



Creating forest sector solutions

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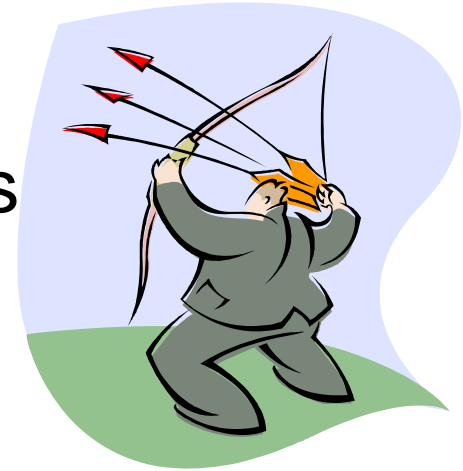
Biodiesel Demo Project in the forestry and construction industry

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Program Leader Energy & Emissions

National Biodiesel Conference
Ottawa November 16, 2010

Session Plan

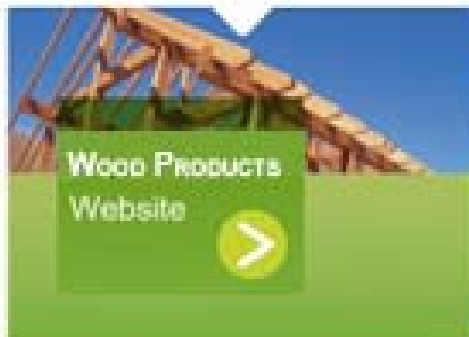
1. **FPInnovations** overview
2. **FPInnovations** biodiesel projects
3. What we learned from the NRDDI study
4. Recommendations for use of biodiesel



FPInnovations

FPInnovations works towards optimizing the forest sector value chain. It capitalizes on Canada's fibre attributes and it develops new products and market opportunities within a framework of environmental sustainability.

OUR DIVISIONS



FPInnovations – Forest Operations Division

- Founded in 1975 (Feric)
- Practical research in forestry operations
- Division of FPInnovations since April 2006
- Consists of members, partners and associate members
- Now includes PIT (Program Innovation Transport)

Forest Operations Research personnel

- Approx. 100 employees (East - West)
- Engineers, foresters, forestry technicians, programmers and support staff

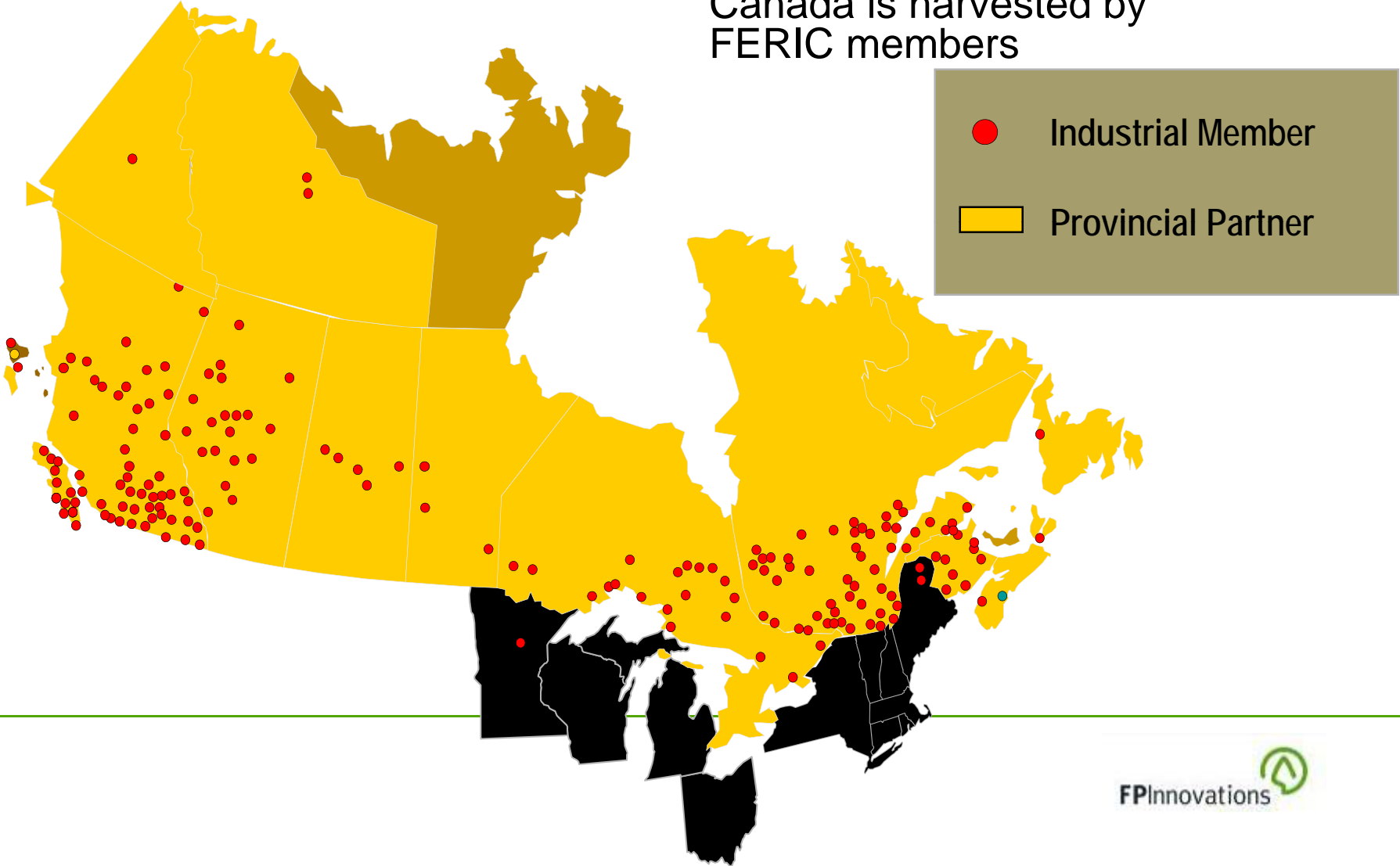


FPInnovations – FO offices



FO Members & Partners

80% of the wood harvested in Canada is harvested by FERIC members



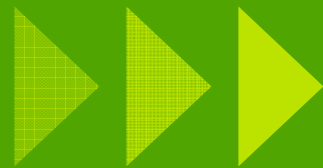
FPInnovations Performs...

- **Research** : Ensuring that our members have a competitive advantage
- **Tech Transfer** : Providing timely and wide spread use of our results
- **Implementation** : Assisting our members with putting our research results into action.

FPInnovations technology & expertise



- Trucking – Forestry and road (PIT)
- Resource road construction and maintenance
- Fuel management and consumption
- Machine productivity studies (time and motion)
- GPS and GIS expertise
- Automated data transfer from machines to office
- Decision support tools (costing and software)



FPInnovations Biodiesel Projects

FPInnovations Report – Long term study

“Introducing biodiesel to the forest transportation sector: a case study”

Followed the progress of a fleet of 5 log trucks in BC using B20 for a year.

- Encountered temperatures of -25 to -35 C
- One hard start condition was fixed with fuel filter change
- Oil analysis confirmed a 300 hour change interval as a conservative and acceptable maintenance interval
- High acceptance of the fuel from the drivers



FPInnovations Report – Engine dyno

“The impact biodiesel blend levels have on engine performance”



Using canola B100, blend ratios of B0, B10, B20, B30, B40, B50 and B100 were evaluated on an engine dynamometer.

- Engine power affected insignificantly (-0.9% B10, -2.3% B100)
- Fuel consumption varied little (B10 to B50, -0.4%)
- Emissions varied according to engine load (horsepower) and RPM, but generally B10 had slightly lower emissions for CO₂, CO, & NO_x

PIT Energotest Report – On the test rack

B5 made from tallow improved fuel economy 1.6%



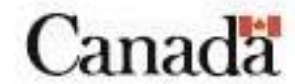
The National Renewable Diesel Demonstration Initiative

Biodiesel Demonstration
Project

Projet de démonstration
sur le biodiesel

Renewable Fuels for Canada's Future !

Des carburants renouvelables pour l'avenir du Canada !



The National Renewable Diesel Demonstration Initiative

- Funded by Natural Resources Canada
- Many studies across all industries
- FPInnovations managed the study on behalf of the construction and forest sectors.
- Took place this past winter and documented the challenges typical to the Canadian environment.

The NRDDI Study - An overview

- 47 machines running blend ratios from B2 to B10 (JJM Construction ran B10 in 16 machines at their Coquitlam jobsite).
- Over 300,000 Litres of biodiesel blends consumed.
- Over 7,000 hours of problem free machine operation.



Demonstration

of the Potential Use of Biodiesel
for Off-Road Machinery in
Canadian Highway Construction
and Forest Operations

A project co-funded by Natural Resource
Canada's National Renewable
Diesel Demonstration Initiative



Interim Report May 15, 2010
(Contract Report CR-W476-1)

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The NRDDI Project

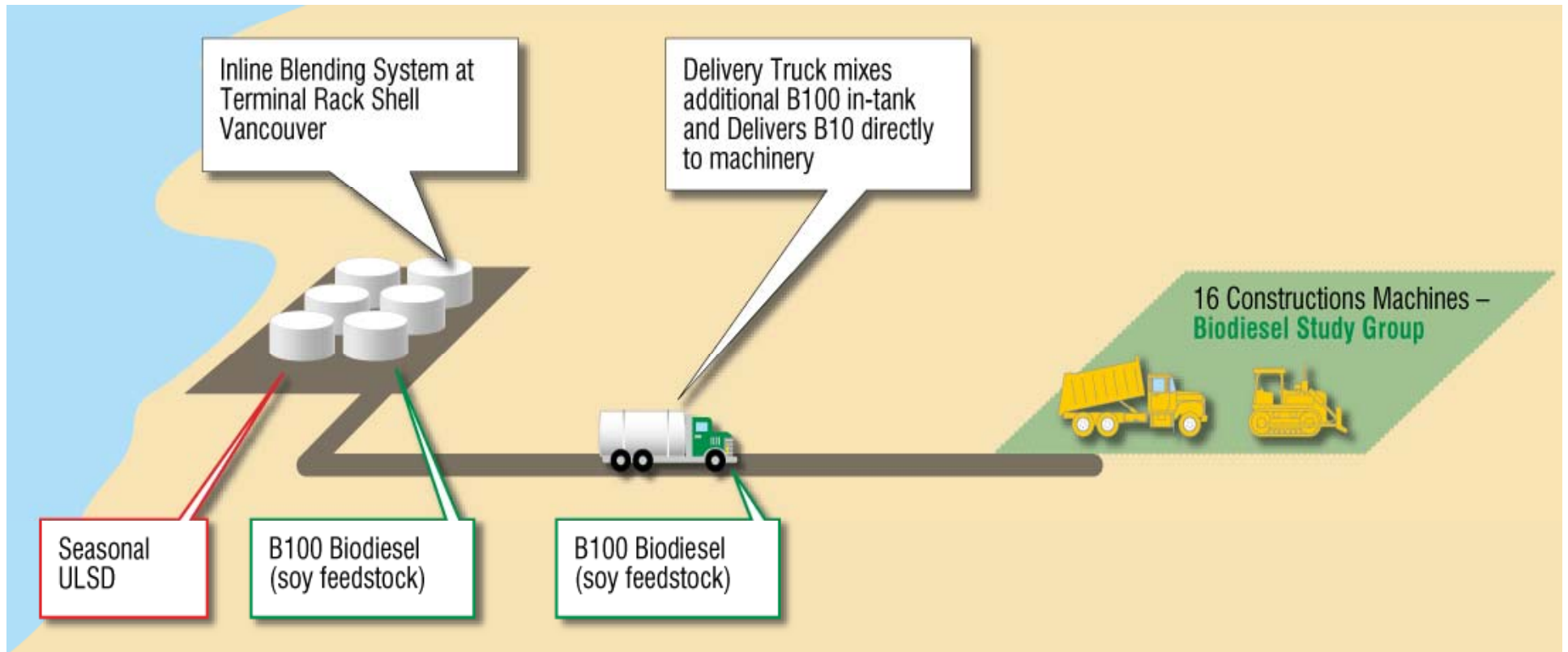
What was studied

- Fuel infrastructure
- Fuel supply logistics
- Cold weather performance
- Blending methods
- Engine oil analysis and biodiesel's effect on oil life



Fuel Distribution Networks

- 5 distinct networks documented

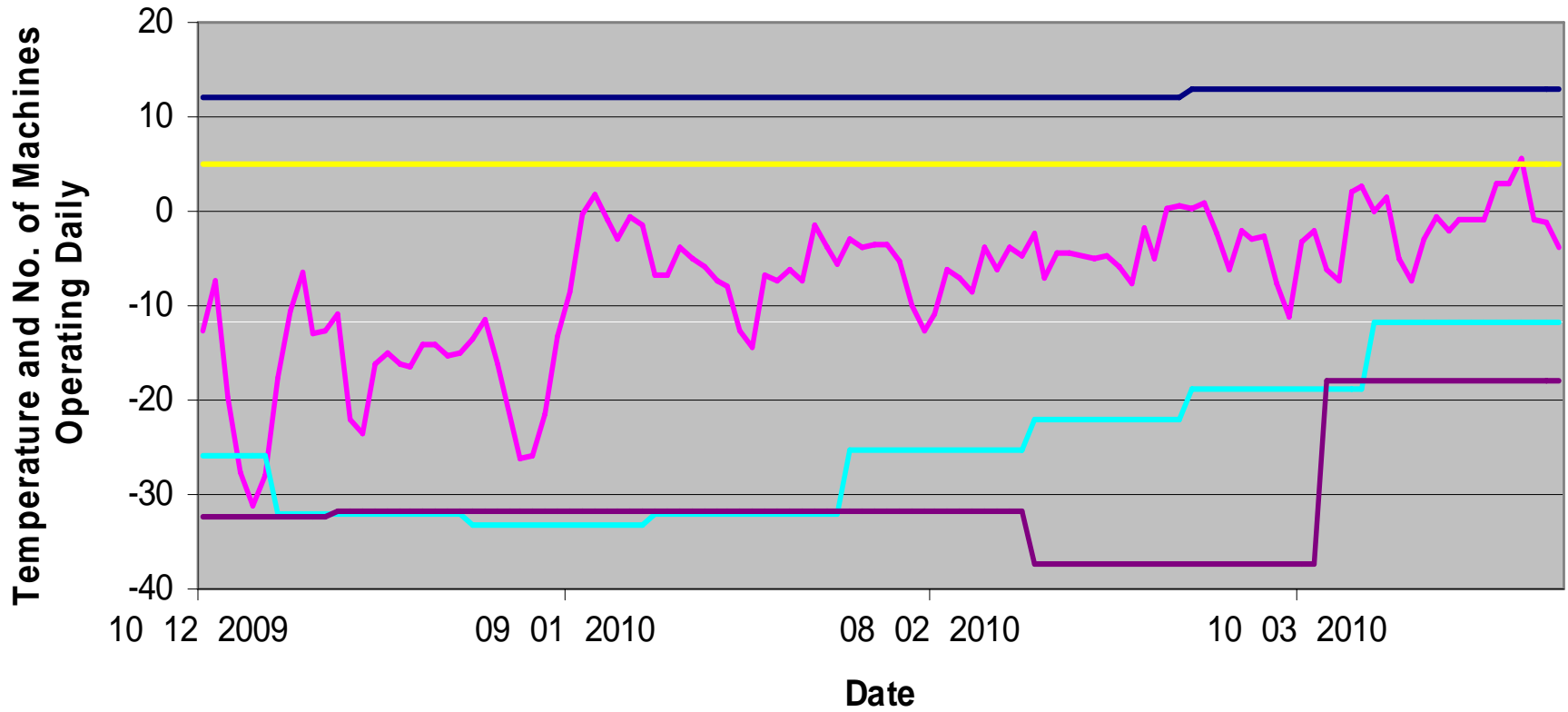


Examples of forestry machines in study





Cold Weather Performance of Fuels and Machines



— No. of Machines in Study
 — Daily Low Temperature (Celsius)
 — Blend Ratio (%)
— CGSB Cloud Point Target
 — Actual Cloud Point

Fuel sampling



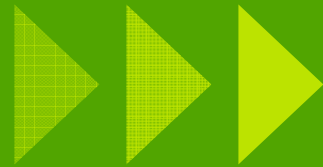
Oil sampling



Oil samples for used oil compared to unused oil. No statistical difference was seen between the oil wear rates of machines using B5 and ULSD fuelled machines on the Lakeland site

What we learned from the NRDDI Study...

- No changes to the current fuelling practices and infrastructure are required for storage periods of 6 months or less.
- Machines maintained in accordance with OEM specifications experienced no problems.
- In-line blending as performed at the refinery/bulk terminal is preferred to do-it-yourself blending and/or splash blending.



General Recommendations for Biodiesel Use

General Recommendations for Biodiesel Use

1. Regular engine oil analysis is recommended
2. Filters on dispensing pumps are needed, particularly when tank condition is poor.
3. Vent driers are needed for long term fuel storage.*
4. Don't hold summer fuel in storage into the winter.
5. Change out fuel filters on equipment within a weeks time of first biodiesel use to guard against the “solvent effect”.

* Recommended if you take deliveries very infrequently – twice per year or less.

Biodiesel user guide

For blends
up to B5



for the forest industry



Biodiesel user guide

For blends
up to B5



for the construction industry



For more info: <http://fptransport.org/biodiesel>

Use of biodiesel

for off-road machinery



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✦ About the new field-study

✦ Executive Summary

✦ OEM WARRANTY STATEMENTS

Other FPInnovations publications:

“The impact biodiesel blend levels have on engine performance”

Abstract

FPInnovations investigated the impact of different diesel/biodiesel blend ratios on engine performance, exhaust emissions, and fuel consumption. The following blend levels were tested: 100% diesel, B10, B20, B30, B40, B50, and B100 (100% biodiesel). The biodiesel studied was made from virgin canola feedstock. An engine dynamometer was used to run a CAT 3406E engine through a series of duty cycles with the different fuel blends. Exhaust emissions (NO_x, CO₂, O₂, CO, and SO₂) were measured using a continuous emission monitor. The biodiesel, containing 11% oxygen, has a lower heating value than diesel, a higher flash point (161 °C) and higher cloud point (-1.6 °C). The effect of engine power output on biodiesel addition was small, with a maximum of 2.3% reduction with B100. While the fuel consumption rate in kg/cycle was slightly higher at high blend levels (B40-100), the energy consumption rate in MJ/KWh was slightly lower with biodiesel blends. Compared to petroleum diesel, NO_x emissions increased by 14% with B100, CO emissions decreased with all biodiesel blends to a maximum of 58% with B100, and CO₂ emissions increased by 3% with B100. Considering that biofuel is carbon neutral, however, there would be a net reduction in CO₂ emissions when diesel is blended with biodiesel.

Report available to FPInnovations members.

“Introducing biodiesel to the forest transportation sector: a case study”

Abstract

FPInnovations - Feric Division followed the progress of a small log hauling contractor in southeastern British Columbia from fall 2007 to spring 2009. The five-truck fleet used a B20 biodiesel blend and encountered no problems in its daily operations. Driver feedback from the use of the renewable biofuel was positive and the owner of the company remains committed to the use of biodiesel. The trial took place during the winter when temperatures of -35 °C occurred and cold weather operability was never an issue. Furthermore, used engine oil analysis verified that engine longevity was not compromised. Engine dynamometer testing was performed in a related study to verify that power, fuel consumption, and emissions were not significantly affected. This report provides recommendations for log hauling operators that are considering using biodiesel in their fleets.

Report available to FPInnovations members.



FPInnovations – Biodiesel Workshop

THANK-YOU!

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