
- *i*CET's sustainable fuel work is under the official support of China's **National Energy Administration** (NEA), since 2011 (*see letter on the right*).
- *i*CET established **profound relationships with over 200 stakeholders** from the bio-fuel sector, including officials, research institutes and industry players.
- iCET conducted over **10 reports and policy papers** to inform officials and stakeholders to promote biofuel in a sustainable way.


国 家 能 源 局

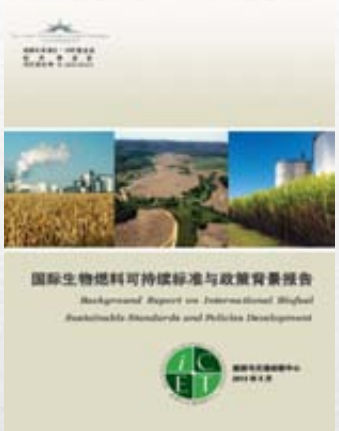
关于支持开展非粮生物液体燃料
可持续标准体系建设研究工作的函

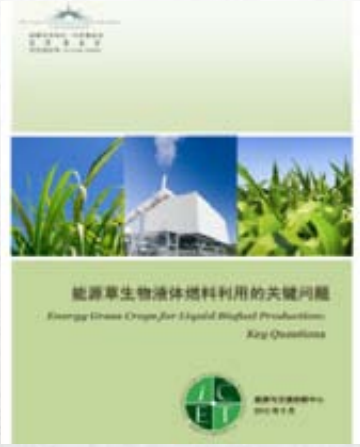
中国交通能源快速增长加剧了石油安全、城市空气污染、温室气体排放等问题，因此需积极有序地发展清洁、低碳交通替代燃料。根据中国政府提出的可再生能源利用及温室气体经济强度减排目标，"十二五"期间将继续推进非粮生物液体燃料的试点和示范，以实现交通能源的可持续发展。

我们将支持能源与交通创新中心与国家能源生物液体燃料研发中心和国家能源非粮生物质原料研发中心（筹建）合作，共同开展非粮生物液体燃料可持续标准体系相关研究。

二〇一一年四月二十九日

*i*CET Biofuel Reports and Papers





Biofuels Development in China

2002	2004	2006	2012	**2014**
Kick-off	Expanding	Slowing down	Advancing	

Drivers at early stages:
- Digesting expired grains
- Booming rural economy
- Increasing farmers' income

More drivers now:
- Alternative transportation fuel
- GHGs emission reduction
- Air quality improvement

China is…
- ✓ 58% oil import dependent (2013);
- ✓ Global leader in fuel consumption, vehicle gasoline and diesel consumption reached 180 million tons (2013);
- ✓ Biggest CO2 emitter, accounting for 25% of global emissions.
- ✓ Biggest car market with 20 million new car sales (16% growth), reaching 100 million total cars (2013).

Main Biofuels Types in China

The biggest concern for developing biofuel in China is its competition with human food and animal feedstuff, so China has been encouraging non-grain/oil based fuel, such as cassava, sweet sorghum and cellulosic fuels.

Biofuels in China are always emphasized grain/food-based or non grain/food-based fuels.

Fuel Type*	Main product	Main feedstock	Status
1.0 G biofuel	**Grain-based** ethanol	Corn, wheat	Industrialized (2004-)
	Waste oil based diesel	Waste-cooking oil	Industrialized (2006-)
1.5 G biofuel	**Non-grain**, but sugar or starch based ethanol	**Cassava**, **sweet sorghum**	Industrialized (2008-)
	Non-edible oil based biodiesel/Bio-jet fuel	Jatropha	Demonstration (2010-)
2.0 G biofuel	**Cellulosic** ethanol	**Corn cob**; corn stalk;	Demonstration (2010-); three scaled-up(2013)
	BtL	Agricultural residue	Research stage

* it is not a standard but a conventional way to define biofuel types, 1.5 generation biofuels are produced by using non- food sugar/starch/oil crops, to separate from the first generation food-based fuels

Non-grain Biofuel Feedstock in China

Ethanol

Cassava

Sweet sorghum

Biodiesel

Used cooking oil

Jatropha

2nd G biofuels

Corn cob

Corn/wheat stalk

Biofuel policies framework overview

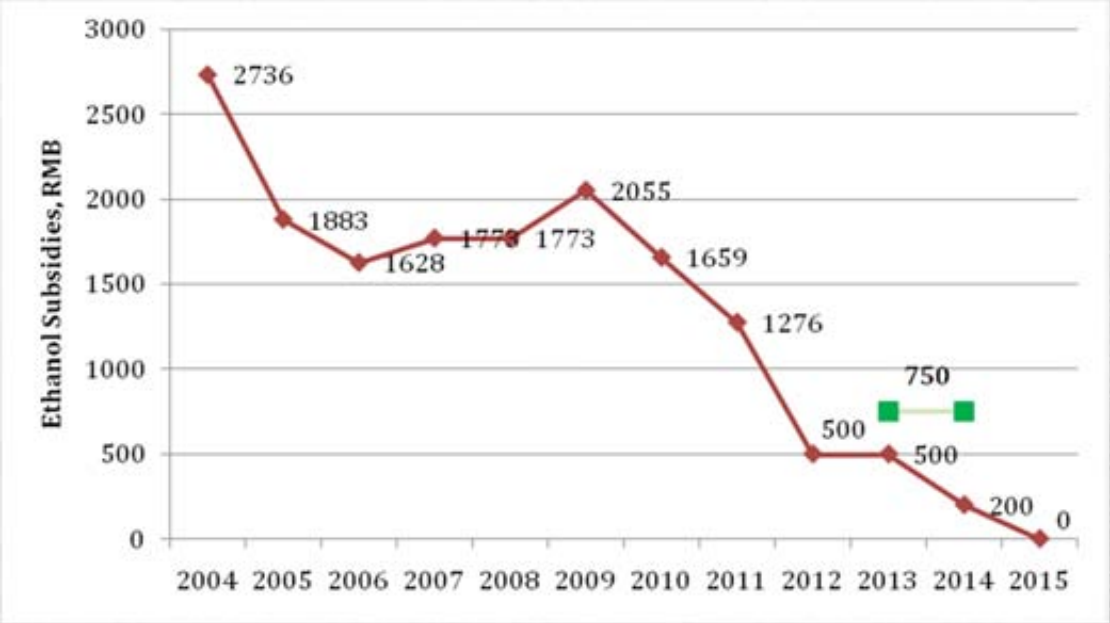
- **China bio-fuel development is highly dependent on policies framework**, especially ethanol;
- **China National Energy Administration (NEA) is leading biofuel Industry planning and development**, while other government arms such as Ministry of Finance and Ministry of Agriculture also address policies and implementation;
- Biofuel development principles: **can't compete with human food and land for food, can't destroy ecology.**
- **Currently, there is a very clear policy-making direction**: limiting 1st biofuel generation, encouraging generation 1.5, promoting 2nd generation, and research and development of the 3rd generation;
- During the last two years, more effort was placed on **advancing 1.5 generation and 2nd generation bio-ethanol and bio-kerosene** development.
- At present, support for bio-ethanol includes **subsidies, tax incentives, research support, and preferential loans**.
- The industry is looking forward to introduction of *"2014 ethanol fuel industry support policies"*, which projected to be announced on October 2014.

3. Current state of biofuel governance: policies and instruments

Targets

Fuel type	Tons in 2015	Tons in 2020
Bio-ethanol	4,000,000	10,000,000
Biodiesel and bio-jet fuel	1,000,000	2,000,000

Subsidies



- Grain-based ethanol subsidy is deceasing and will end by 2015;
- Non-grain ethanol (cassava, sweet sorghum)subsidy in 2013 was set at **750 RMB**;
- Cellulosic ethanol subsidy is set at **800 RMB** in 2014**.**

Tax Incentives

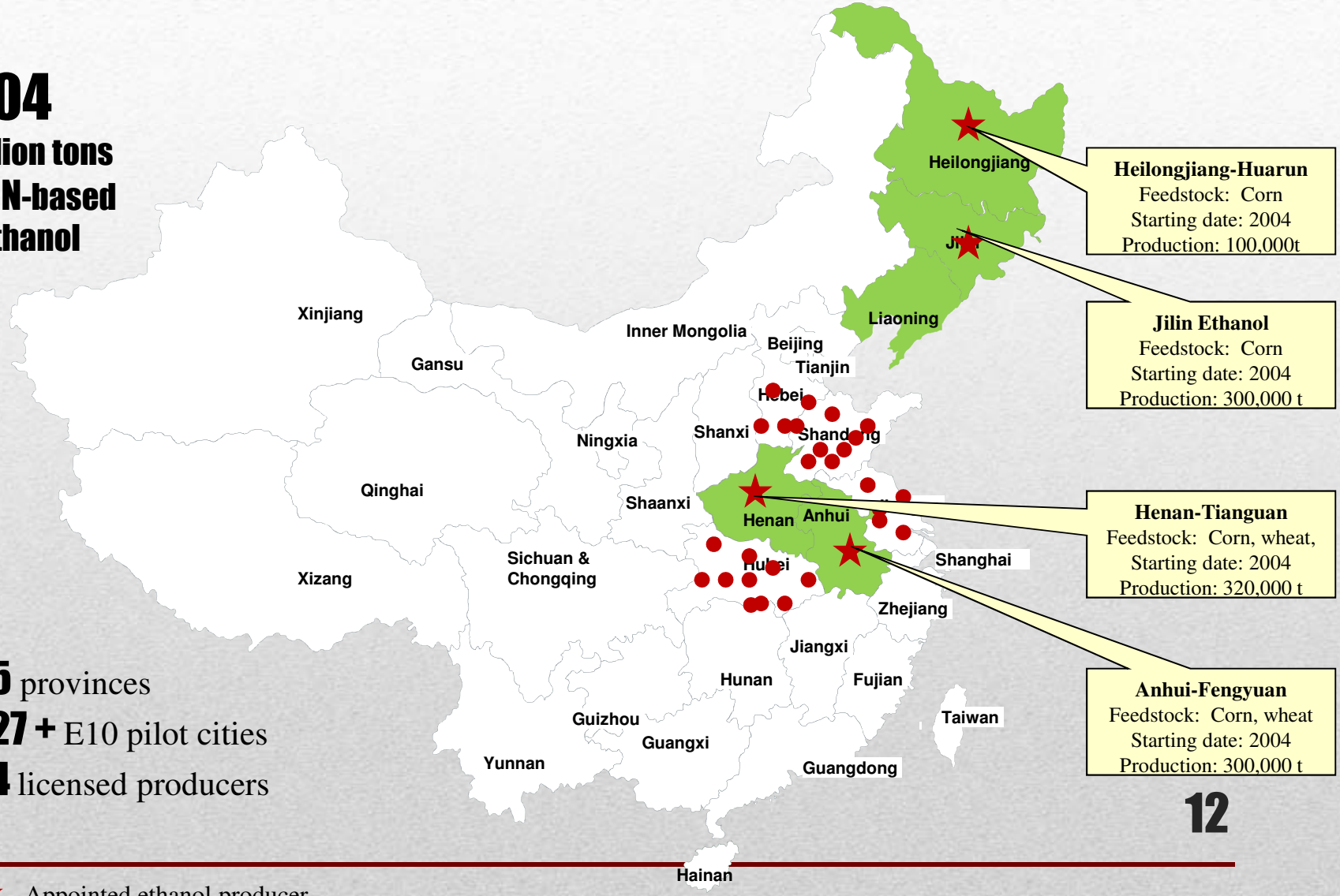
- Valued Added Tax(VAT) exemption is gradually reduced for grain ethanol; but 1.5 and 2G bio-ethanol and Used Cooking Oil (UCO) biodiesel VAT continuing 100% exemption.
- Grain ethanol excise tax(5%) is being restored; and second-generation ethanol from non-grain relief continues;
- Used Cooking Oil (UCO) biodiesel can get 0.8 Yuan/L consumption tax exemptions and 20% total investment subsidies

Year	VAT exemption		Excise Tax rate		
	1 G ethanol (Grain-based)	1.5 and 2 G ethanol (Non-grain)	1 G ethanol (Grain-based)	1.5 and 2 G ethanol (Non-grain)	UCO Bio-diesel
2004-2010	100%	100%	0%	0%	0.8 RMB /L
2011	80%	100%	1%	0%	0.8 RMB/L
2012	60%	100%	2%	0%	0.8 RMB/L
2013	40%	100%	3%	0%	0.8 RMB/L
2014	20%	100%	4%	0%	0.8 RMB/L
2015	0%	100%	5%	0%	0.8 RMB/L

China ethanol market is operated in a closed system.

2004

1 million tons GRAIN-based Bioethanol



5 provinces
27 + E10 pilot cities
4 licensed producers

★ Appointed ethanol producer

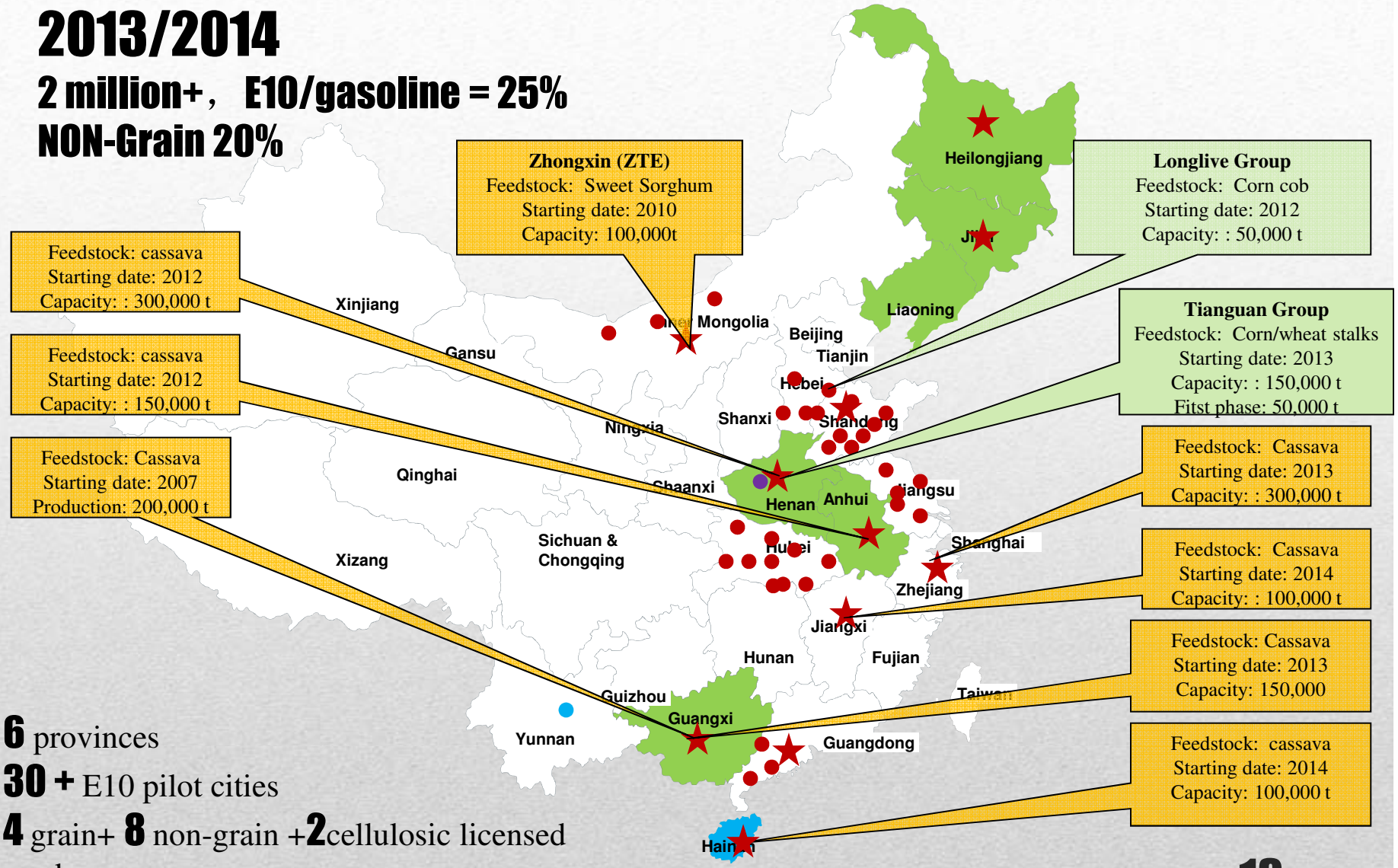
E10 pilot city and area

4. China's unique market development, challenges and opportunities

2013/2014

2 million+， E10/gasoline = 25%

NON-Grain 20%



6 provinces

30 + E10 pilot cities

4 grain+ **8** non-grain +**2**cellulosic licensed producers

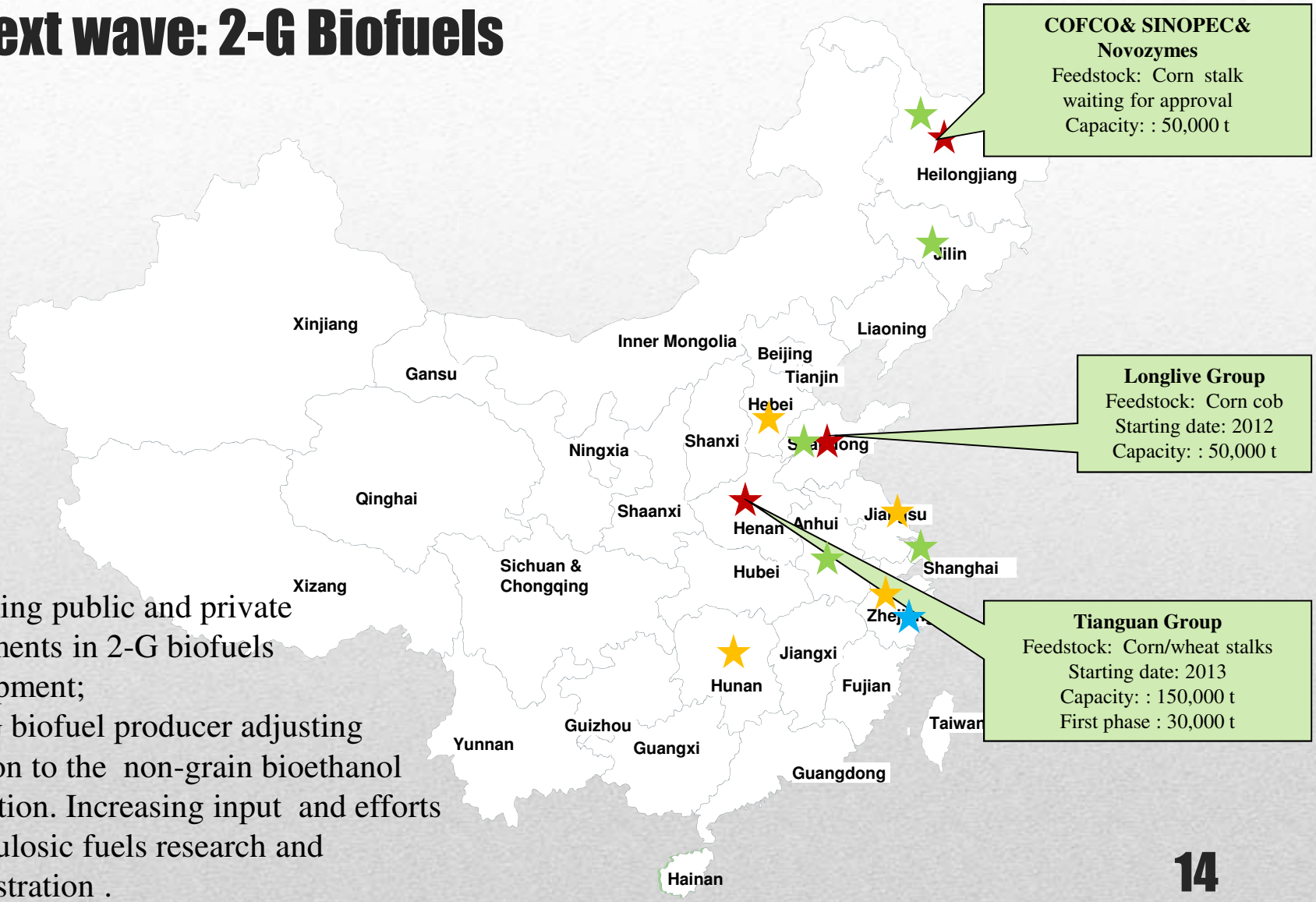
★ Appointed ethanol producer

E10 pilot city and area

B 5 pilot city and area

E85 pilot city

Next wave: 2-G Biofuels



- Increasing public and private investments in 2-G biofuels development;
- the 1G biofuel producer adjusting direction to the non-grain bioethanol production. Increasing input and efforts on cellulosic fuels research and demonstration .

★ 2G ethanol: pilot project
★ Bio-jet fuel: pilot project
★ 2G ethanol: finished construction
★ 2G ethanol: under construction

CASE STUDY: Longlive Group 2G ethanol production

Food company producing xylitol and other ingredients using corn cob.

➢ The first Chinese large-scale cellulosic ethanol producer with annual capacity of ~50,000 tons, went into operation in 2012 .

➢ Using corn cob as feedstock through a unique technology for producing ethanol, xylitol and another high value products.

Feedstock	Products	Value
Corn cob (10 tons)	1. xylitol (1.2 tons)	CNY 27600
	2. Ethanol (1.5 tons)	CNY 10800
	3. pure lignin (1.0 tons)	CNY 4500
Total CNY 42900(Euro 5300), profit is much higher than traditional technology		

Market overview and opportunities

- Ethanol
  - The industry is heavily regulated, licensed production, certain market supply, and closed operation management;
  - Ethanol price is not determined by the market, but set at 0.911 times the ex-factory price of gasoline;
  - Domination of large oil companies and big producers; small companies can't engage.
  - While the grain fuel ethanol project is no longer approved, prospects for non-grain fuel ethanol are more optimistic;
  - 1.5 generation fuel ethanol is being scaled and 2nd generation ethanol shifting from demonstration to market scaling.
- Biodiesel
  - At present, small-scale production by small companies, while large companies are stepping into the 1.5 and 2nd generation biodiesel industry;
  - Market is immature, biodiesel is illegal for transportation fuel except in several B5 pilot cities; biodiesel plants with low operating rate, which is lower than 40%.
  - In order to avoid the inflow of waste oil to table, UCO diesel has been largely encouraged since 2009.
  - Bio-aviation fuel gradually attracts policy-makers and market attention.

Biofuel comparing to other alternative Fuel in China

Fuel Type		Pathway	Technology	Policy Supportive	Industry perspective	International Competition	GHG emission	Overall
Fossil Fuel	Gasoline, diesel	ICE	☆☆☆☆	☆☆	☆☆☆	☆☆	☆☆ (baseline)	☆☆ (baseline)
		Hybrid	☆☆☆	☆☆☆	☆☆☆☆	☆☆	☆☆☆	☆☆☆
Gas	CNG/LNG/LPG	NGV	☆☆☆☆	☆☆☆	☆☆☆	☆☆☆	☆☆☆	☆☆☆
Biofuel	1 G biofuel	ICE	☆☆☆☆	☆	☆	☆☆	☆☆☆	☆
	2 G biofuel	ICE	☆☆	☆☆	☆☆☆☆	☆☆☆	☆☆☆☆	☆☆☆
Coal-based fuel	Methanol	ICE ICE	☆☆☆	☆☆	☆☆	☆☆	☆	☆
	CTL	ICE ICE	☆☆	☆☆	☆☆	☆☆	☆	☆
Electricity	Grid electricity	PHEV	☆☆	☆☆☆☆	☆☆☆☆	☆☆☆	☆☆	☆☆☆
		EV	☆☆	☆☆☆☆	☆☆☆☆	☆☆☆	☆☆	☆☆☆
Hydrogen	NG based hydrogen	FCV	☆	☆☆☆	☆☆☆	☆☆	☆☆	☆☆

Source：*i*CET,. Policy Recommendations for supporting the Development of Low Carbon Automotive Fuels in China. 2011

Challenges

- **Feedstock** is the biggest challenge for China biofuels development: corn/grain is forbidden, 70% cassava imported from Southeast Asia, sweet sorghum storage issues, cellulosic gathering/transporting issues.

- **Technology** lack, especially energy and water conservation advanced technologies and equipments for application of 1.5 and 2 generation biofuels, advance equipments are required for strengthening the ethanol fuel industry, improving competitiveness to free from market protection.

- **Policy** support and guidance is required, advance subsidies governance (especially for feedstock, the threshold is really high and subsidies are low now), the 1.5 and 2 G biofuel industry is calling for stronger policy support.

International Collaboration Experience and future Opportunities

The Chinese government encourages foreign companies to participate in the biofuel industry development, there are some international collaboration experiences, e.g.:

- Sinopec & Airbus collaborated on production of bio-jet fuel (April 2013 - successful test flight).
- COFCO & Novozymes (Denmark) have a joint R&D for second generation biofuels production.
- US-China advanced biofuel research collaboration; Sinopec first imports of ethanol from the United States in February 2014.
- In 2013 nearly 70% of cassava imported from Southeast Asian countries.
- International oil and biofuel companies (e.g. Shell, BP, DSM etc.) established partnerships with Chinese companies, and are looking for cooperation opportunities.
- Research collaboration on E85, including pilot implementation in Henan, was sponsored by the EU.

Potential international collaboration areas:

- Feedstock trading
- Biofuel trading(importing ethanol would be increasing)
- Advanced technology transfer
- Research collaboration and policy imitative exchange.

Areas for future action

- Promote the legal use of bio-diesel as a transportation fuel;
- Advance 2nd generation biofuel support policies, particularly in feedstock.
- Promote market-based mechanisms for competitive biofuels production;
- Establish sustainability framework to ensure biofuels sustainable development;
- Promote China & international biofuel trading and R&D collaboration.
- Establish a mechanism to benefit biofuel from carbon and trade system

THANK YOU!

Please contact me for further information and collaboration opportunities!

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