



CITIZENS RESEARCH COUNCIL OF MICHIGAN

Detroit Public Schools Financial Crisis

Michigan Senate
Government Operations Committee
February 9, 2016

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- Statewide
- Non-partisan
- Private not-for-profit
- Promotes sound policy for state and local governments through factual research – accurate, independent and objective
- Relies on charitable contributions of Michigan foundations, businesses, and individuals
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Current Situation

Nothing Short of a Crisis

- Crisis years/decades in the making
- General Fund deficit balloons from \$83M (FY2012) to \$335M (FY2016)
- Legacy debts total \$440M at start of this year
- DPS continues to hemorrhage students (revenue)
- Aging and deteriorating capital facilities
- Academic performance at bottom, both in Michigan and nationally
- Four state-appointed emergency managers since 2009; each unable to solve financial problem



Legacy Costs

Mostly Unfunded Pension Benefits

	Amount (\$millions)
<u>Operating Liabilities - Legacy Costs</u>	
MPSERS - Pension Unfunded Actuarially Accrued Liability (UAAL)	\$ 872.7
MPSERS - Retiree Health UAAL	443.8
Delinquent MPSERS payments	80.9
Termination Incentive Plan - UAAL	16.6
<i>Subtotal - Legacy Costs</i>	<u>\$ 1,414.0</u>



Operating Debts

Mainly Refinanced Cash Flow Borrowings

	Amount (\$millions)
<u>Operating Liabilities - Debts</u>	
Refinanced 2005 and 2011 cash flow borrowings	\$ 259.2
Refinanced 2014 cash flow borrowing	82.8
2015 cash flow borrowing	121.0
<i>Subtotal - Debts</i>	<u>\$ 463.0</u>



Total Debts of \$3.5B

Operating Liabilities of \$1.9B

Detroit Public Schools Legacy Costs and Other Liabilities, 2015 (Dollars in millions)

Operating Liabilities

	<u>Amount</u>
MPSERS – Pension Unfunded Actuarially Accrued Liability	\$872.7
MPSERS – Retiree health Unfunded Actuarially Accrued Liability	443.8
Delinquent MPSERS payment (principal and interest)	80.9
Termination Incentive Plan – UAAL	16.6
Refinanced 2005 and 2011 cash flow borrowings	259.2
Refinanced 2014 cash flow borrowing	82.8
2015 cash flow borrowing	<u>121.0</u>
<i>Subtotal – operating liabilities</i>	<i>\$1,877.0</i>

Capital Liabilities

"Qualified" general obligation bonds	1,452.1
School Loan Revolving Fund loan (principal and interest)	<u>198.7</u>
<i>Subtotal – capital liabilities</i>	<i>\$1,650.8</i>

Total **\$3,527.8**

Source: Comprehensive annual financial reports of Detroit Public Schools from multiple years, comprehensive annual financial reports of the Michigan Public School Employees Retirement System, official prospectuses for various borrowings by Detroit Public Schools, and State of Michigan sources. Information is reported for the most recent fiscal year (FY2015) when available.



A Common Response

Convert Short-Term Obligations to Long-Term Debt

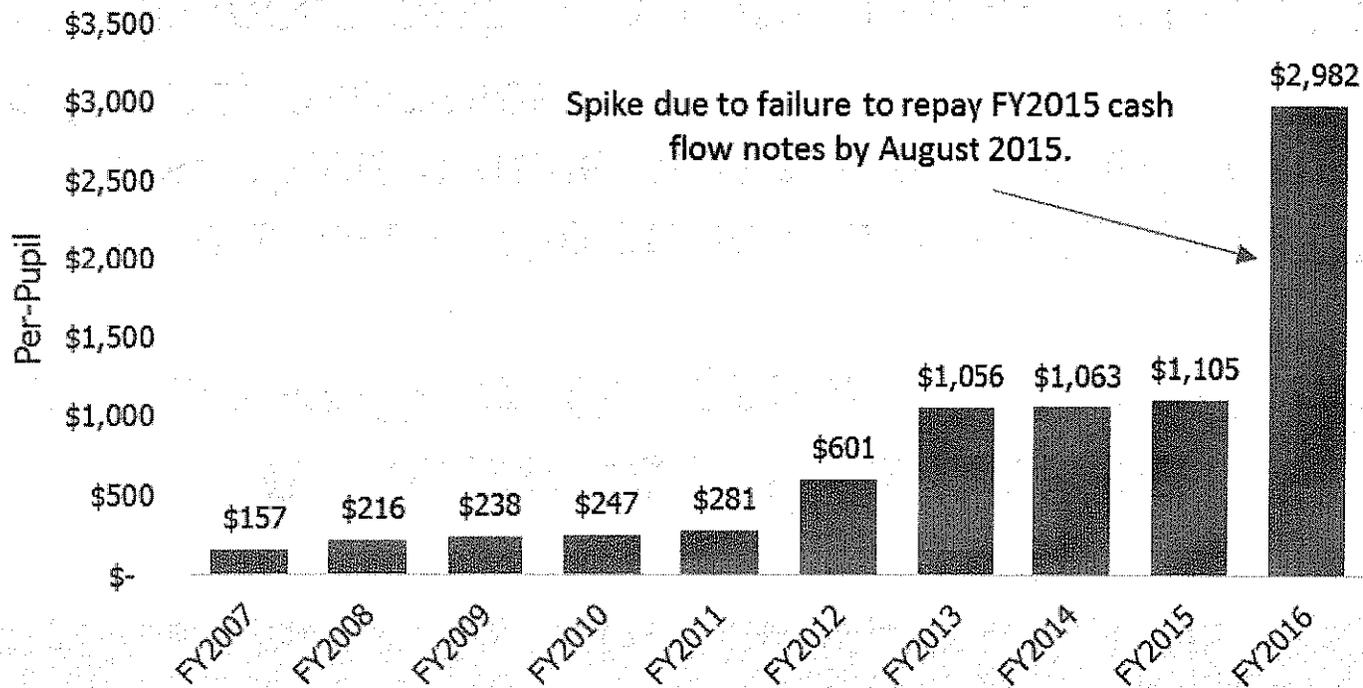
- Unable to address the structural imbalance in DPS finances, officials have repeatedly pushed costs into the future, examples:
 - Refinanced cash flow notes (2005, 2011, 2014)
 - Delinquent pension contributions (2015)
 - Termination Incentive Plan (2009)
- Result: Costs being borne by current students



Per-Pupil Debt Service Payment Grows

Additional Debt and Declining Enrollment

Annual Debt Service for Past Cash Flow Borrowings

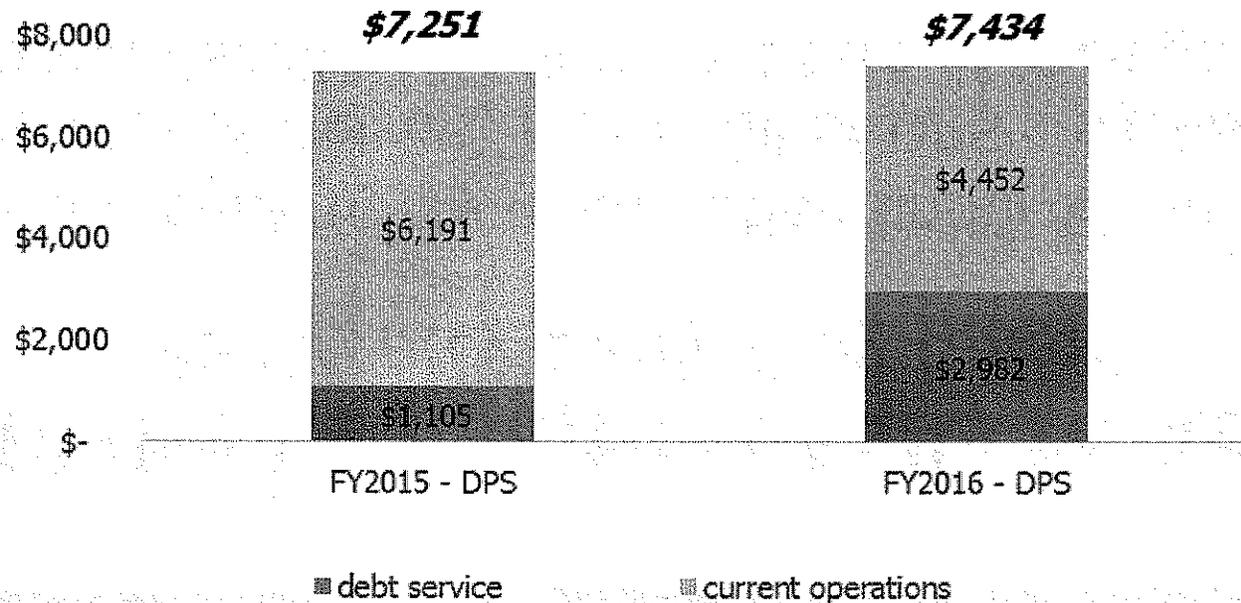




Fewer Discretionary Resources

40% of FY2016 Grant to Debt Service

Allocation of Per-Pupil Foundation Allowance



Source: Office of Retirement Services, DPS



If the Legislature Fails to Act *Bankruptcy Likely Only Option*

- Court-led bankruptcy is an option under EM law
- Unlike City of Detroit, nearly all of DPS's \$1.9B operating liabilities backed by State of Michigan
 - \$1.3B unfunded retirement liabilities fall to other districts and state
 - Various cash flow borrowings issued by Michigan Finance Authority
- Capital debt/loans (\$1.7) secured by property tax
- Bottom line, state responsible for majority of DPS operating debts



CRC Publications

- *Detroit Public Schools' Legacy Costs and Indebtedness*, January 2016
- *Paying for Former Students' Education with Today's Dollars*, November 2015
- *Snyder's DPS Plan May Ultimately Hinge on Local Vote*, October 2015
- *State Assumption of School Debts*, April 2015

Available at:
www.crcmich.org

THE UNIVERSITY OF CHICAGO

PHYSICS DEPARTMENT

PHYSICS 439: QUANTUM MECHANICS
LECTURE 10: THE HARMONIC OSCILLATOR
PROFESSOR JOHN MITCHELL

WINTER 2011

1. The harmonic oscillator is a fundamental system in quantum mechanics. It is the only potential for which the Schrödinger equation can be solved exactly. The potential energy is given by $V(x) = \frac{1}{2}kx^2$, where k is the spring constant. The total energy is the sum of the kinetic energy and the potential energy. The energy levels are equally spaced, and the ground state energy is non-zero. The wavefunctions are given by Hermite polynomials multiplied by a Gaussian factor. The probability density is the square of the wavefunction. The expectation values of position and momentum are zero for all energy levels. The uncertainty principle is satisfied, with the uncertainty in position and momentum being inversely proportional to the energy level.