

Identifying Opportunities for Wisconsin to Participate in Advanced Energy Manufacturing: An investigation into the State's real capacity for green manufacturing

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PROJECT BACKGROUND

NEED TO ADDRESS CLIMATE CHANGE

IN RECENT YEARS, THE NEED TO ADDRESS THE ONGOING CLIMATE CHANGE ISSUE HAS PREVAILED IN ALL AREAS, ESPECIALLY THE NEED FOR GREEN ENERGY SUCH AS SOLAR PANELS AND WIND TURBINES. CURRENTLY, THERE IS LARGE PRESSURE THROUGH THE PARIS CLIMATE AGREEMENT FOR CARBON NEUTRALITY BY 2050. ALTHOUGH THE US IS NOT CURRENTLY A PART OF THE PARIS CLIMATE AGREEMENT, THERE IS POTENTIAL FOR SIMILAR BINDING AGREEMENTS IN THE NEAR FUTURE. ADHERENCE TO THIS WOULD REQUIRE A TRANSITION INTO GREEN ENERGY PRODUCTION QUICKLY AND SWIFTLY. THIS DOES NOT MEAN CONSUMPTION OF LESS PRODUCTS OR LABOR, CONSUMPTION IN MORE ENVIRONMENTALLY CONSERVATIVE MANNERS. CONDUCTING BUSINESS THROUGH GREEN ENERGY ENSURES ENVIRONMENTAL STABILITY FOR THE STATE FOR YEARS TO COME.

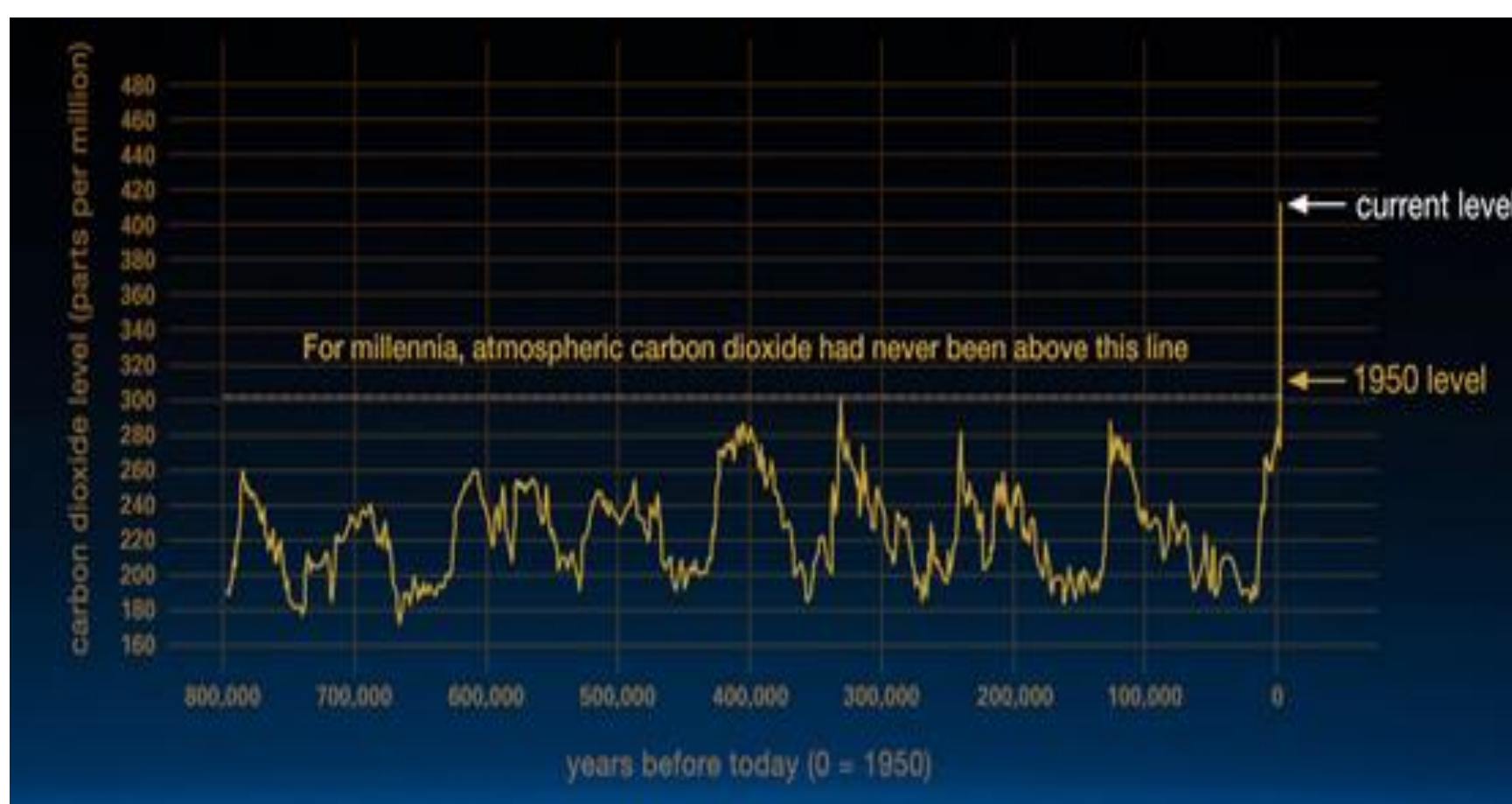


FIGURE 1, ATMOSPHERIC CARBON DIOXIDE LEVELS
<https://climate.nasa.gov/evidence/>

CURRENTLY, THE CARBON DIOXIDE IN THE ATMOSPHERE HAS NEVER RISEN ABOVE 300 PARTS PER MILLION. CURRENTLY, THE RATIO IS 420 PARTS PER MILLION, WITH AN INCREASE OF 120P/PM SINCE THE 1950'S, THE LARGEST JUMP IN 800,000 YEARS. ACROSS ALL STATISTICS, THERE HAS BEEN A SHARP INCREASE, WITH A 95% LIKELIHOOD THIS IS DUE TO HUMAN ACTIVITY.

STRUCTURAL OPPORTUNITIES AND CHALLENGES TO FUTURE SHIFT

OUR RESEARCH PROJECT STEMS FROM THE NEED TO SEE WISCONSIN'S ABILITY TO SHIFT TO GREEN ENERGY. FINDING THE STRUCTURAL OPPORTUNITIES AND CHALLENGES WILL HELP WISCONSIN'S MANUFACTURING TO BE FLEXIBLE WITH THE UPCOMING NEED TO CHANGE PRODUCTION TO GREEN PROCESSES. THIS WAY THE LARGE PRESENTS OF MANUFACTURING IN WISCONSIN WILL BE ABLE TO CONTINUE WITH THE CHANGING CLIMATE NEEDS.

NEED FOR STATE INCENTIVES TO BE ALIGNED WITH FUTURE NEEDS

UNDERSTANDING WISCONSIN'S CAPACITY AND ABILITY TO SWITCH TO GREEN MANUFACTURING IS IMPORTANT FOR MANY REASONS. THIS INCLUDES ENSURING THAT POLICIES AND INCENTIVES ARE ALIGNED WITH FUTURE ENERGY NEEDS. THIS RESEARCH CAN BE USED BY POLICY MAKERS TO UNDERSTAND WHERE INCENTIVES WOULD BE MOST EFFECTIVE AND WHERE THEY WOULD BE INEFFECTIVE. IT IS ALSO BENEFICIAL FOR THOSE IN THE INDUSTRY OF MANUFACTURING AS A LOOK INTO WHAT SUB-INDUSTRIES WILL BENEFIT FROM THE TRANSITION AND WHERE THERE MAY BE CHALLENGES IMPLEMENTING GREEN ENERGY MANUFACTURING.

METHOD AND DATA

METHOD

AS WE ARE ANALYZING THIS, WE ARE LOOKING AT THE REAL ECONOMIC ANALYSIS-WHICH IS WHAT WE ARE ABLE TO ACTUALLY PRODUCE. BECAUSE OF THIS, THERE IS THE POSSIBILITY FOR A LARGE GAP FOR EITHER DIRECTION IN CAPACITY BASED ON WHAT COULD BE PRODUCED THAT IS NOT CAPTURED IN THE LABOR EMPLOYMENT. THIS IS IN PART DUE TO THE HEAVIER AUTOMATION THAT IS OCCURRING IN THESE INDUSTRIES. ADDITIONALLY, BUSINESS RECEIPT DATA BY STATE AND INDUSTRY HAS NOT BEEN PUBLISHED SINCE 2012. THEREFORE, WE WERE REQUIRED TO ESTIMATE REVENUE BASED ON LABOR. WE HAVE DONE THIS UNDER THE ASSUMPTION BACKED BY SIMILAR RESEARCH THAT LABOR WOULD BE BETWEEN 50% TO 66% OF A COMPANIES TOTAL REVENUES OR RECEIPTS

NAICS CODE SYSTEM

THE NAICS SYSTEM IS A SYSTEM OF CODES THAT IDENTIFY FIRM TYPE. NAICS CODES CONSISTS OF 6-DIGITS. AS THE DIGITS INCREASE THE CODES GET MORE SPECIFIC TO DESCRIBING THE FIRM TYPE. FOR EXAMPLE, NAICS CODE 11 IS AGRICULTURE, FORESTRY, FISHING AND HUNTING, 1111 IS OILSEED AND GRAIN FARMING, 111110 IS SOYBEAN FARMING. WE USED THE NAICS SYSTEM IN OUR PROJECT TO MATCH CENSUS DATA WITH PROPRIETARY DATA THAT WE ANALYZED.

CENSUS INDUSTRIAL DATA

WE WERE ABLE TO UTILIZE CENSUS DATA TO IDENTIFY THE LARGEST MANUFACTURING INDUSTRIES IN WISCONSIN BASED ON EMPLOYMENT AND PAYROLL AS IDENTIFIED IN FIGURE 2. MANY OF THESE DATA CATEGORIES WOULD NOT BE ABLE TO BE TRANSITIONED OR EFFECTED BY GREEN ENERGY MANUFACTURING, SUCH AS CHEESE MANUFACTURING, MEAT PROCESSED FROM CARCASSES AND ANIMAL SLAUGHTERING. FOR THIS REASON, WE HAVE FOCUSED ON INDUSTRIES FOUND IN FIGURE 4.

Industry	Employment	Payroll in thousand
Commercial Printing (except Screen and Books)	23,199.00	\$ 1,142,460.00
Cheese Manufacturing	17,223.00	\$ 924,163.00
All Other Plastics Product Manufacturing	16,005.00	\$ 702,924.00
Machine Shops	11,773.00	\$ 557,647.00
Paper (except Newsprint) Mills	9,726.00	\$ 635,005.00
Meat Processed from Carcasses	9,283.00	\$ 366,929.00
Iron Foundries	6,107.00	\$ 332,999.00
Animal (except Poultry) Slaughtering	5,962.00	\$ 281,673.00
Wood Window and Door Manufacturing	5,805.00	\$ 228,063.00
Sheet Metal Work Manufacturing	5,455.00	\$ 282,595.00
Relay and Industrial Control Manufacturing	5,368.00	\$ 376,791.00

FIGURE 2, WISCONSIN INDUSTRIES

PROBLEMS ASSOCIATED WITH RECEIPTS

WHEN LOOKING AT THE CENSUS RECEIPTS, THERE ARE SEVERAL LIMITATIONS WITHIN THIS DATA. THE LARGEST BEING THAT THE 2017 BUSINESS CENSUS DATA AT THE STATE LEVEL WAS NOT ABLE TO BE PUBLISHED DUE TO STATISTICAL ERRORS. THEREFORE, WE DO NOT HAVE ANY RECENT DATA BY INDUSTRY, PRIOR TO 2012. ADDITIONALLY, THIS DATA DOES NOT UTILIZE THE STANDARD NAICS CODES, PROHIBITING US FROM BEING ABLE TO COMPARE THE SAME CATEGORIES.

PROPRIETARY DATASET AND LIMITATIONS OF DATASET

THROUGH ACCESS VIA THE EAU CLAIRE PUBLIC LIBRARY SYSTEM, WE WERE ABLE TO OBTAIN ACCESS TO THE A-Z DATABASE SYSTEM LISTING ALL REGISTERED FIRMS WITHIN THE STATE OF WISCONSIN. THIS INCLUDES REVENUE AND EMPLOYMENT DATA FOR ALL INDUSTRIES LOCATED WITHIN THE STATE. THIS INFORMATION IS COLLECTED THROUGH MARKETING FIRMS AND OTHER PRIVATE BUSINESS LISTINGS. HOWEVER, THERE WAS NO PRESSURE FOR THESE FIRMS TO ACCURATELY REPORT THEIR DATA, AS THERE IS WHEN WORKING WITH THE CENSUS. IF INFORMATION IS INCORRECTLY REPORTED TO THE CENSUS, IT IS A FEDERAL VIOLATION. ADDITIONALLY, THE REPORTED INFORMATION WAS FOR THE ENTIRE COMPANY, REGARDLESS OF THEIR PORTION WITHIN WISCONSIN.

METHOD AND DATA CONT.

COMBINING CENSUS DATA AND PROPRIETARY DATA

TO USE THE US CENSUS DATA, WE HAD TO MATCH IT WITH PROPRIETARY DATA. THE PROPRIETARY DATA DOESN'T HAVE NAICS CODE TO MATCH CATEGORIES OF FIRMS WITH THE NAICS USED ON THE US CENSUS DATA. WE HAD TO MAKE SOME ASSUMPTIONS WHEN MATCHING CATEGORIES OF FIRMS IN THE US CENSUS DATA AND PROPRIETARY DATA. WITHIN EACH LEADING NAICS CODE THAT WE WERE INTERESTED IN, WE WERE ABLE TO IDENTIFY THE LARGEST CONTRIBUTORS OF THAT NAICS CODE WITHIN WISCONSIN UTILIZING A-Z DATABASES BY NAME OF THE COMPANY. THROUGH FURTHER INVESTIGATION, WERE ABLE TO DESCRIBE THE CAPABILITIES OF THESE MANUFACTURERS.

SOLUTIONS:

BECAUSE OF THE ABOVE-MENTIONED PROBLEMS, WEHAVE DETERMINED THE BEST SOLUTION WOULD BE TO ESTIMATE RECEIPTS FROM THE LABOR PAYROLL DATA GIVEN BY THE CENSUS. UTILIZING INDUSTRY STANDARDS, WE WERE ABLE TO ESTIMATE THAT LABOR COSTS ARE 50% TO 66% OF TOTAL RECEIPTS. THIS ALLOWED US TO ESTIMATE RECEIPTS BASED FROM THE PAYROLL, GIVING US A ROUGH ESTIMATE ON TOTAL RECEIPTS WITHIN THE STATE, WHICH CAN BE SEEN BELOW.

NAICS	Description	Payroll	Payroll*1.33	Payroll *2
323111	Commercial Printing (except Screen and Books)	\$ 1,142,460.00	\$ 1,519,471.80	\$ 2,284,920.00
311513	Cheese Manufacturing	\$ 924,163.00	\$ 1,229,136.79	\$ 1,848,326.00
326199	All Other Plastics Product Manufacturing	\$ 702,924.00	\$ 934,888.92	\$ 1,405,848.00
322121	Paper (except Newsprint) Mills	\$ 635,005.00	\$ 844,556.65	\$ 1,270,010.00
332710	Machine Shops	\$ 557,647.00	\$ 741,670.51	\$ 1,115,294.00
334510	Electromedical and Electrotherapeutic Apparatus Manufacturing	\$ 442,242.00	\$ 588,181.86	\$ 884,484.00
335314	Relay and Industrial Control Manufacturing	\$ 376,791.00	\$ 501,132.03	\$ 753,582.00
311612	Meat Processed from Carcasses	\$ 366,929.00	\$ 488,015.57	\$ 733,858.00
331511	Iron Foundries	\$ 332,999.00	\$ 442,888.67	\$ 665,998.00
322220	Paper Bag and Coated and Treated Paper Manufacturing	\$ 327,042.00	\$ 434,965.86	\$ 654,084.00
333120	Construction Machinery Manufacturing	\$ 325,594.00	\$ 433,040.02	\$ 651,188.00
326112	Plastics Packaging Film and Sheet (including Laminated) Manufacturing	\$ 319,671.00	\$ 425,162.43	\$ 639,342.00

FIGURE 3, ESTIMATED PAYROLLS FOR SELECTED INDUSTRIES

DESCRIBE SORTING PROCESS

UTILIZING THE US CENSUS ANNUAL DATASETS BY ESTABLISHMENT INDUSTRY, WE WERE ABLE TO DEVELOP A LISTING OF THE LARGEST INDUSTRIES IN THE STATE BY BOTH EMPLOYMENT AND PAYROLL. WITH THIS, WE RECEIVED THE FOLLOWING INDUSTRIES. YOU MAY NOTE THAT OF THE TOP 10 INDUSTRIES, 5 ARE NOT RELATED TO THE PRODUCTION OF GREEN ENERGY SUPPLY CHAIN COMPONENTS. THESE ARE INCLUDED HERE FOR THE FOLLOWING REASONS, 1) LABOR TRAINING IN MANUFACTURING PROCESSES ARE MORE LIKELY TO BE AVAILABLE AS THESE INDUSTRIES DECLINE IN IMPORTANCE AND OTHER GREENER INDUSTRIES EXPAND, 2) DATA COMMONLY GIVES STATE MANUFACTURING CAPACITY/SHARE. THIS DATA IS MISLEADING BECAUSE IT INCLUDED MANY INDUSTRIES UNRELATED TO 'HIGH-TECH', AND 3) IN THE STATE OF WISCONSIN THERE ARE STRONG TAX INCENTIVES TO CLASSIFY A BUSINESS AS 'MANUFACTURING', AS SUCH MANY INDUSTRIES THAT MIGHT NOT COMMONLY BE THOUGHT OF AS MANUFACTURING ARE CATEGORIZED THAT WAY IN THE DATA. THROUGH EXAMINATION OF THE CAPABILITIES OF THESE CATEGORIES, WE WERE ABLE TO REDUCE THE LIST DOWN TO INDUSTRIES THAT WOULD BE ABLE ENTER INTO THE SUPPLY CHAIN FOR THE MANUFACTURING OF GREEN ENERGY MATERIALS SUCH AS SOLAR PANELS, WIND TURBINES AND NUCLEAR REACTORS. WHEN DOING THIS, WE LOOKED SPECIFICALLY AT THE ABILITY FOR HIGH PRECISION MANUFACTURING WITH HIGH TEMPERATURE VARIANCES WITHIN THE NEEDED INDUSTRY. WITH THIS, WE HAVE PINPOINTED SEVERAL INDUSTRIES AS SEEN IN FIGURE 4.

Industry	Employment	Payroll	Relation to Green Energy Manufacturing
Commercial Printing (except Screen and Books)	23199	1142460	No
Cheese Manufacturing	17223	924163	No
All Other Plastics Product Manufacturing	16005	702924	Yes
Machine Shops	11773	557647	Yes
Paper (except Newsprint) Mills	9726	635005	No
Meat Processed from Carcasses	9283	366929	No
Iron Foundries	6107	332999	Yes
Animal (except Poultry) Slaughtering	5962	281673	No
Wood Window and Door Manufacturing	5805	228063	No
Sheet Metal Work Manufacturing	5455	282595	Yes
Relay and Industrial Control Manufacturing	5368	376791	Yes

FIGURE 4, PINPOINTED INDUSTRIES

ANALYSIS CONTINUED

PINPOINTED INDUSTRIES

METAL FABRICATORS: CONTRACT BASED MANUFACTURING MOST TYPICALLY SPECIALIZING IN: CNC MACHINING, LASER/PLASMA CUTTING, STAMPING (METAL), FORMING AND PUNCHING (METAL), METAL FORMING. THESE ARE TYPICALLY SMALLER SHOPS WITH SPECIFIC CAPABILITIES.

RELAY AND INDUSTRIAL CONTROLS: THESE INDUSTRIES SUPPORT THE ELECTRONIC AND CONTROL NEEDS FOR AEROSPACE, INDUSTRIAL VEHICLES, MARINES AND MILITARY VEHICLES INCLUDING TRANSMISSIONS, CIRCUIT BOARD MANUFACTURING AND GEAR BOXES. THEY ALSO INCLUDE THE CAPABILITIES OF HAVING HIGH PRECISION SOLDERING AND ASSEMBLY, MECHATRONICS, MULTI-STAGE ELECTRIC WORK, PNEUMATIC AND HYDRAULIC WORK AND MICROCHIP BONDING.

MACHINE SHOPS: GENERALLY, DO CONTRACT-BASED MACHINING FOR A VARIETY OF CUSTOMERS (FEW ARE INDUSTRY DEDICATED). A HANDFUL OF SHOPS ARE ISO 9001 CERTIFIED. WORK IN METALS, PLASTICS, CHEMICAL, AND WOOD. SEEMS TO BE MOSTLY METALS AND PLASTICS. MOST SHOPS UTILIZE CNC MACHINES. SERVICES COMMONLY INCLUDE: FABRICATION (VARIETY OF MATERIALS), CASTING (VARIETY OF MATERIALS), TOOL AND DIE, PRECISION MILLING, WELDING, GRINDING AND BONDING.

ENGINE EQUIPMENT MANUFACTURING: COMMERCIAL AND CONSUMER ENGINE PRODUCTION FOR GASOLINE, DIESEL AND ALTERNATIVE FUELS. THESE HAVE THE CAPABILITIES OF MANUFACTURING LIQUID AND AIR COOLING, MANUAL AND ELECTRIC STARTS WITH CAPABILITY FOR UP TO 10 HORSEPOWER. THERE ARE THREE INTERNATIONAL ENGINE MANUFACTURERS WITH THEIR HEADQUARTERS IN WISCONSIN LOCATED ON THE EASTERN SIDE OF THE STATE.

CONCLUSIONS AND REMAINING QUESTIONS

CLIMATE CHANGE IS SHIFTING THE NEED FOR ENERGY TO MORE SUSTAINABLE OPTIONS. OUR RESEARCH WAS TO FIND STRUCTURAL OPPORTUNITIES AND CHALLENGES FOR INDUSTRIES IN WISCONSIN AND ASSESS THEIR ABILITY TO PARTICIPATE IN MANUFACTURING SUSTAINABLE ENERGY OPTIONS. WE FOUND THAT THERE EXIST SIGNIFICANT OPPORTUNITIES FOR WISCONSIN MANUFACTURING TO TRANSITION TO A 'GREENER' FUTURE. CITIZENS TODAY HAVE A GREATER DESIRE TO REDUCE THEIR ENVIRONMENTAL IMPACT WHICH IS TRANSITIONING THEIR DEMAND TO MORE SUSTAINABLE BUSINESSES AND GREEN ENERGY. A TRANSITION TO GREENER MANUFACTURING COULD PROVIDE WISCONSIN WITH NOT ONLY MORE ENVIRONMENTAL STABILITY BUT ALSO ECONOMIC STABILITY. FINDING IN-STATE GREEN ENERGY OPPORTUNITIES WILL BENEFIT WISCONSIN AND ITS MANUFACTURERS. THIS RESEARCH COULD ALLOW INCENTIVES TO BE PLACED THAT WILL HELP TRANSITION WISCONSIN MANUFACTURING INTO AREAS THAT WILL HAVE MORE DEMAND AND PROSPERITY IN THE FUTURE.

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CITATIONS

UNITED STATES CENSUS BUREAU. "2016 SUBS ANNUAL DATASETS BY ESTABLISHMENT INDUSTRY." 2019.

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